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WHITE PAPER

# Brocade Networks for Dell EMC Enterprise Hybrid Cloud

## Cloud Evolution Utilizing Existing Infrastructure

Brocade® network solutions have long been part of EMC's core product portfolio and we have worked together to provide this answer for the organization wishing to keep their existing infrastructure and integrate it into an Enterprise Hybrid Cloud model. Brocade's inherent automation, network expansion simplicity and management, tightly coupled with VMware virtualization technologies and EMC's entire portfolio, is the connectivity supporting the Dell EMC Enterprise Hybrid Cloud (EHC) solution described in this paper.

## Enterprise Hybrid Cloud

Enterprise Hybrid Cloud is a modern model for the blend of IT resources, infrastructure automation, and user simplicity. It delivers on the promise that technology applied to a pool of resources can assist with any task using a few points and clicks. The challenge with this is that resources are still required to facilitate the process. Architects, Administrators and IT Operations teams are still necessary to plan and to ensure the smooth running of this pool to meet user and workload demands. As organizations move forward with IT automation, they will inevitably encounter the Hybrid Cloud. In some instances, it will be appropriate to roll in an entire new technology stack to replace existing investments and then software can run on this stack like an integrated cloud environment. However, in most organizations the existing infrastructure will remain intact and will need to integrate into the Enterprise Hybrid Cloud.

## Dell EMC Enterprise Hybrid Cloud

The Dell EMC EHC solution is a virtualized data center including automation delivered through programmability and software. It delivers IT as a service (ITaaS) and also includes options for high availability, backup and recovery, and disaster recovery. EMC EHC also provides a foundation for connecting to cloud services and managing them along with the local environment under common tools. Intended as a guide for organizations desiring to create an IaaS-like IT environment within their own data center, EHC is based on EMC Federation products including EMC portfolio storage options and VMware virtualization and orchestration tools. This document will explain the role of the Brocade network

fabric in enabling this environment, and the automation capabilities included in the integrations with VMware tools.

## Modern Network Fluidity

Datacenter modernization provides new technologies for delivering IT services, efficiency improvements by IT teams improvising cloud technologies for their needs, and the increasing expectations of users and line-of-business partners who are focused on the workflows they need rather than the speeds-and-feeds of infrastructure they use. This focus on the flow of operations through IT rather than silos of capacity has created demand for a new approach to connectivity between people, places, and needs. This connectivity is defined by modern standards to meet the demands of simplicity, automation, and flexibility. Brocade network fabrics are the preferred choice for organizations' critical data operations and are leading the way into the Enterprise Hybrid Cloud by providing a fluid character that is "build once, use many" and can grow with the organization's needs.

## Brocade Products for Dell EMC EHC

The EMC EHC incorporates the following networks:

- Management Network
- Application Network
- vMotion Network
- Backup Network
- Storage Network
- Data Replication for Disaster Recovery

Specific products and capabilities of the Brocade portfolio come together to create these networks in a simple, scalable,

proven design that can be automated for IT operations. The following guide explains the products, what they deliver for EHC workloads and how to scope and scale for a customer's needs.

## Summary of Brocade Products for EMC EHC

Table 1 on the next page provides a summary of Brocade products that are typically used in an EMC EHC deployment and support the scaling of the EHC environment to any size. The following sections will dive deeper into each EHC network solution.

## Management Network

Innovative monitoring, management, and diagnostics across Fibre Channel and IP networks help administrators avoid performance issues before they impact operations. With intuitive reporting and trend analysis, maintaining network health and meeting Service Level Agreements is easy.

### Brocade ICX product portfolio

The Brocade ICX® family of fixed form-factor switches works together to deliver a complete, scalable, and high-performance network solution that supports today's demanding video, Unified Communications (UC), VDI, and mobile applications. These are just some of the variable workloads creating a significant operational management overhead. They leverage the innovative Brocade Campus Fabric technology, which provides simplified network deployment and management, scale-out networking, and investment protection with the industry's lowest total cost of ownership.

