

# IP Storage Networks for VM Farms

## HIGHLIGHTS

Application Service-Level Agreements (SLAs) rely on resilient and high-performing data environments. Moving storage traffic to a dedicated IP storage network based on Brocade VCS Fabric technology and optimized for storage simplifies performance scaling to meet current and future line-of-business SLAs.

### Dedicated IP Storage Network Advantages

VM farms see immediate advantages by moving business-critical applications to the dedicated Brocade IP storage network:

- **Assured packet delivery:** A dedicated IP storage network can be optimized specifically to meet storage best practices.
- **Manageable latency:** Latency is reduced in a network optimized for and limited to storage traffic.
- **Simplified storage management:** vRealize integration sees and manages virtual and physical networks together in one tool.
- **Simplified scaling:** Self-forming multipath links mean that you just add ports, and growth is automatic.

## Dedicated IP Storage Networks for Business-Critical Applications

Storage and network administrators everywhere are realizing that the traditional approach to IP storage networking can create a bottleneck to both the high-performance storage that sits on the network, as well as to the application SLAs that must be maintained. To support the needs of Virtual Machine (VM) farms and take network performance and ease of use to the next level, Brocade recommends a move to a storage-optimized, dedicated IP storage network based on the more robust and manageable Brocade® VCS® Fabric technology.

### Fast Track to the Virtualized Data Center

Moving from the traditional data center—with islands of technologies and dedicated personnel supporting individual applications—to a virtualized data center with efficient resource pools supporting VM farms made business sense to anyone who did the math. It was so obvious, the transition happened rapidly, relative to standard IT evolution. However, a learning curve occurred along the way. An increase in infrastructure utilization led to various performance bottlenecks that required new IT business practices—as well as purpose-built, next-generation datacenter tools, technologies, and equipment. With the new generation

of high-performance, massively scalable IP storage arrays becoming common, along with continuing growth in client-server applications sharing common data, the industry is seeing limitations in the ability of the general-use data center LAN to keep up. This is causing application errors, missed SLAs, and complex troubleshooting scenarios. As network performance requirements continue to climb, the problem will get worse.

### Unintended Consequences

Given the move to virtualized data centers and the need to support large VM farms, IP storage has quickly become a common deployment with a relatively low cost to scale, and with the performance gains of storage arrays covering for inefficiencies

## LAB RESULTS: IMPACT OF MOMENTARY CONGESTION ON IP STORAGE NETWORK LATENCY

To see what would happen in a data center with multiple applications and Network-Attached Storage (NAS) storage traffic sharing the same Inter-Switch Links (ISLs), Brocade conducted baseline tests using the VMware VMmark test suite. Also, the Spirent test tool was used to inject traffic into Brocade VDX® switches. This was done to simulate momentary congestion caused by additional traffic on the same network from desktop backups, YouTube, large file attachments, uploads of large documents to cloud storage, and so on. When averaged over time, the ISL links did not look congested, but during the short duration of the Spirent traffic injection, they were congested. This simulated the effect of spikes in traffic from other applications that shared the network with the NAS traffic and degraded performance for workflows that matter.

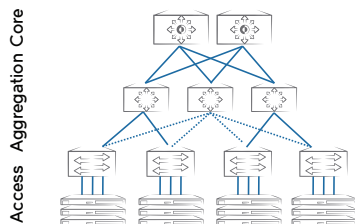
### Results

- **Misleading network health measurement:** Bandwidth and link capacity never exceeded 60 percent of total capacity.
- **Application issues:** Transaction response was slowed down by factors of between 10 and almost 100 during the traffic spikes.

To read this lab test case in its entirety, please go to:

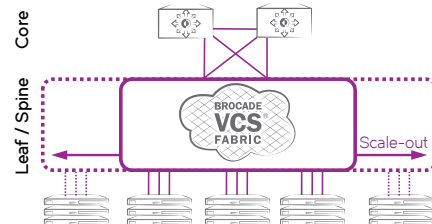
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## Classic Hierarchical Architecture



- Rigid architecture, north-south optimized
- Inefficient link utilization
- Individually managed switches
- VM-ignorant
- No network virtualization

## VCS Fabric Architecture



- Topology freedom, east-west optimized
- All links active, Layer 1/2/3 multipathing
- Fabric managed as one logical switch
- VM-aware
- Native network virtualization

Figure 1. Traditional STP vs. VCS Fabric Network Architecture.

in the network. However, sizing the data center network for average bandwidth utilization, and attaching all of these applications and storage, has resulted in high-value business-critical storage traffic competing with high-volume, low-priority network traffic. This is generating a performance problem condition that is responsible for slower response times and cascading application service issues.

