



Lenovo ThinkAgile MX Certified Configurations for Azure Local - Edge Servers

Last Update: January 2025

Provides details of certified configurations for Lenovo ThinkAgile MX solutions that are based on SE350, SE450, and SE455 V3 edge servers

Applies to both Azure Local and Windows Server S2D

Provides guidance for properly configuring nodes for an Azure Local or Windows Server S2D

Lists supported options that can be used when configuring Azure Local or Windows Server S2D cluster nodes

Dave Feisthammel

Guy Fusman

Hussein Jammal

Mike Miller

David Ye



Abstract

This document provides background information regarding the Microsoft Windows Server Software-Defined (WSSD) certification program for Azure Local and Windows Server S2D, as well as the benefits of deploying certified configurations based on Lenovo® ThinkAgile™ MX Certified Nodes and Appliances. We focus on details of current Lenovo certified configurations for Azure Local and Windows Server S2D that are based on Lenovo ThinkSystem™ SE350, SE450, and SE455 V3 servers, including processor, memory, GPU, network, and storage components available for each cluster node. This includes the following solutions:

- ▶ ThinkAgile MX1020 Integrated System/Appliance
- ▶ ThinkAgile MX1021 Certified Node
- ▶ ThinkAgile MX450 Edge Integrated System/Appliance
- ▶ ThinkAgile MX455 V3 Edge Premier Solution

Looking for Lenovo ThinkAgile MX solutions that are based on our rack servers? Check our companion documents.

- ▶ For ThinkSystem V1 rack servers: <http://lenovopress.com/lp0866>
- ▶ For ThinkSystem V2 rack servers: <http://lenovopress.com/lp1520>
- ▶ For ThinkSystem V3 rack servers: <http://lenovopress.com/lp1741>

At Lenovo Press, we bring together experts to produce technical publications around topics of importance to you, providing information and best practices for using Lenovo products and solutions to solve IT challenges. See our publications at <http://lenovopress.com>.

Do you have the latest version? We update our papers from time to time, so check whether you have the latest version of this document by clicking the **Check for Updates** button on the front page of the PDF. Pressing this button will take you to a web page that will tell you if you are reading the latest version of the document and give you a link to the latest if needed. While you're there, you can also sign up to get notified via email whenever we make an update.

Contents

Introduction	3
ThinkAgile MX Series solutions	4
Lenovo certified configurations for Microsoft Azure Local	5
Component selection for ThinkAgile MX Edge servers	15
Network switches	24
Other recommendations	26
Summary	27
Change History	27
Authors	27
Notices	29
Trademarks	30

Introduction

Deploying hyperconverged infrastructure has become the de-facto standard for organizations looking to modernize their aging infrastructure. Large storage deployments are increasingly being replaced by HCI-based solutions for most general-purpose workloads. HCI has proven to deliver better efficiency and price performance in the datacenter. Additionally, customers have been choosing a hybrid approach, migrating certain workloads to the cloud, while keeping other workloads on-premises.

Host operating system Azure Local is Microsoft's HCI solution for customers who wish to run workloads on-premises and extend easily to Microsoft Azure for hybrid capabilities such as back-up, site recovery, storage, cloud-based monitoring and more. Whether you prefer to deploy the Azure Local operating system or take advantage of Azure Local functional capabilities that are built into Windows Server, Lenovo ThinkAgile MX solutions provide hardware that is certified for use in both scenarios.

The benefits of Lenovo HCI solutions include:

- ▶ Highly available scale-on-demand compute/storage integrated solutions
- ▶ Easily provisioned new IT services that reduce deployment time
- ▶ Better performance and lower Total Cost of Ownership (TCO)
- ▶ Flexible infrastructure and data centers

For decades Lenovo has worked closely with Microsoft to ensure our products perform smoothly and reliably with Microsoft operating systems and software. Our customers can reap the benefits of our partnership with Microsoft by taking advantage of HCI solutions that have been certified under the Microsoft Azure Local certification program.

Deploying Lenovo certified configurations for Microsoft HCI solutions takes the guesswork out of system configuration. Whether you intend to build an Azure Local instance or a Windows Server S2D cluster (disaggregated or hyperconverged), you can rest assured that purchasing a certified configuration will provide a rock solid foundation with minimal obstacles along the way. All node configurations shown in this document are certified by Lenovo and validated by Microsoft for out-of-the-box optimization. Using Lenovo ThinkAgile MX solution configurations presented in this document, you can get up and running without lengthy design and build time, knowing that the solution will work as intended.

This document presents certified configurations for Lenovo ThinkEdge Edge Servers that have been validated for use in a Microsoft HCI solution under the Microsoft Windows Server-Software Defined (WSSD) certification program. Details of each node are specified, including all key components. Since there is latitude for customization in these configurations, the rules for customization are also described.

For an overview of the Microsoft Azure Local solution, visit the following URL:

<https://docs.microsoft.com/en-us/windows-server/azure-stack-hci>

To help understand the technical value of the WSSD program and learn why deploying a certified configuration for Azure Local or Windows Server S2D provides an optimal path to success for deployment, read this Microsoft blog post:

<https://cloudblogs.microsoft.com/windowsserver/2018/02/20/the-technical-value-of-wssd-validated-hci-solutions>

To see all Lenovo certified solutions in the Microsoft Azure Local Catalog, visit:

<https://azurestackhcisolutions.azure.microsoft.com/#/catalog?vendorName=Lenovo>

ThinkAgile MX Series solutions

As previously discussed, the Microsoft HCI certification programs allow OEM partners to deliver pre-engineered, validated HCI solutions. Whether your preference is for a Certified Node or an Appliance, Lenovo has designed, tested and validated the ThinkAgile MX Series offerings to quickly and easily provide the solutions you need, with the confidence required to exceed the stringent requirements of today's IT. The result is that you can quickly deploy a robust, high-performance storage solution and rapidly solve your IT challenges.

ThinkAgile MX Certified Node (CN)

Lenovo ThinkAgile MX Certified Nodes map to Microsoft "Azure Local Validated Nodes" in the Microsoft Azure Local Catalog (see link above). These solutions package Microsoft-certified HCI capabilities into easy-to-use machine types to provide the following:

- ▶ Easy to order
- ▶ Enforced configuration rules to ensure a valid configuration
- ▶ Best recipe firmware and device drivers
- ▶ Premier Support (where available)
- ▶ Optional services such as deployment, management, etc.

ThinkAgile MX Integrated System (IS)

Lenovo ThinkAgile MX Integrated Systems (some models known as Appliances) map to Microsoft "Azure Local Integrated Systems" in the Microsoft Azure Local Catalog (see link above). These solutions are based on exactly the same hardware as ThinkAgile MX Certified Nodes. The only differences between a ThinkAgile MX Certified Node and Integrated System that are based on the same server (for example, the ThinkSystem SR650 V3 rack server) is that the Integrated System configuration includes the following items:

- ▶ Azure Local operating system, along with the latest Best Recipe device drivers, is preloaded before shipping to the customer
- ▶ ThinkAgile Premier Support for 3 years (can be uplifted to a longer term or quicker response time)

ThinkAgile MX Premier Solution (PR)

Lenovo ThinkAgile MX Premier Solutions map to Microsoft "Azure Local Premier Solutions" in the Microsoft Azure Local Catalog (see link above). ThinkAgile MX Premier Solutions are turnkey solutions that are designed to accelerate the deployment of Azure Local and greatly reduce the dock to rack timing to install the necessary infrastructure for your operational transformation. Premier Solutions for Azure Local offer significant deployment and management time reduction to set up entire fleets of systems. Additionally, these turnkey solutions offer:

- ▶ Deepest integration and highest level of automation, built through deep engineering collaboration between Microsoft and Lenovo
- ▶ Continuous testing by Microsoft and Lenovo to ensure higher reliability, minimal downtime
- ▶ End-to-end deployment workflows that make it easy to deploy one cluster or many clusters

The remainder of this document focuses on describing the existing Lenovo configurations that have been certified under the Microsoft WSSD program and the details of key components contained in each configuration. The purpose of this document is to provide guidance for Lenovo customers and technical pre-sales personnel during the process of configuring a

Microsoft certified HCI solution. This document assumes the reader has prior knowledge of Microsoft HCI technologies, including Azure Local and Windows Server S2D.

Lenovo certified configurations for Microsoft Azure Local

The Microsoft WSSD certification program allows for solution certification using a min/max paradigm. The configurations presented in this document represent examples of what has been certified, rather than an exhaustive list of the certified configurations that are available. Refer to “ThinkAgile MX450 Edge IS” on page 18 for additional information regarding the components that have been certified.

Table 1 lists the key components of the example configurations for Azure Local or Windows Server S2D that have been certified under the Microsoft WSSD program. For ThinkAgile MX Edge solutions, the number of nodes can range from 1 to 4 in a single cluster. Up to three nodes are supported for direct-connected (switchless) configurations. Note that four network ports are required for storage traffic in a 3-node direct-connected cluster. This is in addition to network ports required for Compute and Management traffic.

The format of the configuration name follows a specific pattern. The first two alphabetic characters define the storage types included in the configuration (“N” for NVMe, “S” for SSD, and “H” for HDD). The next three or four alphanumeric characters define the total raw storage capacity of the node (e.g. “80T” indicates a total capacity of 80TB per node). The last numeric character defines the configuration sequence for the given component parameters. For example, there are two certified configuration examples in the table that contain NVMe storage devices with a total raw capacity of 15TB per node. Example NN15T1 is for the MX450 Edge IS and example NN152 is for the MX455 V3 Edge PR.

Table 1 Example configuration highlights for Lenovo ThinkAgile MX Edge solutions¹

Config	Server/CPU/RAM	Cache	Capacity	Storage Controller	Network	Nodes
NN16T1	MX1021 (SE350) 1 CPU 64-256GB	8 x 2TB NVMe FC: B75E (all-NVMe)		N/A	SE350 10GbE SFP+ 2-port Wired Network Module FC: B6F4 ²	1-4 ³
NN12T1	MX1021 (SE350) 1 CPU 64-256GB	2 x 650GB High Endurance NVMe FC: B75C	6 x 2TB NVMe FC: B75E	N/A	SE350 10GbE SFP+ 2-port Wired Network Module FC: B6F4 ²	1-4 ³
SS08T1	MX1021 (SE350) 1 CPU 64-256GB	4 x 1.92TB SATA SSD (non-SED) FC: B75B		Onboard SATA Controller	SE350 10GbE SFP+ 2-port Wired Network Module FC: B6F4 ²	1-4 ³
NN15T1	MX450 Edge IS 1 CPU 128GB	4 x 3.84TB NVMe FC: BKWS (all-NVMe)		N/A	Mellanox CX-6 Lx OCP 10/25GbE FC: BMHD	1-4
SS08T2	MX450 Edge IS 1 CPU 128GB	4 x 1.92TB SSD FC: BKSW (all-SSD)		4350-8i SAS/ SATA 12Gb HBA FC: BJHH	Intel E810-DA2 10/25GbE PCIe FC: BCD6	1-4
NN51T1	MX455 V3 Edge PR 1 CPU 256GB	8 x 6.4TB NVMe FC: BNEZ (all-NVMe)		N/A	Mellanox CX-6 Dx PCIe 100GbE FC: B8PP	1-4

Config	Server/CPU/RAM	Cache	Capacity	Storage Controller	Network	Nodes
NN15T2	MX455 V3 Edge PR 1 CPU 128GB	4 x 3.84TB NVMe FC: BNF5 (all-NVMe)		N/A	Intel E810-DA2 10/25GbE PCIe FC: BCD6	1-4

¹ This list is not exhaustive and can be customized. Refer to the “ThinkAgile MX450 Edge IS” on page 18 for information about customizing these configurations.

