

# ThinkAgile MX1020 Appliance and MX1021 Certified Node for Microsoft Azure Stack HCI

## Product Guide

The Lenovo ThinkAgile MX1020 Appliance and ThinkAgile MX1021 Certified Node are designed for deploying highly available, 2-node hyper-converged infrastructure (HCI) from Microsoft in remote offices/branch offices (ROBO) environments and at the edge.

The MX1020 Azure Stack HCI Appliance and MX1021 Azure Stack HCI Certified Node are validated platforms that help modernize on-premises infrastructure with pre-tested, pre-configured, and easy-to-order configurations, with seamless Azure integration.

The **ThinkAgile MX1020 Azure Stack HCI Appliance (Integrated System)** includes the new Azure Stack HCI and includes ThinkAgile Advantage support with one single point of contact for support of the hardware and warm-case transfer for software. Deployment and update features in Windows Admin Center and tight integration with Lenovo XClarity make cluster management, hardware and software update management & enforcing site wide policies easy for the IT administrators. Native integration with Azure services makes it easy for customers to adopt a hybrid cloud strategy for their workloads.

The **ThinkAgile MX1021 Azure Stack HCI Certified Node** delivers fully validated and integrated Lenovo hardware and firmware that is certified for Microsoft Azure Stack HCI solutions. The ThinkAgile MX1021 has the option of Windows Server 2019 Datacenter Edition for HCI functionality, and guest licenses are included.

The systems offer one Intel Xeon processor, up to 256 GB memory, up to eight M.2 drive bays, and 10Gb network connectivity with an option for wireless connectivity (Wi-Fi and LTE). The systems are optimized for various types of edge and ROBO workloads that need compute power, data storage, and network closer to where data is generated, such as IoT, and require small compute footprint and operations in rugged environments.



Figure 1. Lenovo ThinkAgile MX1020 Appliance and ThinkAgile MX1021 Certified Node

### Did you know?

As a new direct and indirect Microsoft Cloud Solution Provider, Lenovo offers cloud services and subscriptions through the Lenovo Cloud Marketplace, which enable HCI use cases with the ThinkAgile MX platforms.

The ThinkAgile MX1020 and MX1021 offer a compact design, low power usage, high performance, and security for edge locations. They can be wall-mounted, stacked on a shelf, or installed in a rack cabinet, and they are designed to operate in rugged environments with temperatures of up to 55°C and extreme shock and vibration.

## Key features

The ThinkAgile MX1020 Appliance (Integrated System) offers the following key features:

- Quick and convenient path to implement a hyperconverged solution powered by the new Azure Stack HCI OS with Hyper-V virtualization, Microsoft Storage Spaces Direct (S2D), Software Defined Storage (SDS), and Software Defined Networking (SDN) network virtualization.
- Streamlined management of Azure Stack HCI with unified single-pane-of-glass for creating and managing VMs, S2D volumes, and virtual networks through Windows Admin Center.
- Consistent, low latency performance with hypervisor-embedded architecture, built-in read and write cache, and support for NVMe PCIe drives.
- Provides per-VM storage performance management with policy-driven Quality of Service (QoS) and continuous built-in monitoring and alerting with cluster-wide performance and capacity metrics.
- Can sustain drive, server, or component failures with built-in resiliency for continuous availability.
- GPU support to enable AI training, inferencing and data visualization scenarios, HPC workloads, virtual desktops and graphics intensive applications.
- Built on proven and reliable Lenovo ThinkSystem servers that provide compute power and space efficiency for a variety of edge workloads and applications.
- Provides comprehensive hardware management with advanced systems management capabilities with XClarity
- Delivers fully validated and integrated hardware and firmware that is certified for Microsoft Azure Stack HCI solutions.
- Ready for out-of-box deployment with the mandatory Azure Stack HCI OS preloaded, with the option to purchase a Windows Server 2019 Datacenter license if unlimited guest OS VMs are desired.
- Includes Lenovo ThinkAgile Advantage Single Point of Support for quick 24/7 problem reporting and resolution.
- Includes Lenovo deployment services to get customers up and running quickly.

The ThinkAgile MX1021 Certified Node offer the following key features:

- Quick and convenient path to implement a hyperconverged solution powered by Windows Server 2019 Datacenter with Hyper-V virtualization, Microsoft Storage Spaces Direct (S2D), Software Defined Storage (SDS), and Software Defined Networking (SDN) network virtualization.
- Streamlined management of Azure Stack HCI with unified single-pane-of-glass for creating and managing VMs, S2D volumes, and virtual networks through Windows Admin Center.
- Consistent, low latency performance with hypervisor-embedded architecture, built-in read and write cache, and support for NVMe PCIe drives.
- Provides per-VM storage performance management with policy-driven Quality of Service (QoS) and continuous built-in monitoring and alerting with cluster-wide performance and capacity metrics.
- Can sustain drive, server, or component failures with built-in resiliency for continuous availability.
- GPU support to enable AI training, inferencing and data visualization scenarios, HPC workloads, virtual desktops and graphics intensive applications.
- Built on proven and reliable Lenovo ThinkSystem servers that provide compute power and space efficiency for a variety of edge workloads and applications.
- Provides comprehensive hardware management with advanced systems management capabilities.
- Delivers fully validated and integrated hardware and firmware that is certified for Microsoft Azure Stack HCI solutions.
- Ready for out-of-box deployment with the optional Windows Server 2019 Datacenter preload.
- Provide flexibility in using the existing Microsoft Windows Server 2019 enterprise license agreements

or purchasing new software licenses from Microsoft or Lenovo.

- Optional Lenovo deployment services to get customers up and running quickly.

## Components and connectors

The following figures show the front view of the MX1020 and MX1021 systems with 10 GbE SFP+ (wired module), 10 GbE RJ-45 (wired module), and 10 GbE SFP+ and 1 GbE SFP (wireless module) ports.

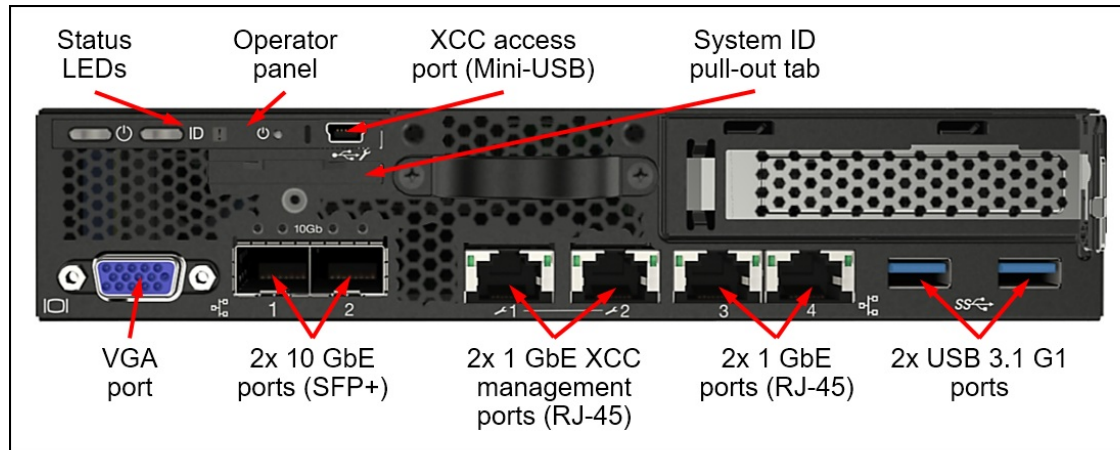


Figure 2. MX1020 and MX1021 with 10 GbE SFP+ ports: Front view

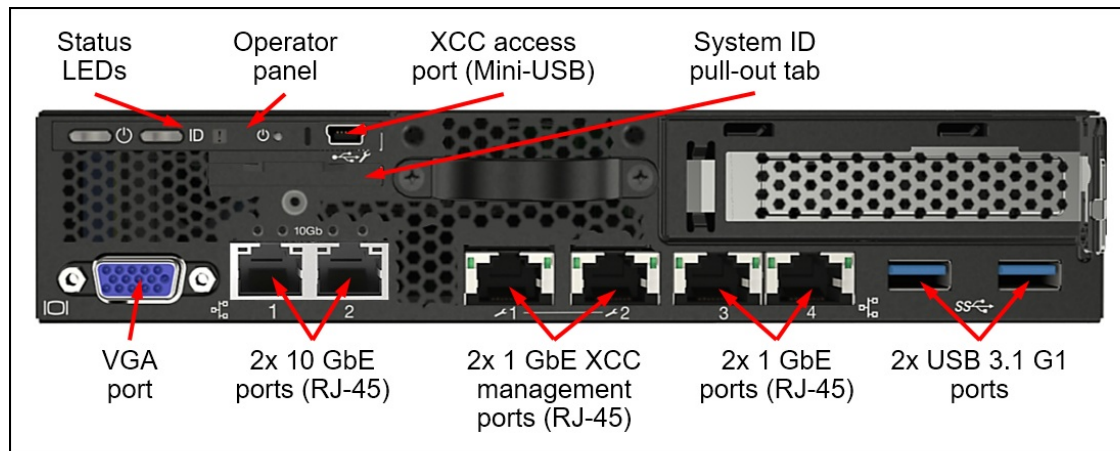


Figure 3. MX1020 and MX1021 with 10 GbE RJ-45 ports: Front view

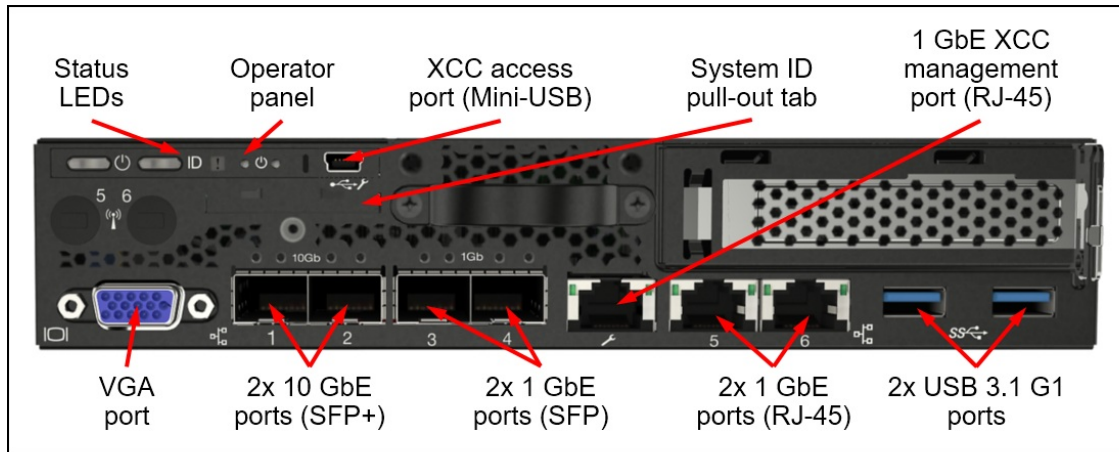


Figure 4. MX1020 and MX1021 with 10 GbE SFP+ and 1 GbE SFP ports: Front view

The front of the MX1020 and MX1021 includes the following components:

- Two 10 GbE SFP+ or RJ-45 ports.
- Two 1 GbE SFP ports (wireless module only).
- Two 1 GbE RJ-45 ports.
- One (wireless module) or two (wired modules) 1 GbE RJ-45 management ports for XClarity Controller access.
- Two USB 3.1 G1 ports.
- One VGA port.
- One Mini-USB port for XClarity Controller access.
- Operator panel.
- Status LEDs.
- System ID pull-out tab.

