Unified Data Center Fabric: Reduce Costs and Improve Flexibility

What You Will Learn

Understand how Unified Fabric reduces costs and improves the alignment of data center assets to business requirements.

The Challenge

As organizations increasingly rely on IT to help enable, and even change, their business strategies, they need their IT infrastructure to be more powerful, agile, and cost effective than ever. Today's enterprises require continual system availability, demand ubiquitous access, and expect rapid and fluid responses to their ever-changing business needs.

To provide these functions, enterprise data centers are challenged to get more use out of existing resources and operate quickly, with increased agility. Specifically, they must address the following data center challenges:

- Improve asset utilization to reduce or defer capital expenses
- Reduce power and cooling consumption to cut costs and align with green business practices
- Make data and resources available in real time to provide flexibility and alignment with current and future business needs

To meet these challenges, organizations must build a single network-based data center infrastructure that unifies traditional server, storage, and network operations to more efficiently support evolving business applications.

Currently, the server environment and the server access layer of the network are particular areas of focus. Because of the scale of the server environment, with hundreds or even thousands of servers, small changes can have significant effects. Multi-core computing and virtualization technologies are rapidly changing the data center landscape, promoting the need for higher-bandwidth, lower-latency switching. Increasingly dense, rack-mount and blade servers running multiple virtualized environments place increased power and cooling demands on data center architectures. Virtualization enables higher utilization levels, and with higher utilization comes increasing demand for 10 Gigabit Ethernet, Fibre Channel, server clustering network connectivity to each server and blade. Fortunately, even modest improvements to total cost of investment (TCO), energy efficiency, and complexity can have a significant cumulative effect on the data center.

IT departments are grappling with a number of specific challenges in the server environment. For instance, equipping every server and blade server chassis with a pair of redundant adapters for specific networks such as LANs and storage area networks (SANs) and networks for backup, management, and virtual machine mobility adds to cost and complexity:

- Direct costs
  - Interfaces
  - Cabling
- Indirect costs
  - Additional interfaces force a move to a large server form factor
  - Additional interfaces consume upstream switch ports
  - Additional infrastructure increases power and cooling load

◦ Additional complexity complicates business continuance and disaster recovery strategies

Meanwhile, server virtualization has emerged as a significant trend to deal with the cost and complexity of today's server infrastructure. While effective in its goal, server virtualization tends to stress network infrastructure through increased topology complexity and higher overall bandwidth utilization. Additionally, certain tactical and proprietary approaches to server and network boundary concerns tend to undermine design, operations, and management best practices.

Cisco Data Center 3.0 Strategy

The Cisco® Data Center 3.0 strategy allows customers to directly address the cost inefficiencies and service inflexibly that are inherent in many current data centers that evolved with an accidental architecture based on the premise of one application, one server.

Cisco Data Center 3.0 focuses on the concept of transforming the data center's traditional separate infrastructures into pools of virtualized storage, computing, and I/O resources. This consolidation promotes direct TCO savings, and virtualization allows more granular, dynamic, and flexible allocation of data center resources. The critical element of Cisco Data Center 3.0 is a cross–data center orchestration strategy to mitigate the complexity of this virtualized environment and to develop the capability of the data center to sense and respond to changing business needs.

Cisco Nexus 5000 Series

A primary tenet of the Cisco Data Center 3.0 strategy is the concept of a unified data center network fabric. This unified fabric will have the operational characteristics to concurrently handle LAN, SAN, and server clustering traffic. Consolidating the multiple networks in the data center into a single network will promote significant reductions in capital and operating expenses. Just as important, giving every server in the data center consistent and ubiquitous I/O capabilities will markedly improve the service capabilities, flexibility, and resilience of the data center.

Cisco Nexus 5000 Series Switches are the first members of the Cisco data center switch portfolio to deliver on the promise of a Unified Fabric and represent another step toward making the Cisco Data Center 3.0 strategy a practical reality. These 10 Gigabit Ethernet access layer switches deliver the following capabilities:

- **Unified Fabric:** The Cisco Nexus 5000 Series delivers the capability to consolidate IP, storage, and server clustering networks on a unified fabric over Ethernet. This capability reduces the number of server interfaces and simplifies cable management, resulting in lower costs, more efficient operations, and investment protection for current data center resources. This unified fabric is delivered through open standards using protocol technologies such as Fibre Channel over Ethernet (FCoE) and IEEE Data Center Bridging (DCB) in partnership with a broad group of market-leading vendors.

- **Virtual machine optimized services:** One of the most significant challenges faced by IT organizations when trying to build a virtualized data center is the difficulty of orchestrating provisioning and mobility of virtual machines while preserving network services and capabilities. The Cisco Nexus 5000 Series delivers VM (Virtual Machine) optimized services, supporting the Data Center 3.0 vision by allowing IT organizations to dynamically respond to changing business demands through rapid provisioning of application and infrastructure services from shared pools of consolidated compute, storage, and network resources. Virtual machine deployments rely on a combination of LAN traffic, SAN traffic and Server Clusters to implement VM infrastructure services such as VM mobility; all of which can be implemented on a unified fabric delivered by the Cisco Nexus 5000. The Cisco Nexus 5000 series supports end-port virtualization, where the switch takes ownership of the Layer 2 connectivity for connected servers. This approach simplifies the network, supporting massive scale, high-performance active/active links, and fine-grained control over network resources.

