



Install Unified Manager on Windows systems

Active IQ Unified Manager

NetApp

January 31, 2022

This PDF was generated from https://docs.netapp.com/us-en/active-iq-unified-manager/install-windows/concept_what_unified_manager_server_does.html on January 31, 2022. Always check docs.netapp.com for the latest.

Table of Contents

- Install Unified Manager on Windows systems 1
 - Introduction to Active IQ Unified Manager 1
 - Requirements for installing Unified Manager 2
 - Installing, upgrading, and removing Unified Manager software 10

Install Unified Manager on Windows systems

Introduction to Active IQ Unified Manager

Active IQ Unified Manager (formerly OnCommand Unified Manager) enables you to monitor and manage the health and performance of your ONTAP storage systems from a single interface. You can deploy Unified Manager on a Linux server, on a Windows server, or as a virtual appliance on a VMware host.

After you have completed the installation and have added the clusters that you want to manage, Unified Manager provides a graphical interface that displays the capacity, availability, protection, and performance status of the monitored storage systems.

Related information

[NetApp Interoperability Matrix Tool](#)

What the Unified Manager server does

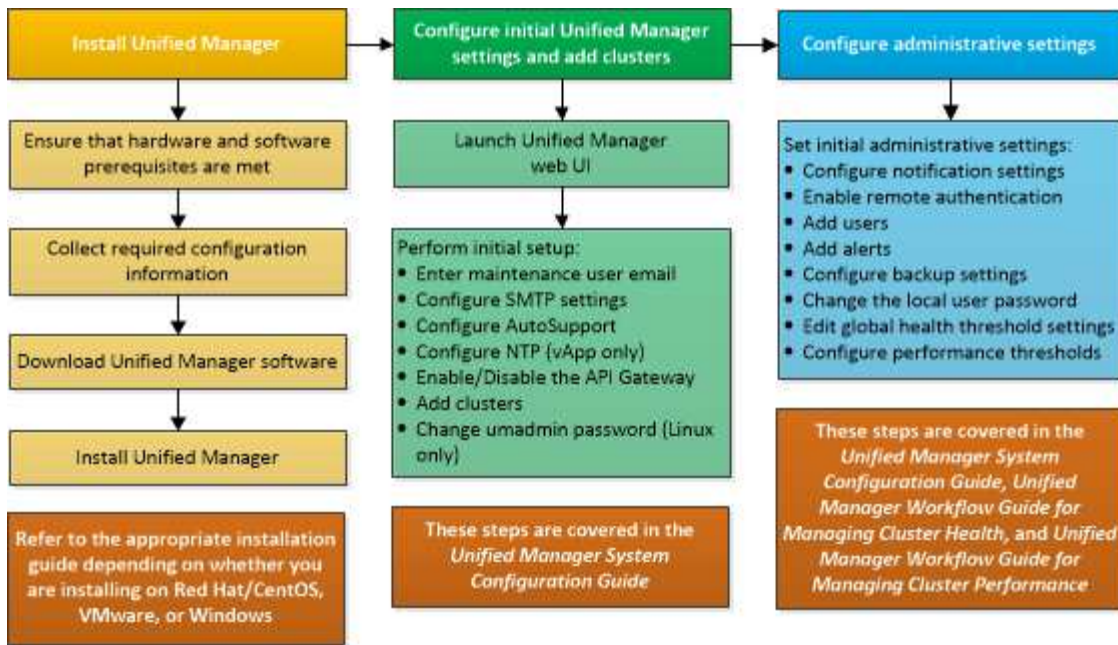
The Unified Manager server infrastructure consists of a data collection unit, a database, and an application server. It provides infrastructure services such as discovery, monitoring, role-based access control (RBAC), auditing, and logging.

Unified Manager collects cluster information, stores the data in the database, and analyzes the data to see if there are any cluster issues.

Overview of the installation sequence

The installation workflow describes the tasks that you must perform before you can use Unified Manager.

The chapters of this installation guide describe each of the items shown in the workflow below.



Requirements for installing Unified Manager

Before you begin the installation process, ensure that the server on which you want to install Unified Manager meets the specific software, hardware, CPU, and memory requirements.

NetApp does not support any modification of the Unified Manager application code. If you need to apply any security measures to the Unified Manager server, you should make those changes to the operating system on which Unified Manager is installed.

For more details about applying security measures to the Unified Manager server, see the Knowledge Base article.

