

**DATA CENTER**

Brocade VCS Fabric Technology Provides Simplicity, Agility, and Ease of Management Through Automated Deployment Features

Brocade VCS Fabric technology can help government agencies update their networking infrastructure and implement cloud computing by radically simplifying network deployment, configuration, and management. Network administrators can deploy and expand highly automated, reliable, efficient Brocade VCS fabrics *at least five times faster* than other vendors' fabric offerings.

As many government agencies seek to update their network technology, they are discovering the benefits of virtualization and cloud-based service models. Although some of their interest is driven by government's mandate to increase transparency, the tradeoff between increasing innovation and reducing costs makes many agencies unsure of how to upgrade their technology in a cost-effective manner.

One of the initiatives driving the need to upgrade government networks is the Cloud First policy. It directs agencies to take full advantage of cloud computing benefits to maximize capacity utilization, improve IT flexibility and responsiveness, and minimize cost. However, cloud computing imposes new requirements on the data center network infrastructure, and conventional hierarchical data center network topologies, originally designed to support client-server traffic, are unable to meet the automation, efficiency, and scalability requirements necessary. To realize the full benefits of a cloud environment, government data centers must be upgraded and redesigned using the latest technology.

INTRODUCTION

In order to make cloud deployments an integral part of a government organization's data center plan, network service delivery—from initial setup to managing elastic demand—must be simplified and automated as much as possible, while keeping spending under control. To address these critical requirements, Brocade pioneered the Ethernet fabric category with the delivery of Brocade® VCS® Fabric technology on Brocade VDX® switches in 2010 — enabling networks that are simple to architect, easy to manage, and more efficient, with lower Total Cost of Ownership (TCO).

Brocade VCS Fabric technology¹ is designed specifically to address the needs of a highly virtualized, dynamic data center environment. Inheriting many of its key features and advantages from the industry-leading Brocade Fibre Channel fabric technology, Brocade VCS Fabric technology addresses three key challenges common to the traditional hierarchical networks in place in most government agencies:

1. Server-to-server traffic must traverse multiple tiers of switches. This introduces undue latency, which ultimately hampers application performance.
2. Active-passive links and gateways due to Spanning Tree and inactive Layer 3 gateways constrain traffic and create inefficiency.²
3. Traditional networks are operationally complex and lack the automation needed to support today's rapid growth in network demand, including the ability to deploy network services in minutes instead of days.

This paper focuses on the third challenge, in particular the ease of deploying and expanding Brocade VCS fabrics at least five times faster than other fabrics in the market.

SELF-FORMING FABRIC

Brocade VCS Fabric technology was designed to make things easier for government network administrators, not harder. The simplest, more scalable way to manage data center components is to not have to manage them at all. VCS Fabric technology radically simplifies the configuration, management, and ongoing operation of network infrastructures by automating most of the configuration tasks. Creating a VCS fabric of the maximum number of members requires just three basic steps:

Brocade VCS Fabric Creation

Step 1: Power up each switch.

Step 2: Configure a unique identifier (RBridge ID) for each switch.

Step 3: Connect the cables between the switches.

Average setup time: 2 minutes or less

¹ For more information, see [What is an Ethernet Fabric?](#) and [Introducing Brocade VCS Fabric Technology](#).

² For more information, see [Setting a New Standard for Network Efficiency with VCS Fabric Multilayer, Multipathing Capabilities](#).

Once the cables are connected, the fabric members automatically detect each other, discover the fabric topology, and populate their routing tables to start forwarding traffic immediately. Ports do not need to be micromanaged or manually configured to form Inter-Switch Links (ISLs) or to connect to end devices or legacy Ethernet switches; their profile is auto-discovered at link initialization time. Adding new fabric members requires minimal configuration: just power up the new switch, assign a unique identifier, and connect it to the fabric. The fabric automatically welcomes the new member and starts routing traffic accordingly to devices attached to it.

By contrast, both traditional Ethernet switches, as well as other vendors' fabrics, require laborious and error-prone configuration tasks. As an example, configuring a 10-node LAN or fabric from the nearest competitor in the industry can take well over 100 commands.

Creation of Traditional Switch Pair—or Competitor's Fabric

Step 1: Create (2) port channels between a switch pair.

Step 2: Activate vPC between them.

Step 3: Activate fabric technology on the vPC pair.

Step 4: Activate vPC+ in the pair (~7 commands per switch).

[...]

Step 19: Configure MAC learning mode for fabric VLANs.

Step 20: Activate fabric technology in the defined port channel.

Step 21: Repeat previous 20 steps for the four other vPC+ pairs.

[...]

Step 101: Configure (2) port channels between each edge vPC pair and the core vPC pair.

