

Lenovo Unified Manager Best Practices User Guide

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Abstract

Lenovo® Unified Manager is the most comprehensive product for managing and monitoring Lenovo **ONTAP®** systems. The need to support various installation platforms, infrastructure scalability, and deployment scenarios creates such a complex list of requirements that one configuration might not fit all. This document outlines basic deployment and best practice guidelines for Unified Manager. The document is for users who are already familiar with the fundamentals of Lenovo ONTAP and Unified Manager.

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Introduction

Lenovo Unified Manager is the most comprehensive product for managing and monitoring performance, capacity, and health in ONTAP systems through features like events, alerts, performance troubleshooting, capacity reporting, and more.

The purpose of this guide is to address some of the design aspects needed to be considered when creating an instance of Unified Manager. With large ONTAP environments, the proper planning of Unified Manager

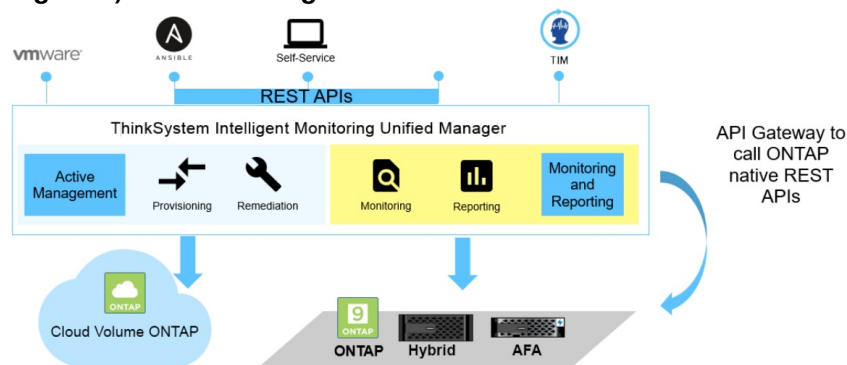
deployments is essential to help scale later.

Architecture

Unified Manager architecture

With the release of Unified Manager 9.7, several new capabilities have been introduced in Unified Manager. Unified Manager can be used to perform active management and intelligent provisioning of ONTAP clusters across the datacenter with the GUI or automate with any standard tools by using Unified Manager's REST APIs. With several HTML5-based dashboards, security conformance, enhanced risk assessment, and analysis backed by ThinkSystem Intelligent Monitoring's community intelligence and VMware awareness, Unified Manager 9.7 is power packed for the modern data center operations and hybrid environments. Figure 1 shows the various capabilities and third-party integration capabilities you have with Unified Manager.

Figure 1) Unified Manager architecture.



Intelligent provisioning with Unified Manager and REST APIs

Unified Manager allows management of storage infrastructure based on service level objectives (SLOs), which helps assign performance service levels to workloads and allows storage consumption against these defined performance levels. This results in intelligent provisioning and workload management because storage can be provisioned by users without requiring detailed knowledge of the underlying storage. There are also SLO-based APIs that can be leveraged to provision and monitor storage and platform-specific device APIs for storage management in a data center.

Sizing guidelines

There is no one-size-fits-all option for planning compute resources for Unified Manager because every environment is different. Various factors determine resource requirements for each Unified Manager instance. Customers use Unified Manager for various purposes; some people only use the alerting and event functionality, while some use it for operational reporting. Some advanced customers use it for end-to-end monitoring and management of Lenovo resources with various integrated solutions, such as Workflow Automation (WFA).

Challenges to providing scaling precision

Unified Manager is primarily a monitoring solution. Many resource requirements depend on various factors, some of which are under the control of Unified Manager, and some of which are beyond Unified Manager's scope. This section describes the challenges to providing scale precision.

Note: The items in red are beyond the control of Unified Manager for discovery:

- The number of clusters per Unified Manager instance
- The number of nodes per cluster
- The number of each type of storage object (physical or logical) in a cluster
- The number of concurrent Unified Manager users
- The web pages that each Unified Manager user requests

- The external load (for example, WFA)
- Reports generated (on demand or scheduled)
- The ONTAP version for objects managed and collection method
- The time between performance collection periods (5 to 15 minutes)
- Network issues or latency
- The frequency of object configuration changes on the cluster

In addition, load on the cluster also increases the ZAPI response time. This is ONTAP related, so it cannot be discovered by Unified Manager.