[Supportability for Security Measures applied to Active IQ Unified Manager for Clustered Data ONTAP](#)

Related information

[NetApp Interoperability Matrix Tool](#)

Virtual infrastructure and hardware system requirements

Installing Unified Manager on virtual infrastructure or a physical system should meet the minimum requirements for memory, CPU, and disk space.

The following table displays the values that are recommended for memory, CPU, and disk space resources. These values have been qualified so that Unified Manager meets acceptable performance levels.

Hardware configuration	Recommended settings
RAM	12 GB (minimum requirement 8 GB)
Processors	4 CPUs

Hardware configuration	Recommended settings
CPU cycle capacity	9572 MHz total (minimum requirement 9572 MHz)
Free disk space	150 GB, where the capacity is allocated as follows: <ul style="list-style-type: none"> • 100 GB of disk space for the installation directory • 50 GB of disk space for the MySQL data directory

Unified Manager can be installed on systems with a small amount of memory, but the recommended 12 GB of RAM ensures that enough memory is available for optimal performance, and so that the system can accommodate additional clusters and storage objects as your configuration grows. You should not set any memory limits on the VM where Unified Manager is deployed, and should not enable any features (for example, ballooning) that hinder the software from utilizing the allocated memory on the system.

Additionally, there is a limit to the number of nodes that a single instance of Unified Manager can monitor before you install a second instance of Unified Manager. For more information, see the *Best Practices Guide*.

[Technical Report 4621: Unified Manager Best Practices Guide](#)

Memory-page swapping negatively impacts the performance of the system and the management application. Competing for CPU resources that are unavailable because of overall host utilization can degrade performance.

Requirement for dedicated use

The physical or virtual system on which you install Unified Manager should be used exclusively for Unified Manager and should not be shared with other applications. Other applications might consume system resources and can drastically reduce the performance of Unified Manager.

Space requirements for backups

If you plan to use the Unified Manager backup and restore feature, allocate additional capacity so that the “data” directory or disk has 150 GB of space. A backup can be written to a local destination or to a remote destination. The best practice is to identify a remote location that is external to the Unified Manager host system that has a minimum of 150 GB of space.

Requirements for host connectivity

The physical system or virtual system on which you install Unified Manager should be configured in such a way that you can successfully ping the host name from the host itself. In case of IPv6 configuration, you should verify that ping6 to the host name is successful to ensure that the Unified Manager installation succeeds.

You can use the host name (or the host IP address) to access the product web UI. If you configured a static IP address for your network during deployment, then you designated a name for the network host. If you configured the network using DHCP, you should obtain the host name from the DNS.

If you plan to allow users to access Unified Manager by using the short name instead of using the fully qualified domain name (FQDN) or IP address, then your network configuration has to resolve this short name to a valid FQDN.

Windows software and installation requirements

For the successful installation of Unified Manager on Windows, you should ensure that the system on which Unified Manager is being installed meets the software requirements.

Operating system software

You can install Unified Manager on the following Windows editions: * Microsoft Windows Server 2016 Standard and Datacenter Edition * Microsoft Windows Server 2019 Standard and Datacenter Edition

Unified Manager is supported on 64 bits Windows operating system for the following languages:

- English
- Japanese
- Simplified Chinese

See the Interoperability Matrix for the complete and most current list of supported Windows versions.

mysupport.netapp.com/matrix

The server should be dedicated to running Unified Manager. No other applications should be installed on the server.

Third-party software

The following third-party packages are bundled with Unified Manager. If these third-party packages are not installed on your system, Unified Manager installs them as a part of the installation.

- Microsoft Visual C++ 2015 Redistributable package version 14.26.28720.3
- Microsoft Visual C++ Redistributable Packages for Visual Studio 2013 version 12.0.40660.0
- MySQL Community Edition version 8.0.27
- Python 3.9.x
- OpenJDK version 11.0.12
- p7zip version 18.05 or later



Starting with Unified Manager 9.5, OpenJDK is provided in the Unified Manager installation package and installed automatically. Oracle Java is not supported starting with Unified Manager 9.5.

If MySQL is pre-installed, you should ensure that:

- It is using the default port.
- The sample databases are not installed.
- The service name is "MYSQL8".

Unified Manager is deployed on a WildFly web server. WildFly 19.0.0 is bundled and configured with Unified Manager.