The following figures show the rear view of the MX1020 and MX1021 systems with -48 V DC and 12 V DC PDMs.

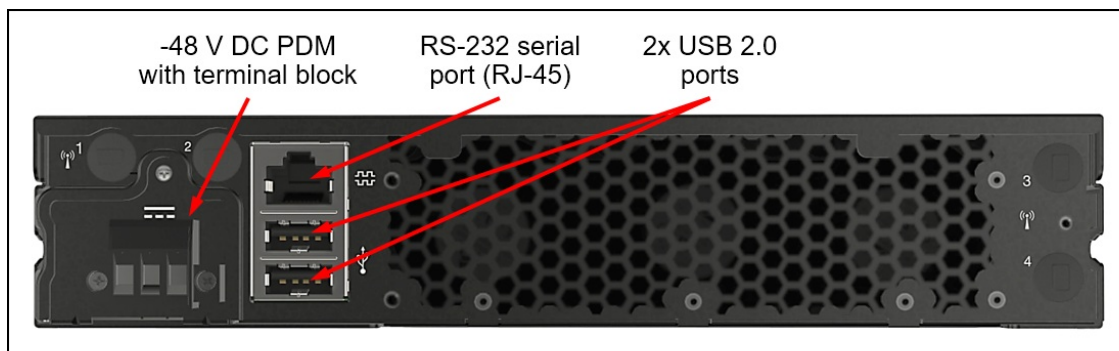


Figure 5. MX1020 and MX1021 with -48 V DC PDM: Rear view

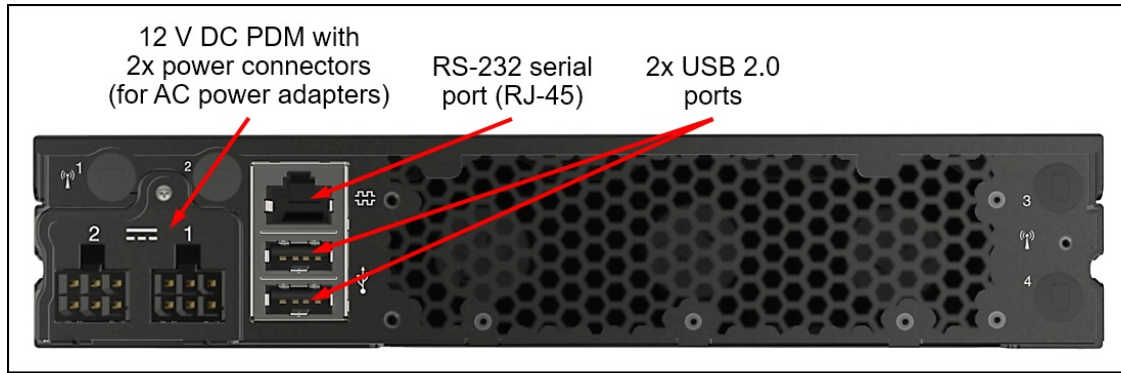


Figure 6. MX1020 and MX1021 with 12 V DC PDM: Rear view

The rear of the MX1020 and MX1021 systems includes the following components:

- One PDM:
  - -48 V DC with one terminal block.
  - 12 V DC with two power connectors for 240 W AC power adapters.
- One RS-232 serial port.
- Two USB 2.0 ports.

## System specifications

The following table lists the system specifications for the MX1020 and MX1021 systems.

Table 1. System specifications

Attribute	Specification
Machine type	MX1020 Appliance: 7D5S (for India: 7D5T) MX1021 Certified Node: 7D1B (for India: 7D2U)
Form factor	1U half-wide node: <ul style="list-style-type: none"> <li>• Rack installation               <ul style="list-style-type: none"> <li>◦ MX1021 E1 Enclosure: 1U two-node (1U2N) rack-mount.</li> <li>◦ MX1021 E2 Enclosure: 2U two-node (2U2N) rack-mount.</li> </ul> </li> <li>• DIN Rail installation.</li> <li>• Wall-mount installation.</li> <li>• Desktop installation.</li> <li>• Stacked installation.</li> </ul>
Processor	One Intel Xeon-D 2100 Series processor with integrated PCH and networking (System-on-a-chip [SoC]).
Memory	4 DIMM slots (four processor's memory channels with one DIMM per channel). Support for TruDDR4 2666 MHz 16 GB RDIMMS, 32 GB RDIMMs, or 64 GB LRDIMMs. Memory speeds up to 2400 MHz (depending on processor capabilities). <b>Note:</b> All memory DIMMs must be of the same type and capacity.
Memory capacity	Up to 256 GB (A minimum of 64 GB is required).
Memory protection	Error correction code (ECC), Single Device Data Correction (SDDC; for x4-based memory DIMMs), patrol scrubbing, and demand scrubbing.

Attribute	Specification
Internal storage	<ul style="list-style-type: none"> <li>● Single-tier: <ul style="list-style-type: none"> <li>○ 4 M.2 SATA SSDs or</li> <li>○ From 4 to 8 M.2 NVMe PCIe SSDs.</li> </ul> </li> <li>● Two-tier: Two NVMe PCIe high endurance SSDs (cache) and from 4 to 6 NVMe PCIe SSDs (capacity).</li> </ul> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>● For single-tier configurations, all SSDs (SATA or NVMe PCIe) must be of the same model and capacity (same feature code).</li> <li>● For two-tier configurations, all cache SSDs (NVMe PCIe high endurance) must be of the same model and capacity, and all capacity SSDs (NVMe PCIe) must be of the same model and capacity.</li> <li>● Mixing SATA SSDs and NVMe PCIe SSDs is not allowed.</li> </ul>
Drive bays	<ul style="list-style-type: none"> <li>● 4x M.2 SATA/NVMe non-hot-swap drive sockets or</li> <li>● 8x M.2 NVMe non-hot-swap drive sockets.</li> </ul>
Drive capacities	<ul style="list-style-type: none"> <li>● M.2 6 Gbps SATA SSDs up to 1.92 TB.</li> <li>● M.2 NVMe PCIe 3.0 x4 SED high endurance SSDs up to 650 GB.</li> <li>● M.2 NVMe PCIe 3.0 x4 SED SSDs up to 2 TB.</li> </ul>
Storage controller	<ul style="list-style-type: none"> <li>● 6 Gbps SATA AHCI (Processor's PCH) or</li> <li>● PCIe 3.0 NVMe (Processor's PCIe controller).</li> </ul>
Network interfaces	<ul style="list-style-type: none"> <li>● 2x 10 GbE (10 Gbps) RJ-45 and 2x 1 GbE (10/100/1000 Mbps) RJ-45 ports or</li> <li>● 2x 10 GbE (10 Gbps) SFP+ and 2x 1 GbE (10/100/1000 Mbps) RJ-45 ports or</li> <li>● 2x 10 GbE (10 Gbps) SFP+, 2x 1 GbE (1 Gbps) SFP, and 2x 1 GbE (10/100/1000 Mbps) RJ-45 ports, Wi-Fi (802.11 a/b/g/n/ac), and LTE (optional).</li> </ul> <p><b>Note:</b> Wi-Fi and LTE interfaces have two external antennas.</p>
Boot drive	2x 480 GB M.2 non-hot-swap SSDs (RAID-1).
Ports	<ul style="list-style-type: none"> <li>● Front: 2x USB 3.1 G1 ports, 1x VGA port, 1x Mini USB 2.0 port for XClarity Controller access, and 2x RJ-45 10/100/1000 Mb Ethernet ports for systems management.</li> <li>● Rear: 2x USB 2.0 ports and 1x RJ-45 RS-232 serial port.</li> </ul>
Cooling	Three non-hot-swap system fans.
Power modules	<ul style="list-style-type: none"> <li>● One -48 V DC (-40 to -72 V DC) power module or</li> <li>● One 12 V power module with one or two 240 W (100 to 240 V AC) adapters.</li> </ul>
Video	Matrox G200 with 16 MB memory integrated into the XClarity Controller. Maximum resolution is 1920x1200 at 60 Hz with 32 bits per pixel.
Systems management	Lenovo XClarity Controller (XCC) Enterprise (Pilot 4 chip), Lenovo XClarity Administrator (optional), Lenovo XClarity Integrator for Microsoft System Center (optional), Lenovo XClarity Integrator for Microsoft Admin Center (optional), Lenovo XClarity Energy Manager (optional).
Security features	System Lockdown Mode, motion detection, power-on password, administrator's password, secure firmware updates, Trusted Platform Module (TPM) version 2.0, chassis intrusion detection (optional), security-lock slot with intelligent lock position switch, lockable front bezel (optional), and self-encrypting drives (optional).
Software	<p>MX1020 Appliance: Microsoft Azure Stack HCI operating system is preloaded, with an option to purchase a Windows Server 2019 license (Standard or Datacenter edition) to provide guest OS licenses for virtual machines running in the solution. Standard edition provides 2 guest OS licenses, while Datacenter edition provides unlimited guest OS licenses.</p> <p>MX1021 Certified Node: Microsoft Windows Server 2019 Datacenter edition can be optionally preloaded. Having the Azure Stack HCI operating system preloaded is not currently an option for a Certified Node.</p>

