

Cisco & NetApp FlexPod

Leveraging Cisco UCS, Cisco Nexus One, and NetApp Storage for Multi-System Deployments

EXECUTIVE SUMMARY

Modern enterprises require infrastructure that can adapt as application platforms, virtualization strategies, and business requirements evolve. Organizations need the flexibility to support traditional and cloud-native workloads, multiple virtualization environments, and diverse storage protocols without introducing unnecessary infrastructure silos, operational complexity, or barriers to workload mobility.

Cisco and NetApp commissioned Tolly to evaluate FlexPod, a jointly engineered and validated converged infrastructure solution integrating NetApp storage with Cisco Unified Computing System (UCS) and Cisco Nexus One. Tolly evaluated FlexPod demonstrating simultaneous support for VMware vSphere, Red Hat OpenShift, and Microsoft Hyper-V, workload migration from VMware to OpenShift and Hyper-V using the NetApp Shift Toolkit, and multiprotocol storage connectivity using NFS, FCP, NVMe/TCP, and iSCSI.

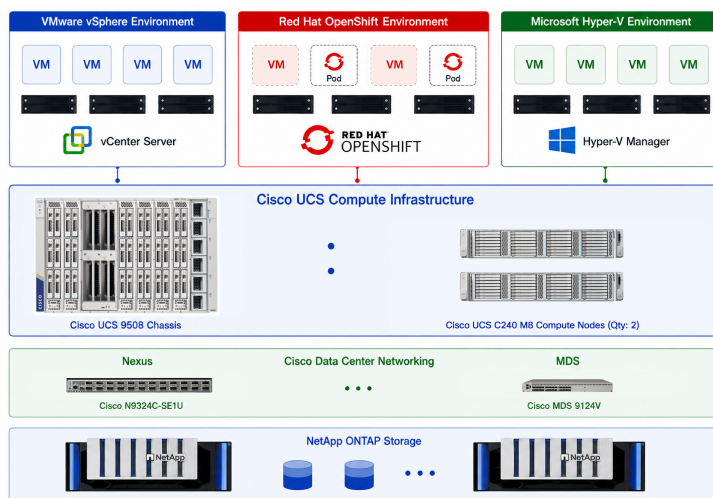
Testing demonstrated that FlexPod simultaneously supported VMware vSphere, Red Hat OpenShift, and Microsoft Hyper-V environments. Tolly successfully migrated Rocky Linux workloads from VMware to both OpenShift and Hyper-V using the NetApp Shift Toolkit. Testing also demonstrated multiprotocol storage connectivity using MDS/FCP, Nexus9K-NVMe/TCP, and iSCSI across the virtualized environments, illustrating the flexibility of the integrated Cisco and NetApp infrastructure. See Figure 1 for an environment diagram.

THE BOTTOM LINE

The Cisco + NetApp FlexPod Solution provides:

- 1 Simultaneous support for VMware vSphere, Red Hat OpenShift, and Microsoft Hyper-V environments
- 2 Multiprotocol storage support across NFS, FCP, NVMe/TCP, and iSCSI
- 3 Streamlined workload migration from VMware to OpenShift and Hyper-V using the NetApp Shift Toolkit
- 4 Integrated observability across the FlexPod environment using Splunk by Cisco
- 5 A jointly engineered and validated architecture integrating Cisco UCS and Cisco Nexus One with NetApp storage

Cisco + NetApp FlexPod: Simultaneous Support for Multiple Environments



One Cisco + NetApp FlexPod deployment simultaneously supporting:

- 1) VMware vSphere 9
- 2) Red Hat OpenShift v4.20
- 3) Microsoft Hyper-V on Windows Server 2025

Source: NetApp, Cisco Systems, Tolly, July 2026

Figure 1



Background

FlexPod combines Cisco UCS and Cisco Nexus One networking with NetApp storage in a jointly engineered and validated infrastructure architecture. This approach provides organizations with a common foundation for supporting diverse application and virtualization requirements while maintaining flexibility in compute, network, storage, and storage protocol choices. As enterprises reassess virtualization strategies and adopt cloud-native platforms alongside traditional applications, infrastructure flexibility and workload mobility become increasingly important.

