

An Overview of Brocade VCS Logical Chassis

Brocade VCS Fabric technology helps organizations deliver efficient, highly automated networks for modern data centers. Ethernet fabrics built on Brocade VCS Fabric technology provide unmatched simplicity and manageability compared to traditional network architectures and competitive fabric offerings. In addition, they increase flexibility and IT agility, enabling organizations to transition smoothly to offering elastic, mission-critical services within cloud data centers.

Brocade VCS Logical Chassis functionality allows organizations to manage an entire VCS fabric as a single switch. This eliminates the need to manually configure and manage each switch, simplifying management and reducing operational costs.

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Introduction

In Transparent Interconnection of Lots of Links (TRILL)-based fabrics such as Brocade® VCS® Fabric technology, the control plane is distributed such that all nodes are aware of each other and share information about their health and that of the physical and virtual devices attached to them. This intelligence allows the fabric to function with minimal administrator intervention, because changes and failures are automatically detected, and traffic is rerouted without interruption while the fabric adjusts itself to address the changes. Current users of Brocade VCS fabrics consistently report an annual reduction in administrator work hours of 20 percent or more, due to the fact that VCS fabrics are automated and self-healing.

Brocade VCS Logical Chassis further reduces the administrative overhead of standard network operations by aggregating the operations on individual fabric nodes within a common fabric management plane. Logical Chassis provides a single point of management for fabric-wide configuration, software maintenance, and troubleshooting, as well as a simplified interface with a fabric-level Application Programming Interface (API) for integration with higher-level orchestration tools. Network services become even faster to deploy and simpler to manage, even as the network is scaled out.

Management Options for Brocade VCS Fabrics

To understand how Logical Chassis operates in a fabric environment, it is helpful to understand two terms:

- **Fabric mode:** In fabric mode, individual nodes share health and state information, yet they possess sufficient local intelligence to function semi-autonomously within the fabric cluster. Each node has its own management IP addresses and RBridge IDs and are configured on an individual basis, either through the Brocade Network OS CLI or the Representational State Transfer (REST) API. To learn more about how RBridge IDs are configured and managed in fabric mode, see the [Brocade VCS Fabric Configuration Management section](#) of the Brocade Network OS Administration Guide.
- **Logical Chassis mode:** In this mode, the entire fabric is treated as a single logical switch for management purposes. It uses a single IP address, which is referred to as the Virtual IP (VIP). The VIP is leveraged by the Brocade Network OS REST API, which operates at a fabric level, as well as a node level, to provide integration with network automation and cloud management tools from third parties or in-house sources. Within the fabric, a principal switch and backup principal switch are designated by the operator as the point of interaction with the fabric, but the administrator can reassign this role to another node at any time. Member switches retain unique RBridge IDs.

Current users of Brocade VCS fabrics will be familiar with fabric mode. To enable Logical Chassis mode, simply use the **vcs logical-chassis enable** command in Brocade Network OS release 4.0 and later.

When implementing Logical Chassis mode, you must specify whether you want to convert all nodes in the fabric from fabric mode to Logical Chassis mode, or that you want to convert only a range of nodes. **Note that nodes that do not participate in the Logical Chassis domain are no longer part of that fabric.**

Logically Centralized Configuration Management

At the simplest level, Logical Chassis provides a means of automatically ensuring consistency of the existing fabric configurations across all the nodes of the cluster, streamlining deployment and reducing configuration conflicts and downtime due to manual errors. These configurations are stored in a database that is replicated across the fabric cluster and automatically applied to all nodes by the principal switch. For example, if AutoQoS needs to be configured for the network, because of Logical Chassis AutoQoS can be configured just once for the entire fabric instead of configuring AutoQoS on a switch by switch basis.

Architecturally, Brocade VCS fabrics are masterless; all nodes operate as peers with the fabric. The principal switch is a temporary designation for the switch that serves as the fabric management interface via a VIP. The principal switch can be either manually selected by the administrator or inherited based on preassigned priority, and the administrator can change the priority of the switch at any time. If the principal switch fails or is removed, a new principal switch is automatically elected, and the VIP is moved to the new principal switch. In heterogeneous VCS fabrics with both fixed and modular Brocade VDX® switches, the Brocade VDX 8770 Switch is the preferred principal switch, due to its more extensive high-availability features.