[...]

Step 106: Activate fabric technology on the (8) defined port channels.

[...]

Step 114: On each switch in the core vPC, define (8) port channels.

Average setup time: over 10 minutes

Adding Bandwidth at Need

Adding additional bandwidth between switches in a Brocade VCS fabric requires no configuration at all. You simply connect new cables, frame-based ISL trunks form and traffic is automatically redistributed among the trunk members at the frame level, with no impact to the applications. By comparison, creating a single two-link Link Aggregation Group (LAG) between two switches in a traditional Ethernet network or fabric from another well-known vendor can take up to 30 commands:

Configuring LAG (for 2 members)	Configuring Brocade ISL Trunking (for up to 8 members)
<p>Execute the following commands on one switch:</p> <ul style="list-style-type: none"> • configure terminal • interface port-channel 1 • switchport • switchport mode trunk • switchport trunk allowed vlan all • qos flowcontrol tx on rx on • mtu 9208 • no shutdown • interface tengigabitethernet 1/0/5 • channel-group 1 mode active type standard • no shutdown • interface tengigabitethernet 1/0/6 • channel-group 1 mode active type standard • no shutdown • exit <p>Repeat same commands on other end switch.</p> <p>Total commands: 30</p>	<p>Absolutely no configuration required.</p> <p>Total commands: 0</p>

Figure 1.
Comparing traditional LAG and Brocade ISL Trunking configuration

Finally, if any fabric member or link fails, the VCS fabric automatically finds an alternative route and re-routes all user traffic around the failed component, with no user intervention.

The leading cause of network downtime is human error. Overly complex network configurations greatly increase the chances of making a mistake. Brocade VCS Fabric technology virtually eliminates human error from the equation and greatly increases the reliability and uptime of mission-critical network infrastructures within the data center.

EASY INTERCONNECTION WITH THE BROADER DATA CENTER NETWORK

All the switches in a VCS fabric appear as a single logical switch when interfacing with external switches and end devices, including servers. Internally, Brocade VDX switches run all the fabric protocols to provide all the features mentioned above, but externally Brocade VCS Fabric technology supports protocols like IEEE 802.3ad (LAGs) to interoperate with traditional Ethernet switches at L2. At L3, Brocade VCS Fabric technology supports Open Shortest Path First (OSPF) and is fully interoperable with any classic IP router that also supports OSPF.

Since all the switches inside a Brocade VCS fabric behave as a single logical switch, external switches can terminate a single LAG into as many as four (4) different nodes within the VCS fabric. Each external switch or end device that supports 802.3ad-compliant LAGs can establish a virtual LAG group (vLAG) with a different set of (up to 4) fabric members, providing unprecedented levels of flexibility.

In alternative fabric solutions as well as traditional networks, switches have to be manually and statically bound in pairs, and external LAGs can only be terminated into those rigid associations, limiting the maximum number of nodes that can create a LAG to two.

Brocade VCS Fabric technology uses Transparent Interconnection of Lots of Links (TRILL) in the data plane. As such, it implements the standard TRILL frame format within the fabric, which simplifies troubleshooting with standards-compliant tools. The control plane runs Fabric Shortest Path First (FSPF), a well-known and widely deployed fabric protocol. Additionally, VCS Fabric technology implements IEEE Data Center Bridging (DCB), another set of industry-standard protocols designed to provide lossless connectivity for loss-sensitive traffic classes like storage (Fibre Channel over Ethernet, or FCoE).

SUMMARY

Brocade is leading the industry in the transformation of the data center for next-generation cloud-enabled IT services, helping government organizations transition from the rigid, multi-tier, hierarchical networks of the past to new fabric-based infrastructures. Fabric-based networks make it simpler and easier to add new IT services and take full advantage of virtualization and cloud computing, preparing them for the ever-growing and dynamic demands of government and the people it serves. In the era of the cloud, making the most efficient use of an IT organization's network infrastructure and optimizing network operations for virtualized environments becomes an advantage that government organizations cannot just forgo.

Delivered on Brocade VDX switches, Brocade VCS Fabric technology radically changes the way networks have been managed and operated over the past few decades. Instead of spending hours typing hundreds of commands or creating complex scripts to build a fabric with optimal performance characteristics at every layer, government network administrators can focus their time on creating and deploying value-added services that leverage this highly reliable, efficient fabric.

ABOUT BROCADE

Brocade networking solutions help the world's leading organizations transition smoothly to a world where applications and information reside anywhere. Innovative networking solutions for data center and campus environments help reduce complexity and cost while enabling virtualization and cloud computing to increase business agility. To help ensure a complete solution, Brocade partners with world-class IT companies and provides comprehensive education, support, and professional services offerings.

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