Lenovo RAID Management Tools and Resources
Reference Information (withdrawn product)

Lenovo offers a suite of management tools to simplify the configuration and management of the RAID controllers for ThinkSystem, ThinkServer, and System x servers. These tools enable Lenovo RAID controllers to be managed through a user interface or command line interface in the pre-boot environment, during the deployment of an operating system, and after the operating system is deployed.

This guide introduces the RAID management tools and their capabilities, along with the links to download these tools and the respective user guides,for use on supported ThinkSystem, ThinkServer, and System x servers with the following RAID controllers:

- ThinkSystem:
  - Onboard SATA RAID for Intel processor-based servers (Intel VROC SATA RAID, formerly known as Intel RSTe)
  - Onboard NVMe RAID for Intel processor-based servers (Intel VROC NVMe RAID)
  - ThinkSystem M.2 with Mirroring Enablement Kit
  - RAID 530-8i
  - RAID 730-8i 1GB Cache (not available in USA or Canada)
  - RAID 730-8i 2GB Flash
  - RAID 930-8i 2GB Flash
  - RAID 930-16i 4GB Flash
  - RAID 930-16i 8GB Flash
  - RAID 930-24i 4GB Flash
  - RAID 930-8e 4GB Flash
  - RAID 940-8i 4GB Flash
  - RAID 940-8i 8GB Flash
  - RAID 940-16i 8GB Flash
  - RAID 940-16i 8GB Flash Internal Adapter
  - RAID 940-32i 8GB Flash

- System x:
  - ServeRAID C110
  - ServeRAID M1210
  - ServeRAID M1215
  - ServeRAID M5210 and M5210e
  - ServeRAID M5225-2GB

- ThinkServer:
  - ThinkServer RAID 110i AnyRAID
  - ThinkServer RAID 121i
  - ThinkServer RAID 510i AnyRAID
  - ThinkServer RAID 520i PCIe
  - ThinkServer RAID 720i AnyRAID
  - ThinkServer RAID 720i PCIe
  - ThinkServer RAID 720ix AnyRAID
  - ThinkServer 9286CV-8e
  - ThinkServer 9380-8e

Lenovo RAID controllers

Topics in this section:

- Controller positioning
- ThinkSystem RAID controllers
- System x RAID controllers
- ThinkServer RAID controllers
- Controller features

Controller positioning

The following table positions the Lenovo RAID controllers based on the interface and category.

Table 1. RAID controller positioning

Interface	Server Internal storage			External storage expansion
	Embedded software RAID	Basic hardware RAID	Advanced hardware RAID	Advanced hardware RAID
ThinkSystem RAID controllers				
NVMe PCIe	● Onboard NVMe (Intel VROC NVMe RAID)		● 940-8i 4GB Flash ● 940-8i 8GB Flash ● 940-16i 8GB Flash	
12 Gbps SAS PCIe 4.0			● 940-8i 4GB Flash ● 940-8i 8GB Flash ● 940-16i 8GB Flash ● 940-32i 8GB Flash	
12 Gbps SAS PCIe 3.0		● 530-8i ● 730-8i 1GB Cache* ● 730-8i 2GB Flash	● 930-8i 2GB Flash ● 930-16i 4GB Flash ● 930-16i 8GB Flash ● 930-24i 4GB Flash	● 930-8e 4GB Flash
6 Gbps SATA	● Onboard SATA (Intel VROC SATA RAID, formerly RSTe)			
System x ServeRAID controllers				
12 Gbps SAS PCIe 3.0		● M1210 ● M1215	● M5210 ● M5210e	● M5225-2GB
6 Gbps SATA	● C110			
ThinkServer RAID controllers				
12 Gbps SAS PCIe 3.0		● 520i	● 720i ● 720ix	● 9380-8e
6 Gbps SAS		● 510i		● 9286CV-8e
6 Gbps SATA	● 110i ● 121i			

* ThinkSystem RAID 730-8i 1GB Cache adapter is available worldwide except US and Canada

ThinkSystem RAID controllers

The following tables summarize features of ThinkSystem RAID controllers. For an online comparison of ThinkSystem controllers, see the following:

