Fast track to a European digital highway

Telecom operators embrace hybrid networks
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The rapidly growing demand for television, video, music, and Internet browsing in the home and other locations is increasingly challenging the networks of traditional convergent telecommunications providers. Current copper networks lack speed, and the mobile alternative offers insufficient capacity. Although fiber is the accepted long-term solution, laying such a network could take as long as 10 years at great cost. During this lengthy deployment period, operators risk losing substantial numbers of customers to competitors, making the stand-alone fiber business case even less attractive.

By adopting a hybrid approach that intelligently combines fixed and mobile access technologies, convergent operators can differentiate themselves from their “pure-play” fixed and mobile competitors. If executed well, such a move could delay the change to fiber and even lower the overall network upgrade cost, while offering greater speed and capacity to a much wider customer base. Capital expenditure savings of 30 percent or more compared with the cost of a fiber-to-the-home (FTTH) centric rollout may be possible, with the added benefit of ongoing mobile network ownership costs lower than those of a purely mobile player.

This strategy requires a radical reappraisal of network planning and execution to achieve truly integrated fixed–mobile operations and infrastructure. If established operators with converged fixed and mobile networks fully embrace this approach, they can offer a distinct service: a true high-speed broadband proposition across most of the country at a lower cost—something beyond the reach of their pure-play cable and mobile rivals.
High stakes for European operators

The major converged European telecommunications network providers are nervously looking over their shoulders as they consider the huge investment required to upgrade their broadband access networks. With cable companies and utilities eager to grab a share of the home high-speed multimedia broadband market, and mobile operators promising faster services to a wider audience, there is pressure to deliver an improved customer experience. Yet the business case for upgrading legacy copper networks to fiber optic is far from compelling; as if high capital expenditure and a long payback for investors weren’t discouraging enough, there’s the added fear that European regulators will insist on open access to these new networks — at relatively low prices. Faced with such risks, it’s no surprise that operators are hesitating over their next steps.

While grappling with this difficult business case, the main European convergent players are losing ground. Many cable companies already enjoy significantly higher margins than their established competitors. Moreover, cable upgrades are outperforming copper and are much more cost-effective and faster to deploy than a comparable FTTH rollout.

To upgrade or not to upgrade to FTTH?

The prevailing mind-set among established operators is to upgrade the entire network to fiber in order to build a future-proof infrastructure with limited sunk costs. However, such a strategy comes at no small risk. The expected timescale to complete this immense task can be as long as 10 years. The vast sums needed to deploy fiber across a whole nation will have a big impact on profitability, which will alarm investors accustomed to very stable returns and high dividends.

When annual customer defection rates in the range of 5 percent are taken into account, operators may find themselves building an entirely new network for a user population just half the size of their current base. Another concern is the substantial time gap between making the initial investment and achieving a fully operational network with
a critical mass of customers connected. Given all these factors, there is some uncertainty over whether a stand-alone fiber network could ever provide a positive return.

An alternative is to restrict the rollout to more profitable regions and centers, but even then the payback would by no means be guaranteed. Such a move would also leave large swaths of the population with limited access to next-generation broadband. Offering a multi-tier service can undermine countrywide marketing efforts and is likely to further accelerate customer defections.

Although partnering with other providers could help spread the risks and costs of a fiber rollout, rival operators have largely tended to steer clear of this route, worried that they may lose competitive advantage. Likewise, cooperation with utility organizations (mainly electricity) and other communities has proven difficult due to differences in culture, strategy, risk, and investment cycles. The fragmented nature of the utility market adds to the complexity, as telecommunications operators would have to form multiple partnerships in different cities and regions.

Regulatory uncertainty can only add to shareholder fears. Operators that take the up-front risk and invest in a next-generation fiber network fear that they may have to open up their new networks to other providers, which could affect their competitive advantage, put pressure on prices, and further dilute their investment.