You should shut down a running instance of Unified Manager before upgrading any third-party software. After the third-party software installation is complete, you can restart Unified Manager.

Installation requirements

- Microsoft .NET 4.5.2, or greater, should be installed.
- The `temp` directory should be configured with 2 GB of disk space for extracting the installation files. To verify whether the directory is created, run the following command on the command-line interface: `echo %temp%`
- You should reserve 2 GB of disk space in the Windows drive for caching the Unified Manager MSI files.
- The Microsoft Windows Server on which you want to install Unified Manager should be configured with a fully qualified domain name (FQDN) such that `ping` responses to the host name and FQDN are successful.
- You should disable Microsoft IIS worldwide web publishing service and ensure that ports 80 and 443 are free.
- You should make sure that the Remote Desktop Session Host setting for “Windows Installer RDS Compatibility” is disabled during the installation.
- UDP port 514 should be free, and should not be used by any other service.

The Unified Manager installation program configures the following exclusions in Windows Defender:



- Unified Manager data directory
- Unified Manager installation directory
- MySQL data directory

If your server has a different antivirus scanner installed, you should configure these exclusions manually.

Supported browsers

To access the Unified Manager web UI, use a supported browser.

The Interoperability Matrix has the list of supported browser versions.

mysupport.netapp.com/matrix

For all browsers, disabling pop-up blockers ensures that software features are displayed properly.

If you plan to configure Unified Manager for SAML authentication, so that an identity provider (IdP) can authenticate users, you should check the list of browsers supported by the IdP as well.

Protocol and port requirements

The required ports and protocols enable communication between the Unified Manager server and the managed storage systems, servers, and other components.

Connections to the Unified Manager server

In typical installations you do not have to specify port numbers when connecting to the Unified Manager web UI, because default ports are always used. For example, because Unified Manager always attempts to run on its default port, you can enter `https://<host>` instead of `https://<host>:443`.

The Unified Manager server uses specific protocols to access the following interfaces:

Interface	Protocol	Port	Description
Unified Manager web UI	HTTP	80	Used to access the Unified Manager web UI; automatically redirects to the secure port 443.
Unified Manager web UI and programs using APIs	HTTPS	443	Used to securely access the Unified Manager web UI or to make API calls; API calls can only be made using HTTPS.
Maintenance console	SSH/SFTP	22	Used to access the maintenance console and retrieve support bundles.
Linux command line	SSH/SFTP	22	Used to access the Red Hat Enterprise Linux or CentOS command line and retrieve support bundles.
Syslog	UDP	514	Used to access subscription-based EMS messages from ONTAP systems and to create events based on the messages.
REST	HTTPS	9443	Used to access realtime REST API-based EMS events from authenticated ONTAP systems.
MySQL database	MySQL	3306	Used to enable OnCommand Workflow Automation and OnCommand API Services access to Unified Manager.



The ports used for HTTP and HTTPS communication (ports 80 and 443) can be changed using the Unified Manager maintenance console. For more information, see the *Active IQ Unified Manager System Configuration Guide*.

Active IQ Unified Manager System Configuration Guide

Connections from the Unified Manager server

You should configure your firewall to open ports that enable communication between the Unified Manager server and managed storage systems, servers, and other components. If a port is not open, communication fails.

Depending on your environment, you can choose to modify the ports and protocols used by the Unified Manager server to connect to specific destinations.

The Unified Manager server connects using the following protocols and ports to the managed storage systems, servers, and other components:

Destination	Protocol	Port	Description
Storage system	HTTPS	443/TCP	Used to monitor and manage storage systems.
Storage system	NDMP	10000/TCP	Used for certain Snapshot restore operations.
AutoSupport server	HTTPS	443	Used to send AutoSupport information. Requires Internet access to perform this function.
Authentication server	LDAP	389	Used to make authentication requests, and user and group lookup requests.
	LDAPS	636	Used for secure LDAP communication.
Mail server	SMTP	25	Used to send alert notification emails.
SNMP trap sender	SNMPv1 or SNMPv3	162/UDP	Used to send alert notification SNMP traps.
External data provider server	TCP	2003	Used to send performance data to an external data provider, such as Graphite.

Destination	Protocol	Port	Description
NTP server	NTP	123/UDP	Used to synchronize the time on the Unified Manager server with an external NTP time server. (VMware systems only)

Completing the worksheet

Before you install and configure Unified Manager, you should have specific information about your environment readily available. You can record the information in the worksheet.

