Modern Virtualization with Red Hat OpenShift on Lenovo ThinkSystem

Solution Brief

Enterprise IT organizations are modernizing virtualization strategies as rising licensing costs, operational complexity, and the need for consistent hybrid-cloud operations drive reassessment of traditional hypervisor platforms. Red Hat OpenShift® provides a Kubernetes-native application platform that enables organizations to run and manage virtual machines and containerized applications through a single, unified operational model.

This solution highlights Red Hat OpenShift Virtualization deployed on Lenovo ThinkSystem infrastructure, delivering a supported, enterprise-ready platform for modernizing virtual machine environments without disruption. The solution is delivered on a broad portfolio of Lenovo ThinkSystem servers, SR630, SR650, SR635, SR655, and SR665 along with DM5200H Storage, allowing organizations to align infrastructure choice to workload requirements while maintaining a consistent OpenShift control plane across environments.

Business Challenges

IT organizations must continue to support mission ￼critical virtual machines while simultaneously deploying containerized, hybrid ￼cloud, and AI-enabled workloads. Rising hypervisor licensing costs, fragmented infrastructure stacks, and siloed operational models increase total cost of ownership and slow innovation, Common virtualization challenges include:

- **Escalating Licensing Costs**

  Rising hypervisor licensing and subscription models are increasing operational expenses and reducing cost predictability for existing virtualized environments

- **Modernization Without Disruption**

  Mission-critical VM workloads must remain stable and supported even as organizations pursue cloud-native and Kubernetes-based modernization

- **Hardware Underutilization**

  Legacy architectures often limit consolidation density, preventing organizations from fully leveraging modern, high-core-count processors

- **Parallel VM and Container Platforms**

  Separate stacks for virtual machines and containers create infrastructure sprawl, inefficient resource utilization, and higher management overhead

- **Operational Complexity**

  Disparate tooling, security models, and lifecycle processes across platforms slow operations and increase the risk of configuration drift.

- **Hybrid-Cloud Readiness Gaps**

Inconsistent platforms across on premises and cloud environments hinder application portability, automation, and long term cloud strategy alignment

Many enterprises are forced to operate separate VM and container platforms, increasing cost, complexity, and operational risk while limiting flexibility for future modernization initiatives.

Solution Overview

The solution architecture is centered on **Red Hat OpenShift**, which provides a Kubernetes-native platform for running and managing virtual machines and containerized applications through a single, unified control plane.

Red Hat OpenShift Virtualization extends the platform to support traditional virtual machine workloads alongside containers, enabling consistent lifecycle management, security enforcement, and automation across infrastructure environments. OpenShift serves as the authoritative management layer, abstracting underlying hardware differences while delivering a common operational model for virtualization modernization and hybrid-cloud adoption.

Compute Foundation

Lenovo ThinkSystem servers provide a validated, high-performance compute foundation:

- **ThinkSystem SR630 V4 / SR650 V4 (Intel-based)** - Balanced platforms optimized for general-purpose virtualization and mixed workloads.
- **ThinkSystem SR635 V3 / SR655 V3 (AMD-based)** - Efficient single-socket systems designed for high VM density and optimal price-performance.
- **ThinkSystem SR665 V3** - High-density, dual-socket platform for large-scale and performance-intensive environments. Persistent storage services are delivered by Lenovo

Storage Integration

Lenovo ThinkSystem DM5200F all-flash storage provides enterprise-grade persistent storage for both virtual machines and containers. Integration through the Lenovo Triton CSI driver enables:

- Kubernetes-native storage provisioning
- Snapshots, cloning, and replication
- Consistent data management across workloads

Management and Operations

The solution integrates:

- Red Hat OpenShift for cluster lifecycle, workload orchestration, and automation
- Lenovo XClarity for hardware management, monitoring, and firmware lifecycle

Together, these components deliver a cohesive solution architecture that supports virtualization modernization today while providing a scalable, future-ready foundation for hybrid-cloud and application modernization initiatives.