The European Union has pledged support in the form of an estimated €1.8 billion (US$2.5 billion) broadband investment subsidy, but this figure pales in comparison to the hundreds of billions required to upgrade Europe as a whole. In contrast, many governments — particularly in emerging markets, but also in Australia, Japan, and elsewhere — are investing heavily in creating nationwide fiber-optic networks, often state-owned, with open access to all operators. The European regulators’ desire to maintain competition, although well-intentioned, has arguably cast doubt on future margins and in turn slowed investments in next-generation broadband. With little likelihood of further substantial financial support from the public — and with no clear indication of the type and degree of regulatory intervention — the established converged operators need to chart their own course of action.

The unclear regulatory environment, along with the indecision of operators, could hold back the onset of a faster digital highway, putting at risk not just the telecommunications companies themselves, but potentially the whole European economy.
The next generation of fixed-mobile convergence

Mobile and fixed broadband each come with their own advantages and drawbacks, and neither will be able to cost-effectively capture future demand alone. Hence, future investments will likely involve a combination of both kinds of infrastructure.

Mobile: Fast and flexible, but expensive

Improvements in mobile technology are rapidly raising transmission speeds, making mobile broadband a serious competitor to fixed-line broadband, with almost instant and ubiquitous availability. Compared with fixed, mobile networks can be scaled up far more quickly to meet changing demand; upgrading an existing base station or erecting an aerial is considerably simpler and initially more cost-effective than laying new wires under the ground. Next-generation mobile offers high-speed connectivity, making it very suitable for browsing, chatting, and e-mail (see Exhibit 1, next page). However, to cope with the large traffic volumes typically associated with high-quality video, mobile networks would require prohibitively expensive capacity upgrades.

Of course, the converged players would also have to continue to compete with their mobile-only rivals, which would involve big investments in their own wireless infrastructure regardless of their fixed network strategy.

Fixed: Sunk cost and high capacity, but costly to upgrade

Advances of mobile networks notwithstanding, fixed networks — with their higher capacity — remain the preferred option for streaming video content (such as films or games), particularly for time-sensitive live broadcasts. In such cases, customers require a stable connection to transport high data volumes with “guaranteed” bandwidth. With an HDTV live stream typically requiring six to 10 megabits per second, this type of traffic could easily be covered by current VDSL or even ADSL2+ networks, without necessarily requiring a full upgrade to FTTH.
Unfortunately, in areas of limited bandwidth, once the fixed line is loaded with a time-sensitive, real-time stream, there is less additional bandwidth available for other services (see Exhibit 2, next page). Where connections are copper-based, Internet browsing can consequently be perceived as rather slow if the majority of the available bandwidth is reserved for an IPTV transmission that is running in parallel. Such a scenario is most common in rural areas with high copper loop length.

FTTH and fiber-to-the-basement (FTTB) deployment is further handicapped by the relatively low number of homes connected compared with the number of homes “passed” (i.e., dwellings in the network area that have yet to be connected). In Europe this ratio is often as little as one-to-10. By taking so long to convert customers to fiber, operators are further compromising the business case, which means that a key objective for all fiber-to-anywhere (FTTx) investments is to minimize this time gap.
Exhibit 2
Typical daily traffic pattern for a high-end residential home

Illustrative

- Limited volume
- High speed
- Traffic in bursts

- High volume
- Medium speed
- Real time/streaming

Source: Strategy& analysis

Hybrid: Speed and flexibility of mobile, with high capacity of fixed

Given their inherent limitations, neither fixed nor mobile alone appears to offer a complete, cost-effective solution for addressing customer needs in the short to medium term. As the vast majority of wireless data traffic is stationary (“in-home”) with no real need for mobility, a converged operator has the unique option to dynamically route in-home traffic via either its fixed or its mobile infrastructure. Using such bidirectional off-loading, the converged operator could offer a combination of peak data rates and superior streaming capabilities, while requiring only limited infrastructure investment.

