



Photo: Anagoria, 2012

## Development of an LTE Network Overlay by MOTIV / Mobifon in Central Russia

Mobifon is the transmission arm of MOTIV (<http://motivtelecom.ru/ekb/>) – the cellular operator based in Yekaterinburg, Russia's fourth largest city — covering the Urals, Central Russia, Northern and Western Siberia. Serving some of the harshest territories, MOTIV uses iDirect satellite infrastructure to provide 2G coverage to almost 100 remote locations spread over thousands of kilometers.

Mobifon has deployed LTE data services for urban areas since 2014, and is now starting to offer LTE services as an overlay to their 2G satellite connected sites. Having won the trust of MOTIV for reliability and performance, the new iDirect SatHaul™ system was the natural choice to provide an optimized LTE experience.

Mobifon found the ability for a single hub to support multiple satellites, bands or transponders from a single chassis is one of the key benefits of the iDirect hub system. Their existing services utilize two satellites, Yamal-401 and Yamal 402, and their teleport has two hub antennas beaming at 55E and 90E.

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These two satellites are used to provide broadband access, including Wi-Fi service, internet connection, VPN for businesses and VoIP services, and cellular backhaul services. Having two satellites in different orbital slots provides the option to use diverse links and provide coverage at important sites.



iDirect is able to support the LTE network natively with their Layer 2 over Satellite (L2oS) system. Since each remote terminal can simultaneously be part of both a Layer 2 and a Layer 3 (IP) network (using VLANs to distinguish the traffic), the existing IP network feeding the GSM base stations can be kept in place, while simultaneously operating at L2 for the LTE backhaul.

For the existing 2G network, approximately 30 Mbit/s of throughput is required. The actual usage by site varies moment to moment, and based on daily and weekly patterns. One of the key advantages of the iDirect TDMA system is that the bandwidth is reallocated across the network eight times per second, allowing it to keep up with changing bandwidth demands in real-time. For example, if someone starts or stops speaking on a call, the bandwidth demand varies quickly. For this voice-oriented service, MOTIV has the choice of using optimization systems over and above the header compression built into the iDirect system.

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The key requirements for LTE backhaul are similar to those for 2G and 3G – the provision of high quality links with minimal jitter and delay. But in order for customers to benefit from the higher speeds possible with LTE, the use of special TCP acceleration software is a must. While every satellite terminal contains TCP acceleration software for normal TCP/IP traffic, when the traffic is encapsulated in the LTE protocol stack, this no longer operates. This acceleration is one of the key functions of the SatHaul™ system running on iDirect's X7-EC embedded-compute platform.

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As this three-week sample of traffic from four of the new LTE sites shows, the traffic is highly variable and ideally suited to a TDMA system. It also shows that the LTE signaling traffic is a very small proportion of the overall traffic. This is a key advantage for using LTE over satellite compared to 3G, where signaling could occupy 40% of the available bandwidth.



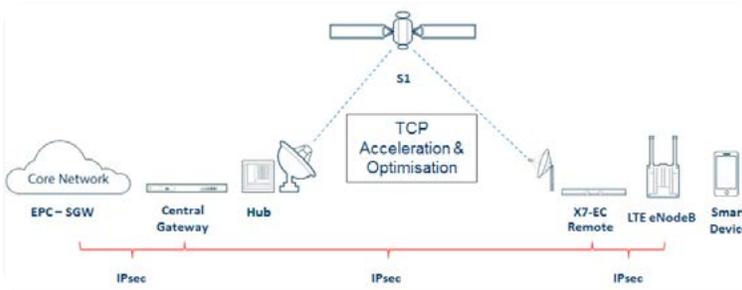
The other key functions of SatHaul™ are:

- Support for 3GPP compliant, end-to-end IPsec, including full IKE implementation;
- Use of RoHCv2 header compression to drastically improve the efficiency;
- Use of LZ4 payload compression to further improve efficiency.

All of these functions can be performed with no impact on the satellite modem throughput, due to the separation of function between the satellite modem “data pump” and the high-performance embedded Intel server system.

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Overall, MOTIV has reported a 20% gain in efficiency due to the use of SatHaul™ for their data overlay network. When VoLTE is deployed, they can expect to see this figure rise, as with the small packets used for VoLTE transport and the headers can represent around two thirds of the traffic.



Since the X7-EC has a built-in VLAN aware switch and 8 ports, it's possible to connect the LTE base station via the SatHaul system, while keeping a direct connection to the existing 2G network equipment, either with or without existing optimization systems.

A final benefit from using the X7-EC is that it supports VSAT mobility, and so enables MOTIV to operate cells on wheels to support emergency or special event deployments. As well as supporting the OpenAMIP protocol that is used to drive steerable antennas, the X7-EC can also be connected directly to a standard GNSS (GPS, GLONASS etc.) receiver to obtain its position automatically, and thus connect without requiring reconfiguration.



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