



Lessons we can learn from Africa

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why African operators are leading
the way in preparation for 4G.

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African operators are arguably better prepared for 4G than many of their counterparts in developed markets. Crucial to this is the fact that they are solving the key issue of backhauling the high volumes of data associated with technologies such as HSPA, WiMAX and LTE – and doing so cost effectively. Whilst most operators in ‘the west’ have entered into arrangements with fixed line providers to supply fibre connectivity to cell sites, it has come at a hefty cost (around \$40,000 annually per 34Mbps site). In these circumstances operators are faced with significant operating expenditure that is largely beyond their control. It is a situation that limits the extent to which operators can make data ‘pay’.

The adoption of point-to-multipoint in Africa has given operators full control of their backhaul networks and control of the costs associated. It is a proven technology that has already demonstrated that it’s ‘4G ready’ – it currently powers the backhaul networks of several WiMAX operators in the region. Contrast that with the launch of Sprint’s Xohm WiMAX network in the US, which was delayed for several months principally because the backhaul network was not felt to be robust enough.

Through a liberal dose of innovation driven by necessity, African operators have successfully overcome the fundamental backhaul issues being faced by their counterparts in the developed markets. It may now be time for the developed markets to learn from the African experience.

An African Success Story

Mobile is truly an African success story. Now out-stripping landline connections by a factor of eight, the mobile subscriber base has grown to 282 million, an increase of 30 percent in the 12 months to May 2008. Furthermore, mobile broadband services in the region are on target to outstrip the fixed line alternatives. According to AfricaNext Investment Research, mobile broadband will account for more than half of the continent’s broadband subscriber base by 2012, more than a four-fold increase. Perhaps most telling of all is analyst firm Informa Telecoms and Media’s prediction that African mobile data traffic will grow from 33.11 Petabytes (PB) in 2008 to 94.21 PB in 2012 – an astonishing compound annual growth rate of 23.3 percent.

While much of this growth is due to a lack of fixed line infrastructure, African mobile consumers are also replicating the behavioural trends seen in other parts of the globe. In South Africa for instance, demand for mobile content is expected to grow by an average of 15 per cent per year during 2008-2013 according to Frost and Sullivan. The forecast growth is attributed to rising customer awareness of the wide range of content-based services and applications available, and the added functionality those applications and

services provide. Instead of simply downloading, users are now creating content themselves and sharing it amongst their friends and colleagues.

Yet there is another crucial dynamic behind the upward trend. Unlike the developed world, much of the growth in data traffic has been driven by the small medium enterprise (SME) sector for access to essential business services such as email and web browsing. In a continent where fixed line connections are either unavailable, unreliable or expensive, mobile operators have been able to steal a march on their fixed line competitors by offering fast, reliable and cost-effective connectivity to the mass market

Operator challenges

This success story brings with it significant challenges for operators in the region.

The performance of any cellular network, particularly where data is concerned, is only as good as its ability to backhaul voice and data traffic from its base stations and into the core network. It doesn't matter how the radio access network performs, if backhaul capacity isn't available, end users will be presented with a degraded service and disappointing data transfer rates. Providing optimal backhaul capacity comes at a significant cost – estimated at around 30 percent of a typical operators' annual capital and operational expenditure. And this expense becomes harder to justify when average revenues per user (ARPU) are relatively low.

In Africa this can vary from as much as \$11.25 in South Africa to \$5.31 in the Democratic Republic of Congo and \$2.61 in Mozambique.

This puts African operators at an obvious disadvantage compared to those in developed markets such as Europe and North America where ARPU – to take Verizon in the US as an example – can be as high as \$53.9. African operators have limited room for manoeuvre when it comes to costs relative to their counterparts in 'the west'. Carriers in the region simply cannot afford to over spend on the provision of backhaul.

African carriers also have fewer alternatives for backhaul provision. The lack of fixed line infrastructure, as much as it has benefited their business in terms of subscriber growth, has severely restricted their backhaul options. The fibre and E1/T1 leased lines in use in many markets simply aren't available in many African countries. This means that operators in the region have had to get smart when it comes to backhaul and has largely led them to opt for a microwave solution.

