BUSINESS CONTINUITY AND LIVE APPLICATION MOBILITY

Network Infrastructure for the Private Cloud: VMware vMotion and EMC VPLEX with Brocade IP and Storage Infrastructure

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Agenda

• Market Drivers and Use Cases
• Distance vMotion Overview
• VPLEX to VPLEX Connectivity
• Ethernet Fabric for Top of Rack
• L2 Ethernet Data Center to Data Center
• ADX Client to Application Connectivity
• Solution Testing and Results
vMotion over Distance
Can enable entirely new use cases

• Relocate Data Center workloads without disrupting applications to
  • Avoid Disasters
  • Load Balance/Consolidate
  • Leverage Cloud Infrastructure
  • Optimize power consumption
  • Perform maintenance

Round the globe computing
vMotion over Distance

Use Case: Consolidation / Load Balancing

• 70% – 75% of Data Center capacity set aside for “spikes” during peak demand period(s)

• Backup/DR Data Centers are often idle

• Solution: Relocate Virtual Server hotspots to underutilized Data Centers which in turn increases utilization of Storage and Networking Assets

• Utilize current assets as “spike insurance”
vMotion over Distance

Use Case: Disaster Avoidance

• Disaster Avoidance (DA) versus Disaster Recovery (DR)
• Today: DR is default choice
• Disasters
  • With warning: hurricane, volcanic eruption, wildfire, most floods, rolling blackout
  • Unpredictable: earthquake, local fire, terrorist attack
• DA highly preferred over DR: no Recovery needed
  • Pre-emptive migration of services completely non-disruptive to the end user
  • Better management control to schedule, plan, operate resources (and prioritize in DA scenario)
• Strategy: Augment (not replace) DR with DA
Infrastructure for vMotion over Distance
End to End Solution with EMC and Brocade

- VPLEX AccessAnywhere™ storage federation
- Brocade IP and storage networking
- VMware vSphere with vMotion
Long-Distance vMotion Architecture

End to End highly reliable and scalable solution

- EMC VPLEX Directors for Active/Active storage
- Brocade DCX Director with extension blades (FX8-24) for SAN extension over FCIP
- The vSphere servers with the Brocade 1020 Converged Network Adapters (CNA) and Host Bus Adapters (HBA) are used to provide access to the VMware VMFS data stores
- The vSphere migration network with Brocade Virtual Cluster Switching and MPLS/VPLS technologies

Also scales for clustered applications that require layer-2 adjacency (Oracle RAC, Oracle WebLogic Cluster, VMware SRM, etc)
When the Mission is VMware vMotion, the Solution is EMC VPLEX and the Network is Brocade

Double Your VPLEX Metro Performance with Brocade Networking

- Brocade FCIP with **Fast Write** reduces response time by 50% or increases distance by 2X for VPLEX Metro by reducing latency.
- Brocade VPLS provides robust, scalable, standards based L2 IP Virtual Private Network.
- Brocade ADX enables non-disruptive Live vMotion possible using vCenter integration.

[http://www.youtube.com/watch?v=sd1VgZCqMFk](http://www.youtube.com/watch?v=sd1VgZCqMFk)
VPLEX to VPLEX Connectivity
FCIP vs. FC at 75 KM
VPLEX to VPLEX Connectivity

• FX 10GbE FCIP at 75 km has:
  • Faster response times
  • More throughput
  • Capability for longer distances

• DCX 8510 lowest latency for local
  • 16Gb for true dark fiber
  • 16Gb FC Ports include Compression
  • 16Gb FC Ports include Encryption

<table>
<thead>
<tr>
<th>FX 10GE FCIP</th>
<th>Native 10G FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response Time (µs)</td>
<td>1282</td>
</tr>
<tr>
<td>Throughput (Gbps)</td>
<td>16</td>
</tr>
</tbody>
</table>

