


InfoCom Competence Center

Solving the Network Strategy Puzzle for Mobile Broadband Operators

April, 2009



IT'S CHARACTER THAT CREATES IMPACT!

- > We are one of the world's leading strategy consultancies
- > Our consulting service is based on the entrepreneurial character and individuality of our consultants
- > Together with our clients, we develop customized, creative strategies that work
- > We attract and retain top talent and work with open structures and approaches
- > We are committed to three core values: entrepreneurship, partnership and excellence
- > Entrepreneurship – We are a network of entrepreneurs who provide pragmatic and practical solutions
- > Partnership – We are an independent partnership and build trust-based relationships in our company and with our clients
- > Excellence – We achieve excellent results and develop global best practices for measurable and sustainable success

SOLVING THE NETWORK STRATEGY PUZZLE FOR MOBILE BROADBAND OPERATORS

- > Mobile telecommunication operators face rapidly growing demand for mobile broadband services, driven in large part by data cards
- > To meet rising bandwidth and capacity needs, and to prevent network congestion, operators must adjust their network strategy
- > Investments in new access technology bring along radically new network economics leaving mobile operators with the quest to gear their network investments towards a cost optimal access, backhaul and core portfolio
- > To make the required investments financially viable represents a major challenge. There is no one size fits all solution
- > Roland Berger has extensive experience in network strategy for mobile, fixed and convergent operators. We can help you tailor a cost-efficient network strategy and thereby take your mobile broadband business to the next level

8 KEY STATEMENTS DRIVING NETWORK STRATEGY

- > Mobile broadband usage is finally becoming a fact for customers: mobile and fixed broadband will coexist
- > To manage the challenge of surging traffic, a coherent approach to network strategy is imperative for today's mobile operators. With OPEX and CAPEX optimization as its goal, the strategy must incorporate both mobile and fixed access as well as backhaul and core strategies
- > The existing infrastructure will inevitably have to be upgraded to align the network with the projected growth in mobile data use, rather than merely enforcing fair usage measures
- > A stand-alone mobile network solution will likely not be enough to handle the anticipated mobile data traffic, especially in densely populated areas
- > It is key for operators to exploit their existing technological footprint in order to minimize CAPEX and OPEX – At the same time, they must aim for the most actionable economically sound wireless broadband technology while simultaneously leveraging the best available frequencies and licenses for incremental technology deployment
- > Fixed access networks can constitute a cost efficient add-on to mobile access and can significantly improve data transfer rates for customers. Convergent mobile operators, however, do not have to build fixed access networks on a large scale, but must selectively identify and exercise the option to enhance their mobile network
- > Any technology taken into consideration for backhaul and core must be NGN-ready in the long-term, since future convergence aims at an all-IP core network with the capability to seamlessly handle traffic from fixed and mobile access networks
- > Mobile operators can choose to follow established blueprints for investing in networks, but they will likely make expensive mistakes and miss the opportunities of adapting their approach to changing supply and demand conditions. To ensure success in solving the network strategy puzzle, they must effectively minimize the investment risks by partnering or recruiting

MOBILE BROADBAND CHALLENGES

I. Mobile broadband usage is becoming a fact for customers – Finally

All across Europe, mobile telecommunication operators face rapidly growing demand for mobile broadband services as customers supplement their fixed-line broadband behavior with mobile usage. Especially data dongles and the spreading acceptance of newly developed handsets make mobile broadband usage finally a fact among customers and open up long-awaited business opportunities for mobile service providers. Moreover, acceptance of data dongles has led some customers to substitute fixed broadband with mobile use, at a level and frequency great enough for mobile operators to institute "fair usage" policies and deploy usage-limited price packages with strong disincentives for exceeding monthly limits.

II. Challenges accompanying mobile broadband surge

On the one hand, to meet rising bandwidth and capacity needs top level decisions about network investments have to be made within the next few years, while neither a specific access technology nor a specific network strategy is prevailing so far. On the other hand, the corporate bottom line is shrinking. Revenues are decoupling from the huge increase in traffic and will rise comparatively slowly over time due to heated competition with flat-rate and bundle offers [see Figure 1]. Total network costs are simultaneously catching up despite economies of scale.