Attribute	Specification	
Warranty and support	<p>MX1020 Appliance: Three-, four-, or five-year customer-replaceable unit and onsite limited hardware warranty with ThinkAgile Advantage Support and selectable service levels: 9x5 next business day (NBD) parts delivered, 9x5 NBD onsite response, 24x7 coverage with 2-hour or 4-hour onsite response, or 6-hour or 24-hour committed repair (select areas). Also available are YourDrive YourData, Premier Support, and Enterprise Software Support.</p> <p>MX1021 Certified Node: Three-, four-, or five-year customer-replaceable unit and onsite limited warranty with selectable service levels: 9x5 coverage with next business day (NBD) parts delivered (base warranty), 9x5 coverage with NBD onsite response (Foundation Service), 24x7 coverage with 4-hour onsite response or 24-hour committed repair (select areas) (Essential Service), or 24x7 coverage with 2-hour onsite response or 6-hour committed repair (select areas) (Advanced Service). Also available are 1-year and 2-year post-warranty extensions, YourDrive YourData, and Enterprise Software Support.</p>	
Dimensions	<p>Node (standalone):</p> <ul style="list-style-type: none"> <li>● Height 43 mm (1.7 in.)</li> <li>● Width: 209 mm (8.2 in.)</li> <li>● Depth: 376 mm (14.8 in.)</li> </ul> <p>Node (with the node sleeve):</p> <ul style="list-style-type: none"> <li>● Height 49 mm (1.9 in.)</li> <li>● Width: 217 mm (8.5 in.)</li> <li>● Depth: 422 mm (16.6 in.)</li> </ul>	<p>E1 Enclosure:</p> <ul style="list-style-type: none"> <li>● Height: 43 mm (1.7 in.)</li> <li>● Width: 435 mm (17.1 in.)</li> <li>● Depth: 736 mm (29.0 in.)</li> </ul> <p>E2 Enclosure:</p> <ul style="list-style-type: none"> <li>● Height: 87 mm (3.4 in.)</li> <li>● Width: 435 mm (17.1 in.)</li> <li>● Depth: 441 mm (17.4 in.)</li> </ul>
Weight	<ul style="list-style-type: none"> <li>● Node (fully-configured): 3.6 kg (7.9 lb).</li> <li>● E1 enclosure (with two fully-configured nodes and four AC power adapters): 15 kg (33.1 lb).</li> <li>● E2 enclosure (with two fully-configured nodes and four AC power adapters): 15 kg (33.1 lb).</li> </ul>	

## Models

MX1020 and MX1021 systems are configured by using the Lenovo Data Center Solution Configurator (DCSC):  
<http://dcsc.lenovo.com>

The following table lists the CTO base models of the MX1020 and MX1021 systems and Enclosures.

Table 2. CTO base models

Machine Type/Model	Description
MX1020 and MX1021 systems	
7D5SCTO1WW	ThinkAgile MX1020 Appliance
7D5TCTO1WW	ThinkAgile MX1020 Appliance (India only)
7D1BCTOAWW	ThinkAgile MX1021 Certified Node
7D2UCTO1WW	ThinkAgile MX1021 Certified Node (India only)
Enclosures	
7D6JCTO1WW	ThinkAgile MX1020 E1 Enclosure
7D6JCTO2WW	ThinkAgile MX1020 E2 Enclosure
7D22CTO1WW	ThinkAgile MX1021 E1 Enclosure
7D22CTO2WW	ThinkAgile MX1021 E2 Enclosure

The following table lists the base chassis for the MX1020 and MX1021 systems and Enclosures.

Table 3. Base chassis

Feature code	Description
BCGF	ThinkAgile MX Edge Server Chassis
BCGG	ThinkAgile MX Enclosure for Mounting SE350 Side by Side in Rack (for all enclosure Machine Type/Models)

**Configuration note:** An enclosure is required for selection for mounting two MX1020 and MX1021 systems in a rack cabinet.

The MX1020 and MX1021 systems ship with the following items:

- *Activation Flyer*
- *ISG IoT Compliance Booklet*
- One or two AC power adapters (per node, for systems with the 12 V PDM)
- One DC or AC, or two AC customer-selected power cables (per node)
- Slide Rail (if configured with the enclosure)
- Cable Management Arm (if configured with the enclosure)



## Processors

The MX1020 and MX1021 systems ship with one processor that is embedded into the system board. The following table lists the processor options that are available for selection.

Table 4. Processor selection options

Description	Feature code	
	NA, LA*	EMEA, AP**
ThinkSystem SE350 Edge Server Intel Xeon D-2143IT 8C 65W 2.20 GHz	B93A	B6ES
ThinkSystem SE350 Edge Server Intel Xeon D-2163IT 12C 75W 2.10 GHz	B93C	B6EU
ThinkSystem SE350 Edge Server Intel Xeon D-2166NT 12C 85W 2.00 GHz	B93D	B6EV
ThinkSystem SE350 Edge Server Intel Xeon D-2183IT 16C 100W 2.20 GHz	B93B	B6ET

\* NA = North America; LA = Latin America.

\*\* EMEA = Europe, Middle East, Africa; AP = Asia Pacific.

The following table lists the specifications of the processors for the MX1020 and MX1021 systems.

Table 5. CPU specifications (HT: Hyper-Threading, TB: Turbo Boost 2.0, VT: Virtualization Technology)

CPU model	Cores / threads	Core speed (Base / TB Max)	Cache	Max DDR4 speed	Max memory capacity	TDP	HT	TB	VT-x	VT-d
<b>Intel Xeon Silver processors</b>										
D-2143IT	8 / 16	2.2 / 3.0 GHz	11 MB	2133 MHz	512 GB	65 W	Y	Y	Y	Y
D-2163IT	12 / 24	2.1 / 3.0 GHz	17 MB	2133 MHz	512 GB	75 W	Y	Y	Y	Y
D-2166NT	12 / 24	2.0 / 3.0 GHz	17 MB	2133 MHz	512 GB	85 W	Y	Y	Y	Y
D-2183IT	16 / 32	2.2 / 3.0 GHz	22 MB	2400 MHz	512 GB	100 W	Y	Y	Y	Y

## Memory

The MX1020 and MX1021 systems support Lenovo TruDDR4 memory. TruDDR4 memory uses the highest-quality components sourced from Tier 1 DRAM suppliers and only memory that meets strict requirements is selected. It is compatibility tested and tuned to maximize performance and reliability.

The systems support up to four DIMMs. The processor has four memory channels, and there is one DIMM per channel.

The following rules apply when selecting the memory configuration:

- The systems support from 64 GB to 256 GB of memory capacity.
- RDIMMs and LRDIMMs are supported at the rated speeds of 2666 MHz.
- All DIMMs operate at the same speed, which is determined by the maximum memory speed supported by the specific processor (2133 MHz or 2400 MHz).  
**Note:** Maximum memory speed can be achieved when Max performance mode is enabled in UEFI.
- All DIMMs must be of the same type and capacity (the same part number or feature code).

The following memory protection technologies are supported:

- ECC
- SDDC (for x4-based memory DIMMs)
- Patrol scrubbing
- Demand scrubbing

The following table lists the memory options that are available for selection.

Table 6. Memory options

Description	Part number	Feature code	Maximum quantity
RDIMMs - 2666 MHz			
ThinkSystem 16GB TruDDR4 2666 MHz (2Rx8 1.2V) RDIMM	7X77A01303	AUNC	4
ThinkSystem 32GB TruDDR4 2666 MHz (2Rx4 1.2V) RDIMM	7X77A01304	AUND	4

## Internal storage

The MX1020 and MX1021 systems support the following configurations for data storage:

- 4x M.2 SATA/NVMe non-hot-swap drive sockets or
- 8x M.2 NVMe non-hot-swap drive sockets

In addition, the systems support two internal M.2 SATA SSDs for the Windows Server boot volume.

The following table lists the internal storage options.

Table 7. Internal storage options for the MX1020 and MX1021 systems

Description	Feature code	Maximum quantity
Riser cages		
PCIe Riser Cage	B6FD	1
PCIe Riser Cage (Extreme Shock & Vibe)	BAGF	1
M.2 Riser Cage Assembly	B6FE	1
M.2 Riser Cage Assembly (Extreme Shock & Vibe)	BAGG	1
Data drive enablement kits		
M.2 SATA/NVMe 4-bay Data Drive Enablement Kit	B6FF	2
M.2 SATA/NVMe 4-bay Data Drive Enablement Kit (Extreme Shock & Vibe)	BBZ5	2
Boot drive enablement kit		
M.2 Mirroring Enablement Kit	B88P	1

The following table lists supported internal storage configurations.

Table 8. Internal storage configurations

Drive quantity (min / max)	M.2 data storage configuration	Riser Cage		Data drive enablement kit quantity and M.2 socket interface type <sup>^</sup>
		PCIe	M.2	
4 / 4	4x SATA/NVMe non-hot-swap	1	0	1x M.2 SATA/NVMe 4-bay Data Drive Enablement Kit: <ul style="list-style-type: none"> <li>• 6 Gb SATA AHCI (4) or</li> <li>• PCIe 3.0 x4 NVMe (4)</li> </ul>
		0	1	
4 / 8	8x NVMe non-hot-swap	0	1	2x M.2 SATA/NVMe 4-bay Data Drive Enablement Kits: <ul style="list-style-type: none"> <li>• PCIe 3.0 x4 NVMe (4+4)</li> </ul>

<sup>^</sup> The numbers in brackets (x or x+y) specify the quantity of M.2 drive sockets connected to each of the data drive enablement kits.

