

Don't worry – Mobile broadband is profitable

Following the success of mobile broadband as a service, traffic shows explosive growth. But is it profitable? Dimensioning networks and **figuring out the right price** and packaging have worried some operators. A cost-benefit analysis based on **real operator cases** reveals that mobile broadband is, **in fact**, very profitable.

► **RECENT REPORTS** (from Yankee Group and Heavy Reading) warn operators to be careful of the traps they may face when calculating business cases. At the same time, an increasing number of operators are betting heavily on mobile broadband and positioning it as an alternative to DSL or cable. These operators are seeing tremendous subscriber growth, reaching typically 3 percent – even as high as 5 percent – of the population after two or fewer years of offering the service.

Ericsson, after more than two years of research in close cooperation with 18 operators, has come to a clear conclusion: Mobile broadband business cases show high profit margins, even if the operator is only a pure bit-pipe provider catering to the needs of subscribers using computers.

Here is a snapshot of a cost-benefit analysis based on real and forecasted costs and revenues. (see graph 1)

This analysis is made as an investment case, meaning that any costs that occurred prior to the decision to launch mobile broadband are considered to be sunk costs. The result, even after only a few years and with good but not aggressive growth, shows margins in line with or above what operators typically generate today. The conclusion at this stage is that mobile broadband provides a great addition to any operator's business, and can match and compete effectively with DSL.

To substantiate this, we must look at what costs a DSL operator may have. The typical cost per subscriber per month for the unbundling fee can vary by EUR 5–10 (plus equipment). It can go up to EUR 15–30 in a wholesale (bitstream) situation for fiber and VDSL. For an operator owning the copper lines (assuming all equipment is written off), the opex per subscriber per month ranges from EUR 3–5 in urban areas and rises to EUR 6–10 in rural areas, depending on the quality of the copper network.

The comparable costs for mobile broadband are the network opex and capex. Adding the cost for the sites, assuming average traffic of 2GB per subscriber per

month, of which 8 percent at busy hour, the network cost comes to around EUR 1.5–2 per subscriber in a suburban or rural area if the network is reasonably well utilized. In a network where the operator already has sites available, from a 2G network, and in an urban area with higher utilization, the equivalent network cost per subscriber is below EUR 1.

HOW WE CALCULATED

To clarify our method, let's start with a cost analysis for just a radio base station.

Base stations account for a substantial part of an operator's mobile broadband costs, because of the large number deployed. A typical radio base station (NodeB) in an HSPA mobile network, offering 7.2Mbps, with a three-sector configuration and a cell capacity of approximately 4Mbps (3×4 Mbps totaling 12Mbps), costs up to EUR 40,000. This investment is depreciated over 5–10 years.

Most people look at mobile broadband production cost in terms of cost per gigabyte (GB), and sometimes as cost per subscriber, as we did in the DSL comparison. Let's start with the GB cost to see what an operator can get out of one NodeB. In this calculation we leave out site acquisition/build, which is typically depreciated over 15–20 years and only has a small impact on the result, although it represents a large investment. Some basic assumptions are:

- At 1Mbps it is possible to download approximately 300GB in a month (28 days). (1Mb = 125,000 bytes × 86,400 seconds per day.)
- Each subscriber generates an average of 2GB per month.
- Depreciation is five years.
- Cell capacity is 4Mbps (GRAKE2, 16QAM, 10 Codes, and a 500m suburban cell. Result from Ericsson Radio Network Planning Tool and measurements in real-life networks.)

With a theoretical maximum of over 43,000GB per year, the production cost

using this site would be EUR 0.17 per GB or EUR 0.34 per subscriber per month. No site will ever be utilized to its theoretical maximum, but it could be used up to and above 50 percent. Thus the cost per GB lands at EUR 0.34 and the cost per subscriber at EUR 0.68 per month. Adding the site acquisition/build into the equation with, for example, a EUR 100,000 investment depreciated over 20 years results in around EUR 0.55 per GB. A more loaded site with a 3x2 configuration brings this cost down to around EUR 0.37 per GB. A shared 2G/3G site with a 3x2 configuration costs around EUR 0.26 per GB.

If we do the same type of calculation for the equivalent of a NodeB in a DSL network, namely the DSLAM, the result is as follows: Assuming a price of around EUR 20,000 and an existing site in a suburban scenario with an average speed of around 8 Mbps, the price per GB is around EUR 0.27. The opex related to maintaining the copper lines will of course add to this cost and adds another EUR 0.25–0.30 if we assume the cost to be shared with voice (POTS) and an average consumption of 10GB per month.

