

The Lenovo logo is displayed in white text on a black rectangular background.

Introduction to the Scale Computing HC3 Hyperconverged Solution on Lenovo Servers

Provides an overview of the hyperconverged offering from Lenovo and Scale Computing

Explains the benefits to small and mid-sized businesses, as well as distributed enterprises

Describes the three recommended configurations

Provides the bill of materials for each server configurations

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Abstract

The Scale Computing HC3 hyperconverged solution on Lenovo servers includes storage, compute, hypervisor, data management, data protection, and disaster recovery capabilities for small, midmarket and distributed enterprises.

This paper describes the major features of the Lenovo-Scale Computing solution. The intended audience for this paper includes IT professionals, technical architects, sales engineers, field consultants, and partner engineers who plan to deploy this solution.

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Introduction

The cooperation between Lenovo and Scale Computing is focused on combining the best technologies for small, midmarket, and distributed enterprises. Lenovo's broad and successful range of server has been combined with efficient, hyperconverged infrastructure software from Scale Computing for simplicity, scalability, and availability.

This solution replaces traditional complex and expensive on premise infrastructures with modern, scalable, state of the art, optimized solutions offering the best value for money.

Business value

The HC3 hyperconverged solution on Lenovo servers is specifically built for organizations with small IT staffs. HC3 solutions are widely used in the health care, education, manufacturing, financial services, and government industries. They have been specifically built for easy deployment and to be managed by IT administrators who want to spend more time focused on business needs and applications, rather than troubleshooting infrastructure and hardware issues.

Ideal for main offices, remote offices and DR sites, HC3 fits any type of environment where applications need high availability, not high costs and complexity.

The Scale Computing HC3 hyperconverged solution has the following benefits:

- ▶ Virtualization

HC3 forms the basis for a complete 'datacenter in a box' with servers, storage and virtualization integrated into a single appliance to deliver simplicity, availability and scalability.

The integrated hypervisor offers proven, open source technology with no additional licenses that guarantees easy migration from any physical or virtual environment.

- ▶ Storage

Storage is seamlessly integrated HC3 as a global namespace that is local to the applications running on HC3. No more storage subsystem, SAN, or storage protocols to manage.

- ▶ Management

There is no SAN to buy and manage, no separate management servers to buy and manage, and no separate virtualization software to manage. HC3 combines these functions into a single appliance.

- ▶ Scalability

X86 based nodes of different types can be mixed and matched in a single cluster, providing flexibility to build out the perfect infrastructure for applications.

- ▶ Economic savings

The economic value of the Lenovo/Scale Computing solution, strongly depends on the starting point and customer situation. In general, moving from the extreme situation where a customer replaces a physical, non-virtualized environment to HC3 and Lenovo servers, the solution has the following benefits:

- Save by increasing server utilisation through Virtualization by moving from physical servers to fewer servers with Virtualization (P2V)

- Save on Virtualization licensing (VMware or Microsoft) when moving to HC3 and Lenovo servers
- Save by eliminating SAN/NAS external arrays by HC3 and Lenovo servers
- Save up to 80% of infrastructure management time by using the simplified HC3 web interface running on Lenovo servers and dramatically reduce the number of vendors and management tools and required skills.

Solution overview

Scale Computing and Lenovo have partnered to combine the proven feature set built into Scale Computing's patented HC3 offering with the industry-leading reliability of Lenovo systems. The result is a world-class hyperconverged solution designed to deliver simplicity, availability, and scalability in an appliance form.

Figure 1 shows the infrastructures needed for virtualization of a traditional data center compared to virtualization with HC3.

