

The case for rural data services and satellite backhaul

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Executive summary

Mobile operators are now facing a plethora of challenges to maintain the high levels of profitability they are accustomed to. Issues including increased regulation, heightened competition from the traditional mobile value chain and new competitors from the Internet world are starting to seriously challenge operators. Furthermore, internal challenges including the rapid growth of traffic – without the respective revenue growth – and saturated urban markets are making operators look for new areas of growth, particularly organic growth.

Mobile operators are now turning to rural, unconnected areas to continue increasing their subscriber base. Traditionally, such areas have been very expensive to connect and the business case was driven either by regulation or social issues and, in many cases, profitability was not the top priority. However, new technologies are now coming to market which can support the business case and improve the profitability of these networks considerably. The opportunity for mobile operators is greater in developing markets, where several millions of potential subscribers are still unconnected and mobile networks may be the only medium that can reach them.

Data services are particularly interesting for rural areas, since many vertical markets are very suitable for mobile services, including agriculture, healthcare and transport. New services are currently being introduced in India and other developing markets, driving economic development.

One of the technologies that is currently evolving is backhaul, which has traditionally been very expensive to roll out in rural areas, using either microwave or through Geostationary Earth Orbit (GEO) satellites. A survey conducted by Informa Telecoms & Media on rural connectivity reported that backhaul is among the most critical elements of a successful rural network rollout.

A new Medium-Earth Orbit (MEO) constellation now being launched by O3b is expected to be a more suitable technology for rural backhaul since it is more cost-effective and it is well positioned for data services.

Informa Telecoms & Media performed economic modeling for a rural network with a variety of backhaul technologies and concluded that MEO-driven backhaul is the most effective technology, assuming that data services are significant in rural areas and require in excess of 2Mbps in backhaul capacity. Above this threshold, the superior opex performance of MEO backhaul performs better than the rest of the technologies assessed.

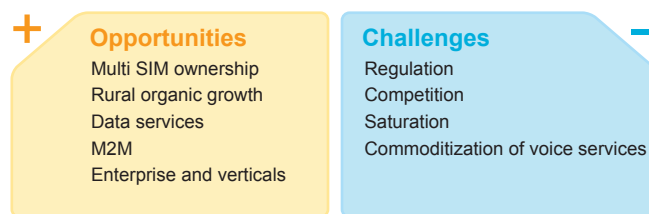
Introduction

Mobile operators are increasingly challenged today as remaining profitable is becoming more difficult. Regulation, 100% market penetration, increased competition from direct (other mobile operators) and indirect (Internet companies) services are a few of the critical reasons why profitability is becoming a major challenge. Nevertheless, there are still several opportunities in the mobile market, but perhaps not in the high-margin business sense, that operators have been comfortable – and very profitable – with.

Mobile market landscape

Mobile operators today are faced with both new challenges and new opportunities to maintain or even improve their business potential (see fig. 1). Although mobile telephony markets are still expected to show very robust growth in Africa, Latin America, Asia Pacific and the Middle East, there is very little expectation of growth from mature markets in terms of the number of unique users of mobile telephony. Furthermore, by 2015, no region will have subscriber-number growth rates that exceed a low single-digit figure.

Fig. 1: Mobile operator opportunities and challenges



Source: Informa Telecoms & Media

In most markets – developed and developing – organic growth can only be achieved in rural areas. Operators wanting to grow their subscriber base and revenues in these economies need to adopt business models that are considerably different from those used traditionally, and applied by their European and North American counterparts in the early days of mobile telecommunications.

There is communality between mature and emerging economies: While operators in mature economies will have to manage the decline of voice revenues by focusing on the cost of delivering services, operators in emerging economies will implement business models that will allow them to penetrate the very-low-ARPU customer segments. In both cases, the emphasis will be on cost and penetration rates and subscription growth will lose some significance.

Data service growth is crucial in both developed and developing markets. While operators in developed markets are starting to roll out LTE, their counterparts in developing markets are starting to roll out 3G services in non-urban areas as the availability of 3G smartphones continues to improve. Several operators are now demanding that 3G technology be included in all rural equipment in order to either launch services or make sure technology is available for a future launch.

Emerging markets are often multi-SIM markets. Many people have two, three or four SIM cards – one for each network – and will tend to make decisions about which network to use on a call-by-call basis. On-net calls tend to be cheaper than off-net calls so the choice tends to be based on the network to which the called party (or number) is connected. Subscribers may also prefer networks with better voice quality which is another benefit of MEO satellites. Mobile

users will either keep separate handsets, swap their SIMs between the same device or, as part of a growing new trend, own dual- or even tri-SIM devices.