A blessing in disguise?

The lack of fixed line infrastructure may have first been seen as a severe restriction but in many ways it has benefited operators in Africa. By choosing microwave, and in particular point-to-multipoint microwave, operators have been spared the prohibitive cost of digging hundreds of kilometres of tunnelling to lay fibre optic cable. In turn their customers haven't been inconvenienced by associated road works as a result of the construction.

Even more importantly, carriers have been able to achieve fibre-like connectivity speeds whilst owning and controlling their own backhaul network. This has meant some operators are able to operate their backhaul infrastructure with half of the operating expenditure of their counterparts using more traditional options.

As African markets become more competitive operators have limited room to manoeuvre on voice pricing. The challenge for operators is to build their networks quickly and cost-effectively so they can introduce additional features based on data and improve coverage range and service quality. Point-to-multipoint aids the process by supporting voice and data on a single platform and dramatically reducing the time it takes to build the network – up to 50% less than a comparable point-to-point architecture.

Point-to-point versus point-to-multipoint backhaul

As has been indicated, there are two flavours of microwave backhaul: point-to-point, and point-to-multipoint. Traditionally mobile networks have been designed using the 'fat pipe' point-to-point (PTP) approach, where the links operate at a fixed frequency and capacity, and operators have to design the network to provision for peak loads. PTP is best suited to rural areas and longer range or short very high capacity links. Generally a spectrum license for each link is required and that link can only carry one type of traffic over one frequency.

Provisioning for peak loads means that PTP links operate at well below maximum capacity most of the time. Additionally, some frequencies are affected by atmospheric conditions, requiring a step-down in capacity for a short period of time whilst an atmospheric event – like a rain storm – passes. The overall effect is that individual PTP links may be operating at only 10 percent capacity most of the time, a highly inefficient model and a poor use of valuable spectrum resources.

Point-to-multipoint (PMP) microwave, by contrast, uses a different and dynamic architecture to address the backhaul issue. Rather than fixed links, PMP brings a number of cell-site links back to a single aggregation point or hub. Immediately, this reduces the

number of radios and antennae making the network less expensive to build, as well as energy efficient. In addition, because the spectrum for the system is licensed across a number of radios, the resource is in effect shared – making the utilisation of the spectrum more efficient and more flexible. PMP microwave systems also lend themselves to a more IP-like approach to packet data management.

Working with a base raw data rate of over 150Mbps gross throughput, PMP backhaul architectures then apply data optimisation and statistical multiplexing to provide an ‘efficiency gain factor’ of up to 5x. This effectively upgrades the capacity of a comparable PMP solution to backhaul 700 Mb/s or more per sector – sufficient for the onset of ‘4G’ technology such as WiMAX and LTE. Not only is PMP easier to deploy than other backhaul technologies, it also offers increased capacity at a much lower ‘cost per bit’. For a typical African operator the cost savings can amount to 50 percent compared with traditional microwave solutions.

As a result of these capabilities, Cambridge Broadband Networks estimates that market for this technology will grow from \$115M per annum in 2008 to \$442M in 2012.

Point-to-multipoint as an access technology

Operators in Africa are also benefiting from the fact that point-to-multipoint can be used as an enterprise access technology. With the ability to connect multiple sites from one point-to-multipoint hub (as well as simultaneously backhauling macro cellular traffic) this gives operators a valuable additional revenue stream since they can charge for specialist enterprise access. This sector is currently growing very rapidly – it offers businesses an ‘always on’, highly resilient internet and data connection.

Breaking with tradition

Although point-to-multipoint has been deployed for cellular backhaul in western markets, it has not been embraced with the same enthusiasm shown by African operators where, in some cases, it comprises more than 30% of their backhaul network. While the western operators do have to deal with legacy issues, they might be able to learn a trick or two from their African counterparts who have broken with tradition and deployed new architectures and technologies that will support them in the years to come.