Introduction to Scale Computing HC3

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Provides an overview of the Scale Computing HC3 offering from Lenovo and Scale Computing

Explains the benefits to distributed enterprises looking to deploy edge computing

Describes the multiple configuration options

Provides the bill of materials for each server configurations

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Abstract

The Scale Computing HC3 Edge solution on Lenovo® servers includes storage, compute, hypervisor, data management, data protection, and disaster recovery capabilities for edge computing in 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 relationship between Lenovo® and Scale Computing is focused on combining the best technologies for both Edge Computing and core data center computing. These IT infrastructure technologies are ideal for organizations of all sizes and industries for core data center deployments and for edge computing deployments across distributed enterprises in Retail, Manufacturing, Healthcare, Finance, Transportation, and other industries. Lenovo's broad and successful range of server has been combined with efficient, edge infrastructure software from Scale Computing for simplicity, scalability, high availability, and right-sized implementations.

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.

Core Data Center Challenges

The core data center requires both powerful and reliable computing infrastructure to run all of the core applications that keep the organization operational. The data center may run a wide variety of applications and services to support all departments with differing needs. These core applications are critical to the success of the organization.

The core data center administrators are challenged to maintain 24/7 uptime and to protect the critical data that resides in the databases and file services that make up the data center that may be spread across dozens or hundreds of workloads. The infrastructure to run all of these workloads and store their data can become complex as it grows and administrators may be challenged to manage multiple server, storage, and virtualization technologies to form the infrastructure.

Key challenges include:

- Overly Complex Architecture

  In the data center, traditional virtualization solutions have connected a number of separate solutions including servers, storage appliances, hypervisors, networking, and backup/DR from different vendors to create an infrastructure platform. The complexity of integrating all of these vendor solutions just to be able to start running applications often leads to greater instability, more security vulnerabilities, and performance inefficiency.

- Inability to Scale

  The complexity of traditional virtualization architectures often makes infrastructure harder to scale out when growth is necessary. These solutions require scaling out multiple solutions at the same time, increasing the risk of integration failures across mismatched solution versions. The complexity of scaling out often leads to costly decisions to rip and replace infrastructure.

- Operational Costs

  Traditionally complex virtualization architectures usually require multiple experts for components like storage, hypervisors, backup/DR, networking, and even server hardware. The complexity of integration between multiple vendor solutions and their experts increase the management and maintenance time spent simply keeping the infrastructure running. It also makes projects such as deployments, migrations, and scale-out more complicated and costly.

Distributed Enterprise Challenges

Data and digital systems are growing more and more outside the data center. At remote facilities, stores, offices, and even on transportation vessels, data is being collected and utilized more than ever before on premises. Distributed enterprises are tasked with providing the IT infrastructure to support data and applications being used onsite in these remote sites and connect them to the cloud, the data center, or both.

Both automated systems and end users require reliable and rapid access to data to work accurately and efficiently. Remotely accessing data from a data center or the cloud poses challenges to latency and network outages at remote sites. On-premises infrastructure can keep local systems online and data fresh when remote connectivity is lost or latency is an issue.

Key challenges include:

- Inadequate Infrastructure

  With IoT and Edge Computing, retailers are requiring more powerful computing resources on-premises at remote sites. Traditional infrastructure consisting of traditional single servers or single virtual hosts are no longer enough. More efficient, flexible architecture is required. That infrastructure also needs to be right-sized to the needs of sites because over-provisioning and over-paying at each store adds up fast when multiplied by dozens, hundreds, or thousands of sites.

- Up-time at Risk

  Traditional, small implementations of a couple servers, possibly with external storage without reliable replication or high availability capabilities are more likely to cause downtime. As organizations innovate, their new applications and services become more business critical requiring better availability. Downtime means productivity disruption, services customers expect being unavailable, and the cost of rushing to bring systems back online.

- Operational Costs

  Every aspect of IT management can be measured in cost from implementation of infrastructure in terms of time and expertise, power consumption, ongoing support and maintenance, and management time. Organizations need solutions that are easy to deploy, easy to manage, easy to support, and require little or no need for IT resources to be deployed onsite at remote retail locations.

