Analysis of operator options to reduce the impact of the revenue gap caused by flat rate mobile broadband subscriptions

Bengt G Mölleryd, Jan Markendahl and Östen Mäkitalo

***Abstract*— Mobile broad band is increasing rapidly both when it comes to traffic and number of subscriptions. The rapid growth of the demand will require substantial capacity expansions. Operators are challenged by the fact that revenues from mobile broad band are limited, just a few per cent of the overall APRU, and thus not compensating for the declining voice revenues. In this paper we analyze the potential of different strategies to reduce the network costs, to use alternative pricing schemes and to increase revenues.**

***Index Terms* — Mobile broadband, data traffic, network cost and capacity, pricing, flat rate, ARPU, value added services**

I. Introduction

The usage of Internet is currently changing from primarily being a service consumed in fixed and known locations to be a service used at any place. People bring their Internet behavior outside homes and offices as part of the daily life activities using wireless technology. Public wireless broad band access is based on two different development paths: 1) WLAN based local networks and systems, and 2) wide area networks using cellular technology (UMTS, HSPA) [1].

Access in commercial WLAN hot spots has been available during the last 10 years. These access services target business users and the service is quite costly, e.g. €10 per hour, €20 - 30 for 24 hours or €200 per month. The last 5 years WLAN services have been introduced access service is offered at very low price, for free or included in some other kind of service; e.g. train travel, a stay at a hotel or a hamburger meal [2].

Mobile network operators have also deployed WLAN hot spots for business users, but their major efforts are now made in deploying wide area networks with capability for high data rates. Mobile data usage is increasing in both handheld devices and in laptops. In several European countries the number of Mobile Broad Band (MBB) subscriptions has shown an annual growth of several hundred per cent. In Sweden the number of MBB subscriptions will surpass 1 million during 2009 (~10% penetration). With the same growth rate 2 million subscriptions can be expected within the next 3 – 4 years [3].

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Figure 1: Development of number of mobile broad band subscriptions in Sweden (thousands)

One reason for the rapid development is the introduction of flat rate subscriptions with a monthly fee typically in the range of €10 - 20. This type of pricing schemes has some consequences for the operators. The price per transferred MB of data is much lower for the data service compared to voice (SMS) services. The price per MB for voice has typically been €1 - 2 the last years whereas the price for data services is around € 0,01 per MB. The data services are now also the dominating type of traffic in the networks, 70-80% of all traffic is from data usage. However, only a small fraction of the revenues are derived from data services, typically only a few per cent, see more in section II.

In this paper we will address this traffic, cost & revenue problem for mobile operators. The data traffic and the need for additional network capacity (i.e. investments) are increasing substantially while revenues are growing at a very low level. The operators are facing a number of challenges related to i) the scalability and cost structure of cellular systems, ii) the use of flat rate subscriptions and iii) the changes in the business landscape. We will analyze the potential impact of different strategies to reduce the network costs, to use alternative pricing schemes and to find new sources of revenues. The paper is organized as follows. Section II provides traffic and revenue data and section III summaries the implications of the current development. Different types of challenges for operators are described in section IV and in section V strategies to handle these challenges are described. In section VI we present prediction of the financial performance for a fictitious operator making use of the different strategies in section V. Conclusions are found in section VII.

II. TRAFFIC, REVENUES AND COST

Mobile operators have built their business on providing voice services to a continuously growing customer base. The customer base for one Nordic operator grew with a 5.4% CAGR (Compounded Annual Growth Rate) during 2000-08. Concurrently, usage increased with a 5.6% CAGR, propelled by an 11% CAGR decline in ARPU per Minute of Use (MoU). Voice makes up 60-70% of the total revenues, while mobile broadband generates just 2-3% of the mobile revenues. Other revenues in fig 2 are non-traffic revenues i.e. fixed fees.

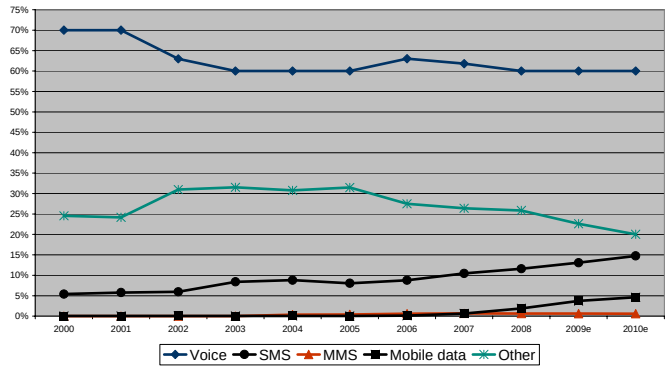

Figure 2: The share of revenues for various services

Voice was the primary traffic generator up to 2007 when mobile data surpassed voice. Mobile data generated 16% of the total traffic in 2006 which increased to 79% in 2008, while its share of revenues went from 0.1% in 2006 to 1.9% in 2008. SMS generated 0.2% of the traffic, while the share of revenues increased from 5.4% in 2000 to 11.6% in 2008.