SR630 V4	High-density performance in a 1U footprint for scalable virtualization and efficient workload consolidation
SR635 V3	Balanced performance and density for general-purpose virtualization and consolidation
SR650 V4	Flexible 2U performance and expansion optimized for large-scale virtualization, hybrid cloud, and future-ready workloads
SR655 V3	High memory capacity and expansion for core data center virtualization workloads
SR665 V3	Maximum compute density, I/O scalability, and performance for large-scale and mission-critical virtualization
DM5200F	Enterprise all-flash storage delivering shared persistent storage for virtual machines and containers via Triton CSI

Simplified Deployment and Management

This solution is designed to streamline deployment and simplify ongoing operations through validated Lenovo infrastructure and integrated Red Hat tooling. Some of the capabilities that this enable include:

- Standardized cluster deployment and lifecycle management
- Integrated storage provisioning within OpenShift
- Unified management for VMs and containers
- Automated infrastructure and workload operations

Storage provisioning and lifecycle operations are integrated directly into OpenShift using the Lenovo Triton CSI driver, enabling consistent storage management workflows across both virtual machines and containers.

Key Benefits

Key benefits of the solution include the following:

- **Unified Virtualization Platform**

  Run and manage virtual machines and containers together using Red Hat OpenShift Virtualization.

- **Modernization Without Disruption**

  Preserve existing VM workloads while adopting Kubernetes and cloud-native practices at your own pace.

- **Operational Consistency**

  Standardize operations using OpenShift APIs, security, and lifecycle tooling across environments.

- **Efficient Infrastructure Utilization**

  Intel Xeon 6 and AMD EPYC–powered ThinkSystem platforms enable high consolidation density aligned with OpenShift's node-based subscriptions.

- **Operational Consistency**

  A unified Kubernetes-based operating model simplifies management, automation, and security.

- **Enterprise Storage Integration**

  Persistent storage services delivered through DM5200F and Triton CSI provide snapshots, cloning, and data protection using Kubernetes-native workflows.

- **Hybrid-Cloud Readiness**

  Consistent OpenShift operations across on-premises and public cloud environments.

Use Cases

These solutions address a wide range of enterprise deployment scenarios:

- **Enterprise Virtualization Consolidation**

  Optimize and consolidate large-scale VM environments.

- **Virtualization modernization and VMware alternative**

  Transition from traditional hypervisors to a modern Kubernetes-based platform.

- **Mixed VM and container environments**

  Run virtual machines and containers side-by-side.

- **Dev/Test and CI/CD platforms**

  Support modern application development pipelines.

- **Edge and ROBO deployments**

  Extend consistent infrastructure to distributed environments.

- **Infrastructure consolidation**

  Power your most performance-sensitive enterprise workloads easily.

Conclusion

Lenovo ThinkSystem servers, combined with DM5200F storage and Red Hat OpenShift, provide a

modern, enterprise-ready platform for virtualization transformation. By unifying virtual machines and containers on a single platform, organizations can reduce complexity, improve infrastructure efficiency, and regain cost control, while preparing for hybrid-cloud and AI-driven use cases. Backed by Lenovo's global support and close collaboration with Red Hat, this solution delivers a scalable, low-risk path to modernization and long-term innovation.

Bill of Materials

Bill of Materials configurations may vary based on selected ThinkSystem Server platform (SR630, SR635, SR650, SR655, or SR665), and the ThinkSystem Storage platform (DM5200H) workload requirements, and target scale.

The following tables list the components of the solution.