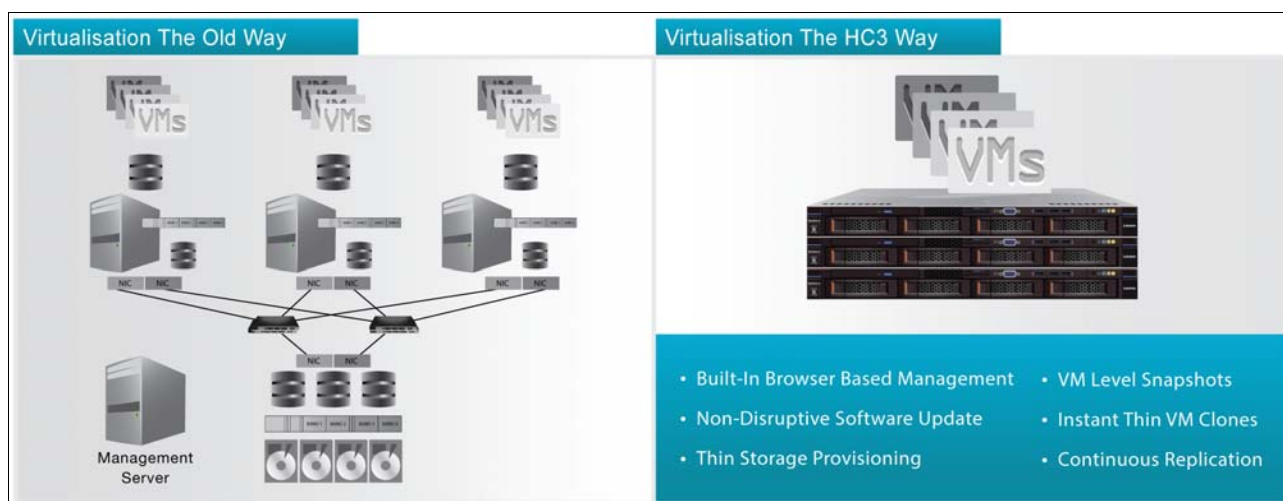


Figure 1 Traditional vs. Modern datacenter infrastructures

The solution has the following characteristics:

► **Simple**

Rather than treat storage, servers, virtualization, and management as different datacenter silos, HC3 brings these components together in a single, unified system. This unified architecture, which includes advanced automation features, allows IT administrators to focus on managing applications, not infrastructure.

HC3 lowers out-of-pocket costs and radically simplifies the infrastructure by eliminating the need for external storage, virtualization licensing, or deep-dive training on virtual infrastructure. HC3 makes deploying and managing a highly available, scalable, and high performance infrastructure as easy as managing a single server.

► **Available**

Scale Computing incorporated high availability into every level of the HC3 architecture design including hypervisor-level VM failover, storage resiliency, redundant hardware components, and even failover between HC3-based clusters.

Every VM created on an HC3 cluster is automatically highly available. HC3 stripes and mirrors data across all the drives in the cluster similar to a RAID 10 architecture so there is no single point of failure.

In the event of a failed node, HC3 automatically determines placement and restarts the virtual machines on other nodes. This clustered architecture provides the fault tolerance, redundancy, and automation built in for a highly available infrastructure.

► **Scalable**

HC3 clustered, scale out architecture allows you to seamlessly add capacity as you need it, eliminating the need to over-provision and pay for resources you won't be using. Simply add nodes when needed to increase performance, compute and storage capacity. This architecture future-proofs your infrastructure allowing users to add newer, better, faster nodes into the infrastructure as they become available.

With HC3, you can simply add capacity and performance as you need it. You no longer have guess or attempt to forecast for the unknown, what you'll need in 6 months, 1 year, or 2 years.

The HC3 hyperconverged solution on Lenovo servers is delivered as a turnkey solution based on the following components:

- Lenovo System x3550 M5 rack server with integrated storage elements
- Scale Computing HC3 KVM-based hyperconverged infrastructure software.

HC3 overview

The uniqueness of this solution is the patented HC3 software. HC3 is installed by authorized Lenovo channel partners onto specific server nodes, ready to deploy straight out-of-the-box, fine-tuned for each Lenovo node type with nothing additional to license or install. HC3 continuously monitors all virtual machines, software, and hardware components to detect and automatically respond to common infrastructure events, maintain application availability, and simplify data center management.

The Scale Computing solution on Lenovo servers was designed to provide highly available, scalable compute and storage services while maintaining operational simplicity through highly intelligent software automation and architecture simplification. HC3 puts intelligence and automation in the software layer of the infrastructure.

The solution is designed to take advantage of low cost, easily replaceable and upgradable hardware components including the virtualization capabilities built into the Lenovo server architecture. By clustering these components together into a single unified and redundant system, these attributes combine to create a flexible and complete "datacenter in a box".

Operating like a redundant and elastic "private cloud", additional nodes can be automatically "incorporated" into the cluster, and with failed hardware being expected, can easily be replaced with minimal effort or disruption.

Server Virtualization features include:

- Integrated hypervisor based on proven, open source technology with no additional licenses
- Integrated management
- Live VM migration
- Cluster to Cluster Replication

- ▶ Easy migration from physical or virtual environments with HC3 Move

Storage features include:

- ▶ Software-defined, hybrid storage system
- ▶ High performing spinning disk with optional SSD storage tier
- ▶ Streamlined, direct block-access data path
- ▶ Wide striping across cluster with redundant data placement
- ▶ Thin provisioning, snapshots, cloning

Integrated Management features include:

- ▶ Web based UI with remote site monitoring
- ▶ VM console access from within a browser
- ▶ Self-healing including automatic failover of VMs in clusters of 3+ nodes
- ▶ Rolling upgrades and patching with no downtime in clusters of 3+ nodes

Flexible scalability features:

- ▶ Industry-leading, Lenovo hardware
- ▶ Remote HC3 support
- ▶ Turnkey plug and play expansion

H3 features

Scale Computing software layer brings a range of capabilities to the Lenovo Hardware, from data efficiency, to single-click manageability:

- ▶ **HyperCore**

The heart of the HC3 platform is the HyperCore operating system which includes a fully integrated KVM-based hypervisor with Scale Computing's patented block access, direct attached storage system called SCRIBE. SCRIBE includes HEAT to automate tiering across our own hybrid flash storage architecture.

