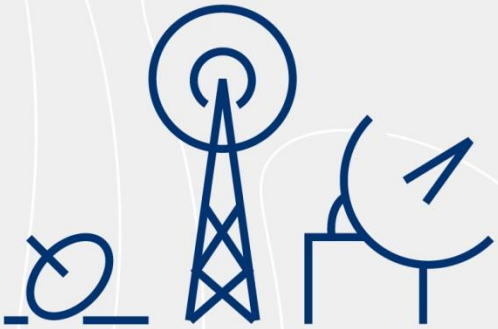
WHITE PAPER



Claiming 4G Market Share in Untapped Areas

Boundless Communications

Not "if" but "when"

When MNOs dream of expanding their network into untapped regions, a primary consideration is how to handle the exponential growth of data traffic. Deploying a high-capacity 4G network is inseparable from the challenge of handling massive quantities of data in a rapidly expanding network.

For MNOs to upgrade their existing network with additional cell towers with 4G backhaul capacity is a non-trivial effort; the required infrastructure investment is significant. Maximum network throughput speeds are up to five times faster in a 4G network than a 3.5G network. This requires a huge boost in capacity. In addition, erecting high-performance cell towers in sufficient proximity to reach new areas, along with installing a backhaul infrastructure, takes time – sometimes more time than MNOs can afford.

Meanwhile, the passage of time works against the MNO's aspirations. If an MNO cannot enter a new area and set up a 4G network quickly, a competitor will most assuredly do so and reach those potential customers first. This has weighty business implications: the loss of potential revenue, the difficulty of convincing a customer who has signed up with one mobile service carrier to switch carriers, and the ongoing cost of having to pay other carriers high roaming charges in areas where the MNO has no coverage.

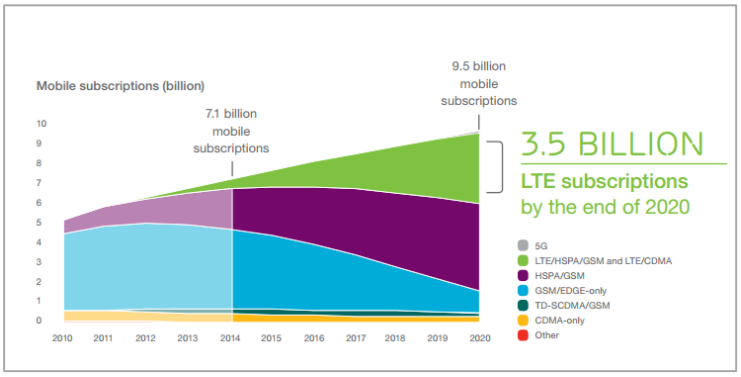


Figure 1: Ericsson Mobility Report, Nov 2014

As the chart above shows, LTE coverage is not a matter of "if", but "when". Its implementation will certainly not be evenly paced around the world, but eventually, everyone will reach LTE network levels.

In this race, there is little consolation for second place – the subsequent carriers to enter a market are at a distinct disadvantage. By providing a connection within days rather than years, MNOs can leapfrog competitors relying on slower-to-deploy backhaul technologies.

Speed is key

To win this contest, rapid deployment is a must. Here, satellite backhauling has a huge advantage. Fiber and microwave backhauling solutions represent substantial CAPEX costs, are time-consuming and often not feasible when spanning long distances or difficult terrain. Satellite, on the other hand, bypasses many of the logistical obstacles to deployment. In a single hop, a satellite solution provides a connection to the core LTE network.

Several factors mitigate satellite backhaul's CAPEX expense. One is the benefit of rapid deployment; the immediate collection of revenue from 4G service helps offset the cost. Another is reusability. As their networks grow, MNOs can relocate equipment purchased and deployed for satellite backhaul elsewhere as needed.

The quest for terrestrial quality

Of course, an equally important consideration is ensuring a quality user experience. To do so, a satellite backhaul solution should include a VSAT that supports the full capability of 4G handheld devices.

Another obstacle inherent in satellite communications is the inevitable delay that limits throughput and performance. Acceleration techniques are required to compensate for the delay, and guarantee a user experience that is indistinguishable from terrestrial solutions.

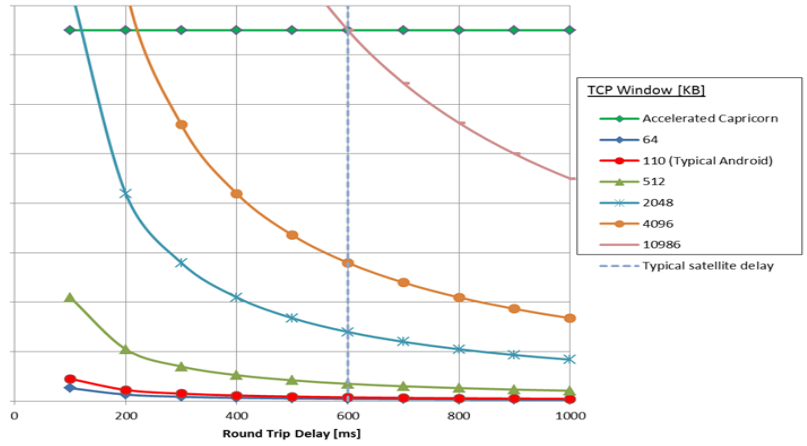


Figure 2: Round Trip Delay vs Speed

Generally, lower speeds result in delay and a poor user experience. As the chart above shows, embedded GTP/TCP acceleration boosts speeds to maximum handheld device performance.

