White Paper

Design a Remote-Office or Branch-Office Data Center with Cisco UCS Mini

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Executive Summary

This document describes a typical remote-office or branch-office (ROBO) data center deployment using Cisco UCS® Mini. The design provides a cost-effective deployment of computing, storage, and networking resources all in a single chassis using Microsoft Windows Server 2012 Release 2 features such as Microsoft Windows Server 2012 storage services and Cisco UCS Mini.

This document provides a reference design that can be deployed in remote and branch offices using Cisco UCS Mini and Microsoft Windows Server 2012 R2 storage service. Typical remote and branch offices don't need lot of computing and storage capacity. It is, however, very important that remote- and branch-office IT infrastructure be monitored and maintained by IT to help ensure business continuity, but deploying dedicated IT staff in remote and branch offices does not make sense financially.

The design presented in this document shows how IT infrastructure in remote and branch offices can be simplified by deploying Cisco UCS Mini for computing and Microsoft Windows Server 2012 R2 storage running on Cisco UCS C240 M3 Rack Servers. With Cisco UCS Central Software in the data center managing Cisco UCS Mini, the operational aspect of the ROBO IT infrastructure can be managed entirely from the data center. Such a solution tremendously reduces both the capital expenditures (CapEx) and operating expenses (OpEx) needed to manage the ROBO IT infrastructure.

Introduction

With Cisco UCS Mini, the Cisco Unified Computing System™ (Cisco UCS), originally designed for the data center, is now optimized for ROBO, point-of-sale, and smaller IT environments, making it an excellent fit for supporting your Microsoft workload needs. Cisco UCS Mini delivers servers, storage, and 10 Gigabit networking in an easy-to-deploy, compact form factor. Expandable to 15 servers, Cisco UCS Mini provides a scalable solution with the proven management simplicity of the Microsoft Tech Ed award-winning Cisco UCS Manager. If you have more than one site, Cisco UCS Central Software provides multisite remote management, helping ensure server consistency across every site: updating 100 sites is as easy as updating one site.

A highly manageable computing and networking platform, Cisco UCS Mini provides the optimal infrastructure for deploying and managing a Microsoft-based IT environment: from Microsoft Active Directory to a Microsoft Hyper-V based private cloud deployment.

Microsoft Windows Server 2012 R2 offers a wide variety of storage features and capabilities to address the storage challenges faced by your organization. Whether you intend to use cost-effective industry-standard hardware for most of your workloads, or SANs for your most demanding workloads, Windows Server 2012 R2 provides you with a comprehensive set of features that can help you increase the return on all your storage investments.

Windows Server 2012 R2 is designed with a strong focus on storage capabilities: from the foundation of the storage stack to improvements ranging from storage provisioning to the way that is clustered, transferred across the network, and ultimately accessed and managed. With flexible capabilities that can be combined to meet your business needs, Windows Server 2012 R2 storage solutions deliver the efficiency, performance, resiliency, availability, and versatility you need at every level.

The combined power of Cisco UCS Mini computing and Microsoft Windows Server 2012 R2 storage provides a solid infrastructure platform for ROBO applications. And with the powerful Cisco UCS management framework, the solution is cost effective to deploy and manage.

Cisco UCS Mini Solution Components

Cisco UCS B200 M3 Blade Server

Delivering performance, versatility, and density without compromise, the Cisco UCS B200 M3 Blade Server addresses a broad set of workloads, including IT and web infrastructure and distributed database, enterprise resource planning (ERP), and customer relationship management (CRM) applications. The Cisco UCS B200 M3 server harnesses the power of the Intel® Xeon® processor E5-2600 v2 product family, with up to 768 GB of RAM, two hard drives, and 10 Gigabit Ethernet, to deliver exceptional levels of performance, memory expandability, and I/O throughput for almost all applications.

Cisco UCS Virtual Interface Card 1240

A Cisco innovation, the Cisco UCS Virtual Interface Card (VIC) 1240 is a 4-port 10 Gigabit Ethernet, Fibre Channel over Ethernet (FCoE)–capable modular LAN on motherboard (mLOM) designed exclusively for the M3 generation of Cisco UCS B-Series Blade Servers. When used in combination with an optional port expander, the Cisco UCS VIC 1240 capabilities can be expanded to eight ports of 10 Gigabit Ethernet. With Receive-Side Scaling (RSS)–enabled VIC, a Server Message Block (SMB) client can make use of multichannel-enabled SMB for data transfer.

