THE DIALOG ADVANTAGE: Expand Your Service Reach

ST Engineering

Today, demand for mobile connectivity is exploding across every nation, industry and society. Across the developing world, the market for remote and rural coverage is growing exponentially, and mobile subscription rates are projected to surge and help bridge the digital divide. All around the world, mobile operators face the challenge of maintaining service availability and quality — whether the challenge is caused by a sudden spike in network congestion, an unforeseen natural disaster or a video streaming at ever-higher screen resolutions.

In these situations, satellite connectivity can be a difference maker, given its inherent capabilities and recent innovations. By backhauling voice and data traffic over satellite networks, mobile operators can grow their subscribers in previously unreachable areas, protect network availability and enable cost-effective media distribution.

A Multiservice Platform for Every Network and Application Profile

When it comes to advancing their networks by leveraging satellite connectivity, mobile network operators are looking for efficiency, performance, flexibility and scalability. They want a reliable service to easily extend connectivity to rural sites and integrate seamlessly within their terrestrial network. Cost efficiencies are also key to connect the lower average revenue per user (ARPU) regions that cannot afford costly build-outs. They need to meet the scale requirements of large point-to-multipoint networks and support the throughput demands of high-speed trunking.

ST Engineering iDirect's Dialog solution is a multiservice platform for mobile network operators and service providers to meet the needs of a full range of markets and applications to increase their revenue across 2G, 3G, 4G/LTE and coming 5G networks. They can cost-effectively manage a multitude of small, medium or large networks, including trunking and fiber backup. Further, Dialog can match the network configuration for any customer application, spanning a vast choice of satellite bands and transmission speeds while optimizing network efficiencies and offering high Quality of Experience (QoE).

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Solution Overview

Dialog is a multiservice VSAT platform that allows mobile network operators and service providers to build and adapt their infrastructure and satellite network according to their business model at hand.

- **Highest bandwidth efficiencies with award-winning Mx-DMA**
- **Low- to very-high-speed connectivity options**
- **Advanced QoS and QoE performance**
- **Efficient utilization with embedded acceleration and compression**
- **Modular design for scalability**

Highest Efficiency Available

The Dialog backhaul solution combines multiple technology features to provide the industry's highest efficiency — at both an operational and a technological level with its innovative outbound and return links.

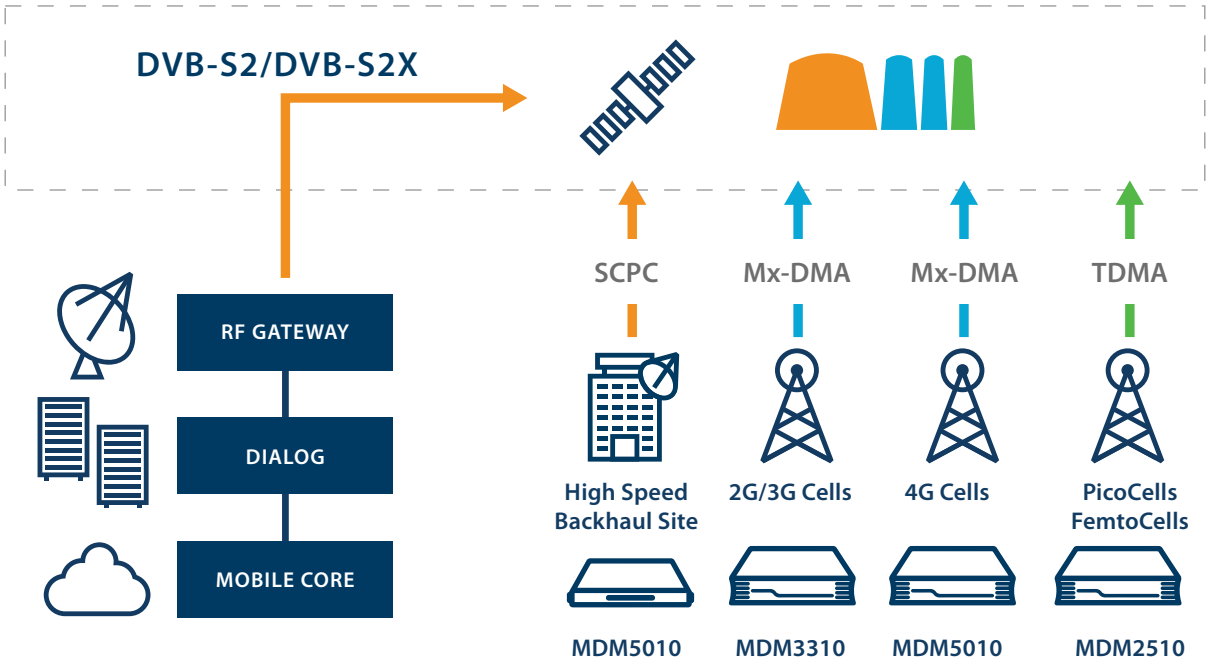
On the satellite **outbound link** level, service providers can select the best transmission technology for their particular application. All applications share a highly efficient DVB-S2 or DVB-S2X technology. Dialog provides major performance gains when combined with other advanced transmission technologies such as our Equalink®, a revolutionary linear and nonlinear predistortion technology designed to enable clean satellite channels by compensating for transmission imperfections. Combined, the efficiency gains can exceed 40% while maintaining the same OPEX or can substantially reduce OPEX for the same amount of capacity.