A fresh look at the economics of satellite bandwidth

Another important point to consider is that new satellite technologies are lowering the cost of satellite connectivity. According to industry analysts, this trend is expected to continue well into the future. The main reason: High-Throughput Satellites (HTS) offer significantly increased capacity, reducing bandwidth costs by as much as 70 percent. This breakthrough has helped position satellite communication as a cost-effective alternative for delivering broadband while reducing operating expenses.

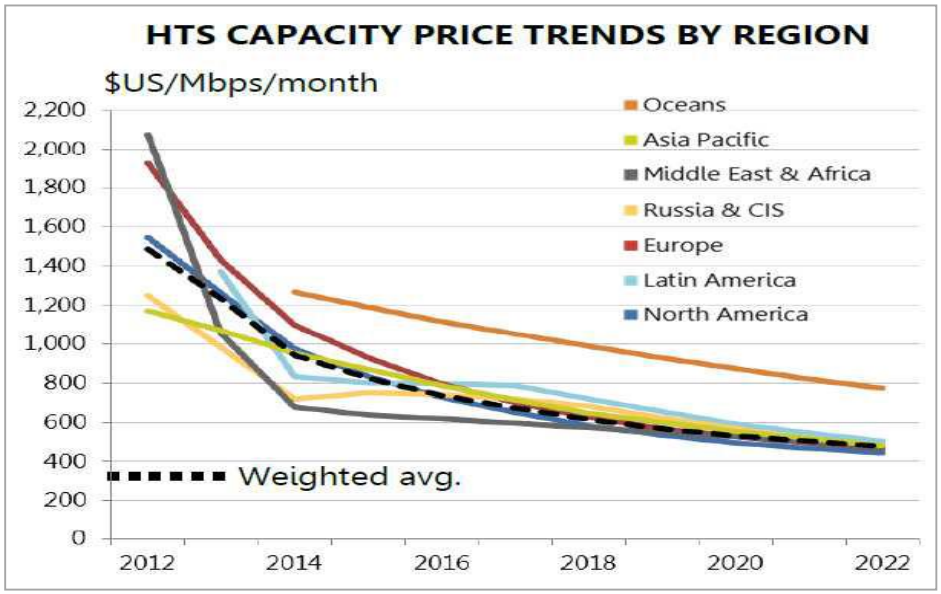


Figure 3: HTS Capacity Price Trends by Region

A cost variable to consider is the backhauling access scheme. When providing a satellite backhaul link, the question of bandwidth efficiency is crucial. The goal is to save money by using exactly the amount of bandwidth that meets the subscriber's performance needs. For this reason, MNOs must determine which access scheme best fits the download as well as the upload direction: TDM/TDMA or TDM/SCPC.

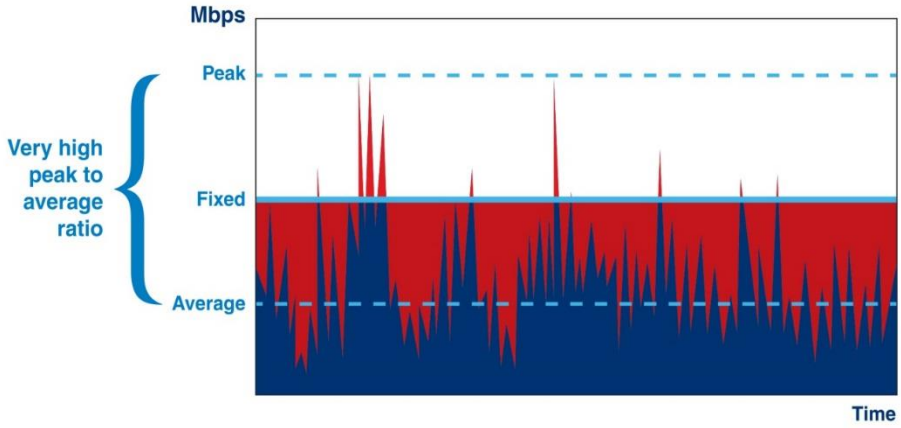


Figure 4: LTE Network Traffic Profile

When data traffic is bursty with a high peak to average ratio, as is the case in an LTE network, the traditional SCPC fixed-speed access scheme suffers from two main drawbacks:

- SCPC does not meet peak traffic demand
- SCPC wastes satellite bandwidth when demand is average

For these reasons, bandwidth sharing is a must in both the upload as well as the download directions.