Lenovo ThinkSystem RAID Adapter and HBA Reference
https://lenovopress.com/lp1288

Table 2. Advanced hardware RAID controllers

Feature	RAID 930-8i	RAID 930-16i 4GB / 8GB	RAID 930-24i	RAID 940-8i 4GB / 8GB	RAID 940-16i 8GB / Int	RAID 940-32i 8GB
Part number	7Y37A01084	7Y37A01085 4Y37A09721	7Y37A01086	4Y37A09728 4Y37A09729	4Y37A09730 4Y37A09735	4Y37A09733
Form factor	PCIe low profile	PCIe low profile	PCIe FHHL	PCIe low profile	PCIe low profile or Custom	PCIe FHHL
Controller chip	LSI SAS3508	LSI SAS3516	LSI SAS3508 + LSI SAS35x36R	Broadcom SAS3908	Broadcom SAS3916	Broadcom SAS3916 + SAS35x36R
Broadcom equivalent	MegaRAID 9460-8i	MegaRAID 9460-16i	MegaRAID 9460-24i	MegaRAID 9560-8i 4/8G	MegaRAID 9560-16i 8G	MegaRAID 9367-32i 8G
Host interface	PCIe 3.0 x8	PCIe 3.0 x8	PCIe 3.0 x8	PCIe 4.0 x8	PCIe 4.0 x8	PCIe 4.0 x8
Port interface	12 Gb SAS	12 Gb SAS	12 Gb SAS	12 Gb SAS	12 Gb SAS	12 Gb SAS
Number of ports	8	16	24	8	16	32
Port connectors	2x Mini-SAS HD x4 (SFF-8643)	4x Mini-SAS HD x4 (SFF-8643)	6x Mini-SAS HD x4 (SFF-8643)	One x8 SFF-8654	Two x8 SFF-8654	Four x8 SFF-8654
Drive interface	SAS, SATA	SAS, SATA	SAS, SATA	SAS, SATA	SAS, SATA	SAS, SATA
Drive type	HDD, SED, SSD	HDD, SED, SSD	HDD, SED, SSD	HDD, SED, SSD	HDD, SED, SSD	HDD, SED, SSD
Hot-swap drives	Yes	Yes	Yes	Yes	Yes	Yes
Max devices	8	16	24	8	16	32
RAID levels	0, 1, 10, 5, 50, 6, 60	0, 1, 10, 5, 50, 6, 60	0, 1, 10, 5, 50, 6, 60	0, 1, 10, 5, 50, 6, 60	0, 1, 10, 5, 50, 6, 60	0, 1, 10, 5, 50, 6, 60
JBOD mode	Yes	Yes	Yes	Yes	Yes	Yes
Cache	2GB (Standard)	4GB or 8GB (Standard)	4GB (Standard)	4GB or 8GB (Standard)	8GB (Standard)	8GB (Standard)
Flash cache protection (CacheVault)	Yes	Yes	Yes	Yes	Yes	Yes
Performance Accelerator (FastPath)	Yes	Yes	Yes	Yes	Yes	Yes
SSD Caching (CacheCade)	No	No	No	No	No	No
SED support (SafeStore)	Yes	Yes	Yes	Yes	Yes	Yes
Consistency check	Yes	Yes	Yes	Yes	Yes	Yes
Patrol read	Yes	Yes	Yes	Yes	Yes	Yes
Online capacity expansion	Yes	Yes	Yes	Yes	Yes	Yes
Online RAID level migration	Yes	Yes	Yes	Yes	Yes	Yes
Global Hot Spare	Yes	Yes	Yes	Yes	Yes	Yes
Auto-rebuild	Yes	Yes	Yes	Yes	Yes	Yes