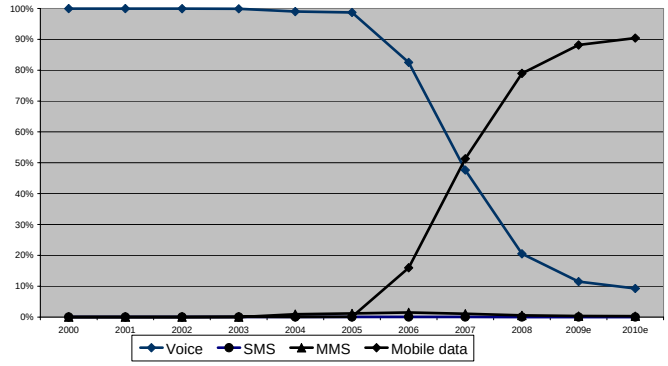

Figure 3: Traffic distributions for different services for a Nordic mobile operator

The price for SMS is equivalent to €351 per MB, with a marginal cost close to zero. Assuming a 33% EBITDA margin for a large operator and a 95% EBITDA margin on SMS and that SMS makes up 12% of the revenues text messages would generate 1/3 of the EBITDA for the mobile business. The price for voice, calculated as per MB, has declined at an average rate of 8% per annum during 2001-08.

EUR per MB	2005	2006	2007	2008
Voice	1,91	1,69	1,46	1,36
SMS	686,8	549,4	439,5	351,6
Mobile data (laptop)	1,386	0,016	0,014	0,011

Table 1 Price per MB for voice, SMS and data

The combination a of rapid price erosion on mobile broad band and steeply increased usage has resulted in that the price per MB has declined with 30% from 2006 to 2008, being around €0.011 in 2008. This should be compared with mobile data over handsets on which operators charge €1-2 per MB.

As mobile data generates 80% of the traffic while only contributing with 2% of the revenues operators are facing a problem, a revenue gap, see Figure 4. Due to the flat rate charging for mobile data the increased data usage does not automatically transform into increased revenues which is the case for voice service as it is generally charged per minute of use. This implies that operators have not moved far in the transition from the voice centric business to the IP business model. The minimal impact on revenues from mobile broadband gives no contribution to cash flow, which limits the room for increased investments, which is required by the rapidly growing traffic. The total traffic will continue to grow due to the increased usage of mobile broadband and the operators will need to increase the network capacity. Hence, the profitability of the "networking business" will depend heavily on the costs for this network build out.

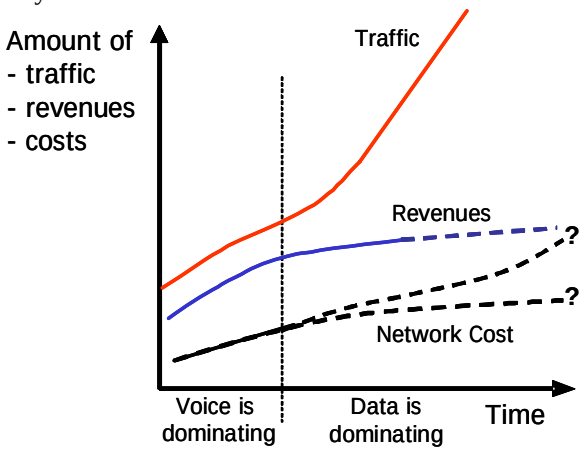

Figure 4: Traffic and revenues for increasing data volumes

III. FINDINGS FROM THE CURRENT DEVELOPMENT

A. Mobile broadband unable to drive revenues

The data points underscores that operators are highly dependent upon the revenue stream from the voice business. It requires limited network capacity as voice customers only generates 10 MB of traffic per month, while mobile broadband users in average consumes 130 times more traffic, paying only 1% of the price per MB compared to voice. This asymmetry is unsustainable, although low utilization rates in the UMTS networks initially can handle the increased load factors.

B. Operators forced to look for new revenue streams

The mobile voice business has stagnated as the influx of new customers is declining as penetration rates on mature markets have passed 100%, with an average of 119% in Europe. This indicates multiple SIM cards in combination with intense competition making it challenging for operators to raise prices. This implies that the basic voice business hardly will grow, but rather is subject to the risk of a decline.

This forces operators to launch new value added services to compensate for a deteriorating voice business. But this has so far been unsuccessful, illustrated by the limited interest users have showed for mobile videoconference, mobile-TV, and gaming. Neither would an entry to emerging markets solve the problem as prices are considerable lower, competition fierce and penetration rates high on most markets.

