

## International FTTH Deployments

# Lessons Learned Around The Globe

Unlimited bandwidth and lower cost make fiber the broadband choice of the future.

by Bob Whitman

### Author Profile

*Bob Whitman is the Manager of Global Broadband Market Development at Corning, Inc., in Corning, NY. He is responsible for analyzing market opportunities for FTTH and for FTTP worldwide. Corning sells optical fiber products for FTTH, FTTP and "fiber-to-the-curb" worldwide.*

(WhitmanRJ@Corning.com)

In each region of the world, unique political, economic and cultural factors influence how and why broadband may be deployed. But the decision to deploy broadband is only a starting point. The more important next step is to select from among a variety of competing broadband technologies.

Increasingly, the broadband technology of choice for leading-edge countries around the world is fiber-to-the-home, or FTTH.

With FTTH, these countries are meeting the ever-growing need for bandwidth to enable both existing applications and applications yet to be conceived.

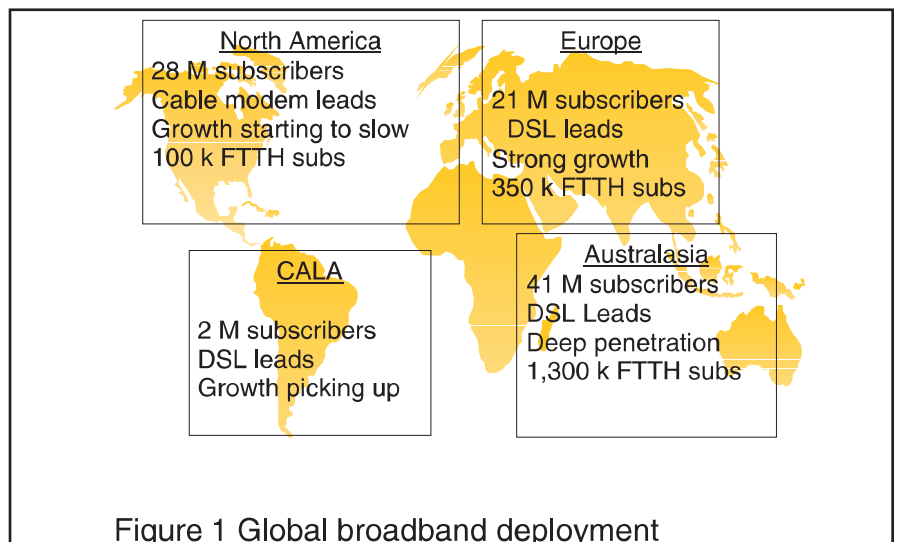
Yet the choice of FTTH itself presents a number of variables, including the type of "architecture" used to build an FTTH infrastructure and deploy the technology. The options include passive optical networks (PON) or active optical networks (AON); protocols, including Ethernet and asynchronous

transfer mode (ATM); services such as analog or digital video, circuit-switched voice or voice over IP (VoIP); and data rates.

Lessons may be learned from the choices different regions and nations around the world have made from among these variables.

### Regional View

North America is unique in that broadband deployment to-date is dominated by cable modem-based services, which have twice the number of subscribers as digital subscriber line (DSL) services. There are several reasons for this disparity, including the facts that North America has longer and older local copper loops than European and Asian countries, and that cable-TV systems have been widely upgraded and reach over 80% of the population. FTTH has been deployed in mostly rural areas by alternative carriers such as municipalities, home developers and rural local exchange carriers (RLECs).



Source: Corning Incorporated, RHK, Render Vanderslice

The latest development is the commitment by Verizon to pass one million homes with FTTH in 2004 and up to two million homes in 2005. If other carriers develop similar rollout plans, the US will be in a position to catch up to some of the early leaders in FTTH deployment as reflected in Figure 1.

Europe as a whole has seen strong broadband growth, primarily through DSL. The short loop lengths and lack of competition from cable companies is enabling incumbent carriers to deploy broadband at their own paces. Proactive regional and local governments have been driving forces for many of the current and planned FTTH deployments. Sweden, Italy and the Netherlands lead Europe in FTTH deployments.

