Storage Access Network Design Using the Cisco MDS 9124 Multilayer Fabric Switch

Executive Summary

Commercial customers are experiencing rapid storage growth which is primarily being fuelled by E-Mail, Database applications, Backup/Archive, and the compliance and regulatory requirements. Because commercial customers have limited IT budgets and skills, they are looking for SAN solutions that are affordable, easy-to-use and have enterprise class capabilities.

The existing SAN fabric switches fall short when it comes to addressing these emerging SAN solutions. These legacy switches were designed to provide basic SAN connectivity only and consequently they lacked advanced SAN capabilities such as security, availability, and flexibility.

Cisco MDS 9124, powered with industry-leading SAN-OS software, is a new breed of easy-to-use SAN fabric switch that provides advanced storage networking features and functions at an affordable price. Specifically, it provides advanced security to address compliance and regulation requirements, higher availability to reduce downtime and address business resiliency concerns, and increased flexibility to grow the SAN with changing business needs. Simply stated, MDS 9124 offers enterprise-class capabilities on easy-to-use affordable fabric switches which until now were only available on Director-class platforms.

Introducing the Cisco MDS 9124—A Best-in-Class Product

The Cisco MDS 9124, a 24-port, 4-, 2-, or 1-Gbps fabric switch (Figure 1), offers exceptional value by providing ease of use, flexibility, high availability, and industry-leading security at an affordable price in a compact one-rack-unit (1RU) form factor. With its flexibility to expand from 8 to 24 ports in 8-port increments, the Cisco MDS 9124 offers the densities required for both departmental SAN switches and edge switches in enterprise core-edge SANs. Powered by Cisco MDS 9000 SAN-OS Software, it includes advanced storage networking features and functions and provides enterprise-class capabilities for commercial SAN solutions. It also offers compatibility with Cisco MDS 9500 Series Multilayer Directors and the Cisco MDS 9200 Series Multilayer Fabric Switches for transparent, end-to-end service delivery in core-edge enterprise deployments.

Figure 1. Cisco MDS 9124 Multilayer Fabric Switch

SAN Design with the Cisco MDS 9124 Fabric Switch

Deploying the Cisco MDS 9124 fabric switch allows commercial environments to fully utilize a SAN infrastructure by providing the underlying capabilities:

- Ease of use—Simplifies deployment and management of applications
- Flexibility—Allows commercial environments to scale as the SAN grows
- Enhanced availability—Provides enhanced data protection and network availability
- Security—Protects network integrity and provides troubleshooting tools