C. *Lower termination fees puts pressure on ARPU*

The EU Commission, as well as National Regulatory Agencies (NRA), are determined to reduce interconnect rates. It is driven by an ambition to 1) balance termination charges between mobile and fixed, the difference today is a factor of at least 10 times, 2) to lower retail prices as the level of termination charges correlates to end customer prices, and 3) to lower prices for international roaming.

The established way to calculate termination charges is to use LRIC (Long Run Incremental Cost) model, which use traffic data and network investments in order to calculate the cost for a terminating minute. Given that the traffic volumes have increased substantially through the breakthrough for mobile broad band the calculated interconnect levels are reduced with over 30%. Interconnect makes approximately up 10-20% of ARPU, and the net impact depends on traffic flows, giving a boost to net profit for operators with a large share of incoming traffic. A reduction of interconnect charges with 35% for an operator with an ARPU of €22, of which 15% are made up of interconnect charges, would decrease ARPU with 5%. Altogether, this implies that operators' revenues will be driven by Average Bill Per User (ABPU) as the development is going towards a regime of "Bill and Keep", where termination charges are totally eliminated. .

D. *Lower free cash flow restricts capex*

The financial crisis has placed the focus on debt making operators more cautious on capex in order to have the ability to service debt, pay dividends and strengthen their balance sheets. But the operators' ambition to expand aggressively on mobile broadband requires capex upgrades. Given that mobile broadband generates no cash flow it weakens operators financially in a time when investors and banks are favoring financial stability. This forces operators to make strategic prioritizations and subsequently alter business models for mobile broadband.

IV. Operator challenges

We are highlighting four types of operator challenges related to a rapid growth of mobile broad band traffic.

A. *Flat rate subscriptions*

The impact of flat rate subscriptions, the differences in price per MB between voice and data and the revenue gaps have been described in the previous sections. Identified problems with flat rate for mobile broad band are related to both usage patterns and "mis-use". It is reported that a large share of the total traffic is generated by quite few "heavy data users". This usage may be intentional, e.g. continues downloading of music and films, or un-intentional, e.g. a laptop is left connected while not used [4].

One identified issue with flat rate is the waste generation in the user utility. In a situation with "all you can eat" for a fixed price some users will consume resources that they may not need or value, illustrated by the fact that almost half of the HSPA data traffic is P2P. The utility is low but the operator still has the costs for providing the service (resource) [5]. The operator cannot charge the user for this low utility service. One operator strategy is to put limits on the data usage, and differentiate prices.

B. *Scalability of cellular systems*

For a specified amount of spectrum and for the same type of Radio Access Technology deployment of N times more capacity will imply N times higher network costs. The cost is proportional to the number of users, the demand per user, the service area and also a function of quality [6]. Development of new more cost efficient technology will help but the underlying problem with scalability will remain.

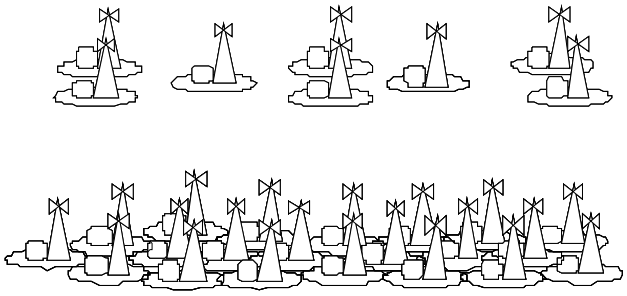

Figure 5: More capacity per area unit implies denser networks and higher network costs.

C. *Cost structure of cellular systems*

Costs for the radio access network include not only costs for the base station equipment but also costs for transmission and sites, see Figure 5. For outdoor deployment (macro and micro base station sites) the site costs are substantial [7]. Site costs include both capex and opex and can typically be costs for towers, power, installation, site survey & planning and site leases. With increasing capacity requirements the transmission to the sites must be upgraded. Transmission using 2Mbps E1 leased lines are not sufficient to support HSPA data traffic which implies build out of fiber connections.

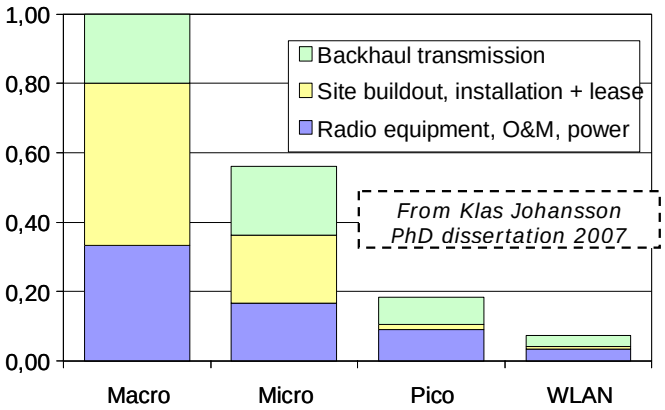

Figure 6: Example of base station cost structure including capex and opex for greenfield deployment [7]

D. *Changes in the business landscape*

The deployment and operation of mobile and broadband networks have traditionally been an infrastructure business. Large companies with solid financial resources make long term commitments when networks are deployed and upgraded. Long term customer relations (subscriptions with post-paid bills) are very common.