Asia is the clear leader in both current-generation broadband and FTTH. There, Korea has long led global broadband penetration and continues to advance, having migrated from DSL to "VDSL" and now toward a national build-out of FTTH. Indeed, the fast evolution of broadband within Korea is a model for developing nations that want to quickly deploy broadband without first utilizing older, slower technologies.

While Korea leads in broadband penetration, Japan leads in the deployment of FTTH. As of May 2004, Japan had more than 1.2 million FTTH subscribers. This is an order of

magnitude more than most developed countries. Moreover, the pace of FTTH deployment in Japan has continued to rise over the last two years. Right now, 100,000 new subscribers are added per month (Figure 2).

This growth is driven by multiple carriers deploying independent fiber networks. In some places in Japan, such as downtown Tokyo, consumers have a choice of FTTH providers, because multiple fiber connections from different carriers pass their homes. Currently, the leading FTTH carriers are NTT (East and West), followed by USEN, Tokyo Electric Power Company, PowerCom, K-Opticom, IP Revolution, and KDDI.

**Public Policy And Regulation**

A common misconception by industry analysts is that the success of many leading broadband nations is driven by government subsidies. In fact, Japan has led the deployment of FTTH without the help of a government subsidy.

A more vital and common thread among leading broadband nations is a national broadband policy. Nations with progressive national broadband policies have readily adopted new technologies and integrated them into their citizens' daily lives, and these are the countries that are reaping the benefits of advanced broadband infrastructures in terms of labor efficiency, improved education and better entertainment.

National broadband initiatives in Ireland, Canada, Korea, Netherlands, France, Japan, Australia, China and other nations have at least one thing in common – the philosophy that broadband connectivity for their citizens is essential for their nation to actively participate in the global economy. Commitment to building for the future requires resolve and an environment, both political and economic, that rewards investment.

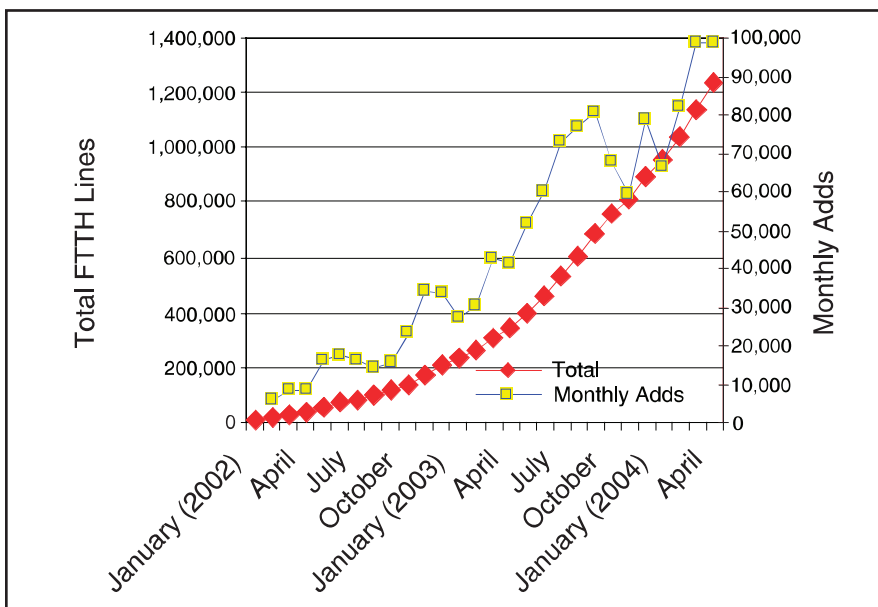
In some nations, many incumbent phone companies are required through telecommunications policies to allow competitors to use their facilities to provide voice services.

However, as carriers evolve to offer the "triple play" of voice, video and data services, the regulations in some countries have been unclear, causing uncertainty in the market. This uncertainty has had the effect of delaying investment by both carriers and investors.

This had been the situation in the U.S. until recently. Last year the U.S. modified these sharing obligations in the Federal Communications Commission's (FCC) Triennial Review Order. In essence, the changes mean incumbent phone providers will not be required to share their new fiber networks if they bring fiber all the way to the home. Thus, with new FTTH networks, there are no sharing requirements, and with "overbuilds" – where fiber is added to an existing, older network infrastructure – the incumbent is required to share only a voice circuit on the fiber or allow use of the installed copper plant if they choose not to retire it. This FCC ruling provides an incentive for FTTH providers to build new networks while achieving a return on their investment.