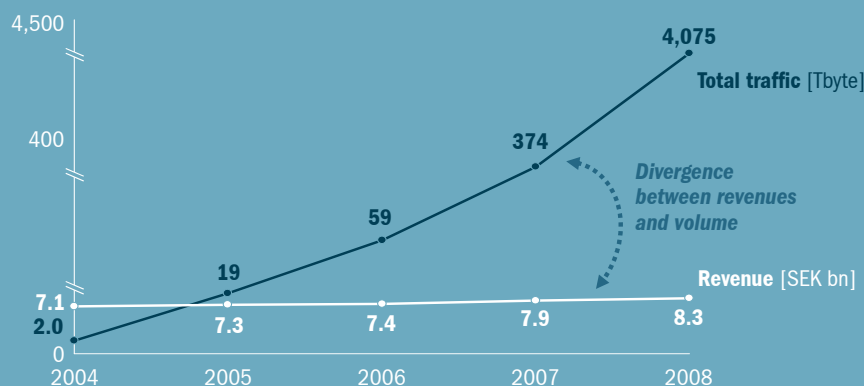
Mobile broadband development scenarios:

1. Mobile broadband does not take off
2. Fixed and mobile broadband coexist
3. Mobile replaces fixed broadband

Roland Berger assumptions:

- > Technological advantage of fixed-line broadband (in terms of speed and reliability) will survive
- > Mobile will surpass fixed broadband in numbers of subscribers but not in bandwidth
- > Mobile and fixed broadband will coexist

Figure 1: Mobile broadband traffic and revenue progression (example Sweden)



Source: The National Post and Telecom Agency; Roland Berger

Investments in new access technology usher in radically new network economics, forcing mobile operators to gear their network investments toward an access, backhaul and core portfolio optimized for cost. Obviously, the principles of network economics are dramatically changing with regard to costs, capacity and demand. This puts the established architectures and modes of operation on shaky ground. Mobile operators can choose to follow established blueprints for investing in networks, but they can make expensive mistakes and miss the opportunities of adapting their approach to changing supply and demand conditions.

III. Solving the mobile broadband puzzle – Old ways will not suffice

Restricting heavy mobile data users through fair usage management as well as forced fixed broadband migration were hitherto prevalent ways to enable mobile broadband access with good speed to the early adopters. It is foreseeable, however, that these measures will not be adequate any longer for two main reasons:

1. Increase of usage will cause capacity shortage – The average data traffic per user will grow significantly and more users will access the network at the same time, both driving the current mobile access network to its limits.
2. The market comes down to competition – Future differentiating factors will be mainly price and available bandwidth, while differentiation via service is expected to be less important. Users will choose the service with the best relation between cost, speed and reputation for reliability. Fixed broadband cases have shown this evolution. Mobile data access is a commodity and pricing measures will therefore not be adequate to ensure high-speed mobile data access and prevent network congestion in increasingly mature markets.

Thus, new ways have to be considered to solve the mobile broadband puzzle. Roland Berger Strategy Consultants believes that the existing infrastructure will inevitably have to be upgraded to align the network with the projected growth in mobile data use, rather than merely enforcing fair usage measures. A coherent and comprehensive approach combining all of today's network infrastructure – mobile and fixed as well as the respective backhaul and core network infrastructures – is needed to satisfy increasing mobile broadband usage.