This innovative technology collapses multiple network layers into a single logical switch, flattening the network

and eliminating deployment complexity while simplifying network management and reducing operating costs. Brocade Campus Fabric technology enables organizations to build networks that deliver:

- **Consolidated management**: Reduces unnecessary network layers to create large management domains that eliminate individual switch touch points, reducing maintenance time and costs.

- **Shared network services**: Allows premium and entry-level switches to mesh together into a single logical switch and share advanced Layer 2/3 services, delivering lower price-per-port functionality without compromising performance.

- **Scale-out networking**: Integrates high performance, fixed form-factor switches to create a single distributed logical switch that is independent of physical location and allows organizations to add ports whenever and wherever needed across the campus without adding complexity.

### Brocade Campus Fabric Deployment

Brocade campus fabric technology offered for the Brocade ICX family of switches extends network options and scalability. It integrates premium Brocade ICX 7750, midrange Brocade ICX 7450, and entry-level Brocade ICX 7250 Switches, collapsing network access, aggregation, and core layers into a single logical switch. This allows an existing switch to share its configuration and policies with all other switches added to the fabric, reducing management touch points to just 1 switch and gaining automation through the entire fabric.

**Table 1:** Summary of Brocade Products for Dell EMC EHC.

| EHC Network | Brocade products | Benefits |
|---|---|---|
| Management Network | The Brocade ICX family of fixed form-factor switches | • Scalable, and high-performance.<br>• Supports demanding video, Unified Communications, VDI, and mobile applications.<br>• Simplified deployment and management, scale-out networking, and investment protection with the industry's lowest TCO. |
| Application Network | Brocade VCS® fabrics, delivered on Brocade VDX® switches | • For Layer 2 deployments of up to 10,000 servers.<br>• Open, highly automated and programmable to achieve seamless scale and operational efficiency. |
| | Brocade IP Fabrics | • For scale beyond 10,000 servers.<br>• Proven, open-standards protocols.<br>• Superior automation and scalability for rapidly changing requirements facing cloud data centers.<br>• Based on a cloud-proven, standard BGP-based design, these fabrics bring the best practices of mega-scale data center automation and expansion to any data center. |
| vMotion Network | Brocade VCS fabrics, delivered on Brocade VDX switches | • Highly resilient and high performance switching platform, with proven ability to handle bursty traffic types.<br>• Line rate performance across all ports. |
| Backup Network | The Brocade VDX and ICX families of fixed form-factor switches | • High performance for segregated backup infrastructure needs. |
| Storage Network | Connectrix FC fabric portfolio<br>• Brocade DCX® Backbones<br>• Fixed form-factor switches<br>• Brocade FCoE 10-24 Blades<br>• ESCON, FICON®, FCP over FCIP (Fibre Channel over IP), and IP extension solutions<br>• Brocade Analytics Monitoring Platform<br>• Brocade Fabric Vision™ technology<br>• Brocade Network Advisor | • Connectrix directors are ideal for the largest mission-critical network environments that require massive consolidation and nonstop operations.<br>• Connectrix switches are ideal network switches for departmental or edge storage area networks (SANs) where you need highly available access to expanding network storage.<br>• Connectrix switches provide best-in-class availability through hot-swappable components and scale seamlessly from eight to 96 ports. |
| | Connectrix IP storage fabrics portfolio<br>• Brocade VCS fabrics, delivered on Brocade VDX switches | • In addition to SAN, some Connectrix switch models also support dedicated IP storage networks. |
| Disaster Recovery data replication | Brocade 7840 Extension Switch | • Purpose-built extension platform.<br>• Extend open systems and mainframe storage applications over any distance.<br>• Quickly and cost effectively scale WAN rate from 5 Gbps to 40 Gbps per platform via software licenses. |

## Application Network

Build a smart virtualization strategy by meeting the demands of today's applications with easy scalability and automated management. Brocade supports the EMC EHC application network through the Brocade VDX product line featuring Brocade VCS fabrics. Brocade VCS fabric integration with VMware simplifies management and maximizes flexibility at all scales supporting the Software Defined Data Center (SDDC) model.