Third-party validation provides independent confirmation that key elements of the integrated solution operate as intended under controlled test conditions. For this evaluation, Tolly focused on practical capabilities relevant to infrastructure choice, including simultaneous operation of multiple virtualization platforms, migration of workloads between platforms, and use of multiple storage protocols. This testing complements the engineering and validation performed by Cisco and NetApp by independently documenting the capabilities demonstrated in the FlexPod environment.

Test Results

Support for Multiple Virtualization Platforms

During Tolly testing, the Cisco and NetApp FlexPod environment shown in Figure 1 simultaneously hosted VMware vSphere, Red Hat OpenShift, and Microsoft Hyper-V. This demonstrated that a common infrastructure could support multiple enterprise

virtualization platforms without requiring separate compute, networking, or storage infrastructures.

The evaluation further demonstrated that the common infrastructure could support multiple storage protocols and workload migration between supported virtualization environments, allowing organizations to evolve their virtualization strategy while continuing to leverage the same Cisco and NetApp FlexPod foundation without requiring separate compute, networking, or storage infrastructures.

Validation Across Multiple Virtualization Platforms

Following deployment of the shared FlexPod infrastructure, Tolly verified that VMware vSphere, Red Hat OpenShift, and Microsoft Hyper-V could operate concurrently while accessing the common Cisco UCS and networking infrastructure and shared NetApp storage. The evaluation confirmed that each virtualization environment functioned independently while coexisting within the same FlexPod deployment.

This validation established the common infrastructure foundation used for the remaining protocol, migration, and observability testing described in this report.

Cisco Nexus One

Cisco Nexus One is a unified, next-generation architecture spanning from silicon to workload. It delivers standards-based, extensible, and secure data center networking with integrated operations across hybrid cloud, AI, and traditional environments. By anchoring on open standards and flexibility, Cisco Nexus One empowers customers to choose their preferred operational model, on-premises via Cisco Nexus Dashboard or cloud-managed via Nexus Hyperfabric¹, while ensuring consistent security and observability across all layers. Overarched by Cisco Cloud Control, Cisco Nexus One provides a unified management plane that empowers both human and AI-driven operations, ensuring seamless scalability and simplified lifecycle management. See the Cisco Cloud Control sidebar for an overview of the platform and key capabilities. See the Cisco Smart Switches sidebar on page 7 for additional information.

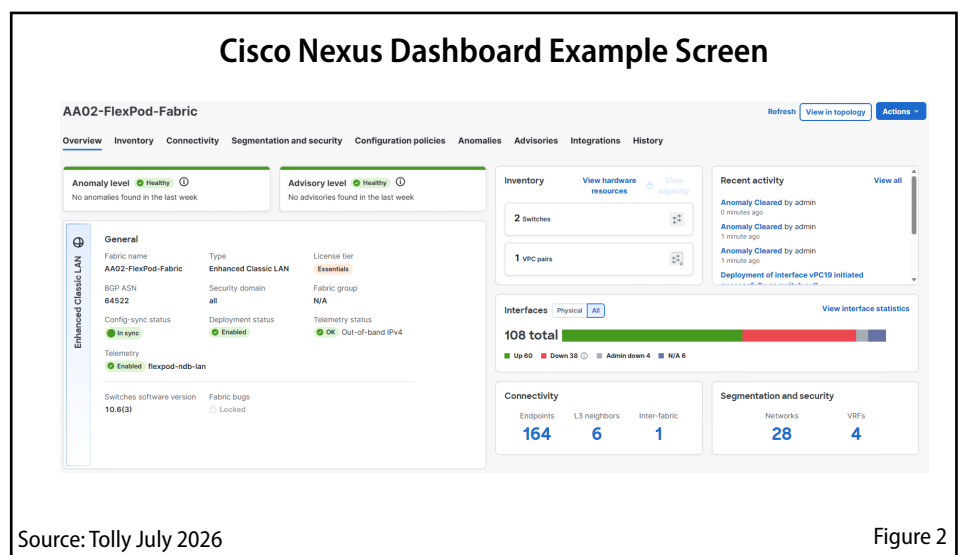


Figure 2

¹ FlexPod has not been tested with Nexus Hyperfabric or its supported switches in this validation report.