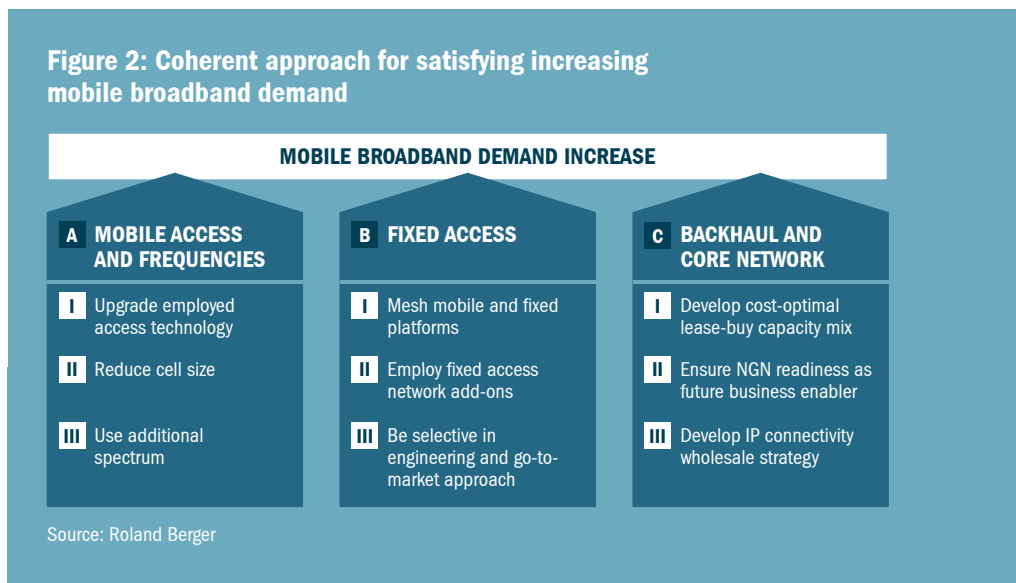
As mobile broadband usage is evolving into coexistence with fixed broadband services the infrastructures for fixed and mobile broadband will converge and complement each other.

Key questions of the mobile broadband puzzle:

- > Which technology is going to be most cost-efficient?
- > How does the network architecture change?
- > How do the new technologies change network economics?
- > What frequency bands are ideally suited and how are these to be acquired – without overpaying?
- > In which regional/local clusters does mobile broadband make sense?
- > What are forecast mobile broadband usage scenarios?

The mobile and fixed access network together with the backhaul and core network will jointly form the infrastructure to facilitate a full-fledged (mobile) broadband offer to the end user. A stand-alone mobile network solution will likely not be enough to handle the forecasted mobile data traffic, especially where integrated operators offer competing services and can rely on their fixed-line infrastructure to handle mobile traffic.

Therefore, a coherent approach to network strategy is imperative for today's mobile operators. With OPEX and CAPEX optimization as its goal, the strategy incorporates mobile access, fixed access and backhaul [see Figure 2].



A. MOBILE ACCESS AND FREQUENCIES

To improve mobile access network capacity for increased broadband demand, three general options exist:

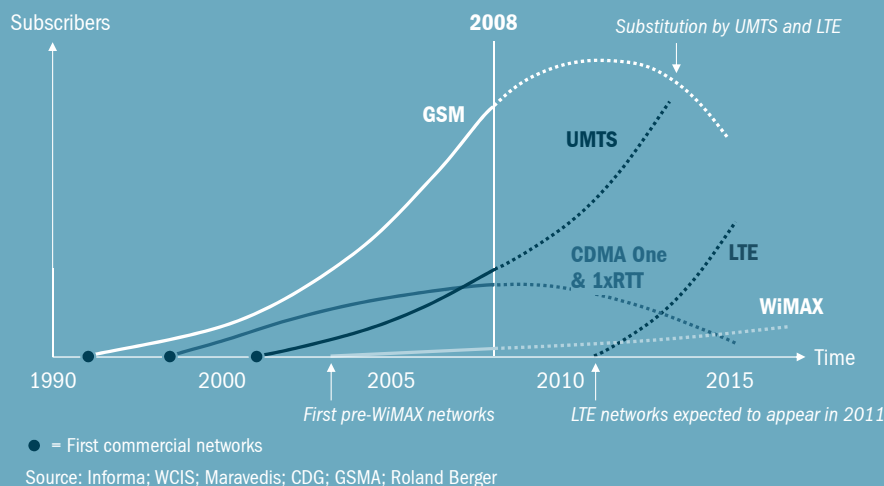
- I. Upgrade existing access technology, such as from HSPA to HSPA+
- II. Reduce cell size through deployment of additional base stations, or selective use of picocells and repeaters, or femtocells
- III. Access additional spectrum through acquisition of frequency bands (UHF spectrum, GSM 900 refarming, 2 GHz spectrum (UMTS))

In defining their network strategy, operators must exploit their existing technological footprint in order to minimize CAPEX and OPEX. At the same time, they must aim for the most action-able economically sound wireless broadband technology while simultaneously leveraging the best available frequencies and licenses for incremental technology deployment.