**Configuration notes:**

- One riser cage and one or two data drive enablement kits are required for selection.
- The SATA interface in the enablement kit provides 4x SATA 6 Gbps ports that are routed from the SATA AHCI controller in the PCH for JBOD (non-RAID) connectivity to the SATA SSDs in the M.2 drive sockets.
- The NVMe interface in the enablement kit provides 4x PCIe 3.0 x4 ports that are routed directly from the processor for JBOD (non-RAID) connectivity to the NVMe PCIe SSDs in the M.2 drive sockets.
- Mixing SATA SSDs and NVMe PCIe SSDs is not allowed.
- The M.2 Mirroring Enablement Kit is connected to the PCH via the PCIe link, and the kit supports two M.2 SATA SSDs configured in a RAID-1 drive group for a boot volume.
- To enable selection for operations under the Extreme Shock and Vibration (feature code BCDN) environmental conditions, the Extreme Shock and Vibe Riser Cage (feature code BAGF or BAGG) and Drive Enablement Kit (feature code BBZ5) must be selected.

## Drives for internal storage

The following table lists M.2 drive selection options for the boot volume.

Table 9. Drive options for boot volume

Description	Feature code	Quantity
ThinkSystem M.2 480GB Industrial A600i SATA SSD	B91K	2

The following table lists drive options for the MX1020 and MX1021 systems.

Table 10. M.2 drive options for MX1020 and MX1021 systems

Description	Part number	Feature code	Quantity (min / max)
NVMe High Endurance SED SSD - P4511			
ThinkSystem M.2 650GB P4511 NVMe SED High Endurance SSD	4XB7A39426	B75C	2 / 8
NVMe SED SSDs - P4511			
ThinkSystem M.2 1TB P4511 NVMe SED SSD	4XB7A39427	B75D	4 / 8
ThinkSystem M.2 2TB P4511 NVMe SED SSD	4XB7A39428	B75E	4 / 8
SATA 6Gbps SSDs - 5100			
ThinkSystem M.2 5100 480GB SATA 6Gbps Non-Hot Swap SSD	7SD7A05703	B11V	4 / 4
ThinkSystem M.2 5100 960GB SATA 6Gbps Non-Hot Swap SSD	4XB7A14048	B5UP	4 / 4
ThinkSystem M.2 1.92TB 5100 Pro SATA 6Gbps Non-Hot Swap SSD	4XB7A39425	B75B	4 / 4
NVMe SED SSDs - 7450 MAX and 7450 PRO			
ThinkSystem M.2 7450 MAX 800GB Mixed Use NVMe PCIe 4.0 x4 NHS SSD (with Heatsink)	4XB7A82676	BQUL	4 / 8
ThinkSystem M.2 7450 PRO 960GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD (with Heatsink)	4XB7A82674	BQUJ	4 / 8
ThinkSystem M.2 7450 PRO 1.92TB Read Intensive NVMe PCIe 4.0 x4 NHS SSD (with Heatsink)	4XB7A82675	BQUK	4 / 8

### Configuration notes:

- The MX1020 and MX1021 supports the following data drive configurations:
  - Single-tier:
    - 4 SATA SSDs or
    - From 4 to 8 NVMe PCIe SSDs.
  - Two-tier: Two NVMe PCIe high endurance SSDs (cache) and from 4 to 6 NVMe PCIe SSDs (capacity).
- For single-tier configurations, all SSDs (SATA or NVMe PCIe) must be of the same model and capacity (same feature code).
- For two-tier configurations, all cache SSDs (NVMe PCIe high endurance) must be of the same model and capacity (same feature code), and all capacity SSDs (NVMe PCIe) must be of the same model and capacity (same feature code).
- Mixing SATA SSDs and NVMe PCIe SSDs is not allowed.

## Network connectivity

The MX1020 and MX1021 systems provide the following network connectivity interfaces with the network modules that use the Intel Ethernet Connection X722 10 GbE technology integrated into the Intel Xeon D-2100 Series processors:

- Two 10 GbE SFP+ and two 1 GbE RJ-45 ports; or
  - Two 10 GbE RJ-45 and two 1 GbE RJ-45 ports; or
  - Two 10 GbE RJ-45, two 1 GbE SFP, and two 1 GbE RJ-45 ports, Wi-Fi (802.11 a/b/g/n/ac), and LTE (optional).
- Note:** Wi-Fi and LTE interfaces have two external antennas.

The following table lists the network modules available for selection.

Table 11. Network module selection options

Description	Feature code	Maximum quantity
<b>Network modules</b>		
10GbE RJ-45 2-Port, 1GbE (10/100/1000 Mb) RJ-45 2-Port Intel i350	B7Z7	1
10GbE SFP+ 2-Port, 1GbE (10/100/1000 Mb) RJ-45 2-Port Intel i350	B6F4	1
10GbE SFP+ 2-Port, 1GbE (10/100/1000 Mb) RJ-45 2-Port Intel i350 (Extreme Shock&Vibe)	BBZ7	1
10GbE SFP+ 2-Port, 1GbE SFP 2-Port Switch, Wireless Capable	B6F3	1
10GbE SFP+ 2-Port, 1GbE SFP 2-Port Switch, Wireless Capable (Extreme Shock&Vibe)	BBZ6	1
<b>Wireless modules for wireless-capable network modules (feature codes B6F3 or BBZ6)</b>		
ThinkSystem M.2 WiFi Module	B6XJ	1
ThinkSystem M.2 WWAN LTE Module	B6XK	1

**Configuration notes:**

- A network module is required for selection.
  - If a Wireless Capable module (feature code B6F3 or BBZ6) is selected, the WiFi Module (feature code B6XJ) is required for selection, and the WWAN LTE Module (feature code B6XK) is optional (allowed for selection only in addition to the WiFi Module).
  - To enable selection for operations under the Extreme Shock and Vibration (feature code BCDN) environmental conditions, the 10 GbE SFP+ Extreme Shock and Vibe (feature code BBZ7), 10 GbE RJ-45 (feature code B7Z7), or 10 GbE SFP+ Wireless Capable (feature code BBZ6) must be selected.
  - 10 GbE ports support iWARP (RDMA over IP).
  - 10 GbE Port 1 on the network modules supports direct connectivity to the XClarity Controller via the Network Controller Sideband Interface (NSCI) for out-of-band systems management.
  - A two-node cluster supports direct node-to-node (no external switch is needed) or switched (an external switch is needed) network connectivity with the network ports on the network modules.
  - Supported DAC cables should be purchased for the SFP+ network ports, and UTP Category 6 cables should be purchased for the 10 GbE or 1 GbE RJ-45 network ports. The maximum number of cables that are supported per network module equals the quantity of the network module ports, and all network ports must have the same type of the cable selected.
- Note for customers in Mexico: Wireless functionality not supported in Mexico.

The following transceiver and cables can be purchased:

- [UTP cables for 10 GbE and 1 GbE RJ-45 ports](#)
- [DAC cables for 10 GbE SFP+ ports](#)

The following table lists cables for the 10 GbE and 1 GbE RJ-45 ports.

Table 12. Cables for 10 GbE and 1 GbE RJ-45 ports

Description	Part number	Feature code
0.75m Cat6 Green Cable	00WE123	AVFW
1.0m Cat6 Green Cable	00WE127	AVFX
1.25m Cat6 Green Cable	00WE131	AVFY
1.5m Cat6 Green Cable	00WE135	AVFZ
3m Cat6 Green Cable	00WE139	AVGO

The following table lists DAC cables for the 10 GbE SFP+ ports.

Table 13. DAC cables for 10 GbE SFP+ ports

Description	Part number	Feature code
Lenovo 0.5m Passive SFP+ DAC Cable	00D6288	A3RG
Lenovo 1m Passive SFP+ DAC Cable	90Y9427	A1PH
Lenovo 1.5m Passive SFP+ DAC Cable	00AY764	A51N
Lenovo 2m Passive SFP+ DAC Cable	00AY765	A51P
Lenovo 3m Passive SFP+ DAC Cable	90Y9430	A1PJ

## GPU adapters

The following table lists additional supported GPU that can be installed in the PCIe slot when the PCIe Riser (feature B6FD) is selected.

Table 14. Supported GPU

Part number	Feature	Description	Maximum supported	
			MX1020	MX1021
4X67A14926	B4YB	ThinkSystem NVIDIA T4 16GB PCIe Passive GPU	1	1
4X67A81547	BP05	ThinkSystem NVIDIA A2 16GB PCIe Gen4 Passive GPU	1	1
4M17A60523	BAGM	ThinkSystem SE350 NVIDIA A2/T4 GPU Holder (Extreme Shock & Vibe)	1	1

Configuration Note: GPU consumes the only available PCIe slot, only 4 SSD or NVMe devices can be configured in any SE350 server that includes a GPU.

For information about the GPU, see the ThinkSystem GPU Summary, available at: <https://lenovopress.com/lp0768-thinksystem-thinkagile-gpu-summary>

## Power supplies and cables

The MX1020 and MX1021 systems can be configured with one -48 V DC power distribution module (PDM), or one 12 V PDM and one or two 240 W AC power adapters. The following table lists the power selection options.

Table 15. Power module selection

Description	Feature code	Maximum quantity per node
Power distribution modules		
ThinkSystem SE350 -48VDC PDM (-40VDC to -72VDC) (Worldwide)	BAG6	1
ThinkSystem SE350 -48VDC PDM (-40VDC to -72VDC) (PRC only)	B6FV	1
ThinkSystem SE350 12V PDM	B6FU	1
AC Adapter		
ThinkSystem SE350 240W AC Adapter	B6FW	2

**Configuration notes:**

- One of the PDMs is required for selection.
- If the 12 V PDM is selected, a minimum of one and a maximum of two 240 W AC adapters are required for selection.
- With two 240 W AC power adapters, the node is capable of N+N redundancy, depending on the configuration.
- To ensure that the proper quantity of 240 W AC power adapters is chosen for optimal performance, or configuration is capable of N+N redundancy, it is highly recommended to validate the node configuration for specific power requirements by using the latest version of the Lenovo Capacity Planner:  
<http://datacentersupport.lenovo.com/us/en/solutions/lnvo-lcp>

The MX1020 and MX1021 systems ship with one (-48V DC PDM, or 12V PDM and one AC power adapter) or two (12V PDM and two AC power adapters) customer-configured power cords per node. The following table lists the rack power cables and line cords that are available for selection.