Cisco MDS 9000 Series Fibre Channel Switches

Cisco notes that the Cisco MDS 9000 Series Multilayer switches provide a robust, intelligent foundation for your storage network, lowering total cost of ownership through advanced management and multiprotocol convergence. The MDS 9124V, a 64-Gbps 24-port fibre channel switch within the Cisco MDS 9000 Series portfolio, delivers advanced capabilities including high-performance throughput, fully integrated SAN analytics, and Dynamic Ingress Rate Limiting (DIRL) to ensure congestion-free, reliable operations. These insights are seamlessly surfaced through Cisco SAN Analytics, which streams real-time performance data directly into the Cisco Nexus Dashboard for a unified, end-to-end management experience that simplifies operations and accelerates troubleshooting across your entire data center infrastructure.

Cisco Nexus Dashboard Visibility

Following deployment of the FlexPod environment, Cisco Nexus Dashboard provided centralized management and visibility into the networking infrastructure across both LAN and SAN fabrics supporting VMware vSphere, Red Hat OpenShift, and Microsoft Hyper-V. From a single management interface, administrators could view network segments, virtual routing instances, VLAN configuration, and deployment status across the shared FlexPod environment.

The Cisco Nexus Dashboard complemented the jointly engineered FlexPod architecture by providing a consolidated operational view of the underlying Cisco Nexus One data center networking infrastructure. As

organizations deploy multiple virtualization platforms within a common FlexPod environment, centralized visibility can simplify day-to-day administration and verification of network configuration. See Figure 2.

Multiprotocol Storage Support

One of the key advantages of the Cisco + NetApp FlexPod architecture is its ability to support multiple enterprise storage protocols within a common infrastructure. This flexibility enables organizations to select the storage protocol most appropriate for individual workloads while continuing to leverage the same Cisco UCS and networking infrastructure integrated with NetApp ONTAP storage infrastructure.

NetApp differentiates its NFS implementation by combining mature, high-performance NFS capabilities with enterprise data management. This provides a common platform for file workloads, data protection,

Cisco Systems +
NetApp, Inc.

Cisco + NetApp
FlexPod

"Better Together"
Multi-Tenant
Solution



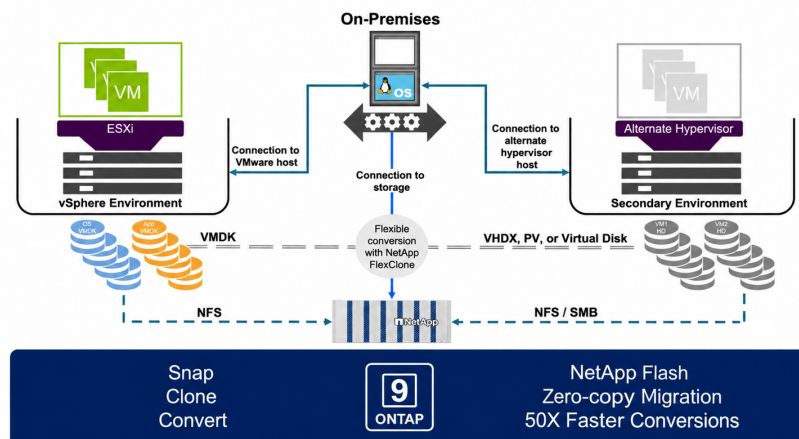
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and hybrid-cloud operations, with NFS benefiting from ONTAP capabilities for performance, availability, protection, and data mobility.