Table 3. Embedded and Basic hardware RAID

Feature	Intel RSTe	Intel VROC NVMe	RAID 530-8i	RAID 530-16i	RAID 730-8i 1GB*	RAID 730-8i 2GB
Adapter type	Software RAID	Software RAID	RAID controller	RAID controller	RAID controller	RAID controller
Part number	None	None	7Y37A01082	4Y37A09727	7Y37A01083	4Y37A09722
Form factor	Onboard	Onboard	PCIe low profile	PCIe low profile	PCIe low profile	PCIe low profile
Controller chip	Intel PCH (RSTe)	Intel PCH (VROC)	LSI SAS3408	LSI SAS3416	LSI SAS3108	LSI SAS3108
Vendor equivalent	Not applicable	Not applicable	MegaRAID 9440-8i	MegaRAID 9440-16i	MegaRAID 9361-8i	MegaRAID 9361-8i
Host interface	Not applicable	Not applicable	PCIe 3.0 x8	PCIe 3.0 x8	PCIe 3.0 x8	PCIe 3.0 x8
Port interface	6 Gb SATA	PCIe NVMe	12 Gb SAS	12 Gb SAS	12 Gb SAS	12 Gb SAS
Number of ports	Varies	Varies	8	16	8	8
Port connectors	2x onboard SATA	Varies	2x Mini-SAS HD x4 (SFF-8643)	4x Mini-SAS HD x4 (SFF-8643)	2x Mini-SAS HD x4 (SFF-8643)	2x Mini-SAS HD x4 (SFF-8643)
Drive interface	SATA	NVMe	SAS, SATA	SAS, SATA	SAS, SATA	SAS, SATA
Drive type	HDD, SSD	SSD	HDD, SED, SSD	HDD, SED, SSD	HDD, SSD	HDD, SED, SSD
Hot-swap drives	Yes (system dependent)	Yes (system dependent)	Yes	Yes	Yes	Yes
Max devices	Varies	Varies	8	16	8	8
RAID levels	0, 1, 10, 5	0, 1, 10, 5‡	0, 1, 10, 5, 50	0, 1, 10	0, 1, 10, 5, 50	0, 1, 10, 5, 50, 6, 60
JBOD mode	Yes	Yes	Yes	Yes	Yes	Yes
Cache	None	None	None	None	1GB (Standard)	2GB (Standard)
Flash cache protection (CacheVault)	No	No	No	No	No	Yes
Performance Accelerator (FastPath)	No	No	Yes	Yes	No	Yes
SSD Caching (CacheCade Pro 2.0)	No	No	No	Yes	No	No
SED support (SafeStore)	No	No	Yes	Yes	No	Yes
Consistency check	Yes	Yes	Yes	Yes	Yes	Yes
Patrol read	Yes	Yes	Yes	Yes	Yes	Yes
Online capacity expansion	Yes	Yes	Yes	Yes	Yes	Yes
Online RAID level migration	Yes	Yes	Yes	Yes	Yes	Yes
Global Hot Spare	Yes	Yes	Yes	Yes	Yes	Yes
Auto-rebuild	Yes	Yes	Yes	Yes	Yes	Yes

‡ Intel VROC NVMe RAID supports Intel-branded NVMe SSDs without any additional license. To enable RAID using non-Intel NVMe SSDs requires VROC Premium which is a Feature on Demand (FoD) license upgrade (part number 4L47A39164, feature code B96G)

System x RAID controllers

The following table summarizes features and specifications of System x RAID controllers.

Table 4. System x RAID controller features and specifications summary

Feature	C110	M1210	M1215	M5210	M5210e	M5225-2GB
Form factor	Onboard	Custom	PCIe low profile	PCIe low profile	Onboard	PCIe low profile
Controller chip	N/A*	LSI SAS3004	LSI SAS3008	LSI SAS3108		LSI SAS3108
Host interface	N/A*	PCIe 3.0 x4	PCIe 3.0 x8	PCIe 3.0 x8		PCIe 3.0 x8
Port interface	6 Gb SATA	12 Gb SAS	12 Gbps SAS	12 Gb SAS		12 Gb SAS
Number of ports	4	4	8	8		8
Drive interface	SATA	SAS, SATA	SAS, SATA	SAS, SATA		SAS, SATA
Drive type	HDD, SSD	HDD, SSD	HDD, SSD	HDD, SSD		HDD, SSD
Hot-swap drive support	No	Yes	Yes	Yes		Yes
Number of drives*	4	4	32	32		192
RAID levels	0/1/10/5	0/1/10; Optional 5/50	0/1/10; Optional 5/50	0/1/10; Optional 5/50 and 6/60		0/1/10/5/50; Optional 6/60
JBOD mode	Yes	Yes	Yes	Yes (Without cache)		No
Cache	None	None	None	Up to 4 GB (Optional)		2 GB (Included)
Cache protection	None	None	None	Flash backup (Optional)		Flash backup (Included)
SED support (SafeStore)	No	Optional	Optional	Optional		Yes
Performance Accelerator (FastPath)	None	None	None	Optional		Optional
SSD Caching (CacheCade Pro 2.0)	None	None	None	Optional		Optional
Consistency check	Yes	Yes	Yes	Yes		Yes
Patrol read	Yes	Yes	Yes	Yes		Yes
Online capacity expansion	Yes	Yes	Yes	Yes		Yes
Online RAID level migration	Yes	Yes	Yes	Yes		Yes
Global Hot Spare	Yes	Yes	Yes	Yes		Yes
Auto-rebuild	Yes	Yes	Yes	Yes		Yes

* The number of drives depends on the RAID controller capabilities and supported internal drive bay configurations (including SAS expanders in drive backplanes) or external storage expansion configurations for the server in which the RAID controller is installed.