However, with the introduction of Internet based services the business landscape has changed. "Any" actor connected to the Internet can start to make business, even with very low investments. For mobile and broad band access the service "itself" is closely related to the network and the related characteristics, e.g. bit rate, coverage, and reliability. For internet based services (using the network) there are other company assets and capabilities than the network that enable an actor to enter business. In addition to the value added service itself other assets can be customer or billing relation, local presence, payment and billing support.

We can see a transition from the "telecom view" to the "Internet view" or a combination of the two [8], see figure 7. In the first case the main aspect is the infrastructure and services that are added "on top of" the networks. Using the second view the networks are seen as an asset similar to roads, railways, water supply, schools that are needed in order to facilitate markets, companies and the society to function as expected.

As identified by a representative for the Gartner group at the Mobile World Congress in Barcelona 2009 other types of actors make large efforts in order to obtain a share of the internet business and to connect customers more closely. Examples are Microsoft (SW), Nokia (mobile phones) and Google (internet), i.e. large, global and powerful companies. This raises the inevitable question: what is left for operators?

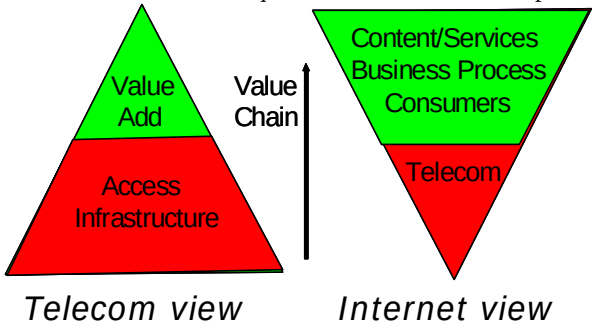

Figure 7: Different business perspectives (from [8])

V. Operator options

In this section we will discuss different types of strategies for operators to bridge the revenue gap. In section VI these strategies are evaluated using a sensitivity analysis approach.

A. *Network sharing*

Network sharing includes all forms of operator cooperation where sites or parts of the radio access networks are shared. This is a form of long term cooperation. In Sweden all 3G operators are involved in different types of joint ventures, and a new constellation has been announced regarding the deployment of LTE. The cost savings can be in the range 20-40% depending on the level of sharing. The potential for saving is obvious when you consider coverage and macro base station deployment where the site costs are large, see figure 6. For capacity expansion in urban areas the potential savings with shared networks would presumably be much lower.

B. *Spectrum refarming*

Another way to exploit current networks and re-use existing sites is to replace or mix radio access technologies in specific frequency bands. One example is the 900 MHz band where WCDMA, HSPA or LTE can replace GSM/EDGE resulting in increased capacity per site and MHz of spectrum. WCDMA in the 900 MHz band implies that 3G coverage can be achieved with a lower number of sites than in the 2.1 GHz band. Hence, these benefits would be most valuable for wide area coverage. On the other hand the present usage of the 900 MHz band is for GSM and EDGE. So when calculating the benefits the costs for the whole WCDMA implementation has to be included. These costs have to be covered by the additional revenues resulting from WCDMA. Nokia Siemens Networks claims that the total savings in capex and opex can be up to 60%, i.e. total cost of ownership (TCO) is reduced to 40% compared to deployment in the 2.1 GHz band [9].

For indoor coverage the benefits of the abovementioned type of spectrum refarming is more difficult to exploit than for wide area coverage. In urban areas high capacity is already achieved by dense deployment of macro or micro sites using WCDMA or HSPA operating at 2.1 GHz.

C. *Offloading heavy data traffic to local networks*

Instead of deploying a large number of outdoor base stations for mobile broadband the heavy data traffic can be *offloaded* to local networks or operators using indoor systems [10]. In addition to the potential of substantially lowered network costs a number of other motivations can be identified:

- the data traffic is mostly (~90%) generated indoors
- the users are stationary or nomadic
- the users are "known" (at the office or at home)
- no need to deal with wall attenuation

Previous studies have indicated large cost savings using indoor local networks to satisfy the indoor demand of wireless data services. Compared to capacity expansion using macro or micro base stations the use of cellular femtocells or WLAN systems indicate cost savings in the range 20 times [11].

The choice between WLAN and femtocells is probably not the main issue. Performance and cost for equipment, deployment and operation are similar. But the conditions can be different for different operators depending on availability of own WLAN networks, own fixed broad network and business partners. Interference and availability of spectrum is another issue. The opportunities with indoor deployment can be exploited if the local networks easily and cost efficiently can be deployed and operated. This usually requires cooperation with facility managers/owners and enterprises.