Traffic distribution in the networks Ericsson is monitoring (some 30 deployed around the world) shows that only a few sites carry most of the traffic. A normal scenario shows around 20 percent of the sites carrying more than 50 percent of total network traffic.

This means that most of the sites deployed in a network, whether for voice or broadband, can be considered “coverage” sites. The number of sites carrying heavy traffic is even lower, perhaps 3–5 percent for broadband. These sites will be the first to require upgrading to “second carrier” or higher modulation schemes to provide better capacity. But they are usually the sites that provide the shortest pay-back time.

Considering that cost per GB is related to how the nodes are used, the operator’s challenge is to make use of available free capacity rather than risk congestion.

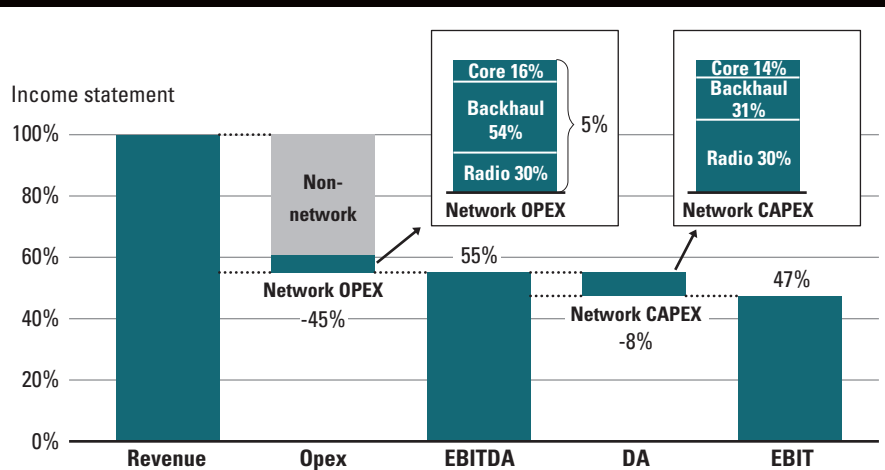
THE IMPORTANCE OF SCALE

When subscriber numbers increase, both traffic and revenue rise. (see graph 2) The operator will eventually have to invest in more capacity, in the form of additional carriers, each using 5MHz of the WCDMA spectrum. Each added carrier represents an investment. Because these investments are driven by traffic from more subscribers, there is, of course, a correlation to revenue. That makes the ability to improve cost-

efficiency important; otherwise, margins would slowly deteriorate as users demand more capacity and tariffs are lowered. Meeting this requirement is what the technical evolution is all about. Consider a given site configuration, starting at 7.2Mbps and going up to 21 Mbps using HSPA Evolution, which adds a cost of around 10–15 percent. At the same time, capacity increase is around 70 percent. Going to even higher speeds using dual carriers and other features improves the site’s efficiency.

Let’s look at a site with a cell radius of 400m using 10Mhz spectrum and MIMO

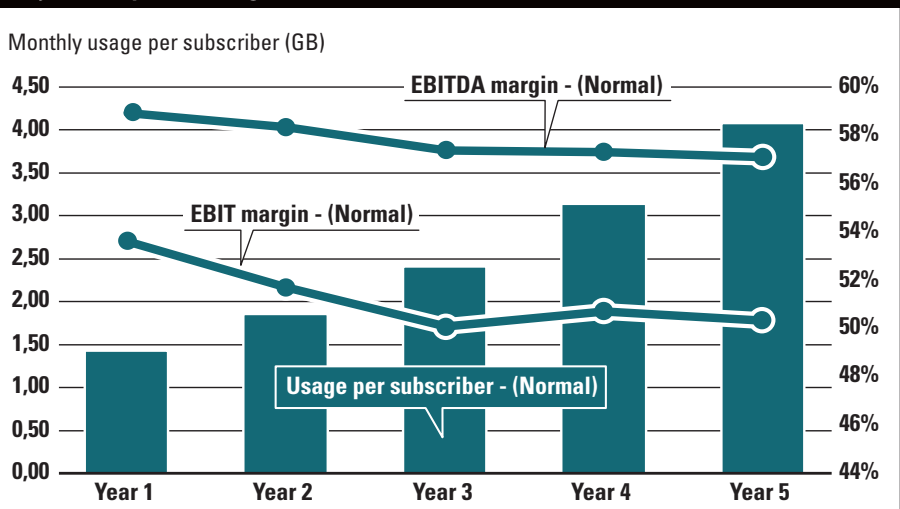
[graph 1]
Profitability of mobile broadband



Source: Ericsson Analysis; BNET Sales Development Mobile Broadband Team

Assuming 4 percent of the population has been reached four years after launch, with an ARPU of EUR 20 using unlimited flat rate and average traffic per subscriber of 2GB per month. All costs related to mobile broadband are included in the case. The revenue bar is aggregated revenue based on subscribers times ARPU (EUR 20). Non-network costs include terminal subsidies, marketing, customer care, and IS/IT. Network opex includes power consumption and support for related equipment. Capex includes any expansions or additions required to support HSPA depreciated over 8 years for hardware and 3 years for software.