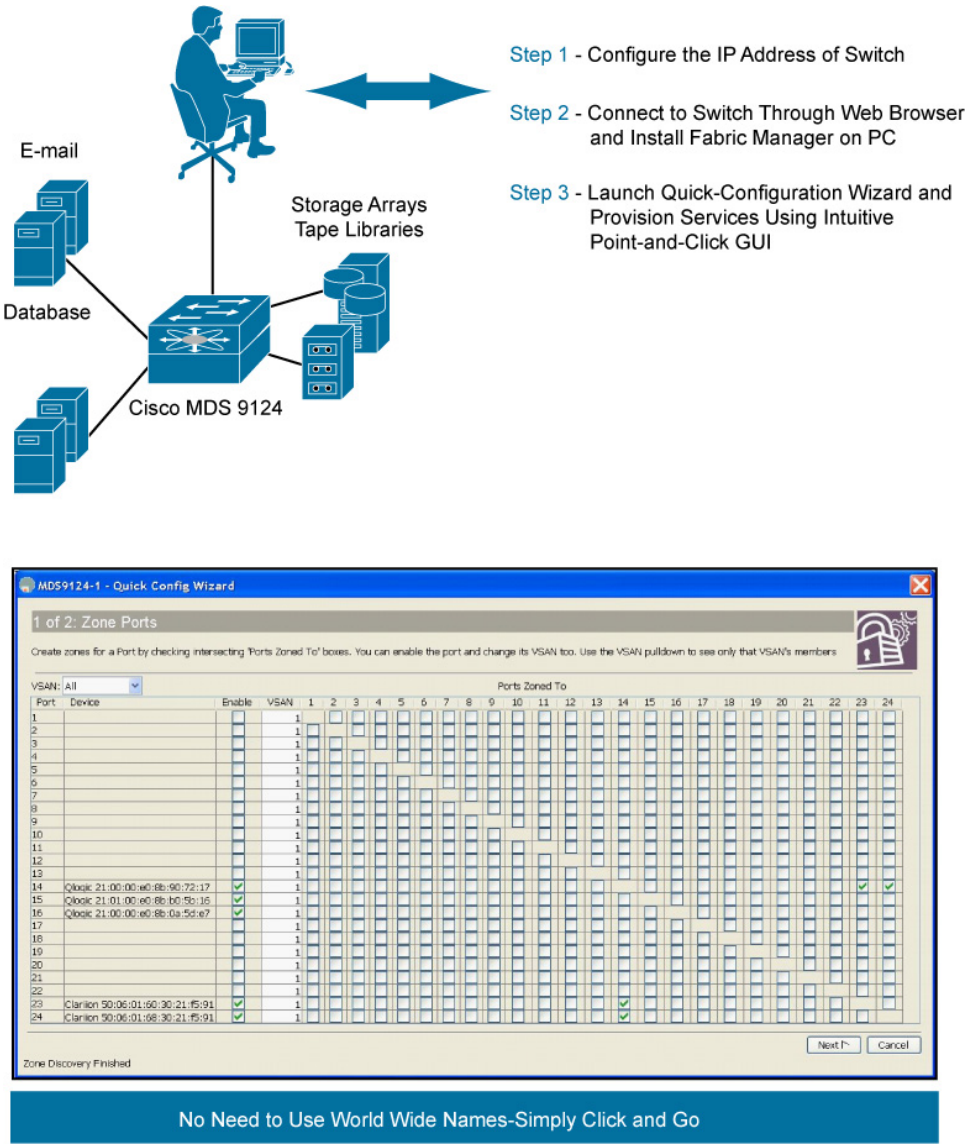
Ease of Use

One of the limiting factors for commercial customers in deploying a SAN infrastructure is the complexity of implementing and managing a new SAN. The Cisco MDS 9124 includes a quick-configuration wizard that simplifies deployment and eliminates all the complexity of deploying new storage access to the application server. IT managers can now provision new or additional storage within minutes.

The Cisco MDS 9124 also simplifies management of all application servers in the network. A single point of management can now efficiently provision storage as applications require more capacity through the Cisco Fabric Manager graphical user interface (GUI). This free management tool provides a fabric view of the SAN; the Cisco Device Manager GUI offers a device-level management tool as well.

Out of box, the Cisco MDS 9124 can be up and operational within minutes. Figure 2 shows the simple steps that are needed to complete this task.

Figure 2. Cisco MDS 9124 Easy Configuration Wizard



Note: From the Device Manager GUI, a quick-configuration wizard is available. Using simple point-and-click operations, storage can be easily provisioned to an application server.