Table 16. Power cables

Description	Feature code
DC power cord	
ThinkSystem SE350 -48V DC Power Cord (2.0m)	B7FE
AC rack power cables	
1.0m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	A4VP
1.5m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	6201
2.0m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	B0N4
2.8m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	6311
4.3m, 10A/100-250V, C13 to IEC 320-C14 Rack Power Cable	6263
AC line cords	
2.8m, 10A/125V, C13 to CNS 10917-3 Line Cord	6386
2.8m, 10A/125V, C13 to NEMA 5-15P Line Cord	6313
2.8m, 10A/250V, C13 to AS/NZS 3112 Line Cord	6211

Description	Feature code
2.8m, 10A/250V, C13 to BS 1363/A Line Cord	6215
2.8m, 10A/250V, C13 to CEE7-VII Line Cord	6212
2.8m, 10A/250V, C13 to CEI 23-16 Line Cord	6217
2.8m, 10A/250V, C13 to CNS 10917-3 Line Cord	6317
2.8m, 10A/250V, C13 to DK2-5a Line Cord	6213
2.8m, 10A/250V, C13 to GB 2099.1 Line Cord	6210
2.8m, 10A/250V, C13 to IRAM 2073 Line Cord	6222
2.8m, 10A/250V, C13 to IS 6538 Line Cord	6269
2.8m, 10A/250V, C13 to NBR 14136 Line Cord	6532
2.8m, 10A/250V, C13 to NEMA 6-15P Line Cord	A1RF
2.8m, 10A/250V, C13 to SABS 164 Line Cord	6214
2.8m, 10A/250V, C13 to SEV 1011-S24507 Line Cord	6216
2.8m, 10A/250V, C13 to SI 32 Line Cord	6218
2.8m, 12A/125V, C13 to JIS C-8303 Line cord	A1RE
2.8m, 12A/250V, C13 to JIS C-8303 Line Cord	6533
2.8m, 12A/250V, C13 to KS C8305 Line Cord	6219
4.3m, 10A/125V, C13 to CNS 10917-3 Line Cord	AX8B
4.3m, 10A/125V, C13 to NEMA 5-15P Line Cord	6370
4.3m, 10A/250V, C13 to AS/NZS 3112 Line Cord	6574
4.3m, 10A/250V, C13 to BS 1363/A Line Cord	6577
4.3m, 10A/250V, C13 to CEE7-VII Line Cord	6572
4.3m, 10A/250V, C13 to CEI 23-16 Line Cord	6493
4.3m, 10A/250V, C13 to CNS 10917-3 Line Cord	6531
4.3m, 10A/250V, C13 to DK2-5a Line Cord	6575
4.3m, 10A/250V, C13 to GB 2099.1 Line Cord	6580
4.3m, 10A/250V, C13 to IRAM 2073 Line Cord	6492
4.3m, 10A/250V, C13 to IS 6538 Line Cord	6567
4.3m, 10A/250V, C13 to NBR14136 Line Cord	6404
4.3m, 10A/250V, C13 to NEMA 6-15P Line Cord	6373
4.3m, 10A/250V, C13 to SABS 164 Line Cord	6576
4.3m, 10A/250V, C13 to SEV 1011-S24507 Line Cord	6578
4.3m, 10A/250V, C13 to SI 32 Line Cord	6579
4.3m, 12A/125V, C13 to JIS C-8303 Line Cord	6335
4.3m, 12A/250V, C13 to JIS C-8303 Line Cord	6495
4.3m, 12A/250V, C13 to KS C8305 Line Cord	6494

## Mounting

The MX1020 and MX1021 systems support the following mounting capabilities.

- [Rack installation](#)
- [DIN Rail installation](#)
- [Wall-mount installation](#)



- [Desktop installation](#)
- [Stacked installation](#)

The following table lists the mounting options that are available.

Table 17. Mounting selection options

Description	Feature code
Configure with MX E1 Enclosure for Mounting MX1021 Side by Side in Rack	BD1P
Configure with MX E2 Enclosure for Mounting MX1021 Side by Side in Rack	BF11
DIN Rail Mount Kit	B753
Wall Mount Kit	B752
Desktop Mode	B755
Stacking Mount Kit	B754

## Rack installation

Two MX1020 and MX1021 systems can be installed in the ThinkAgile MX1021 E1 (1U) or E2 (2U) Enclosure for mounting in a rack cabinet. The following table lists the rack installation options that are available.

Table 18. Rack installation

Description	Feature code	Maximum quantity per enclosure
Rail kit and CMA for MX1021 E1 Enclosure		
1U and 2U Slide Rail (4-post)	AVAL	1
CMA (1U)	AVAX	1
Rail kits for MX1021 E2 Enclosure		
ThinkSystem Short Rack Rail Kit (4-post)	B7L3	1
ThinkSystem Friction 2-Post Screw-in Rail Kit (2-post)	B6H2	1
Dust filter		
ThinkSystem Enclosure Edge Server - Rack Dust Filter	B6PY	2

The following table summarizes the rail kit features and specifications.

Table 19. Rail kit features and specifications summary

Feature	4-Post Slide Rail	4-Post Short Rail Kit	2-Post Screw-in Rail Kit
Feature code	AVAL	B7L3	B6H2
CMA	Optional (feature AVAX)*	None	None
Rail length	807 mm (31.8 in.)	484.0 mm (19.1 in.)	486.2 mm (19.2 in.)
Rail type	Full-out slide (ball bearing)	Half-out slide (friction)	Half-out slide (friction)
Tool-less installation	Yes	Yes	No
In-rack node maintenance	Yes	No	No
1U PDU support	Yes	Yes	Yes
0U PDU support	Limited**	Yes	Not applicable

Feature	4-Post Slide Rail	4-Post Short Rail Kit	2-Post Screw-in Rail Kit
Rack type	4-post, EIA standard-compliant	4-post, EIA standard-compliant	2-post, EIA standard-compliant
Mounting holes	Square or round	Square or round	Square, round, or threaded
Mounting flange thickness	2 mm (0.08 in.) – 3.3 mm (0.13 in.)	2 mm (0.08 in.) – 3.3 mm (0.13 in.)	2 mm (0.08 in.) – 3.3 mm (0.13 in.)
Distance between front and rear mounting flanges <sup>^</sup>	609.6 mm (24 in.) – 863.6 mm (34 in.)	355.6 mm (14 in.) – 609.6 mm (24 in.)	Not applicable

\* If a CMA is used, the rack cabinet must be at least 1100 mm (43.31 in.) deep.

\*\* If a 0U PDU is used, the rack cabinet must be at least 1100 mm (43.31 in.) deep if no CMA is used, or at least 1200 mm (47.24 in.) deep if a CMA is used.

<sup>^</sup> Measured when mounted on the rack, from the front surface of the front mounting flange to the rear most point of the rail.

**Configuration note:** MX1021 E1 and E2 enclosures do not support MX1021 nodes with the wireless network modules.

## DIN Rail installation

The MX1020 and MX1021 systems can be mounted on a DIN Rail vertically by using the installation options listed in the following table.

Table 20. DIN Rail installation

Description	Feature code	Quantity per node
ThinkSystem SE350 DIN Rail Kit	B6F1	1
ThinkSystem SE350 DIN Mount Kit (Extreme Shock & Vibe)	B87S	1
ThinkSystem SE350 Node Sleeve	B6EZ	1
ThinkSystem SE350 AC Adapter Bracket	B6F0	1

### Configuration notes:

- Either DIN Rail Kit (feature code B6F1) or DIN Mount Kit (Extreme Shock & Vibe) (feature code B87S) is required for selection (but not both kits at the same time).
- To enable selection for operations under the Extreme Shock and Vibration (feature code BCDN) environmental conditions, the DIN Mount Kit (Extreme Shock & Vibe) (feature code B87S) must be selected.

## Wall-mount installation

The MX1020 and MX1021 systems can be mounted on a wall vertically by using the installation options listed in the following table.

Table 21. Wall-mount installation

Description	Feature code	Quantity per node
ThinkSystem SE350 Node Sleeve	B6EZ	1
ThinkSystem SE350 AC Adapter Bracket	B6F0	1

## Desktop installation

The MX1020 and MX1021 systems can be placed on a horizontal surface by using the installation options listed in the following table.

Table 22. Desktop installation

Description	Feature code	Quantity per node
ThinkSystem SE350 Rubber Feet (contains 4 rubber feet)	B6Q3	1

## Stacked installation

Two MX1020 and MX1021 systems can be attached to each other and placed on a horizontal surface (stacked) by using the installation options listed in the following table.

Table 23. Stacked installation

Description	Feature code	Quantity per node
ThinkSystem SE350 Node Sleeve (includes 4 rubber feet)	B6EZ	1

## Software

The ThinkAgile MX1020 Appliance includes the preloaded Azure Stack HCI operating system only and requires activation via a CSP such as Lenovo Cloud Marketplace, with the option to purchase a Windows Server 2019 Datacenter license if unlimited guest OS VMs are desired.

The ThinkAgile MX1021 Certified Node can optionally have Windows Server 2019 Datacenter preinstalled.

Customers can use the existing Windows Server 2019 Datacenter software licenses, or they can purchase new software licenses from Lenovo or Microsoft. If the licenses are purchased from Lenovo, Windows Server 2019 can be factory-installed or shipped in the box with the certified node for the installation at the customer site.

The following table lists the Windows Server 2019 Datacenter software options that are available for selection from Lenovo for the MX1021 Certified Node.

Table 24. Windows Server 2019 Datacenter software selection options

Feature code	Description
Windows Server 2022 Datacenter (Factory installed)	
BPA7	Windows Server Datacenter 2022 for Microsoft Azure Stack HCI - English (factory installed)
Windows Server 2022 Datacenter (Not preinstalled)	
BPA3	Windows Server Datacenter 2022 for Microsoft Azure Stack HCI - Multilanguage (not pre-installed)
BPA4	Windows Server Datacenter 2022 for Microsoft Azure Stack HCI - Simplified Chinese (not pre-installed)
BPA5	Windows Server Datacenter 2022 for Microsoft Azure Stack HCI - Traditional Chinese (not pre-installed)
BPA6	Windows Server Datacenter 2022 for Microsoft Azure Stack HCI - Japanese (not pre-installed)
Windows Server 2019 Datacenter (Factory-installed)	
B6P2	Windows Server 2019 Datacenter - English

Feature code	Description
B6P3	Windows Server 2019 Datacenter - Japanese
B6P4	Windows Server 2019 Datacenter - Simplified Chinese
Windows Server 2019 Datacenter (Not preinstalled)	
B6NY	Windows Server 2019 Datacenter - Multilanguage
B6NZ	Windows Server 2019 Datacenter - Japanese
B6P1	Windows Server 2019 Datacenter - Traditional Chinese
B6P0	Windows Server 2019 Datacenter - Simplified Chinese

The following table lists the Windows Server software licenses that are derived by the configuration tool based on the selected processor and warranty period.