Business Value

The Scale Computing HC3 solutions on Lenovo servers are built to satisfy the needs of both the core data center with onsite IT staff and distributed organizations with remote sites where there is no IT staff. HC3 Edge solutions are widely used in the retail, health care, education, manufacturing, financial services, and government industries.

As organizations both large and small are challenged to do more with less while expanding the scope of computing to include technologies like IoT and edge computing, less complex solutions are needed both at the core and at the edge. And as large organizations, such as retail organizations, deploy more applications to remote locations like stores to enhance the shopping experience with new services and IoT, more computing is required at these locations close to the source of the data.

HC3 computing solutions for the core and the edge provide an easy to use, flexible, right-sized, highly available, and high-performance virtualization platform for on-site computing.

The Scale Computing HC3 Edge 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 in HC3 Software as a global namespace that is local to the applications running on HC3. Even when scaling out, new storage is automatically and seamlessly added to the global storage pool. No more storage subsystem, SAN, or storage protocols to manage.

- Management

  HC3 includes storage, servers, and virtualization in a single solution with unified management. There are no separate management consoles for SANs, servers, and hypervisors as you would expect in other solutions. Multiple HC3 systems can be managed from a single web interface.

- Self-Healing Automation

  Clustering and redundancies combined with intelligent automation allow the HC3 system to recover quickly or seamlessly from a variety of faults and failures so that IT specialists do not need to be deployed immediately to remote sites. Systems can be managed remotely or on-site without the need for IT specialists.

- Right-Sizing and Scalability

  With HC3, x86 based nodes of different types can be mixed and matched in a single cluster, or run as a single appliance, providing flexibility to build out the perfect infrastructure for applications. HC3 scales up or down to support both large deployments and very small appliances for remote edge locations. Clusters can be scaled out easily and seamlessly with new nodes as needed.

- 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 Edge and Lenovo servers, the solution has the following benefits:

  - Save by increasing server utilization 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 with 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 HC3 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.

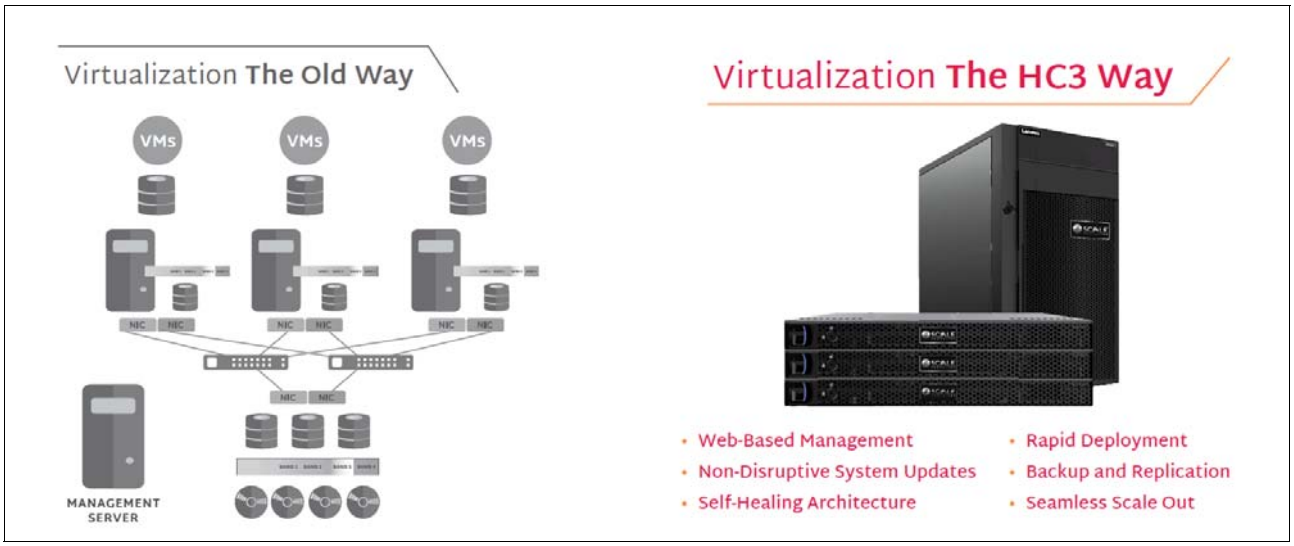

Figure 1 Traditional vs. modern virtualization infrastructures

The solution has the following characteristics:

- **Simple**

  HC3 Software bring storage, servers, virtualization, and management together in a single, unified system. HC3 Software eliminates wasteful management tasks and allows IT administrators to focus on improving business processes. The simplicity of HC3 Software directly impacts IT with higher productivity and lower costs.

