Cisco Data Center Networking Dynamic and Cost-Effective Solutions for Midsize Companies

Executive Summary

Business and IT leaders of midsize companies are looking for ways to regain control over their information and IT assets. This is essential for all companies that rely on technology to help them compete in an increasingly global economy but are finding that the costs, complexity, and robustness of their current server and storage infrastructure models are putting them at risk.

To enhance the responsiveness, efficiency, and resilience of their businesses and to ensure compliance with emerging regulations, companies need to evolve to a more integrated, service-centric approach to the lifecycle management of the IT infrastructure. This will allow IT organizations to share, provision, and use resources more efficiently and flexibly than traditional line-of-business IT silos previously allowed.

Companies adopting this service-centric approach need to consider their data center network architecture as a critical foundation. Traditionally, the network has provided users with secure, optimized access to applications and services residing in the data center. Today, the evolving data center network also provides the fabric across which server and storage infrastructures can be consolidated, virtualized, replicated, and dynamically provisioned. This approach is designed to improve efficiency, release budgets for revenue-generating projects, and enable fast and flexible delivery of critical applications throughout an organization.

The Cisco® data center networking portfolio offers midsize companies enterprise-class capabilities and choice together with best practices, a "plug and play" design, and management features that reduce cost and complexity.

Keeping the Business on Track

In today's demanding commercial environment, midsize companies – either with hundreds of servers and multiple terabytes of data or with 250 employees and growing – are engaged in an ongoing battle. They must keep up with growing demands to supply employees, partners, and customers with the services they need while keeping IT costs under control. They also have to be sure they can rapidly respond to any disruption or disaster that threatens the day-to-day running of the business and protect their valuable information and assets from internal and external attacks.

Another challenge is the proliferation of applications and servers and the vast amounts of data that companies now generate. Much of the data comes from business applications and e-mail, but it is also generated by multimedia services such as voice and video that are being added to data networks. In addition, the amount of data that companies have to maintain, to comply with legislation such as Sarbanes-Oxley, is growing at an estimated 40 percent each year. Not surprisingly, many organizations are struggling to keep up.

While fighting to protect and support the business, companies must become more agile so they can respond dynamically to changing customer needs and shifting market conditions. Companies must also become more environmentally responsible and find ways to improve the energy efficiency associated with powering and cooling their data centers.

Strategic Role of the Data Center

The burden of managing all these demands typically falls heavily on a company's data center department, which has overall responsibility for deploying, maintaining, and administering all the compute and storage resources that host the company's business-critical applications and data.

In a typical midsize company, the daily demands of the business often interfere with longer-term planning. This is a real problem for the IT organization because it encourages short-term decisions that result in separate, disparate systems being installed, often at the departmental level, that do not necessarily offer the best solution for the company as a whole.

Organizations that follow this path often end up with multiple isolated, heterogeneous systems that are underutilized and complex to maintain, secure, upgrade, and back up. According to industry estimates, this infrastructure model results in 70 percent of all data center costs being dedicated to simply sustaining current applications. This means that most companies are just "keeping the lights on," instead of introducing innovative new applications or technologies that will help improve their competitive advantage and generate business growth.

Midsize companies need to regain control over their data and IT assets. They can do so by consolidating many of the servers that are being used throughout the organization and centralizing them in the data center, by consolidating multiple applications onto fewer physical servers, by introducing more effective networked storage solutions, and by optimizing the performance and availability of critical applications. Security, business continuance, and disaster recovery are all high priorities.

The data center network plays a key role in enabling companies to successfully achieve all these goals. Cisco uniquely offers a comprehensive portfolio of integrated data center networking solutions and best practices that allow midsize customers to build a foundation that facilitates immediate projects, while evolving to meet future needs.

