What You Need to Know Before Hitting the Open (Networking) Road

by Rod Naphan, CTO, Fujitsu Network Communications

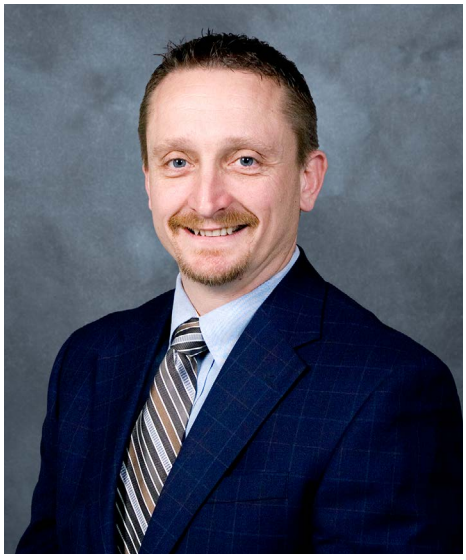
As communications service providers and multiple system operators (MSOs) seek to transform network infrastructure and business models, the groundswell of support for open networking continues to gain momentum. Following the lead of data centers and the success of various Open Compute initiatives, service providers are moving to disaggregated optical networking platforms making use of SDN/NFV technology, hybrid cloud and virtualized environments – often running on white box systems or multi-vendor hardware. This adoption of open, plug-and-play architecture in optical networks offers a number of promising benefits, including greater efficiency, flexibility and agility.

However, there are inherent differences involved in the design, deployment and management of open optical systems versus traditional vendor-proprietary equipment. As a result, many network operators are now left wondering, 'How does this architecture evolution change network planning and deployment?' Perhaps even more important is the question of where service providers can turn for support to ensure performance and interoperability of open optical system components from various vendors.

Mapping the Open Road

The fact is that making the transformation to an open network is not a straightforward process, requiring a cultural shift at all levels of network operation. In order to design and plan deployment of an open network, including interoperable hardware, software and application programming interfaces (APIs), service providers need to adopt a new mindset, as well as vendor-neutral processes and tools.

For the most part, network tools available today are specific to a particular vendor's equipment, with limited capabilities to model alternative systems. Many vendor design tools encapsulate the equipment specification - along with the algorithms used - inside the tool, making it nearly impossible to integrate with third-party proprietary, open or white box systems. In the future, multivendor design tools may use analytics and artificial intelligence (AI) to accurately model the network and provide real-time path computation and allocation, eliminating error-prone manual calculations.



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Beyond the design and planning phase, deployment and operation of an open network also presents new challenges. Despite all the best efforts of industry experts, open does not necessarily guarantee interoperability; yet the requirement to ensure network performance remains the same. With multiple suppliers involved in an open system, troubleshooting takes on new complexities.

In the event that a service provider needs to call in vendor support to resolve an issue, network technicians first must be able to isolate the root cause of the failure to determine which vendor to call. The ability to isolate the root cause might depend on the ability of the network controller to consolidate and analyze the data. If the root cause is not evident, the network operator may need to enlist support from multiple vendors to address the problem. The extra time required for resolution in these instances increases the possibility that subscribers will be affected.

Moreover, another factor related to operation and maintenance of open networks is the consideration of sparing. With a closed system, each vendor's equipment is separately managed and spared. In an open network, however, network operators need to consider sparing for all the specific elements deployed – the extent of this process is highly dependent on the degree of openness adopted in the network.

For example, a service provider using transponders from multiple vendors would need to maintain spares for each different transponder. This could significantly increase required sparing levels, complicating equipment inventories and thereby increasing operational costs. This challenge will be alleviated by the advancement of industry standards and specifications. With an Open ROADM-compliant system, for instance, a failed unit from one vendor can be replaced with a spare from another compatible vendor. Various sparing scenarios may influence changes in 'Repair and Return' processes, as well as the way that equipment inventories are managed by service providers.

Choose Your Own Pace

Although service providers have embraced the idea of open-source networking architecture, there are varying degrees and definitions of what it means to be open versus closed. It's not an either-or decision. Network operators have a choice of how fast and how far to travel along the continuum – from proprietary to fully open architecture – and all points in between.

To assist with the transition to open, the Open Line System (OLS) reference architecture provides a general guide for constructing disaggregated systems. OLS allows independent selection of ROADM and transponder vendors in various configurations. Transponders are typically used in a bookended configuration, allowing for earlier deployment of new innovations. With OLS, network operators often pass up vendor support in favor of conducting system integration in-house or contracting third-party services from a systems integrator like Fujitsu.

A key benefit of OLS is the ability to upgrade the network one piece at a time while maintaining operations, achieving a smooth evolution as new technology is introduced. This capability allows new innovations to be introduced more quickly while managing costs. The OLS framework also allows service providers to gradually open up the network as they feel comfortable, making their own decision how far to extend the open concept.

The good news is that there are a number of industry associations, technology suppliers and standards bodies actively involved in sorting out the open optical networking roadmap. But the bad news is that this crowded landscape is quite murky and confusing. At this point, the industry is still a long way from reaching consensus on the best path forward; however, there is progress being made on the journey to open networking.

The Open ROADM Multi-Source Agreement (MSA) industry consortium has developed specifications to define interoperability between ROADM platform interfaces and data models. With Open ROADM, network operators can select and freely mix ROADM equipment and transponders from Open ROADM-compliant vendors, without requiring a bookended configuration. This not only eliminates proprietary lock-in challenges, it maximizes cost-efficiency by allowing equipment to be sourced from multiple vendors. As with OLS, however, integration and performance testing are not provided by a single vendor, potentially impacting network engineering. While this may be less of an issue in smaller metro areas, it could be a daunting challenge in long-haul networks.

The Open Networking Foundation (ONF) consortium is pursuing a number of projects that leverage network disaggregation, white box technology and standard models, such as OpenConfig. The operator-led ONF consortium initiated the Open and Disaggregated Transport Network (ODTN) project to build disaggregated reference platforms based on open and common standards, driving innovation and enabling a white box optical 'peripherals' ecosystem.

For those service providers interested in open network design tools and white box solutions, the Telecom Infra Project (TIP) launched the Open Optical and Packet Transport Group to define Dense Wavelength Division Multiplexing (DWDM) open packet transport architecture. White box designs, such as TIP's Voyager platform, can be sourced directly from a contract manufacturer. Although this approach reduces capital expenditures, it may result in increased operational costs as the network operator is responsible for integration and performance assurance.

Are We There Yet?

Although no one is exactly sure where the road to disaggregation will lead, we can say for certain that open networking is here to stay. We are already seeing service providers adopting blade-based architectures that lend themselves to disaggregation, and collaboration is apparent among various consortia and standards bodies. As network operators face mounting competitive pressures to offer faster speeds, higher capacity and innovative new services, the need for greater efficiency and flexibility will continue to drive the evolution to open network architectures.

While open offers significant promise for network transformation, it ushers in a radical shift in how networks are designed, deployed and managed. Before you put the pedal to the metal on the open road, make sure you know what lies ahead and how to avoid any potential speed bumps.