The Cisco Nexus 5000 Series switches are not a tactical point product, but rather a holistic solution to address near-terms needs while also integrating into a long-term business and technical strategy. The solution consists of several elements:

- **Partnerships:** The Cisco Nexus 5000 Series is an open, standards-based platform supported by a broad group of partners. These partners provide converged network adapters (CNAs) that allow both LANs and SANs to be accessed from one adapter using existing operating systems and drivers, and a low-latency, low-cost cable and transceiver combination that dramatically decreases power consumption. With its standards-based, open partnership approach, the Cisco Nexus 5000 Series helps ensure end-to-end data center architectural integrity, providing improved business continuity, security, and resiliency.

- **Cisco Nexus 5000 Series Switches:** Built for high-performance, Unified Fabric delivery over Ethernet, the series provides investment protection for current data center assets and the performance and operational characteristics necessary to keep pace with growing business needs for many years to come.

- **Cisco NX-OS Software operating system:** This Linux-based operating system combines the lossless architecture of Cisco MDS 9000 SAN-OS Software with the Layer 2 and 3 protocol richness of Cisco IOS® Software.

- **Cisco Data Center Network Manager (DCNM):** This Cisco Nexus family management tool increases operational efficiency, a key design goal of unified fabric delivery.

- **Full portfolio of lifecycle services:** Cisco offers a comprehensive suite of services to support enterprises in the design, implementation, and operation of the Cisco Data Center 3.0 strategy. Specifically, Cisco offers professional services to help customers assess the benefits of migration to a unified fabric as well as support to design, plan, implement, and maintain that migration.

- **Cisco Data Center Assurance Program (DCAP):** Cisco DCAP provides a unique system-level tested and documented validation of Cisco (and third-party vendor) data center technologies to assist customers in the design and implementation of data center infrastructures. Cisco DCAP offers customers a validated baseline data center infrastructure that includes designs, configurations, test plans, test results, and recommended software selections.

Cisco Nexus 5000 Series: Benefits of Unified Fabric Delivery

The unified data center fabric delivered with the Cisco Nexus 5000 Series will help organizations align their IT assets with their business priorities and deliver tangible business benefits:

- **Lower TCO:** The Cisco Nexus 5000 Series provides a unified fabric over Ethernet for LAN, SAN, and server cluster traffic. This unified fabric provides consolidation and higher utilization of previously separate resources, reducing the number of server I/O adapters and cables by as much as 50 percent and lowering power and cooling costs by up to 30 percent through the elimination of unnecessary switching infrastructure. The simplified infrastructure will also lower operational expenses related to management and operations.

- **Investment protection:** The evolution to a Unified Fabric will happen gradually as compelling business and technical factors present themselves. The Unified Fabric provided by the Cisco Nexus 5000 Series allows organizations to preserve the investment they already have in their existing Ethernet and Fibre Channel infrastructure during this transitional period. The Cisco Nexus 5000 Series is designed to allow customers to take advantage of the immediate benefits of a unified fabric without compromising architectural, management, or operational best practices in either Ethernet or Fibre Channel networks. This approach allows customers to take advantage of the platform's benefits without having to invest in extensive staff training, rewrite network architecture plans and operating procedures, or endure the risks associated with a complete architectural makeover.

- **Increased business agility:** The Cisco Nexus 5000 Series supports virtual machine server cluster, enabling applications to move across the network while maintaining their provisioned network services, such as security policy, quality of service (QoS), and overall performance. As a result, IT managers can easily move applications based on factors such as CPU utilization and thermal loads. This capability allows IT departments to rapidly respond to changing business demands through rapid provisioning of the dynamic and flexible application infrastructure enabled by the combination of server virtualization and the Cisco Nexus 5000 Series virtual machine optimized services.

- **Enhanced business resilience:** As should be expected of any data center–class infrastructure, the Cisco Nexus 5000 Series is engineered with specific hardware and operating systems to deliver component- and system-level operational continuity. In addition to offering component-level protection, the Cisco Nexus 5000 Series can have a significant positive effect on a customer's business continuance capabilities. Virtual machine optimized services helps ensure that applications can be quickly and transparently moved to a new infrastructure in response to challenges such as hardware failure or unexpectedly high application use. Similarly, in a recovery scenario, the simplified infrastructure and consistent I/O capabilities facilitate service recovery: no more "we cannot use that server; it's big enough, but it does not have a Fibre Channel host bus adapter."

Conclusion

Enterprises' growing dependence on IT for business advantage invariably manifests itself as growth in the server infrastructure that supports these new business systems. The Cisco Nexus 5000 Series delivers a server access networking solution that addresses the biggest challenges associated with this growth, namely sprawling, inefficient, inflexible infrastructure, with the resulting spiraling TCO. The Cisco Nexus 5000 Series directly addresses these challenges while improving the feasibility and applicability of related strategies such as server virtualization.

The Cisco Nexus 5000 Series offers customers the best of both worlds. The platform offers an open, standards-based solution that addresses some of today's most pressing concerns in the data center. Concurrently, the Cisco Nexus 5000 Series helps lay the foundation for broader data center transformation.

For More Information

http://www.cisco.com/go/nexus5000

http://www.cisco.com/go/nexus

http://www.cisco.com/go/datacenter