Table 1. Bill of Materials for Small Three Node Intel Cluster with Storage

Part Number	Product Description	Quantities
7DG9CTO1WW	ThinkSystem SR630 V4-3yr Base Warranty	3
C5QV	Intel Xeon 6517P 16C 190W 3.2GHz Processor	6
C0U9	ThinkSystem 32GB TruDDR5 6400MHz (1Rx4) RDIMM	48
BM35	ThinkSystem RAID 940-16i 4GB Flash PCIe Gen4 12Gb Adapter	3
C0ZU	ThinkSystem 2.5" U.2 VA 3.84TB Read Intensive NVMe PCIe 5.0 x4 HS SSD	12
CC7G	ThinkSystem M.2 RAID B550i-2i SATA/NVMe Enablement Kit	3
C287	ThinkSystem M.2 VA 960GB Read Intensive NVMe NHS SSD	3
BE4T	ThinkSystem Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-port OCP Ethernet Adapter	3
B8PP	ThinkSystem Mellanox ConnectX-6 Dx 100GbE QSFP56 2-port PCIe Ethernet Adapter	3
C0U5	ThinkSystem 1300W 230V/115V Platinum CRPS Hot-Swap Power Supply v2.4	6
C1YT	ThinkSystem 1U V4 Performance Fan Module	12
SCY0	Lenovo XClarity XCC3 premier - FOD	3
7Q01CTS4WW	SERVER PREMIER 24X7 4HR RESP	3
7DHYCTO1WW	Lenovo ThinkSystem DG5200 QLC All Flash Array	1
BF3C	Lenovo ThinkSystem Storage 2U NVMe Chassis	1
C4A5	Lenovo ThinkSystem DM/DG5200 Series Controller, 64GB	2
C5RG	Lenovo ThinkSystem 30.7TB (2x 15.36TB QLC NVMe SED) Drive Pack	4
C4AA	Lenovo ThinkSystem Storage 100Gb 2 port Ethernet	2
CCWL	Lenovo ThinkSystem Storage ONTAP 9.17 Software Encryption - IPAv2	1
C6S2	Premier 24x7 4hr Response and KYD	1

Table 2. Bill of Materials for Medium Six Node Intel Based Cluster with Storage

Part Number	Product Description	Quantities
7DGDCTO1WW	ThinkSystem SR650 V4-3yr Base Warranty	6
C3QK	ThinkSystem SR650 V4 24x2.5" Chassis	6
C3JB	ThinkSystem General Computing - Power Efficiency	6
BVGL	Data Center Environment 30 Degree Celsius / 86 Degree Fahrenheit	6
C5QV	Intel Xeon 6517P 16C 190W 3.2GHz Processor	12
BPDQ	ThinkSystem SR650 V3 AL Extrusion Entry Heatsink	12
C0U2	ThinkSystem 16GB TruDDR5 6400MHz (1Rx8) RDIMM	96

Part Number	Product Description	Quantities
5977	Select Storage devices - no configured RAID required	6
B8NZ	ThinkSystem RAID 940-16i 8GB Flash PCIe Gen4 12Gb Adapter	12
C0ZU	ThinkSystem 2.5" U.2 VA 3.84TB Read Intensive NVMe PCIe 5.0 x4 HS SSD	12
C3RT	ThinkSystem 2U V4 8x2.5" SAS/SATA Backplane	18
C46G	ThinkSystem 2U V4 Rear 4x2.5"AnyBay Gen5 Backplane	6
C26V	ThinkSystem M.2 RAID B545i-2i SATA/NVMe Adapter	6
7DHYCTO1WW	Lenovo ThinkSystem DG5200 QLC All Flash Array	1
BF3C	Lenovo ThinkSystem Storage 2U NVMe Chassis	1
C4A5	Lenovo ThinkSystem DM/DG5200 Series Controller, 64GB	2
C5RG	Lenovo ThinkSystem 30.7TB (2x 15.36TB QLC NVMe SED) Drive Pack	6
C4AA	Lenovo ThinkSystem Storage 100Gb 2 port Ethernet	2
CCWL	Lenovo ThinkSystem Storage ONTAP 9.17 Software Encryption - IPAv2	1
C6S2	Premier 24x7 4hr Response and KYD	1