Cisco UCS Mini Blade Server Chassis

The blade server chassis for the Cisco UCS Mini can accommodate up to eight half-width Cisco UCS B200 M3 Blade Servers. The 6-rack-unit (6RU) chassis can be mounted in an industry-standard 19-inch rack such as the Cisco® R Series Racks, or it can be placed on any sturdy surface. Dual-voltage AC (100 to 120V and 200 to 240V) DC power supplies make the Cisco UCS Mini ready for global deployment.

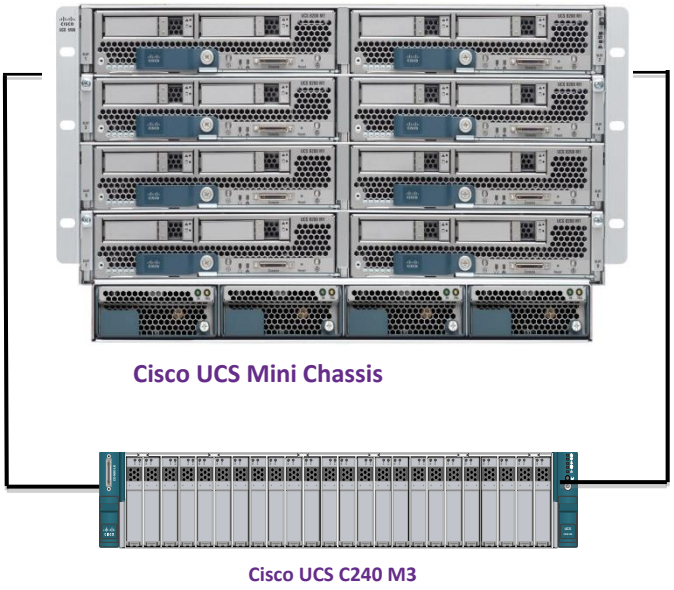
Cisco UCS 6324 Fabric Interconnect

The Cisco UCS 6324 Fabric Interconnect extends the Cisco UCS architecture into environments that require smaller domains. Providing the same unified server and networking capabilities as the top-of-rack Cisco UCS 6200 Series Fabric Interconnects, the Cisco UCS 6324 Fabric Interconnect embeds the connectivity within the Cisco UCS 5108 Blade Server Chassis to provide a smaller domain of up to 15 servers: 8 blade servers and up to 7 direct-connect rack servers.

Cisco UCS C240 M3 Rack Server

The Cisco UCS C240 M3 Rack Server (Figure 1) is designed for both performance and expandability over a wide range of storage-intensive infrastructure workloads, from big data to collaboration. The enterprise-class Cisco UCS C240 M3 server further extends the capabilities of the Cisco UCS portfolio in a 2RU form factor with the addition of the Intel Xeon processor E5-2600 and E5-2600 v2 product families, which deliver an outstanding combination of performance, flexibility, and efficiency gains. The Cisco UCS C240 M3 offers up to two Intel Xeon processor E5-2600 or E5-2600 v2 processors, 24 DIMM slots, 24 disk drives, and four 1 Gigabit Ethernet LAN-on-motherboard (LOM) ports to provide exceptional levels of internal memory and storage expandability and exceptional performance.

Figure 1. Cisco UCS Mini with Cisco UCS C240 M3 as Storage Server



Cisco UCS VIC 1225: 10 Gigabit Ethernet Option

The Cisco UCS VIC 1225 is a dual-port Enhanced Small Form-Factor Pluggable (SFP+) 10 Gigabit Ethernet and FCoE–capable PCI Express (PCIe) card designed exclusively for Cisco UCS C-Series Rack Servers. With its half-height design, the card preserves full-height slots in servers for third-party adapters certified by Cisco. It incorporates next-generation converged network adapter (CNA) technology. The Cisco VIC 1225 supports the RSS feature, which is used by the Microsoft Windows storage service to enable the multichannel SMB feature. This feature takes full advantage of the available bandwidth for SMB traffic.

Microsoft Windows Server 2012 R2

Microsoft Windows Server 2012 R2, with it many unique features, has changed the way that operating systems design storage, Hyper-V functions, and networking. With the new Microsoft Storage Spaces features, Windows 20012 R2 makes it easier and less expensive to set up rack servers such as the Cisco UCS C240 M3 to provide storage space for virtual machine and application data. Storage Spaces delivers storage virtualization capabilities so that customers can use industry-standard storage for failover clusters as well as for single-server deployments. By using the Storage Spaces tiering function introduced in Windows Server 2012 R2, both solid-state drives (SSDs) and hard-disk drives (HDDs) can be added to a storage space, and Storage Spaces will automatically differentiate between the two types of storage. The tiering function in Storage Spaces then moves frequently accessed data to the faster SSD storage and infrequently accessed data to the slower HDD storage. This movement occurs without any administrator intervention.