• Compression mode 1
• FastWrite enabled
• 512-byte payload

• Compression n/a
• FastWrite n/a
• 512-byte payload

Tests performed at 75 KM
Brocade FCIP with DCX Products

Storage Extension for Data Availability with VPLEX

• Flexible network options
  • DWDM / SONET
  • IP Networks at 1GbE or 10GbE

• SCSI write optimization (FastWrite)
  •Eliminates latency for synchronous write integrity

• Compression
  • 2:1 HW compression at full line rate
  • 4:1 SW compression

Optimize your storage distance connectivity

Connectrix MP-7800B Extension Switch and PB-DCX-FX8-24 Extension Blade for DCX and DCX8510

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Optimizing SCSI Writes for Distance
Brocade FCIP FastWrite

The standard SCSI write operation un-optimized

SCSI write operation optimized with FastWrite
Brocade DCX 8510 Backbone
Industry’s Highest Performing SAN Backbone (16Gb FC)

- Breakthrough performance for storage growth and virtualization demands
  - Unmatched speed and port density: 384 16 Gbps ports or 512 8 Gbps ports
  - 8.2 Tbps of bandwidth (up to 7x competitive offerings)
- Reduces network complexity, management, and cost
  - Advanced automation, diagnostics, and monitoring
  - Superior energy efficiency at 0.2 watts/Gbps (15x improvement over competition)
Metro Cloud Connectivity
Fibre Channel Port Enhancements for Metro (Dark Fiber)

- Integrated Metro Distance ISL Support
  - Wire Speed encryption and compression
    - E_Port to E_Port
    - 8 Ports (128 Gbps of BW) per blade
    - No license Required
- In-flight Compression
  - 2:1 compression using Brocade LZO
- In-flight Encryption
  - AES-GCM for authentication and encryption
  - Requires no external key management
  - Compatible with Existing Data-at-rest Encryption
- 10Gb speed option for DWDM compatibility

Use FX8-24 For FCIP
1GbE and 10GbE over longer Distance
New Operational Simplicity

Improve TCE

- Non-intrusively verify transceiver and cable health
  - Test electrical and optical transceiver components
  - Monitor and trend transceiver health based on uptime and digital diagnostics
  - Conduct cable health check

- Predictable application performance over links
  - Granular latency and distance measurement for buffer credit assignment or SLA monitoring
  - Replace expensive Traffic Test tools and stress/sanity check with I/O profiles
Ethernet Fabric for Top of Rack
Brocade VCS Technology with VDX
IP Network Foundation for VMware Connectivity

• Highly reliable and scalable layer 2 Ethernet Fabric for efficient and seamless VM Mobility
  • ESX cluster Connectivity
  • No Spanning Tree
  • Ultra-low latency
  • Fast and automatic convergence in case of failures
Brocade Virtual Cluster Switching (VCS)

First true data center Ethernet fabric

Revolutionizes Layer 2 connectivity

Increases scalability of virtual server environments and sphere of mobility

Maximizes network performance—reduces network complexity
CORE TECHNOLOGY
Brocade Virtual Cluster Switching (VCS)

• First data center Ethernet fabric
• No Spanning Tree Protocol
• Multi-path, deterministic
• Auto-healing, non-disruptive
• Lossless, low latency
• Built for convergence
CORE TECHNOLOGY
Brocade Virtual Cluster Switching (VCS)

- Fully distributed control plane
- Arbitrary topology, self-forming
- Network-wide knowledge of all members, devices, VMs
- Automatic Migration of Port Profiles (AMPP)
CORE TECHNOLOGY

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- Automatic Migration of Port Profiles (AMPP)

AMPP =
- QoS
- VLAN
- ACL
- Storage
CORE TECHNOLOGY

Brocade Virtual Cluster Switching (VCS)

- Managed as a single switch
- Logically collapses network layers
- Auto-configuration for new devices
- Centralized or distributed management
- Radically reduces managed elements
VDX6720 Product Overview
Enhanced Access/Aggregation Layer Switching

