



# **Mediator service for MetroCluster and SnapMirror Business Continuity**

## **ONTAP 9**

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# Mediator service for MetroCluster and SnapMirror Business Continuity

## ONTAP Mediator overview

The ONTAP Mediator provides several functions for ONTAP features:

- Provides a persistent and fenced store for HA metadata.
- Serves as a ping proxy for controller liveliness.
- Provides synchronous node health query functionality to aid in quorum determination.

The ONTAP Mediator provides two additional systemctl services:

- **ontap\_mediator.service**

Maintains the REST APIs server for managing the ONAP relationships.

- **mediator-scst.service**

Controls the startup and shutdown of the iSCSI module (SCST).

## Tools provided for the system administrator

Tools provided for the system administrator:

- **/usr/local/bin/mediator\_change\_password**

Sets a new API password when the current API username and password are provided.

- **/usr/local/bin/mediator\_change\_user**

Sets a new API username when the current API username and password are provided.

- **/usr/local/bin/mediator\_generate\_support\_bundle**

Generates a local tgz file containing all useful support information needed for communication with NetApp customer support. This includes application configuration, logs, and some system information. The bundles are generated on the local disk and can be transferred manually, as needed. Storage location:  
`/opt/netapp/data/support_bundles/`

- **/usr/local/bin/uninstall\_ontap\_mediator**

Removes the ONTAP Mediator package and the SCST kernel module. This includes all configuration, logs, and mailbox data.

- **/usr/local/bin/mediator\_unlock\_user**

Releases a lock-out on the API user account if the authentication retry limit was reached. This feature is used to prevent brute force password derivation. It prompts the user for the correct username and password.

- `/usr/local/bin/mediator_add_user`

(Support only) Used to add the API user upon installation.

## Special Notes

ONTAP Mediator relies on SCST to provide iSCSI (See <http://scst.sourceforge.net/index.html>). This package is a kernel module that is compiled during installation specifically for the kernel. Any updates to the kernel might require SCST to be re-installed. Alternatively, uninstall then re-install the ONTAP Mediator, then reconfigure the ONTAP relationship.



Any updates to the server OS kernel should be coordinated with a maintenance window in ONTAP.

## What's new with the ONTAP Mediator

New enhancements to the ONTAP Mediator are provided with each release. Here's what's new.

### Enhancements

| ONTAP Mediator version | Enhancements  |
|------------------------|---|
| 1.6                    | <ul style="list-style-type: none"> <li>• Python 3.9 updates.</li> <li>• Support for RHEL 8.4-8.7, 9.0-9.1, Rocky Linux 8 and 9.</li> <li>• Discontinued support for RHEL 7.x / CentOS all releases.</li> </ul>                        |
| 1.5                    | <ul style="list-style-type: none"> <li>• Optimizes speed for larger scale SMB systems.</li> <li>• Cryptographic code-signature added to the installer.</li> <li>• Includes deprecation warnings for RHEL 7.x / CentOS 7.x.</li> </ul> |
| 1.4                    | <ul style="list-style-type: none"> <li>• Support for RHEL 8.4 and 8.5.</li> <li>• Includes SCST version 3.6.0.</li> <li>• Added support for UEFI-based firmware's Secure Boot (SB).</li> </ul>  |
| 1.3                    | <ul style="list-style-type: none"> <li>• Support for RHEL/CentOS 8.2 and 8.3.</li> <li>• Includes SCST version 3.5.0.</li> </ul>  |
| 1.2                    | <ul style="list-style-type: none"> <li>• Support for HTTPs mailboxes.</li> <li>• For use with ONTAP 9.8+ MCC-IP AUSO and SM-BC ZRTO.</li> <li>• Includes SCST version 3.4.0.</li> </ul>   |

|     |  |
|-----|--|
| 1.1 | <ul style="list-style-type: none"> <li>• Support for RHEL/CentOS 7.6, 7.7, 8.0, and 8.1.</li> <li>• Eliminates Perl dependencies.</li> <li>• Includes SCST version 3.4.0.</li> </ul> |
| 1.0 | <ul style="list-style-type: none"> <li>• Support for iSCSI mailboxes.</li> <li>• For use with ONTAP 9.7+ MCC-IP AUSO.</li> <li>• Support for RHEL/CentOS 7.6.</li> </ul>             |