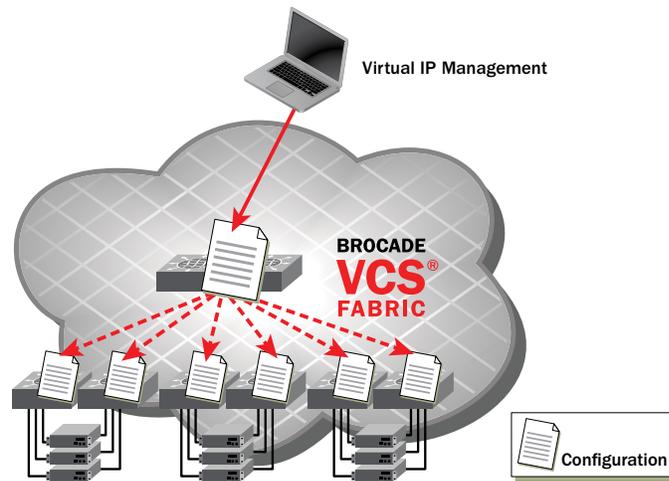


Figure 1: The Logical Chassis principal switch applies configuration settings to all nodes in a Brocade VCS fabric.

The Brocade VCS Logical Chassis manages two types of configuration objects: global configurations and local configurations.

Global configuration objects span across multiple physical nodes. Examples include Virtual Local Area Networks (VLANs), port profile policies, Role-Based Access Control (RBAC) parameters and Access Control Lists (ACLs), Authentication, Authorization, and Accounting (AAA) logins, Media Access Control (MAC) address lists, and so forth.

Local configurations address only individual nodes or specific physical ports or interfaces. Port profiles are applied to specific ports via local configuration, as are Layer 3 protocols (such as Open Shortest Path First [OSPF], Border Gateway Protocol [BGP], and Virtual Router Redundancy Protocol-Extended [VRRP-E]).

The database instance on the principal switch owns the configuration for the fabric. The VIP facilitates centralized AAA interactions and provides unified discovery, configuration, and operational data across the VCS fabric.

Usually a default configuration is applied when the nodes are converted from standard fabric mode to Logical Chassis mode. To implement Logical Chassis mode with existing configurations that were defined in fabric mode, save the configurations of each node and then restore from the principal switch upon bringing up the fabric in Logical Chassis mode.

When a new node is added, the configuration of the new node is done through the principal switch, if any changes are needed to the default configuration. Both the config and the appropriate firmware are automatically downloaded on the new node. If a previously in-service node leaves and rejoins the fabric, the principal switch performs a check to ensure that the configuration is in synch before including the node back into the fabric.

The administrator can take snapshots of specific configurations on a per-RBridge basis and store them in the configuration database for future use on the same node. This allows administrators to experiment fearlessly with new configuration parameters, then readily restore proven configuration files as needed.

By further consolidating the number of steps required to deploy a fabric or add new nodes, Logical Chassis management allows operators to improve their response time to new capacity requests. This is valuable in all types of data center environments, but especially for public and private cloud providers with aggressive service-level requirements. Routine network administration tasks are also reduced and streamlined for overall Total Cost of Ownership [TCO] improvement.

Simplified Maintenance and Upgrades

Firmware management is a classic pain point for many network administrators. With Logical Chassis, firmware upgrades are greatly simplified. A single command downloads a new firmware version to all nodes in a fabric, although by default the new version is not activated on any node until a time designated by the administrator. If desired, the user can also specify automatic activation of new firmware versions upon download completion.

In the event of a switch failure or hardware upgrade, the new node is easy to replace. A single command (`vcs config snapshot copy | restore`) allows the administrator to apply the previous settings to the new node and place it in operation within less than five minutes.

Brocade Network OS 5.0 will support zero-touch provisioning for a new fabric and any incoming nodes, making it possible to provision an entire pod from bare metal without any CLI commands.

Granular Monitoring and Troubleshooting

The Brocade VCS Logical Chassis interfaces—both CLI and REST API—provide a comprehensive view for the entire fabric, in addition to highly granular visibility at the node, switch, and port level. Using Logical Chassis, monitoring remains discrete, distributed, and atomic even while configuration is centralized, providing the necessary balance of global and granular views.