A Data Center Model for Midsize Companies

By adopting a far-sighted approach to evolving to a service-centric data center, midsize companies can carry out short-term projects for immediate benefits and return on investment within the context of a broader, longer-term strategy. Short-term projects may include the following:

- Direct attached storage (DAS) and storage area network (SAN) consolidation for improved utilization and reduced management overhead

- Branch server consolidation into the data center for simplified, centralized administration and backup, improved server and storage utilization, and improved protection of data assets

- Server consolidation onto fewer physical servers by using virtual machines and hypervisor virtualization technologies

- Disaster recovery with asynchronous or synchronous data replication across metro or wide area networks

Longer-term projects, which build on the short-term projects, may include:

- Heterogeneous, continuous data protection and business continuance to reduce recovery point objectives and recovery time objectives

- Storage virtualization for achieving storage provisioning and data migration with minimal impact on applications

- Dynamic, streamlined infrastructure provisioning and repositioning to rapidly meet changing business requirements

When done properly, this approach enables a smooth migration to newer technologies as they become appropriate to rapidly growing and increasingly sophisticated midsize companies. In addition, this approach significantly increases investment protection in an environment that is undergoing rapid technological change, driven by strong market demand.

Overview of the Cisco Data Center Network Architecture

Cisco has developed its data center network architecture around a broader vision of the network as a platform, not just a conduit for moving information. The architecture is flexible enough to support, and align with, a company's business strategy. This is because it forms part of Cisco's intelligent information network, a framework designed to help companies evolve their networks from traditional IT cost centers into strategic tools.

Within this framework, Cisco offers a comprehensive data center portfolio that was first developed for the enterprise market. Although midsize companies may not require every element, they can select the ones that meet their needs.

Cisco data center networking offerings are based on the following concepts:

- A common network fabric for the connectivity and aggregation of all data center components and resources. This fabric gives companies the freedom to choose the hosts, storage devices, and technologies that best meet their requirements. This includes support for most compute types, regardless of form factor, as well as rack-optimized, blade, and symmetric multiprocessing (SMP) servers. It encompasses all storage types, including SAN, network attached storage (NAS), IP storage, and Fibre Channel storage.

- The same network fabric provides secure consolidation by offering isolated environments for each physical or virtual server deployed through the use of in-depth security and network fabric partitioning.

- Optimized application delivery to users regardless of location or application type.

- A platform for network-hosted infrastructure services such as heterogeneous data replication, continuous data protection, and storage virtualization.

- Simplified administration with commonality across tools and interfaces, and integration with third-party tools.

- Tested, validated, and documented best-practice integrated designs for reducing costs associated with testing and design, faster time to deployment, improved robustness and lower risk.

The Cisco data center network architecture is shown in Figure 1 and can be described according to the following layers:

- Networked infrastructure layer: Meets all the bandwidth, latency, and protocol requirements for user to server, server to server, and server to storage connectivity and communications

- Interactive services layer: Provides the infrastructure enhancing services and application networking services that reside on the networking platforms and are critical to the delivery of a service-centric data center

Figure 1. The Two Layers of the Cisco Data Center Network Architecture
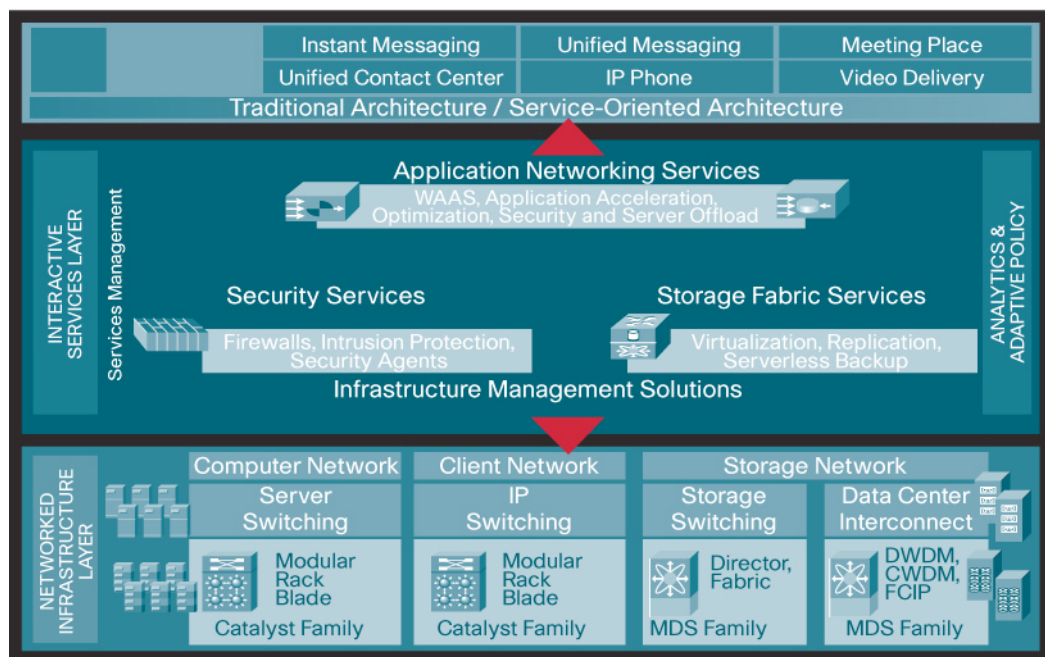
The Networked Infrastructure Layer