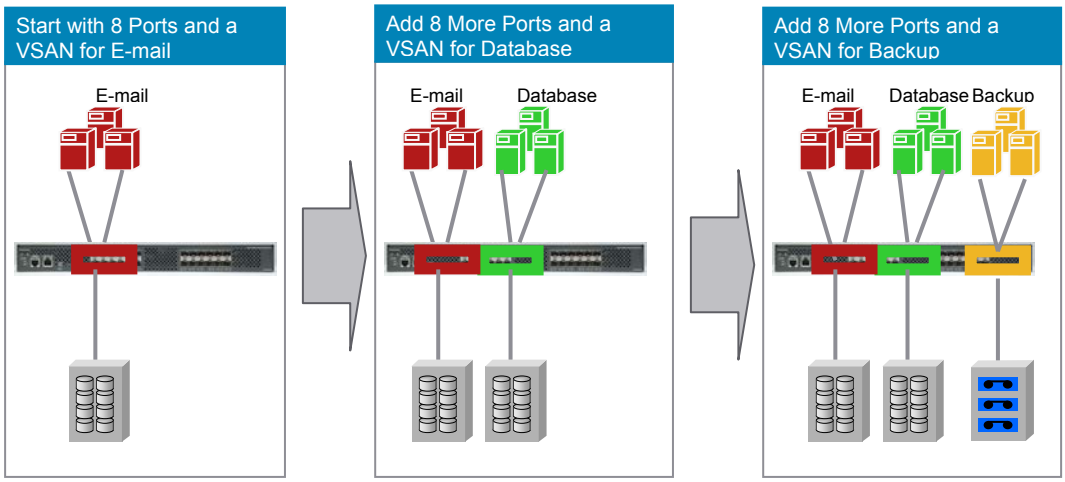
Flexibility

The Cisco MDS 9124 offers up to 24 4-, 2-, or 1-Gbps autosensing Fibre Channel ports in a compact 1RU form-factor chassis with 4 Gbps of dedicated bandwidth to each port and an aggregate platform bandwidth of 192 Gbps. It starts with a base configuration of 8 4-, 2-, or 1-Gbps ports with flexibility to upgrade in the field to 16 4-, 2-, or 1-Gbps and 24 4-, 2-, or 1-Gbps ports using the 8-port port activation license. The Cisco MDS 9124 is an ideal platform both as a standalone departmental SAN switch and as an edge switch in enterprise core-edge SANs.

In the Cisco MDS 9000 family of switches, Cisco introduced the concept of virtual fabrics, called virtual SANs (VSANs). VSANs allow the creation of separate virtual fabric services within a physical switch. With the flexibility to create VSANs on a per-port basis and the flexibility of the Cisco MDS 9124 to activate ports as needed, small and medium-sized business (SMB) environments can now

build VSANs for separate applications easily and dynamically (Figure 3).

Figure 3. Cisco MDS 9124 Flexibility



Note: With the flexibility to start with a small number of ports, the Cisco MDS 9124 provides the capability to create VSANs for each different application on a per-port basis. As new ports are activated, they can be added to existing application VSANs or to new application VSANs.

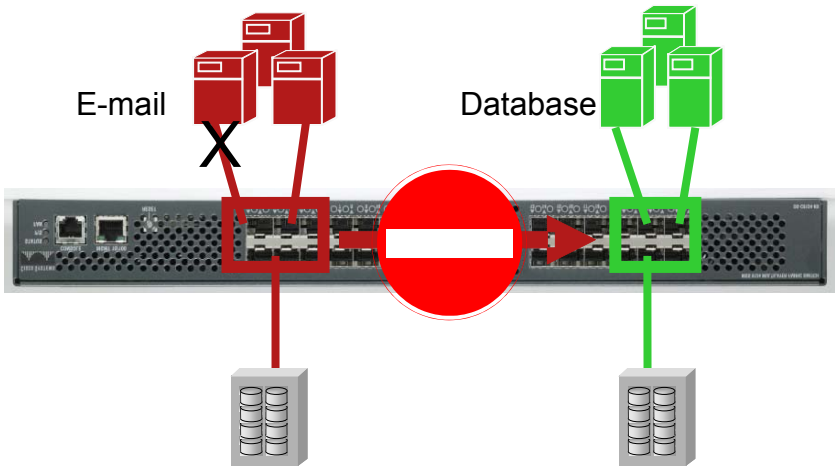
Enhanced Availability

Migrating data storage to the SAN makes better use of the available capacity. With consolidation of storage, data protection and availability are no longer concerns for the applications servicing the business. The Cisco MDS 9124 provides the following features to enhance data protection and availability:

- VSAN technology, which provides separate fabric services to segregate disruptions
- Online nondisruptive software upgrades
- Optional dual power supply

The Cisco MDS 9124 enhances data protection and availability for applications such as Microsoft Exchange, SQL, and backup solutions with the capability to create VSANs. With the Cisco MDS 9124, VSAN segregates any fabric disruptions or operating errors within that particular VSAN (Figure 4). For example, a Registered State Change Notification (RSCN) storm in the backup VSAN will affect only that VSAN; the Exchange VSAN or any other VSAN will not be affected.