Even though most major fixed-line operators own mobile networks, convergence to date has been focused primarily on areas such as operations and customer service. By embracing true fixed–mobile convergence, operators can offer many more customers all the high-speed broadband benefits of a fiber-optic network at considerably less cost and with a faster time-to-market.
The advantages of a hybrid network

Truly hybrid networks allow providers to intelligently combine fixed and mobile access, which could greatly improve the broadband business case in the following ways:

• Stretching more life out of a copper network

• Postponing FTTH investment

• Routing traffic intelligently (switching in-home traffic between fixed and wireless, with streaming via fixed and traffic bursts via mobile)

• Offering superior bandwidth to more customers

• Closing the gap between investment and returns

Stretching more life out of a copper network

By planning networks as an integrated service with hybrid architectures, it’s possible to get the best from both fixed and mobile and greatly extend the life of copper.

One key element of the hybrid concept is to follow a smarter approach of upgrading existing fixed networks by making better use of existing copper lines and spreading the overall investment over a longer time period. Rather than installing fiber lines directly to every home, operators can instead concentrate on fiber-to-the-cabinet (FTTC), achieving a quicker rollout speed at a lower cost (see Exhibit 3, next page). In addition, the speed of selected copper lines could be further increased by applying vectoring or bonding and phantom solutions on top of a typical FTTC upgrade. Although not all of these new copper technologies are suitable for a broad customer base, they can extend the lifetime of copper; speeds of 100 megabits per second or more would be possible for some customers without having to build fiber lines to every home beforehand.
Exhibit 3
Capital expenditure on different types of infrastructure with hybrid potential

* Hybrid fiber coax (current cable network technology); typically not available in less urban areas.

Source: Strategy& analysis
Postponing FTTH investment

Utilizing FTTC in this way can free up much of the investment currently planned for FTTH. The surplus funds can be used either to deploy FTTC to a much wider audience, to accelerate 4G rollout, or to support other initiatives with a much more compelling business case and faster payback. Should demand for high bandwidth and high capacity ultimately exceed the capabilities of FTTC, the option to upgrade to FTTH remains. Such an approach would still be economically viable in most cases, as the slightly higher overall capital expenditure would be offset by the gains resulting from deferred investments (see Exhibit 4, next page).

Routing traffic intelligently

Convergent operators’ mobile capability provides the vital linchpin of this strategy. The approach is based primarily on an intelligent traffic routing mechanism that recognizes the demand from the user and diverts data along the more appropriate network — fixed (for high volume or streaming) or mobile (for high speed but lower volume). The fixed route would generally take priority (assuming capacity is available), as marginal costs tend to be lower through this channel. The concept is similar to a utility grid, where a hydropower plant covers the baseload while the storage power station takes care of the peaks in demand.

There are a number of ways to exploit this concept. An iPad user at home might watch a high-definition video stream via Wi-Fi connected to DSL while simultaneously (and without additional cost) accessing cloud services using long-term evolution (LTE) technology over the macro wireless network. Such an approach illustrates the advantages of combining the two networks to achieve a maximum peak rate along with the lowest-cost streaming of large data volumes.

Alternatively, a home or small office could have a gateway with an interface to both mobile and fixed networks on the back end, while providing a Wi-Fi or local area network (LAN) connection to the user. Customers can thus enjoy both high-speed and high-volume information exchange, with traffic routed over the more appropriate medium in a manner invisible to the user. While backup to cloud services would be streamed through DSL, there may be times when fixed-line capacity is exhausted, in which case interactive services would be provided at high speeds via the mobile network, offering more than 100 megabits per second over LTE.

Although such integrated home gateways are not yet commercially available, the majority of the required elements have already been
Exhibit 4
Benefits of deferring FTTH investments

Rolling out FTTC as a first step represents a cost premium of 26% of the FTTH rollout

<table>
<thead>
<tr>
<th>Euros per home passed</th>
<th>512</th>
<th>756</th>
<th>+26%</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTTC</td>
<td>372</td>
<td>456</td>
<td></td>
</tr>
<tr>
<td>Upgrade</td>
<td>132</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>504</td>
<td>787</td>
<td></td>
</tr>
<tr>
<td>FTTH</td>
<td>108</td>
<td>239</td>
<td></td>
</tr>
</tbody>
</table>

But delaying the investment for the FTTH upgrade can still turn the case around

<table>
<thead>
<tr>
<th>Years of delayed investment for FTTH upgrade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>6%</td>
</tr>
<tr>
<td>8%</td>
</tr>
<tr>
<td>10%</td>
</tr>
<tr>
<td>12%</td>
</tr>
<tr>
<td>14%</td>
</tr>
</tbody>
</table>

Example:
Upgrading to FTTH 5 years after the FTTC rollout, and assuming a 10% WACC, results in a 9.1% saving in capex

Note: Numbers might not add up due to rounding.