## OS support matrix

| OS for ONTAP Mediator | 1.0             | 1.1 | 1.2     | 1.3 | 1.4 | 1.5 | 1.6      |
|-----------------------|-----------------|-----|---------|-----|-----|-----|----------|
| 7.6                   | Yes (RHEL only) | Yes | Yes     | Yes | Yes | Yes | Obsolete |
| 7.7                   | No              | No  | Yes     | Yes | Yes | Yes | Obsolete |
| 7.8                   | No              | No  | Yes     | Yes | Yes | Yes | Obsolete |
| 7.9                   | No              | No  | Implied | Yes | Yes | Yes | Obsolete |
| RHEL 8.0              | No              | Yes | Yes     | Yes | Yes | Yes | Obsolete |
| RHEL 8.1              | No              | No  | Yes     | Yes | Yes | Yes | Obsolete |
| RHEL 8.2              | No              | No  | No      | Yes | Yes | Yes | Obsolete |
| RHEL 8.3              | No              | No  | No      | Yes | Yes | Yes | Obsolete |
| RHEL 8.4              | No              | No  | No      | No  | Yes | Yes | Yes      |
| RHEL 8.5              | No              | No  | No      | No  | Yes | Yes | Yes      |
| RHEL 8.6              | No              | No  | No      | No  | No  | No  | Yes      |
| RHEL 8.7              | No              | No  | No      | No  | No  | No  | Yes      |
| RHEL 9.0              | No              | No  | No      | No  | No  | No  | Yes      |
| RHEL 9.1              | No              | No  | No      | No  | No  | No  | Yes      |
| CentOS 8 and stream   | N/A             | N/A | N/A     | No  | No  | No  | No       |

|               |     |     |     |     |     |     |     |
|---------------|-----|-----|-----|-----|-----|-----|-----|
| Rocky Linux 8 | N/A | N/A | N/A | N/A | N/A | N/A | Yes |
| Rocky Linux 9 | N/A | N/A | N/A | N/A | N/A | N/A | Yes |

- OS refers to both RedHat and CentOS releases unless otherwise specified.
- "Implied" means that the OS was released after the ONTAP Mediator was shipped, but support has been confirmed.
- "No" means that the OS and ONTAP Mediator are not compatible.
- Centos 8 was removed for all releases due to its rebranching. Centos Stream was deemed as not a suitable production target OS. No support is planned.
- ONTAP Mediator 1.5 was the last supported release for RHEL 7.x branch operating systems.
- ONTAP Mediator 1.6 adds support for Rocky Linux 8 and 9.

## Resolved issues

| Date of change | Change ID | Description   |
|----------------|-----------|---|
| 10 Jan 2023    | 6567145   | <p>The following changes were made:</p> <ul style="list-style-type: none"> <li>• Added support for additional operating systems for ONTAP Mediator: RHEL 9.6, 8.7, 9.0, and 9.1.</li> <li>• Added new SCST version 3.7.0 to unblock issues for newly supported operating systems.</li> <li>• Added support for Rocky Linux: Rocky 8 and 9.</li> </ul> |
| 24 Jan 2023    | 6621319   | Allowed pre-installed SCST library for ONTAP Mediator installations.  |
| 27 Feb 2023    | 6623764   | Implemented changes to always load the scst_disk kernel module when the mediator-scst service restarts. These changes ensure the service will always be ready to create new iSCSI targets using the standard logic.   |
| 28 Feb 2023    | 6625194   | Added a new option to the ONTAP Mediator installer: <code>--skip-yum-dependencies</code>  |
| 24 Mar 2023    | 6652840   | Updated the ONTAP Mediator installer so that it is able to reinstall or repair the SCST installation.   |
| 27 Mar 2023    | 6655179   | Fixed a parsing issue that occurred when the support bundle collection with a complex password was triggered.   |
| 28 Mar 2023    | 6656739   | Changed the SCST comparison logic so that it will install the right version when ONTAP Mediator is upgraded.  |

# Install or upgrade

## Prepare to install or upgrade the ONTAP Mediator service

To install the ONTAP Mediator service, you must ensure all prerequisites are met, get the installation package and run the installer on the host. This procedure is used for an installation or an upgrade of an existing installation.

- Beginning with ONTAP 9.7, you can use any version of ONTAP Mediator to monitor a MetroCluster IP configuration.
- Beginning with ONTAP 9.8, you can use any version of ONTAP Mediator to monitor an SM-BC relationship.

### Before you begin

You must meet the following prerequisites.

| ONTAP Mediator version | Supported Linux versions   |
|------------------------|--|
| 1.6                    | <ul style="list-style-type: none"><li>• Red Hat Enterprise Linux: 8.4, 8.5, 8.6, 8.7, 9.0, 9.1</li><li>• Rocky Linux 8 and 9</li></ul>                       |
| 1.5                    | <ul style="list-style-type: none"><li>• Red Hat Enterprise Linux: 7.6, 7.7, 7.8, 7.9, 8.1, 8.2, 8.3, 8.4, 8.5</li><li>• CentOS: 7.6, 7.7, 7.8, 7.9</li></ul> |
| 1.4                    | <ul style="list-style-type: none"><li>• Red Hat Enterprise Linux: 7.6, 7.7, 7.8, 7.9, 8.1, 8.2, 8.3, 8.4, 8.5</li><li>• CentOS: 7.6, 7.7, 7.8, 7.9</li></ul> |
| 1.3                    | <ul style="list-style-type: none"><li>• Red Hat Enterprise Linux: 7.6, 7.7, 7.8, 7.9, 8.1, 8.2, 8.3</li><li>• CentOS: 7.6, 7.7, 7.8, 7.9</li></ul>           |
| 1.2                    | <ul style="list-style-type: none"><li>• Red Hat Enterprise Linux: 7.6, 7.7, 7.8, 8.1</li><li>• CentOS: 7.6, 7.7, 7.8</li></ul>                               |