### Brocade VDX product portfolio

Brocade VCS fabrics, delivered on Brocade VDX switches, are designed to meet the needs of cloud environments and scale-out data center architectures. These open, highly automated, software-driven, and programmable solutions support a breadth of network virtualization options. As an integral part of the Brocade open, standards-based data center design stack elements, they enable enterprise and cloud service provider organizations to achieve seamless scale and operational efficiency for Layer 2 deployments of up to 10,000 servers. For scale beyond 10,000 servers an IP fabric architecture is recommended.

Brocade IP fabrics leverage proven, open-standards protocols and deliver superior automation and scalability to address the rapidly changing requirements facing cloud data centers. Based on a cloud-proven, standard BGP-based design, these fabrics bring the best practices of mega-scale data center automation and expansion to any data center.

They enable open programmability and integration with common automation tools, providing an evolutionary approach to data center automation and cloud optimization that allows organizations to address their needs at their own pace. As an integral part of the Brocade open, standards-based data center design stack elements, IP fabrics are optimized for Layer 3 deployments of up to 500,000 servers, and support flexible network virtualization options to enable seamless workload mobility, security, and segmentation within and across data centers.

With both VCS and IP fabric open automation and built-in plug-and-play scalability, the foundation for cloud based data centers is provided without the steep cost and learning curves of today's proprietary, hardware-based, or open script-based solutions.

Brocade VCS fabrics deliver high levels of performance, utilization, availability, and simplicity. They are flatter than classic Ethernet architectures, eliminating the need for Spanning Tree Protocol (STP), yet are completely interoperable with existing Ethernet networks. In addition, they are resilient, offering multiple low cost paths for high performance and reliability, and easily scale up and down as needed.

### Optimized East-West traffic

Traditional data centers are architected with a rigid, three-tier tree topology optimized for the north-south traffic flow of client-server computing environments, compromising performance, increasing latency, and creating bottlenecks. With the increased prevalence of virtualization and distributed applications, data center network traffic is now predominantly east-west, or server-server. The Brocade VCS fabric was designed and optimized to address these traffic patterns by moving traffic through any of the active paths and avoiding the multiple hops required in other tiered topologies.

VCS fabrics also are self-forming and function as a single logical entity in which all switches automatically know about each other as well as all connected physical and logical devices. This allows management to span across the entire domain, rather than being limited to each individual device. These features, along with virtualization-specific enhancements, make it easier for organizations to explicitly address the challenges of VM automation and evolve their networks to take full advantage of cloud, mobile, and social networking advancements.

### Zero-touch VM discovery

Brocade VM-Aware Network Automation eliminates the manual configuration of port profiles when a VM is added to the fabric or moved, providing an additional level of automation. The VCS fabric directly communicates with VMware vCenter, automatically downloading all port profile information and the associated MAC address, and distributes the VM-specific information to all switches within the fabric. When the VM moves, no additional configuration is required.

### Automatic port profile migration

During a VM migration, the destination network switch ports must be configured to ensure that the VM traffic experiences consistent policies and configurations. With the Brocade Automatic Migration of Port Profiles (AMPP) feature, the VM policies and networking policies follow the VM within the VCS fabric. As a VM migrates, the destination port in the fabric learns of the MAC address move and automatically activates the port profile configuration within a single fabric or across separate fabrics. AMPP is hypervisor-agnostic and can therefore be used with various hypervisors.

*VMware NSX integration*
Brocade VCS Gateway for NSX is a solution that unifies both virtual and physical infrastructure for a seamless transition to cloud environments. By unifying the best of both worlds, physical and virtual, Brocade VCS Gateway for NSX allows physical devices to connect to virtual devices.

Brocade VCS Gateway is integrated with VMware NSX, enabling the entire VCS fabric to function as a VXLAN gateway and eliminating the need for specific network placement. As such, the NSX Controller sees the VCS fabric as a single logical gateway, thereby simplifying management and providing resiliency. Administrators can leverage existing infrastructure while gaining the benefits of VXLAN to support multi-tenancy and large-scale deployments of distributed applications.

In addition, Brocade VCS Gateway for NSX is integrated with the VMware NSX Controller. It offers the benefits of agility with self-service provisioning, flexible network architecture, scale-out modularity with the VCS fabric, multi-tenancy, and an easily managed unified solution for physical and virtual assets.

