High-Density Data Center Connectivity with WAN Security

**TABLE OF CONTENTS**

- Brocade SLX Routers .................................. 2
- Coriant Groove G30 Network Disaggregation Platform .......... 2
- Coriant Groove G30 with Brocade Routers: Use Cases .......... 3
  - Disaggregated DWDM Transponder .................................. 3
  - Groove G30 Encryption with Storage Area Connectivity .......... 3
  - Open Line System for High Capacity and Reach .................. 4
- Summary of Use Cases .................................... 4
- Benefits: Secure IP-Optical Data Center Connectivity ............ 5
- Learn More .................................................. 6
- About Brocade ............................................... 6
- About Coriant ............................................... 6

**Brocade SLX Routers and Coriant Groove G30**

Today’s networks are experiencing massive growth driven by video, cloud services, and Big Data, as well as a rapidly growing number of Internet of Things (IoT) and mobility devices. As a result, network capacity is now measured in peta- and zetabytes, and it is fairly common for networks to be connected to billions of devices.

Very simple operational concepts, such as low power consumption, a small footprint, and massive scale, are prerequisites to meeting networks’ increasing capacity and scalability needs. With this in mind, carriers are transforming their networks from central offices with IP/MPLS routers and L0-L2 networking equipment, operated via multiple NMS and OSS systems, to a data center-centric, Software-Defined Networking (SDN)-controlled, and highly automated networking layer.

Achieving high-density data center connectivity with WAN security is not an easy challenge. Operating connections between data centers requires state-of-the-art, high-performance data center gateway routers with sufficient scalability and operational efficiency, as well as wide area Wavelength-Division Multiplexing (WDM) networking equipment that provides the density, scale, and simplicity sought by network operators. The combination of Coriant Groove G30 with Brocade® SLX® or Brocade MLX® router platforms provides a comprehensive solution for these networks.

Given the large number of devices connected to the network and the sheer volume of data, security is critical in these environments. Data center and network operators are therefore establishing a wide range of measures to secure the data they process and transmit. At the same time, new standards and regulations, such as the recent EU directive on security of Network and Information Systems (NIS), are being introduced to help organizations strengthen their network security and ward off cyber attacks.

In this context, organizations are becoming more focused on securing the fiber infrastructure between data centers, since listening devices can be easily installed outside the secure area of networking sites. To guard against such attacks, organizations should encrypt their WDM channels, an approach that is protocol-agnostic and provides the lowest latency.
Brocade SLX Routers

Brocade offers agile, high-performance data center networking and automation solutions to enable digital transformation. These products easily integrate with a rich ecosystem of hardware, open source community software, analytics tools, and cloud orchestration solutions to address current needs and to build a platform for innovation. Brocade VDX® data center switches and Brocade SLX switches and routers deliver flexible IP fabrics and Brocade VCS® fabrics, providing the simplicity and scalable features to meet the demands of today’s virtualized and cloud environments.

With real-time network visibility and DevOps-style automation (with Brocade Workflow Composer™), Brocade networking solutions handily address the massive and growing scale, analytics, and agility needs of the digital business world. Brocade offers open, flexible platforms that give service providers and enterprises the power to deliver high-performance services on demand.

The Brocade SLX 9850 Router provides the cost-effective density, scale, and performance needed to dramatically reduce CapEx and OpEx in today’s quickly evolving networking environment. It is the most powerful IPv4, IPv6, and multi-VRF MPLS data center router available with extensive scalability. From the Brocade SLX 9850-4 shelf with up to 144×100 GbE, the Brocade SLX 9850-8 scales up to 230 Tbps of non-blocking capacity in a multi-stage architecture.

Coriant Groove G30 Network Disaggregation Platform

Committed to open solutions and disaggregation, Coriant empowers cloud data center operators with the game-changing Coriant Groove G30 Network Disaggregation Platform, the industry’s highest-density Data Center Interconnect (DCI) and Open Line System (OLS). Purpose-built for the surging demand for DCI cloud and metro applications, the Groove G30 can be equipped as a muxponder terminal solution and as an OLS optical layer solution, and features the industry’s highest density and lowest power consumption.

With a plug-and-play modular architecture, the Groove G30 provides the lowest startup costs with cost-effective scalability. As an open Network Disaggregation Platform (NDP) offering configurations for secure DCI transmission and optical line solutions enabled through open APIs, the Groove G30 ensures rapid introduction and integration within any data center or telecom operating environment.