² SE350 10GBASE-T 4-port Wired Network Module (FC B7Z7) and SE350 Wireless Network Module (FC B6F3) are also certified for this configuration.

³ Only 2 nodes are supported for direct-connect (switchless) configurations using the SE350.

Lenovo certified configuration details

This section includes details of each of the example Lenovo configurations contained in Table 1 that have been certified under the Microsoft HCI certification programs. Each configuration lists the Lenovo ThinkAgile MX Certified Node that is used for the Azure Local or Windows Server S2D cluster node, as well as the storage and network devices that have been certified for the configuration.

Again, the configurations shown are example configurations and are not meant to provide an exhaustive list of all available certified configurations. Refer to “ThinkAgile MX450 Edge IS” on page 18 for additional information regarding components that have been certified. If you have questions about the validity of a configuration you would like to purchase, check with your account team.

NN16T1 all-flash configuration (all-NVMe)

This configuration uses the Lenovo ThinkAgile MX1021 on SE350 Certified Node with eight 2TB NVMe storage devices configured as a single-tier solution. Total raw capacity of this configuration is approximately 16TB per node. The focus of this configuration is for Remote Office/Branch Office (ROBO) environments at the edge. It is typically deployed as a two-node direct-connected Azure Local solution.

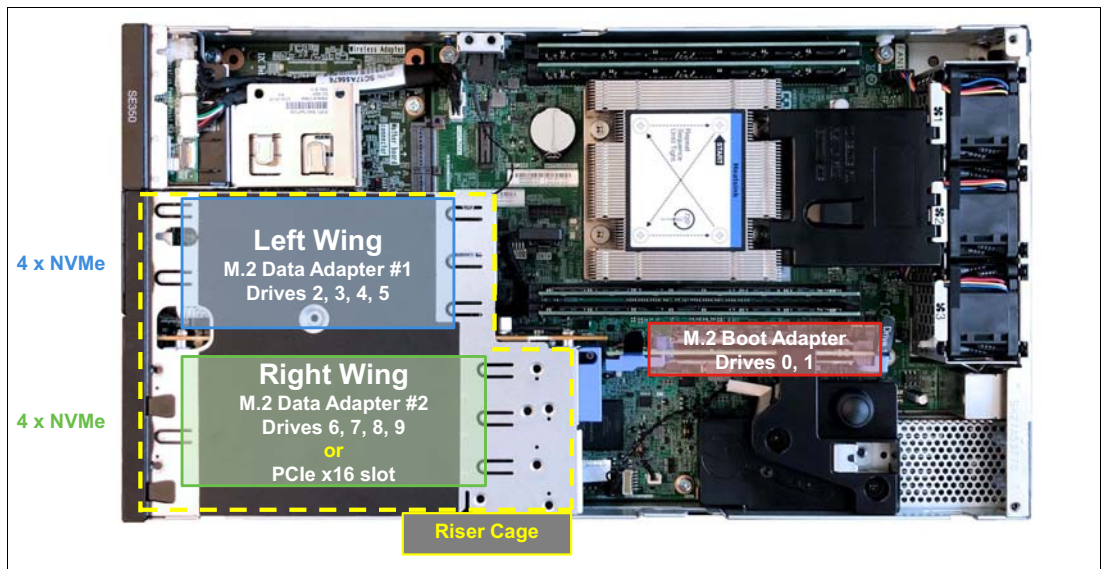


Figure 1 Lenovo ThinkAgile MX1021 on SE350 Certified Node configuration NN16T1

Additional details include the following:

- ▶ CPU: 1 x Intel Xeon D-2100 series processor, soldered to system board
- ▶ Memory: 2 x ThinkSystem SE350 64GB TruDDR4™ 2666 MHz LRDIMM (FC BNVN)
- ▶ Network adapters: The following network modules have been certified:
 - SE350 10GbE SFP+ 2-port Wired Network Module (FC B6F4)
 - SE350 10GBASE-T 4-port Wired Network Module (FC B7Z7)
 - SE350 Wireless Network Module (FC B6F3)
- ▶ Storage: The following storage devices have been certified:
 - ThinkSystem SE350 M.2 Mirroring Enablement Kit for boot drives (FC B88P)
 - ThinkSystem M.2 480GB Industrial A600i SATA SSD for boot (FC B91K)
 - 2 x ThinkSystem SE350 M.2 SATA/NVMe 4-bay Data Drive Enablement Kit (FC B6FF)
 - 8 x 2TB ThinkSystem M.2 P4511 NVMe SED SSD (FC B75E)

This is a single-tier high performance all-NVMe configuration that uses only NVMe devices for storage, with a raw capacity of approximately 16TB per node. Based on the small form factor of the ThinkSystem SE350 Edge Server, this configuration is ideal for use at the edge, where high-speed network switches are not available to handle storage traffic inside the cluster. Note that for direct-connected scenarios, ThinkAgile MX1021 supports only 2 nodes due to the limited number of high-speed network ports available in these systems.

NN12T1 all-flash configuration (all-NVMe)

This configuration uses the Lenovo ThinkAgile MX1021 on SE350 Certified Node with two 650GB High Endurance NVMe storage devices configured as the Cache tier and six 2TB NVMe storage devices configured as the Capacity tier. Total raw capacity of this configuration is approximately 12TB per node. The focus of this configuration is for Remote Office/Branch Office (ROBO) environments at the edge. It is typically deployed as a two-node direct-connected Azure Local solution.

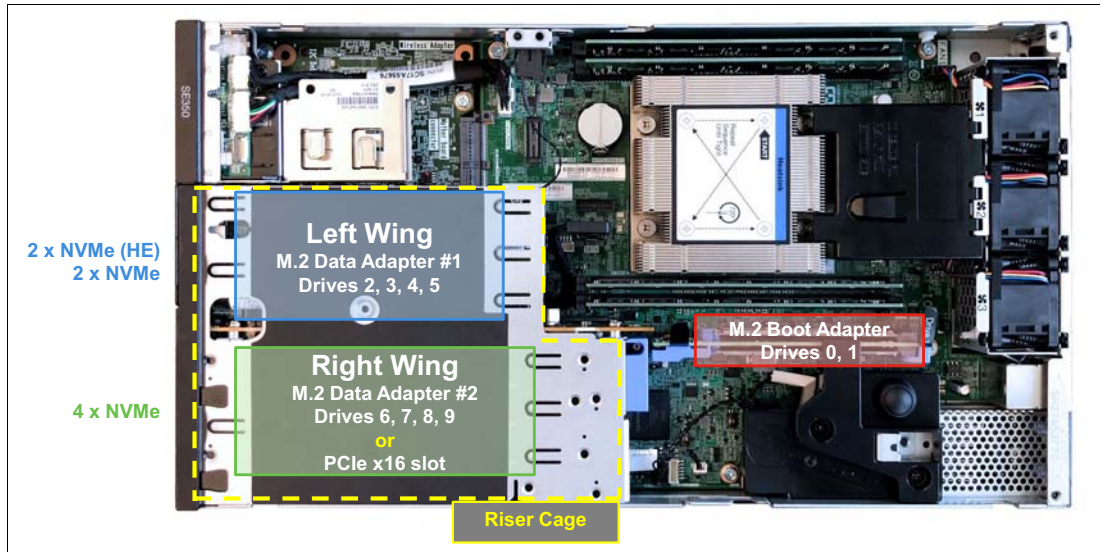


Figure 2 Lenovo ThinkAgile MX1021 on SE350 Certified Node configuration NN12T1

Additional details include the following:

- ▶ CPU: 1 x Intel Xeon D-2100 series processor, soldered to system board
- ▶ Memory: 2 x ThinkSystem SE350 64GB TruDDR4 2666 MHz LRDIMM (FC BNVN)
- ▶ Network adapters: The following network modules have been certified:
 - SE350 10GbE SFP+ 2-port Wired Network Module (FC B6F4)

- SE350 10GBASE-T 4-port Wired Network Module (FC B7Z7)
- SE350 Wireless Network Module (FC B6F3)
- ▶ Storage: The following storage devices have been certified:
 - ThinkSystem SE350 M.2 Mirroring Enablement Kit for boot drives (FC B88P)
 - ThinkSystem M.2 480GB Industrial A600i SATA SSD for boot (FC B91K)
 - 2 x ThinkSystem SE350 M.2 SATA/NVMe 4-bay Data Drive Enablement Kit (FC B6FF)
 - 2 x 650GB ThinkSystem M.2 P4511 NVMe SED High Endurance SSD (FC B75C)
 - 6 x 2TB ThinkSystem M.2 P4511 NVMe SED SSD (FC B75E)

This is a two-tier high performance all-NVMe configuration that uses only NVMe devices for storage, with a raw capacity of approximately 12TB per node. Based on the small form factor of the ThinkSystem SE350 Edge Server, this configuration is ideal for use at the edge, where high-speed network switches are not available to handle storage traffic inside the cluster. Note that for direct-connected scenarios, ThinkAgile MX1021 supports only 2 nodes due to the limited number of high-speed network ports available in these systems.

SS08T1 all-flash configuration (all-SATA SSD)

This configuration uses the Lenovo ThinkAgile MX1021 on SE350 Certified Node with 4 1.92TB SATA SSD storage devices configured as a single-tier solution. Total raw capacity of this configuration is approximately 8TB per node. The focus of this configuration is for Remote Office/Branch Office (ROBO) environments at the edge. It is typically deployed as a two-node direct-connected Azure Local solution.

