

Fujitsu and Brocade: Improving Application Performance Starts with Improving the Data Center Backbone

According to July 2013 research by Vanson Bourne, two-thirds of IT decision-makers need a more agile, on-demand data center; they seek infrastructure to provision compute, network, storage and services capacity required to deliver high-value applications faster and easier compared to legacy data centers. Behind greater data center agility needs, lurk real, everyday problems that need real solutions. Every IT department is experiencing rapid data growth, as well as staffing, budget, and skill limitations. At the same time, IT has broad application performance improvement mandates whether its infrastructure is physical, virtual, or cloud. Proven blade server systems from Fujitsu, partnered with data center network leader Brocade, can help IT teams solve today's application performance and management problems while building a solid data center technology foundation for the future.

Challenge to Strike the Cost-Performance Balance in the Data Center

Considering wider data center requirements, IT teams must balance many priorities. Along with uncontrolled data growth, comes data center space and power constraints. Network congestion quickly can occur, along with systems performance and scalability issues. Backup and replication, disaster recovery, and compliance also are constant stresses. Instead of easing problems, virtualization has only increased network demand, which can impair network and application performance, and create new management challenges.

Against this backdrop, changes in the business constantly increase demands. Thus every data center decision, from architectural planning and scaling, to network and compute infrastructure purchasing, and to daily operations, must deliver a balance of flexibility, high performance, and high value. Achieving it is difficult for even the best data center IT professionals.



A New, Scalable Data Center Approach is Key to Finding the Balance

To become more agile, reliable, and scalable, a fundamentally new approach is needed. Data centers need to be energy and space efficient, intelligent, and ultra-reliable. Specifically, networks must support:

- True converged networking that runs IP and storage traffic using Fibre Channel over Ethernet (FCoE) and native Fibre Channel on the same network,
- Extremely high input/output (I/O) requirements of highly virtualized multicore processor servers, and
- Shifting network traffic patterns resulting from distributed and tiered application architectures.

To move network traffic between these servers and support Virtual Machines (VMs) more efficiently with high bandwidth at low latency, a flatter Ethernet-fabric-based data center network is required. So to improve application throughput and manageability, IT must start replacing server systems using the traditional three-tier, hierarchical data center network with flatter data center networking with truly converged storage and Ethernet networks.

Managing the next-generation data center has many of the same requirements as traditional data centers. Enterprises must be mindful of space, power, and manageability. They also need intelligent and easy-to-use systems management to productively view and control infrastructure in physical and virtual environments. Since virtualized and cloud environments are so dynamic, IT must also seek highly automated solutions to efficiently deploy, change, and manage workloads and infrastructure.

Data center IT needs servers with low power and space needs, easy and standardized administration, and high availability suitable for highly virtualized environments. To best meet these needs, blade server systems are preferred over sprawling standalone physical servers.

What is an Ethernet Fabric?

Characteristics:

- Ensures any node can reach any other node with minimal switch hops
- Is self-aggregating to enable a flatter network
- Has all links actively able to carry traffic
- Automatically chooses the shortest path without manual configuration where multiple links know about each other and all connected devices.

The benefits are a faster and highly available network with high bandwidth utilization over equal cost paths; it also allows non-disruptive network changes, and IP and storage traffic on the same wire.

Blade servers with their energy-efficient, high density form factors offer both superior manageability and use of precious data center space and energy. However, it's equally critical that enterprises deploy blade server systems that can help transition to a flatter data center network. Not all applications will immediately transition, so blade server systems need to be built for flexibility and networking must work with existing hierarchical networks, preserve existing network designs and cabling, and gain active-active server connections without using Spanning Tree Protocol (STP).

