Satellite Connectivity: Changing the Landscape of the Cellular Backhaul Market

The growth and popularity of mobile voice and data services are causing mobile operators around the globe to evaluate different backhaul technologies to meet the rapidly increasing demand for their 3G/4G/LTE network deployments. Especially in rural areas mobile operators are looking at satellites to extend their coverage as it is now becoming a more economical and rapidly deployable solution for backhauling.

Improvements in mobile infrastructure along with new developments in satellite technology are changing the business case for upgrading to more modern networks. New High Throughput Satellite architecture is dramatically lowering the cost per bit for bandwidth. Next-generation satellite ground infrastructure is improving throughput levels, form factors, network efficiency and the end user experience.

With these advances, mobile operators are now evaluating the latest backhaul solutions in the market based on criteria and requirements that ultimately will increase performance and cost efficiencies. To determine the best platform, mobile operators are now looking for carrier grade architecture that ensures link quality is maintained and available; for efficient bandwidth allocation and link optimization; and for high throughput with advanced Quality of Service (QoS) features to maintain multiple Service Level Agreements (SLAs). In the eyes of mobile operators, these features—such as link speed, data compression, and traffic optimization techniques—are essential to meet high throughput demands while keeping overall OPEX and bandwidth costs to a minimum.

Cellular Backhaul with SatHaul –XE Solution Overview
The iDirect Solution

Bandwidth Efficient Platform

iDirect’s bandwidth efficient satellite platform enables mobile network operators and service providers to cost effectively manage a multitude of small, medium or large networks, whether it’s serving 2G, 3G or 4G. It can span over five satellites in C- or Ku-band, all from one hub. The modular hub design allows the service provider to launch a network with a few line cards and limited bandwidth, and then scale effectively by adding new line cards as the BTS build-out continues or traffic demand grows.

For very large-scale networks, service providers can easily take advantage of the most efficient bandwidth technology, iDirect’s DVB-S2 or DVB-S2X. The DVB-S2X standard extends SNR well above the current DVB-S2 ranges driving efficiency gains and performance with MODCOD’s up to 256APSK. This is achieved by leveraging more powerful capacities of HTS, improving efficiency for existing RF/Antenna with a software upgradeable design.

Advanced Platform Features

Superior Quality of Service (QoS): iDirect’s bandwidth allocation algorithm allows for countless possibilities of quality of service levels, bandwidth management, and traffic prioritization. Mobile network operators can map their core networks to VSAT networks to prioritize traffic and maintain distinct QoS settings by remotes, bandwidth groups, and applications to satisfy Service Level Agreements.

iDirect’s advanced QoS capabilities prioritize packet delivery based on the type of traffic, automatically allocating bandwidth instantaneously, ensuring carrier-grade link quality so that the integrity of the connection is maintained while reducing overall bandwidth requirements. A network operator can guarantee a QoS that can be established by traffic type, origination and destination, while being able to allocate bandwidth on demand to maintain the highest quality of calls and connectivity at every BTS/(e) Node B site. iDirect’s Real-Time Traffic Management features provide advanced algorithms to help avoid pitfalls by instantaneously allocating bandwidth for real-time applications, while maintaining a quality connection. Further, iDirect minimizes jitter without adding delay, using a flexible range of timeslot sizes on the in-route transmission combined with a technique called feathering that ensures timeslots allocated to a remote are evenly spread across the time plan.
Seamless Integration with Layer 2 over Satellite (L2oS): This feature offers mobile network operators the option to run an iDirect network in a Layer 2 bridging mode with high efficiency as an alternative to the traditional Layer 3 mode architecture. In doing so, they can implement a variety of modern, converged network architectures, pass any Layer 3 protocols desired, and easily modify Layer 3 architectures after deployment. This Layer 3 transparency is expected to greatly increase the adoption of Evolution within the global carriers. The technology emulates standard Ethernet across the satellite link, forming an end-to-end network and transparent pathway for Layer 3 traffic, transparent Layer 3 Delivery (IPv4, IPv6, OSPF, BGP, and IPsec). It provides more virtual network options such as physical access ports, VLAN tags, or Q-in-Q tags, simplified network management with reduced number of IP address assignments and less tunneling. L2oS becomes a valuable tool, expanding support of Telco capabilities. A service provider gains freedom to deploy whatever meets the customer application, including building a mixed hybrid network to take advantage of the strengths of all approaches. L2oS is best for maximizing protocol support, simplifying network architectures, and scaling tagging with customer edge tag transparency using Q-in-Q.