- ▶ **Scale Computing Reliable Independent Block Engine (SCRIBE)**

SCRIBE is a wide-striped storage architecture that combines all disks in the cluster into a single storage pool that is tiered between flash SSD and spinning HDD storage.

Blocks are striped across all nodes in a cluster redundantly to protect both against individual drive failure and node failure. The use of every drive through wide striping gives a performance advantage to every VM on the cluster.

Performance is also enhanced through direct block access because of the direct integration between the storage and the hypervisor resulting in Hypervisor Embedded Storage. There are no inefficient storage protocols that would normally be found in SAN or NAS-based storage solutions including Virtual Storage Appliance architectures.

- ▶ **HyperCore Enhanced Automated Tiering (HEAT)**

HyperCore Enhanced Automated Tiering is the part of SCRIBE that manages data efficiently between the flash SSD tier and the spinning HDD tier in the cluster storage pool.

HEAT prioritizes blocks of data on SSD or HDD based on a I/O heat map that tracks I/O against each virtual disk. Although HEAT is primarily automation happening behind the

scenes, it provides the ability for the user to tune the relative priority of every virtual disk in the cluster to further optimize the SSD usage where it is needed the most.

► **HC3 Web Interface**

The entire HC3 based solution (hardware and software) is managed from a single web interface that can be accessed from any node in a cluster. The simple intuitive interface design allows both storage and compute resource management and virtual machine management from a single screen. Resource statistics are displayed in real-time along with IOPS, both per VM and cluster wide. VM consoles are also immediately available from the web interface.

Figure 2 shows an example of the web interface.