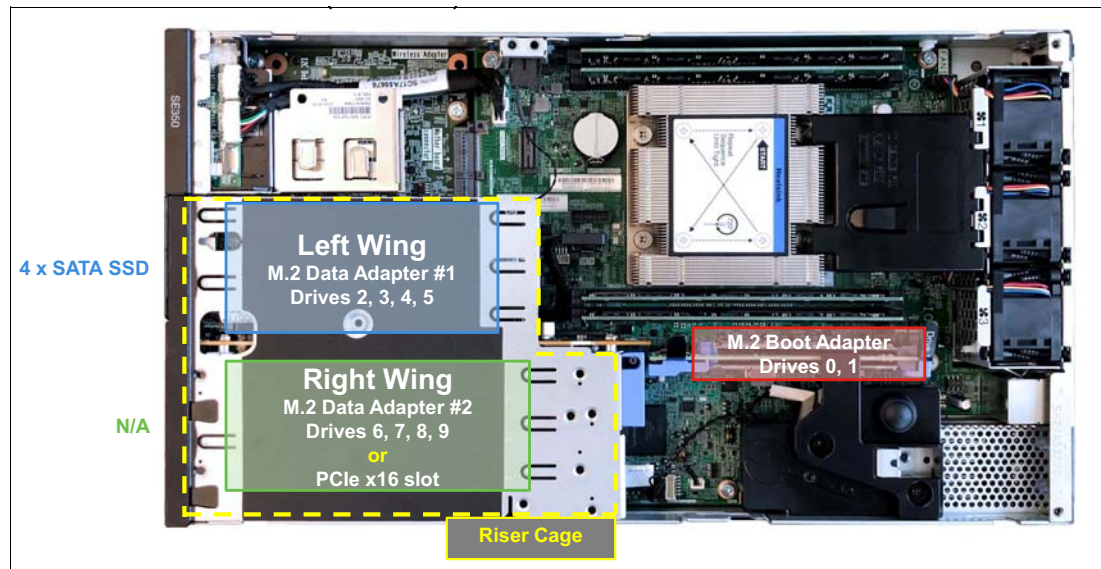


Figure 3 Lenovo ThinkAgile MX1021 on SE350 Certified Node configuration SS08T1

Additional details include the following:

- ▶ CPU: 1 x Intel Xeon D-2100 series processor, soldered to system board
- ▶ Memory: 2 x ThinkSystem SE350 64GB TruDDR4 2666 MHz LRDIMM (FC BNVN)
- ▶ Network adapters: The following network modules have been certified:
 - SE350 10GbE SFP+ 2-port Wired Network Module (FC B6F4)
 - SE350 10GBASE-T 4-port Wired Network Module (FC B7Z7)
 - SE350 Wireless Network Module (FC B6F3)
- ▶ Storage: The following storage devices have been certified:
 - ThinkSystem SE350 M.2 Mirroring Enablement Kit for boot drives (FC B88P)

- ThinkSystem M.2 480GB Industrial A600i SATA SSD for boot (FC B91K)
- 1 x ThinkSystem SE350 M.2 SATA/NVMe 4-bay Data Drive Enablement Kit (FC B6FF)
- 4 x 1.92TB ThinkSystem M.2 5100 Pro SATA 6Gbps SSD(FC B75B)

This is a single-tier all-SSD configuration that uses only non-SED SATA SSD devices for storage, but has a relatively small raw capacity of under 8TB per node. Based on the small form factor of the ThinkSystem SE350 Edge Server, this configuration is ideal for use at the edge, where high-speed network switches are not available to handle storage traffic inside the cluster. Note that for direct-connected scenarios, ThinkAgile MX1021 supports only 2 nodes due to the limited number of high-speed network ports available in these systems. Since SED storage devices cannot be shipped into certain countries, including China, the single-tier all-SSD configuration is currently the only ThinkAgile MX1021 configuration available in these countries.

NN15T1 all-flash configuration (all-NVMe)

This configuration uses the Lenovo ThinkAgile MX450 CN or IS solution with four 3.84TB NVMe storage devices configured as a single-tier solution. Total raw capacity of this configuration is approximately 15.4TB per node. The focus of this configuration is for Remote Office/Branch Office (ROBO) environments at the edge. It is typically deployed as a two-node direct-connected Azure Local solution.

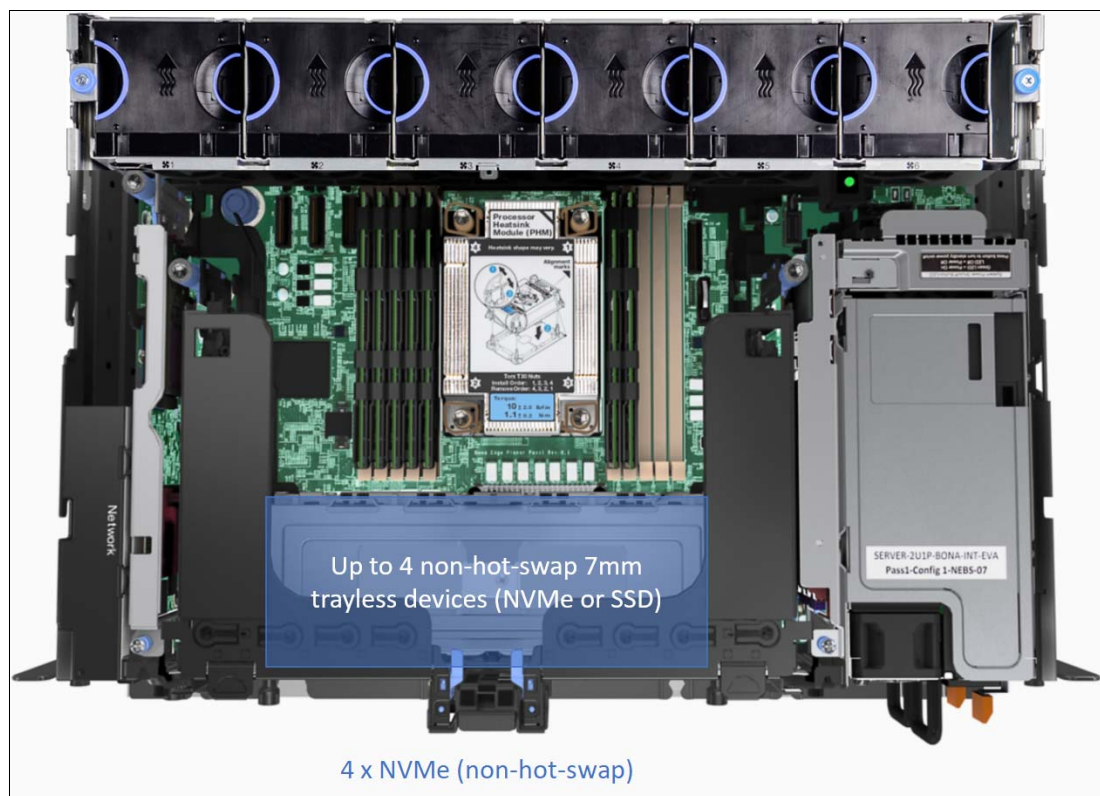


Figure 4 Lenovo ThinkAgile MX450 IS configuration NN15T1

Additional details include the following:

- ▶ CPU: 1 x Intel Xeon Gold 5317 12C 150W 3.0GHz processor, soldered to system board
- ▶ Memory: 2 x ThinkSystem 64GB TruDDR4 3200 MHz RDIMM (FC B966)
- ▶ Network adapters: 1 x ThinkEdge Mellanox CX6 Lx 10/25GbE 2-Port OCP (FC BMHD)
- ▶ Boot drive controller: 1 x ThinkSystem M.2 SATA/NVMe 2-Bay Adapter (FC B5XJ)

- ▶ Boot drives: 2 x ThinkSystem M.2 5400 PRO 480GB SATA SSD (FC BQ1Y)
- ▶ Storage controller: 1 x ThinkSystem 4350-8i SAS/SATA 12Gb HBA (FC B5XJ)
- ▶ Storage devices: 4 x ThinkSystem 2.5" 7mm 5400 PRO 3.84TB SATA SSD (FC BS2T)

This is a single-tier high performance all-NVMe configuration that uses only NVMe devices for storage, with a raw capacity of approximately 15.4TB per node. Based on the small form factor of ThinkAgile MX450 Edge solutions, this configuration is ideal for use at the edge, where high-speed network switches are not available to handle storage traffic inside the cluster.

SS08T1 all-flash configuration (all-SSD)

This configuration uses the Lenovo ThinkAgile MX450 CN or IS solution with four 1.92TB SSD storage devices configured as a single-tier solution. Total raw capacity of this configuration is approximately 7.7TB per node. The focus of this configuration is for Remote Office/Branch Office (ROBO) environments at the edge. It is typically deployed as a two-node direct-connected Azure Local solution.

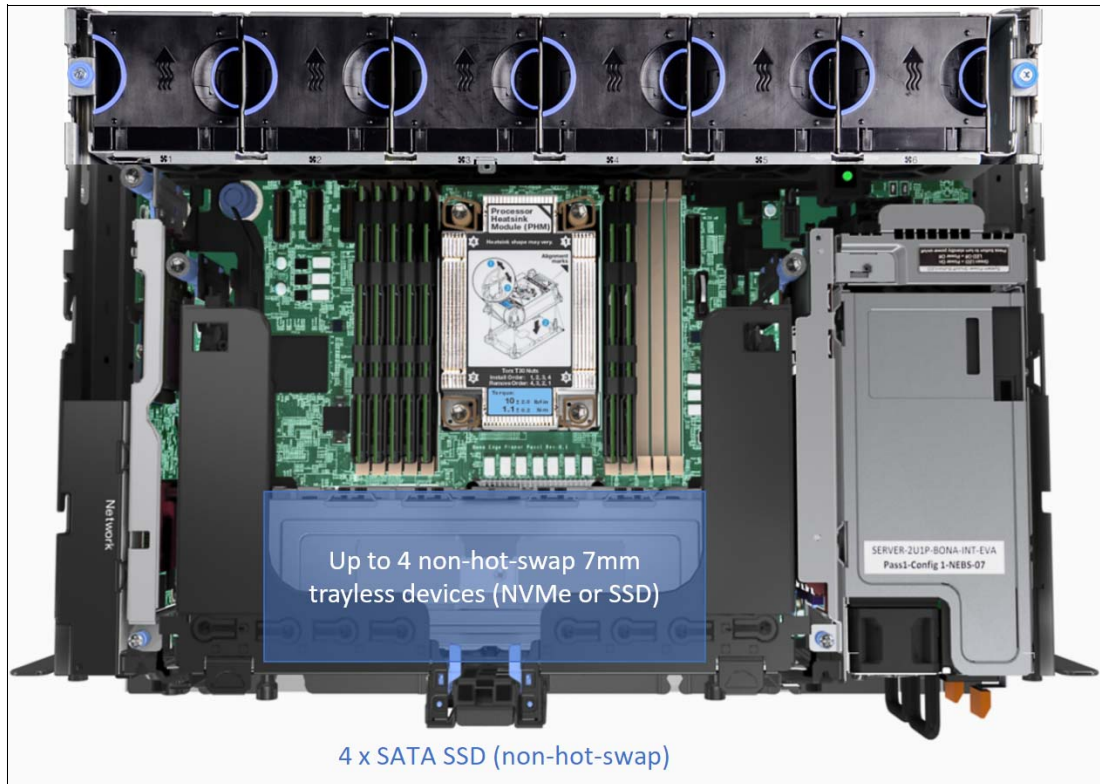


Figure 5 Lenovo ThinkAgile MX450 IS configuration SS08T1

Additional details include the following:

- ▶ CPU: 1 x Intel Xeon Gold 5317 12C 150W 3.0GHz processor, soldered to system board
- ▶ Memory: 2 x ThinkSystem 64GB TruDDR4 3200 MHz RDIMM (FC B966)
- ▶ Network adapters: 1 x ThinkSystem Intel E810-DA2 10/25GbE 2-Port PCIe (FC BCD6)
- ▶ Boot drive controller: 1 x ThinkSystem M.2 SATA/NVMe 2-Bay Adapter (FC B5XJ)
- ▶ Boot drives: 2 x ThinkSystem M.2 5400 PRO 480GB SATA SSD (FC BQ1Y)
- ▶ Storage controller: 1 x ThinkSystem 4350-8i SAS/SATA 12Gb HBA (FC B5XJ)
- ▶ Storage devices: 4 x ThinkSystem 2.5" 7mm S4520 1.92TB SATA SSD (FC BKSW)

This is a single-tier high performance all-NVMe configuration that uses only NVMe devices for storage, with a raw capacity of approximately 16TB per node. Based on the small form factor of ThinkAgile MX450 Edge solutions, this configuration is ideal for use at the edge, where high-speed network switches are not available to handle storage traffic inside the cluster.

