

3G/LTE SATELLITE BACKHAUL

Enabled by SkyEdge II-c Capricorn



BENEFITS

- **Meet high performance data needs**
- **Overcome the inherent delay in satellite communications and smart phone limitation**
- **Expand high speed networks where terrestrial infrastructure is impractical**

MIGRATION TO 3G/LTE NETWORKS

Mobile operators around the world are expanding their GSM networks to 3G/LTE in order to keep up with consumers' insatiable demand for more data delivered at high speeds. These cellular networks can reach download speeds of 100Mbps and must be supported by high-speed backhaul infrastructure. In most parts of the world there are a variety of terrestrial options available such as fiber. In remote areas traditional terrestrial backhaul is cost prohibitive making satellite backhaul the only option. However there are several challenges that must be addressed to cost effectively enable and maintain the required performance via satellite.

INDUSTRY DRIVERS

High throughput satellites (HTS) have helped to dramatically reduce the cost of bandwidth. This is accomplished by significantly increasing the available capacity through frequency re-use and multi-spot beam technology.

The advent of small cell base transceiver stations (BTS) for 3G/LTE have allowed operators to expand their networks to remote locations that would have previously been too expensive to operate. Traditional macro cells have high operating costs because they are run on diesel generators in areas without electrical infrastructure.

These remote areas also have periods of low activity, which makes it challenging to generate enough revenue to cover the cost of maintaining the site. Reducing the size and power requirements of the base transceiver station allows it to run on solar power, greatly reducing the cost of operation.

TDMA VS SCPC

Mobile operators used to face a dilemma when planning their satellite backhaul systems. The choice was between time/frequency sharing systems (TDM/ TDMA) and dedicated channels with a single channel per carrier (SCPC) system. The decision usually came down to a few factors including: cell activity, network size, and traffic patterns.

2G networks exhibit a continuous traffic pattern because the majority of the traffic is voice. However, 3G/LTE data networks are characterized by highly bursty traffic patterns which experience a large difference between the peak rate of > 100Mbps and the average rate of < 1Mbps. This creates an opportunity for bandwidth sharing in both the upload and download direction, making it an excellent fit for the TDM/TDMA access scheme. Utilizing TDM/TDMA will allow the network to share the capacity required to reach the peak rate when it is needed at an individual site. If a SCPC system was used, each site would constantly have

100Mbps dedicated all the time despite not being used most of the time, prohibitively increasing the space segment cost.

MEETING THE SPEED CHALLENGE

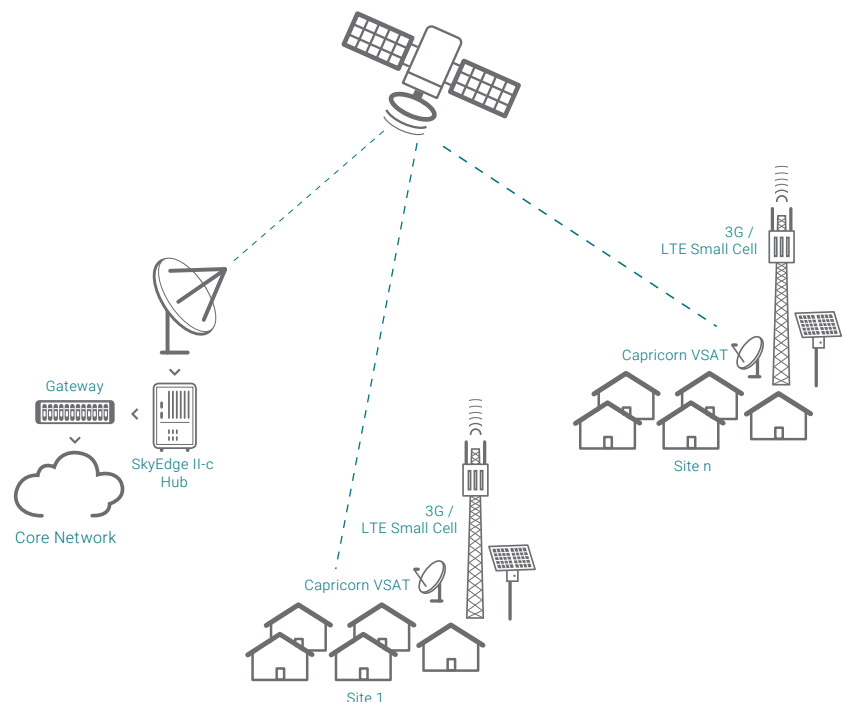
SkyEdge II-c was designed to operate with high throughput multi-spot beam satellites and enables the ultra-high performance necessary for 3G/LTE backhaul applications. The Capricorn VSAT, which supports TDM/TDMA at 200Mbps, was designed explicitly to meet the 3G/LTE performance requirements.

Further examination of satellite communication challenges when dealing with 3G/LTE base stations reveals the acceleration issues required over the satellite medium.

The inherent delay in satellite communications and the limited window size of the TCP implementation in the phone causes degraded traffic throughput. Measurements show that the LTE smartphone speed with traditional satellite backhaul is reduced to 2-6Mbps per session - a dramatic reduction below the native LTE speeds of 100Mbps.

Wavestream solved this problem through cost effective embedded acceleration in the SkyEdge II-c hubs and terminals, which overcame the latency issues to support the high speed requirements of 3G/LTE networks.

HIGH THROUGHPUT SATELLITE DVB-S2 / MF-TDMA



ABOUT WAVESTREAM

Wavestream sets the standard in the design and manufacture of next generation high power solid state amplifiers. Wavestream's Family of Ka, Ku and X-band Solid State Power Amplifiers (SSPAs), Block Upconverters (BUCs) and transceivers provide systems integrators with field-proven, high performance solutions designed for ground mobile and fixed, gateway and airborne satellite communication systems worldwide.

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