What is not commonly known is that this set of conditions is not only a bandwidth issue, but also a latency issue caused by intermittent traffic spikes from any of the applications or users on the mixed traffic environment. These spikes can lead to dropped storage packets and, ultimately, to application issues.

Traditionally, IP network health is measured by constant average bandwidth utilization over time and planned overhead capacity for short spurts. However, through lab testing, Brocade has found that even small, momentary congestion events can result in large, detrimental

reductions in application transaction performance. This is true even when the average bandwidth utilization remains at only 50 to 60 percent of available link bandwidth. Although the average bandwidth utilization does not exceed the average planned capacity, the short duration traffic spikes result in support calls and complaints about the slow response of business applications. This is because traffic spikes of milliseconds can cause minutes of decreased application response time.

### Cascading Application Failure

Due to the shared nature of storage that is available to a VM farm, latency spikes on one or more storage volumes that are caused by a single application's traffic spike can affect the performance of every application running within the VMs on the provisioned storage volumes.

For example, a typical VM farm with a vCenter cluster running several hundred VMs, may share a single storage array with 10 provisioned LUNs supporting

40 VMs each. Applications within this environment can also utilize multiple VMs. If a traffic spike is large enough and long enough, switches can have contention issues trying to service the load leading to queuing and then latency spikes. Within this shared network infrastructure, a single application's network traffic can affect the storage connectivity to all 40 supported VMs within the infrastructure due to latency caused by congestion. This can lead to application degradation for all VMs accessing storage through the general use IP network.

### Real Costs

While it is easy to think that a delay of a few seconds, at best, causes minimal impact, this is not always true. The dropped storage packets may lead to real costs, including these:

- **Downtime:** Host failures are sometimes caused by storage timeouts requiring hands-on administrative support for complex troubleshooting and manual reboots.
- **Productivity loss:** Whether e-mail, Unified Communications (UC), or an inventory application, widespread interruptions can kill employee productivity.
- **Lost business:** Business-critical applications, such as a shopping cart, can fail during customer order entry. This can result in a lost sale or an incomplete or uncertain transition—and a very negative experience for the customer.

### Spanning Tree

Classical network designs with rigid, north-south optimized architectures are not well-suited for today's data center applications, which perform better with east-west optimization. Therefore, designing IP storage networks using classic Spanning Tree Protocol (STP) is not ideal. Even classic Multi-Chassis Link Aggregation (MLAG) designs do not scale easily for storage networks. As shown in Figure 1, the classic network architecture creates inherent deficiencies in the modern virtualized data center—especially in VM farms notably, that they are non-VM-aware. As a single point of cascading network failure, and with its unwieldy management, these traditional designs have been replaced by the much more robust and scalable Ethernet fabric. Brocade VCS Fabric technology provides today's data centers with unmatched automation, efficiency, and agility and it is VM-aware. Simple, centralized management with zero-touch provisioning helps create highly scalable, flexible, and resilient environments.

### Data Center Advances that Add Stress

VM farms are expected only to grow larger and require greater network performance. With this further stress added to the network, your business-critical application SLAs are harder to achieve. Even if the amount of application failure due to mixed traffic latency issues is acceptable today, how much more can you stress your system before the situation becomes critical?

## VCS FABRIC IS THE BEST NETWORK TOPOLOGY FOR VM FARMS AND IP STORAGE NETWORKS

Here are top 5 reasons for VM farms to move to Brocade's VCS Fabric:

1. **VM Aware:** Brocade VM-aware network automation provides full visibility to virtualized resources with dynamic learning and activation of port profiles. This enables seamless VM migration, since the VCS Fabric is aware of port profiles and automatically tracks them as they move.
2. **Increased Link Density:** Increasing VM density means increasing I/O at the access point. By eliminating STP within the access layer, Brocade VCS Fabric technology immediately doubles the available links and bandwidth to the servers, with the same number of switches.
3. **Simplified Management:** The VCS Fabric is centrally managed as one logical switch.
4. **Automated Scaling:** Automated provisioning for simplified scaling in high growth environments – self-forming multi-path links mean just add ports and growth is automatic.
5. **vRealize Integration:** See and manage the virtual and physical networks together with vRealize integration.

