

Infinera Case Study: XO Communications / GMPLS



GMPLS Technology Enables XO Communications to Deliver Services Fast, Efficiently, and Accurately

XO Communications entered the wholesale telecom market in 2006 with a nationwide Infinera optical network. Today, XO has built a \$1 billion business offering a wide range of services to service providers and enterprises nationwide. With a unique digital architecture based on large-scale photonic integrated circuits, Infinera has helped XO win a reputation for speed, flexibility, and reliability in its long-haul network.

A key element of Infinera's Digital Optical Networks architecture is the GMPLS control plane in Infinera's IQ™ network operating system. The GMPLS control plane enables the system to build and maintain real-time a logical and physical view of all the assets on the network and calculate paths for circuits on the network quickly and reliably. This network intelligence simplifies management of the optical network in many ways. According to XO Engineering Manager Luis Escobedo, the key benefits are in enabling XO to deliver circuits and services to customers more quickly and reliably than with a traditional DWDM optical system. This benefits XO in terms of costs—managing a very large network with lower operational expenses—and, equally important, in terms of revenue, helping the company win more business by being quicker and more reliable when it comes to delivering services to customers.

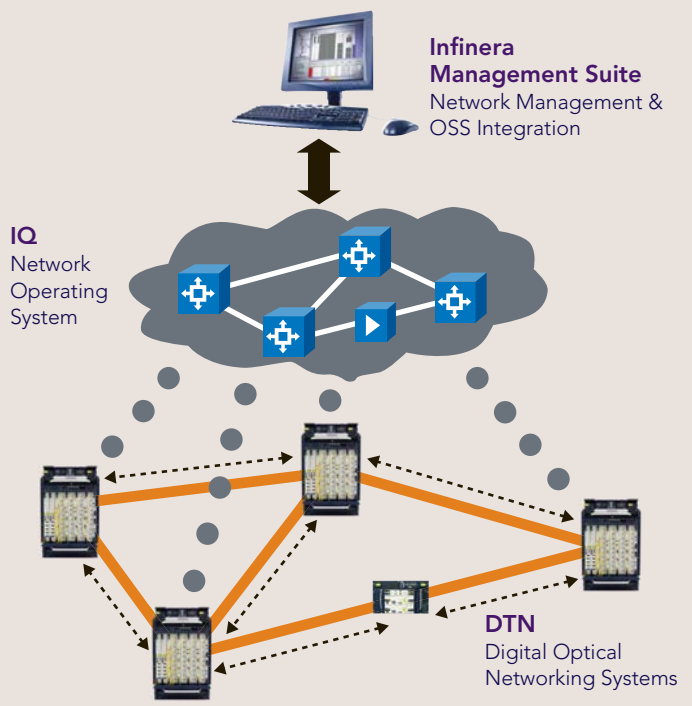
The GMPLS capability helps XO in two distinct phases. First, when an XO salesperson bids on an order, XO's network operations is able to confirm quickly that the bandwidth is indeed available to support that order. Consider a salesperson bidding on an order for a 10 Gigabit circuit from New York to Los Angeles. With a traditional DWDM system, the engineering team has to plot each link span on the circuit and confirm that there is available bandwidth in all of the link spans to support that service. For example, is there 10 Gigabits of spare capacity between New York and Washington, Washington and Atlanta, Atlanta and Dallas, and so on? Often, truck rolls are required to confirm that resources shown in the file do actually exist at each site.

Infinera's GMPLS Control Plane: IP Technology in the Optical Layer

Every Infinera DTN system includes integrated digital bandwidth management at 2.5 Gb/s granularity for switching, grooming, and adding/dropping of traffic. Each DTN also runs Infinera's IQ™ network operating system with the GMPLS control plane. Infinera's GMPLS uses two algorithms that are well-known in IP networks:

- RSVP-TE is used for signaling and bandwidth reservation to set up end-to-end A-Z circuits.
- OSPF-TE is used for network auto-discovery and optimized routing. This algorithm can also provide fast re-routing and restoration in the event of single or multiple network failures.

The Infinera Management Suite provides intuitive, easy-to-use GUI-based network management and OSS integration.



Infinera uses GMPLS to simplify that process. Because the Infinera DTN system puts 100 Gigabits of capacity on every line card, Infinera networks tend to have far more spare capacity than traditional DWDM networks. Infinera's GMPLS control plane maintains a view of the entire network including real-time data on all network resources and whether they are committed or available. Infinera's GMPLS uses the IETF OSPF Traffic Engineering (TE) routing protocol to calculate the shortest route between the two endpoints for the service requested by the salesperson. Once it is confirmed that the spare capacity and circuit diversity are satisfied for the requested service, XO then "pre-provisions" that capacity. This means that if any other XO team member tries to plan other circuits, he or she will be able to see that the resources needed by that potential NY-LA order are pre-reserved by the previous salesperson. This prevents confusion or double-booking.

When the salesperson is in a position to confirm the order and XO engineering is asked to provision the bandwidth, the second phase of the process comes into play. Known as RSVP-TE or resource reservation traffic engineering, this includes locking down the bandwidth and provisioning it. All that's left now is for the client-facing service modules called TAMs (Tributary Adaptor Modules) to be fitted to the line cards at each end-point, and the service is live.

Luis Escobedo cites an example of an XO customer who asked XO if it could provide two Gigabit Ethernet services in San Francisco within 48 hours. Using Infinera's GMPLS technology, XO had the circuits live in 24 hours.

"Infinera's GMPLS allows us to manage the network with a lot less resources than we would otherwise need," comments Luis Escobedo. "We need far fewer truck rolls, and when we do need to send out a truck, we are confident we are sending it to the right place with a low margin of error."

The speed and accuracy of Infinera's GMPLS-based provisioning system has helped XO salespeople win customers. Nicole Cooper, strategic carrier account executive at XO, says it has helped her build multimillion dollar accounts with several large customers in the three years since XO entered the long-haul market with its own network. "Infinera's provisioning makes it easy to go into a customer and bid on a deal, because I always know the bandwidth will be there," she says. "Once our customers see that we can always deliver on what we promise, we win a lot of customer loyalty. Our long-haul network is a key competitive weapon for XO."

Unlike some other optical networking systems, Infinera's GMPLS software reaches every node on the network. "We have hundreds of GMPLS elements in our network," explains Escobedo. "It's on a scale that's completely different from most other networks. And it gives us the power to control and manage our network with a relatively modest team of engineering and operations folks."



XO Engineering Manager Luis Escobedo: "Infinera has allowed us to turn up services pretty much in real-time."



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