

iDirect SatHaul™ Solution Overview

Mobile operators are continuously investing to build out their network infrastructure to meet the expanding demand for voice and data services. As operators move beyond urban and suburban areas, it generally becomes more expensive to connect customers, making it difficult to justify the investment in technology to serve populations that are in remote or rural locations. For many operators, serving these customers has been a mandate, not a business priority, as they need to provide coverage in order to receive spectrum licenses or government funding. In many cases, the business model did not support the expansion, but an operator would take the loss to benefit other areas of their business.

Today, advances in technology are enabling mobile operators to reach new subscribers and expand their networks into remote and rural areas in a smart, profitable way. As customer demands increase and throughput requirements expand, mobile operators can profitably expand their Radio Access Network using new mobile infrastructure and advanced satellite technology. This combination dramatically changes the business case for reaching remote and rural areas, opening up new customer markets that were not previously accessible.

Three areas of development are transforming this market:

Satellite & Ground Equipment



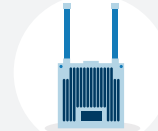
- Bandwidth sharing
- High-speed devices
- Optimized voice and data traffic
- Carrier class quality
- Highly secure

High Throughput Satellite



- Lower-cost bandwidth
- Higher speed
- Managed service
- Ultra-high availability
- Ubiquitous coverage

Small Cell



- Cost effective
- Focused coverage
- Low Power
- Easy Deployment
- Open Standards

Advanced Satellite Infrastructure: Enabling higher throughput capabilities at the edge of the network, the ground infrastructure is designed to take full advantage of HTS capacity. Coupled with improved digital processing capabilities, this can now be cost-effectively deployed at a cell site for optimization and content distribution.

High Throughput Satellites: Originally designed for consumer networks, High Throughput Satellites (HTS) are bringing huge amounts of capacity to the enterprise market. This increased capacity is lowering the cost of the most expensive part of a rural connected site, satellite bandwidth.

Small Cells: Perhaps the biggest change for mobile operators is the use of cost-effective small cells to provide targeted coverage. Instead of using large macro cells that may become quickly congested, operators are deploying small cells to help offload data traffic and provide coverage in specific areas. Based on their size, small cells are easier to deploy, require less energy and need less infrastructure at a site. As a result, small cells have changed the business case for rural connectivity.

iDirect's advanced satellite infrastructure has been deployed by mobile operators in over 55 networks around the globe to connect remote and rural sites. The iDirect SatHaul™ solution provides the most innovative and efficient satellite transport for small cells or macro cells using traditional broad beam or new High Throughput Satellites. Additional optimization capabilities reduce the amount of bandwidth needed for voice or data, helping to provide the most efficient solution over satellite. The combination of these elements redefines the business case for servicing the remote market. iDirect has a strong background working with many of the different mobile infrastructure vendors, from the traditional big-five suppliers to the newer small cell manufacturers.

As the leading developer of satellite communications technology, iDirect continues to develop solutions to help mobile operators 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 SatHaul can help mobile operators achieve their business goals. The use of satellite technology will vary by mobile operator based on the challenges they are trying to solve, the area being served, the mobile infrastructure they are using, and how the technology fits into their larger mobile strategy.

2G Connectivity

2G networks will be the primary technology to connect the more than one billion people in rural areas. The availability and low cost of 2G handsets make it the logical choice for expanding into many remote and rural locations. Satellite technology is well suited for serving this market as the quality of voice service and the predictability of bandwidth per call has made the business case attractive.

The 2G RAN interfaces from different infrastructure vendors vary greatly, so iDirect works with each of them to optimize the effectiveness of carrying traffic over satellite.

For mobile operators looking to roll out or expand 2G networks for rural and remote connectivity, iDirect SatHaul has various options to fit their needs.

2G – Packaged Solution: If an operator is looking for a small cell that is optimized to run over satellite, iDirect works with specific small cell vendors to offer an optimized solution that enables a network to be setup and running in a cost-effective way. Designed for extremely efficient voice calls with minimum power requirements, this solution leverages industry leading optimization capabilities from iDirect combined with a small cell to provide an efficient product that works great over satellite. Through direct interaction with the small cell vendor, iDirect has been able to optimize not only the transmission protocols and signaling, but also the user content including voice and data. iDirect does not provide the small cell, but optimizes the solution so that it is the most efficient 2G service over satellite.