The kernel version must match the operating system version.

- 64-bit physical installation or virtual machine
- 8 GB RAM
- User: Root access

Any library packages except the kernel can safely be updated but might require a reboot to take affect within the ONTAP Mediator application. A service window is recommended when a reboot is required.

If you install the `yum-utils` package, you can use the `needs-restarting` command.

The kernel core can be updated if it is being updated to a version that is still supported by the ONTAP Mediator version matrix. A reboot will be mandatory, so a service window is required.

The SCST kernel module must be uninstalled prior to the reboot, then re-installed after the reboot.



Upgrading to a kernel beyond the supported OS release for the specific ONTAP Mediator release is not support. (This likely indicates that the tested SCST module won't compile).

**Upgrade the host operating system and then the ONTAP Mediator**

To upgrade the host OS for ONTAP Mediator to a later version, you must first uninstall ONTAP Mediator.

**Before you begin**

The best practices for installing Red Hat Enterprise Linux or CentOS and the associated repositories on your system are listed below. Systems installed or configured differently might require additional steps.

- You must install Red Hat Enterprise Linux or CentOS according to Red Hat best practices. Due to end-of-life support for CentOS 8.x versions, compatible versions of CentOS 8.x are not recommended.
- While installing the ONTAP Mediator service on Red Hat Enterprise Linux or CentOS, the system must have access to the appropriate repository so that the installation program can access and install all the required software dependencies.
- For the yum installer to find dependent software in the Red Hat Enterprise Linux repositories, you must have registered the system during the Red Hat Enterprise Linux installation or afterwards by using a valid Red Hat subscription.

See the Red Hat documentation for information about the Red Hat Subscription Manager.

- The following ports must be unused and available for the Mediator:
  - 31784
  - 3260
- If using a third-party firewall: refer to [Firewall requirements for ONTAP Mediator](#)
- If the Linux host is in a location without access to the internet, you must ensure that the required packages are available in a local repository.

If you are using Link Aggregation Control Protocol (LACP) in a Linux environment, you must correctly configure the kernel and make sure the `sysctl net.ipv4.conf.all.arp_ignore` is set to "2".

**What you'll need**

The following packages are required by the ONTAP Mediator service:

|                          |  |  |
|--------------------------|--|--|
| All RHEL/CentOS versions | Additional packages for RHEL 8.x / Rocky Linux 8 | Additional packages for RHEL 9.x / Rocky Linux 9 |
|--------------------------|--|--|



|  |   |  |
|--|---|--|
| <ul style="list-style-type: none"> <li>• openssl</li> <li>• openssl-devel</li> <li>• kernel-devel-\$(uname -r)</li> <li>• gcc</li> <li>• make</li> <li>• libselinux-utils</li> <li>• patch</li> <li>• bzip2</li> <li>• perl-Data-Dumper</li> <li>• perl-ExtUtils-MakeMaker</li> <li>• efibootmgr</li> <li>• mokutil</li> </ul> | <ul style="list-style-type: none"> <li>• python3-pip</li> <li>• elfutils-libelf-devel</li> <li>• policycoreutils-python-utils</li> <li>• redhat-lsb-core</li> <li>• python39</li> <li>• python39-devel</li> </ul> | <ul style="list-style-type: none"> <li>• python3-pip</li> <li>• elfutils-libelf-devel</li> <li>• policycoreutils-python-utils</li> <li>• python3</li> <li>• python3-devel</li> </ul> |
|--|---|--|

The Mediator installation package is a self-extracting compressed tar file that includes:

- An RPM file containing all dependencies that cannot be obtained from the supported release's repository.
- An install script.

A valid SSL certification is recommended.

### About this task

When you upgrade the host OS for ONTAP Mediator to a later major version (for example, from 7.x to 8.x) using the leapp-upgrade tool, you must uninstall ONTAP Mediator because the tool tries to detect new versions of any RPMs that are installed in the repositories that are registered with the system.

Because an .rpm file was installed as part of the ONTAP Mediator installer, it is included in that search. However, because that .rpm file was unpacked as part of the installer and not downloaded from a registered repository, an upgrade cannot be found. In this case, the leapp-upgrade tool uninstalls the package.