Design Considerations

Remote and branch offices typically have smaller numbers of users running a few main applications, with the critical transactions occurring in the main data center. Remote and branch offices serve most data requirements locally, but are connected to the data center through dedicated or other Internet connectivity options. The design of this solution aims to provide a simple computing and storage architecture that serves applications that can use locally cached data and coordinate with data center applications for business-critical transactions.

The storage subsystem design uses the Storage Spaces feature of Microsoft Windows Server 2012 R2 to provide cost-effective SAN-like storage for virtual machines running on the Cisco UCS B200 M3 computing blades in the Cisco UCS Mini chassis. The Hyper-V role in Windows Server 2012 R2 is enabled to provide the virtualization platform on Cisco UCS B200 M3 blade servers.

Cost and ease of management are the main criteria for this design. With the Cisco UCS Mini chassis, you can scale to up to 15 servers to serve typical ROBO computing requirements. The Cisco UCS C240 M3 provides up to 240 terabytes (TB) of raw storage capacity. By mixing disks such as SSD, SAS, and SATA media, you can achieve an optimal balance between cost and performance.

With cost-effective infrastructure, you can reduce CapEx. However, you should not have to spend a lot of time maintaining this infrastructure, because doing so negates the benefits gained through reduced CapEx. With Cisco UCS Central Software, you can manage the Cisco UCS Mini solution as a domain within Cisco UCS Central Software. This approach allows you to employ a uniform management framework integrated with Microsoft System Center 2012 R2.

Although the Cisco UCS C240 M3 provides RAID protection for the storage through the LSI MegaRAID controller, the solution is unlike a traditional SAN, which has redundant storage controllers built in to protect from failures at the controller level.

Solution Design

The design in Figure 2 shows two Cisco UCS B200 M3 servers that are hosting a Microsoft Windows Server 2012 R2 Hyper-V cluster. Virtual machines are running on these Hyper-V clusters, which provide high-availability capabilities for the hosted virtual machines. The Cisco UCS C240 M3 connected to Cisco UCS Mini over the 10-Gbps link acts as an SMB file share for storing virtual machine Hyper-V virtual hard disk (VHDX) files as well as any virtual machine–related data files. Windows Server 2012 R2 runs on the Cisco UCS B200 M3 blades installed on the local disks with a RAID 1 configuration. The shared disk for the cluster configuration is provided by the SMB share.