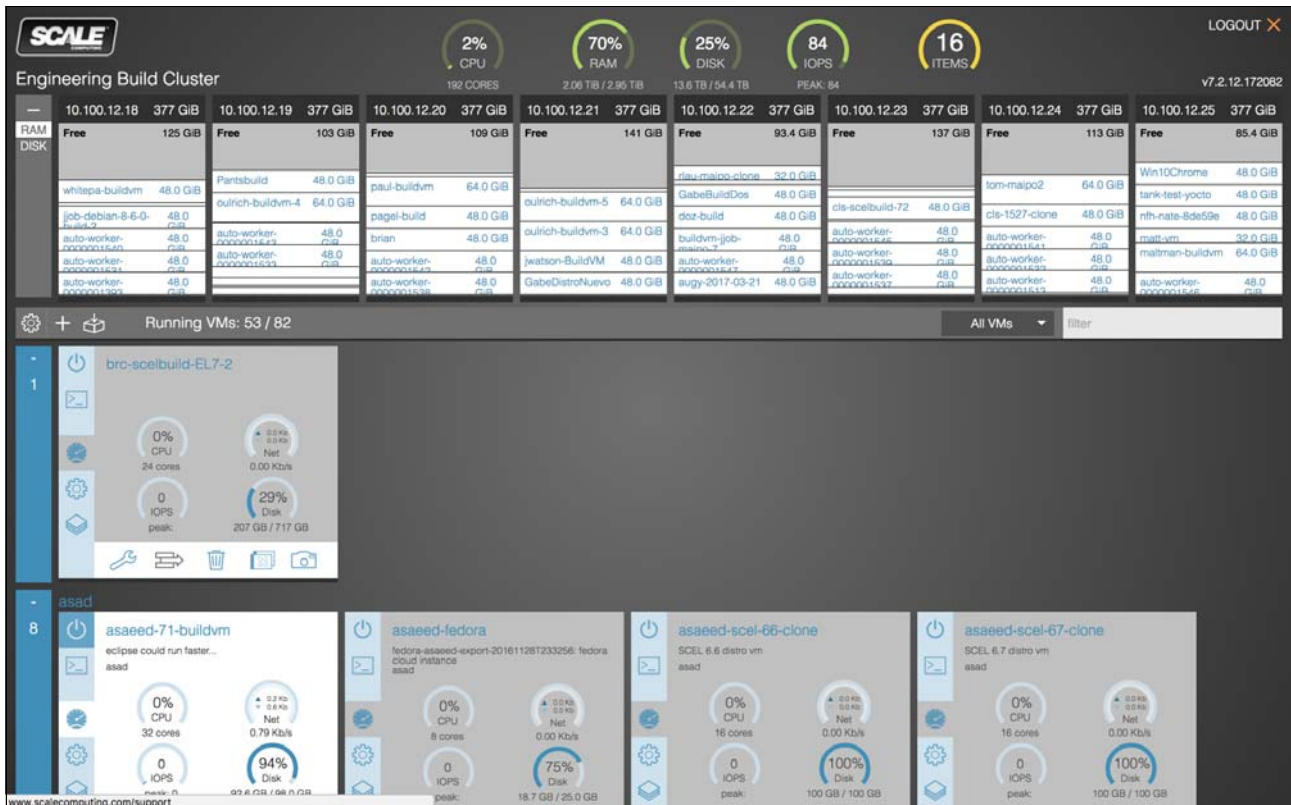


Figure 2 HC3 Web Interface

► **Rapid, Easy Deployment**

A HC3 cluster can be racked, cabled, powered on, configured in a matter of minutes, and VMs can be deployed and running in under an hour. Manage from your preferred web browser to the HC3 web interface. There is no extra software to install, simply upload ISOs to deploy VMs with your required guest OS.

► **Self Healing**

The HC3 architecture is built with layers of redundancy, such as dual active/passive network ports, redundant power supplies, and redundant block storage striped across all cluster nodes. Intelligent automation handles drive failures and node failures, redistributing data across remaining drives and VMs across remaining nodes and automatically absorbing replacement drives and replacement nodes into the resource pools.

► **VM High Availability**

If a node fails within the cluster, all VMs running on that node are automatically failed over to one of the remaining cluster nodes. Failover happens within minutes for minimal disruption. After the node has been restored or replaced, the VMs can non-disruptively be live migrated back if desired.

▶ **Live VM Migration**

VMs on HC3 clusters can be non-disruptively migrated between nodes with no downtime. This not only allows for rebalancing resource allocation across the cluster but also allows VMs to be relocated automatically during our rolling update process for the HyperCore OS firmware.

▶ **Cluster to Cluster Replication**

VMs can be replicated between two HC3 clusters with native, built-in replication. Replication can be local or remote across any distance and can be configured to replicate changes as often as every 5 minutes. Granular selection of VMs for replication allows a range of between one and all of the VMs on a cluster to be replicated. Replica VMs on the target cluster can be booted up within minutes in the event of a failure of the VM on the primary cluster.

▶ **Snapshot Scheduling**

VM snapshots can be scheduled intuitively and flexibly from the HC3 Web Interface. Schedules can include multiple rules spanning schedule intervals based on minutes to months. Schedules are created as templates that can be assigned to one or more VMs across a cluster.

▶ **Thin VM Cloning**

HC3 uses a unique thin cloning technique that allows cloned VMs to share the same data blocks as their parent VM for storage optimization, but with no dependencies. If the parent is deleted, the clone is not affected and continues operating without disruption.

▶ **Per VM Real-Time Statistics**

In addition to providing cluster-wide utilization of IOPS, Storage, RAM and CPU in the primary web interface dashboard for users, VM-level statistics are provided for each individual VM and updated in real-time.

▶ **Non-Disruptive Scale-Out**

When a cluster needs more resources, a new node can be added within minutes without any downtime to the existing nodes or VMs. After racking, cabling, powering up, and assigning an IP address, the new node and its resources are seamlessly absorbed into the cluster, including the storage capacity being immediately added to the storage pool. Adding nodes results in an immediate performance increase to the running VMs as the resource pool is expanded.

▶ **Non-Disruptive Rolling Updates**

HC3 receives software/firmware updates directly to the HC3 Web Interface where they can be applied automatically with no downtime. A single click updates the hypervisor, the storage system, the firmware, and any other part of the system. The automated update process will automatically relocate VMs between nodes to free up the nodes, one at a time, to be updated. When all the cluster nodes are updated, the VMs are returned to their original configuration across the cluster.

▶ **Mix and Match Nodes**

You can easily add a Lenovo server as a new node to increase the cluster storage pool at any point. This allows clusters to grow not just linearly but in whatever way is needed or desired. This support for different size cluster nodes can facilitate non-disruptive upgrades to the infrastructure by adding newer, bigger nodes and then retiring or repurposing older small nodes if desired, all while keeping the VMs running.

- ▶ **ScaleCare Remote Support Access**

The HC3 offers a remote access point exclusive to ScaleCare support, to help installation or diagnose support issues and take corrective actions if necessary. This remote access dramatically speeds up support issue resolution by giving ScaleCare support engineers the ability to see issues first hand and in real time.