The foundation of the Cisco data center network architecture provides intelligent connectivity services for networked elements within the data center, such as servers and storage, as well as to external users or other data centers.

Multiprotocol support helps ensure that all unique application requirements can be met. For example, a data-intensive grid application may require 10 Gigabit Ethernet, a heterogeneous SAN may require Fibre Channel, IBM Fiber Connection (FICON), and Small Computer System Interface over IP (iSCSI), while a synchronous mirroring application may need dense wavelength-division multiplexing (DWDM) connectivity between data centers.

The network fabric is built with highly resilient, scalable platforms that integrate intelligent services directly into the fabric. It comprises purpose-built platforms that address unique connectivity requirements, including highly scalable and service-rich server farm switching; highly scalable, multiprotocol intelligent storage switching; and high-bandwidth, long-distance data center interconnect.

Networked Infrastructure Layer: Server Farm Network

The consolidation of the data center infrastructure is accompanied by the need for a server farm network that is capable of scaling and providing secure environments for each hosted application. Cisco provides secure, optimized user access to applications and high-speed reliable communications between server tiers and clustered computing resources and applications. It does this with the intelligent switching capabilities of its proven, award-winning family of Cisco Catalyst® switches.

Cisco continues to enhance these platforms for data center applications with innovations such as high-density Gigabit Ethernet and 10 Gigabit Ethernet technologies, high-availability services, integrated security, and application networking services modules. Cisco Catalyst 6500 Series Switches meet today's rigorous demands for flexibility, availability, and performance, yet their modular design permits upgrades to support future technologies and services with minimal disruption and expense. Advanced monitoring and management tools allow for proactive troubleshooting and fault analysis, which are critical to consolidated data center deployments.

Cisco also offers a full range of Ethernet and Fibre Channel blade solutions for its Catalyst switches, as well as a growing portfolio of blade switch solutions for Dell, Fujitsu Siemens Computers, HP, and IBM blade servers. Benefits include more scalable architectures, easier manageability, and increased network availability.

For more information on Cisco Catalyst 6500 Series Switches, visit: http://www.cisco.com/en/US/products/hw/switches/ps708/index.html.

Networked Infrastructure Layer: Storage Area Network

The industry transition from DAS and isolated SAN islands to scalable, intelligent storage networking is underway. This trend enables efficient storage pooling and utilization and consistent data replication and mirroring for business continuance.

Cisco storage networking solutions help reduce total cost of ownership (TCO) and improve business continuance over DAS and first-generation SAN solutions. Cisco has applied its advanced data networking experience to the storage environment – for example, by adapting VLAN and IP security (IPsec) technologies to the storage network as virtual SANs (VSANs) and Fibre Channel Security Protocol respectively.

Cisco storage networking solutions range from cost-effective, low-end fabric switches that offer a "pay as you grow" model, to high-end director-class switches. This comprehensive storage networking family offers a consistent and rich set of intelligent services, including VSAN (for virtual fabrics), interVSAN routing, and multiprotocol support (Fibre Channel over IP [FCIP], iSCSI, and so on).