Virtual application (vApp) configuration and run time

Note: The items in red cannot be discovered by Unified Manager and are thus beyond its control.

- The amount of actual RAM memory that VMware provides
- The number of CPU cycles provided by VMware
- If the memory and CPU resources are reserved or shared
- Competition from other workloads in VMware
- The underlying storage technology in VMware
- Host OS performance
- Any hardware failures
- Underlying Java Virtual Machine (JVM) used by Unified Manager
- Class libraries and memory efficiency
- Garbage collector behavior with collection times from 20 second to 10 minutes

These factors explain why precision in Unified Manager scaling is challenging; there are so many attributes that are beyond the scope of the Unified Manager instance. The following general sizing rules might help you with your decisions.

Sizing rules

The built-in Scale Monitor feature indicates when to increase resources or stop adding clusters to the Unified Manager instance. The general rule for sizing is to add additional resources (disk, memory, and/or CPU) to your required or planned capacity. The following pointers might help you with your decision:

- Always add additional resources to your planned capacity to allow for growth. This buffer depends on how quickly your environment will grow. Plan to provision least 10% to 20% above your requirements.
- **It's always good to oversize, because:**
 - Users often don't know their peak loads in advance.
 - Even if you are confident of your Unified Manager capacity, your environment might grow and need more resources.
- Never undersize your disk and memory requirements, always oversize.
- When possible, reserve resources for Unified Manager versus sharing them in virtual environments.

The additional resources required are addressed with Scale Monitor alerts, as described in the next section.

Scale Monitor

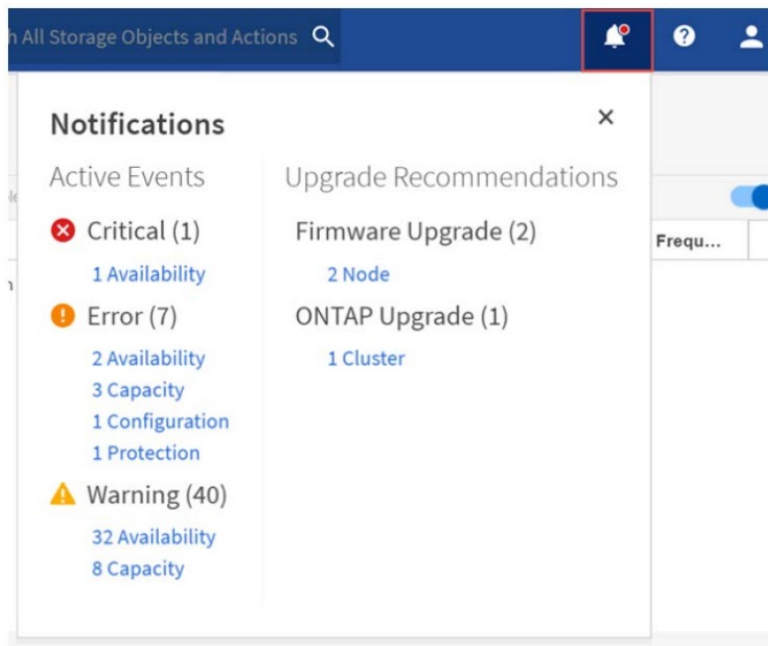
Unified Manager has a built-in Scale Monitor feature that tracks disk and memory usage. This feature can then provide guidance in scenarios where increasing these system resources allows you to scale your Unified Manager instance.

Scale Monitor in Unified Manager

Starting with Unified Manager 9.7, scale monitor alerts are called as Management Station events and are available in the Event Management view. Filter all Management Station events to match by using the Source Type as shown below.

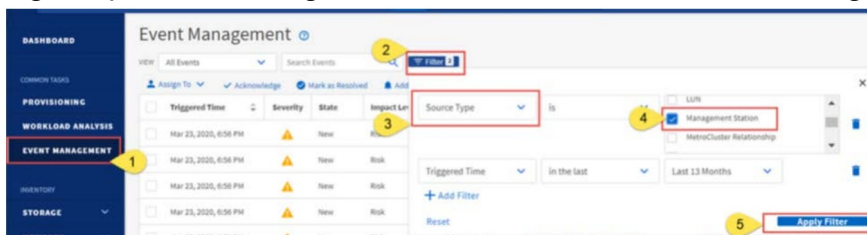
The events are available in the notification bell found in the top right-hand corner of the GUI.

Figure 2) Management station events.



