White paper
Cisco public

Designing a Remote- or Branch-Office Data Center Using Cisco UCS X-Series Direct

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Why you should use Cisco UCS X-Series Direct at your remote-office or branch-office data centers

Executive summary

Remote- and Branch-Office (ROBO) data centers are essential to modern business operations, but they face distinct challenges compared to a centralized data center at headquarters. These challenges include remote or lean IT departments, constrained budgets, and, on top of that, the need for reliable, high-performance, and secure IT infrastructure. Additionally, branch operations are often dynamic, requiring infrastructure that can scale and adapt to changing business needs. The proposed solution leverages Cisco UCS® X-Series Direct to meet these challenges. Critical applications are hosted on the UCS X-Series Direct using a virtualization platform as virtual machines or containers, though this solution focuses on virtual machines. Cisco Intersight® provides streamlined, centralized management and built-in automation, ensuring efficient deployments across diverse geographical locations. This solution enables ROBOs to deliver the same level of performance and security as data centers located in headquarters, while maintaining the flexibility and scalability to adapt to future changes.

Introduction

Branch-office data centers play a crucial role in modern business operations, yet they face significant challenges that differ from those encountered by data centers at centralized headquarters (HQ). Despite these limitations, branch offices are expected to deliver levels of performance, security, and accessibility comparable to those at HQ. Employees at these locations require seamless access to IT resources, applications, and data to maintain productivity, facilitate collaboration, and ensure effective customer interactions.

One of the primary issues is limited or remote IT support at branch locations that is often managed from headquarters. This can lead to reduced visibility and control over branch infrastructure, affecting response times and the ability to perform routine maintenance, troubleshooting, and upgrades efficiently.

A significant challenge is providing a cost-effective solution that meets high performance and security standards. Remote offices often have limited Capital Expenditure (CapEx) budgets and must optimize Operational Expenditure (OpEx) to maximize IT investment value. Additionally, managing IT resources across multiple remote sites presents logistical and technical challenges, emphasizing the need for centralized control and streamlined management processes.

Branch operations are dynamic, with the potential for growth or reorganization over time. They need to seamlessly deploy new applications and workloads, while effectively supporting the increasing performance demands of existing ones. This variability makes it challenging for infrastructure to consistently meet these evolving needs while maintaining performance and security across all locations.

In response to these challenges, this paper outlines a comprehensive solution that leverages Cisco UCS X-Series Direct. The solution is designed to provide high-performance accelerated compute systems for modern business applications. It offers centralized management control, scalability, cost-effectiveness, and is prepared for future technologies, making it ideal for ROBO use cases. A virtualized layer is used to host essential applications, either as a virtual machine or as containers, though this solution emphasizes the user of virtual machines. Cisco Intersight facilitates easy management, ensuring seamless operations and centralized control.

Design considerations

To address the unique needs of remote- and branch-office locations, the proposed solution must deliver high performance and be easy to manage, scalable, and cost-effective.

To meet the required performance for applications, local instances of essential applications can be hosted on Cisco UCS X-Series Direct. The virtualized platform on top of the UCS X-Series compute nodes allows multiple applications to be hosted within a single chassis, optimizing infrastructure utilization. While many such applications can be hosted on UCS X-Series Direct, our solution specifically includes the Cisco Secure Firewall Threat Defense Virtual, Cisco Expressway, and Cisco Catalyst® 8000V, providing the necessary communication and security for the branch.

Cisco Intersight simplifies remote management in the branch by offering centralized control over globally dispersed infrastructure. It allows you to deploy, monitor, manage, and support both physical and virtual infrastructure from a single dashboard, regardless of your location. It helps maintain consistency through deployment-configuration cloning across multiple locations for an enterprise and empowers your team to use automation to eliminate repetitive tasks, whether using Cisco Intersight Cloud Orchestrator for workflow automation designer or integrating existing automation tool-chains.

This solution is cost-effective, reducing CapEx by integrating the Cisco UCS 9108 100G Fabric Interconnect within the chassis for streamlined connectivity to upstream switches. This Cisco UCS fabric interconnect further consolidates LAN and SAN traffic onto a single fabric, saving both CapEx and OpEx compared to traditional compute network architectures that require multiple parallel networks, different adapter cards, switching infrastructure, and complex cabling within racks.

Cisco UCS X-Series Direct is designed for growth and expansion with its modular architecture, supporting up to eight compute nodes per chassis. It features advanced Intel® Xeon® Scalable Processors, high-speed DDR5 memory, and up to 200 Gbps of unified fabric connectivity per node. This system supports emerging technologies, ensuring future-readying and adaptability to evolving business application needs. This modular design of Cisco UCS X-Series Direct allows your ROBO data center to grow alongside your branch. If necessary, the UCS X-Series Direct can also be integrated with a larger existing UCS solution at any time by swapping out UCS 9108 100G fabric interconnects for intelligent fabric modules.