Unified Manager installation information

The details required to install Unified Manager.

System on which software is deployed	Your value
Host fully qualified domain name	
Host IP address	
Network mask	
Gateway IP address	
Primary DNS address	
Secondary DNS address	
Search domains	
Maintenance user name	
Maintenance user password	

Unified Manager configuration information


The details to configure Unified Manager after installation. Some values are optional depending on your configuration.

Setting	Your value
Maintenance user email address	

Setting	Your value
SMTP server host name or IP address	
SMTP user name	
SMTP password	
SMTP port	25 (Default value)
Email from which alert notifications are sent	
Authentication server host name or IP address	
Active Directory administrator name or LDAP bind distinguished name	
Active Directory password or LDAP bind password	
Authentication server base distinguished name	
Identity provider (IdP) URL	
Identity provider (IdP) metadata	
SNMP trap destination host IP addresses	
SNMP port	

Cluster information

The details for the storage systems that you manage using Unified Manager.

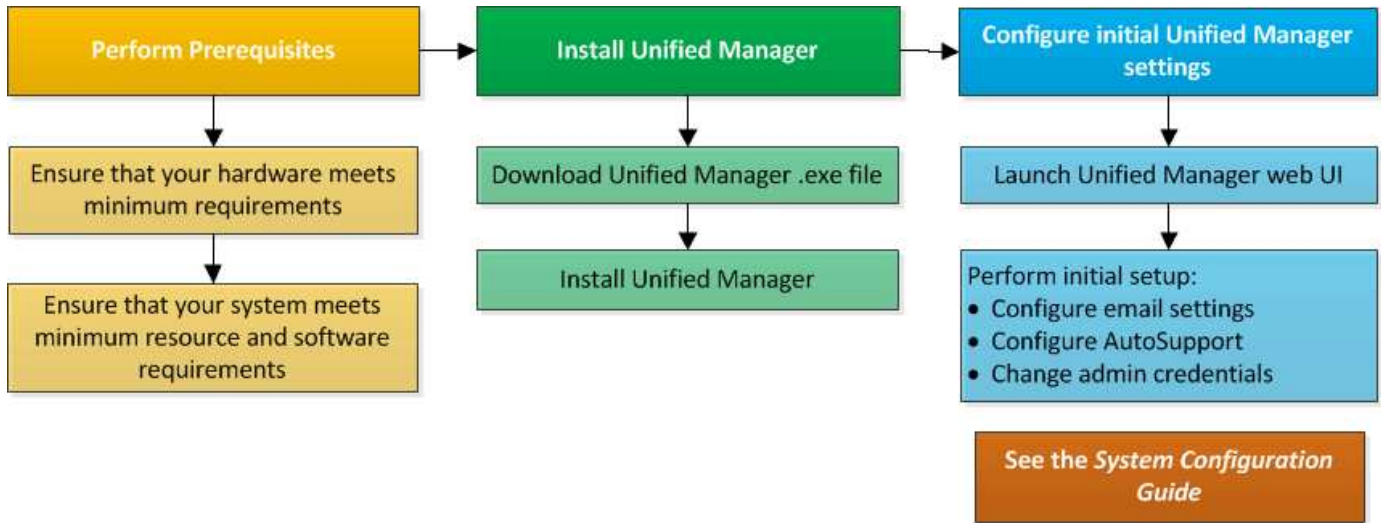
Cluster 1 of N	Your value
Host name or cluster-management IP address	
<div>  <p>The administrator must have been assigned the “admin” role.</p> </div> ONTAP administrator user name	
ONTAP administrator password	
Protocol	HTTPS

Installing, upgrading, and removing Unified Manager software

You can install Unified Manager software, upgrade to a newer version of software, or remove the Unified Manager application.

Overview of the installation process

The installation workflow describes the tasks that you must perform before you can use Unified Manager.



Installing Unified Manager on Windows

It is important that you understand the sequence of steps to download and install Unified Manager on Windows.

Installing Unified Manager

You can install Unified Manager to monitor and troubleshoot data storage capacity, availability, performance, and protection issues.

What you'll need

- The system on which you plan to install Unified Manager should meet the system and software requirements.

[Hardware system requirements](#)

[Windows software and installation requirements](#)



Starting with Unified Manager 9.5, OpenJDK is provided in the installation package and installed automatically. Oracle Java is not supported starting with Unified Manager 9.5.