To view all the Management Station events, navigate to Event Management, and apply filter mapping with the Source Type to search for the Management Station.

Figure 3) Find All Management Station Events in the Events Management GUI.



Note: Scale Monitor checks the amount of memory on the machine and partitions it across MySQL and the two Java processes. When users add more memory to the machine, Unified Manager uses it without any other changes on their part.

Scale guidance strategy

In the case of larger ONTAP environments, it might take additional planning to determine the appropriate resources for your Unified Manager instance. This section describes some of the guidelines that you can use to plan and deploy your own Unified Manager instance.

As general rules of thumb, consider the following scale strategy for your Unified Manager instance:

- Always over provision.
- When Unified Manager starts monitoring beyond a 48-node count, rely on Scale Monitor (Management Station) alerts.
- When possible, reserve resources for Unified Manager versus sharing them in virtual environments.

Minimum resource requirements with Unified Manager

To accommodate different configuration and deployment sizes, Unified Manager has no hard limit on the space and memory reservations. This is particularly helpful for customers with smaller ONTAP footprints and those who have an instance deployed on a host with a very small configuration. However, for Unified Manager instances running as a virtualized instance with sizable footprints, Lenovo recommends reserving resources (CPU, memory) for best performance, although this is optional. Reserving memory eliminates ballooning, swapping on the host, and ensures Unified Manager runs on physical memory. Users can start with the configurations listed in **Table 1**.

Table 1) Configuration recommendation for each Unified Manager instance.

Platform	Memory (GB)	CPU	Disk space (GB)
vApp	12	4 vCPUs	400
Windows/CentOS/RedHat	12	4	400

For enterprise customers with scaled environments, you can use the following resource recommendations for planning your Unified Manager instance. These recommendations are best practices; they are not mandatory.

Unified Manager scalability

Several improvements have been made in the latest releases with a view to increase the scale numbers further in future releases. If you have a significant number of ONTAP instances managed by a single Unified Manager instance, consider investing in the Unified Manager upgrade process.

Unified Manager 9.9 scalability

Unified Manager 9.9 can scale up to 250 nodes, as shown in Table 2. If your node count is greater than 250, contact your Lenovo account team so that they can help coordinate a review of your environment requirements.

Note: Backup space requirements, such as provisioning three times the space for the /data directory, remain unchanged.

Table 2) Resource recommendations for Unified Manager 9.9 and higher

Nodes	RAM (GB)	Disk space (GB)	CPU	Backup space (GB)
Up to 48	12	400	4–8	<div>Three times/data</div> <div>Note: Space taken by the backup directory also depends on the following:</div> <div><ul style="list-style-type: none">• Retention count.• How frequently a full backup is taken; it breaks the ever- growing incremental backup chain.</div>
49–72	60	685	12	
72–150	146	1600	24	
150–200	203	2200	28	
200–250	272	3000	32	
250+	Contact account team			

Note: Beginning in Unified Manager 9.7, the capability to monitor VMware metrics is available. 4,700 VMs have been tested in a standard Unified Manager 9.7P1 and in the above configuration.

Unified Manager 9.7 and 9.8 scalability

Unified Manager 9.7 and 9.8 can scale up to 150 nodes, as shown in Table 3. If your node count is greater than 150, contact your Lenovo account team so that they can help coordinate a review of your environment requirements.

Note: Backup space requirements, such as provisioning three times the space for the /data directory, remain unchanged.

Table 3) Resource recommendations for Unified Manager 9.7 & 9.8.

Node Count	Memory (GB)	Disk space (GB)	CPU	Backup space (GB)
Up to 48	12	400	4–8	Three times/data Note: Space taken by the backup directory also depends on the following: <ul style="list-style-type: none">• Retention count.• How frequently a full backup is taken; it breaks the ever-growing incremental backup chain.
49–72	60	685	12	
72–150	146	1600	24	
150+	Contact account team			

Note: Beginning in Unified Manager 9.7, the capability to monitor VMware metrics is available. 4,700 VMs have been tested in a standard Unified Manager 9.7P1 and above configuration.

Unified Manager 9.6 and earlier versions

Table 4) Resource recommendations for Unified Manager 9.6 and earlier versions

Node Count	Memory (GB)	Disk space (GB)	Cores	Backup space (GB)
49–72	Rely on Scale Monitor to tell you when Unified Manager requires more resources.	Rely on Scale Monitor to tell you when Unified Manager requires more resources	12	Three times MySQL DB space
72+	Upgrade to Unified Manager 9.7 (recommended) or: <ul style="list-style-type: none">Follow Scale Monitor guidance (or).Deploy multiple instances.			