- **Available**

  Based on simplicity of design, HC3 Software is inherently more stable and more highly available than traditional virtualization solutions. Redundancy, high availability, and resiliency are built into HC3 Software in every way, including built-in disaster recovery features like live migration, failover, backup, replication, and recovery. With HC3 Software, both planned and unplanned downtime can be virtually eliminated, creating more confidence with customers both internal and external.

- **Right-Sized and Easily Scalable**

  One of the most challenging tasks for IT can be adding the right amount of capacity without over-provisioning and over-sending. With HC3 Software, the simplicity of design and efficiency allow for implementations of very small infrastructure appliances to run critical workloads as single appliances or clusters of appliances for high availability. The resource footprint of the HC3 software is very small, freeing up the hardware resources for the applications and storage needs of the onsite IT services.

  If edge computing systems do need to be scaled out as on-site services expand or storage needs increase, clusters of appliances can be seamlessly scaled out. This future-proofs

the architecture for growth as needed so scale out can be performed quickly and easily when needed.

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

- Lenovo ThinkSystem™ SR250, ThinkSystem SR630, ThinkSystem SR650 and soon the ThinkSystem SE350 Edge Server.
- 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 web-based 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
- Advanced data services like deduplication

Integrated Management features include:

- Web-based UI with remote site monitoring
- Web-based 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 Scale Computing HC3 support
- Turnkey plug and play expansion

HC3 Features

The Scale Computing HC3 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 Edge 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.