Cisco UCS X-Series Direct solution components

Cisco UCS X9508 Chassis

The Cisco UCS X9508 Chassis offers a flexible and scalable solution for modern data centers. This midplane-less 7-RU chassis supports up to eight front-facing slots that can house a combination of compute nodes and a pool of future I/O resources that may include GPU accelerators, disk storage, and nonvolatile memory. At the top of the chassis are slots that house the Cisco UCS 9108 100G Fabric Interconnect, which connects the chassis to upstream switches. At the bottom are slots ready to house future I/O modules that can flexibly connect the compute modules with I/O devices. The chassis supports six 2800W power supply units (PSUs), which provide 54V power with redundancy, and four 100mm dual counter-rotating fans offer superior airflow and power efficiency.

Cisco UCS X210c M7 Compute Node

The Cisco UCS X210c M7 Compute Node has powerful performance and versatility and is designed to handle a wide range of workloads. It features dual 5th Gen Intel Xeon Scalable Processors with up to 64 cores per processor and up to 320 MB of Level-3 cache per CPU and up to 8 TB of main memory with 32x 256 GB DDR5 5600 MT/s or DDR5 4800 MT/s DIMMs, depending on the CPU. The Cisco UCS X210c M7 offers flexible storage options with up to six hot-pluggable SSDs or NVMe drives, and up to two M.2 SATA drives, with optional RAID controller or up to two M.2 NVMe drives in pass-through mode. It includes LAN on motherboard (mLOM) virtual interface cards (VICs), an optional front mezzanine GPU module, and various optional mezzanine cards. Security features include an optional trusted platform module (TPM) and anticounterfeit provisions.

Cisco UCS 9108 100G Fabric Interconnect

The Cisco UCS 9108 100G Fabric Interconnect is an integrated 1/10/25/40/100 Gigabit Ethernet, Fibre Channel over Ethernet (FCoE), and Fibre Channel switch and connects the chassis to upstream network switches. It offers up to 1.6 Tbps throughput and provides eight ports for upstream connectivity. The fabric interconnect has eight 40/100-Gbps Ethernet ports, of which the first two are unified ports supporting either 40/100-Gbps Ethernet or can break out to eight ports, providing 8/16/32 Gbps Fibre Channel connectivity options. All Ethernet ports can be configured as FCoE uplinks as well. Beyond the eight externally facing 100-G ports, the 9108 100G fabric interconnect also provides 8x 100G or 32x 25G built-in backplane connectivity to UCS X-Series compute nodes having either 100G or 25G Cisco VICs. The Cisco UCS 9108 100G Fabric Interconnect also has one network management port, one console port for initial configuration, and one USB port for saving or loading configurations.

Cisco Virtual Interface Card 15230

The Cisco UCS Virtual Interface Card (VIC) 15230 extends the network fabric directly to both servers and virtual machines so that a single connectivity mechanism can be used to connect both physical and virtual servers with the same level of visibility and control. The Cisco UCS VIC 15230 is a 2x100-Gbps Ethernet/FCoE-capable modular LAN on motherboard (mLOM) adapter designed exclusively for the Cisco UCS X-Series M7 Compute Node. It enables a policy-based, stateless, agile server infrastructure that can present to the host PCIe standards-compliant interfaces that can be dynamically configured as either NICs or HBAs. The Cisco UCS VIC 15230 is functionally equivalent to the former 15231, but it also incorporates secure boot technology.

Cisco Intersight

Cisco Intersight is a cloud-based management platform that provides comprehensive management and monitoring for Cisco UCS X-Series Direct. It allows for remote management of infrastructure, from initial provisioning to ongoing maintenance, using a single, user-friendly interface. Intersight ensures your system is always up to date, supports the latest features, and simplifies operations across multiple sites, making it ideal for remote and branch offices.

Cisco Expressway Series

Cisco Expressway Series, consisting of Expressway-C and Expressway-E, provide secure, VPN-less mobile and remote access for Cisco Webex® and TelePresence™ endpoints. Expressway-E, positioned in the DMZ, functions as the traversal server, enabling secure firewall and NAT traversal, business-to-business calling, protocol interworking, and cloud connectivity. Expressway-C, located within the internal network, forms a secure, trusted connection to Expressway-E, facilitating seamless mobile and remote access, business-to-business communications, and integration with cloud services. This solution is crucial for secure and efficient connectivity within Cisco's Collaboration Edge architecture.

Cisco Catalyst 8000V

The Cisco Catalyst 8000V is a software router that an enterprise can deploy as a virtual machine in its own virtual environment. It can run on premises on VMware ESXi or Red Hat KVM virtualization. It contains Cisco IOS® XE Software networking and security features and provides connectivity to public switched telephone networks (PSTNs) or IP PSTNs.