Rural connectivity: opportunities and challenges

According to estimates by the United Nations, 3.5 billion people were living in rural areas during 2010. This figure is expected to increase further until 2020, when urbanization will result in a negative growth rate for rural population for two main reasons:

- Population will be even more concentrated in urban areas.
- The footprint of urban areas will increase and cannibalize rural geographies.

Nevertheless, rural areas are expected to be the next growth market for a variety of industries, an important one of which is telecoms.

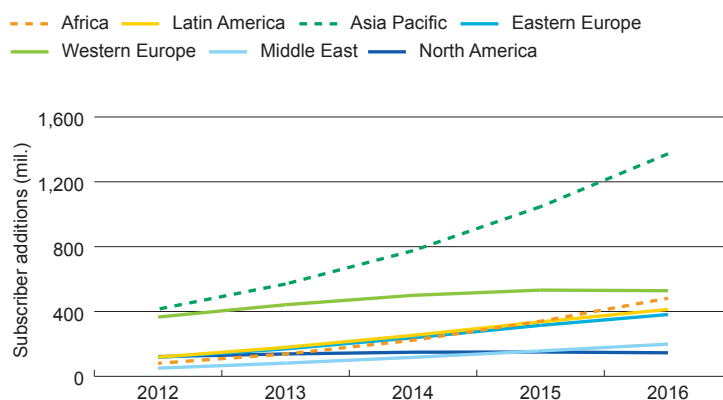
Mobile operators around the world are witnessing increased regulation and competition from both within and outside the established telecoms value chain.

These same operators are now turning to rural areas – even in developed markets – to grow their subscriber base or to increase potential revenues from these markets by penetrating their subscriber base with additional value-added services. The opportunity is even higher in developing markets, where unconnected rural areas hold a potential for significant organic growth. However, mobile operators have somewhat been hesitant to roll out networks in these areas for several reasons, including:

- Urban areas have provided organic growth in developing markets but penetration is nearing 100% in many markets. Urban areas are the “low hanging fruit” since they are easier to deploy in, more cost-efficient and offer bigger revenue opportunities compared with rural areas.
- The business case for rural connectivity has not traditionally been strong enough to justify rollout, unless driven by regulation or government subsidies.
- Mobile service demand in rural areas has been low, but specific services for rural areas have turned mobile connectivity into a practical and indispensable tool (e.g., Indian farmers using SMS to control irrigation, farmers receiving crop prices by SMS, etc.)

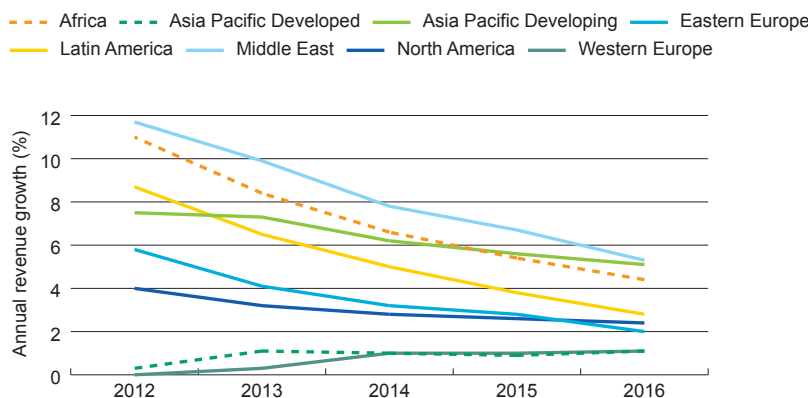
Informa’s subscriber and revenue forecasts (see figs. 2 and 3) illustrate that growth is stronger in developing markets, which is in turn fuelled largely by increasing rural coverage.