ThinkServer RAID controllers

The following table summarizes features of ThinkServer RAID storage controllers.

Table 5. ThinkServer RAID controller features and specifications summary

Feature	RAID 110i	RAID 121i	RAID 510i	RAID 520i	RAID 720i	RAID 720ix	9286CV-8e	9380-8e
Form factor	Onboard	Onboard	AnyRAID	Low profile	Low profile or AnyRAID	AnyRAID	Low profile	Low profile
Controller chip	N/A	N/A	LSI SAS2008	LSI SAS3008	LSI SAS3108		LSI SAS2208	LSI SAS3108
Host interface	N/A	N/A	PCIe 2.0 x8	PCIe 3.0 x8	PCIe 3.0 x8		PCIe 3.0 x8	PCIe 3.0 x8
Port interface	6 Gb SATA	6 Gb SATA	6 Gb SAS	12 Gb SAS	12 Gb SAS		6 Gb SAS	12 Gb SAS
Number of ports	8	6	8	8	8		8	8
Drive interface	SATA	SATA	SAS, SATA	SAS, SATA	SAS, SATA		SAS, SATA	SAS, SATA
Drive type	HDD, SSD	HDD, SSD	HDD, SSD	HDD, SSD	HDD, SSD		HDD, SSD	HDD, SSD
Hot-swap drive support	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Number of drives^	8*	5	8	8	8	26**	192	192
RAID levels	0/1/10; Optional 5	0/1/10/5	0/1/10; Optional 5/50	0/1/10; Optional 5/50	0/1/10/5/50; Optional 6/60 with any cache upgrade		0/1/10/ 5/50/6/60	0/1/10/ 5/50/6/60
JBOD mode	Yes	Yes	Yes	Yes	Yes (Without cache)	Yes***	No	No
Cache	None	None	None	None	Up to 4 GB****		1 GB	1 GB
Cache protection	None	None	None	None	Flash backup (Optional)		Flash backup (Included)	Flash backup (Required)
FastPath	None	None	None	None	Yes		Yes	Yes
CacheCade Pro 2.0	None	None	None	None	Yes (With flash backup)		Optional	None
Consistency check	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Patrol read	No	Yes	Yes	Yes	Yes		Yes	Yes
Online capacity expansion	No	Yes	Yes	Yes	Yes		Yes	Yes
Online RAID level migration	No	Yes	Yes	Yes	Yes		Yes	Yes
Global Hot Spare	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Auto-rebuild	Yes	Yes	Yes	Yes	Yes		Yes	Yes

^ The number of drives depends on the RAID controller capabilities and supported internal drive bay configurations or external storage expansion configurations for the server in which the RAID controller is installed.
* Up to 6 drives can be configured in a RAID array, and the remaining two drives operate in JBOD mode.
** Includes SAS Expander.
*** JBOD mode is supported only with the non-backed cache.
**** A cache upgrade is required for the 720ix AnyRAID adapter operations, and it must be purchased together with the controller.

Controller features

The following table explains the RAID controller features in more detail.