- You should have Windows administrator privileges. Ensure that your user name does not begin with an exclamation mark "!". Installation of Unified Manager might fail if the user name of user running the

installation begins with “!”.

- You should have a supported web browser.
- The Unified Manager maintenance user password should be between 8 and 20 characters, should contain upper-case letters or lower-case letters, numerals, and special characters.
- The following special characters are not allowed in the password string for the maintenance user or for the MySQL root user: " ' ` % , = & < > | ^ \ / () [] ; :

The following special characters are allowed: ~ ! @ # \$ % ^ & * - ? . + { }

Steps

1. Log in to Windows using the default local administrator account.
2. Log in to the NetApp Support Site, and navigate to the Download page for Unified Manager:

[NetApp Support Site](#)

3. Select the required version of Unified Manager and accept the end-users license agreement (EULA).
4. Download the Unified Manager Windows installation file to a target directory on the Windows system.
5. Navigate to the directory where the installation file is located.
6. Right-click and run the Unified Manager installer executable (.exe) file as an administrator.

Unified Manager detects missing or pre-installed third-party packages and lists them. If the required third-party packages are not installed in the system, Unified Manager installs them as part of the installation.

7. Click **Next**.
8. Enter the user name and password to create the maintenance user.
9. In the Database Connection wizard, enter the MySQL root password.
10. Click **Change** to specify a new location for the Unified Manager installation directory and MySQL data directory.

If you do not change the installation directory, Unified Manager is installed in the default installation directory.

11. Click **Next**.
12. In the Ready to Install Shield wizard, click **Install**.
13. After the installation is complete, click **Finish**.

The installation creates multiple directories:

- Installation directory

This is the root directory for Unified Manager, which you specified during installation. Example:
C:\Program Files\NetApp\

- MySQL data directory

This is the directory where the MySQL databases are stored, which you specified during installation.
Example: C:\ProgramData\MySQL\MySQLServerData\

- Java directory

This is the directory where OpenJDK is installed. Example: C:\Program Files\NetApp\JDK\

- Unified Manager application data directory (appDataDir)

This is the directory where all the application-generated data is stored. This includes logs, support bundles, backup, and all other additional data. Example: C:\ProgramData\NetApp\OnCommandAppData\

You can access the web UI to perform the initial setup of Unified Manager, as described in the [Active IQ Unified Manager System Configuration Guide](#).

Performing an unattended installation of Unified Manager

You can install Unified Manager without user intervention by using the command-line interface. You can complete the unattended installation by passing the parameters in key-value pairs.

Steps

1. Log in to the Windows command-line interface by using the default local administrator account.
2. Navigate to the location where you want to install Unified Manager, and choose one of the following options:

Option	Instructions
If third-party packages are pre-installed	<pre>ActiveIQUnifiedManager-x.y.exe /V"MYSQL_PASSWORD=mysql_password INSTALLDIR="Installation directory\" MYSQL_DATA_DIR="MySQL data directory\" MAINTENANCE_PASSWORD=maintenance_passw ord MAINTENANCE_USERNAME=maintenance_usern ame /qn /l*v CompletePathForLogFile"</pre> <p>Example:</p> <pre>ActiveIQUnifiedManager.exe /s /v"MYSQL_PASSWORD=netapp21! INSTALLDIR="C:\Program Files\NetApp\" MYSQL_DATA_DIR="C:\ProgramData\MySQL\ MySQLServer\" MAINTENANCE_PASSWORD=* MAINTENANCE_USERNAME=admin /qn /l*v C:\install.log"</pre>

Option	Instructions
If third-party packages are not installed	<pre>ActiveIQUnifiedManager-x.y.exe /V"MYSQL_PASSWORD=mysql_password INSTALLDIR="Installation directory\" MYSQL_DATA_DIR="MySQL data directory\" MAINTENANCE_PASSWORD=maintenance_passw ord MAINTENANCE_USERNAME=maintenance_usern ame /qr /l*v CompletePathForLogFile"</pre> <p>Example:</p> <pre>ActiveIQUnifiedManager.exe /s /v"MYSQL_PASSWORD=netapp21! INSTALLDIR="C:\Program Files\NetApp\" MYSQL_DATA_DIR="C:\ProgramData\MySQL\ MySQLServer\" MAINTENANCE_PASSWORD=* MAINTENANCE_USERNAME=admin /qr /l*v C:\install.log"</pre>

The `/qr` option enables quiet mode with a reduced user interface. A basic user interface is displayed, which shows the installation progress. You are not prompted for inputs. If third-party packages such as JRE, MySQL, and 7zip are not pre-installed, you should use the `/qr` option. Installation fails if the `/qn` option is used on a server where third-party packages are not installed.