Optimization

iDirect’s optimization features, called SatHaul–XE provides a set of features and capabilities that efficiently manages bandwidth without compromising quality. Voice and data traffic can be sorted, organized and optimized to maintain quality of service requirements for different types of traffic and to overcome various challenges of latency and packet loss. This technology improves throughput and efficiency of traffic over enterprise networks with advanced acceleration and compression capabilities as described below.
TCP Acceleration: Caching, header and payload compression allow for voice and data traffic to be efficiently carried over satellite. iDirect has implemented TCP Acceleration specifically for mobile networks, which allows for the acknowledgement to be sent back to the base station from the satellite terminal before being transmitted over the satellite. Larger amounts of data can be quickly transmitted without being impacted by the satellite delay. Ultimately, the end user gains the high-speed experience they expect with the acceleration being transparent. Preserving protocol information such as IP addresses and port numbers, the intelligent handling of TCP acknowledgements and retransmissions leads to a large reduction in the bandwidth used on the return channel.

Header compression: A key factor for a cost effective solution is the bandwidth efficiency that’s where the ability to compress traffic becomes very important, iDirect provides header compression that works by removing the elements that are not relevant to save on bandwidth. The LTE header stack is compressed over the air interface using a standard called RoHCv2, this is especially effective when small packets are being transmitted and can save up to 70% on bandwidth.

Payload compression: iDirect utilizes some of the latest compression algorithms to optimize the payload traffic while maintaining a good experience at the device level. For general Web browsing or text based traffic, payload compression can have a strong impact compared to traffic that has already been zipped or isn’t able to be compressed. Overall this may save an additional 10-15% on the amount of traffic that is sent over the satellite link.

Secure Link: SatHaul–XE optimization is designed to integrate into the ‘chain of trust’ in the mobile operator’s network. This means that IPSec traffic can be decrypted, optimized, and re-encrypted inside the optimization device’s CPU. This allows the security of the traffic to be maintained throughout the entire network path, even when it is travelling over the satellite link. iDirect uses a processor with hardware encryption support to make sure that this process does not impact the performance of the satellite terminal or the throughput of the traffic. IPsec can be supported and maintained while at the same time optimizing the traffic to significantly improve the efficiency and user experience of running over a satellite link.

High Availability

iDirect’s High Availability Architecture eliminates single points of failure to increase service resilience. The iDirect platform supports gateway redundancy, physical redundancy, power redundancy, logical redundancy, and warm sparing that improves up-time and is able to meet or exceed terrestrial communication performance in many developing regions of the world. With IP at the core, the iDirect platform allows for an all-IP infrastructure that does not require any additional hardware to backhaul traffic from the BTS/eNode B into the core of the network. Virtualization at the Hub system level (protocol processors) allows for increased redundancy for host logical and physical links. Optional redundancy schemes of active/standby, load-balance, cloud architecture are available.
Why iDirect

We deliver a platform that can scale with increasing throughput, run large networks cost-effectively and deploy new services rapidly. With iDirect’s bandwidth sharing platform based on efficiencies gained from DVB-S2/ DVB-S2X and Adaptive TDMA technologies, this represents the next step in the evolution of cellular backhaul.

By enabling intelligent bandwidth sharing, maximizing efficiencies and reducing costs this allows mobile operators to pursue profitable business models with customers in remote markets. End-users in even the most remote regions of the world get new, more widespread and reliable cellular service. And cellular service providers are in the best position to see greater revenue opportunities when extending their reach into previously unserviceable areas. The iDirect cellular backhaul solution is compatible with all major cellular infrastructure solutions and enables mobile operators to expand their networks and offer unique services to a growing and more demanding customer base.

Whether it’s addressing 2G, 3G or 4G/LTE networks, iDirect’s solution can help mobile operators achieve their business goals. Mobile operators can leverage a platform that provides high throughput and bandwidth efficiencies as well as carrier grade architecture, with advanced Quality of Service (QoS) to maintain multiple Service Level Agreements (SLAs).