INFOBRIEF

Overcoming the Top Five Data Center Interconnect Challenges

Today's content is consumed on demand, by users who expect easy access to video and informational services whenever they desire, from nearly any location. In this web-scale world, networks play a crucial role in connecting data centers and enabling organizations to gain greater agility, scalability, and operational simplicity to keep pace with growing capacity and performance demands.

As cloud services grow, mobile devices become more powerful, and demand for video services rises, so too does the strain put on networks, particularly on routes to, from, and between data centers. At the same time, advances derived from the Internet of Things and big data analytics also generate opportunities to grow new revenue streams.

The challenge for most large organizations is how to support all of these advances with shrinking IT budgets and fewer resources.

This challenge is what makes the solutions designed to interconnect data centers critically important. In the Data Center Interconnect (DCI) arena, content, network, and hosting providers, along with other enterprises, are all working to resolve the challenges that stem from unprecedented content demands by transforming and modernizing network operations.

Here is a list of five of the biggest DCI challenges, along with how to reduce or eliminate each.

1. **Distance limitations –** Data centers often require a connection with minimum latency to maintain a proper flow of information and synchronization between the server sending the information and the storage device saving it. When the data centers that need to be connected are far apart, latency increases as a function of distance and the network equipment that interconnects them. Although choosing the shortest physical route can minimize fiber-induced latency,

networking equipment must keep hardware-induced latency to a minimum with proper design practices. Fiber impairments, such as chromatic or polarization mode dispersion—which have long been roadblocks to implementing high-bandwidth connectivity over long distances—are no longer an issue. Breakthroughs in Digital Signal Processing (DSP) have allowed networking equipment providers to introduce packet-optical platforms capable of automatically and intelligently compensating for these fiber-optic transmission effects, allowing large data flows to be carried over several thousands of kilometers over different fiber types, without compromising speed for performance. Today's optical interfaces can be programmed to provide the optimum modulation schemes for different deployment scenarios. Flexible modulation allows an optimum solution for each application's requirements, such as distance and capacity.

> **Technology Innovation for Web-scale DCI**
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2. **Capacity limitations –** Data centers store and deliver data as required by applications. Very often, the size of data sets entering and/or leaving a data center can be very large, ranging from hundreds of Gigabits to Terabits. This is why the network equipment used to connect data centers must be capable of providing reliable, high-capacity connections that can be scaled to address tremendous growth requirements in data center traffic. For example, advances in coherent optics have paved the way to successfully transmitting data at rates of 100 Gb/s, 200 Gb/s, or higher, over almost any distance, dramatically improving DCI performance.
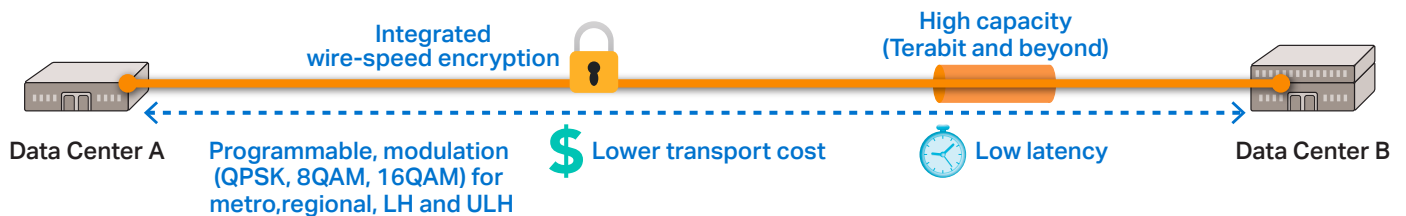
Data Center A — Integrated wire-speed encryption — Programmable, modulation (QPSK, 8QAM, 16QAM) for metro, regional, LH and ULH — $ Lower transport cost — High capacity (Terabit and beyond) — Low latency — **Data Center B**

Figure 1. Technology innovations to help overcome DCI challenges

3. **Security risks –** Sensitive information stored in data centers—including financial transactions, personnel records and other corporate data—is both crucial and confidential, requiring data center network connections that are reliable, safe, and, in many cases, encrypted to avoid costly breaches and/or data losses. While encryption and stringent rules for access to stored data are widely deployed to protect against intrusions, advances in networking equipment can also deliver in-flight data encryption. This offers increased protection for data, from the moment it leaves one data center to the moment it enters another data center over an interconnecting network.

4. **Operational limitations –** Manual operations are labor-intensive, complex, slow, and highly error-prone. Minimizing manual operations by automating frequent and recurring tasks is quickly becoming an operational imperative. Turning up a connection between two data centers must take place rapidly and reliably, and managing each connection should not require ongoing manual operational tasks. Optical networking platforms are meticulously designed and purpose-built for DCI applications. Simple planning, ordering, and installation advances enable data centers to be interconnected faster. Full programmability with open APIs allows data center operators to design and build applications for specific operational requirements.

5. **Cost-related challenges –** Large data streams entering and leaving data centers must be carried as cost-efficiently as possible, especially with network traffic anticipated to reach a compound growth rate of 25 percent per year. For data centers to remain financially viable, costs must not scale linearly alongside bandwidth growth. Instead, the industry is making advances in high-speed networking, including solutions that operate in a small footprint and connect data centers at the lowest possible cost per bit. Solutions that take up less space and reduce power consumption will reduce operating costs. At the same time, modularity advances enable the ability to scale to multiple terabits of transport capacity without hefty capital or operational investments. Data center operators can expect to reduce electricity, cooling, and real-estate costs. Simpler product designs may also lower management, licensing, and training costs.

Why Choose Ciena?

Market research firm Ovum recognizes Ciena as the DCI industry's networking leader. The Waveserver® stackable interconnect system—addresses growing needs for high-capacity, programmable operations in a smaller footprint. Waveserver is designed for any-distance DCI scenarios to serve the bandwidth needs of data center operators—including Internet Content Providers (ICPs), Carrier Neutral Providers (CNPs), enterprises, government, and military—or any environments connecting data centers over metro, regional, and long-haul distances. Waveserver functions as a high-capacity 'bandwidth server' extending typical server functions to networks, including 400 Gb/s capacity in a compact (1RU) footprint. Waveserver runs open Linux in a scalable, modular, space-saving design that features up to 44 units installed in a single rack. It also decreases costs, lowering the cost per transported bit and per bit/per rack, along with power consumption expenses.

Learn more about Ciena's new Waveserver →

Ciena's DCI solutions were designed and built to be flexible for various connections and interfaces (protocol, rates), modulation schemes (QPSK, 8QAM, and 16QAM), deployment scenarios (over existing photonic lines, protected, unprotected), and capabilities (packet aggregation and switching), allowing data center operators to embrace web-scale requirements. Ciena can help data center and network operators accelerate the pace of deployments, reduce operating costs, and raise the level of flexibility and efficiency of their network infrastructures.

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