I. Upgrade employed access technology

Several viable technology options for a broadband mobile (data) platform exist, with the available portfolio ranging from eGSM, EV-DO, W-CDMA to WiMAX and LTE. While revolutionary advances will likely not arise within the next 2-3 years, technology upgrades, such as from HSPA to HSPA+, are generally regarded as a very promising instrument to realize capacity increases. System enhancements like HSPA+ introduce important features such as the option of all-IP traffic from the base station which bypasses RNC and SGSN and can be handled by more cost-effective IP routers.

Figure 3: Subscriber base growth and decline of mobile access technologies



On a more mid- to long-term horizon, LTE – touted as the "natural evolution" from GSM and UMTS networks and expected to take off in 2011 – is a highly promising development. However, HSPA+ performance can be similar depending on the available spectrum. In the radio network, LTE performance improvements over HSPA+ come from usable bandwidths greater than 5MHz, higher-order MIMO and beam forming. MIMO and beam forming are key techniques in realizing higher speed mobile data. Support for MIMO and beam forming will progressively enter system standards, but it is up to operators to exploit their potential. Especially for rural areas WiMAX is a viable alternative due to the large area covered with one cell.

II. Reduce cell size

An alternative to upgrading mobile access technology is reducing cell sizes in established networks as a means of adding capacity to meet increasing demand. Additional capacity can theoretically be realized by installing additional base stations, picocells and repeaters, or femtocells. Femtocells are small and inexpensive in-house access points for 2G/2.5G/3G technology which typically relay traffic over residential DSL as the mechanism of backhaul and are thought to be promising for solving capacity problems in metropolitan areas. Where residential DSL is not generally available, however, mobile operators need to consider their options for backhaul when deciding the case for indoor radio cells versus an increased density of wide-area macro cells. In any case, the technology is only one side of the story. The most prevalent challenge is getting customers to adopt this technology: The value proposition for these customers is doubtful since for them femtocell base stations are not needed to access mobile services. Marketing this concept will therefore be of high importance for mobile operators.