For example, if the MySQL directory (/opt/netapp/data) space is set to 150GB, the backup space should be set to 450GB (three times the MySQL data space).

Notes:

- If you plan to create Unified Manager backups, configure your backup destination to have three times the

consumed primary data (/opt/netapp/data) space.

- **You can mount a LUN or NFS share on the backup path. This creates two advantages:**
 - The database has more space to accommodate growth.
 - Because backup files are hosted on a storage server, they are safe from accidental VM outage.
- In general, 5GB of disk space is required per node for performance data retention. This is a general observation, and actual requirements can vary.

If you need an environment that supports over 72 nodes, upgrade to Unified Manager 9.7P1 or later to take advantage of additional features and scale improvements.

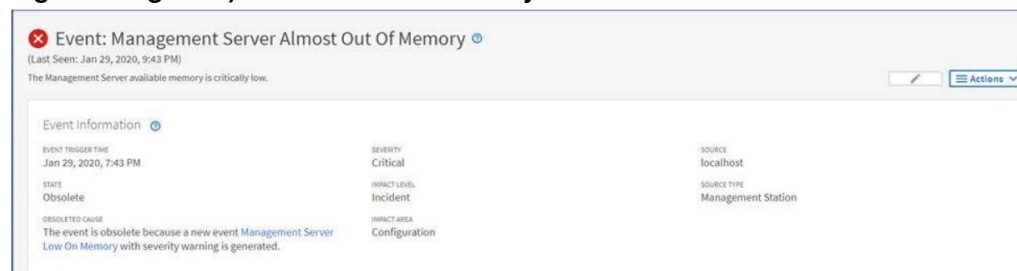
Scale Monitor events

Scale Monitor events can be a useful mechanism for addressing many scale issues. Table 5 lists the Management Station events that are currently available.

Table 5) Management Station events.

Event name	Impact level
Unified Manager Server Disk Space Nearly Full	Risk
Unified Manager Server Disk Space Full	Incident
Unified Manager Server Low on Memory	Risk
Unified Manager Server Almost Out of Memory	Incident
MySQL Log File Size Increased; Restart Required	Risk

Each event provides a recommendation with guidance on the implementation plan, as shown in the example in **Figure 4. Figure 4) Almost Out of Memory event.**




Enhancements with



Unified Manager 9.7P1

Starting with 9.7P1, Unified Manager monitors how frequently MySQL writes to disk and tunes it to optimize writes. Scale Monitor makes these changes automatically and creates a new event in the notification bell when a reboot is required. The new event is shown in **Figure 5.**

Figure 5) New event to measure database behavior .


Event: MySQL Log File Size Increased; Restart Required

MySQL log file was too small and it was affecting Management Server performance. The size has been increased from 3094MB to 3191MB to fix the performance issue.

Suggested Actions to Fix The Issue

- Restart the MySQL and Management Server services to activate this change.

Event Information

EVENT TRIGGER TIME	SEVERITY	SOURCE
Jun 4, 2020, 9:06 AM	Warning	150-nodes.ONTAP
STATE	IMPACT LEVEL	SOURCE TYPE
New	Incident	Management Station
	IMPACT AREA	
	Configuration	

Installation guidelines

Organizations have requirements for certifying software versions and security updates in their environment. These requirements might force you to decide on a platform to host your software. Before you start a fresh installation of Unified Manager, you must decide on the platform (vApp, Red Hat Enterprise Linux, CentOS, or Windows) that best suits your environment.

Selecting the right platform

Organizations have different security procedures, patching policies, and regulations that limit the way a product is installed. With Unified Manager, you have the flexibility to install your Unified Manager instance in the platform that best suits your organizational needs. Although there is no significant performance, operational, or functional differences between the three platforms, you should understand how your platform selection affects your operations:










With the vApp distribution, the underlying operating system is locked down behind a network firewall. There is no user access to the file system or to the operating system components. Any updates to the software must be applied through a Unified Manager update downloaded from the Lenovo Support site. Scale might be limited by VMWare's CPU and RAM allocation capability. vApp is an excellent choice for customers who have less need for independent verification and control of software components. Deployments are up and running in a matter of minutes.