[graph 2]
Projected 30 percent YoY growth



In the long run, *unlimited flat rate* with a fair-use clause is potentially cheaper and more profitable for the operator than bucket plans.

► (2GB/month, 8 percent busy hour). It has a capability to handle over 4000 subscribers at 50 percent load. That cell radius equals approximately ½ km² and can be compared to New York with around 25,000 people per km². Assuming an operator gets 30 percent of the total population, that equals 3,750 subscribers per site.

These examples show only the cost per GB for a NodeB. But if we look at the entire HSPA network (reasonably well utilized, with the cost of site acquisition and build included), we see that all costs, including the radio network controller (RNC) and the core nodes SGSN and GGSN, typically represent a small part of the total cost per GB. The mobile backhaul and optical transmission in the core cost less than EUR 0.1 per GB compared to a 3x2 NodeB at EUR 0.37 per GB. (see graph 3)

REAL-LIFE BUSINESS CASES

Simple calculations don't tell the full story of a real business, but they provide a good indicator. Let's turn our focus to real-life cases, based on research in cooperation with established operators from all parts of the world.

Ericsson has developed a tool to make a complete end-to-end analysis, including all aspects relevant to the business case. Even

voice and SMS traffic, though not part of mobile broadband, should be considered because they affect overall network dimensions. Mobile broadband must share network capacity with other services, especially the radio bearer, and voice in particular. All operators in our research have a 3G network covering 40–70 percent of their respective populations.

We have noticed that operators often struggle with their own calculations because of difficulties in identifying or allocating costs that are strictly related to mobile broadband.

In our work to produce real business case examples, we have proceeded as follows:

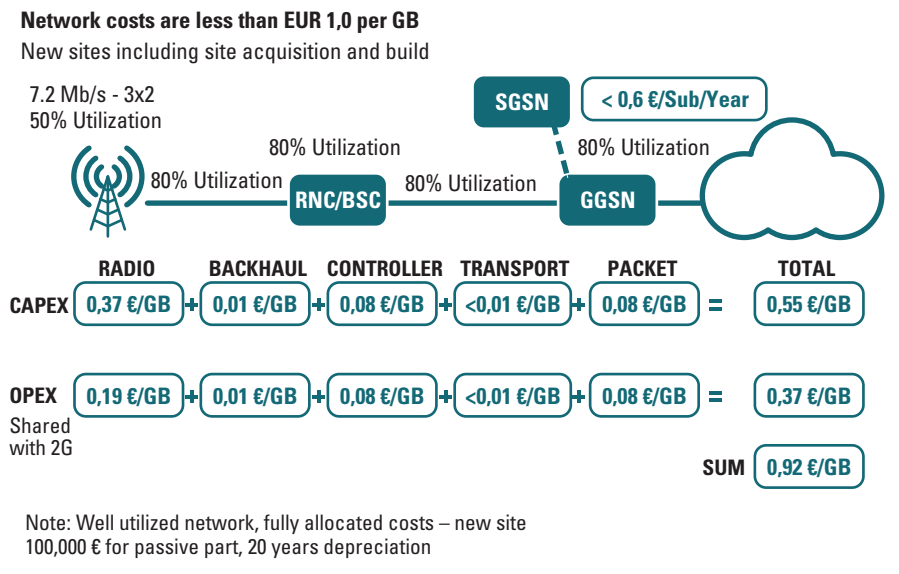
Analysis is based on existing traffic patterns and forecasts, creating a scenario for the next five years. The traffic and subscriber growth scenario determines the capacity required in all nodes including radio and backhaul, and thus drives cost over the five-year scenario. The case includes all non-network costs, such as handset subsidies, marketing, and customer care. Although marketing costs, for example, may be much higher initially, we believe that within three to five years they will stabilize at a level similar to today. Therefore, the non-network costs will be around 40 percent of revenue for a Western world operator and somewhat lower in low-ARPU regions.

