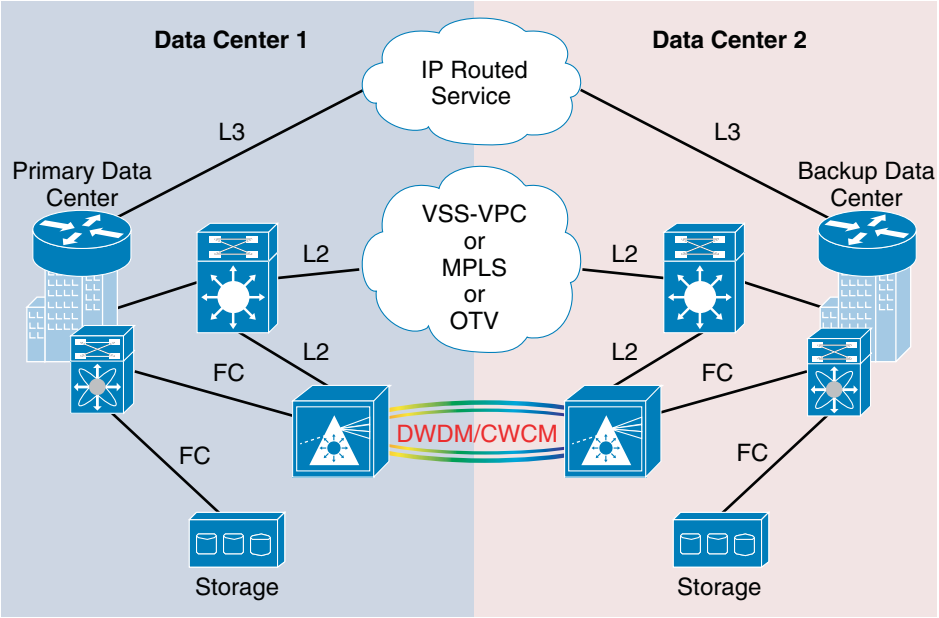
Data Center Interconnect—Design Considerations for Virtualized Workload Mobility with Cisco, EMC, and VMware

At-A-Glance

Data Center Interconnect Solution

The term DCI (Data Center Interconnect) is relevant in all scenarios where different levels of connectivity are required between two or more data center locations in order to provide flexibility for deploying applications and resiliency schemes.

Figure 1 DCI Overview



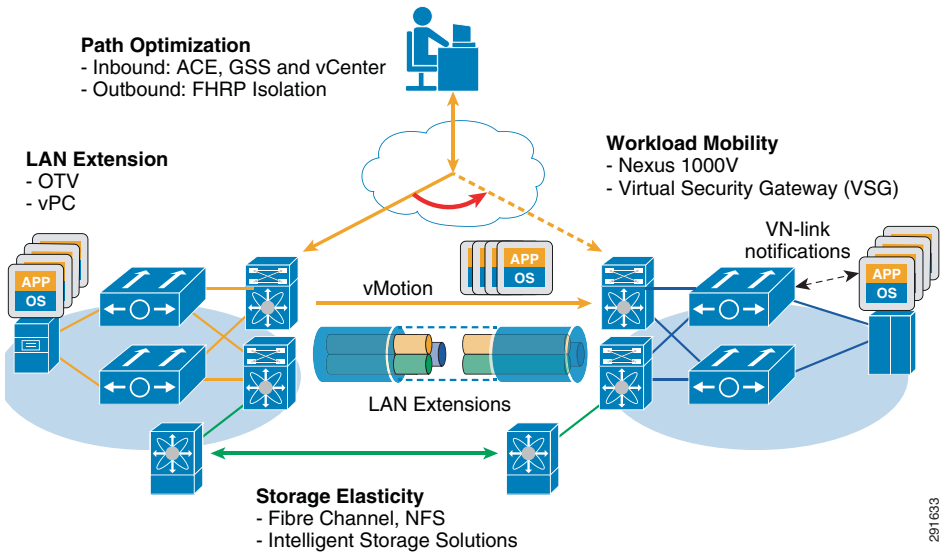
DCI Components

- LAN Extension—Provides a single Layer 2 domain across data centers. Layer 2 extension provides a transparent mechanism to distribute the physical resources required by some application frameworks such as the mobility of the active machine (virtual or physical).
- Path Optimization—Optimizes client-server traffic flow between the external client and internal server. As virtual machines are stretched between data center locations, path optimization enables efficient traffic patterns.
- Layer 3 Extension—Provides routed connectivity between data centers used for segmentation/virtualization and file server backup applications. This may be Layer 3 VPN-based connectivity, and may require bandwidth and QoS considerations.
- SAN Extension—Integrates Fibre Channel, Fibre Channel over IP, NAS IP Filers, and other protocols into the overall DCI framework to maintain continuous data availability.

Virtualized Workload Mobility Use Case

The ability to move workloads between physical locations over a Data Center Interconnect has been a goal of progressive IT departments since the introduction of virtualized server environments and increases the flexibility and agility of entities with new use case opportunities.

Figure 2 Virtualized Workload Mobility Overview



Virtualized Workload Mobility Enables

Data Center Capacity Expansion and/or Consolidation

Applications need to be migrated from one data center to another without business downtime as part of data center migration, maintenance, or consolidation efforts. Virtual machines need to be migrated to a secondary data center as part of data center expansion to address power, cooling, and space constraints in the primary data center.