Figure 4. Cisco MDS 9124 Fault Isolation with VSAN



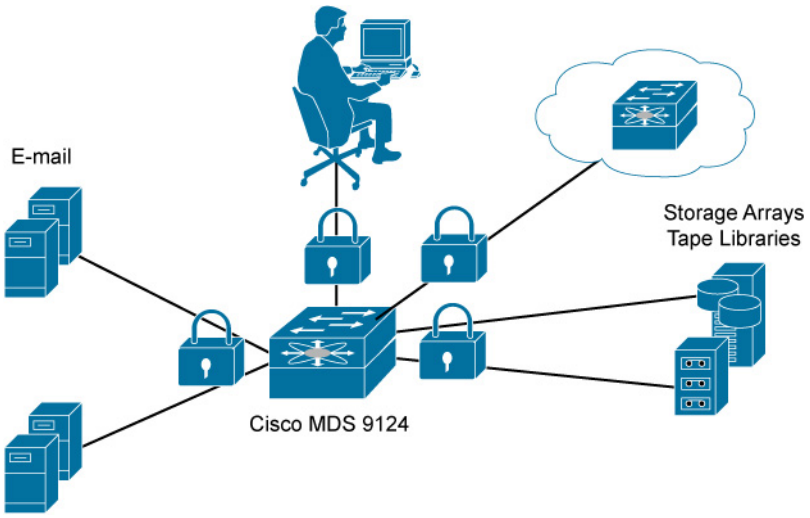
Note: Using Cisco VSAN technology, fabric disruption within one VSAN will isolate that disruption to that particular VSAN only, providing better availability and minimizing application disruption for different fabrics.

Security

With resources consolidated and shared in the SAN, security is essential to maintaining the integrity of the network (Figure 5). Securing the SAN so that only authorized users and devices are allowed offers peace of mind to the enterprise. The Cisco MDS 9124 provides the following features to secure the network:

- Secure Shell (SSH) and Simple Network Management Protocol Version 3 (SNMPv3)—Encrypt access to the Cisco MDS 9124 switch
- Authentication, authorization, and auditing (AAA) through RADIUS and TACACS+ servers—Provides centralized secure access to the SAN
- Role-based access control (RBAC) on a per-VSAN basis—Allows multiple administrators to be created to manage multiple VSANs
- Secure host-to-switch authentication—Allows only particular hosts to access the switch
- Secure switch-to-switch authentication—Allows only particular switches to join the fabric

Figure 5. Cisco Secure Network



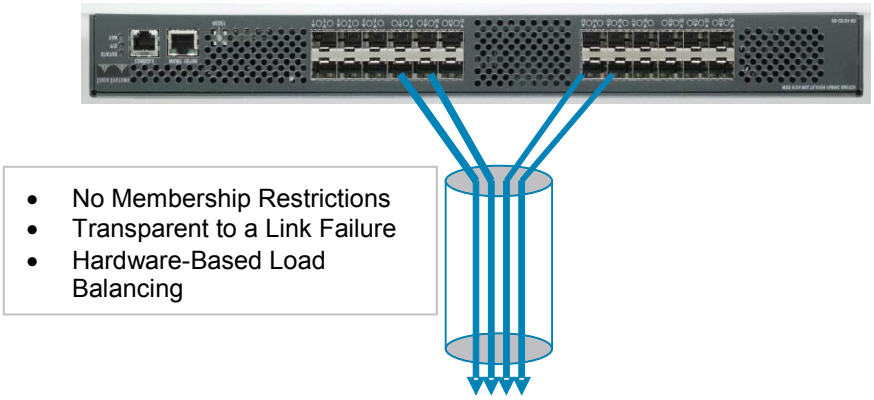
Note: Cisco MDS 9124 security can restrict unauthorized access to the network. By preventing rogue switches or servers from joining the network, Cisco security feature provide peace of mind for IT administrators concerned with accidental or malicious access.