Rather than evaluating comparative protocol performance, Tolly verified successful operation of Fibre Channel Protocol (FCP), NVMe/TCP, and iSCSI across the supported virtualization environments. As summarized in Table 1, FlexPod successfully supported the tested protocol combinations for VMware vSphere, Red Hat OpenShift, and Microsoft Hyper-V. The multiprotocol capabilities

NetApp Shift Toolkit VM Conversion Overview

Migrating VMs: VMware ESXi / Hyper-V / OpenShift Virt / OLVM / Proxmox / AWS



Source: NetApp July 2026

Figure 3



Protocol Support and Virtual Machine Migration Tested Across Cisco + NetApp FlexPod Environment

Area	Test Case	Test Result
Protocol Support	FCP on Red Hat OpenShift	✓
	NVMe-TCP on Red Hat OpenShift	✓
	iSCSI on Red Hat OpenShift	✓
	FCP on VMware	✓
	NVMe-TCP on VMware	✓
	FC-NVMe on VMware	✓
	iSCSI on VMware	✓
	FCP on Hyper-V on Windows Server 2025	✓
NetApp Shift Toolkit VM Migration	VMware Rocky Linux to Red Hat OpenShift	✓
	VMware Windows Server 2025 to Red Hat OpenShift	✓
	VMware Rocky Linux to Microsoft Hyper-V	✓
	VMware Windows Server 2025 to Microsoft Hyper-V	✓

Note: As of July 2026 Microsoft did not offer a production driver for FC-NVMe on Windows Server 2025.

Source: Tolly July 2026

Table 1

demonstrated during testing enable organizations to consolidate diverse workloads onto a shared storage infrastructure, reducing operational complexity while improving storage utilization and management consistency.

Workload Migration with NetApp Shift Toolkit

Organizations evaluating alternative virtualization platforms require practical methods for migrating existing workloads while minimizing operational complexity. As part of this evaluation, Tolly used the NetApp Shift Toolkit to migrate both Linux and Windows virtual machines from VMware vSphere to Red Hat OpenShift and Microsoft Hyper-V. See Figure 3.

As summarized in Table 1, the migration scenarios completed successfully for each supported operating system and destination

platform. These results demonstrate that organizations can migrate existing VMware-hosted workloads to alternative virtualization environments while continuing to leverage the common Cisco UCS and networking infrastructure integrated with NetApp ONTAP storage infrastructure.

The migration validation complements the FlexPod architecture by demonstrating that infrastructure flexibility extends beyond storage connectivity and virtualization platform support.

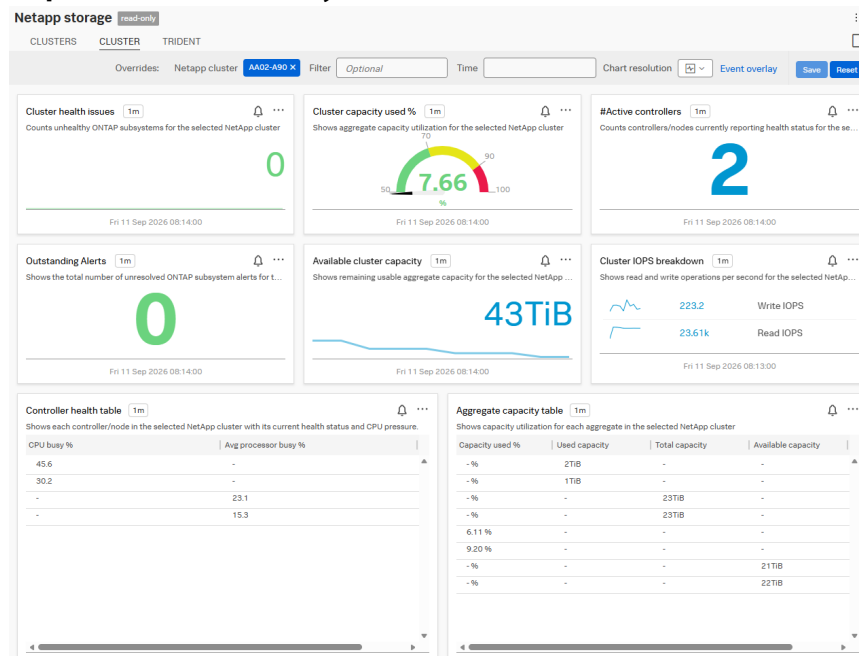
Organizations can evolve virtualization strategies while preserving investments in existing compute, network, and storage infrastructure, reducing the cost and risk associated with platform transitions.