Table 25. Windows Server Datacenter software licenses (7S05CTO3WW)

Description	Feature code
Windows Server 2019 Datacenter (16-core license, factory-installed)	
Windows Server 2019 Datacenter (16 core) - English (factory installed)	S09E
Windows Server 2019 Datacenter (16 core) - Japanese (factory installed)	S09F
Windows Server 2019 Datacenter (16 core) - Simplified Chinese (factory installed)	S09D
Windows Server 2019 Datacenter (16-core license, not preinstalled)	
Windows Server 2019 Datacenter (16 core) - Multilanguage (not preinstalled)	S09K
Windows Server 2019 Datacenter (16 core) - Japanese (not preinstalled)	S09J
Windows Server 2019 Datacenter (16 core) - Traditional Chinese (not preinstalled)	S09H
Windows Server 2019 Datacenter (16 core) - Simplified Chinese (not preinstalled)	S09G

#### Configuration notes:

- The selection of Windows Server software licenses from Lenovo is optional.
- The quantity of core-based licenses is derived by the configuration tool based on the number of cores in the processor selected for the certified node.  
**Note:** 8-core licenses are derived only for the Intel Xeon D-2143IT processors.

## Systems management

The MX1020 and MX1021 systems support the following systems management tools:

- [Activation](#)
- [Lenovo XClarity Controller](#)
- [Lenovo XClarity Administrator and XClarity Pro](#)
- [Lenovo XClarity Integrator for Microsoft Windows Admin Center](#)
- [Lenovo XClarity Integrator for Microsoft System Center](#)
- [Lenovo XClarity Energy Manager](#)

## Activation

Activation is an optional security feature of the MX1020 and MX1021 that ensures that the system delivered from the factory is only used by its intended recipient and that all data and applications remains secure. Activation is enabled on a factory order when the Security Pack Enabled feature code (feature BLZ2) is selected as described in the [Security Pack](#) section.

**Enabled by default:** Activation is enabled by default for new CTO orders. Activation can be disabled in the factory order as described in the [Security Pack](#) section.

If Activation is enabled, the system is delivered in system lockdown and will require activation before operation. There are three ways the server can be activated:

- Using a mobile device (iOS or Android) connect to the server to the mini-USB port on the front of the server and running the [ThinkShield Edge Mobile Management app](#).
- Connecting the system to the Internet via the XCC management port on the front of the server and accessing the [ThinkShield Key Vault Portal](#) from a web browser on another system.
- In a disconnected mode, where neither a mobile device or an internet connection to the MX1020 and MX1021 are available.

Details of the activation process are described in the following documents:

- Activation Guide (2-page flyer that is included with the server)
- SE350 Setup Guide, Chapter 4

These documents are available from:

[https://thinksystem.lenovofiles.com/help/topic/SE350/pdf\\_files.html?cp=2\\_0\\_0](https://thinksystem.lenovofiles.com/help/topic/SE350/pdf_files.html?cp=2_0_0)

For further information on activation and the use of the ThinkShield Edge Mobile Management app, including videos and tours, see this support page:

<https://support.lenovo.com/us/en/solutions/ht509033>

## Lenovo XClarity Controller

The MX1020 and MX1021 systems contain Lenovo XClarity Controller (XCC) Enterprise, which provides advanced service-processor control, monitoring, and alerting functions.

XClarity Controller Enterprise offers the following capabilities in these systems:

- Gathering and viewing system information and inventory
- Monitoring system status and health
- Alerting and notifications
- Event logging
- Syslog alerting
- Configuring security
- Updating system firmware
- Real-time power usage monitoring
- Displaying graphics for real-time and historical power usage data and temperature
- Capping power usage
- Remotely controlling power (Power on, Power off, Restart)

The XClarity Controller provides remote node management through the following interfaces:

- IPMI Version 2.0
- SNMP Version 3
- Common Information Model (CIM)
- DCMI Version 1.5
- Redfish REST API
- Web browser with HTML5 support
- Command-line interface
- Virtual Operator Panel with XClarity Mobile App via the front USB port with XClarity Controller access

Virtual Operator Panel provides quick access to system status, firmware, network, health, and alerts information. With proper authentication, it also allows to configure systems management and network settings and to control system power (Power on, Power off, Restart). The Virtual Operator Panel can be accessed from the XClarity Mobile App running on the Android or iOS mobile device that is connected to the front USB port with XClarity Controller access (See [Components and connectors](#)).

### Lenovo XClarity Administrator and XClarity Pro

Lenovo XClarity Administrator is a centralized systems management solution that helps administrators deliver infrastructure faster. This solution integrates easily with Lenovo x86 servers, appliances, certified nodes, Top-of-Rack Ethernet switches, and storage systems, providing automated agent-less discovery, inventory, monitoring, and alerts across multiple systems. In addition, some managed endpoints support firmware updates and configuration management.

Lenovo XClarity Administrator is an optional software component for managing ThinkAgile MX Series systems which can be downloaded and used at no charge to discover and monitor the nodes and manage firmware upgrades for them.

If software support is required for XClarity Administrator and XClarity Integrator for System Center, Lenovo XClarity Pro software subscription should be ordered. Lenovo XClarity Pro is licensed on a per managed system basis, that is, each managed Lenovo system requires a license.

The following table lists the Lenovo XClarity Pro license options available for selection.

Table 26. Lenovo XClarity Pro licenses

Description	Feature code
Lenovo XClarity Pro, per Managed Server w/3 Yr SW S&S	B3XS
Lenovo XClarity Pro, per Managed Server w/5 Yr SW S&S	B3XT

Lenovo XClarity Administrator offers the following standard features that are available at no charge:

- Auto-discovery and monitoring of Lenovo x86 servers, appliances, certified nodes, Top-of-Rack Ethernet switches, and DM/DE/DS Series storage systems
- Firmware updates and compliance enforcement
- External alerts and notifications via SNMP traps, syslog remote logging, and e-mail
- Secure connections to managed endpoints
- NIST 800-131A or FIPS 140-2 compliant cryptographic standards between the management solution and managed endpoints
- Integration into existing higher-level management systems such as cloud automation and orchestration tools through REST APIs, providing extensive external visibility and control over hardware resources
- An intuitive, easy-to-use GUI
- Scripting with Windows PowerShell, providing command-line visibility and control over hardware resources

For more information, refer to the Lenovo XClarity Administrator Product Guide:

<http://lenovopress.com/tips1200>

### **Lenovo XClarity Integrator for Microsoft Windows Admin Center**

Lenovo XClarity Integrator for Microsoft Windows Admin Center is a software plug-in module for Lenovo XClarity Administrator that provides customers a smooth and seamless management experience across Windows Server hyperconverged and physical infrastructure in a single unified user interface.

Lenovo XClarity Integrator for Windows Admin Center offers the following features:

- Monitoring health status of cluster hardware and generating alerts
- Collecting inventory, including available firmware updates
- Managing firmware updates for nodes and clusters
- Performing remote management, including remote power on/off and remote control.

Lenovo XClarity Integrator for Windows Admin Center can be downloaded and used at no charge. For more information, refer to the Lenovo XClarity Integrator for Microsoft System Center web page:

<http://support.lenovo.com/us/en/solutions/ht507549>

### **Lenovo XClarity Integrator for Microsoft System Center**

Lenovo XClarity Integrator for Microsoft System Center is a software plug-in module for Lenovo XClarity Administrator that allows customers to integrate the management features of the Lenovo x86 servers, appliances, and certified nodes with Microsoft System Center.

Lenovo XClarity Integrator for System Center offers the following features:

- Integrated end-to-end management of node hardware with monitoring of both physical node and virtual server health
- Deployment of the latest Lenovo firmware and driver update management
- Non-disruptive node maintenance in clustered environments that reduces workload downtime by dynamically migrating workloads from affected hosts during rolling firmware updates
- Greater service level uptime and assurance in clustered environments during unplanned hardware events by dynamically triggering workload migration from impacted hosts when impending hardware failures are predicted

Lenovo XClarity Integrator for System Center can be downloaded and used at no charge. For more information, refer to the Lenovo XClarity Integrator for Microsoft System Center web page: <http://support.lenovo.com/us/en/solutions/lvno-manage>

## Lenovo XClarity Energy Manager

Lenovo XClarity Energy Manager provides a stand-alone, web-based agent-less power management console that provides real time data and enables you to observe, plan and manage power and cooling for Lenovo servers, appliances, and certified nodes. Using built-in intelligence, it identifies node power consumption trends and ideal power settings and performs cooling analysis so that you can define and optimize power-saving policies.

Lenovo XClarity Energy Manager offers the following capabilities:

- Monitors room, row, rack, and device levels in the data center
- Reports vital system information, such as power, temperature and resource utilization
- Monitors inlet temperature to locate hot spots, reducing the risk of data or device damage
- Provides finely-grained controls to limit platform power in compliance with IT policy
- Generates alerts when a user-defined threshold is reached

Lenovo XClarity Energy Manager is an optional software component for the MX systems that is licensed on a per managed node basis, that is, each managed system requires a license. The 1-node Energy Manager license is included in the XClarity Controller Enterprise upgrade.

For more information, refer to the Lenovo XClarity Energy Manager web page: <http://datacentersupport.lenovo.com/us/en/solutions/lvno-lxem>

## Security

The MX1020 and MX1021 systems offer the following security features:

- System Lockdown Mode
- Motion detection
- Power-on password
- Administrator's password
- Secure firmware updates
- Onboard Trusted Platform Module (TPM) version 2.0 (available worldwide excluding PRC)
- Nationz Trusted Platform Module v2.0 (PRC only)
- Chassis intrusion detection (optional)
- Security-lock slot with intelligent lock position switch (turns optional intrusion detection on or off)
- Lockable front bezel (optional)
- Self-encrypting drives (optional)

The following table lists the security options that are available for the MX1020 and MX1021 systems.