Figure 2. Physical Design of Cisco UCS Mini with Cisco UCS C240 M3

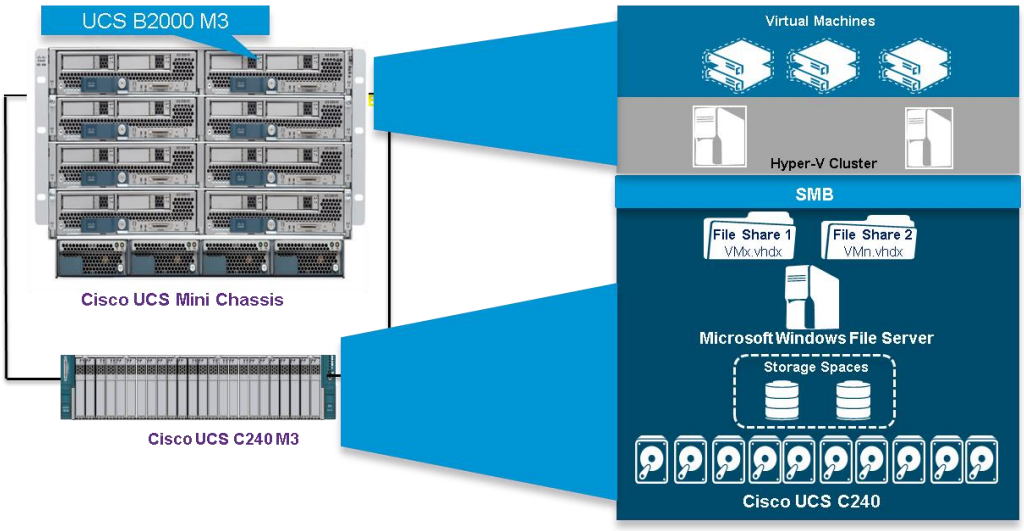


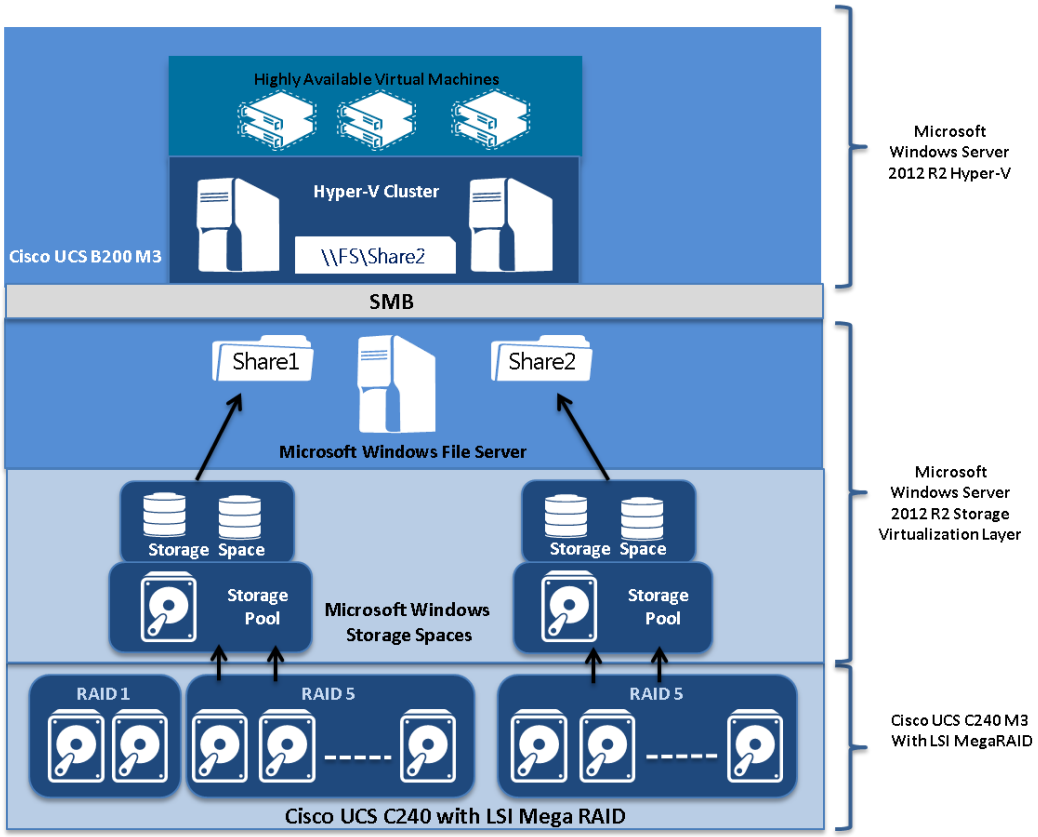
Figure 3 shows the logical design of the proposed solution. The Cisco UCS C240 M3 is configured as the Microsoft Windows SMB file server. The Cisco UCS 240 M3 can host up to 24 SFF SAS disks, which can be both SSD and SAS disks. Storage Spaces uses tiering to achieve optimal performance. In the design, three virtual disks are configured using an LSI MegaRAID card on the Cisco UCS C240 M3. A RAID 1 virtual disk is used for hosting the Windows Server 2012 R2 OS for the Cisco UCS C240 M3.

The RAID 5 virtual disks are used for Storage Spaces storage. Two storage pools are created here: one for storing virtual machine VHDX files, and another for storing virtual machine–specific data. SMB file shares are created and presented to Hyper-V and virtual machines running on the Cisco UCS B200 M3.

Because there are two 10-Gbps links between the Cisco UCS C240 M3 and the Cisco UCS Mini chassis, the SMB multichannel function is automatically configured to use the full bandwidth of both links. With this configuration, you can achieve up to 2 GB of storage bandwidth.

In this design, Microsoft Windows infrastructure management components such as Active Directory and the domain controller are outside the scope of this solution and are assumed to be provided separately.

Figure 3. Logical Configuration of the Individual Components



Conclusion

Cisco UCS Mini offers an excellent self-sufficient infrastructure solution for remote and branch offices that meets both computing and networking requirements. With Cisco UCS C240 M3 servers using Microsoft Windows Server 2012 R2 storage services features, you can design a cost-effective storage solution for to serve the Cisco UCS Mini computing stack without any additional infrastructure. With Cisco UCS Central Software, the solution is cost effective to deploy and manage. This complete end-to-end ROBO solution looks like an extension of the main data center infrastructure from the deployment and management perspectives.

For More Information

- Cisco UCS mini
  http://www.cisco.com/c/en/us/products/servers-unified-computing/ucs-mini/index.html
- Cisco UCS 240 M3 Rack Server
  http://www.cisco.com/c/en/us/products/servers-unified-computing/ucs-c240-m3-rack-server/index.html
- Microsoft Windows 2012 R2 Storage Services
  https://technet.microsoft.com/en-us/library/hh831487.aspx

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