D. *Pricing strategies and service differentiation*

Currently the flat rate subscriptions area associated with some type of restrictions, e.g. maximum amount of data per month (1GB, 5GB) and maximum data rate (384 kbps, 3,8Mbps, 7Mbps). Operator "3" in the UK offers

subscriptions with different maximum amount of data per month, e.g. 1 GB for £10, 5 GB for £15, and 15 GB for £30. Heavy data users have to pay more. This kind of pricing scheme is a way to handle the "waste" problem associated with flat rate.

In the sensitivity analysis presented in the next section we study the impact of differentiated prices using different assumption related to the questions:

- How many are the "heavy" data users?
- How many of these users are prepared to pay more?
- How much are they prepared to pay?

The same questions are relevant for subscriptions where the operator offer some guarantees for the service availability.

E. New types of services and revenues

For mobile broad band access and voice services the added value for the customer is mainly related to connectivity and the possibility "to connect" or "to be reached". But operators also business-to-consumer (B2C) services based on SMS. One type focuses on confirmation and notification of events (ticket sales, deliveries, appointments with dentist etc). In this case operator revenues come from the charging of the SMS. However, the value of the service for the users is much higher implying that customers would be prepared to pay more. The operator is not really "involved" in the B2C relation.

However, for SMS based ticketing services, e.g. for parking and bus transportation, the operator make use of its customer and billing relationship and the service platforms that enable payment support. Hence, the operator is an actor that contributes actively to the value chain for a non-telecom type of service.

This kind of business approach can be extended in order to provide operators an opportunity to offer new types of value added services to their customers. Using NFC technology (Near Field Communication) and adding this functionality the mobile terminal can to be used as a "mobile wallet and key" and exploit the opportunity with micro transactions [13]. This enable the operators to be involved in services supporting "daily life activities", e.g. mobile payments, ticketing, access control to offices, public transportation etc. The operator would be part of an ecosystem for delivery of business-to-business-to-consumer (B2B2C) services [12].

We believe that these B2B2C services have a large potential for increasing the ARPU for operators. Firstly, the services based on NFC enabled handsets and B2B2C service platforms offer added value to "many" users "many" time each day. The SMS based notification and ticketing services mentioned above are used more seldom. Compare the ARPU contribution to operators of one additional SMS per day (for some people). Secondly, these B2B2C services imply a kind of "natural" possibility for operators to contribute to the value chain. Operators can re-use and exploit the control of the SIM-cards, the customer relations and the payment and billing support functionality. In this case we believe that operators have an advantage compared to Microsoft, Nokia and Google.

VI. Analysis of an Operator Case

The presented data points show that mobile broadband (MBB) is transforming the mobile networks while hardly making an impact on revenues. In order to explore the impact of differentiated prices and of increased capex we will use a reference case with an "operator North". We carry out a sensitivity analysis and use European average KPIs,

A. The reference case: Operator North mobile broadband

The modeled market has 10m inhabitants, a mobile voice & broadband penetration of 125% year 2008 and expected to continue to grow. This operator has a stable 45% market share. The share of mobile broadband customers out of the own customers will grow from 5% in 2008 to 17% in 2011.

We assume that operator North has an voice ARPU of €22 in 2008, falling by 3% per annum. The declining revenues are driven by the combination of reduced number of voice subscribers and lower ARPU. The Minutes of Use (MoU) was 245 in 2008, gradually growing during the forecast period. This translates into a calculated price per MB for voice of €1.64 in 2008, declining to €1.29 in 2011, see table 2.

	2008	2009	2010	2011
Mobile voice subs '000	5 451	5 491	5 340	5 361
ARPU EUR	22,0	21,3	20,7	20,1
MoU	245	257	270	284
Revenues MEUR	1439	1406	1326	1292
Price per MB	1,64	1,51	1,40	1,29

Table 2: Mobile voice business for operator North

We have penciled in a strong growth for operator North's mobile broadband customer base, with a MBB ARPU of €17.0 in 2008 expected to be €18.0 in 2011. We assume mobile data usage per subscriber and month to be 1.3GB in 2008growing to 1.7GB in 2011.