Deployment examples

The Lenovo Scale Computing HC3 Solution enables a wide variety of applications and use cases. Typical deployment scenarios include the following:

- ▶ **Datacenter consolidation - Physical to Virtual (P2V) and Virtual to Virtual (V2V)**

HC3 is the excellent environment when moving from a pure physical, virtual or a combination of the two. In both cases, savings will be gained by server consolidation, Virtualization and Virtualization licensing costs. With HC3, you can move from a traditional infrastructure to a modern and scalable environment that is optimized for small, midmarket, and distributed enterprises.

- ▶ **Business-critical applications**

Applications such as Microsoft Exchange, SQL Server, SharePoint, Oracle, SAP or industry-specific line-of-business applications will run just like the more traditional hyperconverged application environments such as VDI (Virtual Desktop Infrastructure), VSI (Virtual Server Infrastructure) and Test and Development.

- ▶ **Single-node configurations**

Scale Computing has always offered clusters of three or more appliances (or nodes) but also recognized that there are some use cases where even a 3-node cluster is unnecessary. A single node appliance configuration can be deployed alongside HC3 clusters to enable distributed enterprise and disaster recovery use cases that provide more flexibility and cost savings than traditional cluster configurations.

- ▶ **Distributed enterprise or ROBO**

For distributed enterprise, which is sometimes referred to as remote office/branch office (ROBO), single nodes address the need for very small infrastructure requirements at locations supporting a small number of users. These remote sites, away from the central IT hub, most likely do not have any dedicated IT staff which makes management problematic. Still, these sites often need several services from Active Directory, DNS, messaging and communications, file and print services, among others.

You may be thinking that a low-cost traditional server or two would suffice for these sites, and that is how these sites have traditionally been architected. However, HC3 offers so much more than traditional server architecture for distributed enterprise. With HC3 running at both the central IT hub and the remote sites, the distributed enterprise infrastructure is not only easier to manage, but more resilient and able to be recovered from disaster much more quickly.

Remote management capabilities along with the built-in replication and self-healing alone make HC3 ideal for these remote sites but the fact that HC3 is so simple and easy to use, makes it perfect for sites without dedicated IT staff.

- ▶ **Disaster recovery**

Disaster Recovery (DR) is not a one-size fits all solution. That's why it was built into HC3 to allow you to protect your workloads down to the individual VM level. Depending on your business, you may need to protect only a few critical workloads or you may need to

protect most or all your workloads. Just because you have a multi-node HC3 cluster in production does not necessarily mean you need a duplicate cluster for DR.

The single node appliance configuration provides budget-friendly options for protecting critical workloads with replication and failover. If you can identify a handful of critical workloads that will keep your business operation in the event of disaster, you may be able to use a single node appliance to recover those workloads until you can reinstate your full HC3 production cluster. For some organizations, a single node appliance as a local replication target can provide an effective backup solution.

By implementing disaster recovery with HC3, you have great flexibility in choosing the recovery capacity you need and using capabilities that are built in at no extra cost. The single node appliance configuration enables DR to be achieved at a very low cost but with the benefits of continuous replication and failover.

► **Cloud computing**

The background for many hyperconverged infrastructure designs is based on the need to scale out, using smaller x86 type servers as building blocks for both on-premises (Private Cloud) and off premises (Public Cloud) infrastructures.

Depending on the nature of the business we expect cost, compliance, regulatory, latency, familiarity, and privacy concerns to be the basis of what the split between public and private will be. In any case, the needs for on premises infrastructure will be based on scalability, availability, and simplicity. The functionality of the HC3 hyperconverged solution is designed to address the large number of small, midmarket, and distributed enterprise in combination with global or in most case local managed/cloud service providers.

Hardware components

This section describes the major hardware components of the solution.

Lenovo System x3550 M5 rack server

The versatile 1U two-socket Lenovo System x3550 M5 rack server fuels almost any workload from infrastructure to Big Data with industry-leading reliability. It comes integrated with up to two Intel Xeon processors E5-2600 v4 series (44 cores per system), faster, energy-efficient TruDDR4™ Memory, and up to 12 drives of storage.