With the Red Hat Enterprise Linux and CentOS distribution, the user retains control of the operating system. Any required agents (such as backup, auditing, and so on) can be installed, and the user is free to choose the patch levels for third-party software packages used by Unified Manager, such as Java and MySQL. Users can also patch the server on their schedule. Additional security hardening is possible if it doesn't interfere with required network connections. This is a great option for customers who have very specific corporate security requirements.

With the Windows distribution, customers fully control the Windows server and the environment. They can patch the server and choose to change the versions of third-party components. However, the process is not as simple as on Linux.

Use Table 6 when deciding which platform to select.

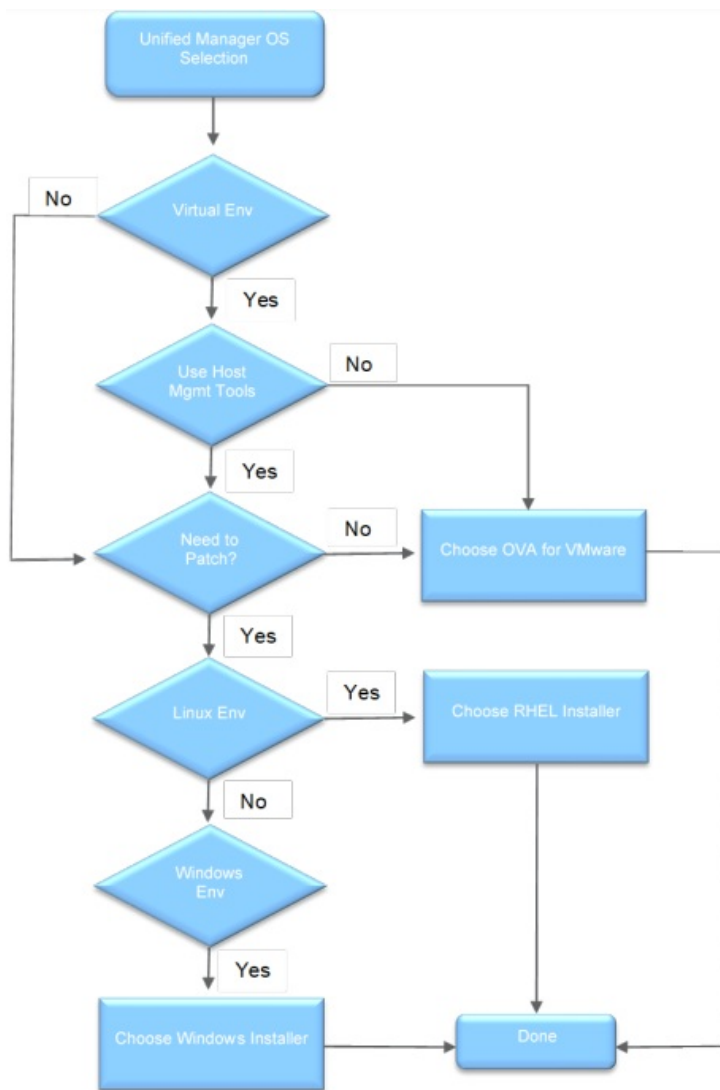
Table 6) Choosing the right platform.

Functional requirement	vApp	Windows (guest OS)	Red Hat/ CentOS (guest OS)	Windows (physical)	Red Hat (physical)
Platform hosting Unified Manager requires regular patching in your environment.					
Platform hosting Unified Manager requires OS hardening.					
Unified Manager requires a certain software component version. For example, MySQL version 5.7.23 is required but the built-in package in vApp (OVA) is currently 5.7.17.					
Unified Manager instance must scale up its resources (memory, disk space) to satisfy new nodes or clusters added.					
You have delegated management roles in your environment for operations and administrative roles.					
You expect to have a higher node count, requiring you to scale your Unified Manager instance vertically.					

*You cannot auto-scale resources in physical servers directly. You can add resources (memory and disk) only during downtime, provided that your hardware supports extra DIMM and disk slots.

Alternatively, you can use the logic shown in Figure 6 to identify the right platform.

Figure 6) Identifying the right platform.



Resource allocation

Follow the sizing recommendations for deployed Unified Manager version in the section “Minimum resource requirements with Unified Manager”.

