THE YANKEE GROUP REPORT

Residential Fiber Slowly Becomes a Reality in Western Europe: Part 1

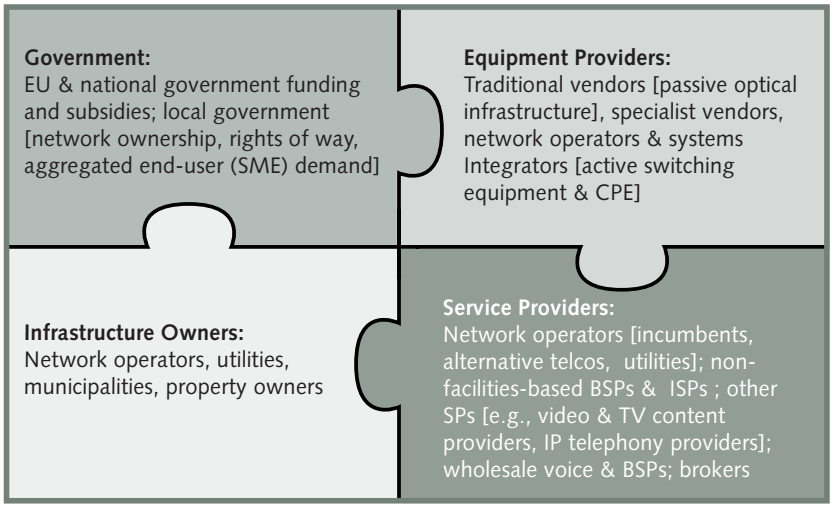
Executive Summary

Despite its slow beginnings, fiber-to-the-home (FTTH) remains the most future-proof broadband access technology, and it will gradually take root in the European residential market during the next 10 years. However, today's fiber landscape remains fragmented, with only patchy deployments in a small number of markets. The biggest barrier to FTTH deployment and adoption remains the cost of infrastructure, which has deterred telcos, Internet service providers (ISPs) and alternative operators from exploring the delivery of next-generation broadband services.

A number of business models are emerging to address the potential development of this nascent access technology market. The most viable are variants of an open network approach, whereby ownership of infrastructure is separate from that of service provision (see Exhibit 1). This will remove the burden of infrastructure provision from broadband service providers (BSPs), enabling effective service competition and the associated benefits of lower prices and greater choice for end users.

In this report, we analyze the strengths and weaknesses of FTTH as a technology. We also examine the development of business models within Europe's budding market for residential broadband services over fiber, assessing the importance of open infrastructure provision, public/private partnerships, demographic considerations, and service strategies.

Exhibit 1
Participants in the Open Network Model
Source: The Yankee Group, 2003



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I. Introduction

Despite the existence of alternatives, DSL and cable modem remain the only mass-market broadband access technologies. However, there are limits to both the existing capacity and geographic reach of today's cable and DSL networks. Moreover, the emergence of high-bandwidth content and applications will challenge the natural life cycle of these technologies, presenting opportunities for the development and deployment of a more future-proof solution to the expected growth in demand for "true" broadband.

Of the other alternative broadband technologies, only optical fiber is showing promise as a potential mass-market solution in Western Europe:

- Broadband fixed wireless access (BFWA) has found a niche in some eastern European countries, but is declining as a consumer technology in Western Europe. There is some interest in hybrid networks that mix fiber and Wi-Fi, especially the emerging technology known as WiMax, but it is too early in the development stage for full consideration of its potential. Depending on the success of technology development and trials, BFWA could see an upsurge in interest from 2004 and beyond.

- Satellite service also offers a niche alternative for those unable to receive either DSL or cable modem, but bi-directional services are currently too expensive for most consumers, while the cheaper one-way variants are dependent on dial-up connections for the return path. Although one-way satellite has picked up a few hundred thousand customers across Europe, growth has stalled—while ADSL and cable forge ahead. Until affordable two-way services are available, broadband satellite will remain a niche product that serves customers beyond the fixed-line footprint.

- Powerline has made limited progress in some German towns, such as Mannheim, as well as in parts of Scotland and Spain, but tends to compete on the same terms as DSL and cable modem. Currently, only a few tens of thousands of homes are connected on commercial services.