Traffic Management

PortChanneling

Link aggregation allows the network to scale and provides the capability to limit fabric disruption if a link fails, without compromising network traffic. The Cisco MDS 9124 provides this capability through PortChanneling. Being able to have up to 16 physical Inter-Switch Links (ISLs) acting as a single logical ISL provides up to 64 Gbps of bandwidth to scale the network. Not unless until every single physical link fails in a PortChannel will the fabric need to perform a Fabric Shortest Path First (FSPF) recalculation. Unlike other vendors' implementations, the Cisco PortChannel can span different ports within the Cisco MDS 9124 and different line cards with other Cisco MDS 9000 family switches, such as the Cisco MDS 9200 and 9500 Series switches. Throughout the fabric, the default load-balancing scheme for all equal-cost paths for ISLs is source and destination exchange, which allows fair load sharing between the ISLs. This load-balancing mechanism is also used in the PortChannels (Figure 6).

Figure 6. Cisco MDS 9124 PortChannels



Note: Link aggregation within a fabric reduces fabric disruptions. Cisco MDS 9124 PortChannels provide this capability to make the fabric more available. The capability to have up to 16 physical links in a PortChannel increases the fabric availability and allows the fabric to scale.

Virtual Output Queue and Quality of Service

The Cisco hardware-based virtual output queue, which provides a completely nonblocking architecture, is extended to the Cisco MDS 9124. The Cisco MDS 9124 provides quality of service (QoS) on application traffic. Being able to assign higher priority to more crucial applications and lower priority to less crucial applications provides better performance for crucial applications in cases of bandwidth contention on ISLs.