Cisco Secure Firewall Threat Defense Virtual

Cisco Secure Firewall Threat Defense Virtual combines advanced firewall capabilities with intrusion prevention, URL filtering, and malware defense. It offers consistent security policies across physical, private, and public-cloud environments, enabling deep network visibility and threat detection. Cisco Secure Firewall Threat Defense Virtual supports various hypervisors, including VMware ESXi, Red Hat KVM, and Nutanix AHV, ensuring robust security for virtualized deployments.

Solution design

The design features a single Cisco UCS X9508 Chassis housing two Cisco UCS X210c M7 Compute Nodes. Each node is equipped with dual 5th Gen Intel Xeon Scalable Processors, 256GB of DDR5 memory, and two 1.6TB solid-state drives. Additionally, each node includes a Cisco UCS VIC 15230 network adapter in the modular LAN on motherboard (mLOM) slot, providing up to 200 Gbps (2x100Gbps) of unified fabric connectivity to the Cisco UCS 9108 100G Fabric Interconnects within the chassis. Integrating the fabric interconnects within the chassis reduces costs and simplifies cabling, because they directly connect to the top-of-rack switches.

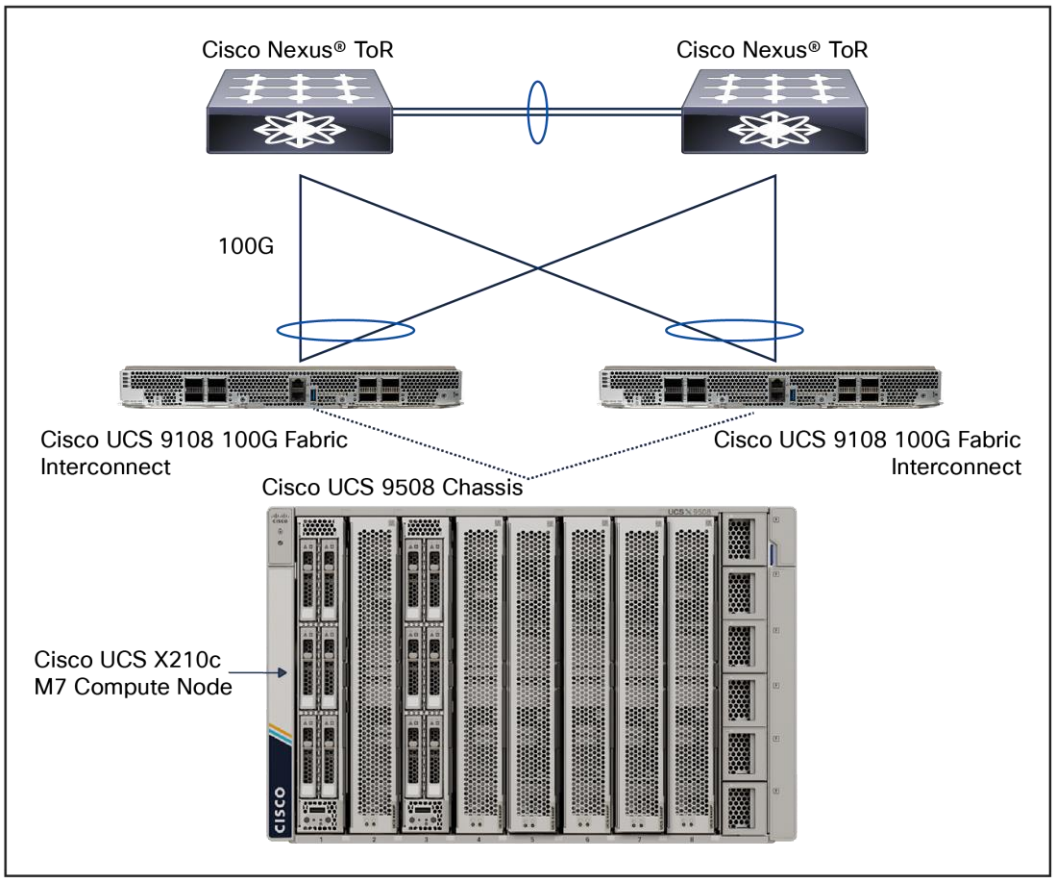

Figure 1.
Physical design of the solution with Cisco UCS X-Series Direct

A virtualization cluster (such as a Hyper-V, vSphere, or Nutanix cluster) is created across the two X210c compute nodes. This provides a layer of abstraction between the hardware of the physical servers (such as CPUs, memory, and storage) and the applications that run on them. It allows for more cost-effective utilization of hardware by running several virtual machines on a single physical server. Using a hyperconverged solution with Nutanix Unified Storage or software-defined storage solutions such as VMware vSAN. The solid-state drives attached to the compute nodes can also be pooled to create shared storage the virtual machines can access on demand. This setup ensures that if a node fails, the data remains accessible, and VMs can be restarted on other nodes in the cluster.