Analyzing a static network won't satisfy an operator looking for real-life answers. So we look at key areas where there are question marks.

What would happen, for instance, if traffic per subscriber increased dramatically? Not the statistical average, which can increase because a few users generate huge amounts of data, such as when using peer-to-peer; but rather a traffic increase that an operator must consider when dimensioning the network. We also investigate what would happen if an operator moved away from E1/T1 (backhaul on leased lines) and used microwave links instead. Finally we consider what effects that variations in subscriber uptake could have on the business case.

The graph (see graph 4) shows how an increase of traffic per subscriber affects profitability, assuming all other things are equal. We conclude that, within limits, we can maintain strong profitability even if

[graph 3] HSPA network costs



traffic increases drastically. In the scenarios modeled with operators, shown in the graph, we have calculated with network capabilities up to 21Mbps, being introduced in some networks during 2009. But we need to remember that technology is evolving very fast. When allowing the network to evolve all the way into a five-year scenario and assuming speeds up to 56Mbps, we have the tools we need to keep up with demand and remain profitable.

The most important element of profitability is subscribers paying for the service. The graph shows how profitability drops unless enough subscribers are added (see graph 5). Many operators still have a long way to go before they have enough subscribers to be profitable. At the same time, we do see a few operators who, after two years, have reached a population penetration above what we use in this sensitivity analysis. What still has an effect on the end result for these operators is the amount of nodes that they have built out so far. The population coverage does vary between operators and the prerequisites vary by country. The Nordic countries for example have quite low population density and therefore require more sites per inhabitant than countries with high population density.

HANDLING THE THREATS

If distribution cost per GB is counted in euro cents, and traffic is not an issue at most of the sites, why do we keep hearing that traffic will kill the networks?

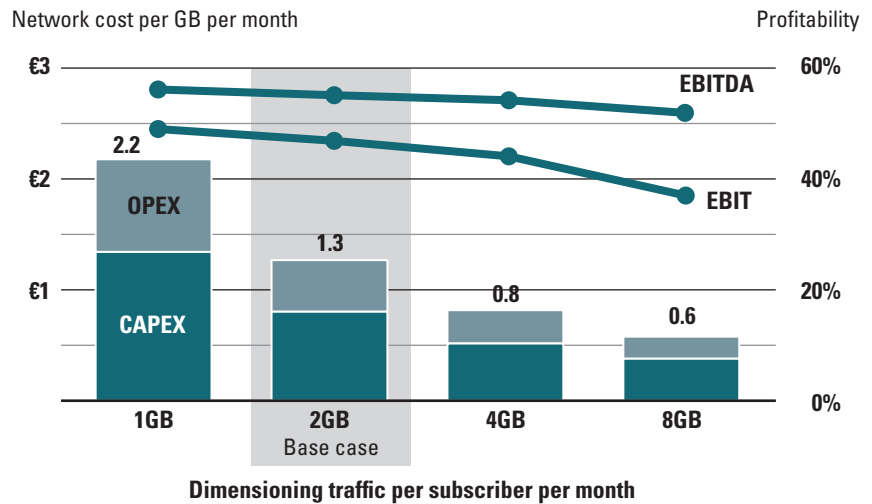
The most common argument is that heavy downloading through file sharing via peer-to-peer applications generates huge amounts of traffic. As a consequence, few operators dare adopt the de facto price model on wireline broadband, namely, unlimited flat rate. Even though this flat rate promotes subscriber uptake and is the easiest pricing for consumers to understand, operators still worry about uncontrolled costs from heavy increases in traffic.

All or most mobile networks today have been running voice, SMS, MMS, and some mobile data traffic. None of these have generated much traffic per subscriber. Revenue growth has been well aligned with traffic growth (and thus traffic cost) per subscriber. Then along came this new service that, compared to SMS, for example, easily generates 10, 100, or even 1000 times more traffic per subscriber. This has triggered a knee-jerk reaction among operators, who think that such a service can't be profitable.