That leaves optical fiber, which has made real progress in Europe, driven by some key advantages:

- Future-proof technology with near limitless capacity: Only fiber is currently capable of handling multichannel high-definition TV (HDTV).

- Costs of installation are continuously falling: Installation costs on greenfield sites are now comparable with the cost of conventional copper-pair systems.

- Allows a more comprehensive package of services: These may include multichannel TV, video-on-demand (VoD), digital video recorders (DVRs) as well as broadband Internet access and telephony.

Access Technology Comparisons

Exhibit 2 compares the capabilities, benefits and drawbacks of today's consumer broadband access technologies.

Fiber has several clear advantages over today's dominant broadband access technologies. First, it offers uncontended, symmetrical bandwidth for virtually unlimited numbers of users connected to a local access node. More importantly, fiber supports much higher upload and download speeds than either ADSL or cable modem, making it far better suited to bandwidth-hungry applications, such as video streaming. However, recent developments in DSL technology have resulted in the emergence of standards for higher capacity DSL flavors. The most notable of these are VDSL and ADSL2+, both of which offer bit rates that would support the delivery of two to three discrete video streams over a single subscriber line. This capability is more than adequate to meet the demands of most of today's broadband consumers. A growing number of network operators and service providers are looking at these high-capacity DSL solutions as an alternative or precursor to the deployment of fiber closer to the home, which remains considerably more expensive.

Exhibit 2
Comparison of Broadband Access Technologies
Source: The Yankee Group, 2003

Access Type	Speeds Offered	Advantages	Disadvantages
ADSL	128-250 Kbps upstream; 128 Kbps-3 Mbps downstream	Point-to-point distribution, giving each customer an individual circuit; no contention in the access network	Limited capability for delivering quality video services over twisted copper pairs; contention in the backhaul network when over-subscribed
Cable Modem	64-256 Kbps upstream; 64 Kbps-4 Mbps downstream	Price: alternative operators typically charge less for broadband than dominant telcos; sometimes offered as part of a discounted "triple-play" bundle	Shared medium: contended service in the access network when over-subscribed; limited geographical rollout of upgraded cable networks; significantly higher speeds are possible, but would require costly backbone upgrade
ADSL2+	12-24 Mbps downstream (7,000-1,000 ft.)	Longer reach than VDSL; standardized technology; interoperability with existing ADSL platforms; suitable for customer premise deployments at 3,000-6,000 ft.	Possible over-proliferation of ADSL standards; distance constraints at distances of more than 8,000 ft., ADSL2+ has no advantages over ADSL2
VDSL	13-50 Mbps symmetrical (5,000-1,000 ft.)	Sufficient bandwidth to accommodate multiple video streams to a single customer premise; suitable for MDU deployment or a remote terminal build within 3,000 ft. of the customer premises	Distance constraints: full bandwidth capability only available within 300 m. of local exchange; lack of equipment standardization keeps costs high
Fiber to the Curb, Home or Building (FTTx)	10 Mbps downstream; up to 100 Mbps possible	Uncontended delivery of symmetrical, very high-speed access and bandwidth-intensive content; no distance constraints (apart from cost issues)	Expensive to deploy; rights-of-way issues; fragmented approach to deployment business models
Broadband Satellite	300 Kbps-6 Mbps downstream	Ability to reach beyond fixed-line footprint	Limited return path capability; expensive to deploy symmetrical service
Powerline	2 Mbps-10 Mbps symmetrical; up to 200 Mbps possible	Even greater ubiquity than copper twisted pairs	Relatively untested technology; ongoing process of standardization

II. The Role of FTTH: Costs and Benefits

Costs

Fiber's big disadvantage remains its cost of deployment. By far, the biggest cost element for FTTH—for which we estimate typical network equipment capital expenditure to be 30 to 40 percent higher than for DSL—is the cost of civil works or digging, which varies widely according to a range of factors:

- **Layout of city:** The proportion of large office buildings is important in establishing the FTTx (fiber to the curb, home or building) deployment cost base. The most important factors in these calculations are the density of the city and the number of people who live in multiple dwelling units (MDU) and businesses that operate in multi-tenant units (MTU).

- **Compensation:** Municipalities demand this for rights of way, traffic diversions, civil disruptions, etc.

- **Local labor costs:** These include the costs both for digging and restoring streets and for fiber splicing and other specialized tasks.