Key value propositions include:

- Leverage configuration flexibility and equip the platform as a disaggregated muxponder terminal solution and/or an OLS solution
- Enable high-speed connectivity to and between data centers
- Enhance end-user quality of experience with best-in-class connectivity solutions
- Reduce Total Cost of Ownership (TCO) via industry-leading low power consumption and the highest density
- Maximize optical transmission performance in metro, regional, or long-haul DCI applications
- Accelerate revenue and service deployment with operational simplicity and open interfaces
- Improve service and application performance by extending automation from the data center to the network
- Evolve transmission toward new technologies using Groove’s unmatched flexibility in configuration and support of technology mixes

Groove also offers real-time, 256-bit AES encryption to secure transmitted data between secure sites, and provides secure connectivity for all supported client interface types: 10 GbE, 40 GbE, and 100 GbE, as well as Fibre Channel, OTN, and SDH/SONET formats.

The Coriant encryption solution has been approved by the German Federal Office for Information Security (BSI) at the VS-NfD (classified) and NATO Restricted security levels. The native support of Fibre Channel makes the solution particularly well suited for protecting backup data, for it can be used to secure the connection of remote storage or Disaster Recovery Centers (DRCs), among other uses. Key security features include:

- High-performance encryption in real time at wire speed
- Protocol support for all protocols and line rates supported in Groove (Ethernet, Fibre Channel, OTN, and SDH/SONET) transparent to VLAN, MPLS, and more
- Asymmetric elliptic curve key exchange
- X.509-signed certificate key management and end-point authentication option
- Unidirectional encryption key
- Programmable key rotation interval
- Simultaneous, independent encrypted streams using a single Lambda
- Encryption with very low latency (<500 ns), with no add-on encryption overhead

**Coriant Groove G30 with Brocade Routers: Use Cases**

Brocade SLX or Brocade MLX routers in combination with Coriant Groove G30 can be used across a variety of IP-optical networking applications, including as a DCI gateway or as a highly efficient IP-over-DWDM routing solution. In addition, organizations have the assurance of a proven solution. Together, Brocade and Coriant have performed rigorous integration testing for the following key use cases:

- Coriant Groove G30 as a disaggregated DWDM transponder for Brocade SLX or Brocade MLX 10/40/100 GbE interconnect (Figure 1)
- Secure transmission using Groove G30 encryption for Brocade SLX or Brocade MLX routers, as well as storage area connectivity (Figure 2)
- Adding Coriant Groove G30 OLS for high capacity and increased reach (Figure 3)

The following sections explore these use cases in more detail and demonstrate the strength of the joint solution.

**Disaggregated DWDM Transponder**

Figure 1 shows the main use case, which uses Coriant Groove G30 as a disaggregated DWDM transponder for Brocade SLX or Brocade MLX routers.

**Groove G30 Encryption with Storage Area Connectivity**

Figure 2 shows the basic use case for the joint solution. The Brocade SLX (or Brocade MLX) router is connected to Groove G30 via 100 GbE interfaces, with up to 16×100 GbE supported within a Groove G30 1U chassis. Groove G30 combines the data into DWDM wavelengths that carry up to 200 Gbps. The modulation format and signal processing automatically adapt to fiber properties such as fiber dispersion and polarization mode dispersion.

The channels are combined into a single fiber per direction via a passive filter module. The maximum reach of this solution depends on overall attenuation of the fiber infrastructure, and extends up to 80 kilometers without any additional equipment (such as optical amplification).

Beyond density, power efficiency, and the simplicity of this solution, the modularity of the systems provides additional benefits. Interface sleds or plugins, as well as pluggable optical interfaces, provide a pay-as-you grow approach, reducing the cost of spares and only using power when the capacity is required.
For use cases that need lower rate interconnect, 10 GbE as well as 40 GbE interfaces have been tested as well. The solution can be extended through additional 16 Gbps or 32 Gbps Fibre Channel interfaces to provide storage connectivity between data centers.

To ensure that traffic cannot be tapped and data cannot be intercepted along the fiber plant outside secure data center sites, Groove G30 offers an encryption option. It uses OTN payload encryption to ensure that eavesdropping on any part of the payload is not feasible between secure data center sites.

Because the encryption mechanism is built on a standard G.709 framing, encryption of all the different traffic formats and client rates is feasible and can be enabled and disabled per client interface use. As a result, payload encryption secures the fiber connection against eavesdropping for all supported interface types: 10 GbE, 40 GbE, 100 GbE, OTN, SDH/SONET, as well as Fibre Channel traffic.

In the use case depicted in Figure 2, payload is encrypted using a NIST-certified 256-bit AES encryption algorithm.