	2008	2009	2010	2011
Mobile broad subs '000	287	477	869	1 098
Mobile broadband ARPU	17,0	17,3	17,7	18,0
Revenues MEUR	59	99	185	238
MB per user	1 300	1 430	1 573	1 730
Price per MB EUR	0,013	0,012	0,011	0,010

Table 3: Mobile broadband business for operator North

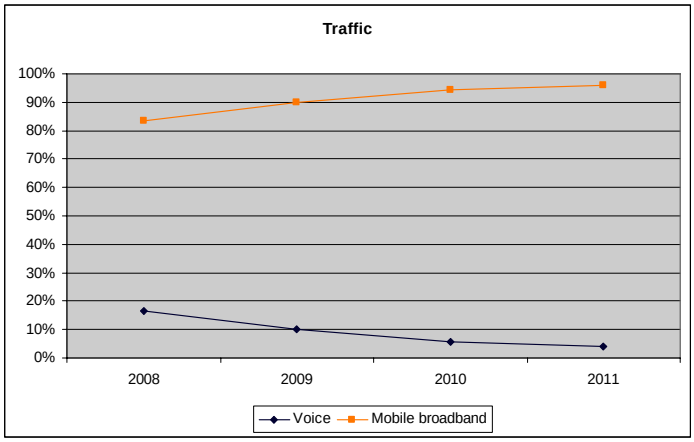

Figure 8: Traffic distribution voice vs. mobile broadband

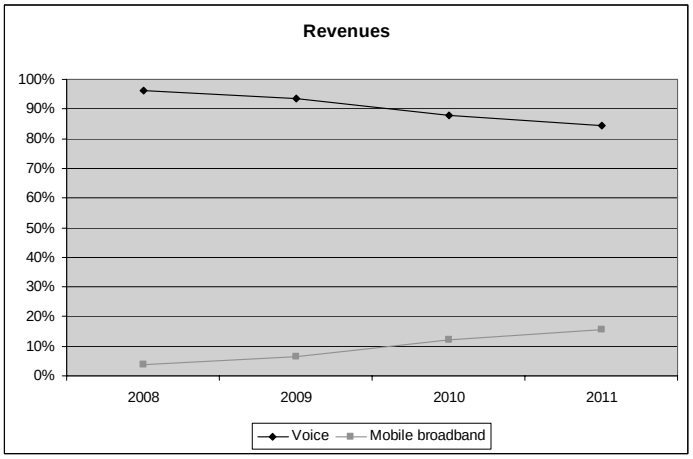

Figure 9: Revenue split for voice and mobile broadband

Total mobile voice revenues are falling gradually, going from 96% of total revenues in 2008 to 84% in 2011. The traffic distribution looks the opposite as mobile broadband is increasing from 84% in 2008 to 96% in 2011. The price per MB for data users is 1.3c in 2008 and set to decline to 1.0c in 2011.

B. Sensitivity analysis on mobile broadband ARPU

The asymmetry with a large share of the traffic and a small share of the revenues is unsustainable. It is therefore not surprising that a growing number of operators are differentiating prices, and introducing caps.

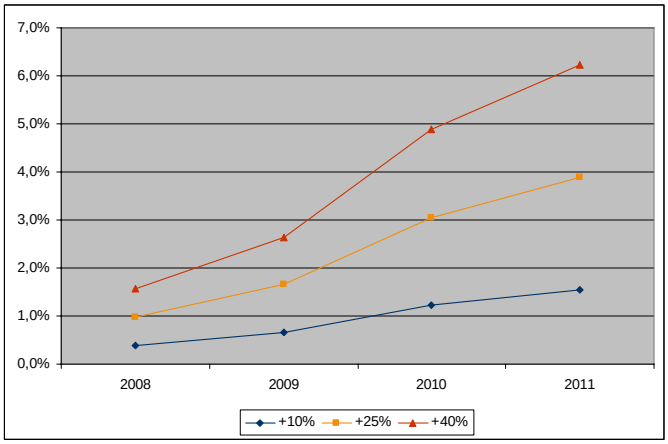

Figure 10: Impact of increased MBB ARPU on revenues

We have modeled price hikes by increasing MBB ARPU with 10%, 25% and 40% in order analyze the impact on total revenues, see Figure 10, while keeping our other parameters unchanged.

A 10% increase of ARPU would lift estimated total revenues with 0.7% in 2009, with a price of 1.3c per MB. A 25% increased MBB ARPU would push up revenues with 1.6% in 2009, with a price per MB of 1.5c, and a 40% higher MBB ARPU would raise revenues with 2.6%, giving a price of 1.7c per MB. However, it would not materially change the gap between mobile broadband traffic generation and revenue contribution.

This analysis show that mobile broadband, in the form of internet access without any strings attached, has the potential to be disruptive for the mobile operator business. Although the loading factor remains low in most HSPA networks the increased diffusion of mobile broadband will subsequently force operators to upgrade capacity and increase capex.

The revenue gap for Operator North is illustrated by the gap of traffic and revenues, and the 30% higher prices on mobile broadband is only making a minimal impact, figure 8.