## Brocade IP Analytics Management pack for vRealize Operations Manager
Brocade IP Content Pack for vRealize Operations Insight, and other tools such as Brocade Network Advisor will help to proactively monitor the network, minimize business disruption, and make the physical network underlay efficient. The Brocade VCS integration with vRealize Operations Manager is complementary to VMware NSX integration with vRealize

Operations Manager to help customers manage their Cloud Network as a whole.

## vMotion Network
VMware VMotion enables the live migration of running virtual machines from one physical server to another with zero downtime, continuous service availability, and complete transaction integrity. It is transparent to users.

Brocade offers two distinct options for deploying the vMotion Network within the Enterprise Hybrid Cloud:

1. **VLAN segmentation**: The first option is to logically segregate vMotion traffic onto its own layer 2 segment. This allows the vMotion traffic to reside in its own collision domain and can assist in preventing contention of network resources. Utilizing logical segmentation saves on hardware costs and complexity within the infrastructure. However, it does come with drawbacks. Depending on the VM memory utilization, vMotion traffic can utilize a large amount of bandwidth and if shared with application data streams, can cause contention during utilization.

2. **Physical segmentation**: The solution that addressed the potential contention problem is a second option: Physically segregate vMotion traffic on to its own specified network infrastructure. With physical segregation of the vMotion traffic, we eliminate contention based issues that can be seen within a shared uplink environment, however, we add complexity and devices to the infrastructure in order to eliminate the issue.

In VMware best practices for vMotion networking, it demarcates itself at the

VMkernel and vSwitch uplink. The consideration point for choosing either VLAN or Physical segmentation is based on the VM type, both in its utilization and also in its criticality to the business. Utilizing the Brocade VCS fabric with either option for vMotion traffic allows for a high-performance, resilient and burst-capable switching platform able to handle even the largest of vMotion tasks.

## Backup Network
Backup Network traffic is an incredibly demanding portion of a company's overall infrastructure usage. The reason behind this is squarely due to the amount of bandwidth utilization a backup stream can utilize and in most cases multiple streams are utilized to shorten backup windows and assure that backups are completed and validated consistently. As we have begun to change our approach with our backups in an Enterprise Hybrid Cloud, so have the tools and their abilities to complete the various backup requirements we have. This has led to a change in our methodology, pushing us further into the hypervisor, giving us many new ways to achieve a previously static task.

However, the network requirements have not changed and have actually increased. With that said, best practice for Backup Infrastructures has been to take them out of band, or off of the application/production data path and onto their own segregated infrastructure. These infrastructures require performance and resiliency, as a backup operation is critical to a business's overall data protection plan.

Brocade VDX (Connectrix VDX) and ICX switches handle the requirements of today's modern backup infrastructure, with the industry's lowest TCO.

## Storage Network

Dell EMC EHC storage networks are built on EMC's Connectrix FC fabric and Connectrix IP storage fabrics which are EMC-optimized Brocade products. Brocade has been at the center of EMC's storage networking portfolio for generations of our shared products, and currently offers IP storage networking as well as Gen 5 and Gen 6 support for EHC storage fabrics.

### Connectrix FC fabric and Connectrix IP storage fabrics portfolio

The EMC® Connectrix® family of directors and switches moves your vital business information to where it's needed, securely, with the highest performance, the highest availability and unsurpassed reliability. Connectrix products can connect physical or virtual servers through Fibre Channel Storage Area Networks (SAN) technology or through Dedicated IP Storage Networking for NAS storage systems.

*Connectrix FC fabric*

The Connectrix FC fabric is built on the Brocade Fabric OS® (FOS) family including a wide range of industry-leading products, including Brocade DCX Backbones with Gen 5/6 Fibre Channel as well as fixed form-factor switches. Brocade DCX Backbones are the industry's most reliable, scalable, and high-performance switching infrastructure for mission-critical storage. They are designed to increase business agility while providing nonstop access to information and reducing infrastructure and administrative costs.