- **Best-In-Class Performance and Density**
  - VDX6720-24 (24 SFP+ ports, 1RU) and VDX6720-60 (60 SFP+ ports, 2RU) DCB ports
  - Non-blocking, cut-through, wire-speed
  - Extremely low latency (600nsec-1.5usec)

- **Optimized for the Virtualized Data Centers**
  - Front-to-rear and Rear-to-Front airflow
  - Best-in-class energy efficiency (~5–6W per port)
  - Virtual Cluster Switching (VCS) technology

- **Maximum Flexibility**
  - Flexible topologies with VCS enable simplistic design
  - 10 GbE and 1 GbE supported on every port
  - Supports Twinax

- **Enables Network and I/O Convergence**
  - Support for DCB, End to End FCoE

- **Highly Resilient and Efficient Design**
  - Runs new modular Brocade Network OS
L2 Ethernet Data Center to Data Center
Brocade MLX and CES
Highly Reliable DC Core and Layer 2 Extension between Datacenters

• Leading performance and scalability for Data Center Core and WAN connectivity
  • Line rate 1 Gig, 10 Gig and 100 Gig Ethernet and WAN

• Optimum flexibility: standalone and chassis options

• Standard-based Layer 2 extension between datacenters with MPLS and VPLS/VLL

• Very High Performance
• Line Rate
• Ultra-Low Latency
• Advanced L2 VPN with VPLS and VLL
MLXe: High-Performance, Multi-Service Router
A Unified Platform That Scales From Data Center Core to SP Core

- **Leading performance and scalability**
  - Up to 15.36 Tbps forwarding capacity in a chassis
  - Up to 32 100GE, 256 10GE, 1,536 1 GbE wire-speed ports

- **Advanced, scalable software features**
  - Proven stack: deployed in 1000s of networks
  - Multiservice feature set (IPv4, IPv6, MPLS, L3 VPNs, VPLS, L2 PW)
  - 1M routes, 2000 BGP peers

- **Unparalleled operational efficiency**
  - Unified chassis with purpose-built modules
  - Common software (image) for all markets
  - Best-in-class power efficiency with rear exhaust

- **Optimum flexibility**
  - 4-, 8-, 16-, 32-slot chassis, all with front-back airflow
  - 1-GbE, 10-GbE, 100-GbE, OC12, OC48 and OC192 modules
  - Field-programmable packet processor

- **High availability**
  - Management, fabric, and M+N power redundancy
  - Hitless failover and upgrade; non-stop routing
  - Future-ready for timing distribution (Sync-E, 1588)
  - NEBS Level 3 Certified
Brocade NetIron CES Switches

Product Highlights

Carrier-class performance
Wire-speed performance: 48 to 136 Gbps
128,000 MAC addresses, 32,000 IPv4 routes, 8128 IPv6 routes, Deep packet buffers

Optimum flexibility
24- and 48-port copper and fiber models
All models are field-upgradable to 2-port 10 GbE

High availability
NEBS Level 3 Certified
Hot-swappable, redundant, load-sharing AC/DC PS
N+1 redundant, replaceable cooling system

Advanced software features
Multiservice feature set (IPv4, IPv6, MPLS, QoS)
MEF 9, MEF 14 and MEF 21 certified
MPLS VPLS and VLLs, PB/PBB, G.8032
Comprehensive OAM capabilities
Brocade MPLS Layer 2 VPN Connectivity
Standard-based Reliable Layer 2 Extension Technology

- Full MPLS capability: VPLS for multipoint and VLL for point to point L2 VPN
- High availability and Fast Recovery with FRR (sub-second failover)
- Advanced traffic management and QoS
- Point and Click Simplified configuration and management with Brocade BNA
Ease of Use

- LSP, VPLS, and VLL creation wizards
- VCID pool management
- Visualization of paths and health
- Diagnostics and troubleshooting
- Real-time collection of VLL and VPLS statistics

CLI Configuration Manager

- Create, update, duplicate, delete, verify, and deploy product monitoring and global configurations
- Schedule script deployment
Ease of Use