Figure 3 *Lenovo System x3550 M5*

Highlights

- Optimize your workloads with choice of flexible storage-based configurations, designed for infrastructure basics to business-critical applications

- ▶ Reduce unplanned downtime and minimize costs with industry-leading reliability features and tools
- ▶ Simplify server management with Lenovo XClarity™
- ▶ Safeguard enterprise data with built-in Lenovo Trusted Platform Assurance, an exclusive set of security features and practices
- ▶ Gain superior performance with Intel Xeon E5-2600 v4 processors (up to 44 cores per server), 1.5TB TruDDR4 2400MHz Memory, end-to-end 12Gbps RAID support—devices and infrastructure
- ▶ Reduce datacenter costs with smart energy-efficient features, including extended operating temperature, Titanium power supplies (up to 96 percent efficiency), active/standby power supply modes, dual fan zone design, TruDDR4 Memory (with up to 45 percent lower energy use over DDR3), and optional Lenovo XClarity Energy Manager
- ▶ Run more virtual machines and workloads with up to 22 percent more cores than the previous generation

For additional information, please refer to:

- ▶ Lenovo Press product guide
<https://lenovopress.com/lp0067-lenovo-system-x3550-m5-machine-type-8869>
- ▶ SPECcpu 2006 benchmark result
<https://lenovopress.com/lp0425-x3550-m5-speccpu2006-benchmark-result-2014-09-08>
- ▶ 3D Interactive Tour
<https://lenovopress.com/lp0481-system-x3550-m5-interactive-3d-tour>
- ▶ Lenovo XClarity management software
<https://lenovopress.com/software/management/xclarity>

Specifications of the solution

The Lenovo-Scale Computing offering is available in three different configurations to meet all customer requirements, from an entry level system, up to a more performance driven setup. The tables in this section help you identify which configuration would fit your workload requirements.

Table 1 Specifications of the Lenovo - Scale Computing offerings

	Base	Standard	Power
x3550 M5 3-node cluster	Compute: <ul style="list-style-type: none"> ▶ 24 cores ▶ 48 threads ▶ 2.1GHz ▶ 192GB RAM Storage: <ul style="list-style-type: none"> ▶ SAS Raw Capacity: 18TB ▶ SSD Raw Capacity: 2.4TB ▶ Total: 20.4TB (10.2TB usable) Network: <ul style="list-style-type: none"> ▶ 12 x 1GbE bonded active/passive 	Compute: <ul style="list-style-type: none"> ▶ 48 cores ▶ 96 threads ▶ 2.1 GHz ▶ 384GB RAM Storage: <ul style="list-style-type: none"> ▶ SAS raw capacity: 36TB ▶ SSD raw capacity: 3.6TB ▶ Total 39.6TB (19.8TB usable) Network: <ul style="list-style-type: none"> ▶ 12 x 10GbE SFP+ bonded active/passive 	Compute: <ul style="list-style-type: none"> ▶ 48 cores ▶ 96 threads ▶ 2.1GHz ▶ 768GB RAM Storage: <ul style="list-style-type: none"> ▶ SAS Raw Capacity: 72TB ▶ SSD Raw Capacity: 4.8TB ▶ Total Raw/Usable: 76.8TB /38.4TBu Network: <ul style="list-style-type: none"> ▶ 12 x 10GbE SFP+ bonded active/passive

	Base	Standard	Power
x3550 M5 Node specs	CPU: E5-2620v4 RAM: 64GB Storage: ▶ NL-SAS: 3 x 2TB ▶ SSD: 800GB Network: 4 x 1GbE	CPU: 2 x E5-2620v4 RAM: 128GB Storage: ▶ NL-SAS: 3 x 4TB ▶ SSD: 1.2TB Network: 4 x 10GbE SFP+	CPU: 2 x E5-2620v4 RAM: 256GB Storage: ▶ NL-SAS: 3 x 8TB ▶ SSD: 1.6TB Network: 4 x 10GbE SFP+

Table 2 Deployment Ready Offerings for Lenovo System x3550 M5

	x330 M5 Spinning Drive Configuration	x3350 M5 with Hybrid Drive Configuration
Use Case	Small, ROBO, Single Node DR target	Standard SMB Datacenter
Compute	1-2x E5-26xx v4	1-2x E5-26xx v4
RAM	64 GB to 768 GB	64 GB to 768 GB
HDD storage	4 x 7200RPM SATA	3 x 7200RPM SATA
SSD storage	None	1 x S3610 SSD
Network	4 x 1GbE or 4 x 10GbE	4 x 1GbE or 4 x 10GbE
Single Node Capable	Yes	No

Detailed Lenovo x3550 M5 configurations

Table 3 Deployment Ready Offerings for the Lenovo System x3550 M5 - E5-2620 v4 with 2.5" drives