Integrated Observability with Splunk by Cisco

Testing demonstrated integrated observability of the FlexPod environment using Splunk by Cisco.

According to Cisco, Splunk Observability Cloud provides end-to-end visibility and real-time, AI-assisted troubleshooting at any scale. This allows the customer team to detect and resolve performance bottlenecks across infrastructure, applications, and user interfaces before they impact your business. Built on OpenTelemetry, the platform standardizes data ingestion to ensure consistent instrumentation across all data types. By transforming raw metrics, traces, and logs into actionable insights, it ensures customer resources remain focused on maintaining reliability, delivering great customer experiences, and accelerating innovation without the friction of data silos.

Splunk Observability Cloud - FlexPod Information Screen



Source: Tolly September 2026

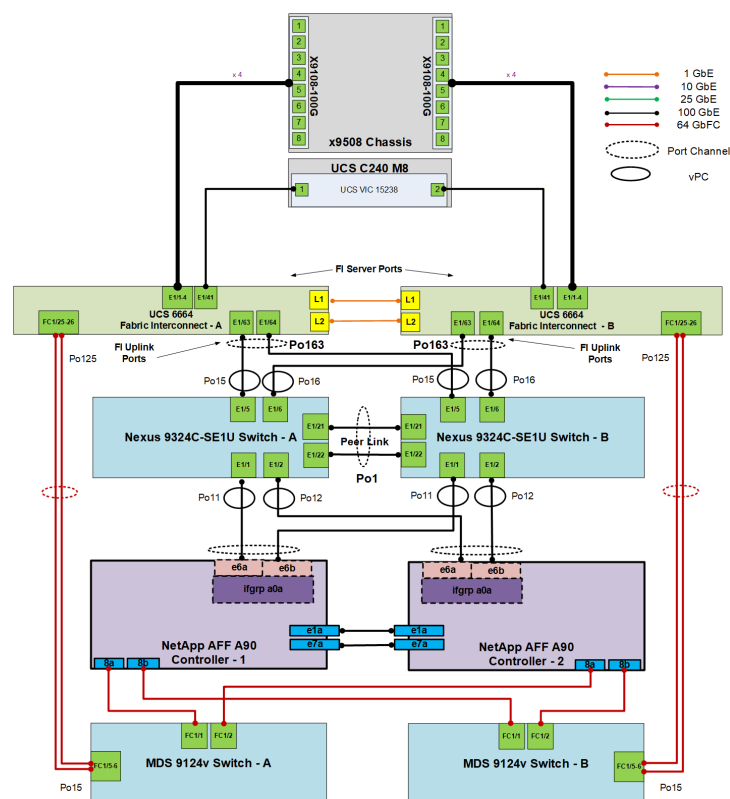
Figure 4

NetApp Harvest running in OpenShift collected telemetry from the NetApp storage system, while NetApp Trident generated Prometheus metrics for the OpenShift storage environment. An OpenTelemetry collector forwarded these metrics to Splunk Observability Cloud, where FlexPod information was displayed through dashboards showing storage health, capacity, controller status, IOPS, and Trident-related metrics. During the demonstration, additional read activity generated by an FIO workload was reflected in the Splunk dashboard, confirming visibility into live FlexPod storage activity. See Figure 4.