NN51T1 all-flash configuration (all-NVMe)

This configuration uses the Lenovo ThinkAgile MX455 V3 Edge PR solution with eight 6.4TB NVMe storage devices configured as a single-tier solution. Total raw capacity of this configuration is approximately 51TB per node. The focus of this configuration is for Remote Office/Branch Office (ROBO) environments at the edge where considerable local storage space is required. It includes a dual-port 100GbE network adapter to maximize storage network traffic throughput. It is typically deployed as a two-node direct-connected Azure Local solution.

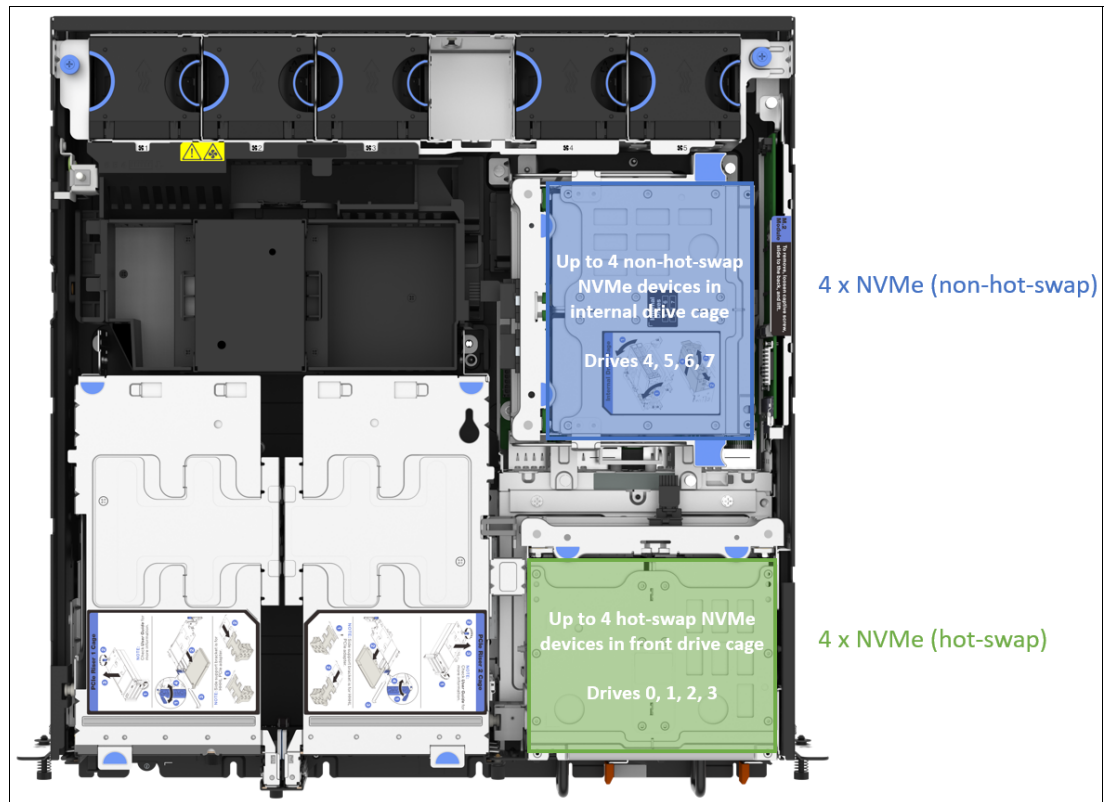


Figure 6 Lenovo ThinkAgile MX455 V3 Edge PR configuration NN51T1

Additional details include the following:

- ▶ CPU: 1 x ThinkEdge SE455 V3 AMD EPYC 8124P 16C 125W 2.45GHz processor
- ▶ Memory: 4 x ThinkSystem 64GB TruDDR5 4800MHz (2Rx4) 10x4 RDIMM-A (FC BQ3D)
- ▶ Network adapter: ThinkSystem Mellanox ConnectX-6 Dx 100GbE 2-port PCIe (FC B8PP)
- ▶ Boot controller: ThinkEdge SE455 V3 M.2 RAID B540i-2i SAS/SATA Adapter (FC BZPA)
- ▶ Boot drives: 2 x ThinkSystem M.2 7450 PRO 960GB NVMe (FC BKSR)
- ▶ Storage controller: All-NVMe configurations do not require a storage controller
- ▶ Storage devices: 8 x ThinkSystem 2.5" 7mm S4520 1.92TB SATA SSD (FC BKSW)

This is a single-tier high performance all-NVMe configuration that uses only NVMe devices for storage, with a raw capacity of approximately 51TB per node. Based on the small form factor

of ThinkAgile MX455 V3 Edge PR solutions, this configuration is ideal for use at the edge, where high-speed network switches are not available to handle storage traffic inside the cluster.

NN15T2 all-flash configuration (all-NVMe)

This configuration uses the Lenovo ThinkAgile MX455 V3 Edge PR solution with four 3.84TB NVMe storage devices configured as a single-tier solution. Total raw capacity of this configuration is approximately 15.4TB per node. The focus of this configuration is for Remote Office/Branch Office (ROBO) environments at the edge. It is typically deployed as a two-node direct-connected Azure Local solution.

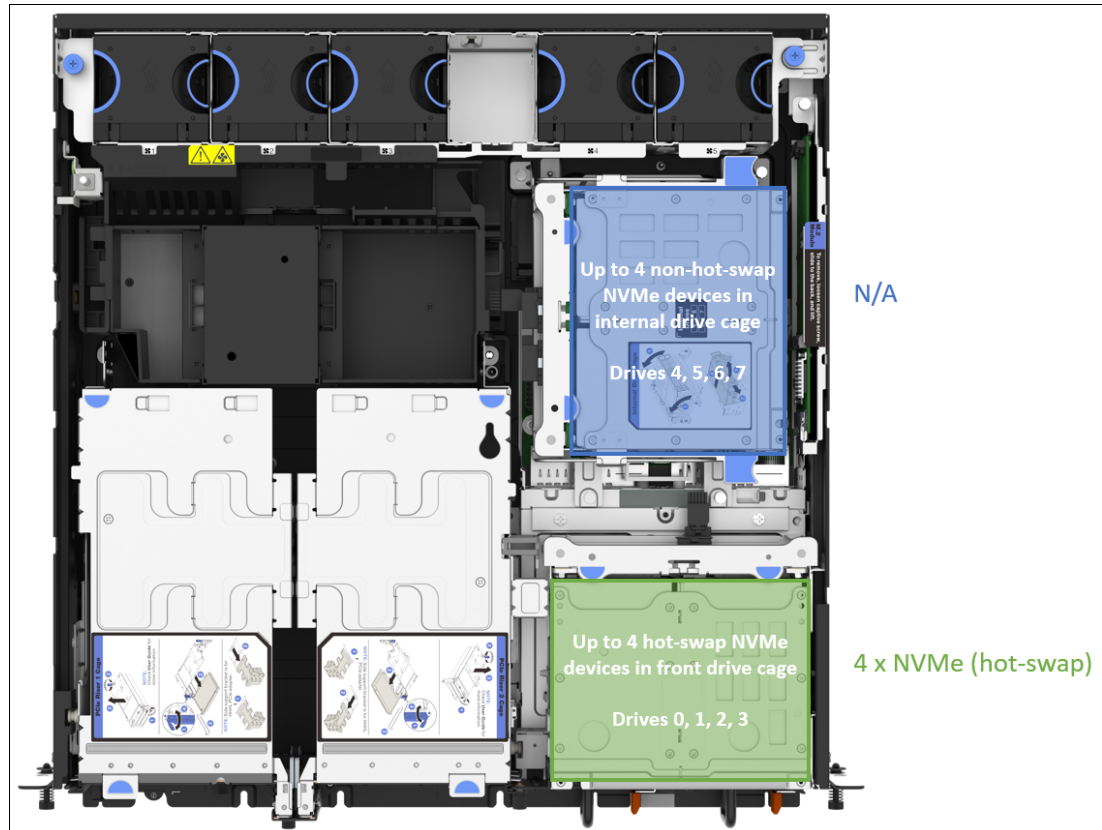


Figure 7 Lenovo ThinkAgile MX455 V3 Edge PR configuration NN15T2

Additional details include the following:

- ▶ CPU: 1 x ThinkEdge SE455 V3 AMD EPYC 8124P 16C 125W 2.45GHz processor
- ▶ Memory: 2 x ThinkSystem 64GB TruDDR5 4800MHz (2Rx4) 10x4 RDIMM-A (FC BQ3D)
- ▶ Network adapter: ThinkSystem Intel E810-DA2 10/25GbE 2-Port PCIe (FC BCD6)
- ▶ Boot controller: ThinkEdge SE455 V3 M.2 RAID B540i-2i SAS/SATA Adapter (FC BZPA)
- ▶ Boot drives: 2 x ThinkSystem M.2 7450 PRO 960GB NVMe (FC BKSR)
- ▶ Storage controller: All-NVMe configurations do not require a storage controller
- ▶ Storage devices: 4 x ThinkSystem 2.5" U.3 7450 PRO 3.84TB NVMe (FC BNF5)

This is a single-tier high performance all-NVMe configuration that uses only NVMe devices for storage, with a raw capacity of approximately 15.4TB per node. Based on the small form factor of ThinkAgile MX455 V3 Edge PR solutions, this configuration is ideal for use at the

edge, where high-speed network switches are not available to handle storage traffic inside the cluster.

Small cluster configurations

There are a few special factors that might come into play when considering a 2-node or 3-node Azure Local or Windows Server S2D cluster. This section outlines the details that are specific to these small clusters.

Direct-connect networking

For a 2-node or 3-node Azure Local instance or Windows Server S2D cluster, it is possible to connect the network adapters directly to each other without placing a network switch between the nodes. For a 2-node cluster using the 2-port Mellanox ConnectX-6 10/25GbE network adapter as an example, this means that Port 1 of the adapter on one node can be cabled directly into Port 1 of the second node and Port 2 from each node can be direct-connected as well. In this example, the network cables are standard SFP28 Direct Attach Cables (DACs). There is no need for a “crossover” cable.

Figure 8 shows diagrams of various network connectivity models between cluster nodes. Microsoft does not support bridged connectivity between cluster nodes and does not recommend single-link connectivity. The only recommended approach is to provide full mesh dual-link connectivity between all nodes for east-west storage traffic. For a 3-node cluster, the only way to provide multiple network connections to each of the other two nodes without using a switch between them is by using two dual-port network adapters.