Planning your MySQL space

With increasing business needs, Unified Manager instances need to scale vertically to monitor and manage additional storage infrastructure. Increasing object counts result in additional space requirements in the /opt/netapp/data space, requiring a flexible /opt/netapp/data partition that can grow with new resource requirements. You might also have to plan additional space for backups, because the partition is housed under /opt/netapp/data. For these reasons, your /opt/netapp/data space must be flexible to allow expansion. NetApp recommends the following:

- **For RHEL and Windows installations:** /opt/netapp/data mounted from a LUN for physical installations.
- **For vApp installations:** Rely on the data store where MySQL database is hosted

Note: For large MySQL databases, you can keep the support bundles in a different location than /opt/netapp/data. This prevents unnecessary space consumption in the /opt/netapp/data space.

To enable your MySQL DB data (/opt/netapp/data) to auto-expand, Lenovo recommends having a volume manager manage your LUN mount. Requirements for the different platforms are discussed in the rest of this section.

Red Hat Enterprise Linux or CentOS

Lenovo recommends mounting /opt/netapp/data from a LUN mount for Unified Manager and to use a volume manager to mount it as a filesystem in your host. This gives you the flexibility of adding LUNs for additional disk space while keeping the /opt/netapp/data mount constant. You can add multiple LUNs under the same mount point with the help of logical expansion.

If you need to increase /opt/netapp/data for an existing Unified Manager instance that is installed on /opt/netapp/data mounted locally, complete the following steps:

1. Install an iSCSI adapter in your Linux server.
2. Create a new LUN and map it to the Unified Manager server.
3. Use LVM or a similar volume manager to mount the LUN.
4. Shut down the Unified Manager instance and then copy the entire contents of /opt/netapp/data into the new mountpoint.
5. After copying is completed, rename the new mountpoint as /opt/netapp/data and bring up the Unified Manager services again.

Plan to mount /opt/netapp/data from a separate LUN, and mount it with a volume manager. This gives you the flexibility of granting additional /opt/netapp/data space by using volume managers like Linux-native LVM. You can add multiple LUNs under the same mount point with the help of logical expansion.

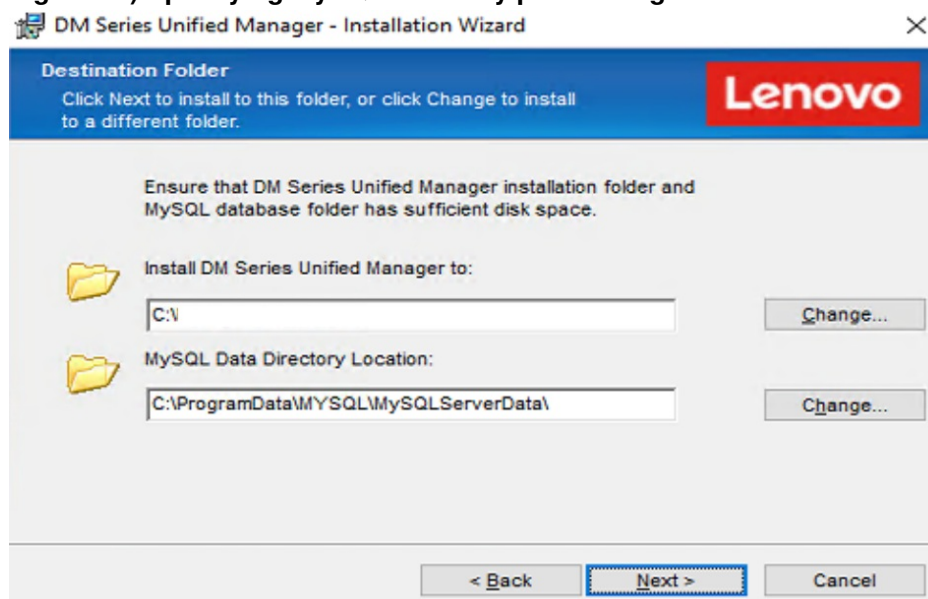
Windows

Always put your Unified Manager data directory in a non-system drive because you cannot expand your system drive. If your system drive is the C drive, do not use the C drive for MySQL data. Lenovo recommends mounting a LUN for placing your MySQL data and making the disk dynamic for future expansions as the need arises.

Alternatively, you can have a volume manager offer a non-system drive; you can always add space to this drive for future expansion.

During installation, you can specify where you want to keep MySQL data, as shown in Figure 7.

Figure 78) Specifying MySQL directory path during Windows installation.



Virtual appliances

vApp deployment follows a simple procedure. The underlying datastore helps in auto-expansion; you can

always expand the current installation space from the underlying datastore.