- **Obligations:** This could include an obligation to provide free access to schools, hospitals, etc.

- **Opto-electronics (i.e., passive optical network equipment):** This can cost as little as €250 per user for a shared connection in an MDU and as much as €50,000 or more for a building with complex requirements for business customers.

- **Fiber:** This can cost between €20 to €40 per meter, although it is cheaper than installing new copper, and prices are falling.

- **Administration:** This covers the front-loaded costs of building relationships with the various parties involved in a FTTH project. Included in this is cooperation with municipalities or utility companies for access to underlying infrastructure and negotiating with real estate owners for access to customer premises.

A study sponsored by Cisco, which supplies infrastructure equipment for several fiber-based metropolitan-area networks (MANs), found that the most significant costs were civil works (i.e., the cost of digging and the acquisition of rights of way). Cisco claims that equipment accounts for only 20 percent of the total deployment cost, with rights-of-way acquisition and civil works (along with fiber verticals) taking up the remaining 30 percent and 50 percent, respectively.

Connecting buildings with fiber is risky because of the big investment required to get into buildings and the limited number of potential clients. A typical building requires an investment of at least €5,000. This depends on a variety of factors: cost of labor; distance to breakout point on the fiber network ring; legal requirements and red tape; and alternate ways of entering a building, such as through sewers. Additionally, renting switch or router space from building owners can sometimes be hefty, but not always. In Italy, telecom service is considered a utility, and a service provider has a legal right to enter a building. The switch or router, along with the "vertical cabling" to connect the end user with the switch or router, is an additional and highly variable cost.

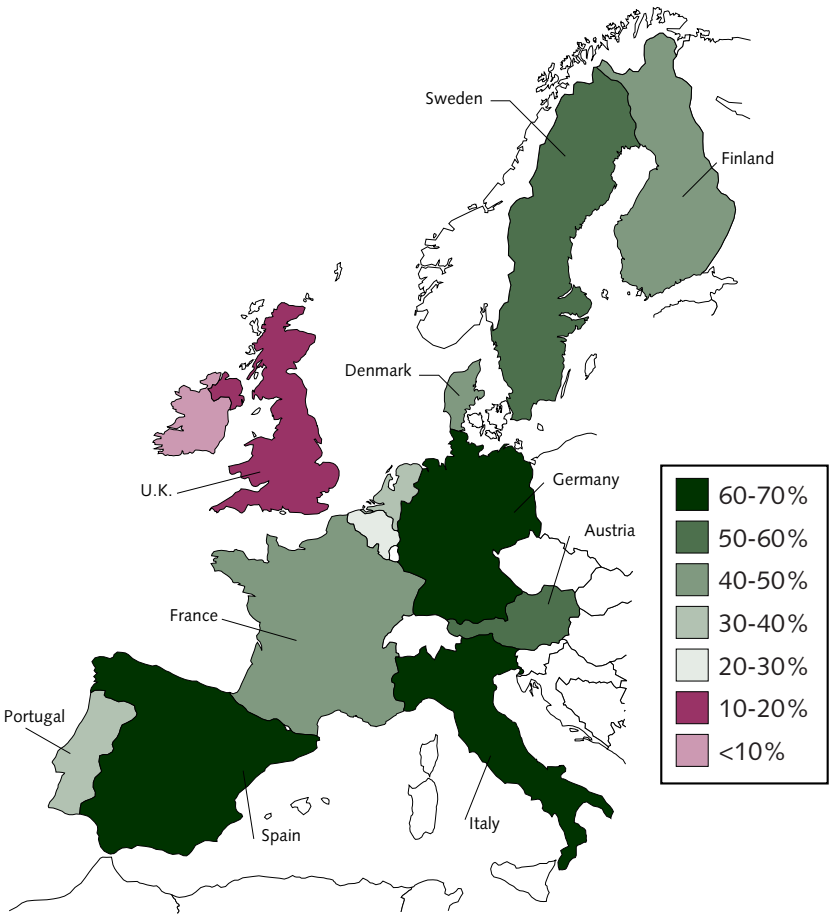
Other Considerations

The legal and regulatory situation impacts a network operator's entry into a city, district or building. If the roads have been repeatedly dug up in the past, then it will be a challenge to acquire permission for additional digging. Unlike in Italy, telecom companies in Paris can enter only with consent from the majority of tenants.