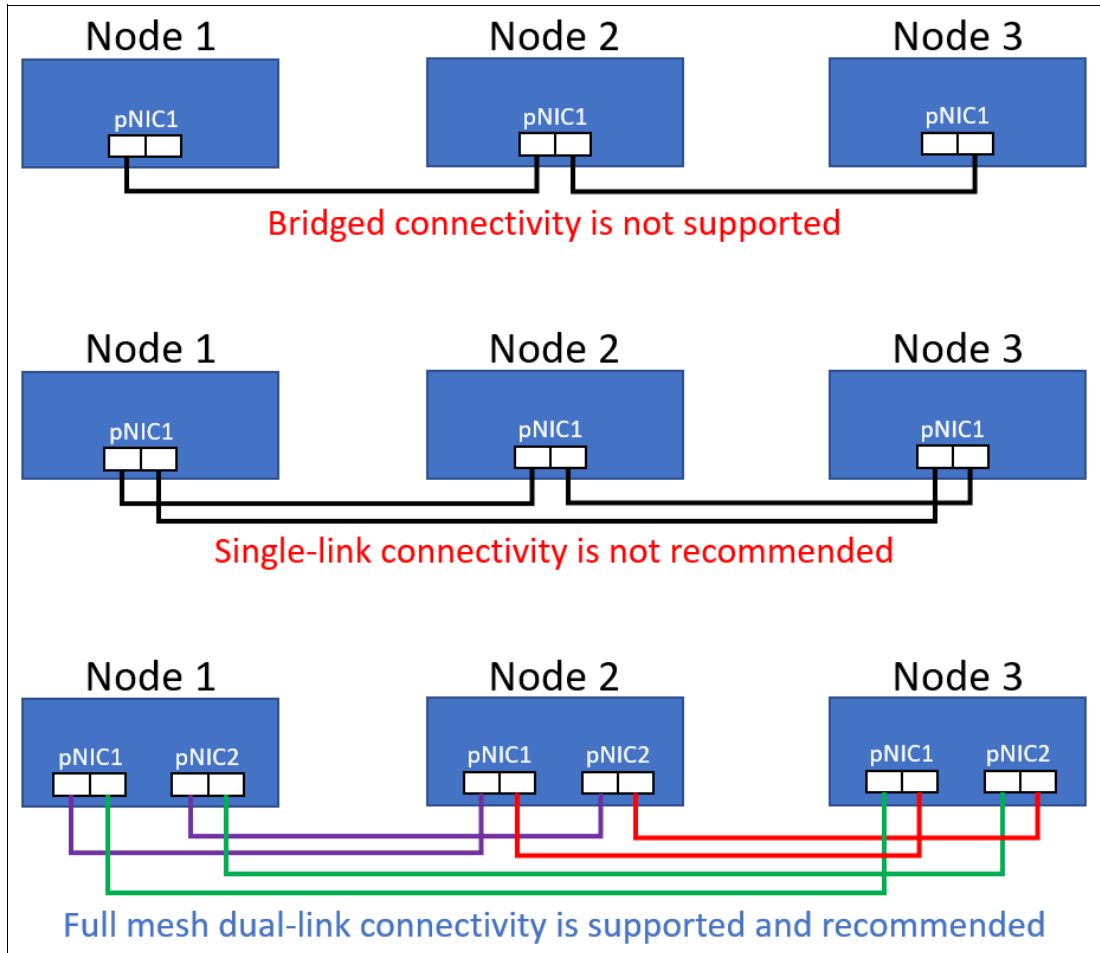


Figure 8 Various node-to-node network connectivity models

One of the most significant benefits associated with the direct-connect method is that high-speed network switches are not required for storage traffic inside the cluster (aka “east-west” traffic). However, separate network connections are still required from the customer network to the cluster for compute and management traffic (aka “north-south” traffic). Although management traffic can travel on a 1GbE network interface, compute traffic (which is often combined with management traffic on the same network interface) requires 10GbE or higher throughput.

Figure 9 shows how network adapter ports are used in a 2-node direct-connected cluster using the ThinkAgile MX455 V3 Edge PR solution.

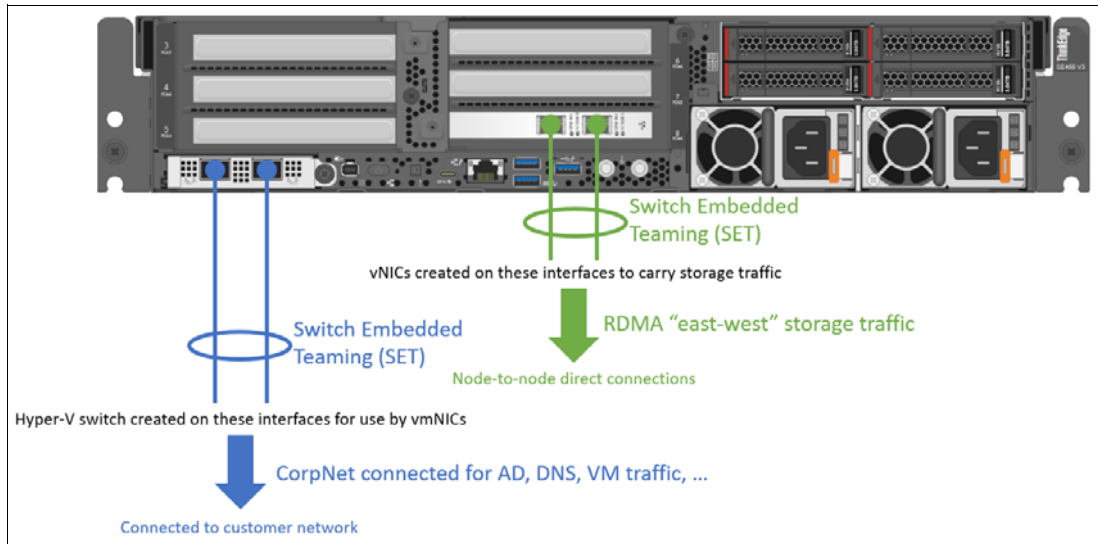


Figure 9 Diagram showing network connectivity for a ThinkAgile MX455 V3 Edge PR node that is part of a direct-connected Azure Local instance or Windows Server S2D cluster.

Component selection for ThinkAgile MX Edge servers

The Lenovo ThinkEdge Edge Servers that are certified for Azure Local or Windows Server S2D have different designs, capabilities, and options that are used by HCI cluster nodes. This section of the document presents the components that have been certified for use in HCI clusters for each ThinkEdge server on which a ThinkAgile MX Edge solution is based. These servers include the SE350, SE450, and SE455 V3 Edge servers.

ThinkAgile MX1020 and MX1021 on SE350

The ThinkSystem SE350 Edge Server is a purpose-built server that is half the width and significantly shorter than a traditional server, making it ideal for deployment in tight spaces. It can be mounted on a wall, stacked on a shelf or mounted in a rack. The ThinkSystem SE350 puts increased processing power, storage and network closer to where data is generated, allowing actions resulting from the analysis of that data to take place more quickly. This makes it ideal for edge computing, including Azure Local and Windows Server S2D workloads in retail, video security, inventory management, building control, manufacturing, telecommunications, and other environments where a small system form factor is required.

The example certified configurations shown in “Lenovo certified configuration details” on page 6 include several common hardware components. Depending on workloads and other requirements, there is some flexibility in customization of each configuration to meet a large range of customer needs. However, the following configuration guidelines *must* be followed:

Nodes

- ▶ For Lenovo ThinkAgile MX1020 and MX1021 Edge solutions, the ThinkSystem SE350 is the server that has been certified for Azure Local and Windows Server S2D.
- ▶ In general, the number of nodes can range from 1 to 4 (refer to Table 1 on page 5), but only 2 nodes can be directly-connected. That is, for 3-node and 4-node clusters, a high-speed switch is required to carry storage traffic.

Processors

- ▶ A single Intel Xeon D-2100 series processor is supported on the SE350

Memory

- ▶ For ThinkAgile MX1020/MX1021, we recommend a minimum of 64GB
- ▶ Since there are only 4 DIMM sockets available in the SE350, memory capacity is restricted to a range between 64 and 256GB per node.

OS Boot

- ▶ Minimum requirement is 200GB OS boot volume
- ▶ ThinkSystem SE350 M.2 SATA/NVMe 4-bay Data Drive Enablement Kit (FC B6FF) with dual 480GB M.2 SSD configured as RAID-1 for resilience

GPUs

The following GPU is supported for ThinkAgile MX1020/MX1021 solutions:

- ▶ ThinkSystem NVIDIA A2 16GB PCIe Gen4 Passive GPU w/o CEC (FC BQZT)

Note: Since a GPU consumes the only available PCIe slot, only 4 SSD or NVMe devices can be configured in any SE350 server that includes a GPU. Also, if a PCIe network adapter is required, a GPU cannot be used.

Storage Network Adapters

Although the SE350 Edge Server has been certified for use in Azure Local instances containing from one to four nodes, its intended purpose is at the edge in a two-node direct-connected cluster. Due to the limited number of 10GbE network ports provided by the SE350 Network Modules, it is not practical to build a cluster containing more than two nodes without requiring a high-speed network switch to handle the storage traffic.

ThinkAgile MX1020 and MX1021 support only the iWARP implementation of RDMA, both via the integrated Network Modules and the only PCIe network adapter supported for these solutions. The following PCIe storage network adapter can be added to ThinkAgile MX1020 and MX1021 solutions:

- ▶ ThinkSystem Intel E810-DA2 10/25GbE SFP28 2-Port PCIe Ethernet Adapter (FC BCD6)

Special considerations for ThinkAgile MX1020 and MX1021 solutions

For ThinkAgile MX1020 and MX1021 solutions, special attention must be paid to Azure Local network requirements and the network adapters that have been certified for use. In particular, since the Intel i350 (a component in all SE350 integrated Network Modules) is not supported for compute traffic, only the following options are available for network connectivity in ThinkAgile MX1020 and MX1021 solutions:

- **If high-speed switches (10-25GbE) are available:** The Intel X722, which is part of the SE350 Network Module, is configured with SET teaming and is used to carry all traffic.

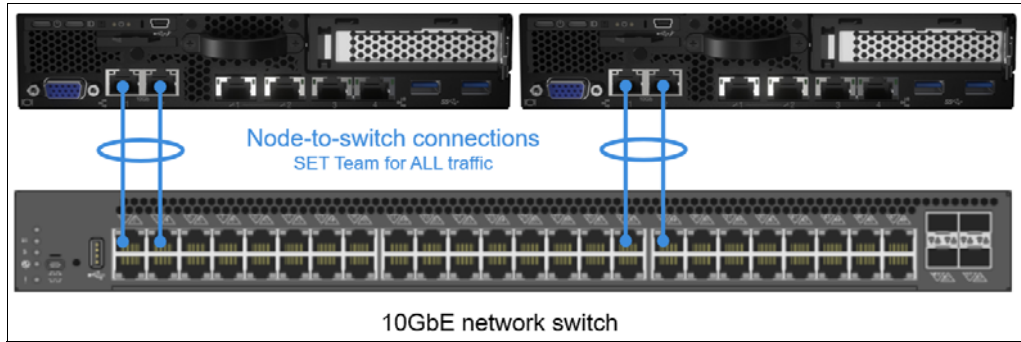


Figure 10 ThinkAgile MX1020/MX1021 network cabling with high-speed switch

- **If high-speed switches are not available:** In this case a two-node direct-connected cluster is still possible. There are two options:
 - The servers are configured with a PCIe network adapter from the Storage Network Adapters section above. These adapters will be connected directly to each other without a switch between them to carry east-west (Storage) traffic. The 10GbE network ports (Intel X722) in the SE350 Network Module are used to carry north-south (Management and Compute) traffic. Although these ports must be connected to a switch, this can be a typical 1GbE network switch. Note that if a network card is placed in the only PCIe slot available, a GPU cannot be used.