Hong Kong has followed with very similar rules, reducing the sharing requirements on network operators that build advanced networks and provide new services. Additional nations may adopt similar rules.

In several countries, telephone companies are prohibited from offering some services over their networks. For example, in China, Vietnam, Turkey and Japan, telephone companies are



Source: Ministry of Public Management–Information and Communications in Japan (May 2004)

restricted from offering video services. There is some evidence that these restrictions may loosen over time since some carriers have successfully won the right to deploy previously restricted services.

To be sure, government subsidies and incentives do exist. In Europe, the European Union has set aside €10 billion through 2006 for broadband in underserved areas. Korea is providing low interest rate loans to carriers for the deployment of broadband. The US legislature is considering tax incentives to carriers for the deployment of advanced broadband services in rural areas, while the US Department of Agriculture sponsors a low interest rate loan program for rural broadband deployment. The US programs are enablers for some rural communities, but the real driver in the US is competition.

### Competition

Early market drivers for broadband consisted of new revenue opportunities and competition for consumers. These

drivers still exist but have been augmented by the desire for faster speeds, as well as new and additional services. For example, cable-TV companies in the U.S. are poised to start offering voice services. They already have two million voice lines that are primarily circuit-switched, and the promise of VoIP has spurred them to offer new broadband-based phone service. Witness the recent announcement by Comcast of plans to roll out VoIP to 40 million customers.

The CATV hybrid fiber-coax (HFC) network is capable of offering the triple play. In fact, where CATV companies have entered the voice market in the U.S., they have been able to garner as much as 15% market share. But the legacy telephone companies' twisted-pair networks in this country are not capable of providing a competitive video offering, and therefore the incumbent telephone companies are responding with FTTH.

Similarly, Korea is experiencing strong competition between cable

modem services and DSL services, with cable modem having garnered 30% of the broadband market.

As discussed previously, there are many carriers deploying fiber networks in Japan. One of the key drivers for FTTH there is the early success of Yahoo! Japan, an independent Internet service provider, in rolling out DSL service by leasing the copper loop at reduced rates for its Yahoo BB service. This created an incentive for Japanese carriers to deploy a redundant fiber network for data services at speeds not achievable over DSL. In fact, the Japanese carriers continue to use the copper loop for voice services, and use the fiber network for data services only.

Regionally, Europe has very little competition for broadband services. CATV networks have not penetrated to the same extent as in other mature regions, nor are they upgraded for two-way broadband communications. The lack of competition from large competitors has allowed the telephone companies, known as PTTs, to deploy

**NEW PROMOTIONAL RATES!**

**teleguide** >> *it's on right now!*



Teleguide is THE choice in a flexible, cost effective on-screen electronic programming guide!

Teleguide also includes a web-based, customizable barker channel that allows your resident managers to use the internet to post advertisements, community announcements, news and information right on their own CTV channel! Provided exclusively by 4com

Check out [www.teleguide.tv](http://www.teleguide.tv) for new promotional pricing information or call 1.800.737.0852

FTTH Architectures	Peak Downstream Delivery	Peak Upstream Bit Rate	Max Split	Protocol	Standards	Standard Body
APON/BPON	622 Mbps	155 Mbps	1:32	ATM	G.983.1/ G.983.3	ITU-T / FSAN
GPON	2.5 Gbps	2.5 Gbps	1:64	ATM	G.984	ITU-T / FSAN
EPON	1 Gbps	1 Gbps	1:16	Ethernet	802.3ah	IEEE
Active optical networks(Pt-Pt)	1 Gbps	1 Gbps	Dedicated	Ethernet	802.3ah	IEEE

Figure 3 Standards-based FTTH architectures

broadband via DSL at their own pace. This lack of competition may stymie the growth of FTTH in Europe.

**Architectures**

FTTH standards do exist and many equipment vendors are shifting from proprietary systems to standards-based systems. While there are several architectures and protocols (Figure 3), some make more sense in particular regions.

The US carriers are becoming full-service providers and require a system fully capable of providing multiple services and integrating with existing systems. The primary choice is an ATM-based PON using circuit-switched voice with an analog video overlay.