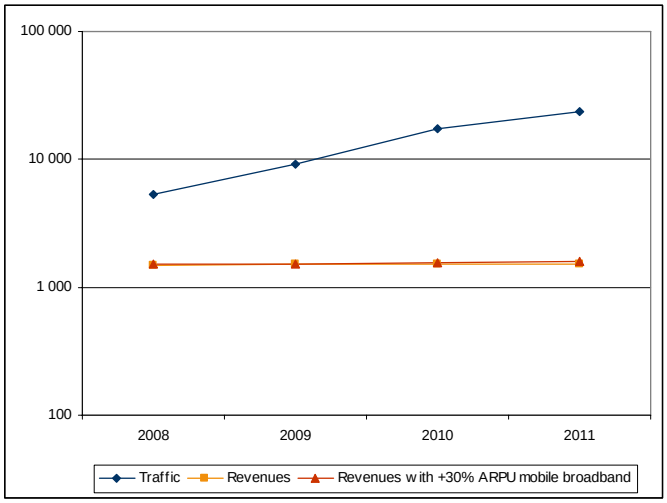

Figure 11: Log scale revenues (MEUR) and traffic (TB)

C. Analysis of network costs

Operator North has an installed base of 5629 base station sites with distribution between urban, suburban and rural according to table 4. We assume that all sites have three sectors and cane be equipped with EDGE, WCDMA or HSPA. With an estimated spectrum efficiency of the installed radio equipment in the range 0,2 – 0,5 bits/second per Hz of radio spectrum [7] the total capacity of all sites are somewhere between 17 – 42 Gbps.

	Thousand km^2	Thousand Pop	Sites
Urban	2,3	5 500	1 689
Suburban	21,4	3 650	1 407
Rural	324	850	2 533
Total	347	10 000	5 629

Table 4: Population and area types in the country

Based on the growths of number of subscribers and the data usage per user, see table 3, the data traffic is assumed to grow 5 times during 2008-2011. Assuming that the date volumes are “consumed” during 2 busy hours during every day of the month we get an estimated total demand of 14 Gbps for year 2008 and 70 Gbps year 2011.

The expansion of the network capacity can include addition of new sites, WCDMA upgrading to HSPA, addition of new carriers and replacement of GSM/EDGE with HSPA or LTE. The amount of capacity and the cost of the upgrading depends on what target demand to satisfy, the existing base station equipment and configuration and what cost savings actions (e.g network sharing) that can be used.

In order to estimate the impact of the network investments on the operator business we employ a sensitivity analysis approach similar to the one used for the pricing analysis in the previous sub section. We assume that the coverage of the network is sufficient and that the expansion includes only capacity. The expansion is made for three different cost levels; very low, low and high capex corresponding to an upgrade of 10 k€, 40 k€ and 80 k€ per site. The investments in order to keep the existing network quality & availability ("the maintenance capex") corresponds to a capex/sales of 8,5 %. The results are shown in table 5 below for the different levels of capex. For the high capex level the impact on the capes/sales (~18%) is substantial. The importance of low cost solutions is obvious when capex/sales are compared. However, the important issue is that the network investments do not results in any major increases of the revenues.

Maintenance capex	127	127	127	127
Very low capex				
Upgrade capex MEUR		19	19	19
Total capex MEUR	127	145	145	145
Capex/sales	8,5%	9,7%	9,6%	9,5%
Low capex				
Upgrade capex MEUR		75	75	75
Total capex MEUR	127	202	202	202
Capex/sales	8,5%	13,4%	13,3%	13,2%
Diff. from very low capex		39%	39%	39%
High capex				
Upgrade capex MEUR		150	150	150
Total capex MEUR	127	277	277	277
Capex/sales	8,5%	18,4%	18,3%	18,1%
Diff. from very low capex		90%	90%	90%

Table 5: Impact of upgrades on capex

D. Analysis of the impact of new services

One option to increase revenues is to introduce new types of Value Added Services (VAS), e.g. mobile payment. In order to explore the impact of these new type of services we differentiate between three user categories, frequent VAS user to low user VAS with three level of "clicks" per month with a price, or value per click of €0.05. This adds up to an additional ARPU per month from €1.25 to €12.50

	click per month	price per click	EUR/ month
VAS - frequent	250	0,05	12,50
VAS - medium	150	0,05	7,50
VAS - low	25	0,05	1,25

Table 6: Three levels of Valued added services (VAS)

We assume that 40% of the customer base of Operator North will not use these services, 30% being low users, 20% mid-users and 10% high users, see table 7.

	2009	**2010**	**2011**
Subs	5 491	5 340	5 361
No usage	40%	40%	40%
Low frequent users	30%	30%	30%
Mid frequent users	20%	20%	20%
High frequent users	10%	10%	10%

Table 7: Distribution of use pattern in the customer base

We take the starting point in our assumed ARPU and add the three levels to the different categories and calculate revenues. It adds up to that the revenues in our base case (i.e. voice services only) would increase with 15-16%, see table 8.