Perhaps the most significant factor determining the viability of rolling out FTTH is population density, relative to the number of buildings in a given locality. Countries or areas with a large presence of multiple-dwelling units (MDUs or apartments) present a more realistic opportunity for implementing fiber infrastructure than those with a higher proportion of individual homes. Exhibit 3 indicates the percentage of people living in MDUs in European countries.

The chart shows Italy, Germany and Spain have the highest percentage of apartment dwellers, making fiber network developers in these countries the biggest potential beneficiaries of the economies of scale associated with MDU rollout.

Exhibit 3
Proportion of People Living in MDUs in Europe
Source: The Yankee Group, 2003



III. Demand Analysis—The Business Case for FTTH

Much of the focus of FTTx provision has remained on the business sector, since it offers higher average revenue per user (ARPU) and a quicker return on investment (ROI) than the consumer market. In fact, the MDU market remains largely untapped to date, due to the low revenue expectations from the residential market. However, BSPs now recognize that three discrete revenue streams (voice telephony, TV/video, and the Internet, sometimes referred to as the "triple play") can be derived from users while operating only one transport platform. In residential buildings with fiber, triple-play revenue can provide an ARPU that at least matches that derived from cable and DSL for basic service, plus potential revenue from value-added services. The business case for fiber-based triple-play services is as follows:

- **Internet access can be offered at optical speeds, subject to sufficient aggregation capabilities in the backhaul network.** When 10 Mbps speeds are available (the usual initial speed for residential fiber providers), the bottleneck between the customer and the server is rarely in the access portion. The current optimization of Web sites is typically for 56 Kbps or "broadband" 512 Kbps. Few sites optimize for 10 Mbps now, and FTTH connectivity is often marketed only as "up to 10 Mbps," rather than a true 10 Mbps all the way through the Internet. However, the continuing growth of peer-to-peer (P2P) activity will ensure more widespread demand for truly high-speed services going forward.

- **TV over IP competes with cable TV and direct-to-home (DTH, satellite) networks.** To the consumer, the perceived value depends on availability and price of cable TV and DTH from other providers. In Italy, for example, there is virtually no cable TV and limited DTH presence, so TV is a clear differentiator for BSPs able to provide it. The ability to source content is essential to any successful TV offering—which can be a problem, since providers may see a new content distribution mechanism as a threat (to existing revenue streams and to content security) rather than as an opportunity. True VoD enables personalized delivery from vast libraries and enables the consumer to pause video, fast-forward and so forth. True VoD is an additional revenue stream, from which FastWeb enjoys a 11 ARPU per month—and this is growing.

- **Fiber bandwidth supports other value-added services that are not possible on lower speed networks.** High-quality video-based services (such as videoconferencing, video telephony and video-based customer services) top the list. The ability to offer the highest quality video feeds could become more important as consumers continue to buy large-format televisions, driving a potential growth in HDTV and video in the future. Data services include remote access connections to corporate networks at LAN speeds. This service is typically sold to businesses but offering transparent LAN services requires home users to have fiber connections. According to the Yankee Group's European Connected Consumer Survey, more than 40 percent of early adopters use their computers to work from home at least once a week.

- **Competitive voice service remains a significant factor in customer acquisition, even though it is readily available through the existing public switched telephone network (PSTN) infrastructure.** IP telephony enables a newcomer to provide higher quality voice service at a lower cost—compared to an indirect access player using the existing incumbent's loop—and potentially add new services. Even though it requires very little bandwidth compared to video or even Internet access, voice over IP (VoIP) is still a significant revenue opportunity. Differentiation from an incumbent's offering is essential to the success of marketing campaigns, so new entrants often offer flat-rate voice services.

IV. Emerging Business Models for FTTH

Public/Private Partnerships and the Role of Municipalities

A variety of potential business models exist for FTTH deployment, and given the expense of digging, the scenarios likely to prevail are those where multiple parties share the cost of infrastructure and service delivery. Local governments, utilities and property owners are playing an important role in providing the underlying passive infrastructure, which consists mainly of ducts and fibers. Network operators lease "dark" or unlit fiber and provide a layer of active equipment, including switches and customer-premises equipment (CPE) on top of it, while multiple third parties compete for service delivery.