Virtualized Server Resource Distribution Over Distance

Virtual machines need to be migrated between data centers to provide compute power from data centers closer to the clients (follow the sun) or to load balance across multiple sites.

Disaster Planning Strategies, including Disaster Avoidance Scenarios

Data centers in the path of natural calamities (such as hurricanes) need to proactively migrate the mission-critical application environment to another data center.

Virtualized Workload Mobility Solution Components

The DCI solution is modular, allowing new technologies and advancements to be seamlessly inserted into the Virtualized Workload Mobility case.

LAN Extension (Two Options in this Solution)

- Option A—Layer 2 dynamic MAC encapsulation in IP using Overlay Transport Virtualization (OTV) on the Nexus 7000
- Option B—Native Layer 2 Ethernet extension using Virtual Port Channels (vPC) on the Nexus 7000

Path Optimization

- Ingress Optimization—DNS-based resolution with the Cisco Global Site Selector (GSS), Application Control Engine (ACE), and integration with VMware vCenter.

  Note: LISP is a new option on the Nexus 7000 with NX-OS 5.2.
- Egress Optimization—First Hop Redundancy Protocol with HSRP Localization on the Nexus 7000

Virtualization/Workloads

- Nexus 1000v—Stretched cluster support with stateful Port Profile mobility, including QoS, Port Security, and Statistics. Virtual Supervisor Module (VSM) and Virtual Ethernet Module (VEM) distributed over 100 kilometers.
- Virtual Security Gateway—Stretched cluster support with Stateful Security Profile mobility, including stateful firewall, zoning, and protection over 100 kilometers. Innovative vPath technology embedded in virtual machine VEM forwarding logic for optimized VSG performance.
- VMware vCenter and ESXi 4.1—VMware strategic partnership using the ESXi 4.1 Hypervisor for virtualizing physical servers and vCenter for virtualization management and workflow integration with the ACE/GSS for Ingress Path Optimization. VMware vMotion technology for virtual machine mobility.

Storage Elasticity with EMC

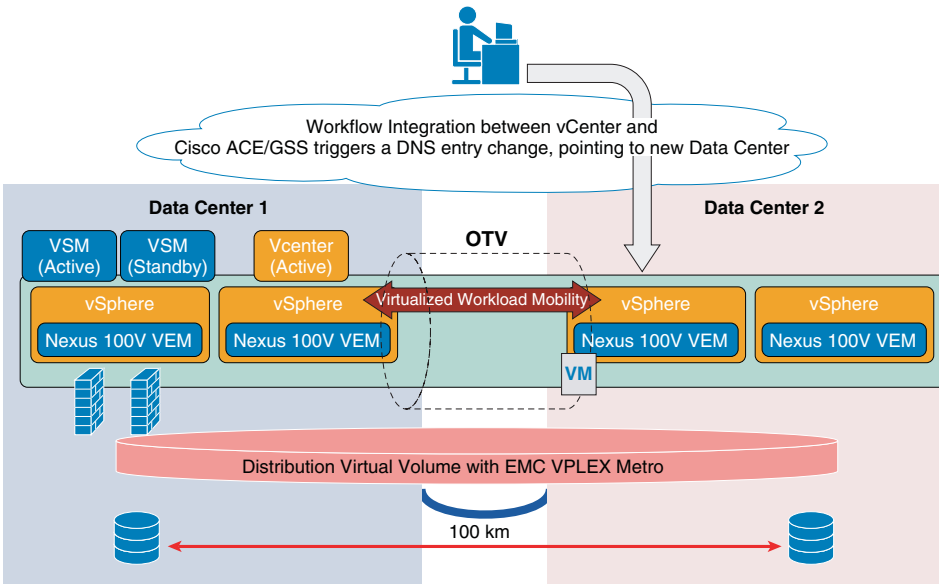
- Shared Storage Model—EMC strategic partnership using Fibre Channel Protocol for Read/Write access to storage content. The MDS 9000 is used for VSAN definitions per data center and inter-VSAN routing between data centers over 100 kilometers.
- Intelligent Storage Solutions—EMC VPLEX Metro is the technology for distributed virtual volumes with synchronous storage replication and guaranteed cache coherency between directors over 100 kilometers.

Virtualized Workload Mobility Use Case Criteria

The boundaries of Virtualized Workload Mobility are derived from within the scope of the solution components and use case.

- Live Migration—A live virtual machine migration requires a Hypervisor layer and VMware ESXi 4.1 is selected. VMware vMotion has a 5 millisecond latency requirement that translates to approximately 100-400 kilometers.
- Non-Disruptive—Existing and new server transactions must be maintained before, during and after the Virtualized Workload Mobility migration.
- Continuous Data Availability—Storage content must be accessible wherever the virtual machine is located, which requires synchronous replication and intelligent storage solutions, including the EMC VPLEX Metro. Synchronous replication is approximately 100 kilometers between locations.

Figure 3 Virtualized Workload Mobility Solution Components



For more information about DCI, see:

- http://www.cisco.com/en/US/docs/solutions/Enterprise/Data_Center/DCI/4.0/EMC/dciEmc.html
- http://www.cisco.com/en/US/solutions/ns340/ns414/ns742/ns743/ns749/landing_site_selection.html
- http://www.cisco.com/go/dci

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