Diagram 1:
Legacy, Three-Tier Hierarchical
Data Center

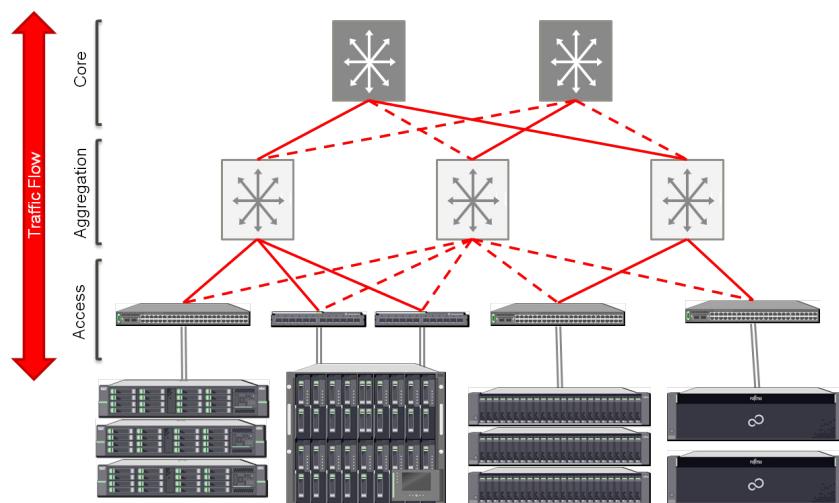
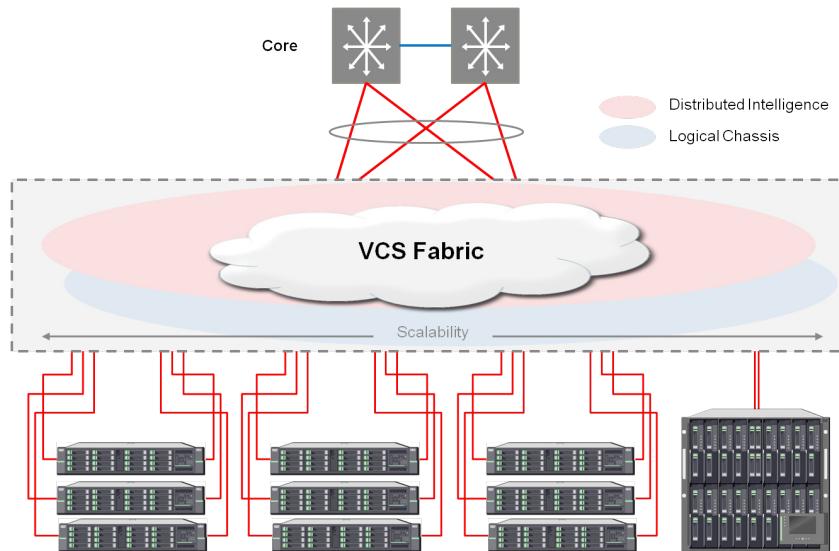


Diagram 2:
The Modern, Flat Data Center



The Best Performing Blade Server Systems Begin with the Best Performing Data Center Backbone: Fujitsu's DynamicFabric with PRIMERGY BX900 S2 and Embedded Brocade VDX 2730 Connection Blades

For the high performance enterprise data center, Fujitsu blade server systems with Brocade VDX switching stand apart from the competition. Built for single apps requiring the highest performance levels, mixed workloads, and cloud, Fujitsu and Brocade offer the only blade server system with three key features. Explicitly, this joint solution offers best-in-class energy efficiency in all components, true converged networking with both FCoE and native Fibre Channel support to eliminate need for Ethernet to network users to apps and FC between servers and storage as separate networks, and embedded two-layer networking. Furthermore, this solution improves data center performance and operations by offering:

- **High performance and high availability networking** with all links active with elimination of STP, a flatter network, support of multiple or mixed protocols with Quality of Service (QoS), and seamless VM mobility,
- **Flexibility and scalability** to grow and change as needs change
- **Ease of an appliance** with automation for simple deployment, reduced complexity, and ability to manage up to 24 switches as a single switch

Because the best performing blade server system begins with the best data center backbone, let's take a closer look at the Brocade VDX 2730 connection blade. The connection blade embedded in the 10U PRIMERGY BX900 S2 features 18 x 10 Gbit/s downlink ports to the server blades as well as 6 x 10 Gbit/s native Ethernet and 6 x 8 Gbit/s native Fibre Channel available for uplinks.