Table 6. RAID controller features explanation

Feature	Description
SED support (SafeStore)	MegaRAID SafeStore encryption services offer instant secure erase and local key management for self-encrypting drives. This technology secures data on a disk drive from any unauthorized access or modification resulting from theft, loss, or repurposing of drives. Instant secure erase permanently removes data when repurposing or decommissioning SEDs. SafeStore local key management provides the necessary management and protection of SEDs by using a simple pass phrase, security key identifier, and security key file that can be set and applied to all SEDs that are assigned to a RAID adapter. This feature removes the complexity of managing each SED's unique encryption key, and it relieves the administrator of most of the daily tasks of securing data.
Performance Accelerator (FastPath)	MegaRAID FastPath feature provides high-performance I/O acceleration for SSD-based virtual drives by using a low latency I/O path to increase the maximum I/O per second (IOPS) capability of the controller. This feature boosts the performance of applications with a highly random data storage access pattern, such as transactional databases.
SSD Caching (CacheCade Pro 2.0)*	MegaRAID CacheCade read/write software accelerates the performance of HDD arrays with only an incremental investment in SSD technology. The software enables SSDs to be configured as a dedicated pool of controller cache to help maximize the I/O performance for transaction-intensive applications, such as databases and web serving. CacheCade software tracks data storage access patterns and identifies the most frequently accessed data. The hot data is then automatically stored on the solid-state storage devices that are assigned as a dedicated cache pool on a RAID controller.
Consistency check	Consistency check verifies that all stripes in a virtual drive with a redundant RAID level are consistent. The consistency check mirrors data when an inconsistent stripe is detected for RAID 1 and re-creates the parity from the peer disks for RAID 5 or RAID 6. Consistency checks can be scheduled to take place periodically.
Patrol read	Patrol read is a background sentry service that pro-actively discovers and corrects media defects (bad sectors) that arise normally as a disk drive ages. The service issues a series of verify commands, and if a bad block is discovered, the card's firmware uses RAID algorithms to re-create the missing data and remap the sector to a good sector. The task is interruptible based on controller activity and host operations. The firmware also provides an interface where the patrol read task can be initiated, set up for continuous operation, and terminated from a management application. Patrol read can be activated by a manual command or automatically.
Online capacity expansion**	Online Capacity Expansion (OCE) allows the capacity of a virtual disk to be expanded by adding new physical disks or making use of unused space on existing disks, without requiring a reboot.
Online RAID level migration**	Online RAID Level Migration, which is also known as logical drive migration, migrates a virtual drive from one RAID level to other RAID level without requiring a reboot. System availability and application functionality remain unaffected.
Hot Spare	A hot spare rebuilds data from all virtual drives within the drive group in which it is configured to replace a failed drive. Hot spares can be configured as either global or dedicated. A global hot spare allows any physical drive to be designated as a hot spare. A dedicated hot spare allows the user to assign a hot spare drive to a particular array of the same drive type.
Auto-rebuild	Auto-rebuild allows a failed drive to be replaced and the data automatically rebuilt by using the new drive in the same drive bay. The RAID drive group continues to handle requests while the rebuild occurs.

* Not all SSDs support CacheCade feature. For details, refer to the following web page:
https://support.lenovo.com/us/en/documents/MIGR-5094754 .
** RAID 10, 50 and 60 drive groups do not support Online Capacity Expansion and Online RAID Level Migration. RAID 0, 1, 5, and 6 drive groups do not support Online Capacity Expansion and Online RAID Level Migration if two or more virtual drives are defined on a single drive group.

ThinkSystem RAID management tools

The following table lists the management tools for the following ThinkSystem RAID controllers:

- RAID 530-8i
- RAID 730-8i 1GB
- RAID 930-8i 2GB Flash
- RAID 930-16i 4GB Flash
- RAID 930-16i 8GB Flash
- RAID 930-24i 4GB Flash
- RAID 930-8e 4GB Flash

Table 7. ThinkSystem RAID controller management tools

Configuration method	Pre-boot tool	Operating system tool (after the OS is installed)		
		Windows	**Linux**	**VMware ESXi**
User Interface (UI)	• F1 Setup: XClarity Provisioning Manager GUI / UEFI System Setup Text-based Utility User Guide • XClarity Controller Web UI RAID Setup User Guide	LSI Storage Authority for Windows • Download • User Guide	LSI Storage Authority for Linux • Download • User Guide	None*
Command Line Interface (CLI)	XClarity Controller CLI • User Guide	StorCLI • Download • User Guide	StorCLI • Download • User Guide	StorCLI • Download • User Guide
Configuration patterns	Lenovo XClarity Administrator (Pro license required) • Download • User Guide	None	None	None

* VMware ESXi hosts running Lenovo Customized images of the ESXi hypervisor version 5.5 Update 1 or later can be managed remotely via the LSI Storage Authority tool installed on a supported operating system.

The following table lists the management tools for the following controllers:

- Onboard Intel RSTe-based SATA RAID controller
- ThinkSystem M.2 with Mirroring Enablement Kit

Note: Onboard SATA RAID feature is not supported by VMware ESXi and other hypervisors.

Table 8. Onboard SATA and M.2 RAID management tools

Configuration method	Pre-boot tool	Operating system tool (after the OS is installed)	
		Windows	**Linux**
User Interface (UI)	• F1 Setup: XClarity Provisioning Manager GUI / UEFI System Setup Text-based Utility User Guide	GUI Utility for Windows • Download	None
Command Line Interface (CLI)	XClarity Controller CLI • User Guide	RSTCLI • Download	MDADM • Native Linux utility

The following table briefly describes the management tools for the ThinkSystem RAID adapters.