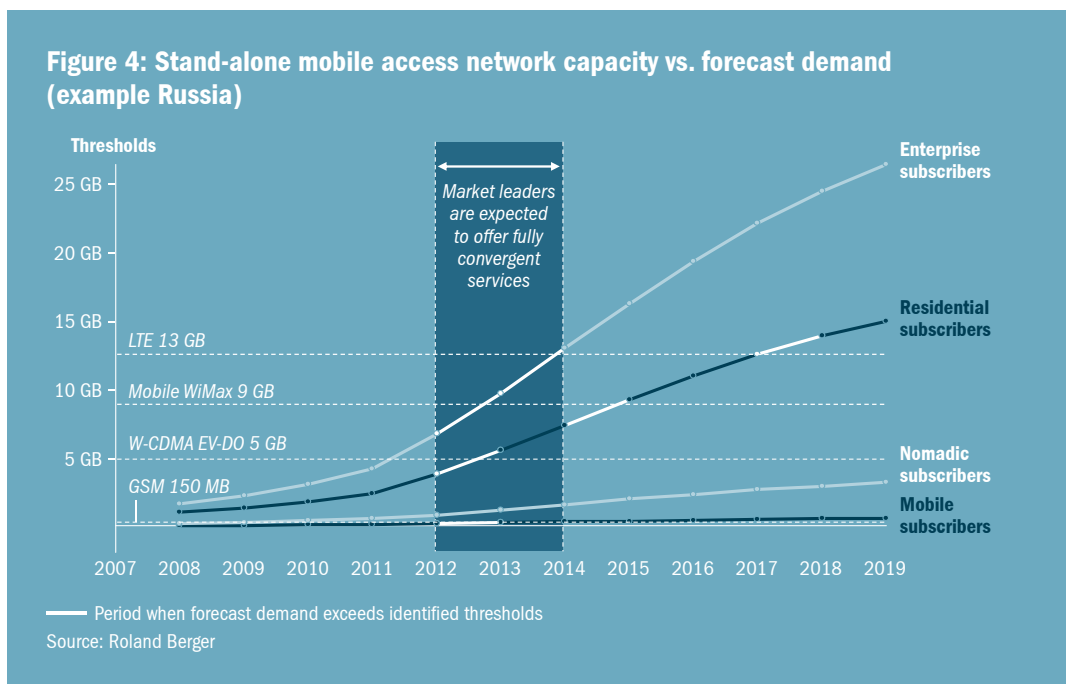
III. Use additional spectrum

The third option for increasing capacity to meet surging demand is the use of additional spectrum by acquiring frequency bands (e.g. UHF spectrum, GSM 900 refarming or the 2 GHz spectrum (UMTS)). Both the amount of spectrum used and the selection of specific frequency bands critically affect mobile broadband performance and the potential capacity of networks, as different frequency bands are differently suited for enabling mobile broadband. We can see the significance of spectrum allocation by looking at the initial coverage impact of operating HSPA at 900 MHz rather than 2 GHz: In a particular deployment plan being considered by Roland Berger Strategy Consultants, the number of base stations required to cover 10,000 km² amounted to roughly 2,000 when operating at 2 GHz, while at 900 MHz band only about 40% of these were needed¹⁾. As both the type of spectrum and the amount of spectrum (bandwidth) used are obviously very closely interlinked with the number of base stations required to obtain a certain coverage and therefore have significant impact on CAPEX, the decision for and acquisition of certain frequency bands is a highly complex matter. Valuation and auction tactics are key catalysts in preparing to acquire 3G frequency bands. The professional preparation of the application process and bidding strategy are crucial with respect to both the auction process itself (and outcome thereof) and the resulting market environment.

1) Circuit-switched with 384 kbps

B. FIXED ACCESS

In areas showing a high concentration of heavy data users, a network relying solely on mobile technology and infrastructure is unlikely to cope with demand economically [see Figure 4]. Fixed access networks can constitute a cost efficient add-on to mobile access and can significantly improve data transfer rates for customers. Indeed, strategies beyond the mobile platform are needed to win in an increasingly convergent market. Nonetheless, mobile network operators must be selective in their approach to engineering solutions and markets served.



I. Mesh mobile and fixed platforms

Of paramount importance for future sustainability is a strategy that unites mobile and fixed platforms. This provides options to serve customer needs more efficiently, but also minimizes overall network costs. Being a convergent mobile operator, though, does not mean having to build fixed access networks on a large scale, but selectively exercising the option to enhance the mobile network. The good news is that current standards are already defining the convergent platform for core networks, so the focus has to be on the options for combining investments in fixed and mobile access. In the future, a substantial proportion of high-volume IP data usage will not be strictly mobile traffic.

Supporting it with mobile access becomes a question of network economics – if mobile operators have viable alternatives to choose from. When maintaining both mobile and fixed access services, economies of scale are the decisive factor in remaining competitive.

II. Employ fixed access network add-ons

Metropolitan areas with growing demand for mobile broadband services can only partly be served with upgrades in mobile technologies. Beyond this, a fixed access network should be treated as an effective add-on to mobile access networks, with comparatively low costs. It is normally not cost-effective to route high volume hot-spot traffic through wide-area mobile base stations. Therefore, fiber will play an increasingly important role although a mix of other technology options may also be used.

FTTx today is already supported by a large number of vendors and is becoming the technology of choice for many operators worldwide. Depending on a country's individual characteristics, either FTTH or FTTC can be preferable. Capacity can be supplemented in new ways to reach mobile base stations: FTTC infrastructure to customers in multi-dwelling units beneath rooftop base stations, or supply to cabled, Ethernet-terminated indoor WiFi. In some cases, the use of femtocells with residential DSL (or other fixed broadband) lines as backhaul becomes an integral part of an operator's network in order to facilitate handset and dongle usage while reducing data load on mobile access infrastructure.