Across Europe, municipal governments in second-tier cities and regions are eager to bring true broadband to their communities. There are four motivations for this:

- They are aware of how important telecom is to the attractiveness of their district and are prepared to assist telecommunications companies in a variety of ways to provide service.

- They do not consider commercial measures of ROI as binding, but instead view the prestige and potential increased tax revenue to be the motivating features. Municipalities are happy to assist, subject to long-run break-even financial constraints, which are much easier to satisfy than short-term ROI constraints.

- They realize that European Union (EU) directives dictate that e-government become a reality during the next four to six years. Broadband connections must be available for users to access e-government resources.

- They want to bring business to local companies. If the region has manufacturers or distributors that can provide the equipment, then the municipality can direct business into the region.

Several municipalities, including the cities of Amsterdam and Stockholm, have partnered with non-telco infrastructure and service provider companies to develop fiber services. The role of municipalities in fiber propagation is twofold. First, they may own and control large parts of the local underlying rights of way, ducts and (occasionally) network infrastructure—they are therefore key participants in both the initiation and continuation of deployment projects. Second, their workforces can provide significant aggregated end-user demand, stimulating the involvement of other parties (such as network operators, equipment vendors and service providers). However, their ability to

act as network operators and service providers varies according to national law and regulation. For example, in June 2003, the French government amended existing legislation to limit local authorities' right to operate telecom networks to situations where private initiatives are lacking. Meanwhile, regulation prohibits Dutch municipalities from becoming service providers on their own broadband networks, whereas Sweden permits this practice.

Power Companies: Utilizing Existing Infrastructure

Utility companies have ready access to many of the requisite elements of an FTTH deployment, such as access to rights of way; existing ducts installed in the streets, through which fiber can be pulled; communal central heating systems with piping that can accommodate blown fiber; experience and knowledge of infrastructure ownership; experience and knowledge of operating networks; and strong balance sheets. This makes utilities, and the municipalities with which they are often associated, ideal participants in FTTH projects. Their involvement in the development of FTTH deployment is discussed in detail in the following sections.

Rural and Regional Development

While cable modem and DSL services are widely available in most urban centers, this is not the case in the many less densely populated towns and villages beyond main cities. Western Europe, as well as North America and parts of Asia, are seeing a proliferation of rural fiber initiatives. Making this possible are the availability of regional development funds and the involvement of local municipalities and property developers. In many areas of low DSL and cable coverage, rural FTTH deployments receive funding on the grounds that a broadband fiber infrastructure can improve broadband availability for residents, attract business to the area and help retain local labor forces. Such projects are not based on purely commercial considerations, where profitability and ROI top the agenda. Rather, political objectives drive them, with socio-economic restructuring of primary importance. The EU encourages this type of scenario, as the organization itself grants funding for rural fiber projects on the condition that the networks provide open access to competing service providers.

However, the positive effects of regional broadband development on economic regeneration remain unproven. Moreover, when allocating funds, subsidies and other concessions to regional projects, the EU (and national regulatory and competition authorities) must be careful not to encourage market distortions by allowing utilities and local authorities to benefit at the expense of private market players.

Mixed Models in the Nascent Netherlands Market

Unlike Sweden, the Netherlands does not have municipally owned power companies, and as a result, there are a higher proportion of municipalities than energy utilities actively and more directly involved in FTTH initiatives. These include pilot trials in the major cities of Amsterdam and Rotterdam, and another 10 to 15 Dutch cities involved in FTTH projects that are in various stages of development. Property owners also are involved, some in the form of housing corporations whose aim is to increase the value and desirability of residential properties. Incumbent KPN historically has taken a slow approach to FTTH, with limited involvement in small local pilots. It is meeting with a

number of city councils, with the aim of deploying fiber over municipal infrastructure up to the street, with copper providing the final link to the customer premises. The telco also is negotiating a joint FTTH project with the city of Amsterdam that aims to connect 40,000 homes in the suburban districts of Zeeburg and IJburg. Plans are also under way for a fiber project connecting around 200,000 homes in the Hague, funded by a combination of private companies (including KPN), housing associations, local authorities and residents. In the third quarter of 2003, KPN publicly indicated its support for shared investment in fiber infrastructure buildout.