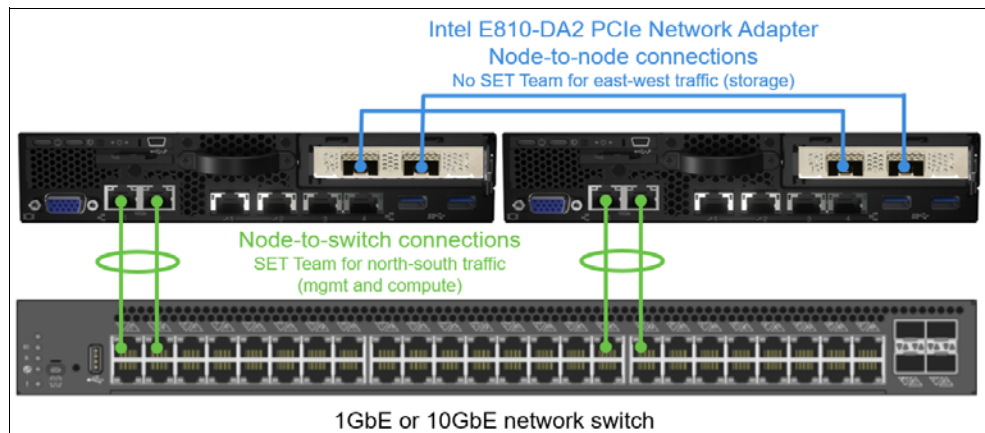


Figure 11 ThinkAgile MX1020/MX1021 direct-connected network cabling for 2-node cluster

- The servers use only the SE350 Network Module ports. In this scenario, one of the 10GbE network ports (Intel X722) in each cluster node is connected directly to the same port in the other node to carry east-west (Storage) network traffic. The second 10GbE network port in each node is connected to a switch to carry north-south (Management and Compute) traffic, which is the same as in the previous bullet. Although no additional network adapters need to be purchased for this use case, there is reduced network port redundancy.

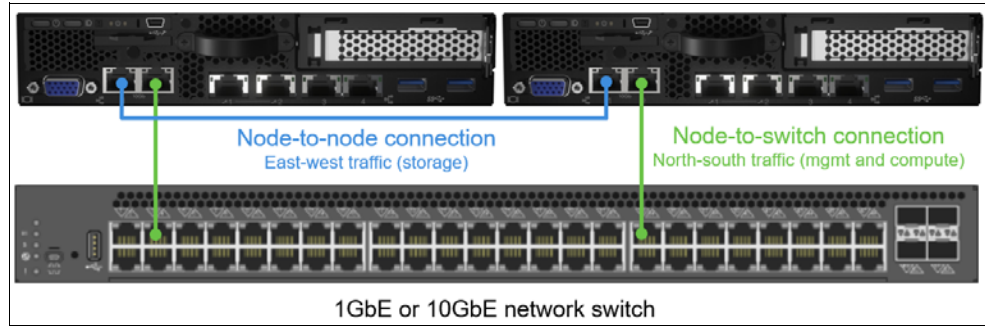


Figure 12 ThinkAgile MX1020/MX1021 direct-connected network cabling without PCIe NIC

Non-storage Network Adapters

For ThinkAgile MX1020 and MX1021 solutions, no other network adapters are available.

Storage HBAs

- ▶ ThinkSystem SE350 M.2 SATA/NVMe 4-bay Data Drive Enablement Kit
 - Used only for ThinkAgile MX1020 and MX1021 on SE350

NVMe switch adapters

- ▶ ThinkSystem 1610-4p NVMe Switch adapter
 - NVMe switches are used for configurations that include more than 4 NVMe devices

Storage devices

- ▶ For configurations with two storage device types, the number of devices can be reduced to a minimum of two cache and four capacity devices
- ▶ Only configurations with a single storage device type (all-SSD or all-NVMe) are supported for ThinkAgile MX1020/MX2021

Table 2 provides a list of all certified Lenovo storage devices that can be used to configure an HCI solution based on Lenovo ThinkEdge SE350 edge servers. This table does not include OS boot devices.

Table 2 Lenovo storage devices certified for ThinkAgile MX1020/MX1021 solutions

Storage devices certified for ThinkAgile MX1020/MX1021 solutions	Feature Code	Type	Usage
ThinkSystem M.2 5400 PRO 480GB Read Intensive SATA 6Gb NHS SSD	BQ1Y	SSD	Capacity
ThinkSystem M.2 5400 PRO 960GB Read Intensive SATA 6Gb NHS SSD	BQ20	SSD	Capacity
ThinkSystem M.2 7450 MAX 800GB Mixed Use NVMe	BQUL	NVMe	Capacity
ThinkSystem M.2 7450 PRO 960GB Read Intensive NVMe	BQUJ	NVMe	Capacity
ThinkSystem M.2 7450 PRO 1.92TB Read Intensive NVMe	BQUK	NVMe	Capacity
ThinkSystem M.2 7450 PRO 3.84TB Read Intensive NVMe	BRFZ	NVMe	Capacity

ThinkAgile MX450 Edge IS

The Lenovo ThinkAgile MX450 Edge Integrated System is a single-socket 3rd Gen Intel Xeon Platinum processor-based server. This server is designed for the Remote/Branch Office and Edge deployments and offers up to 1 TB memory, up to four internal SSD drive bays, and up

to 100Gb network connectivity. With a 2U height and short depth case that can go almost anywhere, it can be mounted on a wall, placed on the floor like a tower server, or mounted in a rack.

The example certified configurations shown in “Lenovo certified configuration details” on page 6 include several common hardware components. Depending on workloads and other requirements, there is some flexibility in customization of each configuration to meet a large range of customer needs. However, the following configuration guidelines *must* be followed:

Nodes

- ▶ In general, the number of nodes can range from 1 to 4 (refer to Table 1 on page 5) for all ThinkAgile MX Edge solutions.

Processors

- ▶ A single Intel processor in the Silver (4300 series) Gold (5300 or 6300 series) or Platinum (8300 series) processor families

Memory

- ▶ For ThinkAgile MX450 Edge IS solutions, we recommend a minimum of 64GB
- ▶ We strongly recommend a “balanced memory configuration” - for details, see the following URL: <http://lenovopress.com/lp1089.pdf>

OS Boot

Microsoft requires an OS boot volume size of at least 200GB. The following RAID kits are supported for the OS boot drive:

- ▶ ThinkSystem M.2 SATA/NVMe 2-Bay Adapter (FC B5XJ)
- ▶ ThinkSystem M.2 RAID B540i-2i SATA/NVMe Adapter (coming soon)

GPUs

The following GPUs are supported for ThinkAgile MX450 Edge IS solutions:

- ▶ ThinkSystem NVIDIA A2 16GB PCIe Gen4 Passive GPU w/o CEC (FC BQTZ)
- ▶ ThinkSystem NVIDIA L4 24GB PCIe Gen4 Passive GPU (FC BS2C)
- ▶ ThinkSystem NVIDIA L40 48GB PCIe Gen4 Passive GPU (FC BT87)

Storage Network Adapters

We recommend 25GbE or 100GbE, depending on storage configuration, for optimal performance. Storage network adapters are shown below by RDMA protocol and apply to ThinkAgile MX450 Edge IS solutions.

- ▶ For RoCE v2 on MX450 Edge IS solutions:
 - ThinkEdge Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-Port OCP Ethernet Adapter (FC BMHD)
 - ThinkSystem Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-Port PCIe Ethernet Adapter (FC BE4U)
 - ThinkSystem Mellanox ConnectX-6 Dx 100GbE QSFP56 2-port PCIe Ethernet Adapter (FC B8PP)

Note: Network switches must support the RoCE v2 feature set for best storage performance. See “Network switches” on page 24 for more information regarding Lenovo and NVIDIA/Mellanox network switches that have been tested with ThinkAgile MX solutions.

- ▶ For iWARP on MX450 Edge IS solutions:
 - ThinkEdge Intel E810-DA2 10/25GbE SFP28 2-Port OCP Ethernet Adapter (FC BMHG)
 - ThinkSystem Intel E810-DA2 10/25GbE SFP28 2-Port PCIe Ethernet Adapter (FC BCD6)

Non-storage Network Adapters

For ThinkAgile MX450 Edge IS solutions, any of the network adapters in the “Storage Network Adapters” section are supported for north-south (Management and Compute) traffic. In addition, the following network adapters can be used for north-south traffic, but not for east-west (Storage) traffic.

- ▶ Management and Compute traffic:
 - ThinkSystem Broadcom 57416 10GBASE-T 2-Port PCIe Ethernet Adapter (FC AUKP)
 - ThinkSystem Broadcom 57454 10GBASE-T 4-port PCIe Ethernet Adapter (FC B5SU)

Storage HBAs

- ▶ For SATA SSD storage, use ThinkSystem 4350-8i SAS/SATA 12Gb HBA (FC BJHH)
- ▶ No HBA is needed for all-NVMe configurations

Storage devices

- ▶ ThinkAgile MX450 Edge IS solutions support either all-NVMe (up to 4 devices) or all-SSD (up to 8 devices) configurations.

Table 3 provides a list of all certified Lenovo storage devices certified for ThinkAgile MX450 Edge IS solutions. This table does not include OS boot devices.

Table 3 Lenovo storage devices certified for ThinkAgile MX450 Edge IS solutions

Storage devices certified for ThinkAgile MX450 Edge IS solutions	Feature Code	Type	Usage
ThinkSystem 2.5" 7mm U.3 7450 PRO 960GB Read Intensive NVMe	BKSQ	NVMe	Capacity
ThinkSystem 2.5" 7mm U.3 7450 PRO 1.92TB Read Intensive NVMe	BKWR	NVMe	Capacity
ThinkSystem 2.5" 7mm U.3 7450 PRO 3.84TB Read Intensive NVMe	BKWS	NVMe	Capacity
ThinkSystem 2.5" 7mm S4520 480GB Entry SATA 6Gb Trayless SSD	BKSU	SSD	Capacity
ThinkSystem 2.5" 7mm S4520 960GB Read Intensive SATA 6Gb Trayless SSD	BKSV	SSD	Capacity
ThinkSystem 2.5" 7mm S4520 1.92TB Read Intensive SATA 6Gb Trayless SSD	BKSW	SSD	Capacity
ThinkSystem 2.5" 7mm S4520 3.84TB Read Intensive SATA 6Gb Trayless SSD	BM1D	SSD	Capacity
ThinkSystem 2.5" 7mm S4520 7.68TB Read Intensive SATA 6Gb Trayless SSD	BM1E	SSD	Capacity
ThinkSystem 2.5" 7mm 5400 PRO 480GB Read Intensive SATA 6Gb Trayless SSD	BS2W	SSD	Capacity
ThinkSystem 2.5" 7mm 5400 PRO 960GB Read Intensive SATA 6Gb Trayless SSD	BS2V	SSD	Capacity

Storage devices certified for ThinkAgile MX450 Edge IS solutions	Feature Code	Type	Usage
ThinkSystem 2.5" 7mm 5400 PRO 1.92TB Read Intensive SATA 6Gb Trayless SSD	BS2U	SSD	Capacity
ThinkSystem 2.5" 7mm 5400 PRO 3.84TB Read Intensive SATA 6Gb Trayless SSD	BS2T	SSD	Capacity
ThinkSystem 2.5" 7mm 5400 PRO 7.68TB Read Intensive SATA 6Gb Trayless SSD	BS2S	SSD	Capacity

Storage device end of life

More than any other component in a certified solution, the storage devices available are constantly changing as new, faster, larger devices are brought to market and previous generations reach their end of life. Table 4 provides details on which devices have reached or are nearing their projected end of life, including estimated last availability date and replacement device (if one is available).