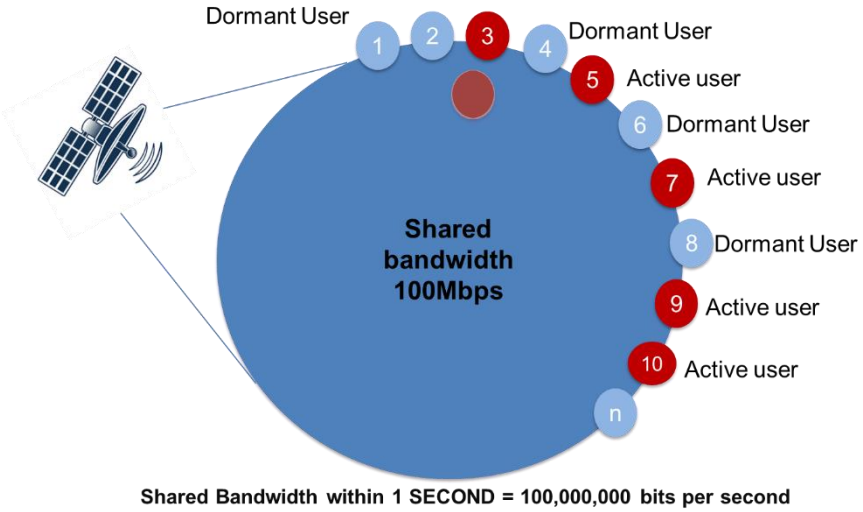


Figure 5: Bandwidth Sharing Model

By sharing bandwidth, operators can maximize the efficiency of their network. Shared bandwidth based on an average of 10KB per user (equivalent to a 3GB plan) translates into 10,000 users enjoying

Internet speeds of 100 Kbps at any given second. To truly maximize cost, bandwidth can be shared in the upload direction as well.

The TDM/TDMA access scheme is a must in LTE networks to reach maximum bandwidth efficiency and realize the full performance potential of handheld devices; other options are not economically viable.

Re-evaluating backhaul

The way forward for rapid 4G deployment is shifting. As solutions that may have seemed peripheral in previous years gain primacy, MNOs are re-evaluating their options. Not only is satellite backhauling a viable option – it is also an option backed by a clear-eyed business case.

For more information on Gilat's SkyEdge II-c Capricorn, a TDMA VSAT that reaches the record-breaking speed of 200Mbps, click here.

Appendix: LTE case study

High-speed LTE backhaul over satellite is a cost-effective proposition with SkyEdge II-c Capricorn, Wavestream's 200Mbps TDMA VSAT

A large Tier-1 mobile operator in Asia recently approached Wavestream with a challenge: the operator was required to expand its new LTE network and connect eNodeB sites in underserved areas, with no reduction in performance or user experience. The mobile operator set a strict benchmark for accepting a satellite-based solution for its LTE backhaul. The solution would need to provide an enhanced user experience for voice and data, security, interoperability, and concurrent support for legacy voice services – all within a tight budget.

The Challenge

LTE deployments are characterized by higher capacity, bursty traffic patterns, and reduced cost per MB. This introduces two major challenges: finding a VSAT that can support the higher speeds and packet per second (PPS) performance, and a solution that reduces space segment cost.

Our Capricorn VSAT, with its ability to reach speeds of up to 200Mbps, is the fastest and highest PPS VSAT on the market. On the cost front, the emergence of multi-spot beam high-throughput satellites (HTS) has helped to dramatically reduce the cost of bandwidth by an order of magnitude. Moreover, LTE backhaul must support the bursty nature of LTE traffic. This support is best provided by the TDMA access scheme, enabling substantial savings on space segment cost compared to SCPC.

The Solution

Before settling on a vendor, the mobile operator conducted rigorous benchmarking. The SkyEdge II-c Capricorn VSAT was tested with eNodeBs from a range of leading vendors, LTE core systems, and a variety of 4G smartphones. Wavestream had the only solution to meet and even exceed the operator's expectations including: secure video streaming and data browsing; voice quality (3.8 PESQ tested); packet per second performance (minimum requirement > 25K PPS); industrial design; low power, and optimized OPEX over the satellite. Backhaul performance of over 100/10Mbps of accelerated and encrypted traffic was measured using a 4G smartphone in a single voice and data session.

Capricorn, part of the VSAT family supported by our SkyEdge II-c platform, is the only VSAT capable of providing this performance. The SkyEdge II-c platform enables satellite backhaul with the same speed and quality as a terrestrial solution. SkyEdge II-c solves satellite

latency concerns with its patent-pending embedded TCP acceleration techniques over GTP/TCP in remote terminals and hubs.

Our Advantage

Market trends, together with Wavestream's innovation, have converged to enable a viable business case for LTE backhaul via satellite. Our SkyEdge II-c platform, with its TDMA solution, best met the operator's stringent benchmark for supporting high-speed, efficient satellite LTE backhaul. Rapid to deploy and easy to monitor, SkyEdge II-c Capricorn is leading the migration to LTE-enabled networks.

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