In the Netherlands, where FTTx is about to move beyond the pilot stage into a phase of real commercial deployments, three distinct business models are emerging for public/private FTTx initiatives: the competition model, the stimulation model and the cooperation model.

Competition model: Plans are under way for the deployment of a third (fiber) infrastructure alongside existing phone and cable local loops. The City of Amsterdam proposes to take a minority stake in the project, along with development companies, financial institutions, construction firms, etc., to finance the passive and perhaps also the active parts of the network. The role of the municipality here is that it initiates and partly finances the project, while other non-telco parties finance the remainder. This model requires a broker company that would connect the service providers with the network. Examples of such brokers include ViaEuropa and Optaxx (a Dutch startup). The tender process for the Amsterdam project will start at the end of 2003, with rollout beginning in mid-2004. Deployment to the entire city is expected to take 10 years. A major downside to this approach is that it promotes the existence of three separate infrastructures, each competing for the same customers.

Stimulation model: The municipality of Rotterdam has various existing infrastructures for sewage, water, gas and electricity and has decided to build a new broadband system as another "essential infrastructure." This typifies the utility principle of making broadband readily available to businesses and consumers in the same way that fuel and energy services are available. The main problem with the utility principle is that it will cost the city dearly, and it has not yet decided whether it can justify the €280 million investment required to implement a passive fiber-optic network for the whole city. However, the active layer also is costly, and it is expected that companies and telcos will finance the active part of the network. From the municipality's perspective, the stimulation model represents a non-profit approach. The participation of local government and building societies means the city will charge very low interest on external capital layout and anticipates a 30-year ROI period. This is similar to the FastWeb and Stokab models, which have been prototyped under a pilot project in a suburb of the city. A decision on whether to extend the project to the entire city is expected by the end of 2004.

Cooperation model: KPN is actively seeking joint ventures with local cable operators to invest in a new network. Its approach requires only a single fiber infrastructure, and the telco and cable operators can achieve efficiencies by jointly utilizing it. The idea is to remove infrastructure competition in the passive part of the network, while maintaining competition for equipment and services through multiple providers in the active part (the open network mode).

While KPN's approach hinges on securing the cooperation of the cable operators, the latter are playing hard to get, since they remain in a stronger position than the telcos for providing high-bandwidth services. At present, the telcos stand to benefit more from a cooperative relationship than the cable operators. From a technical point of view, the cable network is superior to that of KPN, whose fiber reach typically ends more than 1 kilometer from the customer's home, while the cable network's fiber extends as close as 300 meters from the home. Moreover, the existing hybrid fiber coax (HFC) infrastructure is capable of providing higher bandwidth than the telcos' copper network. However, to enable future high-speed services of 100 Gbps to the home, the cable network will require significant equipment upgrades in the backbone. The upgrade technology path for cable is less mature and therefore significantly more costly than that for FTTH, which, ultimately, will make FTTH a more attractive proposition for cable operators.

From a commercial perspective, the cable operators are not yet subject to open network provision (ONP) regulation as is the incumbent, and, at present, they have more to lose by adopting the open network model. However, cable operators will be subject to ONP in 2004, which—along with the expected loss of broadband market share to ADSL—will make the cooperation model a more attractive proposition for them. Without cooperation, cable companies will become increasingly vulnerable to the combined threat of DSL and fiber services from KPN. TV service, which remains cable's core business, also will be part of any FTTH offer, adding an additional competitive threat. The cable companies ultimately will become more interested in teaming up with KPN, since cooperation will provide a better business case for them in the long run, reducing the investment burden for future national FTTH rollout.

A public/private partnership involving the municipalities also will have a role in this model. Local government involvement will facilitate a smooth and fast rollout by offering tax benefits, licensing road works, providing aggregated demand for local government services and occupying a small financial stake. Most importantly, the single infrastructure will be a de facto monopoly, and strong government will be required to prevent misuse.

The cooperation model is the most viable of the three options for the following reasons:

- It is the only one that offers scalability, given the combined scope of cable operators' regional footprint and KPN's national reach.

- Market forces, rather than government or regulatory forces, are driving this model, giving it commercial credibility The removal of infrastructure competition will, in turn, eliminate much of the risk from the business case, making it easier for participants to raise the required investment for a fiber rollout that would cover the whole Netherlands region. (The Netherlands-based fiber advisory company, InterimIC, which specializes in FTTx projects, estimates this cost at €7.5 billion for infrastructure capital expenditure, plus a further €7.5 billion for service development and implementation.)