On the satellite **return link,** Dialog features its award-winning Mx-DMA technology, a highly efficient yet flexible patented waveform, as well as SCPC for high-efficiency trunking links and MF-TDMA for very scalable networks. Dialog's return technology is ideal for scalable throughput modes for low- to high-rate traffic and avoids latency over satellite by using the latest trans-

mission and efficiency technics such as short block codes and highly efficient modcods, combined with reduced roll-off factors, FlexACM and cross-layer optimization.

Mx-DMA® is the best fit for mobile backhaul traffic because it can constantly provide the highest quality of service while enabling spectral efficiency based on real-time traffic and fading conditions. Mx-DMA's seamless dynamic adaptation ensures the mobile voice, signaling and data traffic, including video, are always preserved. Mx-DMA's flexibility also ensures low-throughput 2G networks with symmetrical traffic patterns are accommodated as well as demanding 3G/4G networks with higher asymmetry. With support up to 68 Msps carriers, Mx-DMA's high efficiency enables higher throughput, better network availability and substantial bandwidth savings. The implementation of Mx-DMA can result in the doubling of the transponder throughput while using the same bandwidth — alternatively, it can reduce the required space segment capacity by 50%.

We are introducing an innovative expansion of our Mx-DMA capabilities through a new technology called Mx-DMA MRC. This coming Dialog feature combines the benefits of MF-TDMA (ideal for large-scale networks with bursty traffic and higher contention services) and the spectrum efficiency of Mx-DMA into a single return technology suited to a greatly expanded set of applications, minimizing operational complexity and maximizing statistic multiplexing. Mx-DMA MRC delivers these benefits by maintaining the industry-leading spectral efficiency of Mx-DMA while drastically improving the agility, scalability and fill efficiency of this patented waveform technology.



The Dialog Backhaul Solution

Superior Quality of Service

Providing the highest Quality of Service (QoS) for voice and data services and managing expenditures are two key challenges for mobile operators that are typically in direct opposition. A satellite cellular backhaul solution must ensure the preservation of the voice traffic and signaling with guaranteed performance and an optimized QoE. At the same time, the solution must be efficient by accelerating and optimizing data traffic over satellite links to guarantee low OPEX and leverage cost-effective solutions.

Our bandwidth-allocation algorithm allows for utmost flexibility by enabling countless possibilities of QoS levels, bandwidth management and traffic prioritization. Mobile network operators can map their core networks to satellite networks to prioritize traffic and maintain distinct QoS settings by remotes, bandwidth and applications to satisfy service-level agreements.

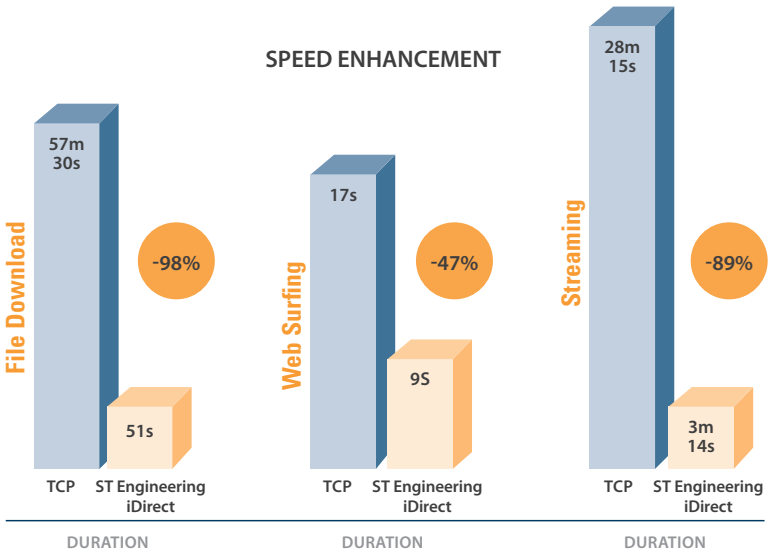
Through cross-layer optimization, satellite modulation equipment is continually interacting with acceleration, compression, bandwidth management and IP shaping technology. As a satellite link condition changes, the link is auto-optimized using preconfigured QoS and priority settings — ensuring neither the link nor data are lost. Cross-layer optimization shapes both the IP and the RF part of the network as well as the QoS and over-booking functionalities. This allows flexible service-level agreements to be formed depending on the different customer requirements, even when they share the same network or satellite link.