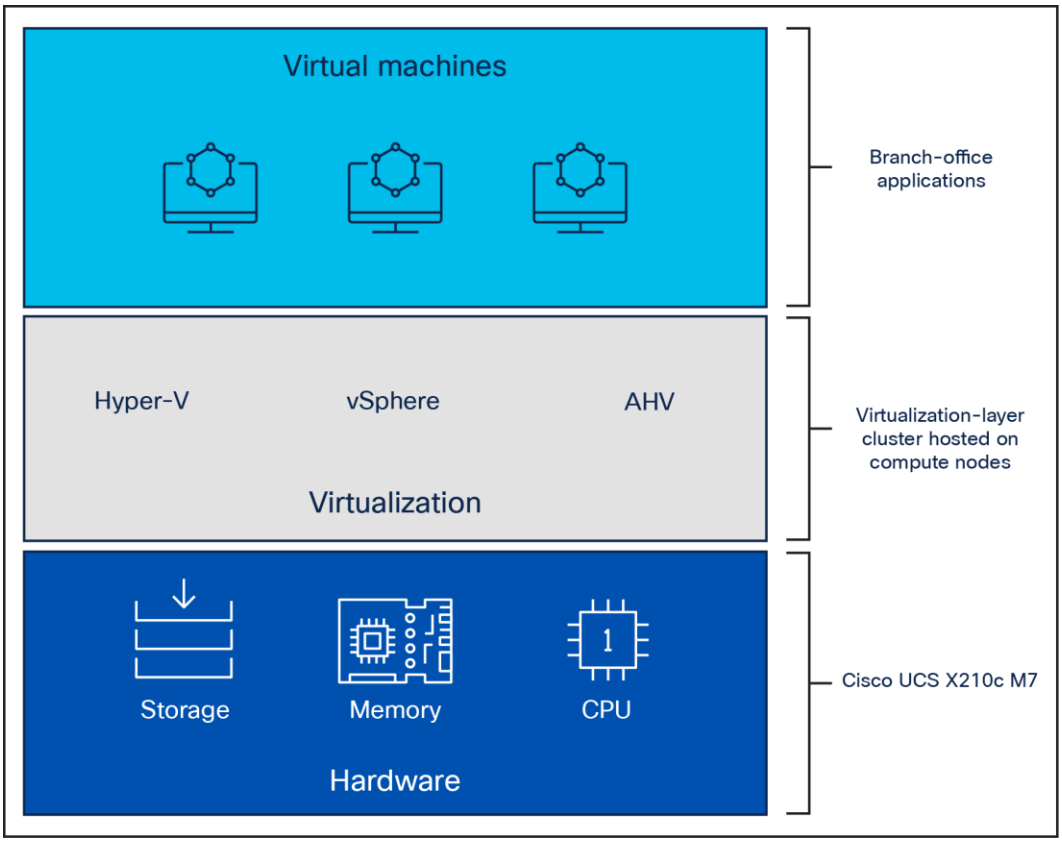

Figure 2.
Logical design of the solution

The virtualization layer on the server compute nodes will host several key applications, designed to support users at the branch. While every branch office's requirements are unique, for the scope of this solution, we integrated applications that we believe are essential components for a ROBO setup. The key applications hosted on the server are Cisco Expressway, Cisco Catalyst 8000V, and Cisco Secure Firewall Threat Defense Virtual. Together, they provide essential connectivity, networking, and security for branch office operations.

Management of the entire infrastructure is handled through Cisco Intersight, which provides cloud-based management and monitoring. This unified management approach reduces the need for on-site IT staff and allows for centralized control of the ROBO data center.

Conclusion

In conclusion, the Cisco UCS X-Series Direct solution addresses the unique needs of remote- and branch-office data centers. By leveraging advanced virtualization and centralized management through Cisco Intersight, this solution ensures high performance, security, and manageability across all locations. The modular design of the Cisco UCS X-Series allows for seamless growth and adaptability, ensuring that businesses can respond dynamically to changing demands. This comprehensive approach not only optimizes infrastructure investments, but it also ensures that remote offices can operate at the same high standards as their central headquarters, ultimately enhancing overall business efficiency and productivity.

For more information

Are you looking to set up or upgrade your Remote-Office/Branch-Office (ROBO) data centers? The Cisco UCS X-Series Direct is designed to meet your needs. For more information, visit:

- Cisco UCS X-Series Direct Data Sheet
- Cisco UCS X-Series Direct Solution Overview

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