Table 27. Security options

Description	Feature code	Maximum quantity per node
ThinkSystem SE350 Tamper Detection Kit with Security Lock	B6Q2	1
ThinkSystem SE350 Sleeve Locking Bezel with Dust Filter Holders	B6GD	1
ThinkSystem SE350 Locking Bezel Dust Filter	B6KU	1



### Configuration notes:

- The Sleeve Locking Bezel (feature code B6GD) is supported only with the Node Sleeve (feature code B6EZ).
- If the Sleeve Locking Bezel (feature code B6GD) is selected, the Dust Filter (feature code B6KU) is required for selection.

### Security Pack

The Security Pack is the collection of security and activation features of the MX1020 and MX1021:

- Unique tamper detection (such as G-sensor) and Automatic actions on tamper detection
- Enablement of local Self-encrypting (SED) authentication key (AK) management
- Mandatory claiming and activation process to identify the owner of MX1020 and MX1021 when the server is first delivered/powerd on

Table 28. Security Pack ordering information

Feature code	Description
BLZ2	ThinkEdge Security Pack Enabled
BKFC	ThinkEdge Security Pack Disabled (default)

### Notes:

- The Security Pack features setting cannot be changed after the system leaves the factory. For example, if you select feature BLZ2 to enable the Security Pack features, then the system will *require* activation before it can be first used. Similarly, if your system was configured in the factory with Security Pack disabled, you cannot enable it at a later time.
- Customers can use the ThinkShield Portal to determine which of their systems have Security Pack enabled or disabled (you will see "Standard" if the system has Security Pack disabled).

### Intel Transparent Supply Chain

Add a layer of protection in your data center and have peace of mind that the server hardware you bring into it is safe authentic and with documented, testable, and provable origin.

Lenovo has one of the world's best supply chains, as ranked by Gartner Group, backed by extensive and mature supply chain security programs that exceed industry norms and US Government standards. Now we are the first Tier 1 manufacturer to offer Intel® Transparent Supply Chain in partnership with Intel, offering you an unprecedented degree of supply chain transparency and assurance.

To enable Intel Transparent Supply Chain for the Intel-based servers in your order, add the following feature code in the [DCSC configurator](#), under the Security tab.

Table 29. Intel Transparent Supply Chain ordering information

Feature code	Description
BB0P	Intel Transparent Supply Chain

For more information on this offering, see the paper *Introduction to Intel Transparent Supply Chain on Lenovo ThinkSystem Servers*, available from <https://lenovopress.com/lp1434-introduction-to-intel-transparent-supply-chain-on-thinksystem-servers>.

## Physical specifications

The MX1020 and MX1021 systems have the following dimensions and weight (approximate):

- Height 43 mm (1.7 in.)
- Width: 209 mm (8.2 in.)
- Depth: 376 mm (14.8 in.)
- Weight (fully-configured): 3.6 kg (7.9 lb)

When installed in the node sleeve, the MX1020 and MX1021 systems have the following dimensions (approximate):

- Height 49 mm (1.9 in.)
- Width: 217 mm (8.5 in.)
- Depth: 422 mm (16.6 in.)

The ThinkAgile E1 Enclosure has the following dimensions and weight (approximate):

- Height: 43 mm (1.7 in.)
- Width: 435 mm (17.1 in.)
- Depth: 736 mm (29.0 in.)
- Weight (with two fully-configured systems and four AC power adapters): 15 kg (33.1 lb)

The ThinkAgile E2 Enclosure has the following dimensions and weight (approximate):

- Height: 87 mm (3.4 in.)
- Width: 435 mm (17.1 in.)
- Depth: 441 mm (17.4 in.)
- Weight (with two fully-configured systems and four AC power adapters): 15 kg (33.1 lb)

## Operating environment

The MX1020 and MX1021 systems comply with ASHRAE class A4 specifications. The node performance might be impacted when the operating temperature is outside the ASHRAE A4 specifications, or outside the ASHRAE A2 specifications in case of a fan failure.

The systems are supported in the following environment:

- Air temperature:
  - Operating:
    - Extended range: 0 °C - 55 °C (32 °F - 131 °F)
    - Standard range: 0 °C - 45 °C (32 °F - 113 °F), including ASHRAE:
      - ASHRAE Class A4: 5 °C - 45 °C (41 °F - 113 °F); for altitudes above 900 m (2,953 ft), decrease the maximum ambient temperature by 1 °C for every 125-m (410-ft) increase in altitude
      - ASHRAE Class A2 (in case of a fan failure): 10 °C - 35 °C (50 °F - 95 °F); for altitudes above 900 m (2,953 ft), decrease the maximum ambient temperature by 1 °C for every 300-m (984-ft) increase in altitude
  - Non-operating:
    - Extended range: 0 °C - 55 °C (32 °F - 131 °F)
    - Standard range: 0 °C - 45 °C (32 °F - 113 °F), including ASHRAE Class A4 and Class A2: 5 °C - 45 °C (41 °F - 113 °F)
  - Storage: -40 °C - +60 °C (-40 °F - 140 °F)
- Maximum altitude: 3050 m (10,000 ft)
- Humidity:
  - Operating: 8% - 90% (non-condensing); maximum dew point: 24 °C (75 °F)
  - Storage: 8% - 90% (non-condensing)
- Electrical:

- 240 W AC Adapter: 100 to 127 V, 200 to 240 V (nominal) AC; 50 Hz / 60 Hz
- -48 V DC PDM: -40 to -72 V DC
- Acoustics (maximum configuration, operating): 5.7 bels
- Operational shock:
  - Standard: 15 G for 11 milliseconds in each direction (positive and negative X, Y, and Z axes)
  - High: 30 G for 11 milliseconds in each direction (positive and negative X, Y, and Z axes)
  - Extreme: 40 G for 6 milliseconds in each direction (positive and negative X, Y, and Z axes)
- Operational vibration:
  - Standard: 0.21 G rms at 5 Hz to 500 Hz for 15 minutes across 3 axes
  - High: 3 G rms at 5 Hz to 500 Hz for 60 minutes across 3 axes
  - Extreme: 3 G rms at 5 Hz to 500 Hz for 60 minutes across 3 axes

The following table lists the maximum system power load, rated inlet current, and system heat output based on the power supply and source voltage.

Table 30. Rated system power, inlet current, and system heat output

Power supply	Source voltage	Maximum power load per system	Rated current per inlet	System heat output
240 W AC (Two power adapters)	100 - 127 V AC	397 W	3.2 A	1355 BTU/hour
	200 - 240 V AC	391 W	1.6 A	1334 BTU/hour
-48V DC (One PDM)	-40 - -72 V DC	336 W	8.4 A	1147 BTU/hour

The following table lists the selection options for the environmental conditions.

Table 31. Environmental conditions selection

Description	Feature code
Temperature	
Operational Temperature 0-45C	B8ZT
Operational Temperature 0-55C	B8ZU
Shock and vibration	
Standard Shock & Vibration (15G & 0.21Grms)	B8ZR
High Shock & Vibration (30G & 3Grms)	B8ZQ
Extreme Shock & Vibration (40G & 3Grms)	BCDN

**Configuration notes:**

- Node components that are required for the selected environmental conditions will be derived by the configuration tool.
- To support the extended temperature range, the nodes must meet the following hardware configuration requirements:
  - No 5100 M.2 SSDs installed.
  - No NVMe SSDs installed.
  - No 12 V PDMs in the nodes installed in the MX1021 Enclosure.

## Regulatory compliance

The MX1020 and MX1021 systems conform to the following regulations:

- FCC Title 47 CFR Part 15 Subpart B
- ICES-003/NMB-03, Class A
- CSA C22.2 No. 62368-1-14
- UL62368-1
- NOM-019
- AS/NZS CISPR 32, Class A
- CCC GB4943.1, GB9254 Class A, GB17625.1, CECP, CELP
- BSMI CNS13438, Class A; CNS14336-1; CNS15663
- KN32, Class A; KN35
- BIS IS 13252 (Part 1)
- VCCI, Class A
- TR CU 020/2011; TR CU 004/2011
- IEC62368-1 (CB Certificate and CB Test Report)
- CE Mark (EN55032 Class A, EN60950-1, EN55024, EN50581, EN61000-3-2, EN61000-3-3, EN62368-1)
- CISPR 32, Class A
- TUV-GS (EK1-ITB2000, EN62368-1)
- Reduction of Hazardous Substances (ROHS)

## Warranty and support

The ThinkAgile MX Series appliances can be configured with a three-, four-, or five-year hardware warranty with 24x7 ThinkAgile Advantage Single Point of Support (Lenovo appliance hardware and Microsoft software) and various levels of coverage with a well-defined scope of services, including service hours, response time, term of service, and service agreement terms and conditions.

For more information refer to the Lenovo Support Plan - MX Appliance support plan  
<https://support.lenovo.com/us/en/solutions/HT511522>

The MX Certified Nodes can be configured with a three-, four-, or five-year hardware warranty and various levels of service coverage with a well-defined scope of services, including service hours, response time, term of service, and service agreement terms and conditions. The base warranty provides 9x5 Next Business Day response with parts delivered. Lenovo's additional support services provide a sophisticated, unified support structure for a customer's data center, with an experience consistently ranked number one in customer satisfaction worldwide.

For more information refer to the Lenovo Support Plan - MX Certified Nodes  
<https://datacentersupport.lenovo.com/us/en/solutions/ht507709>

Lenovo's additional support services provide a sophisticated, unified support structure for your data center, with an experience consistently ranked number one in customer satisfaction worldwide. Available offerings include:

- **Warranty Upgrade (Preconfigured Support)**

Services are available to meet the on-site response time targets that match the criticality of your systems.

- 3, 4, or 5 years of service coverage
- 1-year or 2-year post-warranty extensions
- **Foundation Service:** 9x5 service coverage with next business day onsite response. YourDrive YourData is an optional extra (see below).
- **Essential Service:** 24x7 service coverage with 4-hour onsite response or 24-hour committed repair (available only in select countries). Bundled with YourDrive YourData.
- **Advanced Service:** 24x7 service coverage with 2-hour onsite response or 6-hour committed repair (available only in select countries). Bundled with YourDrive YourData.