Networks need to evolve in order to support the growing demands of highly virtualized environments and private cloud architectures. Fibre Channel is the de facto standard for storage networking in the data center. Brocade DCX 8510 Backbones with Gen 5/6 Fibre Channel deliver scalability and advanced capabilities for this robust, reliable, and high-performance technology. This enables organizations to continue leveraging their existing IT investments as they grow their businesses and solve their most difficult business challenges. It also enables organizations to consolidate their SAN infrastructures to simplify management and reduce costs. Key to EMC EHC, the Brocade DCX also offers:

- **FCoE/DCB solutions**: Brocade Fibre Channel over Ethernet (FCoE) and Data Center Bridging (DCB) solutions enable server I/O consolidation by leveraging Brocade FCOE10-24 Blades for Brocade DCX Backbones. Combining Fibre Channel and IP traffic over the same physical connection simplifies server connectivity to LANs and SANs, and reduces cable clutter, cooling expenses, and power consumption.

- **Extension solutions**: For more than 25 years, Brocade has been delivering robust ESCON, FICON, FCP over FCIP (Fibre Channel over IP), and IP extension solutions. These products are available in fixed-port switch and Brocade DCX blade form-factors.

All Brocade products are based on a foundation of innovative, industry leading core technologies that help improve performance, efficiency, RAS and optimization at an affordable cost. Brocade created the first Fibre Channel switching products, and continues to lead the development of Fibre Channel standards, offering breakthrough Gen 6 Fibre Channel products and innovative Brocade Fabric Vision technology.

## Performance

Fibre Channel SAN fabrics have the most stringent performance requirements of any network technology. They must have low latency and guaranteed delivery while supporting growing workloads and accommodating bursts in application data flows without disrupting applications—capabilities provided by the Brocade FOS family of products.

## Bandwidth

Switching products must have enough bandwidth to avoid congestion for all data traffic. Brocade provides a wide range of price and performance options so organizations can choose the right solutions for their unique business requirements. Brocade backbone products provide both core switch engines and port switch engines, or local switching. This capability boosts performance for high-bandwidth application scalability because fabric traffic increases as storage and server connections grow.

Data center efficiency has become essential for organizations that must manage data growth within their existing power, cooling, and floor space constraints. Brocade is at the forefront of innovative data center efficiency, driving energy use down to 0.23 watts per Gbps for Brocade DCX Backbones with Gen 5/6 Fibre Channel and as low as 0.14 watts per Gbps for Brocade Gen 5/6 Fibre Channel switching products.

*Fabric Vision and MAPS*

Brocade Fabric Vision technology available on Gen 5 and Gen 6 combines the capabilities from the Fibre Channel ASIC, FOS, and Brocade Network Advisor to address the challenges of network monitoring, maintaining 100 percent

uptime, and ensuring network health and top performance. Fabric Vision is a suite of features and technologies that help administrators address problems before they impact operations, accelerate new application deployments, and reduce operational costs. It provides visibility and insight across the storage network through innovative diagnostic, monitoring and management technologies.

Effective use of Fabric Vision is critical in environments with low latency, high IO processing, and flash-enabled storage where network bottlenecks or slow drain issues can quickly accelerate to impact storage response times and application performance. Fabric Vision helps companies to avoid these issues from occurring and enables fast troubleshooting and resolution when issues do occur.

*Connectrix IP storage fabric*
Brocade is redefining networking for IP storage with connectivity solutions optimized for business-critical storage environments. Brocade VDX switches powered by Brocade VCS Fabric technology deliver performance, availability, and management similar to Fibre Channel. Brocade VCS fabric solutions eliminate Spanning Tree Protocol (STP) to deliver active-active