To expand the /data space, you must first expand the hard disk space at the VM's resource tab and then expand the actual space of the MySQL data partition from the vApp maintenance console.

Note: The underlying datastore should have the extra space required for you to provision the VM in question.

Unified Manager backup

Unified Manager collects and maintains performance, capacity, and health data in a single MySQL database. When a full backup is triggered, a temporary dump of the MySQL database is created in the backup directory, requiring additional temporary space for every iteration of backup. For each incremental backup, a separate backup file is generated in /opt/netapp/data/ocum-backup/database-dumpsrepo. Therefore, Lenovo recommends configuring the backup space to be three times the size of the MySQL database.

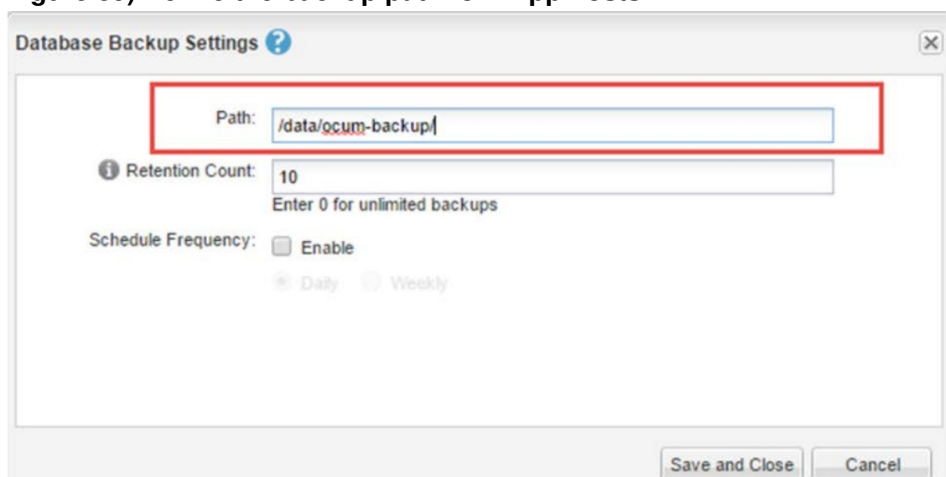
This configuration comes with some additional cost to maintain the temporary space inside the /opt/netapp/data space. You should plan to have the backup directory mounted from low-cost storage and from an independent network location for two reasons:

- **Having your backups in a different location helps with the recovery of your database when the primary location is unavailable. The primary location for each install platform is different:**
 - **vApp:** /data/ocum-backup/
 - **RHEL and CentOS:** /opt/netapp/data/ocum-backup/
 - **Windows:** Available under C:\\ProgramData\\
- The space requirement for backups is three times the size of the MySQL database. Therefore, it is best to store backup data in a different mount point.

Defining a custom backup path

To store your backup data in a different location, define the network path in the backup settings, as shown in **Figure 8**.

Figure 89) Define the backup path for vApp hosts.



Note: The path shown in Figure 8 is different for RHEL, CentOS, and Windows environments.

Defining a custom backup location

RHEL and CentOS

For RHEL and CentOS, Lenovo recommends creating a different backup destination for scaled

environments. This allows you to scale your backup as the database grows. For these reasons, you can consider one of the following options:

- Mount your backup on a dedicated mount point like /mnt/backup.
- Create a symlink from to /mnt/backup.
- Mount your backup on a dedicated mount point like /mnt/backup.
- Create a symlink from to /mnt/backup.

Windows install

For Windows environments, Lenovo recommends creating a different drive for backups. Prerequisites for selecting a different backup location in RHEL/CentOS and

Windows

For the custom backup location to work, you must reassign ownership of a new backup path to User:jboss and Group:jboss. For example, in a Red Hat installation, the custom backup directory should have the use group permission set to jboss:jboss.

vApp backup

For Unified Manager instances deployed on the vApp instance type, you cannot move data out of the vApp instance. Therefore, Lenovo recommends only taking backups with VMware-consistent snapshots.

vApp backup procedure

For Unified Manager vApp deployments, Lenovo recommends the following backup procedure:

1. Create a VMware-consistent snapshot.

Note: You cannot move data out of the vApp instance. Taking VMware-consistent backup snapshots is the best way to maintain backups for longer retention periods.