Japan is primarily using an active point-to-point system, sometimes referred to as a media converter. This architecture is Ethernet based and is well-matched to data-only requirements. The active architecture also is well suited for Europe and other areas without pervasive analog video deployments.

**Applications**

The deployment of advanced networks provides innovators with a platform to develop new applications. Until now, applications have been limited by the network. In Korea, 90% of Internet users are playing online games. They hold tournaments in which professional gamers compete for money and fans come to cheer on their favorite players. Globally, Wi-Fi is changing the way people work and use the Internet at home. Wi-Fi enables multiple devices within the home – for example, computers, televisions, handheld devices, online games and appliances – to connect to the Internet at the same time. Over time, the bandwidth needs of a typical home will quickly outgrow the capabilities of copper-based broad-

band connections. In Europe and parts of Asia, the percentage of the senior citizen population is increasing every year, and this demographic growth will burden the healthcare industry. Telemedicine and in-home monitoring will be necessary to meet the growing medical needs of the elderly.

**Economics**

Of course, some carriers will be driven to provide more or better services to compete for consumers, driving network upgrades and other rehabilitations of existing infrastructure or a complete rebuild of the network. So, an understanding of the economic impact of network choices is fundamentally important.

Fiber networks have proven to be at cost-parity with copper networks for new builds. Indeed, several U.S. carriers have built new PON networks for the same or almost the same cost as a new copper network. To a large extent, the cost-parity has been derived from the advent of environmentally-sealed and hardened optical connectors for drop-cable applications.

For overbuilds, fiber networks initially will cost more to deploy than upgrades to a copper network, but the operating cost savings attributable to reduced power consumption, lower

maintenance requirements and greater network efficiencies add up to a solid business case for full fiber networks.

Figure 4 represents the rapid growth of worldwide FTTH subscribers, which is driven in part by declining costs for active FTTH equipment and the declining price of installing the outside plant network. As FTTH technology continues to mature with deployment, costs will follow an already rapidly declining curve, further defining a solid business case for FTTH.

**Conclusion**

Certainly, a broadband network infrastructure won't be the sole answer to the social and economic development needs of a particular country, but there is evidence that it helps. Countries leading the broadband revolution are upgrading their current copper networks or building FTTH networks to continually provide their citizens with the bandwidth capacity they demand. And national broadband initiatives around the world, including specific broadband policies, have at least one thing in common: the idea that broadband is now a necessity to keep pace in this global economy.

Fiber is not always the first choice in bringing broadband to homes, but the nearly unlimited bandwidth and lower cost of operation will position fiber as the broadband choice of the future. ❖

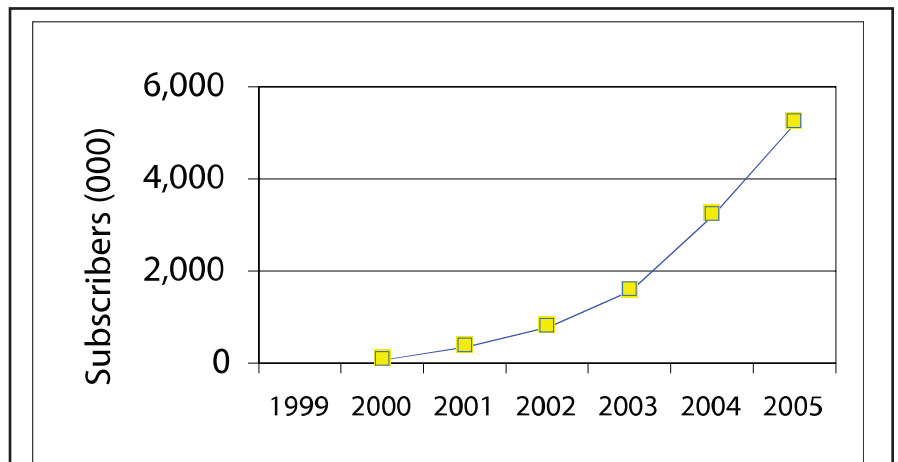


Figure 4 Worldwide FTTH subscribers

Source: Corning Incorporated, In-Stat, Point Topic