Test Environment

Tolly evaluated the Cisco + NetApp FlexPod solution across multiple test scenarios involving VMware vSphere, Red Hat OpenShift, and Microsoft Hyper-V environments. Because the validation encompassed multiple virtualization platforms, storage protocols, and migration

Cisco + NetApp FlexPod Environment Tested



Source: Tolly July 2026

Figure 5

scenarios, the specific configuration and methodology varied according to the test being performed. Figure 5 provides an overview of the environment.

Detailed deployment and configuration guidance for the tested environments is

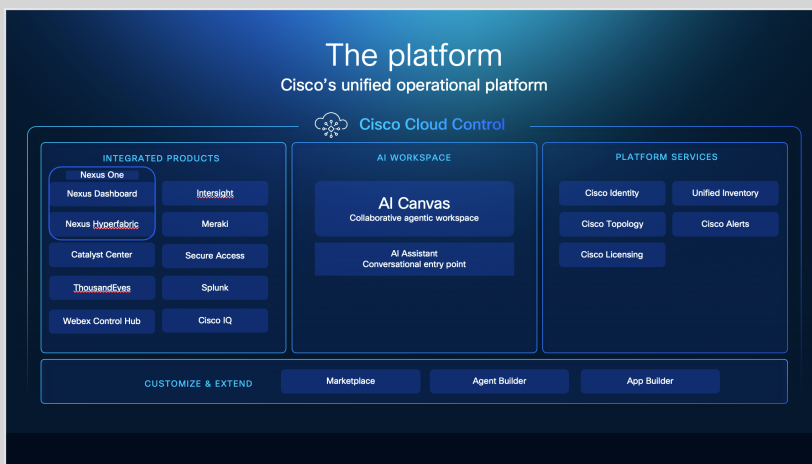
documented in the applicable Cisco Validated Designs (CVDs). These CVDs provide comprehensive information on the Cisco UCS, Cisco Nexus One networking, and NetApp storage configurations underlying the FlexPod environments. See Table 2 for a

listing of the hardware/software elements used in this evaluation.

Readers seeking implementation-level configuration details should refer to the CVDs identified in this report on page 7.

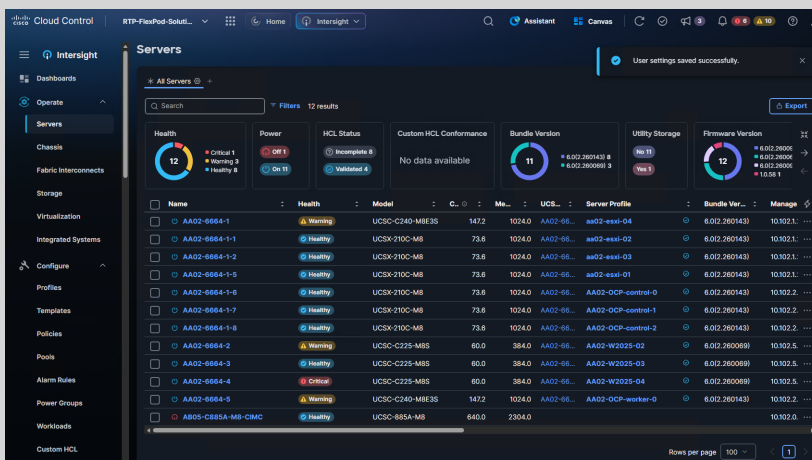
Cisco Cloud Control

Cisco Cloud Control is a unified operations platform designed to simplify management across Cisco networking, security, compute, collaboration, and observability solutions. This platform serves as the foundation for Cisco's "AgenticOps" model, built for humans and AI agents to run critical IT infrastructure together. It provides AI-assisted workflows, cross-domain visibility, and integrated management intended to help IT and Security Ops teams identify, investigate, and resolve operational issues more efficiently. Cisco Nexus One integrates into Cisco Cloud Control to bring the data center networking portfolio under a Cisco-wide unified management plane. The figures provide an overview of the platform and an example of a detailed operational screen.