Table 9. ThinkSystem RAID management tools overview

Management tool	Purpose
Lenovo XClarity Controller (XCC) Web UI	A browser-based user interface for accessing the IMM II features to perform remote server management (system information and inventory, system configuration, firmware management, and other tasks), including configuring RAID volumes.
XCC Command Line Interface (XCC CLI)	A command line interface program for XClarity Controller-based ThinkSystem servers for gathering system information and inventory; viewing, creating, and changing configuration settings, including RAID volumes; managing firmware; performing miscellaneous tasks, such as power control.
Lenovo XClarity Provisioning Manager / F1 UEFI System Setup	An installation assistant that simplifies the process of installing and configuring Lenovo x86 servers, including hardware configuration, RAID configuration, and operating system installation with minimal user intervention.
Provisioning Manager F1 UEFI System Setup	A Human Interface Infrastructure (HII) Utility user interface for configuring controllers, physical disks, and virtual disks, and for performing other configuration tasks in a pre-boot, Unified Extensible Firmware Interface (UEFI) environment.
Lenovo XClarity Administrator	A centralized resource management solution that automates discovery, inventory, tracking, monitoring, and provisioning for server, network, and storage hardware in a secure environment.
LSI/Avago Storage Authority (LSA)	An easy-to-use web-based user interface in the operating system for creating, modifying, monitoring, and maintaining storage configurations (controllers, drives, drive groups, virtual drives, and advanced features) locally and remotely.
Storage Command Line Tool (StorCLI)	An easy-to-script command line interface in the operating system for creating, modifying, monitoring, and maintaining storage configurations (controllers, drives, drive groups, virtual drives, and advanced features).
RSTe GUI Utility	A GUI application in the Windows operating system for managing and monitoring RAID arrays and volumes on the onboard SATA RAID controller.
RSTCLI	A command line application in the Windows operating system that provides basic support for creating and managing RAID arrays and volumes on the onboard SATA RAID controller.
MDADM	A native Linux command line interface tool for managing and monitoring RAID arrays and volumes on the onboard SATA RAID controller.

The following table compares capabilities of the ThinkSystem RAID management tools.

Table 10. ThinkSystem RAID management tool capabilities

Configuration task	XClarity Controller	XClarity Administrator	F1 UEFI Setup / Provisioning Manager	LSA	StorCLI	RSTe GUI / RSTCLI / MDADM
Creating arrays	Yes	Yes	Yes	Yes	Yes	Yes
Creating volumes	Yes	Yes	Yes	Yes	Yes	Yes
Assigning hot spare	Yes	Yes	Yes	Yes	Yes	Yes
Deleting arrays	Yes	No	Yes	Yes	Yes	Yes
Deleting volumes	Yes	No	Yes	Yes	Yes	Yes
Managing controller settings	No	No	Yes*	Yes	Yes	Yes
Managing drive settings	No	No	Yes*	Yes	Yes	Yes
Running consistency check	No	No	Yes*	Yes	Yes	Yes
Expanding capacity	No	No	Yes*	Yes	Yes	Yes
Migrating RAID level	No	No	No	Yes	Yes	Yes

* Not available in the UEFI System Setup for the onboard SATA RAID controller.

System x RAID management tools

The following table lists the management tools for the following Avago/LSI chip-based System x RAID controllers:

- ServeRAID M1210
- ServeRAID M1215
- ServeRAID M5210
- ServeRAID M5210e
- ServeRAID M5225-2GB

Table 11. M1210, M1215, M5210, M5210e, and M5225-2GB management tools

Configuration method	Pre-boot tool	Operating system tool (after the OS is installed)		
		Windows	**Linux**	**VMware ESXi**
User Interface (UI)	Manual configuration: ● F1 UEFI system setup (HII Utility) User Guide ● IMM II Web UI User Guide Guided configuration: ● ServerGuide Download	MegaRAID Storage Manager for Windows ● Download ● User Guide LSI Storage Authority for Windows ● Download ● User Guide	MegaRAID Storage Manager for Linux ● Download ● User Guide LSI Storage Authority for Linux ● Download ● User Guide	None*
Command Line Interface (CLI)	IMM II CLI ● User Guide	StorCLI ● Download ● User Guide	StorCLI ● Download ● User Guide	StorCLI ● Download ● User Guide
Configuration patterns	Lenovo XClarity Administrator (Pro license required) ● Download ● User Guide	None	None	None

* VMware ESXi hosts running Lenovo Customized images of the ESXi hypervisor version 5.5 Update 1 or later can be managed remotely via MegaRAID Storage Manager installed on a supported operating system.

The following table lists the management tools for the Intel RSTe-based ServeRAID C110 RAID controller.

Note: ServeRAID C110 is not supported by VMware ESXi and other hypervisors.