ARPU	**2009**	**2010**	**2011**
No usage	21,3	20,7	20,1
Low frequent users	22,6	21,9	21,3
Mid frequent users	28,8	28,2	27,6
High usage	33,8	33,2	32,6
Subs			
No VAS	2 196	2 136	2 145
Low VAS	1 647	1 602	1 608
Mid VAS	1 098	1 068	1 072
High VAS	549	534	536
Revenues			
No vas	562	531	517
Low VAS	447	422	412
Mid VAS	380	361	355
High VAS	223	213	210
Total	1 612	1 527	1 493
base case voice	1 406	1 326	1 292
Change	**15%**	**15%**	**16%**

Table 8: Impact on revenues with VAS operator North

E. New services potentially bridging the revenue gap

We assume that ARPU for the mobile voice services will drop from €21.3 in 2009 to €20.1 in 2011 in our base case. The MBB ARPU will increase from €17.3 in 2009 to €18.0 in 2011. The growth in traffic and number of MBB users requires investments for network upgrades.

In order to offset the increased capex by growing revenues and reaching a capex/sales of 10.5% in 2011 operator North need to generate an additional ARPU of €2.50 on top of our estimated ARPU. This implies that operator North has to commercially succeed with some types of new service. In our example, we estimate that revenues will increase with 16% which translates into an ARPU ranging from €20.1 to €32.6 for the high frequent users. Although this is a potential, it will be will be a challenge for operator North to reach it.

VII. Conclusions and implications

We have analyzed the traffic and revenue aspects of the increased usage of mobile broad band services. In many markets broad band data traffic is dominating, up to 80% of the total traffic, but the contribution to the revenues is very limited, representing a few per cent of total revenues. With the expected increased data traffic operators are faced with the fact that the user demand for network capacity will increase 3 - 4 times within a few years. The network capacity need to be increased, but the limited revenue stream from mobile broadband has so far failed to support increased investments.

A number of strategies are available for operators in order to bridge this so called "revenue gap"; i) reduction of network costs, ii) increased revenues from existing services and iii) new sources of revenues.

For wide area networks it is possible to reduce network costs using network sharing and/or by replacing GSM in the 900 MHz with other radio access technologies. For local area networks there seems to be a larger potential to lower costs by using WLAN, femtocells or LTE for capacity expansion.

Another way to bridge the revenue gap is to increase the price for existing services. This can be motivated by some type of added value or service differentiation, e.g. in the form of service availability or higher amounts of data. Or alternatively to deliberately aim to lower the traffic levels. In our sensitivity analysis this turns out to have a limited impact on the revenues mainly because it is likely that quite few users are prepared to pay more for the improved service.

Finally, we have considered new sources of revenues with focus on value added services that can be expected to be used "often" by "many" users. One candidate type of services is B2B2C type of services for mobile payment, ticketing and access to offices, hotels and public transportation. We believe that these kinds of services have a good potential for "mass consumption" as well as enabling mobile operators to achieve a central role in the value chain. Operators control SIM cards in the handsets, have established customer and billing relationships and system for payment support. Combined with brand and trustworthiness these factors enable operators to be a trusted provider of payment and ticketing services.

We can conclude that in order to bridge the revenue gap operators need to combine "improvements" of current systems and services with types of solutions and services. Fine tuning and "improvements" will results in limited benefits, e.g. 20-50 % reduction of network costs for some deployment scenarios and doubling of ARPU for some types of users.

Here we would like to highlight "Cooper's law" and some similarities with our problem area. According to "Cooper's law" the wireless voice traffic doubles every 30 months. Between the years 1950 and 2000 a 1million-fold gain can be observed [14]. The enabling factors for this change are:

- 15 times by using more spectrum (150MHz–> 3GHz)
- 5 times from better voice coding
- 5 times from better MAC and modulation methods
- 2,700 times from smaller cells

"More of the same" (spectrum) and "enhanced algorithms" (e.g. coding and modulation) will results in some level of improvement. The dominating impact is a result of another approach, in this case smaller cells. In our case the "new type of challenge" is the combination of flat rate charging and rapidly increasing data traffic, and here we believe that radically new approaches are needed. We would like to highlight two aspects:

1) Off loading of heavy data traffic to local networks with better cost-capacity characteristics than traditional networks

2) Extension of the operator value chain into mobile payment and ticketing using NFC enabled handset and B2B2C relations

When it comes to offloading from wide area networks the gain in cost-capacity performance is achieved since the access service is provided by a cheaper network in a limited area where the users are expected to use the service. In order to exploit these opportunity operators need to cooperate closely with other market actors like facility owners, universities, enterprises and local networks operators.

For the case of B2B2C services a key issue is that operators get a central position in the value creation for both the business customer (the 2nd "B") and the consumer ("C"). Hence, the operators need to market more refined network services and not only raw material such as MB, voice minutes or SMS. They need to be more involved in different forms of value creation and "daily business". Operators need to develop more business understanding and other forms of customer relation management than those related to access and connectivity services.

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