Table 4 Storage device end of life summary

End of Life Device	Date	Replacement Device

ThinkAgile MX455 V3 Edge PR

The ThinkAgile MX455 V3 Edge Premier Solution is a versatile edge solution belonging to the top tier of Azure Local solution categories delivering new levels of AI, compute and storage performance at the edge, built through close engineering collaboration between Lenovo and Microsoft. This single-socket server with a 2U height and short depth case is suitable for deployment in shallow cabinets. It can be mounted in a 2-post or 4-post rack and uses the AMD EPYC 8004 Series processors for an ideal mix of performance and power efficiency.

The example certified configurations shown in “Lenovo certified configuration details” on page 6 include several common hardware components. Depending on workloads and other requirements, there is some flexibility in customization of each configuration to meet a large range of customer needs. However, the following configuration guidelines *must* be followed:

Nodes

- ▶ In general, the number of nodes can range from 1 to 4 (refer to Table 1 on page 5) for all ThinkAgile MX Edge solutions.

Processors

- ▶ A single AMD EPYC 8004 Series processor

Memory

- ▶ For ThinkAgile MX455 V3 Edge PR solutions, we recommend a minimum of 64GB

OS Boot

- ▶ Minimum requirement is 200GB OS boot volume
- ▶ RAID adapters supported for boot volume on ThinkAgile MX455 V3 Edge PR solutions:
 - ThinkEdge SE455 V3 M.2 RAID B540i-2i SAS/SATA Adapter with Carrier (FC BZPA)
 - ThinkSystem RAID 5350-8i for M.2 SATA Boot Enablement (FC BVL1)
 - ThinkSystem RAID 5350-8i for M.2 NVMe Boot Enablement (FC BVL3)

GPUs

The following GPUs are supported for ThinkAgile MX455 V3 Edge PR solutions:

- ▶ ThinkSystem NVIDIA A2 16GB PCIe Gen4 Passive GPU (FC BP05)
- ▶ ThinkSystem NVIDIA A2 16GB PCIe Gen4 Passive GPU w/o CEC (FC BQTZ)
- ▶ ThinkSystem NVIDIA L4 24GB PCIe Gen4 Passive GPU (FC BS2C)
- ▶ ThinkSystem NVIDIA L40 48GB PCIe Gen4 Passive GPU (FC BT87)

Storage Network Adapters

We recommend 25GbE or 100GbE, depending on storage configuration, for optimal performance. Storage network adapters are shown below by RDMA protocol and apply to ThinkAgile MX455 V3 Edge PR solutions.

- ▶ For RoCE v2 on MX455 V3 Edge PR solutions:
 - ThinkSystem Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-Port OCP Ethernet Adapter (FC BE4T)
 - ThinkSystem Mellanox ConnectX-6 Lx 10/25GbE SFP28 2-Port PCIe Ethernet Adapter (FC BE4U)
 - ThinkSystem Mellanox ConnectX-6 Dx 100GbE QSFP56 2-port PCIe Ethernet Adapter (FC B8PP)

Note: Network switches must support the RoCE v2 feature set for best storage performance. See “Network switches” on page 24 for more information regarding Lenovo and NVIDIA/Mellanox network switches that have been tested with ThinkAgile MX solutions.

- ▶ For iWARP on MX455 V3 Edge PR solutions:
 - ThinkSystem Intel E810-DA2 10/25GbE SFP28 2-Port OCP Ethernet Adapter (FC BCD4)
 - ThinkSystem Intel E810-DA4 10/25GbE SFP28 4-Port OCP Ethernet Adapter (FC BP8L)
 - ThinkSystem Intel E810-DA2 10/25GbE SFP28 2-Port PCIe Ethernet Adapter (FC BCD6)
 - ThinkSystem Intel E810-DA4 10/25GbE SFP28 4-Port PCIe Ethernet Adapter (FC BP8M)

Non-storage Network Adapters

For ThinkAgile MX455 V3 Edge PR solutions, any of the network adapters in the “ThinkSystem NVIDIA L4 24GB PCIe Gen4 Passive GPU (FC BS2C)” section above are supported for north-south (Management and Compute) traffic. No other network adapters are supported for MX455 V3 Edge PR solutions.

Storage HBAs

- ▶ Since all MX455 V3 Edge PR solutions use only NVMe devices, no HBA is needed for any configuration

Storage devices

- ▶ ThinkAgile MX455 V3 Edge PR solutions only support all-NVMe configurations (up to 8 devices).

Table 5 provides a list of all certified Lenovo storage devices certified for ThinkAgile MX455 V3 Edge PR solutions. This table does not include OS boot devices.

Table 5 Lenovo NVMe storage devices certified for ThinkAgile MX455 V3 Edge PR solutions

NVMe storage devices certified for ThinkAgile MX455 V3 Edge PR solutions	Feature Code	Type	Usage
ThinkSystem 2.5" U.3 7500 MAX 1.6TB Mixed Use NVMe	C2BV	NVMe	Capacity
ThinkSystem 2.5" U.3 7500 MAX 3.2TB Mixed Use NVMe	C2BW	NVMe	Capacity
ThinkSystem 2.5" U.3 7500 MAX 6.4TB Mixed Use NVMe	C2BF	NVMe	Capacity
ThinkSystem 2.5" U.3 7500 MAX 12.8TB Mixed Use NVMe	C2BX	NVMe	Capacity
ThinkSystem 2.5" U.3 7500 PRO 1.92TB Read Intensive NVMe	C2BR	NVMe	Capacity
ThinkSystem 2.5" U.3 7500 PRO 3.84TB Read Intensive NVMe	C2BS	NVMe	Capacity
ThinkSystem 2.5" U.3 7500 PRO 7.68TB Read Intensive NVMe	C2BT	NVMe	Capacity
ThinkSystem 2.5" U.3 7500 PRO 15.36TB Read Intensive NVMe	C2BU	NVMe	Capacity
ThinkSystem 2.5" U.3 7450 PRO 960GB Read Intensive NVMe	BNF3	NVMe	Capacity
ThinkSystem 2.5" U.3 7450 PRO 1.92TB Read Intensive NVMe	BNF2	NVMe	Capacity
ThinkSystem 2.5" U.3 7450 PRO 3.84TB Read Intensive NVMe	BNF5	NVMe	Capacity
ThinkSystem 2.5" U.3 7450 PRO 7.68TB Read Intensive NVMe	BNF4	NVMe	Capacity
ThinkSystem 2.5" U.3 7450 MAX 1.6TB Mixed Use NVMe	BNEJ	NVMe	Capacity
ThinkSystem 2.5" U.3 7450 MAX 3.2TB Mixed Use NVMe	BNEY	NVMe	Capacity
ThinkSystem 2.5" U.3 7450 MAX 6.4TB Mixed Use NVMe	BNEL	NVMe	Capacity
ThinkSystem 2.5" U.2 P5620 1.6TB Mixed Use NVMe	BNEG	NVMe	Capacity
ThinkSystem 2.5" U.2 P5620 3.2TB Mixed Use NVMe	BNEH	NVMe	Capacity
ThinkSystem 2.5" U.2 P5620 6.4TB Mixed Use NVMe	BNEZ	NVMe	Capacity
ThinkSystem 2.5" U.2 P5620 12.8TB Mixed Use NVMe	BA4V	NVMe	Capacity
ThinkSystem 2.5" U.2 P5520 1.92TB Read Intensive NVMe	BMGD	NVMe	Capacity
ThinkSystem 2.5" U.2 P5520 3.84TB Read Intensive NVMe	BMGE	NVMe	Capacity
ThinkSystem 2.5" U.2 P5520 7.68TB Read Intensive NVMe	BNEF	NVMe	Capacity
ThinkSystem 2.5" U.2 P5520 15.36TB Read Intensive NVMe	BNEQ	NVMe	Capacity

Storage device end of life

More than any other component in a certified solution, the storage devices available are constantly changing as new, faster, larger devices are brought to market and previous generations reach their end of life. Table 6 provides details on which devices have reached or are nearing their projected end of life, including estimated last availability date and replacement device (if one is available).

Table 6 Storage device end of life summary

End of Life Device	Date	Replacement Device

Network switches

Network switches that have been tested in our labs include Lenovo and NVIDIA (Mellanox) switches. Although Lenovo no longer sells network switches, information about them is included here for customers who already own them. Mellanox switches must be ordered directly from NVIDIA.

Lenovo network switches

Lenovo network switches are no longer being offered. The information contained in this section is provided in case customers want to verify that their existing Lenovo switches can be used for an Azure Local solution.

Although network switches are not specifically certified under the Microsoft HCI certification programs, all of the Lenovo certified configurations for Microsoft HCI discussed in this document have undergone rigorous end-to-end solution validation using Lenovo network switches to carry all solution traffic.

Table 7 lists the recommended Lenovo networking switches for S2D deployment. These switches support the Remote Direct Memory Access (RDMA) feature of Microsoft SMB 3.x, which is used extensively by S2D and are fully compatible with the Mellanox ConnectX-4 Lx network adapters used in these solutions to provide the highest storage performance.

Table 7 Recommended Lenovo network switches for S2D

Lenovo Switch	Speed	Part Number	Feature Code
RackSwitch™ G8272	10GbE	7159CRW/7159CFV	ASRD/ASRE
ThinkSystem NE1032 RackSwitch	10GbE	7159A1X/7159A2X	AU3A/AU39
ThinkSystem NE2572 RackSwitch	10/25GbE	7159E1X/7159E2X	AV19/AV1A
ThinkSystem NE10032 RackSwitch	100GbE	7159D1X/7159D2X	AV17/AV18

Note: The first part number and feature code listed in Table 7 is for a switch with rear to front airflow. The second part number and feature code is for front to rear airflow.

RackSwitch G8272

The Lenovo RackSwitch G8272 uses 10 Gb SFP+ and 40 Gb QSFP+ Ethernet technology and is specifically designed for the data center. It is ideal for today's big data, cloud, and optimized workload solutions. It is an enterprise class Layer 2 and Layer 3 full featured switch that delivers line-rate, high-bandwidth switching, filtering, and traffic queuing without delaying data. Large data center-grade buffers help keep traffic moving, while the hot-swap redundant power supplies and fans (along with numerous high-availability features) help provide high availability for business sensitive traffic. In addition to the 10GbE and 40GbE connections, the G8272 can use 1GbE connections.