An encrypted communication channel is created between the two Groove G30 endpoints using Transport Layer Security (TLS) with Elliptical Curve Diffie-Hellman exchange as the crypto key establishment mechanism. This secure communication path can be devised using the Data Communications Network (DCN) established with the General Communications Channel (GCC) within the Optical Data Unit (ODU) or a physically diverse IP network.

Mutual authentication is performed either with a pre-shared key or a signed certificate. The use of signed certificates further enhances the authentication security by eliminating pre-shared key management, which is not only tedious, but also poses a security risk due to the need for human operation.

Each Groove G30 endpoint generates its receive path encryption key and informs the peer via the secure communication channel. The encryption key, therefore, is unidirectional only. This further enhances security, as the transmit and receive paths are each encrypted with a different key.

When a physically diverse IP network is used to distribute the encryption key, it decouples the key distribution from the physical data path. There is no direct association between the encryption key and the data path that uses the key, thus hardening the level of security. To further strengthen the encrypted data path, key rotation is performed at a programmable interval.

Open Line System for High Capacity and Reach

Figure 3 extends this joint use case by adding Groove G30 Metro DWDM, the only 96-channel DWDM system (including optical amplifiers) in a 1U footprint. This application provides increased capacity of up to 96 channels per fiber pair, as well as additional reach through optical amplification.

With a single channel capacity of 200 Gbps, this results in a per-fiber capacity of 192×100 GbE, or 19.2 Tbps, for highly scalable DCI applications.

Summary of Use Cases

The strength of this disaggregated approach—DWDM interfaces in a separate transponder box—is that it provides better scalability and higher density than integrated DWDM approaches that increase power consumption, require more space, and reduce the interface density/slot capacity of scalable router platforms.
As shown in Figure 4, this combination of solutions results in the highest overall density and lowest power consumption available today:

- Highest-density DWDM transponder: Coriant Groove G30
- Smallest footprint 96-channel metro DWDM: Groove G30
- Highest port density router: Brocade SLX

This best-in-class density, combined with the scalable, multi-shelf approach of Brocade SLX routers and switches, provides up to 230 Tbps of capacity, enabling data center networks to support the huge capacity levels needed in the near future.

Together, Brocade and Coriant have performed thorough interworking tests for three key network use cases (as described earlier). This further simplifies the deployment and operation of this unique networking solution.

**Benefits: Secure IP-Optical Data Center Connectivity**

Brocade and Coriant have combined their best-in-class routing and DCI products into the leading solution for secure IP-optical DCI.

The solution includes Brocade SLX and Brocade MLX products as well as the Coriant Groove G30 network disaggregation platform. This combination of the highest interface-density data center routing platform with the highest-density DCI transponder and OLS today provides:

- Leading equipment density and power consumption for IP-optical DCI
- Pay-as-you-grow as well as power-as-you-grow modularity
- Unprecedented scalability:
  - From single blade 3.6 Tbps routing to 230 Tbps multi-chassis configurations
  - From single 10/40/100 GbE DCI to 25.6 Tbps per fiber pair
- A secure and protocol-agnostic payload encryption
- Openness through open APIs and a disaggregated DWDM layer

When combined with the disaggregated networking approach of a Layer 3 data center router, with separate, encrypted DWDM interfaces and OLS, this solution allows organizations to:

- Support a multitude of operational and business models that data center operators face today. For example, it enables secure paths through a third-party network operator infrastructure and even across a third-party DWDM network, with encryption controlled by the data center operator.
• Simplify IT integration and operation of networks.
• Enable fast technology innovation, rapidly reducing power consumption, footprint, and network costs.

In summary, this pre-tested, best-in-class solution for secure data center connectivity addresses the key challenge for data center operators today. At the same time, its structure prepares the network for even higher capacity, density, and lower power consumption in the future.

Learn More
For more information:
• Brocade SLX Series
• Brocade MLX Series
• Coriant Groove G30

About Brocade
Brocade networking solutions help organizations achieve their critical business initiatives as they transition to a world where applications and information reside anywhere. Today, Brocade is extending its proven data center expertise across the entire network with open, virtual, and efficient solutions built for consolidation, virtualization, and cloud computing. Learn more at www.brocade.com.

About Coriant
Coriant delivers innovative and dynamic networking solutions for a fast-changing and cloud-centric business world. The Coriant portfolio of SDN-enabled, edge-to-core packet optical networking and DCI solutions enables network operators to cost-efficiently scale network capacity, reduce operational complexity, and create the resilient foundation for a new generation of mobile, video, and cloud services. Learn more at www.coriant.com.