Source: Strategy& analysis
developed. Taking the next step to build such devices shouldn't take much more than a year.

Through this intelligent routing, heavy data volumes are proactively shifted from mobile to fixed, with mobile primarily used for low-volume/high-speed transmissions. Rather than investing in fiber for all households, operators can be far more selective in their upgrade from DSL to fiber, focusing on those geographic areas where demand has been proven. And rather than designing mobile networks to include higher capacity, operators can instead concentrate on providing coverage. Again, these savings could be used to extend coverage and/or to accelerate the speed of the 4G network rollout. The resulting network typology of a truly hybrid network could be similar to that in Exhibit 5, next page.

**Offering superior bandwidth to more customers**

Through such true integration, converged operators can offer access to both high speed and high capacity to a wide customer base, something the pure-play cable or mobile providers may be unable to replicate in the short term. Furthermore, by marketing wholesale services to other telecommunications companies, the converged providers could also share the benefits of lower production costs among a much wider customer base. With access to attractive wholesale rates and services, competitors may resist building similar (and duplicate) fixed–mobile networks, increasing the macroeconomic efficiency of the overall telecommunications system.

**Closing the gap between investment and returns**

For the majority of European households and businesses, the long-term future almost certainly entails a fiber-optic network. However, the true hybrid approach should enable convergent providers to significantly stretch out the life of their copper wires. Having bought some time, they can selectively upgrade the network to fiber, replacing worn-out sections and installing fiber for business and high-end users as well as in new developments and refurbishments. Over this period they’ll enjoy greater access to lower-cost technology (such as pico IP DSLAMs for in-house connections) and have time to develop local partners for the physical fiber rollout. In addition, this approach leads to smarter investment decisions, as hybrid networks provide a far clearer picture of actual customer demand and hence potential revenues. Consequently, any new deployments or network upgrades can be made in areas with a demonstrated need, making the business case for next-generation broadband access far more compelling.
Exhibit 5
Technology map of future access networks

Traffic demands

- Limited volume
- High speed
- Traffic in bursts

- High volume
- Medium speed
- Real time/streaming

Topologies

Urban
- LTE <900 MHz
- LTE 2.6 GHz
- Wi-Fi

Suburban
- FTTB/H
- VDSL

Rural
- ADSL

Source: Strategy& analysis
Conclusion

A fiber-optic network to every home is likely to be the accepted multimedia technology in the next 10 to 20 years. In the meantime, the main European convergent operators need a solution that satisfies shareholders and customers and also provides a competitive edge in the short to medium term.

By planning for a hybrid approach with a new level of fixed and mobile network integration, established providers can offer both speed and capacity to a much broader customer base, a combination beyond the capabilities of pure-play fixed-line or mobile operators. Although these competitors could potentially team up to provide a similar service, first-mover advantage lies with the existing integrated providers, as followers would need to overcome the substantial and complex process, system, and device issues involved.

In a world where investment stakes are high, a truly integrated service also lowers the risk and cost of upgrading. Rather than facing a 10-year deployment period with uncertain return, companies can lay fiber in a more targeted manner in areas where demand is proven to be high, achieving a more reliable payback. They could save at least 30 percent compared to the FTTH-focused rollout preferred by most current fixed-line operators. And they can also deploy their 4G networks at a lower cost and faster pace than the pure-play mobile operators.

An intelligent hybrid solution enables convergent operators to continue to win or retain customers through a superior service offering. In this way they can substantially narrow the current wide gap between investment and commercial returns, while reducing the overall cost of enhancing their network. Hybrid networks can also play an important role in helping European countries remain technologically competitive.
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