**Table 2:** Fabric Vision comprises a combination of technologies

| | |
|---|---|
| ClearLink Diagnostics | Diagnostic Port (D_Port) provides loopback test capabilities for link latency and distance measurement at the optical and electrical level to validate the integrity and performance of optics and cabling, ensuring signal and optical quality and optimal performance across SAN and WAN connections. Pre-validating the integrity of cables and optics with ClearLink prior to deployment identifies potential support issues before they occur and enhances the resiliency of high-performance fabrics. In particular for all-flash array performance, any impurity in the physical infrastructure can impact performance. |
| Monitoring and Alerting Policy Suite (MAPS) | A policy-based monitoring and alerting tool that proactively monitors the health and performance of the SAN infrastructure based on pre-defined policies that cover over 170 customizable rules, ensuring application uptime and availability. Administrators desiring a pristine network can set an aggressive policy level that has rules and actions with strict thresholds to minimize the possibility of data errors. With the ability to tailor the MAPS policies, you can monitor all-flash ports more closely to faster identify any performance degradation. |
| Flow Vision | A comprehensive tool that allows administrators to identify, monitor, and analyze specific application and data flows in order to maximize performance, avoid congestion, and optimize resources. Flow Vision consists of:<br>• **Flow Monitoring**: Monitors specified traffic flows from source to destination through the SAN.<br>• **Flow Generator**: Generates traffic between any two ports in a Gen 5 fabric.<br>• **Flow Mirroring**: Captures packet data as it flows through the SAN then displays and analyzes the captured packet's data. |
| Fabric Performance Impact Monitoring | Identifies and alerts administrators to device or ISL congestion and high levels of latency in the fabric which can have a severe impact on all flash array performance. FPI Monitoring provides visualization of bottlenecks and identifies slow drain devices and impacted hosts and storage. |
| At-a-glance Dashboard | Includes customizable health and performance dashboard views, providing all critical information in one screen. Viewable dashboard 'widgets' that should be monitored include errors on all flash array facing ports, top 10 flows, memory usage and port health. |
| Forward Error Correction (FEC) | Automatically detects and recovers from bit errors, enhancing transmission reliability and performance. FEC can reduce latency time significantly by preventing the need to retransmit frames with bit errors. |
| Credit Loss Recovery | Automatically detects and recovers buffer credit loss at the Virtual Channel level providing protection against performance degradation and enhancing application availability. |
| Compass | An automated configuration and operational monitoring policy tool that enforces consistency of configuration across the fabric and monitors changes, simplifying SAN configuration and alerting to changes. In medium to large sized environments, this can prevent inadvertent changes to switch configuration that may impact the preferred parameters set across the fabric to optimize performance. |

links, doubling network efficiency and improving resilience. This flat, multipath, deterministic mesh network is ideal for IP storage environments. Storage administrators can efficiently address business-critical SLAs with resilient, high performance fabric network architectures and can manage the network and storage holistically to significantly improve IT agility. Brocade VDX switches powered by Brocade VCS Fabric technology provide the following benefits:

- **Highly automated**: Brocade VCS Fabric technology and Brocade VDX Data Center switches are self-provisioning and self-healing and offer zero-touch scale out, delivering a 50 percent reduction in operational costs.

- **Simple to deploy and manage**: The Brocade VCS Logical Chassis feature enables an entire fabric to be treated as a single logical switch, greatly simplifying management, configuration, maintenance, and troubleshooting. It also provides a single logical interface to orchestration tools.

- **Predictable performance**: Brocade VCS Fabric technology and Brocade VDX switches are optimized for storage performance with the patented Brocade Layer 1 load balancing leveraged from Fibre Channel and Layer 2 multipathing.

- **Deep buffers**: Brocade VDX switches offer the industry's deepest buffers to handle bursty storage traffic and minimize latency and packet drops.

- **Purpose-built solution for next generation data centers**: High Availability, In-Service Software Upgrade (ISSU), and fixed-configuration

redundant power supplies and fans provide a resilient network for business critical applications.

- **Visibility and insight across storage networks**: Brocade Fabric Vision technology, Brocade Network Advisor and support for VMware vRealize deliver visibility, management and analysis across the entire storage network environment.

The portfolio of Brocade VDX switches provides Ethernet storage connectivity for Fibre Channel over Ethernet (FCoE), iSCSI, and NAS storage solutions within a single product family.