The three applications generating the highest volume on the internet today are peer-to-peer file sharing, web browsing,

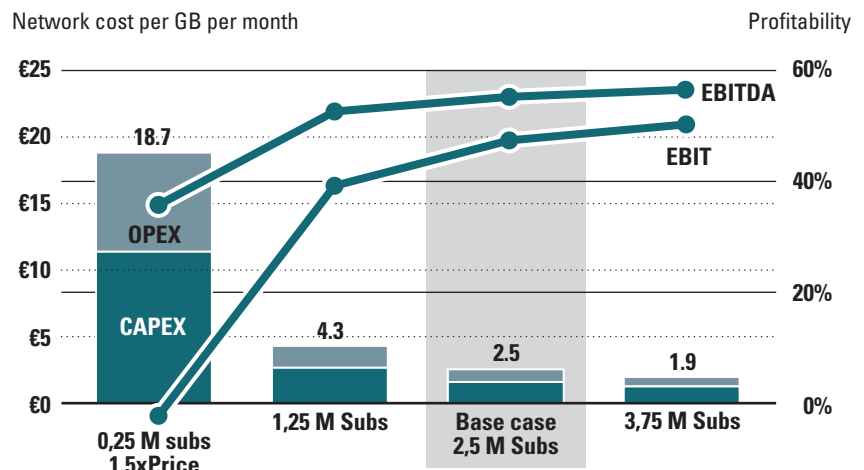
[graph 4] Economies of scale

Data usage does not significantly impact the business case due to economies of scale



Source: Ericsson Analysis

[graph 5] Customer uptake: The driver for profitability due to economies of scale



Source: Ericsson Analysis

and video streaming. Peer-to-peer alone accounts for over 60 percent of all household-generated traffic. And with traffic per subscriber increasing at a yearly rate of 30 percent, driven mainly by file sharing, we should look at peer-to-peer for opportunity.

Operators want as many profitable subscribers as possible. This means that investments made in the network are driven by the bulk of subscribers and not by a few heavy users. Ericsson addresses this by introducing traffic-handling prior-

ity throughout the network, which allows the network itself to manage its resources. The operator must introduce a fair-use clause in the subscriber's contract so it can manage heavy usage intelligently. Most commonly, mobile broadband operators use unconditional throttling today, which means that once the fair-use level is reached, the throughput drops to a predetermined level. Typically, though, these speeds don't allow for meaningful use of the broadband connection.

Traffic-handling priority (see graph 6) gives the heavy user a lower priority in the network once the fair-use level is reached. The heavy user experiences a degradation of the service only when competing for resources in a congested situation. But in peer-to-peer, the experienced reduction of the throughput will, over time, be limited. Only in heavily loaded cells does a peer-to-peer user experience serious problems. Those sites would soon be targeted for capacity upgrades since it is normal usage that is creating the congestion.

Traffic-handling priority allows an operator to focus on dimensioning the network for normal usage while still allowing unlimited or "all you can eat" traffic. The consumer gets better overall quality and the comfort of using an unlimited service that does not generate surprises on the bill.

In the long run, unlimited flat rate with a fair-use clause is potentially cheaper and more profitable for the operator than bucket plans. Subscriber uptake aside, we see that bucket size is increasing drastically, driven by competition and as a way means to segment the market. It's probably fair to assume that buckets of 10, 20, or

even 50GB already on the market must be fulfilled by the operators. With bucket plans, the traffic volumes for dimensioning the network would continually increase, and the only limitation the operator has is the bucket size. However, the fair-use level for an unlimited flat rate offer may not need to change at all, or at least very little, over time since it does provide an "all you can eat" model. The segmentation is instead achieved through speed and price.

Unlimited flat rate is a complex issue, and it is difficult to predict what will actually happen in a network when this model is applied. Although the model does allow each user to generate as much as they want, other factors influence the outcome. The operator's chosen position in the market determines which subscribers it attracts. This in turn defines the behavior of its subscriber base. Great variations exist between operators in the same market with similar packaging and pricing.

We have based this pricing discussion entirely on PC-based subscribers to prove that there is good profitability even in offering a simple bit pipe. Introducing intelligent management functions in the network allows the operator to handle all sorts of situations, such as separating application streams from each other, or varying traffic – and perhaps pricing – depending on time of day; or giving different priority to smartphone users over PC users; or giving paying mobile-TV viewers a higher priority than "best effort" internet. The possibilities are nearly endless, and it comforts operators to know they exist.

When we add them all together and put them on top of the simple bit pipe, we improve on an already powerful concept that will continue to generate good profit for operators in the future.

And finally, it is nice to get the kind of confirmation we recently received when one of Ericsson's customers reported to us that its current cost per GB for mobile broadband is now down below EUR 2, after only two years of operation. ●

AUTHOR



► GREGER BLENNERUD is Director of Business Development at Ericsson Business Unit Networks, responsible for mobile broadband for operators and consumers.

He has over 20 years in telecom with experience in software development, business intelligence, sales, and marketing. He holds a master's degree in Business Administration and Economy from the University of Uppsala, Sweden. (greger.blennerud@ericsson.com)

[graph 6] Traffic handling priority