Table 12. C110 management tools

Configuration method	Pre-boot tool	Operating system tool (after the OS is installed)	
		Windows	**Linux**
User Interface (UI)	Manual configuration: ● F1 UEFI System Setup (HII Utility) User Guide Guided configuration: ● ServerGuide Download	GUI Utility for Windows ● Download	None
Command Line Interface (CLI)	IMM II CLI ● User Guide	RSTCLI ● Download	MDADM ● Native Linux utility

The following table briefly describes the management tools for the System x RAID adapters.

Table 13. System x RAID management tools overview

Management tool	Purpose
Integrated Management Module II (IMM II) Web UI	A browser-based user interface for accessing the IMM II features to perform remote server management (system information and inventory, system configuration, firmware management, and other tasks), including configuring RAID volumes.
IMM II Command Line Interface (IMM II CLI)	A command line interface program for IMM II-based System x servers for gathering system information and inventory; viewing, creating, and changing configuration settings, including RAID volumes; managing firmware; performing miscellaneous tasks, such as power control.
ServerGuide	An installation assistant that simplifies the process of installing and configuring Lenovo x86 servers, including hardware configuration, RAID configuration, and operating system installation with minimal user intervention.
Lenovo XClarity Administrator	A centralized resource management solution that automates discovery, inventory, tracking, monitoring, and provisioning for server, network, and storage hardware in a secure environment.
F1 UEFI System Setup	A Human Interface Infrastructure (HII) Utility user interface for configuring controllers, physical disks, and virtual disks, and for performing other configuration tasks in a pre-boot, Unified Extensible Firmware Interface (UEFI) environment.
LSI/Avago Storage Authority (LSA)	An easy-to-use web-based user interface in the operating system for creating, modifying, monitoring, and maintaining storage configurations (controllers, drives, drive groups, virtual drives, and advanced features) locally and remotely.
MegaRAID Storage Manager (MSM)	An easy-to-use graphical user interface (GUI) tool in the operating system for creating, modifying, monitoring, and maintaining storage configurations (controllers, drives, drive groups, virtual drives, and advanced features) locally and remotely.
Storage Command Line Tool (StorCLI)	An easy-to-script command line interface in the operating system for creating, modifying, monitoring, and maintaining storage configurations (controllers, drives, drive groups, virtual drives, and advanced features).
RSTe GUI Utility	A GUI application in the Windows operating system for managing and monitoring RAID arrays and volumes on the C110.
RSTCLI	A command line application in the Windows operating system that provides basic support for creating and managing RAID arrays and volumes on the C110.
MDADM	A native Linux command line interface tool for managing and monitoring RAID arrays and volumes on the C110.

The following table compares capabilities of the System x RAID management tools.

Table 14. System x RAID management tool capabilities

Configuration task	IMM II	ServerGuide	XClarity	F1 UEFI Setup	LSA	MSM	StorCLI	RSTe GUI / RSTCLI / MDADM
Creating arrays	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Creating volumes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Assigning hot spare	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Deleting arrays	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Deleting volumes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Managing controller settings	No	No	No	Yes*	Yes	Yes	Yes	Yes
Managing drive settings	No	No	No	Yes*	Yes	Yes	Yes	Yes
Running consistency check	No	No	No	Yes*	Yes	Yes	Yes	Yes
Expanding capacity	No	No	No	Yes*	Yes	Yes	Yes	Yes
Migrating RAID level	No	No	No	No	Yes	Yes	Yes	Yes
Configuration wizard	No	No	No	No	No	Yes	No	No

* Not available in the UEFI System Setup for the C110.

ThinkServer RAID management tools

The following table lists the management tools for the following Avago/LSI chip-based ThinkServer RAID controllers:

- RAID 110i
- RAID 510i
- RAID 520i
- RAID 720i
- RAID 720ix
- 9286CV-8e
- 9380-8e

Note: ThinkServer RAID 110i is not supported by VMware ESXi and other hypervisors.

Table 15. Avago/LSI chip-based RAID controller management tools

Configuration method	Pre-boot tool	Operating system tool (after the OS is installed)		
		Windows	Linux	VMware ESXi
User Interface (UI)	Manual configuration: - F1 UEFI System Setup (HII Utility) User Guide Guided configuration: - EasyStartup Download - TDM Download	MegaRAID Storage Manager for Windows - Download - User Guide	MegaRAID Storage Manager for Linux - Download - User Guide	None*
Command Line Interface (CLI)	None	StorCLI - Download - User Guide	StorCLI - Download - User Guide	StorCLI - Download - User Guide

* VMware ESXi hosts running Lenovo Customized images of the ESXi hypervisor version 5.5 Update 1 or later can be managed remotely via MegaRAID Storage Manager installed on a supported operating system.