III. Be selective in engineering and go-to-market approach

With a range of available fixed access technologies, mobile operators must be deliberate in selecting an engineering approach, and in choosing the markets that they plan to serve. Sidestepping the traditional approach to fixed access networks (burying ducts and cables under the streets and pavements), convergent mobile operators must aim to avoid the legal procedures and investments in civil works and construction labor that could occur.

The price-sensitive competition in mobile broadband also implies that operators must find methods for reaching customers at sufficiently low cost. Viable investments should match income potential with cost-to-serve. Marketing dogmas that rely on targeting high-income groups should be avoided, because low-income customers represent viable markets, too, when costs are held down. For this reason, it is paramount to match market knowledge and forecasting with engineering opportunity assessment.

C. BACKHAUL AND CORE NETWORK

Backhaul is currently becoming a constraining factor in many of today's mobile networks. Adjusting backhaul throughput to growth, data traffic network operators are urged to follow a twofold strategy that focuses on areas inside and outside of homes and offices. Nonetheless, any technology taken into consideration must be NGN-ready, since future convergence aims at an all-IP core network with the capability to handle traffic from fixed and mobile access networks.

I. Develop cost-optimal lease-buy capacity mix

The question here is whether to lease or buy backbone capacity. The answer depends primarily on time and cost requirements, and ultimately on the individual business cases that apply to each operator. Due to moderate costs, high capacity and speed of rollout, microwave technology enables mobile operators to build their own networks. However, leasing may be preferable when it comes to optic fiber and cable providers. Especially for scaling up capacity to BTSs, leasing is a more expensive option but with excellent technical performance and reliability.

II. Ensure NGN readiness as future business enabler

There is no single solution for evolving networks. Requirements for each operator are driven by a wide range of factors. It is key for mobile operators to ensure compliance with NGN standards when upgrading their network components. In addition to the cost advantages, NGN excels with access network independence (PSTN/ISDN, ADSL, Cable, Wireless) and the ability to have common and richer services combining multiple media across wire line and wireless networks. Both are of strong importance for mobile broadband providers. Hence, the migration to an all-IP core network will provide the capability to handle traffic from fixed and mobile access networks. Note, however, that even with an NGN infrastructure the mobile operator still needs to adjust its business – not just the network – to fully exploit the convergence opportunities provided. Otherwise, other operators will do so and competitive advantage will be lost.

III. Develop IP connectivity wholesale strategy

Mobile operators need to embrace the notion of wholesale as a key part of their business model. The reason for this lies in the fact that the bulk of tomorrow's more data-centric business is likely to be web-related IP traffic, of which 50% or more is likely to be requests for content originating on servers in international networks. As a future data player, an operator will be an intermediary between customers and global tier 1 carriers. A key group of customers for this will be local ISPs, some with their own networks.

This is a scale game in which the larger regional operators will have the advantage in terms of network quality (number of hops to tier 1 connectivity) and IP access rates with tier 1 operators. The goal is peering agreements rather than payments for transit. The profitability will be determined by network scale economies, the scale of interconnection facilities with the tier 1 operators (also geographically where interconnection takes place) and the balance of uplink to downlink traffic.

A wholesale strategy is not limited to the markets which mobile operators wish to serve, but the manner in which they develop their network infrastructure. By way of example, the international trading of over-dimensioned national backbone capacity for capacity or dark fibers on international routes of other operators can yield significant benefits over the obvious alternatives of leasing capacity or building your own international transmission facilities.

Amsterdam
Bahrain
Barcelona
Beijing
Berlin
Brussels
Bucharest
Budapest
Casablanca
Chicago
Detroit
Düsseldorf
Frankfurt
Hamburg
Hong Kong
Istanbul
Kyiv
Lisbon
London
Madrid
Milan
Moscow
Munich
New York
Paris
Prague
Riga
Rome
São Paulo
Shanghai
Stuttgart
Tokyo
Vienna
Warsaw
Zagreb
Zurich