## Data Replication for Disaster Recovery

Disaster Recovery is one portion of the overall data protection and business continuity model. At a minimum, organizations must have a plan for getting data operations back up and running in the event of a true disaster where primary company operations are unavoidably interrupted. The layman's understanding of this is that a copy of data should exist "somewhere else" to be restored. In reality, we know that this is not so simple. Datasets can be massive and are always changing. The IT team must capture the constant changes, log them, transfer the data over long distances, and ensure that the data on both ends truly is identical. This entire process requires a mix of synchronous and asynchronous replication workflows as well as a storage extension solution offering latency low enough that the data is not changing faster than the ability to update it at the disaster recovery site.

The Brocade 7840 maximizes replication and backup throughput over distance using data compression, disk and tape protocol acceleration, WAN-optimized TCP, and other extension networking technologies.

### A purpose-built extension platform for disaster recovery

The Brocade 7840 is an ideal platform for building a high-performance data center extension infrastructure for replication and backup solutions. It leverages any type of inter-data center WAN transport to extend open systems and mainframe storage applications over any distance. Without the use of an extension, those distances are often impossible or impractical. In addition, the Brocade 7840 addresses the most demanding disaster recovery requirements. Twenty-four 16 Gbps Fibre Channel/FICON ports, sixteen 1/10 Gigabit Ethernet (GbE) ports, and two 40 GbE ports provide the bandwidth, port density, and throughput required for maximum application performance over WAN connections.

To meet current and future requirements, organizations can quickly and cost effectively scale their WAN rate from 5 Gbps to 40 Gbps per platform using software licenses. With compression enabled, organizations can scale up to 80 Gbps application throughput, depending on the type of data and the characteristics of the WAN connection.

The Brocade 7840 base configuration is a comprehensive bundle that includes a set of advanced services: FCIP, IP Extension, Brocade Fabric Vision technology, Extension Trunking, Adaptive

Rate Limiting, IPsec, Compression, Open Systems Tape Pipelining (OSTP), Fast Write, Adaptive Networking, and Extended Fabrics. Optional value-add licenses for Integrated Routing (FCR), FICON Management Server (CUP), and Advanced FICON Accelerator are available to address challenging extension and storage networking requirements in open system and mainframe environments. The Brocade 7840 is a robust platform for large-scale, multi-site data center environments implementing block, file, and tape data protection solutions. It is ideal for:

• Data protection for open systems and mainframe.

• Multi-site synchronous and asynchronous storage replication.

• Centralized tape backup, recovery and archiving.

• Consolidation of Fibre Channel, FICON, and IP storage data flows from heterogeneous arrays.

• Moving more data through industry leading performance and scalability.

The advanced performance and network optimization features of the Brocade 7840 enable replication and backup applications to send more data over metro and WAN links in less time, and optimize available WAN bandwidth. Supporting up to 250 ms Round-Trip Time (RTT) latency, the Brocade 7840 enables cost-effective extension solutions over distances up to 37,500 kilometers (23,400 miles).

## Final Thoughts

Modern data center operations continue delivering the scale, performance, and control that enterprises know they need, but have evolved to add the automation and consumer-friendly expectations that Line of Business teams now have as a result of their experiences with public clouds. Enterprise Hybrid Cloud is not a product—it is a solution consisting of a range of products and technologies mixed together with the software and automation solutions necessary to make it run as a smooth, integrated infrastructure.

Since it is not a new "replacement" product, organizations will continue building on the investments and technology that they already have,

which was chosen after informed, careful consideration. Growing the existing environment into an Enterprise Hybrid Cloud requires developments in the compute, network and storage environments that add the operational simplicity and ability to automate for flexible workloads without compromising the exacted high performance that Enterprise IT relies on.

Brocade is the leader in critical storage networks and as Enterprise Hybrid Cloud becomes increasingly about making the connection between business systems and the data that is the lifeblood of business, Brocade FC and IP networks are delivering the simple automation and reliability that they always have and that has become core to the operation of an Enterprise Hybrid Cloud. With Brocade continuing its VMware software integration and alignment to further simplify this new IT workflow management model, existing Brocade fabrics will continue to be the centerpiece of this new flexible connectivity model that IT Operations teams are growing into the next wave of new solutions.

**BROCADE**