The `/qn` option enables quiet mode with no user interface. No user interface or details are displayed during installation. You should not use the `/qn` option when third-party packages are not installed.

- Log in to the Unified Manager web user interface by using the following URL:

`https://IP address`

Changing the JBoss password

You can reset the instance-specific JBoss password that is set during installation. You can reset the password optionally, in case your site requires this security capability to override the Unified Manager installation setting. This operation also changes the password JBoss uses to access MySQL.

What you'll need

- You should have Windows admin privileges for the system on which Unified Manager is installed.
- You should have the password for the MySQL root user.
- You should be able to access the NetApp-provided `password.bat` script in the directory

`\Program Files\NetApp\essentials\bin.`

Steps

1. Log in as the admin user on the Unified Manager host machine.
2. Use the Windows Services console to stop the following Unified Manager services:
 - NetApp Active IQ Acquisition Service (Ocie-au)
 - NetApp Active IQ Management Server Service (Oncommandsvc)
3. Launch the `password.bat` script to begin the password change process:

```
C:\Program Files\NetApp\essentials\bin> password.bat resetJBossPassword
```

4. When prompted, enter the MySQL root user password.
5. When prompted, enter the new JBoss user password, and then enter it again for confirmation.

Note that the password should be between 8 and 16 characters, and must contain at least a digit, an upper case and lower case characters, and at least one of these special characters:

```
!@%^*-_+=[]:<>./~
```

6. When the script completes, start the Unified Manager services by using the Windows Services console:
 - NetApp Active IQ Management Server Service (Oncommandsvc)
 - NetApp Active IQ Acquisition Service (Ocie-au)
7. After all of the services are started, you can log in to the Unified Manager UI.

Upgrading Unified Manager

You can upgrade Unified Manager 9.8 or 9.9 to 9.10 by downloading and running the installation file on the Windows platform.

What you'll need

- The system on which you are upgrading Unified Manager should meet the system and software requirements.

[Hardware system requirements](#)

[Windows software and installation requirements](#)



Starting with Unified Manager 9.5, OpenJDK is provided in the installation package and installed automatically. Oracle Java is not supported starting with Unified Manager 9.5.



Ensure that Microsoft .NET 4.5.2 or greater is installed on your system before starting the upgrade.

- MySQL Community Edition is automatically upgraded during Unified Manager upgrade. If the installed version of MySQL on your system is earlier than 8.0.27, the Unified Manager upgrade process automatically upgrades MySQL to 8.0.27. You must not run a standalone upgrade of an earlier version of MySQL to 8.0.27.
- You should have Windows administrator privileges. Ensure that your user name does not begin with an exclamation mark "!". Installation of Unified Manager might fail if the user name of user running the installation begins with "!".

- You should have valid credentials to log in to the NetApp Support Site.
- To avoid data loss, you should have created a backup of the Unified Manager machine in case there is an issue during the upgrade.
- You should have adequate disk space available to perform the upgrade.

The available space on the installation drive should be 2.5 GB larger than the size of the data directory. The upgrade stops and displays an error message indicating the amount of space to be added if there is not enough free space.

- During upgrade, you may be prompted to confirm whether you want to keep the previous, default settings for retaining performance data for 13 months or to change it to 6 months. On confirming, the historical performance data after 6 months is purged.
- Before upgrading, you should close any open files or folder in *<InstallDir>\JDK* and *MySQL Data Directory*.

During the upgrade process, Unified Manager is unavailable. You should complete any running operations before upgrading Unified Manager.

If Unified Manager is paired with an instance of OnCommand Workflow Automation, and there are new versions of software available for both products, you must disconnect the two products and then set up a new Workflow Automation connection after performing the upgrades. If you are performing an upgrade to only one of the products, then you should log into Workflow Automation after the upgrade and verify that it is still acquiring data from Unified Manager.