Table 3. Bill of Materials for Large Nine Node Intel Based Cluster with Storage

Part Number	Product Description	Quantities
7DGDCTO1WW	ThinkSystem SR650 V4-3yr Base Warranty	9
C3QK	ThinkSystem SR650 V4 24x2.5" Chassis	9
C3JB	ThinkSystem General Computing - Power Efficiency	9
BVGL	Data Center Environment 30 Degree Celsius / 86 Degree Fahrenheit	9
C5QV	Intel Xeon 6517P 16C 190W 3.2GHz Processor	18
BPDQ	ThinkSystem SR650 V3 AL Extrusion Entry Heatsink	18
C0U2	ThinkSystem 16GB TruDDR5 6400MHz (1Rx8) RDIMM	144
5977	Select Storage devices - no configured RAID required	9
B8NZ	ThinkSystem RAID 940-16i 8GB Flash PCIe Gen4 12Gb Adapter	18
C0ZU	ThinkSystem 2.5" U.2 VA 3.84TB Read Intensive NVMe PCIe 5.0 x4 HS SSD	18
C3RT	ThinkSystem 2U V4 8x2.5" SAS/SATA Backplane	27
C46G	ThinkSystem 2U V4 Rear 4x2.5"AnyBay Gen5 Backplane	9
C26V	ThinkSystem M.2 RAID B545i-2i SATA/NVMe Adapter	9
BYF9	ThinkSystem M.2 ER3 960GB Read Intensive SATA 6Gb NHS SSD	18
BE4T	ThinkSystem Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-port OCP Ethernet Adapter	9
BE4U	ThinkSystem Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-port PCIe Ethernet Adapter	9
SCY0	Lenovo XClarity XCC3 premier - FOD	9
7Q01CTS4WW	SERVER PREMIER 24X7 4HR RESP	9
7DJ2CTO1WW	Lenovo ThinkSystem DM5200F All Flash Array	1
BF3C	Lenovo ThinkSystem Storage 2U NVMe Chassis	1
C4A5	Lenovo ThinkSystem DM/DG5200 Series Controller, 64GB	2
C3XK	Lenovo ThinkSystem 30.7TB (2x 15.36TB NVMe SED) Drive Pack	6
C4AA	Lenovo ThinkSystem Storage 100Gb 2 port Ethernet (Host/Cluster)	2
C4AC	Lenovo ThinkSystem Storage 10/25Gb 4 port Ethernet (Host/Cluster)	2
CCWL	Lenovo ThinkSystem Storage ONTAP 9.17 Software Encryption - IPAv2	1
C6S2	Premier 24x7 4hr Response and KYD	1

Table 4. Bill of Materials for Small Three Node AMD Cluster with Storage

Part Number	Product Description	Quantities
7D9GCTO1WW	ThinkSystem SR635 V3-3yr Base Warranty	3
C2AZ	AMD EPYC 9355 32C 280W 3.55GHz Processor	3
BQ26	ThinkSystem SR645 V3/SR635 V3 Performance Heatsink (Neptune Air)	3
CBN9	ThinkSystem SR635 V3/SR655 V3 32GB TruDDR5 6400MHz (1Rx4) RDIMM-A v2	24
CBSZ	ThinkSystem M.2 VA 480GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	6
BK1J	ThinkSystem Broadcom 57508 100GbE QSFP56 2-Port PCIe 4 Ethernet Adapter	3
BNWM	ThinkSystem Broadcom 57504 10/25GbE SFP28 4-port PCIe Ethernet Adapter	3
BH9M	ThinkSystem V3 1U Performance Fan Option Kit v2	18
BNFG	ThinkSystem 750W 230V/115V Platinum Hot-Swap Gen2 Power Supply v3	6
7S0XCTO5WW	XClarity Controller Platin-FOD	3
5641PX3	XClarity Pro, Per Endpoint w/3 Yr SW S&S	3
7Q13CTOSWW	SERVER INSTALLATION	3
7Q01CTS4WW	SERVER PREMIER 24X7 4HR RESP	3
7DHYCTO1WW	Lenovo ThinkSystem DG5200 QLC All Flash Array	1
BF3C	Lenovo ThinkSystem Storage 2U NVMe Chassis	1
C4A5	Lenovo ThinkSystem DM/DG5200 Series Controller, 64GB	2
C5RG	Lenovo ThinkSystem 30.7TB (2x 15.36TB QLC NVMe SED) Drive Pack	4
C4AA	Lenovo ThinkSystem Storage 100Gb 2 port Ethernet	2
CCWL	Lenovo ThinkSystem Storage ONTAP 9.17 Software Encryption - IPAv2	1
C6S2	Premier 24x7 4hr Response and KYD	1