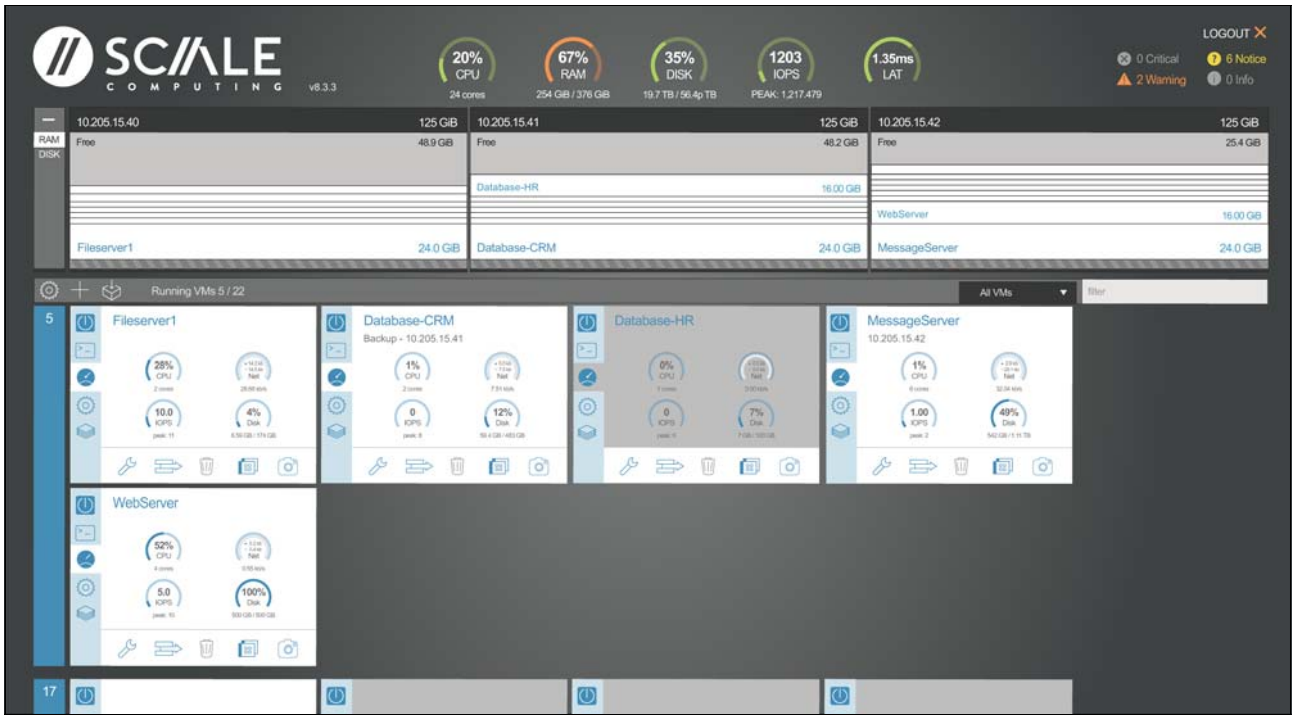

Figure 2 HC3 Web Interface

- **Rapid, Easy Deployment**

  An 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.

- **Storage Deduplication and Detail**

  HC3 storage deduplication reduces the storage footprint of data stored on virtual machines. Virtual disks are deduplicated, post-process to eliminate duplicate data blocks and free up storage with minimal impact to running VMs. With deduplication, disks can hold considerably more data than previously allowed within the same physical disk capacity. Along with the deduplication, the storage details available in the HC3 Web interface provide detailed information on utilization and efficiency.

- **Multi-Cluster Remote Management**

  HC3 offers the ability to monitor multiple clusters within the HC3 Web interface. The intuitive design shows the status of multiple clusters that can be local or remote to keep tabs on your entire enterprise of HC3 nodes and clusters. Whether they are single nodes in remote offices or DR targets, or multi-node clusters, the new multi-cluster view provides at-a-glance monitoring of all your HC3 assets.

- **Multi-User Administration and Logging**

  HC3 offers multi-user login and administration so you can better manage your multiple admins. Multiple users may login with their own credentials to perform their own administrative functions. User access can be limited to read-only, specific functional roles, or full admin rights. Logging keeps track of administrator access to assist in management and troubleshooting.

- **ScaleCare Remote Support Access**

  The HC3 systems offer 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.

- **HC3 Cloud Unity**

  Scale Computing and Google have created a partnership to announce HC3 Cloud Unity, a hybrid cloud solution that is uniquely easy and affordable. By combining HC3 hyperconverged private cloud infrastructure with Google Cloud Platform, HC3 Cloud Unity connects on-prem and cloud infrastructure in a way that is accessible to any size organization.

  HC3 Cloud Unity connects an HC3 system on-prem with an HC3 system instance in Google Cloud Platform, users get a unified management experience for both on-prem and cloud infrastructure. A single HC3 web interface can manage multiple HC3 systems both on-prem and in the cloud.

Deployment Examples

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

- **Core Datacenter**

  HC3 is scalable enough to handle core computing applications or run as centralized disaster recovery in the core datacenter. With HC3, you can replace traditional, complex virtualization infrastructure with a modern and scalable environment that is optimized for distributed enterprises.

- **Business-critical applications**

  Traditional business critical applications such as Exchange, SQL Server, SharePoint, Oracle, SAP or industry-specific line-of-business applications will run efficiently, as well as newer application platforms for IoT, digital video security, and more.

- **Single-node configurations**

  Scale Computing has always offered clusters of three or more appliances (or nodes) for high availability, 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 edge computing and disaster recovery use cases that provide more flexibility and cost savings than traditional cluster configurations.

- **Edge Computing or ROBO**

  For edge computing, which includes remote office/branch office (ROBO) computing, 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 Edge ideal for these remote sites but the fact that HC3 Edge 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 Edge 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 ThinkSystem SR250 rack server

Lenovo ThinkSystem SR250 is an affordable, single-socket 1U rack server for small and medium businesses that need optimized performance and flexibility for future growth, along with enterprise-class reliability, management, and security.