2. For longer retention, take a backup of the VMware snapshot with your vendor-specific backup solution.

Backup and restore using Snapshot on Linux operating system

Unified Manager 9.8 has introduced Backup and Restore of the Unified manager database using Snapshot copies on NFS mounts. If data loss or data corruption occurs, you can restore Unified Manager to the previous stable state with minimum loss of data. You can restore the Unified Manager Snapshot database to a local or remote Red Hat Enterprise Linux or CentOS system by using the Unified Manager maintenance console.

Make sure that the following requirements are met:

• Cluster requirements:

- ONTAP 9.4 or later must be installed.
- Clusters should be geographically close to the Unified Manager server.
- Clusters can be monitored by Unified Manager, but it is not required.

• Storage VM requirements:

- NFS services must be enabled.
- The name switch and name mapping must be set to use "files".
- NFSv4 must be enabled on the NFS server and NFSv4 id domain specified on the client and
- storage VM
- Local users are created to correspond with client-side users.
- Make sure All Read/Write access is selected.

- Make sure that Superuser Access is set to “any” in the export policy

- **Volume requirements:**

- The volume should be at least double the size of the Unified Manager /opt/netapp/data directory.
- Use the command `du -sh /opt/netapp/data/` to check the current size.
- Set the security style to UNIX.
- Disable the local Snapshot copy policy.
- Enable volume autosize.
- Set the performance service level to a policy with high IOPS and low latency, such as “Extreme.”

Backup and restore using Snapshot technology on Windows operating system

From the 9.9 release, Unified Manager supports backup and restore operations by using Snapshot copies on Windows OS with the help of LUN using iSCSI protocol. You should configure your Unified Manager system installed on Windows OS to perform backup and restore operations using Snapshot copies. By default, the backup method is MySQL-based; therefore, you should first configure the Unified Manager backup to the Snapshot copy using the maintenance console.

Note: You should have a dedicated volume and a LUN for the backup configuration. The selected volume should include only one LUN. The size of the LUN should be at least twice the data size expected to be handled by the 9.9 release of Unified Manager.

Make sure to perform the following configurations:

1. Configure an iSCSI enabled storage VM or use an existing storage VM that has the same configuration.
2. Configure a network route for the configured storage VM.
3. Configure a volume of appropriate capacity and a single LUN inside ensuring that the volume is dedicated only for this LUN.
4. Configure an initiator group (igroup) in the storage VM.
5. Configure a port set.
6. Integrate the igroup with the port set.
7. Map the LUN to the igroup.

WFA pairing guidelines

You can pair a Workflow Automation instance with a Unified Manager instance as the data source for active management of your protection relationships. By design, the Workflow Automation and Unified Manager instances must be monitoring source and destination clusters involved in protection relationships for active management.

Figure 910) WFA pairing with Unified Manager.



WFA pairing best practice

As per the best practices detailed under Section 3.3, Unified Manager must be split into two when the instance has more than 72 ONTAP nodes to monitor. This would ideally mean that the Workflow Automation instance now needs to monitor two or more Unified Manager instances as data sources.

In any scenario, Lenovo recommends pairing each Workflow Automation instance with Unified Manager so that each WFA instance has access to source and destination clusters in the protection relationship. In addition, each Unified Manager instance acts as a data source.

WFA needs access to source and destination clusters; active management is required on both sides.

Deployment guidelines

Enterprises usually deploy multiple management servers to manage and monitor their data centers. With Unified Manager, you only need one system to manage, provision, monitor, automate, alert, and report on the health and performance metrics of your Lenovo systems. If your goal is to monitor all ONTAP resources in every data center with a single Unified Manager instance, you should consider a dedicated management network between sites to make sure that polling updates can be completed without delay. This approach might require consultation with your network experts.

Where to find additional information

To learn more about the information that is described in this document, review the following website:

- **Think System Storage DM Series > Unified Manager**

Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to

<https://datacentersupport.lenovo.com/serviceprovider> and use filter searching for different countries. For Lenovo support telephone numbers, see <https://datacentersupport.lenovo.com/supportphonenumberlist> for your region support details.

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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.

Trademarks

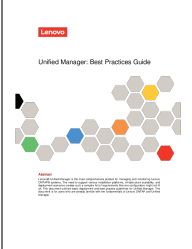
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Documents / Resources

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References

- [Find Lenovo Service Center | Authorized Service Providers- Lenovo Support US](#)
- [SupportPhoneList - Lenovo Support US](#)
- [User Manual](#)