For more information, please see:

[www.brocade.com/downloads/documents/white\\_papers/intro-vcs-fabric-technology-wp.pdf](http://www.brocade.com/downloads/documents/white_papers/intro-vcs-fabric-technology-wp.pdf)

## BUSINESS CRITICAL APPLICATIONS DO NOT BELONG IN A MIXED TRAFFIC NETWORK

In mission critical systems, outages cause business to fail. Business critical refers to the next tier of applications that can cost the business time, money, or opportunity when their performance degrades. The business will not stop if SLAs are missed, but latency and performance issues disrupt productivity.

Examples of typical business critical systems include:

- **Business Intelligence & Reporting:** Owners use BI and reporting to manage their business and the business will not stop due to a delay, but systems are designed to avoid any delay.
- **Collaboration:** Tools such as file-sharing or unified communications lose their value if network quality degrades because slow updates to shared files and intermittent voice delivery are as bad as an outage for productivity.
- **E-mail:** E-mail seems trivial until team distraction and missed communication results from a delay in delivery or an outage.

It is time to pull business critical applications out of the general LAN traffic pool, and provide them with a dedicated IP storage network optimized for performance to support their SLAs.

## Dedicated IP Storage Network Solution

The Brocade solution is to get ahead of the curve and design an environment for high-performance and resilient data access by segmenting business-critical traffic onto its own dedicated IP storage network based on Brocade VCS Fabric technology. The Brocade dedicated IP storage network is optimized for application performance to meet VM farm demands.

The solution delivers:

- **Optimization for storage traffic:** VCS fabric resiliency with any-to-any traffic paths and prioritization of traffic with Quality of Service (QoS)
- **Full capability from high-performance storage:** With a dedicated storage network and VCS fabric that remove the network-as-bottleneck problem
- **Automated provisioning:** For simplified scaling in high-growth environments

- **VMware vRealize integration:** Greatly improves visibility and management across virtual and physical environments in conjunction with Brocade Fabric Vision™ technology and unified management with Brocade Network Advisor

- **Nondisruptive capacity additions:** To grow a live VCS fabric through Ports on Demand (PoD) or the addition of Brocade VDX switches, with no downtime

### Solution Architecture

As shown in Figure 2, the concept of the dedicated IP storage network is simple enough. A basic switch architecture is set up in parallel with the general-use IP Local Area Network (LAN), with storage attached to the IP storage network and servers attached to both.

While this change is simple, the network performance enhancements, management simplification, automation, and new increased resiliency enable significant changes in the data center.

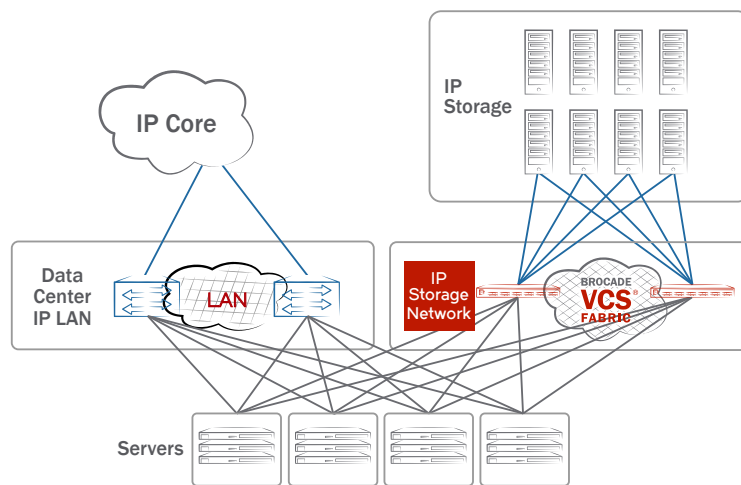


Figure 2. The Brocade dedicated IP storage network.