Cisco storage switches can be deployed with minimal configuration and do not require any special training to operate. The embedded Fabric Manager application and the Quick Configuration Wizard simplify and accelerate the initial fabric activation.

Cisco also offers Fibre Channel blade server solutions that provide the same functions as standalone switches but can be integrated into a company's blade servers. This reduces costs by simplifying management and reducing space requirements.

Several Cisco Data Center Interconnect solutions are available for companies that need to interconnect between data centers for business continuance and disaster recovery. These solutions include low-cost FCIP, low-cost coarse wavelength-division multiplexing (CWDM), and DWDM.

For more information on Cisco storage networking solutions, visit:
http://www.cisco.com/en/US/products/hw/ps4159/index.html.

The Interactive Services Layer

To deploy applications and supporting infrastructure quickly and securely, data center architects need a network infrastructure that displays system-level intelligence, such as storage virtualization, policy-based provisioning, adaptive threat defense, and enhanced application optimization. The Cisco data center network architecture exhibits network system intelligence through a combination of interactive services integrated into the foundation infrastructure platforms, together with complementary services offered on appliances, storage systems, and server hosts. This interactive services layer comprises infrastructure enhancing services and application networking services.

Interactive Services Layer: Infrastructure Enhancing Services

Infrastructure enhancing services improve the reliability and security of the hosted infrastructure and applications. These services also allow centralization and standardization of heterogeneous services that were previously available only as distributed services on end systems, such as servers and storage. These centralized network-based services allow for unified administration, improved performance, and more freedom of choice regarding which end systems to deploy.

Examples of infrastructure enhancing services include:

- Storage fabric services such as virtualization, replication, and virtual fabrics
- Security services in the form of firewall, intrusion protection, and distributed denial of service (DDoS) protection services

Interactive Services Layer: Application Networking Services

As infrastructure is consolidated to centralized locations, the delivery of applications to remote users becomes even more critical. In addition, the trend toward service-oriented architectures (SOAs) and Web services makes the network central to how applications are developed and integrated to support business processes. Application networking services enhance the delivery of applications to the end user as well as communication between application tiers, different applications, and services.

Wide-area application services (WAAS) are of particular interest to midsize companies because they provide employees in remote offices with seamless access over the WAN to centrally hosted applications, storage, and rich media. This reduces costs by simplifying backup and other management functions and removing the need for local devices and IT staff.

The Cisco WAAS portfolio gives remote offices LAN-like access to centrally hosted resources in a standardized, easy-to-manage form. Cisco WAAS is a powerful application delivery, acceleration, and WAN optimization solution. Unlike traditional WAN optimization technology, it also integrates transparently within customers' networks, preserving TCP information to maintain functions such as

security, quality of service, visibility, and monitoring from end to end. Figure 2 illustrates the Cisco data center network topology.

For more information on Cisco WAAS software, visit:
http://www.cisco.com/en/US/products/ps6870/index.html.

Data center application services help midsize companies to increase application performance, control, and security while simplifying their application infrastructures. This removes several potential barriers to business success by efficiently delivering critical applications to remote offices, partners, suppliers, and even customers.

For more information on Cisco data center application services and solutions, visit:
http://www.cisco.com/en/US/products/ps5719/Products_Sub_Category_Home.html.