VCS Fabric Technology: Three Core Design Principles

VCS was designed as a cost-effective entry point allowing the enterprise to transition gracefully from traditional network architectures to elastic, highly automated, mission-critical networks in virtualized data centers. To that end, VCS must support:

Non-stop networking in a modern, highly virtualized environment

Current and future applications that run on the network through **simplified, automated networks** that just work with zero-touch automation support

Evolutionary approach that allows interoperation with existing Ethernet networks and designed to support future network environments to deliver **investment protection**

The technical centerpiece of the VDX is known as Virtual Cluster Switching (VCS), a revolutionary Layer 2 Ethernet technology that dramatically improves performance and application availability, and simplifies the network architecture in next-generation virtualized data center. Introduced in 2010, the well-proven VCS is designed to resolve many of the traditional Ethernet-imposed challenges of server virtualization, while providing dynamic, virtualization-optimized automation and services that go beyond the capabilities provided by basic Ethernet Fabrics. As the following table shows, VCS is composed of three key innovative components, Ethernet Fabric, Distributed intelligence, and Logical Chassis. The VCS architecture is designed to incorporate a set of Dynamic Services for the highest level of functionality and investment protection.

Table 1: Brocade VCS Components and Features

VCS Ethernet Fabric (in the data plane)	VCS Distributed Intelligence (in the control plane)	VCS Logical Chassis (in the management plane)
No STP instead using Transparent Interconnect of Lots of Links (TRILL) for active-active links originating from server	Virtual Access Layer (VAL) interaction to optimize app service levels and scalability and to enable seamless app mobility	Logically flattens and collapses network layers to facilitate East-West data center traffic flows and improve performance
Multi-path, deterministic	Self-forming and self-aggregating for elastic scaling	Scale edge & manage as if single switch to ease management
Auto-healing, non-disruptive	Arbitrary topology to meet various architectural needs	Auto-configuration for rapid deployment
Lossless, low latency to improve performance	Masterless control, reconfiguration without disruption	Centralized or distributed management, end-to-end
Convergence ready	Network aware of all members, devices, VMs	
Connectivity Dynamics	Connectivity over distance, Native Fibre Channel, Security Services, Layer 4 - 7, etc.	

Each component comes with its own set of benefits. Key among them is that Brocade VCS Fabric technology is TRILL-based and does not use STP while still completely interoperable with existing Ethernet networks. Therefore, VCS fabrics allow for active-active connections from servers, enabling much more rapid failover and convergence in the fabric. VCS fabrics are self-monitoring and should an outage occur, links can be added or modified quickly and non-disruptively. This self-healing fabric approach doubles the utilization of the entire network while improving resilience. It also allows IT architects to confidently grow the Ethernet network, which improves VM mobility and network performance.

Brocade VCS Distributed intelligence means VCS fabrics are self-forming and self-aggregating, making them very elastic for real-time scaling. The fabric is automatically aware of all devices and VMs within its domain and provides automatic assignment of RBridge IDs, automatic resolution of duplicate IDs, and automatic ISL formation and topology discovery. This allows the addition and removal of switches without any manual configuration. In addition, Brocade VCS fabrics are masterless and used in various topologies. It allows creation or fine-tuning of different end-to-end subscription ratios as application demands change, and the network can be quickly and easily reconfigured with minimal disruption.

A Brocade VCS fabric is designed to be managed as a single “logical chassis,” so each new switch inherits the configuration of the fabric, and the new ports become available immediately. The fabric then appears as a single switch, which significantly reduces complexity and in turn, improves reliability.

Finally, all VCS components work together to provide superior performance and manageability. Further, as the data center infrastructure scales, the ability to easily integrate new capacity into the fabric is maintained. Simply start building an Ethernet fabric with two Brocade VDX switches, which can be either multiple PRIMERGY blade chassis or external switches, and scale to add additional switches with demand increases to a maximum of 8000 server ports per fabric.

Move to Virtualization and Cloud with the Best Performing Blade Server System with the Best Backbone

Fujitsu’s DynamicFabric with the PRIMERGY BX900 S2 chassis and the Brocade VDX 2730 is a powerful combination for applications requiring the highest performance, even for those in, or transitioning to, highly virtualized or cloud environments. With its wide selection of server blades, no matter where an enterprise starts or the eventual size of its environment, Fujitsu DynamicFabric with Brocade VDX is flexible and easy to grow with changes, including chassis changes. Finally, it is non-proprietary and open; this means that the enterprise chooses its technology partners, instead of other IT equipment vendors

making those critical choices. Finally, DynamicFabric with Brocade VDX boasts a smooth migration to new technology without sacrificing the enterprise's existing infrastructure investment. In sum, DynamicFabric with the PRIMERGY BX900 S2 and Brocade VDX is the ideal data center technology foundation to meet both today's demanding needs and the growing, but unknown needs of tomorrow.

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