The following table lists the management tools for the Intel RSTe-based RAID 121i controller.

Note: ThinkServer RAID 121i is not supported by VMware ESXi and other hypervisors.

Table 16. RAID 121i management tools

Configuration method	Pre-boot tool	Operating system tool (after the OS is installed)	
		Windows	Linux
User Interface (UI)	Manual configuration: ● F1 UEFI System Setup (HII Utility) User Guide Guided configuration: ● EasyStartup Download	GUI Utility for Windows ● Download	None
Command Line Interface (CLI)	None	RSTCLI ● Download	MDADM ● Native Linux utility

The following table briefly describes the management tools for the ThinkServer RAID adapters.

Table 17. ThinkServer RAID management tools overview

Management tool	Purpose
EasyStartup	A tool that simplifies the process of configuring RAID and installing Microsoft Windows and Linux operating systems, VMware hypervisors, and device drivers on a single-socket (1P) ThinkServer system.
ThinkServer Deployment Manager (TDM)	A tool in the server firmware that simplifies the process of updating firmware, configuring UEFI system settings, configuring RAID, and installing Microsoft Windows or Linux operating systems or VMware hypervisors and associated device drivers on a dual-socket (2P) ThinkServer system.
F1 UEFI System Setup	A Human Interface Infrastructure (HII) Utility user interface for configuring controllers, physical disks, and virtual disks, and for performing other configuration tasks in a pre-boot, Unified Extensible Firmware Interface (UEFI) environment.
MegaRAID Storage Manager (MSM)	An easy-to-use graphical user interface (GUI) tool in the operating system for creating, modifying, monitoring, and maintaining storage configurations (controllers, drives, drive groups, virtual drives, and advanced features) locally and remotely.
Storage Command Line Tool (StorCLI)	An easy-to-script command line interface in the operating system for creating, modifying, monitoring, and maintaining storage configurations (controllers, drives, drive groups, virtual drives, and advanced features).
RSTe GUI Utility	A GUI application in the Windows operating system for managing and monitoring RAID arrays and volumes on the RAID 121i.
RSTCLI	A command line application in the Windows operating system that provides basic support for creating and managing RAID arrays and volumes on the RAID 121i.
MDADM	A native Linux command line interface tool for managing and monitoring RAID arrays and volumes on the RAID 121i.

The following table compares capabilities of the ThinkServer RAID management tools.

Table 18. ThinkServer RAID management tool capabilities

Configuration task	EasyStartup / TDM	F1 UEFI Setup	MSM	StorCLI	RSTe GUI / RSTCLI / MDADM
Creating arrays	Yes	Yes	Yes	Yes	Yes
Creating volumes	Yes	Yes	Yes	Yes	Yes
Assigning hot spare	Yes	Yes	Yes	Yes	Yes
Deleting arrays	No	Yes	Yes	Yes	Yes
Deleting volumes	No	Yes	Yes	Yes	Yes
Managing controller settings	No	Yes*	Yes	Yes	Yes
Managing drive settings	No	Yes*	Yes	Yes	Yes
Running consistency check	No	Yes*	Yes	Yes	Yes
Expanding capacity	No	Yes*	Yes	Yes	Yes
Migrating RAID level	No	No	Yes	Yes	Yes
Configuration wizard	No	No	Yes	No	No

* Not available in the UEFI System Setup for the RAID 121i.

Related publications and links

For more information, refer to the following publications:

- Lenovo RAID Introduction
  https://lenovopress.com/lp0578
- Lenovo ThinkSystem RAID Adapter and HBA Reference
  https://lenovopress.com/lp1288
- ThinkSystem M.2 Drives and M.2 Adapters product guide:
  https://lenovopress.com/lp0769-thinksystem-m2-drives-adapters
- Understanding the Performance Benefits of MegaRAID FastPath with Lenovo Servers
  https://lenovopress.com/lp0592
- ThinkSystem Storage Adapter Software User Guide
  https://download.lenovo.com/storage/thinksystem_storage_adapter_sw_ug.pdf
- Lenovo Press Product Guides in the RAID Adapters category:
  https://lenovopress.com/servers/options/raid#resource_type=product-guide&sort=publish_date

Related product families

Product families related to this document are the following:

- RAID Adapters

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This document, LP0579, was created or updated on October 4, 2022.

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