Figure 2.   The Cisco Data Center Network Topology
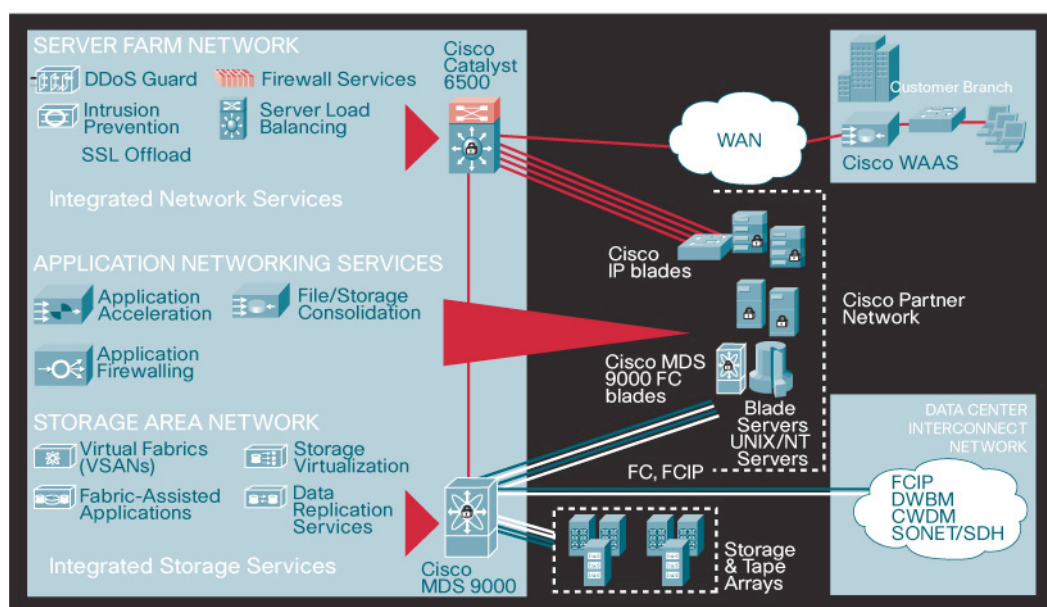
Realizing the Benefits: Customer Case Study

Victrex Brings the Business Closer to the Customer: Victrex plc, headquartered in the United Kingdom, is a leading manufacturer of high-performance materials. The company needed to improve its communications infrastructure to support growth.

Victrex is deploying a Cisco IP network around the world. One infrastructure supports three regional data centers in the United States, the United Kingdom, and the Far East, serving offices in those areas. In the United States, for example, Victrex employs many remote home workers; the company is currently testing Cisco Wide Area File Services (WAFS) technology, which consolidates branch office data in central file servers located in the regional data centers.

By using Cisco WAFS, Victrex will reduce the amount and cost of hardware at local branch offices and make data management and protection easier and more cost-effective. For example, security can be applied more effectively at three locations rather than hundreds. This will also help to bring the business closer to the customer by giving staff located anywhere in the world full access to corporate data.

Why Choose Cisco for Your Data Center?

Many midsize companies are already familiar with Cisco products and services, and the company's technology vision. However, there are more compelling reasons than familiarity to consider Cisco for future data center projects.

- As more applications and services – such as unified communications, voicemail and load balancing – become resources on the network, Cisco's networking expertise makes it an ideal choice for data center network provider

- The overarching Cisco data center network architecture helps companies to better plan for the future by building up an agile infrastructure that can incorporate ongoing improvements

- The built-in scalability of the Cisco data center network architecture can help protect companies' investments

- Cisco data center solutions can manage multiple protocols and support both legacy and emerging technologies, which could offer added investment protection

- Exceptional levels of integration between Cisco solutions could result in improved functionality, security, manageability, and cost control

- The use of industry-standard technologies throughout the Cisco data center portfolio could help to reduce companies' total cost of ownership

- Embedded functionality and intelligence in Cisco solutions enhance their ability to interoperate with applications, and could enhance a company's ability to deploy new applications more quickly in response to business needs – even with relatively few IT staff

- The end-to-end Cisco data center portfolio, combined with its extensive partner network, greatly reduce the complexity – and, potentially, the cost – of designing and implementing a data center solution

- Cisco Capital™ financing enables midsize companies to spread the costs of new technology over time, to help maximize cash flow and preserve capital budgets. Customers get the support they need with Cisco Technical Services, tailored precisely to the needs of their business, to help keep their company up and running and to protect customers' investment in their Cisco installation.

First Step to Regaining Control

For more information about the Cisco data center network architecture and Cisco data center solutions, go to http://www.cisco.com/go/datacenter_sm.

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