Steps

1. Log in to the NetApp Support Site, and navigate to the Download page for Unified Manager:

[NetApp Support Site](#)

2. Select the required version of Unified Manager and accept the end-users license agreement (EULA).
3. Download the Unified Manager Windows installation file to a target directory on the Windows system.
4. Right-click and run the Unified Manager installer executable (.exe) file as an administrator.

Unified Manager prompts you with the following message:

```
This setup will perform an upgrade of Unified Manager. Do you want to
continue?
```

5. Click **Yes**, and then click **Next**.
6. Enter the MySQL8 root password that was set during installation, and then click **Next**.
7. Log in to the Unified Manager web UI, and verify the version number.



To perform a silent upgrade of Unified Manager, run the following command:

```
ActiveIQUnifiedManager-<version>.exe /s /v"MYSQL_PASSWORD=<password>
/qn /l*v <system_drive>:\install.log"
```

Upgrading third-party products

You can upgrade third-party products, such as JRE, on Unified Manager when installed

on Windows systems.

The companies that develop these third-party products report security vulnerabilities on a regular basis. You can upgrade to newer versions of this software at your own schedule.

Upgrading OpenJDK

You can upgrade to a newer version of OpenJDK on the Windows server on which Unified Manager is installed to obtain fixes for security vulnerabilities.

What you'll need

You must have Windows admin privileges for the system on which Unified Manager is installed.

You can update OpenJDK releases within release families. For example, you can upgrade from OpenJDK 11.0.9 to OpenJDK 11.0.12, but you cannot update directly from OpenJDK 11 to OpenJDK 12.

Steps

1. Log in as the admin user on the Unified Manager host machine.
2. Download the appropriate version of OpenJDK (64-bit) from the OpenJDK site to the target system.

For example, download `openjdk-11_windows-x64_bin.zip` from <http://jdk.java.net/11/>.

3. Use the Windows Services console to stop the following Unified Manager services:
 - NetApp Active IQ Acquisition Service (Ocie-au)
 - NetApp Active IQ Management Server Service (Oncommandsvc)
4. Expand the `zip` file.
5. Copy the directories and files from the resulting `jdk` directory (for example, `jdk-11.0.12` to the location where Java is installed. Example: `C:\Program Files\NetApp\JDK\`
6. Start the Unified Manager services by using the Windows Services console:
 - NetApp Active IQ Management Server Service (Oncommandsvc)
 - NetApp Active IQ Acquisition Service (Ocie-au)

Restarting Unified Manager

You might have to restart Unified Manager after making configuration changes.

What you'll need

You must have Windows administrator privileges.

Steps

1. Log in to Windows using the default local administrator account.
2. Stop the Unified Manager services:

From the...	Stop the services in following order...
Command line	a. <code>sc stop ocie-au</code> b. <code>sc stop Oncommandsvc</code>
Microsoft Service Manager	a. NetApp Active IQ Acquisition Service (Ocie-au) b. NetApp Active IQ Management Server Service (Oncommandsvc)

3. Start the Unified Manager services:

From the...	Start the services in following order...
Command line	a. <code>sc start Oncommandsvc</code> b. <code>sc start ocie-au</code>
Microsoft Service Manager	a. NetApp Active IQ Management Server Service (Oncommandsvc) b. NetApp Active IQ Acquisition Service (Ocie-au)

Uninstalling Unified Manager

You can uninstall Unified Manager by using the Programs and Features wizard, or by performing an unattended uninstallation from the command-line interface.

What you'll need

- You must have Windows administrator privileges.
- All clusters (data sources) must be removed from the Unified Manager server before uninstalling the software.

Steps

1. Uninstall Unified Manager by choosing one of the following options:

To uninstall Unified Manager from the...	Then...
Programs and Features wizard :	:
a. Navigate to Control Panel > Program and Features . b. Select Active IQ Unified Manager, and click Uninstall .	Command line

If User Account Control (UAC) is enabled on the server, and you are logged in as a domain user, you must use the command-line uninstallation method.

Unified Manager is uninstalled from your system.

2. Uninstall the following third-party packages and data that are not removed during the Unified Manager uninstallation:
 - Third-party packages: JRE, MySQL, Microsoft Visual C++ 2015 Redistributable, and 7zip
 - MySQL application data generated by Unified Manager
 - Application logs and contents of application data directory

Copyright Information

Copyright © 2022 NetApp, Inc. All rights reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means-graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system- without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP "AS IS" AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7103 (October 1988) and FAR 52-227-19 (June 1987).

Trademark Information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.