- The other two scenarios do not provide a clear path toward a single-fiber infrastructure, which will be the most beneficial outcome for the user in the long run.

- The cooperation model embraces the utility approach and municipal cooperation. Without those, certain sectors of the population always will be excluded from the reach of a broadband rollout based on purely commercial considerations.

The Open Network Model

One key area where utilities and local authorities are lacking is the operation or provision of communications and entertainment services. One way to overcome this deficiency is the open network approach, whereby a utility, municipality or property owner (or a combination of these parties working cooperatively) owns the network but leases out capacity and services to third-party service providers. The open network approach is evolving into a model that regulatory authorities have desired, but were unable to execute due to the telcos' resistance to separate network ownership from service provision. Separating control of access from service provision delivers the following benefits to all participants:

- Freedom of choice for customers, who can select different operators both within and between each level of service.
- Achievement of a competitive environment that will satisfy regulators, deliver lower end-user prices and increase customer choice.
- Network owners can focus on their strengths without having to stray beyond their expertise into service provision.
- Service providers enjoy reduced capital burdens without having to invest in infrastructure.
- Open networks lend themselves to a revenue-sharing model whereby the network owners receives a proportion (typically 30 to 50 percent) of each service sold. The same access can be resold, since the network owner charges per service, rather than per access. Under the open network model, network owners typically use a non-discriminatory tariff structure, charging the same price for access to all service providers. This provides a more equitable environment than the prevailing wholesale DSL market, where costs for service providers and ISPs are largely at the discretion of the incumbent telcos that control the infrastructure.

Stokab of Sweden pioneered the three-layer, open network model for broadband in 1994. The company's goal was to build and operate a fiber-optic network to provide broadband access for businesses throughout Stockholm. Stokab is an operator-independent provider of leased dark fiber (passive fiber-optic connections without active equipment) that offers a cost-effective alternative to customer-owned networks. Stokab is owned by the city of Stockholm, whose access to low-interest capital helped finance its startup costs. Stokab operates a network connecting 29 municipalities or *communes* throughout the county of Stockholm.

ViaEuropa, which adapted Stokab's business concept across Sweden and in other parts of Europe, describes itself as a logistics company, acting as a broker or "forwarder" of services between network operators, service providers and end customers. ViaEuropa claims to be one of the first operators of service provider-independent networks. It built its business model to achieve the following:

- Multiple providers offering competing services over the same line maximizes network usage, lowers end-user prices and increases customer choice.

- Network owners (typically a property owner or municipal entity) achieve an increased valuation of their network investment as well as a regular income from this investment.

- Service providers can access a large customer base without having to invest in infrastructure. Apart from marketing costs, there are zero marginal costs for adding new customers.

ViaEuropa partners with property owners (typically MDU) and municipal network owners with the aim of optimizing the value of their investment in a broadband network. The idea is the property rises in value because of increased revenue streams arising from free competition and the tenants' ability to choose from a wide selection of services and a variety of service providers. The open network model helps to maximize utilization of the broadband network, resulting in increased revenue for the underlying network provider (in this case, ViaEuropa and the property owner). ViaEuropa also offers assistance to municipal network owners in the operation and provision of broadband service over their networks. By combining the operations of several small networks owned by different entities, ViaEuropa widens the service providers' potential end-user base without having to make any infrastructure investments. Services are delivered to the end user via a common, IP-over-Ethernet interface. Service providers currently operating on networks enabled by ViaEuropa include Tiscali, which offers 10 Mbps Internet access from €21.50 per month.

V. Conclusions and Recommendations

- **Adopting the open network approach will pave the way for cost-effective and competitive provision of FTTH services.** It will do this by reducing the capital burden on service providers and enabling freedom of choice for consumers. It also will remove the incumbents' stranglehold over national broadband services and infrastructure. Opening up the network to competing service providers will allow for multiple propositions as well as experimentation with business models and service types.