Benefits of Cisco Cloud Control

- Single login across the Cisco portfolio
- Unified management of entire Cisco estate
- Real-time topology visualization
- Cross-domain operational visibility
- AI-assisted investigation and troubleshooting
- Correlated alerts to help identify root causes
- AI Canvas collaboration workspace for operators and AI agents
- Extensible platform supporting third-party integrations through Cisco Cloud Control Studio
- Powered by the industry-leading Cisco Deep Network Model, delivering 20% greater precision in troubleshooting and operational tasks (not validated by Tolly)



Source: Cisco Systems

Cisco Validated Design (CVD) Program

The Cisco Validated Design (CVD) program consists of systems and solutions designed, tested, and documented to remove guesswork, facilitate faster, more reliable customer deployments with predictable outcomes.



Source: Cisco Systems & NetApp

Examples of Cisco Validated Designs supporting FlexPod include:

- [FlexPod Datacenter Base Manual Configuration with Cisco IMM and NetApp ONTAP Deployment Guide](#)
- [FlexPod Datacenter Zero Trust Framework](#)
- [FlexPod Datacenter with Red Hat OpenShift with Intel CPUs FC-Boot Manual Config Deployment Guide](#)

Cisco Smart Switches

Protecting high-value digital assets is business-critical, and the Cisco Nexus One architecture with Cisco N9300 Smart Switches delivers advanced, zero-trust security without compromise. By integrating the Cisco Silicon One® E100 ASIC with AMD DPUs, the Cisco N9324C-SE1U provides a 24-port 100G switch with 800G DPU service throughput for real-time, stateful microsegmentation. Operations are streamlined through a unified management approach, where Cisco Nexus Dashboard handles networking, while the Hypershield on-premise controller manages security and also integrates with Cisco Security Cloud Control SaaS-based management. Furthermore, the Cisco Hybrid Mesh Firewall solution allows you to manage security policies seamlessly across public-cloud workloads, on-premises segments, and traditional firewalls, future-proofing your infrastructure for the most demanding hybrid-cloud and AI workloads.



Source: Cisco Systems



Cisco + NetApp FlexPod Configuration Summary

Infrastructure Layer	Device	Quantity	Firmware/ Software	Comments
Compute	Cisco UCS Fabric Interconnect 6664	2	6.0(2.260055)	
	Cisco UCS X210c M8 with 2 Intel 6515P CPUs and 1024GB RAM	6	6.0(2.260143)	3 for VMware, 3 for OpenShift
	Cisco UCS C240 M8 EDSFF E3.S with 2 Intel I6530P CPUs and 1024GB RAM	1	6.0(2.260143)	
	Cisco UCS C240 M8 EDSFF E3.S with 2 Intel I6530P CPUs, 1024GB RAM, and 1 NVIDIA L40S GPU	1	6.0(2.260143)	
	Cisco UCS C225 M8 with 1 AMD EPYC 9224 CPU and 384GB RAM	3	6.0(2.260069)	For Hyper-V
	Cisco UCS X9508 Chassis	1	6.0(2.260143)	
	Cisco UCS X580p PCIe Node with 2 NVIDIA H200 NVL GPUs and 2 NVIDIA L40S GPUs	1	6.0(2.260143)	
Network	Cisco Nexus Dashboard	2	4.2.1	1 3-Node Virtual for LAN and 1 1-Node Virtual for SAN
	Cisco N9324C-SE1U NX-OS	2	10.6(3)F	Cisco Nexus Smart Switch
	Cisco MDS 9124V	2	9.4(3b)	
Storage	NetApp AFF A90	2	ONTAP 9.19.1	2-Node Cluster Latest patch release

Source: Tolly, July 2026

Table 2



About Tolly

The Tolly Group companies have been delivering world-class IT services for more than 35 years. Tolly is a leading global provider of third-party validation services for vendors of IT products, components and services.

You can reach the company by E-mail at info@tolly.com, or by telephone at +1 561.391.5610.

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