2G – Macro Cell Connectivity: iDirect has deployed many networks globally for operators that are looking to extend their network using satellite to help backhaul large macro cell sites as part of their core network infrastructure. This can be done by using the Abis interface over satellite, connecting the remote base station back to the core network. This is a strong solution for operators that are not looking to move to small cells, but want to extend their architecture with existing infrastructure from established vendors like Ericsson and Huawei. To optimize this traffic, iDirect partners with third party companies.

3G Connectivity

For 3G, the expanded data capabilities being added into the mobile network made the business case for rural connectivity more challenging. Satellite bandwidth is the most expensive part of using satellite and the variability of data traffic at each site made it difficult to forecast costs.

iDirect SatHaul allows an operator to centrally manage their satellite capacity and allocate it in real time based on the demands of each site. Additionally, iDirect works with the mobile infrastructure vendors to make sure the interface between the systems is optimized. This configuration is often what determines if the implementation will be economically and technically successful.

Various 3G satellite backhaul options are available as well to meet the specific requirements of a mobile operator.

3G – Packaged Solution: Similar to the 2G packaged solution, this enables an operator to have a small cell product that has specific voice and data optimization designed for the solution. A combination of voice optimization combined with data acceleration, optimization and caching, enables 3G services to be delivered while providing a good user experience for customers on the network. iDirect works with specific small cell vendors to offer an optimized solution that enables a mobile operator to extend their coverage in a cost effective way. iDirect does not provide the 3G small cell, but includes advanced optimization capabilities in the solution provided by the small cell manufacturer.

3G – Macro Cell: A mobile operator needs to use satellite bandwidth in the smartest manner

in order to provide the best user experience across its network in a cost-effective way. iDirect employs advanced quality of service capabilities that make sure bandwidth is allocated in real time to each site based on the traffic demands. For 3G networks various types of traffic are prioritized to make sure voice traffic is utilized over best effort data traffic. iDirect's experience working with mobile infrastructure vendors also helps optimize the solution so that parameters are configured on both sides to handle the latency introduced by satellite. Based on the proprietary nature of the 3G LuB protocol, iDirect works closely with other third party vendors that utilize features like header compression and packet coalescing to make sure the solution is as optimized as possible for the mobile operator.

3G – Small Cells: Focusing on population coverage instead of geographic coverage has enabled mobile operators to connect smaller population areas where it wasn't cost effective before. 3G small cells that utilize the LuH protocol make it more efficient to backhaul over a satellite network. In systems where the RAN interfaces are more open, iDirect is able to optimize all layers of communication, including the transmission layer, signaling layers and mobile content. The ability to have greater access into the traffic being transmitted using the LuH protocol allows advanced optimization features including TCP acceleration, header compression and payload compression to improve the transmission of data over satellite. The result is minimizing traffic over the satellite link, which increases savings on the most expensive part of a satellite solution.



4G Connectivity

4G connectivity is the latest generation of mobile communications technology that is being deployed in the market, and the first to be developed with end-to-end IP based services and applications. Designed for much higher data throughput, it delivers a series of enhanced services that subscribers want, the most important being video. The network interfaces for 4G are better defined, allowing for greater contextual-based optimization across a range of different products from different mobile infrastructure vendors. This is important as throughput requirements have jumped substantially on mobile networks.

The iDirect SatHaul solution combines the latest in satellite hardware with advanced optimization capabilities to enable mobile operators to receive 100Mbps/cell, a frequently defined requirement in 4G, using far less bandwidth. Advanced optimization capabilities like TCP Acceleration, header and payload compression, VoLTE optimization, local switching and other features will make iDirect SatHaul the most efficient and cost-effective solution for connecting rural and remote locations over satellite. 4G standards do not differentiate between small cells and macro cells as the S1 protocol is implemented in both. The ability to support and optimize this will be the same no matter the size of the cell being deployed.

iDirect SatHaul Optimization

- **IPsec:** Full data encryption throughout the satellite transport link.
- **Header and Payload Compression:** Optimizes the signaling traffic as well as the user content passing over the satellite link, reducing the bandwidth required.
- **VoLTE:** Reduces the bandwidth of voice calls, while maintaining call quality.
- **Local Switching:** Allows for voice calls between subscribers in the same cell to be switched locally without having to route through the satellite. This saves on bandwidth and provides a better user experience.
- **TCP Acceleration:** Accelerates throughput ensuring a data session on a mobile device is not impacted by the delay inherent in satellite.

A Solution That Fits

As the capabilities of mobile connectivity have increased, so too have the capabilities of satellite connectivity solutions. If you are a mobile operator that wants to deliver 2G voice, 3G data and voice or the latest 4G all IP services to your subscribers, iDirect has a cost-effective solution that can help you achieve that goal.

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