Table 5. Bill of Materials for Medium Six Node AMD Cluster with Storage

Part Number	Product Description	Quantities
7D9ECTO1WW	ThinkSystem SR655 V3-3yr Base Warranty	6
C2AV	AMD EPYC 9355P 32C 280W 3.55GHz Processor	6
BQF9	ThinkSystem SR655 V3 2U High Performance Heatsink	6
CBFR	ThinkSystem SR635 V3/SR655 V3 64GB TruDDR5 6400MHz (2Rx4) RDIMM-A v2	72
B8P9	ThinkSystem M.2 NVMe 2-Bay RAID Adapter	6
CBSZ	ThinkSystem M.2 VA 480GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	6
BNWM	ThinkSystem Broadcom 57504 10/25GbE SFP28 4-port PCIe Ethernet Adapter	6
BK1J	ThinkSystem Broadcom 57508 100GbE QSFP56 2-Port PCIe 4 Ethernet Adapter	6
BLL6	ThinkSystem 2U V3 Performance Fan Module	36
BNFH	ThinkSystem 1100W 230V/115V Platinum Hot-Swap Gen2 Power Supply v3	12
7S0XCTO5WW	XClarity Controller Platin-FOD	6
SBCV	Lenovo XClarity XCC2 Platinum Upgrade (FOD)	6
7Q13CTOSWW	SERVER INSTALLATION	6
7Q01CTS4WW	SERVER PREMIER 24X7 4HR RESP	6
7DHYCTO1WW	Lenovo ThinkSystem DG5200 QLC All Flash Array	1
BF3C	Lenovo ThinkSystem Storage 2U NVMe Chassis	1
C4A5	Lenovo ThinkSystem DM/DG5200 Series Controller, 64GB	2

Part Number	Product Description	Quantities
C5RG	Lenovo ThinkSystem 30.7TB (2x 15.36TB QLC NVMe SED) Drive Pack	6
C4AA	Lenovo ThinkSystem Storage 100Gb 2 port Ethernet	2
CCWL	Lenovo ThinkSystem Storage ONTAP 9.17 Software Encryption - IPAv2	1
C6S2	Premier 24x7 4hr Response and KYD	1

Table 6. Bill of Materials for Large Nine Node AMD Cluster with Storage

Part Number	Product Description	Quantities
7D9ACTO1WW	ThinkSystem SR665 V3-3yr Base Warranty	9
C2AZ	AMD EPYC 9355 32C 280W 3.55GHz Processor	18
BQ29	ThinkSystem SR665 V3 2U High Performance Heatsink	18
CA1Q	ThinkSystem 96GB TruDDR5 6400MHz (2Rx4) RDIMM-A v2	108
B8P9	ThinkSystem M.2 NVMe 2-Bay RAID Adapter	9
CBSZ	ThinkSystem M.2 VA 480GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	18
BNWM	ThinkSystem Broadcom 57504 10/25GbE SFP28 4-port PCIe Ethernet Adapter	9
BK1J	ThinkSystem Broadcom 57508 100GbE QSFP56 2-Port PCIe 4 Ethernet Adapter	9
BLL6	ThinkSystem 2U V3 Performance Fan Module	54
BPK9	ThinkSystem 1800W 230V Titanium Hot-Swap Gen2 Power Supply	18
7S0XCTO5WW	XClarity Controller Platin-FOD	9
SBCV	Lenovo XClarity XCC2 Platinum Upgrade (FOD)	9
7Q13CTOSWW	SERVER INSTALLATION	9
7Q01CTS4WW	SERVER PREMIER 24X7 4HR RESP	9
7DJ2CTO1WW	Lenovo ThinkSystem DM5200F All Flash Array	1
BF3C	Lenovo ThinkSystem Storage 2U NVMe Chassis	1
BWU8	Storage Complete Bundle Offering	1
C4A5	Lenovo ThinkSystem DM/DG5200 Series Controller, 64GB	2
C3XM	Lenovo ThinkSystem 7.68TB (2x 3.84TB NVMe SED FIPS) Drive Pack	12
C4AA	Lenovo ThinkSystem Storage 100Gb 2 port Ethernet (Host/Cluster)	2
C4AC	Lenovo ThinkSystem Storage 10/25Gb 4 port Ethernet (Host/Cluster)	2
CCWL	Lenovo ThinkSystem Storage ONTAP 9.17 Software Encryption - IPAv2	1
C6S2	Premier 24x7 4hr Response and KYD	1