## Configuration

The base recommended configuration is four switches with a leaf-spine topology to support the VCS fabric. This initial configuration is scalable to meet the needs of any size of VM farm, by starting with the base number of ports, activating more with PoD, then adding pairs of new switches as needed. That scalability is enhanced by the VCS fabric's automation and self-configuring nature, which allows ports and switches to be added into live environments. While sizing depends on the specific environment needs, the base configuration is enough to get a dedicated IP storage network working immediately and ready to scale to beyond even 10,000 VMware vSphere servers.

## Why Move to a Dedicated IP Storage Network?

Aside from the performance and SLA benefits, this should be an easy choice for any IT decision-maker, based on simple data center economics.

### • Same Cost/Different Architecture

A dedicated IP storage network uses approximately the same number of ports to support the workload as would be needed in a mixed solution, so this is not really a situation with incremental networking costs for more ports. The cost is equivalent, but key traffic takes a preferred path. These are just different architectures optimized for different traffic, providing better performance and easier management of both.

### • Relative Network Cost

A large software, server, and storage infrastructure investment is being supported by a small number of switches, all of which are performance-dependent and possibly bottlenecked by the network. In fact, a single storage array might be a larger investment

than the entire base architecture for the dedicated IP storage network. It makes no sense to throw that value away with a network deployment that cannot handle the stress. If you check the prices on four Brocade switches, it becomes clear that this option offers a low-cost, high-impact change.

### • Nondisruptive, Two-Hour Setup

Based on the self-configuring Brocade VCS Fabric technology, the entire dedicated IP storage network can be racked and operational for most installs within two hours, including storage arrays. VM mobility allows nondisruptive migration to other storage and servers to complete the change. Setting up a Brocade dedicated IP storage network is a quick and simple procedure.

## Getting Started

If you have applications that are critical to business teams and require increasingly tight SLAs, Brocade offers the best options. Here are a few high-level planning considerations.

### Migration

The most nondisruptive, simple migration plan is to build the IP storage network in parallel to the existing mixed traffic network and use it for all new VMs, leaving the existing mixed infrastructure intact. Then, as existing VMs, servers, and storage reach end of life, or as conditions allow, administrators can systematically move their workloads to the new dedicated IP storage network.

A more selective method is to prioritize business-critical applications to be moved first. Your company likely already has in place strategic infrastructure investments to support mission-critical functions: those whose outages can result in the failure of business operations and permanently harm the company.

Business-critical refers to those systems that can cost your business time, money, or opportunity when their performance degrades. These are the primary driving factor justifying the move to a dedicated IP storage network based on Brocade VCS Fabric technology.

Given the connected nature of business, it is getting harder to determine which applications are business-critical. You determine this during the planning process with line-of-business users and their function within your company. In any case, it is typically prudent to start with applications or storage that are already experiencing performance problems, because this is where you can see benefits immediately.

### Ten-Minute to Half-Day Training

Brocade understands that network administrators are on call and thus have almost no time for training. Yet Brocade makes use of VCS fabric automation and standard CLI availability, such that the training can bring most network administrators up to speed within 10 minutes of hands-on experience. At most, training takes less than a day through a modular online training class.

### Storage Administrators Managing Storage Networks

As a storage problem, it makes sense for the storage administrator to be involved in the solution and to manage the dedicated IP storage network since they are responsible for all the resulting traffic. Storage administrators are already familiar with storage best practices that serve application needs, as well as the topology and the management tools involved. This is a win for network administrators who no longer will have to be responsible for high-value, "hard to troubleshoot" storage traffic. It is also a win for storage administrators who now are able to manage the entire system for which they are responsible.

## Conclusion

To manage increasingly stringent application SLAs and utilize the full performance of next-generation IP storage arrays, it is increasingly apparent that mixed-network traffic is the new performance bottleneck in the data center. Moving to a dedicated IP storage network quickly and cost-effectively moves the bar to the next level required to scale seamlessly into the future.

## For More Information

To learn more about making the move to a Brocade dedicated IP storage network, please consult your local Brocade representative.

Please visit the Brocade web site at:  
[www.brocade.com/solutions-technology/enterprise/ip-storage/index.page](http://www.brocade.com/solutions-technology/enterprise/ip-storage/index.page)

## 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](http://www.brocade.com).

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