Fig. 2: Informa’s 3G subscriber forecasts (annual additions), 2012-2016



Source: Informa Telecoms & Media

Fig. 3: Informa's mobile operator service revenue forecasts (annual growth), 2012-2016



Source: Informa Telecoms & Media

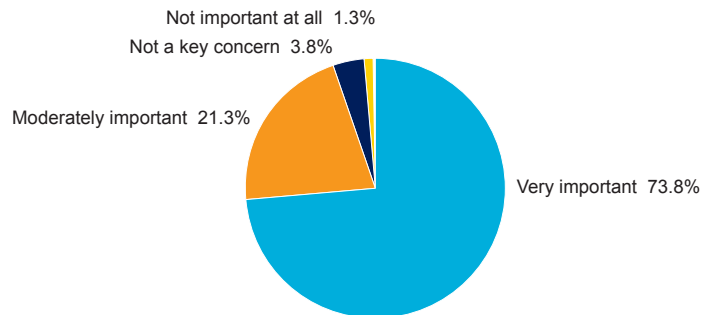
The subscriber forecasts indicate that organic growth is expected to be stronger in Asia Pacific, Africa and Latin America throughout the forecast period. Western Europe and North America (US/Canada) are forecast to have negative growth – particularly during the later years of the forecasts – due to the aggressive rollout of 4G and subscriber migration from 3G to 4G.

Similar to the subscriber growth forecasts, Informa's service revenue forecasts indicate that Asia Pacific, Africa and Latin America will be key growth areas but here North America will also be important due to the emergence of 4G services. The negative slope of all the lines in the graph illustrates that ARPU is dropping considerably faster than subscribers are being added to the network but, nevertheless, there are significant revenue opportunities in these areas.

The findings of the Rural Connectivity Survey, conducted by Informa Telecoms & Media during 2010/2011, illustrate these trends. The survey questionnaire, which was prepared using input from experts across Informa Telecoms & Media and the telecoms industry, was completed by over 200 respondents from a wide range of companies. Some key results from this survey:

- 74% of respondents described rural connectivity as very important for their business (see fig. 4)
- Increasing profitability and revenues were the two most important priorities among operators. There is a notable challenge in that, while providing greater access to rural areas is unlikely to help increase profitability (in the short term at least), if they are to increase revenues, reaching out to rural areas is imperative.
- It is also interesting to note that respondents from Africa were a little more focused on network expansion and improving market share than elsewhere. Both are references to the need to extend connectivity to rural areas and to engage with consumers there.
- Access to power is a key issue. Over a third of respondents from Africa agreed that this is the single biggest challenge facing mobile operators in enhancing rural connectivity.
- Network total cost of ownership (TCO), while still a major challenge, is not as big an issue as expected and respondents from Africa actually saw this as less of a problem than respondents elsewhere in the world.
- Lack of ICT awareness is often overlooked as a challenge and the survey's findings show that it should not be. There is no doubt that ICT services can transform people's lives in a variety of ways, but many rural dwellers will not necessarily appreciate this.

Fig. 4: Rural survey results. Question: How important to your business is the improved access to and adoption of telecommunications services in rural areas?



Source: Informa Telecoms & Media

In terms of barriers for rural connectivity, most of the respondents cited the cost of network expansion followed by concerns about the potential return of investment (ROI). Clearly, these markets are extremely cost-sensitive and, unless driven by regulation, mobile operators scrutinize the business case for each cell site individually. In several cases, backhaul is the biggest challenge to providing connectivity as traditional technologies cannot reach remote rural communities in a cost-effective way and operators are hesitant to invest rigorously in capex – even though it is often depreciated over 10 years or more – due to the challenging business case.

The rural markets are governed by single-digit ARPU levels (US\$). In extreme cases, the income of the majority of the population in rural areas is also at the same level, making the profitability extremely challenging. However, several operators – especially in Africa and India – have launched specific plans for these low-income areas and specific services for farming or other rural applications. Indian operators reported that rural ARPU has diluted their total ARPU levels by 10%, making a significant difference between urban and rural potential revenues.

The geographical nature of rural areas is also a particular and cumbersome characteristic, when population concentrations may be in small areas that are dispersed throughout a vast geographical area. Therefore, mobile operators are not in the position to tackle all connectivity demands even though there may be a service demand throughout the rural geotype.

Nevertheless, rural markets have some unique characteristics, especially if considering telecommunication services. Rural communities are intrinsically more close-knit compared with urban areas, making intra-community communications critical. Moreover, opinion leaders or trend-setters are more important than in the urban areas as they may act as critical word-of-mouth evangelists for new services and increase awareness around mobile services.

Contrary to urban areas, where attention is a scarce resource due to a multitude of advertisements through a variety of channels, the lack of media is the main barrier in rural areas for brands, marketing and advertisements. However, it is significantly easier to attract attention in marketing for these areas and also capture the subscriber interest and loyalty. Although, due to their lack of knowledge and awareness, subscribers may be slower to adopt a mobile service initially, churn is not likely to be a major factor in these areas, making subscriber loss slower as well. The demographics of rural areas are also interesting, as the population is usually very interested in external information and additional entertainment services and advertising are better received.