Table 7. Red Hat Open Shift Subscriptions

Part Number	Product Description
7S0F014MWW	Red Hat OpenShift Virtualization Engine OVE (Bare Metal) Standard 1Yr w/Red Hat support. Feature Code: SEVR
7S0F0149WW	Red Hat OpenShift Kubernetes Engine OKE (Bare Metal) Standard 1Yr w/Red Hat support. Feature Code: SEVD
7S0F013XWW	Red Hat OpenShift Container Platform OCP (Bare Metal) Standard 1Yr w/Red Hat support. Feature Code: SEV1
7S0F014FWW	Red Hat OpenShift Platform Plus OPP (Bare Metal) Standard 1Yr w/Red Hat support. Feature Code: SEVK
7S0F014JWW	Red Hat OpenShift Virtualization Engine (Bare Metal Node), Premium 1Yr w/Red Hat support. Feature Code: SEVN

Part Number	Product Description
7S0F0146WW	Red Hat OpenShift Kubernetes Engine (Bare Metal Node), Premium 1Yr w/Red Hat support. Feature Code: SEVA
7S0F013UWW	Red Hat OpenShift Container Platform (Bare Metal Node), Premium 1Yr w/Red Hat support. Feature Code: SEUY
7S0F014CWW	Red Hat OpenShift Platform Plus (Bare Metal Node), Premium 1Yr w/Red Hat support. Feature Code: SEVG

Why Lenovo

Lenovo delivers a proven, enterprise-class foundation for virtualization modernization with a broad portfolio of ThinkSystem servers and storage platforms validated for Red Hat OpenShift Virtualization. Lenovo's open ecosystem approach, combined with deep collaboration with Red Hat and silicon partners, ensures a jointly tested, supported, and optimized solution that reduces deployment risk and operational complexity. With industry-leading reliability, flexible platform choices aligned to workload requirements, and global lifecycle services, Lenovo enables organizations to confidently modernize virtual machine environments while establishing a scalable foundation for hybrid-cloud and future application modernization initiatives.

For More Information

To learn more about this Lenovo solution contact your Lenovo Business Partner.
https://www.lenovo.com/au/en/c/servers-storage/servers/racks/

References:

Reference Architecture: Red Hat OpenShift Container Platform on Lenovo ThinkSystem, ThinkEdge and ThinkAgile HX Servers
https://lenovopress.lenovo.com/lp0968-red-hat-openshift-container-platform-reference-architecture

Red Hat OpenShift Virtualization
https://www.redhat.com/en/technologies/cloud-computing/openshift/virtualization

Authors

Jessie Lacome is a Platform Solutions Product Manager at Lenovo with extensive experience in enterprise virtualization and modern infrastructure platforms. He brings a strong consulting and solutions architecture background, supporting customers across on-premises and hybrid environments. Jessie has previously held roles at Salesforce, Citrix, and Dell, where he focused on virtualization and infrastructure solutions.

Related product families

Product families related to this document are the following:

- Red Hat Alliance
- Red Hat Enterprise Linux

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