Traffic Optimization and Security

Traffic optimization is enabled through an advanced set of embedded tools focused on compression, acceleration and intelligent delivery of 2G, 3G and 4G/LTE/VoLTE traffic over the links. The latest standards and techniques in acceleration and compression are available to achieve maximum throughput and efficiencies using header and payload compression, packet coalescing and GTP acceleration.

Seamless Network Integration

Mobile network operators can run an ST Engineering iDirect network in a Layer 2 bridging mode with high efficiency as an alternative to traditional Layer 3 mode architecture. By doing so, they can implement a variety of modern, converged network architectures; pass any Layer 3 protocols; and more easily integrate into hybrid network scenarios. Further, a combination of any of these modes can be used in parallel on the same Dialog system. Even more, IPv6 networks along with dual stacks IPv4/IPv6 are natively supported in Dialog.



Improved user experience SLA: 10 Mbps FWD / 1 Mbps RET

Platform and Hub Scalability

The Dialog platform scales to every type of satellite network: from very small networks to the largest networks, having hundreds of thousands of remotes, from single-coverage to multispot HTS networks. Satellite service providers can invest as the business grows with additional Dialog hub module equipment and platform software licenses.

The Dialog hubs provide a high degree of modularity: the 1IF Hub for small-scale, dedicated networks; the 4IF Hub for medium-size gateway deployments; and the XIF Hub for large gateway deployments. Furthermore, service providers can start with a small Dialog platform configuration to address the customer's initial needs. As the business evolves and grows, the platform can be easily extended by adding licenses and modulator and multi-carrier demodulator units. The hub modularity facilitates a unique pay-as-you-grow investment, unmatched ease of installation and instant service deployment.

Dialog can serve many different business models, from offering managed services to enabling business models with multiple VNOs. This produces a multitude of possibilities for optimizing the usage of infrastructure and satellite capacity for different markets.

Dialog hubs are designed to process a very high number of packets per second (PPS), which is key for the mobile voice traffic, and designed to accommodate a very high number of TCP sessions (this becomes important when accelerating the 4G LTE data traffic).

Dialog hubs can be deployed remotely in different teleports while being managed centrally via a single Dialog network management system (NMS). The Dialog NMS comes with a full set of APIs. This enables service providers to easily integrate OSS and BSS tools as well as reservation systems, such as the SatLink Manager or other third-party tools, with the Dialog platform.

ST Engineering iDirect is a leader in satellite ground infrastructure and solutions for the cellular backhaul and trunking market. We have deployed more than 80 mobile backhaul networks. We hold the largest network with 1,500 cellular sites, and 12 of the top 25 telcos are ST Engineering iDirect customers.

Robust Modem Portfolio

The versatile modem portfolio provides the right performance, the right cellular backhaul characteristics and ease of use for a wide range of targeted applications.

- **MDM2510** is a compact, low-power-consumption modem, perfectly suited to service 2G and 3G network deployments. The modem features wideband, high-throughput DVB-S2X and Mx-DMA along with SCPC while guaranteeing the highest efficiency and availability.

- **MDM3310** is a high-throughput VSAT modem supporting a wide range of IP services, including backhauling, internet/intranet access, Voice over IP (VoIP) and enterprise connectivity. Its ease of installation and high-performance modulation techniques of Mx-DMA and SCPC and high number of PPS and TCP session support enable network operators to offer various bandwidth-intensive services in a cost-effective way.

- **MDM5010** is a modem featuring very high throughput and performance enabling more than 500 Mbps of traffic so service providers can set up almost any type and size of network on any available type of satellite — from FSS to HTS. This modem supports a wide range of IP services, including backhauling, trunking for fiber restoral/backup service, first responder, internet/intranet access and VoIP. High spectral efficiency, high packet and bit rate capability make it a perfect fit for bandwidth-intensive services.

Meet Every Need

The Dialog platform is built for today's diverse backhaul applications and tomorrow's intensifying demands. It delivers the efficiency, performance and service capabilities service providers need to win today's opportunities, multiplied by the scale and innovation required to expand into tomorrow's markets. It equips service providers to win every market opportunity, from price-sensitive to premium applications, with a future-proof growth strategy.

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