Part number	Description	Quantity
Base		
8869-EJG	TopSeller™ x3550 M5, Xeon 8C E5-2620 v4 85W 2.1GHz/2133MHz/20MB, 1x16GB, O/Bay HS 2.5in SAS/SATA, SR M5210, 750W p/s, Rack	1
Memory options		
46W0829	16GB TruDDR4 Memory (2Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	3, 7, 11
46W0833	32GB TruDDR4 Memory (2Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	4, 8, 12
46W0841	64GB TruDDR4 Memory (4Rx4, 1.2V) PC4-19200 PC4 2400MHz LP LRDIMM	4, 8, 12
HDD drive options for Spinning Disk configuration		
00NA491	1TB 7.2K 12Gbps NL SAS 2.5 G3HS HDD	4
00NA496	2TB 7.2K 12Gbps NL SAS 2.5 G3HS HDD	
HDD drive options for Hybrid configuration		
00NA491	1TB 7.2K 12Gbps NL SAS 2.5 G3HS HDD	3
00NA496	2TB 7.2K 12Gbps NL SAS 2.5 G3HS HDD	

Part number	Description	Quantity
SSD drive options for Hybrid configuration		
00YK212	Intel S3610 480GB Enterprise Mainstream SATA G3HS 2.5 SSD	1
00YK217	Intel S3610 800GB Enterprise Mainstream SATA G3HS 2.5 SSD	
00YK222	Intel S3610 1.2TB Enterprise Mainstream SATA G3HS 2.5 SSD	
00YK227	Intel S3610 1.6TB Enterprise Mainstream SATA G3HS 2.5 SSD	
Networking options		
00KA066	System x3550 M5 PCIe Riser 2, 1-2 CPU (LP x16 CPU0 + LP x16 CPU1)	1
01DA900	Intel X710-DA2 2x10GbE SFP+ Adapter	2
Additional processor		
00YE895	Intel Xeon Processor E5-2620 v4 8C 2.1GHz 20MB Cache 2133MHz 85W	1
Additional power supply		
00KA096	System x® 750W High Efficiency Platinum AC Power Supply	1

Table 4 Deployment Ready Offerings for the Lenovo System x3550 M5 - E5-2640 v4 with 2.5" drives

Part number	Description	Quantity
Base		
8869-ELG	TopSeller x3550 M5, Xeon 10C E5-2640 v4 90W 2.4GHz/2133MHz/25MB, 1x16GB, O/Bay HS 2.5in SAS/SATA, SR M5210, 750W p/s, Rack	1
Memory options		
46W0829	16GB TruDDR4 Memory (2Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	3, 7, 11
46W0833	32GB TruDDR4 Memory (2Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	4, 8, 12
46W0841	64GB TruDDR4 Memory (4Rx4, 1.2V) PC4-19200 PC4 2400MHz LP LRDIMM	4, 8, 12
HDD drive options for Spinning Disk configuration		
00NA491	1TB 7.2K 12Gbps NL SAS 2.5 G3HS HDD	4
00NA496	2TB 7.2K 12Gbps NL SAS 2.5 G3HS HDD	
HDD drive options for Hybrid configuration		
00NA491	1TB 7.2K 12Gbps NL SAS 2.5 G3HS HDD	3
00NA496	2TB 7.2K 12Gbps NL SAS 2.5 G3HS HDD	

Part number	Description	Quantity
SSD drive options for Hybrid configuration		
00YK212	Intel S3610 480GB Enterprise Mainstream SATA G3HS 2.5 SSD	1
00YK217	Intel S3610 800GB Enterprise Mainstream SATA G3HS 2.5 SSD	
00YK222	Intel S3610 1.2TB Enterprise Mainstream SATA G3HS 2.5 SSD	
00YK227	Intel S3610 1.6TB Enterprise Mainstream SATA G3HS 2.5 SSD	
Networking options		
00KA066	System x3550 M5 PCIe Riser 2, 1-2 CPU (LP x16 CPU0 + LP x16 CPU1)	1
01DA900	Intel X710-DA2 2x10GbE SFP+ Adapter	2
Additional processor		
00YE897	Intel Xeon Processor E5-2640 v4 10C 2.4GHz 25MB Cache 2133MHz 90W	1
Additional power supply		
00KA096	System x 750W High Efficiency Platinum AC Power Supply	1

Table 5 Deployment Ready Offerings for the Lenovo System x3550 M5 - E5-2620 v4 with 3.5" drives