Figure 3 Lenovo ThinkSystem SR250

Specifications of the solution

The following table summarizes the offering.

Table 1 Supported SR250 Configurations with HC3

	SR250		
Processor	1 x Intel Xeon E Processor		
Memory	32-128GB		
HDD storage (Raw)	4 x HDD (4TB-32TB)	3x HDD (4TB-24TB)	-
SSD storage (Raw)	-	1x SSD (480 GB - 1.92TB)	4 x SSD (960GB – 7.68TB)
Network	4 x 1GbE	4x 10GbE SFP+	
Dimensions	Height: 43 mm (1.7 in) Width: 434 mm (17.1 in) Depth: 498 mm (19.6 in)		

For more information, see the Lenovo Press product guide:

https://lenovopress.com/lp1272-thinksystem-sr250-server-e2200

Lenovo ThinkSystem ST250 tower server

The Thinksystem ST250 harnesses enterprise-level server power with the next-generation Intel® Xeon® E-2200 processors, featuring a performance bump of up to 34% generation-to-generation, in tandem with a wide range of storage options.

Figure 4 Lenovo ThinkSystem ST250

Specifications of the solution are listed in the following table.

Table 2 Supported ST250 Configurations with HC3

	ST250	
Processor	1 x Intel Xeon E Processor	
Memory	32-128GB	
HDD storage (Raw)	4 x HDD (4TB-32TB) 8 x HDD (8TB-64TB)	-
SSD storage (Raw)	-	4 x SSD (240GB – 1.92TB)
Network	2 x 1GbE	
Dimensions	Height: 430 mm (17 in) Width: 175 mm (6.9 in) Depth: 566 mm (22.3 in)	

For more information, see the Lenovo Press product guide:

https://lenovopress.com/lp1275-thinksystem-st250-server-e2200

Lenovo ThinkSystem SR630 rack server

Lenovo ThinkSystem SR630 is an ideal 2-socket 1U rack server for small businesses up to large enterprises that need industry-leading reliability, management, and security, as well as maximizing performance and flexibility for future growth.

The SR630 server is designed to handle a wide range of workloads, such as databases, virtualization and cloud computing, virtual desktop infrastructure (VDI), infrastructure security, systems management, enterprise applications, collaboration/email, streaming media, web, and HPC.

Figure 5 Lenovo ThinkSystem SR630

Highlights

- Versatile and scalable to grow with your business needs
- Optimized system design to meet performance and price points for almost any workload
- Shared components across the ThinkSystem portfolio for reduced parts inventory, quicker servicing, and higher availability
- Leadership systems management that leverages industry standards, such as RedFish
- Highly energy-efficient, with ASHRAE A2 compliance, and A4 compliance (with limitations) for up to 45°C continuous operation

Specifications of the solution

The Lenovo-Scale Computing offering is available in many different configurations to meet all customer requirements but below are example configurations, from an entry level system, up to a more performance driven setup to help show the breadth of the options supported on the SR630. The tables in this section help you identify which configuration would fit your workload requirements.

Table 3 Supported SR630 Configurations with HC3

	SR630		
Processor	1 or 2 x Intel Xeon Scalable Processors		
Memory	64GB - 1024GB		
HDD Storage (Raw)	4 x HDD (4TB-64TB)	3 x HDD (3TB – 48TB)	-
SSD Storage (Raw)	-	1 x SSD (480GB – 7.68TB)	4 x SSD (1.92TB - 30.72TB)
Network	4 x 10GBase-T	4 x 10GbE SFP+	
Dimensions	Height: 43 mm (1.7 in), Width: 434 mm (17.1 in), Depth: 715 mm (28.1 in)		

Additional Resources:

- Lenovo Press product guide

  https://lenovopress.com/lp1049-thinksystem-sr630-server-xeon-sp-gen2
- Lenovo XClarity™ Administrator management software

  https://lenovopress.com/tips1200-lenovo-xclarity-administrator

Lenovo ThinkSystem SR650 rack server

Lenovo ThinkSystem SR650 is an ideal 2-socket 2U rack server for small businesses up to large enterprises that need industry-leading reliability, management, and security, as well as maximizing performance and flexibility for future growth.