Logical Chassis monitoring features provide elaborate error reporting, with messages explicitly identifying the nodes that failed to activate the default configuration. The administrator can set threshold and performance monitoring parameters to ensure that the fabric meets all requirements. Audit logs record timestamped actions by user for each physical node, and logs are distributed across the fabric for easy traceability of issues.

When used in conjunction with Brocade Network Advisor, traffic between fabrics can easily be monitored and maintained in the event of a configuration error or node failure.

Extensible Via Northbound APIS for Easier Orchestration

Brocade VCS fabrics are optimized for the demands of heavily virtualized and highly automated data centers. Brocade understands the need for fabrics to participate seamlessly within a variety of management schemes, from virtual machine management tools to broader orchestration frameworks.

Brocade Network OS 5.0 provides a robust REST API and a fully documented YANG model to the Logical Chassis to simplify integration with in-house and third-party management and orchestration tools. A Brocade Network OS plugin supports OpenStack Neutron ML2 today. The APIs are also integrated with additional infrastructure automation and cloud management frameworks—whether commercial or in-house.

The Brocade VCS API presents to the higher-level management system a single logical IP address in place of 48 individual nodes, to significantly simplify cloud orchestration integration and reduce configuration and troubleshooting complexity by reducing the number of ongoing orchestration tool calls to the fabric. At the same time, the underlying fabric automatically tunes itself in response to management-level changes. In addition, leveraging the Brocade Network OS YANG model in development toolsets is fast and more robust across releases than hard coding CLI dependencies into orchestration code.

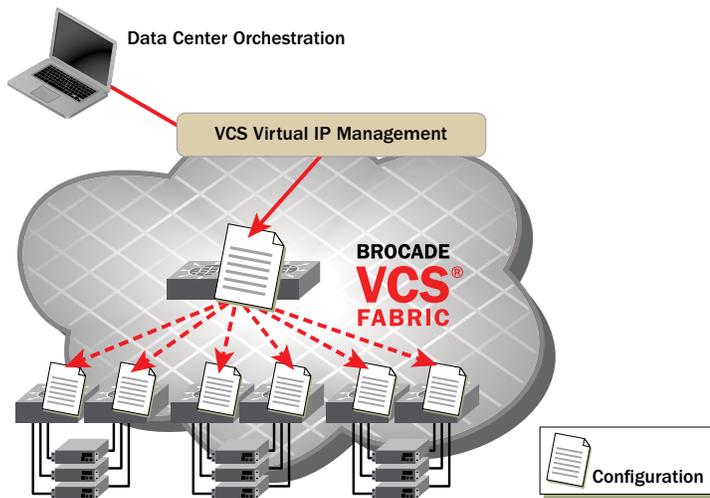


Figure 2: Data center orchestration tools and frameworks can take advantage of the Brocade VCS VIP to simplify integration and deployment.

VCS Logical Chassis is therefore an extremely important tool in implementing SDNs with relatively little development work. Externally-defined network policies and applications can be pushed once to the principal switch and immediately are propagated to all relevant nodes without multiple exchanges with the controller cluster or management system. Similarly, health alerts that might affect the function of the fabric or traffic running across it are aggregated and seamlessly fed to the external orchestration tools, so that the operator can take action if needed.

Summary

The Logical Chassis functionality in Brocade VCS fabrics extends the simplicity of VCS fabric operations by streamlining fabric management and maintenance. In a standard network, you must configure each switch individually with a lengthy series of commands, and then the sequence must be repeated again, exactly, for the next device, and then for the next. In a Brocade VCS fabric operating in Logical Chassis mode, the fabric is centrally managed from a switch of your choice, while allowing for granular visibility and control. Eliminating repetitive, manual commands reduces opportunities for error and downtime, and the system-wide view facilitates fast, easy troubleshooting. Brocade VCS Logical Chassis provides a degree of management abstraction that simultaneously simplifies engagement with higher-level orchestration tools while remaining intimately aware of every aspect of the fabric.

Corporate Headquarters

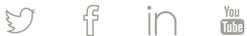
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