Part number	Description	Quantity
Base		
8869EAG	TopSeller x3550 M5, Xeon 8C E5-2620v4 85W 2.1GHz/2133MHz/20MB, 1x16GB, O/Bay HS 3.5in SATA/SAS, SR M5210, 750W p/s, Rack	1
Memory options		
46W0829	16GB TruDDR4 Memory (2Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	3, 7, 11
46W0833	32GB TruDDR4 Memory (2Rx4, 1.2V) PC4-19200 CL17 2400MHz LP RDIMM	4, 8, 12
46W0841	64GB TruDDR4 Memory (4Rx4, 1.2V) PC4-19200 PC4 2400MHz LP LRDIMM	4, 8, 12
HDD drive options for Spinning Disk configuration		
00FN188	2TB 7.2K 12Gbps NL SAS 3.5 G2HS 512e HDD	4
00FN208	4TB 7.2K 12Gbps NL SAS 3.5 G2HS 512e HDD	
00FN228	6TB 7.2K 12Gbps NL SAS 3.5 G2HS 512e HDD	
00WH121	8TB 7.2K 12Gbps NL SAS 3.5 G2HS 512e HDD	
HDD drive options for Hybrid configuration		
00FN188	2TB 7.2K 12Gbps NL SAS 3.5 G2HS 512e HDD	3
00FN208	4TB 7.2K 12Gbps NL SAS 3.5 G2HS 512e HDD	
00FN228	6TB 7.2K 12Gbps NL SAS 3.5 G2HS 512e HDD	
00WH121	8TB 7.2K 12Gbps NL SAS 3.5 G2HS 512e HDD	

Part number	Description	Quantity
SSD drive options for Hybrid configuration		
00YK237	Intel S3610 480GB Enterprise Mainstream SATA HS 3.5 SSD	1
00YK242	Intel S3610 800GB Enterprise Mainstream SATA HS 3.5 SSD	
00YK247	Intel S3610 1.2TB Enterprise Mainstream SATA HS 3.5 SSD	
00YK252	Intel S3610 1.6TB Enterprise Mainstream SATA HS 3.5 SSD	
Networking options		
00KA066	System x3550 M5 PCIe Riser 2, 1-2 CPU (LP x16 CPU0 + LP x16 CPU1)	1
01DA900	Intel X710-DA2 2x10GbE SFP+ Adapter	2
Additional processor		
00YE895	Intel Xeon Processor E5-2620 v4 8C 2.1GHz 20MB Cache 2133MHz 85W	1
Additional power supply		
00KA096	System x 750W High Efficiency Platinum AC Power Supply	1

Networking recommendations

There are several important guidelines and recommendations for networking equipment and its use with Scale Computing HC3-based clusters. This section covers general concepts rather than specific configuration options. If you need information on specific configuration information for a switch or other networking product you can refer to the guides in the Scale Computing Knowledge.

Minimum requirements for the 1 GbE switch

When using 1 GbE switches other than a recommended switch, the following features and attributes should be considered. Optional attributes are strongly encouraged but may not be required depending on your deployment needs.

- ▶ Managed switch
- ▶ 72/144 mpps for 24/48 port switches respectively
- ▶ Allows disabling of spanning tree protocol (STP) at the switch level
- ▶ Supports 802.3x flow control
- ▶ (Optional*) VLAN support
- ▶ (Optional) Allows disabling of spanning tree protocol (STP) on a per port basis
- ▶ (Optional) Offers rapid spanning tree protocol (Rapid STP)
- ▶ (Optional) Stacking or dedicated interconnect for High Availability (HA)

Minimum requirements for the 10 GbE switch

When using 10 GbE switches other than a recommended switch, the following features and attributes should be considered. Optional attributes are strongly encouraged but may not be required depending on your deployment needs.

- ▶ Managed switch
- ▶ SFP+ ports - twinax cables are recommended as they are inexpensive and compatible
- ▶ Allows disabling of spanning tree protocol (STP) at the switch level
- ▶ Supports 802.3x flow control
- ▶ (Optional*) VLAN support
- ▶ (Optional) Allows disabling of spanning tree protocol (STP) on a per port basis

- ▶ (Optional) Offers rapid spanning tree protocol (Rapid STP)
- ▶ (Optional) Stacking or dedicated interconnect for High Availability (HA)

Recommended Lenovo Switches

The recommended 1 GbE switches are as follows:

- ▶ Lenovo RackSwitch™ G7028
<https://lenovopress.com/tips1268-lenovo-rackswitch-g7028>
- ▶ Lenovo RackSwitch G8052
<https://lenovopress.com/tips1270-lenovo-rackswitch-g8052>

The recommended 10 GbE switches are as follows:

- ▶ Lenovo RackSwitch G8124E
<https://lenovopress.com/tips1271-lenovo-rackswitch-g8124e>
- ▶ Lenovo RackSwitch G8272
<https://lenovopress.com/tips1267-lenovo-rackswitch-g8272>

Resources

- ▶ Scale Computing
<http://www.scalecomputing.com>
- ▶ Lenovo rack servers home page:
<http://shop.lenovo.com/us/en/systems/servers/racks/>
- ▶ Lenovo System x3550 M5 data sheet
http://www.lenovo.com/images/products/system-x/pdfs/datasheets/66864_x3550_m5_ds.pdf
- ▶ Lenovo System x3550 Product Guide
<https://lenovopress.com/lp0068-lenovo-system-x3650-m5-e5-2600-v4>

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