- **Forge public/private partnerships, which will facilitate faster and deeper FTTH deployment.** Infrastructure buildout will rely increasingly on local and national government to help take fiber beyond the central metropolitan areas and benefit new outlying districts. Telecoms, ISPs and local authorities are partnering for cost-effective last-mile rollout. We predict that these public/private partnerships will become more common across Europe as both investors and governments recognize the unlikelihood of mass commercial rollout of fiber infrastructure to the customer premises. However, regulatory concerns over the potential anti-competitive nature of positive discrimination in favor of one technology will temper the extent of public participation. To avoid market distortions, public assistance in the form of government subsidies will best be directed toward areas not adequately served by any existing broadband infrastructure.

- **Do not abandon today's broadband technologies. FTTx will take many years to reach the mass market, which cable and DSL will continue to dominate until at least 2010 and probably well beyond that**. Given the anticipated slow expansion of residential fiber, BSPs planning fiber deployments should consider the approach taken by FastWeb, Bostream and, more recently, B2 Software, which employ DSL as a means of building up customer market share in areas the fiber network does not reach. We expect to see a growing trend toward such mixed broadband infrastructures, since FTTx penetration will be a much slower process than DSL rollout.

- **Invest in FTTH for the long term.** Whichever business models prevail, FTTH investors must recognize that demand for high-speed services beyond P2P remains uncertain, and the implementation of advanced broadband infrastructure today represents a significant risk. Profitability and ROI will develop slowly, but creative development and packaging of compelling services can accelerate financial growth.

- **Expect fiber growth to happen locally and erratically, rather than nationally.** This will occur in a patchy manner, unlike DSL and cable, which have grown from a central urban concentration to gradually cover the less densely populated areas until near full geographic or population coverage is achieved. Rather, FTTx will continue to develop in a series of isolated, but continually growing, local pockets situated both in dense urban centers and more sparsely-populated regional or rural areas.

VI. Further Reading

Yankee Group Broadband & Media Europe Reports

Can Broadband Service Providers Make Money from Online Video Content?, July 2003

Is Broadband for Speed, Volume, Content, or None of the Above?, June 2003

Yankee Group Broadband & Media Europe Research Note

Bostream Unleashes Europe's First Consumer VDSL Service, July 2003

Yankee Group Convergent Communications Europe Report

Metro ROI Case Made to Go the Last Meter, December 2002

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RBOCs Will Not Secure a Competitive Advantage With Fiber to the Premises, October 2003

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New DSL Standard With Telco Video Potential Sparks Debate, February 2003

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Decision Instruments

The Yankee Group offers a full portfolio of technology and market forecasts, trackers, surveys, and total cost of ownership (TCO), return on investment (ROI), selection, and migration tools. Decision instruments provide our clients the data required to compare, evaluate, or justify strategic and tactical decisions—a hands-on perspective of yesterday, today, and tomorrow—shaped and delivered through original research, in-depth market knowledge, and the unparalleled insight of a Yankee Group analyst.

Trackers

Trackers enable accurate, up-to-date tactical comparison and strategic analysis of industry-specific metrics. This detailed and highly segmented tool provides discrete proprietary and performance data, as well as blended metrics interpreted and normalized by Yankee Group analysts.

Surveys

Surveys take the pulse of current attitudes, preferences, and practices across the marketplace, including supply, delivery, and demand. These powerful tools enable clients to understand their target customers, technology demand, and shifting market dynamics.

Forecasts

Forecasts provide a basis for sound business planning. These market indicators are a distillation of continuing Yankee Group research, interpreted by our analysts and delivered from the pragmatic stance our clients have trusted for decades.

Signature Events

The Yankee Group's signature events provide a real-time opportunity to connect with the technologies, companies, and visionaries that are transforming Telecommunications; Wireless/Mobile Communications; Consumers, Media & Entertainment; and Information Technology Hardware, Software & Services.

Our exclusive interactive forums are the ideal setting for Yankee Group analysts and other industry leaders to discuss and define the future of conversable technologies, business models, and strategies.

Consulting Services

The Yankee Group's integrated model blends quantitative research, qualitative analysis, and consulting. This approach maximizes the value of our solution and the return on our clients' consulting investment.

Each consulting project defines and follows research objectives, methodology, desired deliverables, and project schedule. Many Yankee Group clients combine advisory service memberships with a custom-consulting project, enabling them to augment our ongoing research with proprietary studies.

Thousands of clients across the globe have engaged the Yankee Group for consulting services in order to hone their corporate strategies and maximize overall return.

For More Information . . .

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