ThinkSystem NE1032 RackSwitch

The Lenovo ThinkSystem NE1032 RackSwitch is a 1U rack-mount 10 GbE switch that delivers lossless, low-latency performance with feature-rich design that supports virtualization, Converged Enhanced Ethernet (CEE), high availability, and enterprise class Layer 2 and Layer 3 functionality. The switch delivers line-rate, high-bandwidth switching, filtering, and traffic queuing without delaying data. The NE1032 RackSwitch has 32x SFP+

ports that support 1 GbE and 10 GbE optical transceivers, active optical cables (AOCs), and DACs. The switch helps consolidate server and storage networks into a single fabric, and it is an ideal choice for virtualization, cloud, and enterprise workload solutions.

ThinkSystem NE2572 RackSwitch

The Lenovo ThinkSystem NE2572 RackSwitch is designed for the data center and provides 10/25 GbE connectivity with 40/100 GbE upstream links. It is ideal for big data, cloud, and enterprise workload solutions. It is an enterprise class Layer 2 and Layer 3 full featured switch that delivers line-rate, high-bandwidth switching, filtering, and traffic queuing without delaying data. Large data center-grade buffers help keep traffic moving, while the hot-swap redundant power supplies and fans (along with numerous high-availability software features) help provide high availability for business sensitive traffic. The NE2572 RackSwitch has 48x SFP28/SFP+ ports that support 10 GbE SFP+ and 25 GbE SFP28 optical transceivers, AOCs, and DACs. The switch also offers 6x QSFP28/QSFP+ ports that support 40 GbE QSFP+ and 100 GbE QSFP28 optical transceivers, AOCs, and DACs. These ports can also be split out into four 10 GbE (for 40 GbE QSFP+) or 25 GbE (for 100 GbE QSFP28) connections by using breakout cables.

ThinkSystem NE10032 RackSwitch

The Lenovo ThinkSystem NE10032 RackSwitch uses 100 Gb QSFP28 and 40 Gb QSFP+ Ethernet technology and is specifically designed for the data center. It is ideal for today's big data, cloud, and enterprise workload solutions. It is an enterprise class Layer 2 and Layer 3 full featured switch that delivers line-rate, high-bandwidth switching, filtering, and traffic queuing without delaying data. Large data center-grade buffers help keep traffic moving, while the hot-swap redundant power supplies and fans (along with numerous high-availability features) help provide high availability for business sensitive traffic. The NE10032 RackSwitch has 32x QSFP+/QSFP28 ports that support 40 GbE and 100 GbE optical transceivers, AOCs, and DACs. These ports can also be split out into four 10 GbE (for 40 GbE ports) or 25 GbE (for 100 GbE ports) connections by using breakout cables.

NVIDIA/Mellanox network switches

Although NVIDIA/Mellanox switches are not orderable from Lenovo, the following Mellanox network switches have been tested with ThinkAgile MX solutions and proper switch functionality has been verified:

NVIDIA MSN2010-CB2F Spectrum Based 25GbE/100GbE with Onyx OS

1U, Half-Width Open Ethernet switch with 18 SFP28 and 4 QSFP28 Ports

<https://www.mellanox.com/sites/default/files/doc-2020/br-sn2000-series.pdf>

<https://www.mellanox.com/sites/default/files/doc-2020/pb-sn2010.pdf>

NVIDIA MSN2410-CB2F Spectrum Based 25GbE/100GbE with Onyx OS

1U, Full-Width Open Ethernet switch with 48 SFP28 Ports 8 QSFP28 Ports

<https://www.mellanox.com/sites/default/files/doc-2020/br-sn2000-series.pdf>

<https://www.mellanox.com/sites/default/files/doc-2020/pb-sn2410.pdf>

NVIDIA MSN3700-CS2F Spectrum-2 Based 100GbE with Onyx OS

1U, Full-Width Open Ethernet switch with 32 QSFP28 Ports

<https://www.mellanox.com/files/doc-2020/br-sn3000-series.pdf>

Other recommendations

We also recommend the features and upgrades in this section to maximize the security and manageability of the Azure Local or Windows Server S2D solution built using the Lenovo certified configurations discussed in this document.

TPM 2.0 and Secure Boot

Trusted Platform Module (TPM) is an international standard for a secure cryptoprocessor, a dedicated microcontroller designed to secure hardware through integrated cryptographic keys. TPM technology is designed to provide hardware-based, security-related functions and is used extensively by Microsoft in Windows Server technologies including BitLocker, Device Guard, Credential Guard, UEFI Secure Boot, and others. There is no additional cost to enable TPM 2.0 on Lenovo ThinkSystem servers.

Note: TPM is not supported in PRC. For systems shipped to China, NationZ TCM is used and supported.

ThinkSystem XClarity Controller Standard to Enterprise Level

The Lenovo XClarity™ Controller is the next generation management controller that replaces the baseboard management controller (BMC) for Lenovo ThinkSystem servers. Although the XCC Standard Level includes many important manageability features, we recommend upgrading to the XCC Enterprise Level of functionality. This enhanced set of features includes Virtual Console (out of band browser-based remote control), Virtual Media mounting, and other remote management capabilities.

Lenovo XClarity Pro

Lenovo XClarity Administrator (LXCA) is a centralized resource management solution that is aimed at reducing complexity, speeding response, and enhancing the availability of Lenovo server systems and solutions. LXCA provides agent-free hardware management for our servers, storage, network switches, hyperconverged and ThinkAgile solutions. Lenovo XClarity Pro offers additional functionality that provide important benefits to managing a Microsoft S2D cluster solution. For more information, see the LXCA Product Guide at the following URL:

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

Lenovo XClarity Integrator for Microsoft Windows Admin Center

Lenovo XClarity Integrator for Microsoft Windows Admin Center (LXCI for WAC) provides IT administrators with a smooth and seamless experience in managing Lenovo servers. Using WAC's Server Manager or Cluster Manager extension, IT administrators can manage Lenovo servers as single hosts or directly manage them as Microsoft Windows Failover clusters. In addition, they are able to manage Azure Local instances as well as Lenovo ThinkAgile MX Appliances and Certified Nodes through the LXCI snap-ins integrated into WAC's cluster creation and Cluster-Aware Updating (CAU) functions. The LXCI for WAC extension simplifies server management of IT administrators, making it possible to remotely manage servers throughout their life cycle in a single unified UI. For more information, see the LXCI for WAC Information Center at the following URL:

<https://pubs.lenovo.com/lxci-wac>

Summary

Lenovo is a key partner in the Microsoft WSSD and Azure Local programs for certification of HCI solutions. Based on Lenovo's investment in these programs and the tremendous amount of time, resources, and effort dedicated to certification and validation testing for each certified configuration discussed in this document, Lenovo's customers can rest assured that the configurations presented will perform smoothly and reliably right out of the box.

This document has provided some background information related to the Microsoft WSSD and Azure Local programs, as well as details of configurations that have been certified and validated under the program to run Storage Spaces Direct on ThinkAgile MX450 Edge IS solutions. Selecting from the list of Lenovo certified configurations found in this document to build an Azure Local or Windows Server S2D solution will save time, money, and effort associated with designing and building a do-it-yourself solution.

Change History

Changes in the January 2025 update:

- ▶ Updated terminology based on Microsoft's change of the Azure Stack HCI operating system name to "Azure Local"

Initial release in December 2024

Authors

This paper was produced by the following specialists:

Dave Feisthammel is a Senior Solutions Architect working at the Lenovo Center for Microsoft Technologies in Bellevue, Washington. He has over 25 years of experience in the IT field, including four years as an IBM client and over 18 years working for IBM and Lenovo. His areas of expertise include Windows Server and systems management, as well as virtualization, storage, and cloud technologies. He is currently a key contributor to Lenovo solutions related to Microsoft Azure Local and Azure Stack Hub.

Guy Fusman is a Windows Engineer working at the Lenovo Center for Microsoft Technologies in Bellevue, Washington. He has over 25 years in the IT industry, focused on client, server, and cloud solutions support and development. For the last 8 years he has primarily worked with Microsoft Azure Stack Hub and Azure Local solutions running on Lenovo servers.

Hussein Jammal is a Senior Solutions Architect Engineer and Microsoft Solution Lead in EMEA working in Bucharest, Romania. He has over 13 years of experience in the IT engineering field. He is focused on Microsoft Cloud on-premises solution development and enablement, including Azure Stack Hub, Azure Local and Azure Stack Edge solutions. He works regularly with customers on complex troubleshooting issues and proofs of concept.

Mike Miller is a Windows Engineer with the Lenovo Server Lab in Bellevue, Washington. He has over 35 years in the IT industry, primarily in client/server support and development roles. The last 13 years have been focused on Windows Server operating systems and server-level hardware, particularly on operating system/hardware compatibility, advanced Windows features, and Windows test functions.

David Ye is a Principal Solutions Architect at Lenovo with over 25 years of experience in the IT field. He started his career at IBM as a Worldwide Windows Level 3 Support Engineer. In this role, he helped customers solve complex problems and critical issues. He is now working in the Lenovo Infrastructure Solutions Group, where he works with customers on Proof of Concept designs, solution sizing and reviews, and performance optimization. His areas of expertise are Windows Server, SAN Storage, Virtualization and Cloud, and Microsoft Exchange Server. He is currently leading the effort in Microsoft Azure Local and Azure Stack Hub solutions development.

A special thank you to the following Lenovo colleagues for their contributions to this project:

- ▶ Daniel Ghidali, Manager - Microsoft Technology and Enablement
- ▶ Vinay Kulkarni, Principal Technical Consultant - Microsoft Solutions and Enablement
- ▶ Laurentiu Petre, Solutions Engineer - ISG Software Development
- ▶ Vy Phan, Technical Program Manager - Microsoft OS and Solutions
- ▶ Garrett Tashiro, Microsoft Cloud Solution Engineer
- ▶ David Watts, Senior IT Consultant - Lenovo Press

Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service.

Lenovo may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

Lenovo (United States), Inc.
1009 Think Place - Building One
Morrisville, NC 27560
U.S.A.
Attention: Lenovo Director of Licensing

LENOVO PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. Lenovo may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

The products described in this document are not intended for use in implantation or other life support applications where malfunction may result in injury or death to persons. The information contained in this document does not affect or change Lenovo product specifications or warranties. Nothing in this document shall operate as an express or implied license or indemnity under the intellectual property rights of Lenovo or third parties. All information contained in this document was obtained in specific environments and is presented as an illustration. The result obtained in other operating environments may vary.

Lenovo may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk.

Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

This document was created or updated on December 6, 2024.

Send us your comments via the **Rate & Provide Feedback** form found at <http://lenovopress.com/lp1984>

Trademarks

Lenovo, the Lenovo logo, and For Those Who Do are trademarks or registered trademarks of Lenovo in the United States, other countries, or both. These and other Lenovo trademarked terms are marked on their first occurrence in this information with the appropriate symbol (® or ™), indicating US registered or common law trademarks owned by Lenovo at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of Lenovo trademarks is available on the Web at <http://www.lenovo.com/legal/copytrade.html>.

The following terms are trademarks of Lenovo in the United States, other countries, or both:

Lenovo®	Lenovo(logo)®	TruDDR4™
Lenovo XClarity™	ThinkAgile™	
RackSwitch™	ThinkSystem™	

The following terms are trademarks of other companies:

Intel, Xeon, and the Intel logo are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Azure, BitLocker, Microsoft, Windows, Windows Server, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.