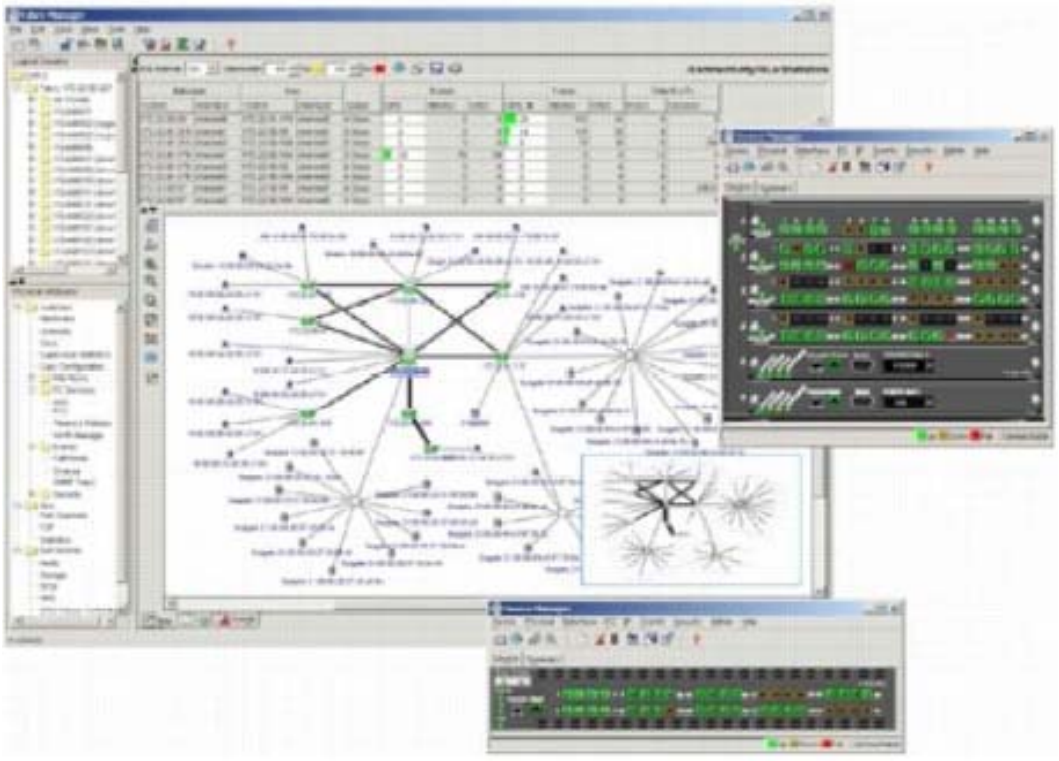
Enterprisewide Management

With complete support of Cisco MDS 9000 SAN-OS Software for the Cisco MDS 9124, the enterprise can transparently manage the Cisco SAN with the Cisco Fabric Manager and Device Manager (Figure 7). The Cisco Fabric Manager offers powerful configuration capabilities for tuning the fabric after it is operational and setting up zones, network security, and VSANs. Wizards are provided to accelerate configuration and eliminate errors in configuring zones, PortChannels, and access control lists (ACLs) and to perform software updates.

The Cisco Device Manager provides a device view, allowing administrators to focus on a specific switch and determine its overall status at a glance. The device view provides realistic, graphical representations of Cisco MDS 9000 family switches. Color-coded status indicators are provided for all major components, including the chassis, fans, power supplies, and individual ports. Clicking a particular component provides immediate access to detailed status information and configuration parameters.

Cisco Fabric Manager Server (FMS) provides networkwide historical performance monitoring and analysis. Throughput on all host and storage device connections and ISLs and between specific Fibre Channel sources and destinations (flows) can be monitored. A one-year history of performance statistics is maintained for trend analysis.

Figure 7. Cisco Enterprisewide Management



Note: With a fabric view to manage the entire storage network and a device view to manage at a port level, the Cisco MDS 9000 SAN-OS Software provides a free and easy management tool. Cisco FMS networkwide historical monitoring and real-time monitoring allows administrators to identify network hotspots quickly and examine performance trends.

Troubleshooting and Diagnostics

The Cisco Fabric Manager includes very powerful Fibre Channel network diagnostic tools that are industry firsts. These diagnostic tools, Fibre Channel traceroute and Fibre Channel ping, provide comprehensive connectivity analysis. Traceroute offers a powerful way to trace paths from any two points within the Fibre Channel network. Hop-by-hop latency calculations are displayed in tabular form, and switches in routes can be highlighted on the topology map, allowing quick identification of routing problems.

The integrated Fibre Channel ping tool offers multipoint connectivity analysis for thorough network connectivity testing and round-trip latency performance validation. The user-defined latency threshold feature allows flagging of out-of-range values. Storage administrators can perform periodic connectivity analysis between all endpoints and run in-depth switch-health analysis to help ensure network reliability between storage devices and application servers.

The Cisco MDS 9000 SAN-OS Software Switched Port Analyzer (SPAN) feature allows administrators to nonintrusively analyze Fibre Channel control and data-plane traffic. Traffic through Fibre Channel interfaces can be replicated on any port configured as a SPAN destination (SD port) in the fabric. Typically, a traffic analyzer had to be brought in and placed in the path of a troubled port, but now with the SD-port feature, a physical analyzer is no longer needed in the path.

The Cisco MDS 9124 gives IT administrators easy-to-use tools to help troubleshoot problems in the

network. Advanced diagnostic features such as SPAN also help administrators nonintrusively detect and analyze errors at the Small Computer System Interface (SCSI) Protocol level. All these tools come bundled with the base software, thus offering a comprehensive set of advanced capabilities with the product.

Summary

The storage market is undergoing transformation as a result of legislation and regulation and growth in digital media needs, causing exceptional growth in storage capacity and a need for easy-to-use backup and archive mechanisms that direct-attached storage (DAS) environments in particular are unable to accommodate.

Challenges for the current DAS model include the following:

- Management complexity
- Inefficient use of servers and storage and the costliness of adding either
- Complexity and expense of adding new applications
- Security concerns

The Cisco MDS 9124 is designed to meet these challenges and offer a real solution in an entry-level switch. It is a new class of fabric switch that targets the enterprise and commercial customer base. The Cisco MDS 9124 along with base software is designed to offer benefits such as the following:

- Ease of deployment with a point-and-click configuration wizard
- Outstanding flexibility
- Industry-leading density in its form factor
- Enterprise-class security and availability at an affordable price, with no hidden costs
- Significant competitive advantages that make it a new type of fabric switch

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