Although not a priority for mobile operators, data services in rural markets are a way to increase revenues, even in saturated markets. Certain studies have even illustrated that the average spend in these areas may be higher than the national average, since mobile may be the only communication medium available to these subscribers.

Backhaul for rural mobile networks

With backhaul being the biggest challenge for rural expansion, which in most cases cannot be addressed cost-effectively, mobile operators have expanded into areas that can be reached with traditional backhaul technologies (see also fig. 5), including:

- **Microwave:** The most popular and attractive technology for non-urban areas, where traffic is transferred through point-to-point (PTP) or point-to-multipoint (PMP) RF signals. Economies of scale, hardware maturity and competition between microwave vendors have brought the price points for microwave links to very attractive levels, often below US\$10K per link when existing towers can be used. In some cases where vendors use their own hardware technology to achieve cost efficiency, price points can be as low as US\$3-5K. However, microwave links for rural markets are somewhat more expensive to install and maintain due to their large footprint, installation in towers and higher transmitter power. Prices for long-distance microwave links can go up to several tens of thousands of dollars which can also provide connectivity up to 20-30kms.
- **Multihop microwave:** In the case when the rural area to be connected is further away from an aggregation point than a single microwave link can provide, multiple hops are introduced for the microwave links. The business case for multihop microwave is challenging as it may involve laying towers in areas with little or no infrastructure (including roads and power), turning this process into a capex-intensive exercise which can bring costs up to several hundred thousand dollars. If the areas between the aggregation point and rural community do not provide a revenue opportunity, the business case is extremely challenging and not something operators would consider – unless driven by regulation.
- **Satellite:** GEO satellite backhaul has traditionally been used by mobile operators. Economies of scale and competition have brought equipment costs to reasonable levels, but leasing satellite capacity is still expensive for operators to consider in large scale deployments (>US\$1500/Mbps/month). TDMA provides additional cost savings by using contention and infrastructure is advancing to minimize traffic carried by satellite (e.g., local switching to avoid tromboning when two rural mobile devices communicate) but still, price points for SLA-bound connections are far higher than operators would consider. Moreover, latency for communications is in the order of 500msec which makes voice potentially a major challenge if both ends of the call are using satellite backhaul (latency~1sec).

Fig. 5: Comparison of backhaul technologies for rural areas

Technology	Advantages	Disadvantages
Microwave	Low cost Mature equipment	Not always available Lower reach
Multihop microwave	High range High throughput	Very high cost
Satellite	Global reach	High opex Low latency (GEO)

Source: Informa Telecoms & Media

As mentioned above, backhaul for rural connectivity is often the biggest barrier for a successful and profitable rollout. This is in agreement with the majority of our satellite-backhaul survey respondents and also interviewees who cited backhaul costs as being the biggest barrier for rural network rollout.

The rural market is usually defined by low average revenue per user (ARPU) profitability which, if coupled with high network-deployment costs, does not present a positive business case. In several cases (including Brazil, India and even Germany's LTE rural rollout), regulation is pushing for rural deployments where operators are either forced to deploy in these lower-profit areas before being granted a spectrum license or before they are permitted to deploy networks in the more lucrative urban areas.

The backhaul market for rural areas is a challenging environment, where either specialist companies have emerged or major infrastructure vendors have adapted business lines to cater for the intricacies of rural connectivity. Backhaul for rural areas needs to be cost-efficient and robust while maintaining a low power footprint. Availability of power is a major issue in rural areas and offering energy-efficient infrastructure has been a priority for vendors in the past years.

ME0 mobile backhaul from 03b

03b Networks is launching a new satellite constellation to provide services, including mobile backhaul. 03b is using the capabilities of ME0 satellites, which are commonly used for navigational purposes. Because of their greater proximity to Earth, ME0 satellites drastically reduce latency, to only 150ms round-trip times from nearly 500ms for GEO satellites. Voice calls and video conferencing are more natural and allow for interactive conversations when the round trip time is less than 200ms. Many applications require 300ms or less to work properly, allowing ME0 backhaul to succeed where GEO cannot.