The SR650 server is designed to handle a wide range of workloads, such as databases, virtualization and cloud computing, virtual desktop infrastructure (VDI), enterprise applications, collaboration/email, and business analytics and big data.

Figure 6 Lenovo ThinkSystem SR650

Highlights

- Top-performing server for data centers needing scalability
- Versatile and scalable to grow with your business needs
- Optimized system design to meet performance and cost points for almost any workload
- Shared components across the ThinkSystem portfolio for reduced parts inventory, quicker servicing, and higher availability
- Leadership systems management that leverages industry standards, such as RedFish
- Highly energy-efficient, with ASHRAE A2 compliance, and A4 compliance (with limitations) for up to 45°C continuous operation

Specifications of the solution

The Lenovo-Scale Computing offering is available in many different configurations to meet all customer requirements but below are example configurations, from an entry level system, up to a more performance driven setup to help show the breadth of the options supported on the SR650. The tables in this section help you identify which configuration would fit your workload requirements.

Table 4 Supported SR650 Configurations with HC3

	SR650	
Processor	2 x Intel Xeon Scalable Processors	
Memory	128GB - 1536GB	
HDD Storage (Raw)	12x HDD (12TB – 192TB)	9x HDD (9TB – 144TB)
SSD Storage (Raw)	-	3x SSD (1.44TB – 23.04TB)
Network	4x 10GBASE-T or 4x 10GbE SFP+	
Dimensions	Height: 87 mm (3.4 in) Width: 445 mm (17.5 in) Depth: 720 mm (28.3 in)	

Additional Resources:

- Lenovo Press product guide:

  https://lenovopress.com/lp1050-thinksystem-sr650-server-xeon-sp-gen2

- Lenovo XClarity management software:

  https://lenovopress.com/tips1200-lenovo-xclarity-administrator

Networking recommendations

There are several important guidelines and recommendations for networking equipment and its use with Scale Computing HC3 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 ow 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 (where applicable) - twinax cables are recommended as they are inexpensive and compatible
- Allows disabling of spanning tree protocol (STP) at the switch level
- Supports 802.3x ow 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 ThinkSystem NE1032 RackSwitch

  https://lenovopress.com/lp0605-thinksystem-ne1032-rackswitch
- Lenovo RackSwitch G8124E

  https://lenovopress.com/tips1271-lenovo-rackswitch-g8124e
- Lenovo RackSwitch G8272

  https://lenovopress.com/tips1267-lenovo-rackswitch-g8272

The recommended 10GBASE-T switches are as follows:

- Lenovo ThinkSystem NE1032T RackSwitch

  https://lenovopress.com/lp0606-thinksystem-ne1032t-rackswitch

Resources

- Scale Computing

  http://www.scalecomputing.com
- Lenovo rack servers home page:

  https://www.lenovo.com/us/en/data-center/servers/racks/c/racks
- Datasheets:
  - ThinkSystem SR250: https://lenovopress.com/ds0066
  - ThinkSystem ST250: https://lenovopress.com/ds0069
  - ThinkSystem SR630: https://lenovopress.com/ds0031
  - ThinkSystem SR650: https://lenovopress.com/ds0032
- Product Guides:
  - ThinkSystem SR250: https://lenovopress.com/lp1272
  - ThinkSystem ST250: https://lenovopress.com/lp1275
  - ThinkSystem SR630: https://lenovopress.com/lp1049
  - ThinkSystem SR650: https://lenovopress.com/lp1050
- Introduction to the SE350 Edge Server: https://lenovopress.com/lp1069

Change history

- June 2020
  - Added Core Data Center Challenges
  - Updated Business Value Section
  - Updated information in SR250, SR630 configurations
  - Added information of ST250 configurations
- March 2020
  - Updated Figure 1 and Figure 2
- March 2019
  - Added Retail Challenges section
  - Added information of SR250 configurations
  - Added information on NE1032 and NE1032T network switches

- May 30, 2018:
  - Added information on SR630 and SR650 configurations, “Hardware Components” on page 13
- September 29, 2017:
  - Added content to “HC3 Features” on page 8

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