- **Managed Services**

Lenovo Managed Services provides continuous 24x7 remote monitoring (plus 24x7 call center availability) and proactive management of your data center using state-of-the-art tools, systems, and practices by a team of highly skilled and experienced Lenovo services professionals.

Quarterly reviews check error logs, verify firmware & OS device driver levels, and software as needed. We'll also maintain records of latest patches, critical updates, and firmware levels, to ensure you systems are providing business value through optimized performance.

- **Technical Account Management (TAM)**

A Lenovo Technical Account Manager helps you optimize the operation of your data center based on a deep understanding of your business. You gain direct access to your Lenovo TAM, who serves as your single point of contact to expedite service requests, provide status updates, and furnish reports to track incidents over time. In addition, your TAM will help proactively make service recommendations and manage your service relationship with Lenovo to make certain your needs are met.

- **Enterprise Server Software Support**

Enterprise Software Support is an additional support service providing customers with software support on Microsoft, Red Hat, SUSE, and VMware applications and systems. Around the clock availability for critical problems plus unlimited calls and incidents helps customers address challenges fast, without incremental costs. Support staff can answer troubleshooting and diagnostic questions, address product comparability and interoperability issues, isolate causes of problems, report defects to software vendors, and more.

- **YourDrive YourData**

Lenovo's YourDrive YourData is a multi-drive retention offering that ensures your data is always under your control, regardless of the number of drives that are installed in your Lenovo server. In the unlikely event of a drive failure, you retain possession of your drive while Lenovo replaces the failed drive part. Your data stays safely on your premises, in your hands. The YourDrive YourData service can be purchased in convenient bundles and is optional with Foundation Service. It is bundled with Essential Service and Advanced Service.

- **Health Check**

Having a trusted partner who can perform regular and detailed health checks is central to maintaining efficiency and ensuring that your systems and business are always running at their best. Health Check supports Lenovo-branded server, storage, and networking devices, as well as select Lenovo-supported products from other vendors that are sold by Lenovo or a Lenovo-Authorized Reseller.

Examples of region-specific warranty terms are second or longer business day parts delivery or parts-only base warranty.

If warranty terms and conditions include onsite labor for repair or replacement of parts, Lenovo will dispatch a service technician to the customer site to perform the replacement. Onsite labor under base warranty is limited to labor for replacement of parts that have been determined to be field-replaceable units (FRUs). Parts that are determined to be customer-replaceable units (CRUs) do not include onsite labor under base warranty.

If warranty terms include parts-only base warranty, Lenovo is responsible for delivering only replacement parts that are under base warranty (including FRUs) that will be sent to a requested location for self-service. Parts-only service does not include a service technician being dispatched onsite. Parts must be changed at customer's own cost and labor and defective parts must be returned following the instructions supplied with the spare parts.

Lenovo Service offerings are region-specific. Not all preconfigured support and upgrade options are available in every region. For information about Lenovo service upgrade offerings that are available in your region, refer to the following resources:

- Service part numbers in Lenovo Data Center Solution Configurator (DCSC):  
<http://dcsc.lenovo.com/#/services>
- Lenovo Services Availability Locator  
<http://lenovocator.com/>

For service definitions, region-specific details, and service limitations, please refer to the following documents:

- Lenovo Statement of Limited Warranty for Infrastructure Solutions Group (ISG) Servers and System Storage  
<http://pcsupport.lenovo.com/us/en/solutions/ht503310>
- Lenovo Data Center Services Agreement  
<http://support.lenovo.com/us/en/solutions/ht116628>

## Deployment services

The MX systems can optionally include Lenovo deployment services to get customers up and running quickly.

The following Lenovo custom installation services are optional for both MX Integrated Systems and MX Certified Nodes:

- Unpacking and inspecting the systems
- Mounting the systems (rack cabinet, desktop, stack, bookshelf, wall or ceiling, or rack installation)
- Connecting the systems to electrical power and network
- Checking and updating firmware to the latest levels
- Verifying operations
- Disposal of the packaging materials (within the customer site)

The following Lenovo deployment services are optional for both MX Integrated Systems and MX Certified Nodes:

- Conducting remote preparation and planning
- Verifying firmware versions and performing firmware updates, if needed
- Configuring XCC management settings
- Configuring Storage Spaces Direct
- Configuring Microsoft System Center and discovering hosts and storage (if System Center is used)
- Configuring Lenovo XClarity network settings and performing discovery and inventory (if XClarity is selected)
- Transferring knowledge
- Developing post-installation documentation

The following table lists ThinkAgile Health Check & Deployment offerings are available for ThinkAgile MX customers. These offerings are performed by Lenovo Professional Services.

- **Onsite Deployment:** Install, configure, and validate solution on-site, and conduct knowledge transfer.
- **Remote Deployment:** Install, configure, and validate solution remotely, and conduct knowledge transfer.
- **Remote Health Check:** Report & remediation of hardware and cluster health issues, including firmware and software updates.

Table 32. ThinkAgile Health Check & Deployment offerings

Part number	Description
<b>Onsite deployment services</b>	
5MS7B09464	ThinkAgile MX Onsite Deployment (up to 2 nodes)
5MS7B09465	ThinkAgile MX Onsite Deployment (additional node)
<b>Remote deployment services</b>	
5MS7B09466	ThinkAgile MX Remote Deployment (up to 2 nodes)
5MS7B09467	ThinkAgile MX Remote Deployment (additional node)
<b>Remote Health Check</b>	
5MS7B00049	ThinkAgile MX 1X Remote Health Check (per 2-4 node cluster)
5MS7B00050	ThinkAgile MX 1X Remote Health Check (additional node)
5MS7B00051	ThinkAgile MX 1X Remote Health Check & Update (per 2-4 node cluster)
5MS7B00052	ThinkAgile MX 1X Remote Health Check & Update (additional node)

For more information, refer to the Data Center Implementation Services web page:  
<https://www.lenovo.com/us/en/data-center/services/implementation-services/>

## Lenovo Financial Services

Lenovo Financial Services reinforces Lenovo's commitment to deliver pioneering products and services that are recognized for their quality, excellence, and trustworthiness. Lenovo Financial Services offers financing solutions and services that complement your technology solution anywhere in the world.

We are dedicated to delivering a positive finance experience for customers like you who want to maximize your purchase power by obtaining the technology you need today, protect against technology obsolescence, and preserve your capital for other uses.

We work with businesses, non-profit organizations, governments and educational institutions to finance their entire technology solution. We focus on making it easy to do business with us. Our highly experienced team of finance professionals operates in a work culture that emphasizes the importance of providing outstanding customer service. Our systems, processes and flexible policies support our goal of providing customers with a positive experience.

We finance your entire solution. Unlike others, we allow you to bundle everything you need from hardware and software to service contracts, installation costs, training fees, and sales tax. If you decide weeks or months later to add to your solution, we can consolidate everything into a single invoice.

Our Premier Client services provide large accounts with special handling services to ensure these complex transactions are serviced properly. As a premier client, you have a dedicated finance specialist who manages your account through its life, from first invoice through asset return or purchase. This specialist develops an in-depth understanding of your invoice and payment requirements. For you, this dedication provides a high-quality, easy, and positive financing experience.

For your region-specific offers, please ask your Lenovo sales representative or your technology provider about the use of Lenovo Financial Services. For more information, see the following Lenovo website:

<https://www.lenovo.com/us/en/landingpage/lenovo-financial-services/>

## Related publications and links

For more information, see these resources:

- Lenovo ThinkAgile MX Certified Node product page  
<https://www.lenovo.com/us/en/data-center/software-defined-infrastructure/ThinkAgile-MX-Certified-Node/p/WMD00000377>
- Lenovo Data Center Solution Configurator (DCSC):  
<https://dcsc.lenovo.com>
- Microsoft Azure Stack HCI documentation  
<https://docs.microsoft.com/en-us/azure-stack/hci/overview>
- Lenovo ThinkAgile MX Best Recipes  
<https://datacentersupport.lenovo.com/us/en/solutions/ht507406>
- Lenovo ThinkAgile MX Information Center  
[https://thinkagile.lenovofiles.com/help/topic/com.lenovo.thinkagile.7Z20.doc/mx\\_appliances.html?cp=3](https://thinkagile.lenovofiles.com/help/topic/com.lenovo.thinkagile.7Z20.doc/mx_appliances.html?cp=3)
- ThinkAgile MX1021 on SE350 Azure Stack HCI (S2D) Deployment Guide  
<https://lenovopress.com/lp1298>
- Lenovo Certified Configurations for Microsoft Azure Stack HCI (S2D)  
<https://lenovopress.com/lp0866>
- Lenovo Data Center Support  
<https://datacentersupport.lenovo.com>



## Related product families

Product families related to this document are the following:

- [Edge Servers](#)
- [Hyperconverged Infrastructure](#)
- [Hyperconverged Infrastructure](#)
- [Microsoft Alliance](#)
- [ThinkAgile MX Series](#)

## 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.  
8001 Development Drive  
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.

© Copyright Lenovo 2023. All rights reserved.

This document, LP1296, was created or updated on November 14, 2022.

Send us your comments in one of the following ways:

- Use the online Contact us review form found at:  
<https://lenovopress.lenovo.com/LP1296>
- Send your comments in an e-mail to:  
[comments@lenovopress.com](mailto:comments@lenovopress.com)

This document is available online at <https://lenovopress.lenovo.com/LP1296>.

## Trademarks

Lenovo and the Lenovo logo are trademarks or registered trademarks of Lenovo in the United States, other countries, or both. A current list of Lenovo trademarks is available on the Web at <https://www.lenovo.com/us/en/legal/copytrade/>.

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

Lenovo®  
Lenovo Services  
ThinkAgile®  
ThinkEdge®  
ThinkShield®  
ThinkSystem®  
TruDDR4  
XClarity®

The following terms are trademarks of other companies:

Intel® and Xeon® are trademarks of Intel Corporation or its subsidiaries.

Azure®, Hyper-V®, Microsoft®, PowerShell, Windows PowerShell®, Windows Server®, and Windows® 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.