Moreover, due to its high-opex nature (approximately US\$1500/Mbps/month), GEO backhaul has traditionally been used for voice services, which have been the biggest revenue driver in rural areas. However, as data connectivity continues to expand from urban to rural areas, mobile operators will need a more efficient technology to expand data services in rural areas. 03b's ME0-backhaul technology offers both lower latency and lower costs, making the business case for mobile services in rural areas more positive for mobile operators.

TCO case study

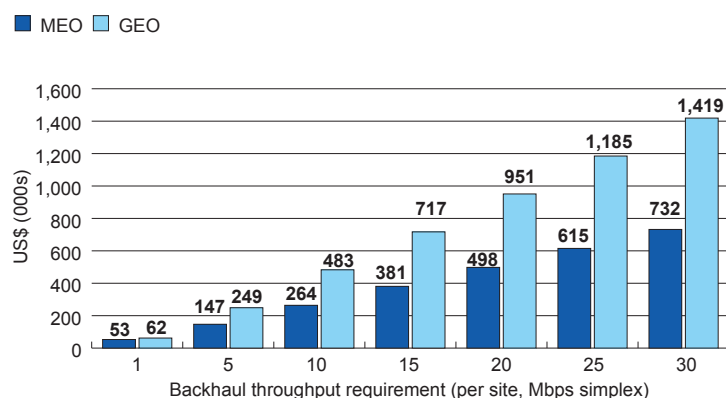
In order to illustrate the financial viability of rural macro cells and ME0 satellite backhaul, a simple TCO model is illustrated here to compare the GEO and ME0 backhaul technologies.

The assumptions for the TCO model (see fig. 6) included a modeling period of three years, a typical timeframe for achieving Return of Investment (ROI) for network infrastructure. In many cases, and especially rural infrastructure, 2-3 years is the maximum an operator can tolerate for achieving ROI while periods longer than this may only be driven by other priorities, including coverage regulations and social responsibility.

Fig. 6: TCO calculation assumptions

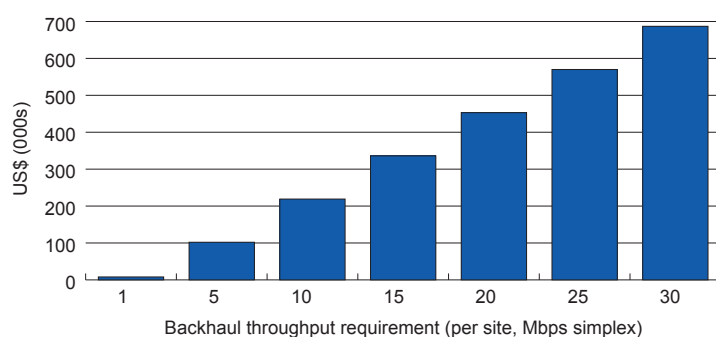
	GEO	MEQ
Capex (US\$)	10,000	30,000
Opex (US\$ per Mbps/month)	1,300	650
Modeling period (months)	36	
Sources: Informa Telecoms & Media, Q3b		

ME0 backhaul's superior opex performance creates significant savings when extrapolated over the three-year period. This trend becomes stronger when higher data rates are necessary for data services in the rural markets (see fig. 7).

Fig. 7: TCO comparison for MEO and GEO backhaul over a 36-month period

Sources: Informa Telecoms & Media, Q3b

MEO backhaul cost savings materialize after 2Mbps simplex, meaning that the high upfront capex requirement may not allow a positive business case for areas with very low traffic. However, if data services are considered, 2Mbps is a very low threshold for backhaul and it is more likely that 10Mbps or even more will be required. In this case, MEO backhaul provides considerable cost savings compared with GEO backhaul (see fig. 8).

Fig. 8: MEO backhaul cost savings compared with GEO over a 36-month period

Sources: Informa Telecoms & Media, Q3b

Conclusions

Although rural connectivity for data services has traditionally taken second place to urban organic growth, mobile operators are now finding out that rural areas are a vital next-growth area for data services. Several new technologies are entering the market for rural connectivity, including MEO satellite backhaul. Although operators have traditionally regarded satellite backhaul as expensive and with high latency, MEO backhaul can provide significant advantages, including lower latency and overall costs, particularly opex.

Informa advises mobile operators interested in rural expansion to assess the impact of MEO backhaul and to reassess the business case for rural connectivity with the new cost structure. Even if not driven by regulation, the business case driven by MEO satellite backhaul can provide organic growth opportunities for operators in many markets where terrestrial or GEO backhaul did not provide a positive business case.