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MPLS/VPLS: The Right Choice for inter-Data Center L2 VPN Interconnectivity

• MPLS/VPLS is the right choice for inter-Data Center L2 VPN interconnectivity

• Risk-free
  • Industry Standard
  • Field Proven

• Robust and resilient
  • Deployable over ANY IP or IP/MPLS network
  • Multiservice
  • Loop-free Multipathing/Traffic Engineering
  • Fast fault-detection and restoration (<50ms failover convergence)
  • Highly Scalable
  • Ease of provisioning and management
  • End-to-end SLA enforcement
Client to Application Connectivity
Brocade ADX Application Delivery Platform

Seamless Client Access to Virtual Machines

- Multi-site redundancy using Global Server Load Balancing to enable vMotion over distance
- Client are automatically redirected to the right VM
- Optimum flexibility modular platforms and capacity on demand
- Industry leading performance and scalability
Brocade ADX: PERFORMANCE LEADERSHIP

For Scalability
- 70 Gbps Layer 4-7 throughput
- 16 million Layer 4 transactions/sec
- 120 million SYN/Sec DoS protection
- 224,000 SSL TPS
- 14 million DNS queries/sec
- 320 Gbps switching fabric
- High-density 16 x 10 GbE ports and the only 10 GbE-capable 1U ADC
- Up to 32 processor cores

For Greatest Flexibility
- Fixed and chassis configurations with interchangeable modules

For Advanced Functionality
- Content switching and rewrite, Transparent Cache Switching, hardware SSL acceleration, and TCP/HTTP multiplexing
- GSLB and FWLB
Using Global Sever Load Balancing
Multi-Site Redundancy with Enhanced Performance

ServerIron GSLB Solution
- GSLB controller works with local ServerIron to load balance global datacenter traffic
- Incorporates site health, load, user proximity, and service response for user site selection
- Provides transparent site failover in case of disaster or service outage
- Supports route health injection using OSPF/BGP when DNS cannot easily be employed

Global DC Deployment Issues
- Handling site failures transparently
- Providing best site selection per user
- Leveraging both DNS and non-DNS solutions for multi-site redundancy
- Providing disaster recovery and non-stop operation
ADX - Application Resource Broker

Brocade ADX Plug-in Module for vCenter Enables Private Clouds

Application Resource Monitoring

Resource Commissioning When Load Increases

Resource De-commissioning When Load Decreases
(1) ADX monitors application performance by measuring application response time.
(2) End of quarter: Financial reports initiated across the company.
(3) Load increases; VM1 response time goes up. ADX automatically redirects new requests to other existing VMs with faster response time.
(4) Load increases further still. Application Resource Broker alerts the operator and commissions additional VM’s from the shared pool.
(5) Earnings are announced; load on application decreases dramatically.
(6) Newly created VM’s are decommissioned and released for use by other applications.
ARB Integration with vCenter Server
ARB handling successful vMotion event to manage ADX/GSLB configuration

1. vCenter Server generates event “VmMigratedEvent”
2. ARB Detects vMotion event
3. ADX remaps Virtual IP to secondary DC
4. Client traffic redirected to migrated VM
Distance vMotion Solution Testing Network Setup
Solution Demonstration Test Results
Application Mobility without any Disruption

• Non interrupted client traffic with DVD Store and Video VMs moving between data centers
  • >18,000 orders/min (2,000 transactions/s) for DVD Store Application at 5ms delay: Seamless VM Migration (vMotion) over VPLS
  • Brocade ADX redirecting client traffic without interruption with Global Server Load Balancing and ARB vCenter plug-in
  • Secure and fast data replication for VPLEX using Brocade DCX with FCIP
  • Data Center VCS fabric with Brocade VDX and MLX for core data center and Layer 2 extension with VPLS enabled VM migration

Application data with no disruption
Simulated distance between DCs >500 miles
FCIP Fast Write to Mitigate Latency
Go Farther and Faster

Enabling FCIP Fast Write, a 10ms RTT performance 30% faster at 2X the Distance
Thank You