In order to preserve the log files, which will be used to triage support cases, you should back up the files prior to doing an OS upgrade and restore them after a reinstall of the ONTAP Mediator package. Because the ONTAP Mediator is being reinstalled, any ONTAP Clusters that are connected to it will need to be reconnected after the new installation.



The following steps should be performed in order. Immediately after you reinstall ONTAP Mediator, you should stop the `ontap_mediator` service, replace the log files, and restart the service. This will ensure logs will not be lost.

### Steps

1. Back up the log files.

```
[rootmediator-host ~]# tar -czf ontap_mediator_file_backup.tgz -C
/opt/netapp/lib/ontap_mediator ./log
./ontap_mediator/server_config/ontap_mediator.user_config.yaml
[rootmediator-host ~]# tar -tf ontap_mediator_file_backup.tgz
./log/
./log/ontap_mediator.log
./log/scstadmin.log
./log/ontap_mediator_stdout.log
./log/ontap_mediator_requests.log
./log/install_20230419134611.log
./log/scst.log
./log/ontap_mediator_syslog.log
./ontap_mediator/server_config/ontap_mediator.user_config.yaml
[rootmediator-host ~]#
```

## 2. Perform upgrade with leapp-upgrade tool.

```
[rootmediator-host ~]# leapp preupgrade --target 8.4
..<snip upgrade checks>..
..<fix issues found>..
[rootmediator-host ~]# leapp upgrade --target 8.4
..<snip upgrade>..
[rootmediator-host ~]# cat /etc/os-release | head -2
NAME="Red Hat Enterprise Linux"
VERSION="8.4 (Ootpa)"
[rootmediator-host ~]#
```

## 3. Reinstall ONTAP Mediator.



Perform the rest of the steps immediately after reinstalling ONTAP Mediator to prevent a loss of log files.

```
[rootmediator-host ~]# ontap-mediator-1.6.0/ontap-mediator-1.6.0

ONTAP Mediator: Self Extracting Installer

..<snip installation>..
[rootmediator-host ~]#
```

## 4. Stop the ontap\_mediator service.

```
[rootmediator-host ~]# systemctl stop ontap_mediator  
[rootmediator-host ~]#
```

5. Replace the log files.

```
[rootmediator-host ~]# tar -xf ontap_mediator_log_backup.tgz -C  
/opt/netapp/lib/ontap_mediator  
[rootmediator-host ~]#
```

6. Start the ontap\_mediator service.

```
[rootmediator-host ~]# systemctl start ontap_mediator  
[rootmediator-host ~]#
```

7. Reconnect all ONTAP clusters to the upgraded ONTAP Mediator

## Procedure for MetroCluster over IP

```
siteA::> metrocluster configuration-settings mediator show
```

| Mediator IP   | Port  | Node        | Configuration | Status | Status |
|---------------|-------|-------------|---------------|--------|--------|
| 172.31.40.122 | 31784 | siteA-node2 | true          | false  | false  |
|               |       | siteA-nodel | true          | false  | false  |
|               |       | siteB-node2 | true          | false  | false  |
|               |       | siteB-node2 | true          | false  | false  |

```
siteA::> metrocluster configuration-settings mediator remove
Removing the mediator and disabling Automatic Unplanned Switchover.
It may take a few minutes to complete.
Please enter the username for the mediator: mediatoradmin
Please enter the password for the mediator:
Confirm the mediator password:
Automatic Unplanned Switchover is disabled for all nodes...
Removing mediator mailboxes...
Successfully removed the mediator.

siteA::> metrocluster configuration-settings mediator add -mediator
-address 172.31.40.122
Adding the mediator and enabling Automatic Unplanned Switchover. It
may take a few minutes to complete.
Please enter the username for the mediator: mediatoradmin
Please enter the password for the mediator:
Confirm the mediator password:
Successfully added the mediator.

siteA::> metrocluster configuration-settings mediator show
```

| Mediator IP   | Port  | Node        | Configuration | Status | Status |
|---------------|-------|-------------|---------------|--------|--------|
| 172.31.40.122 | 31784 | siteA-node2 | true          | true   | true   |
|               |       | siteA-nodel | true          | true   | true   |
|               |       | siteB-node2 | true          | true   | true   |
|               |       | siteB-node2 | true          | true   | true   |

```
siteA::>
```

## Procedure for SnapMirror Business Continuity

For SnapMirror Business Continuity, if you installed your TLS certificate outside of the /opt/netapp directory, then you will not need to reinstall it. If you were using the default generated self-signed certificate or put your custom certificate in the /opt/netapp directory, then you should back it up and restore it.

```
peer1::> snapmirror mediator show
Mediator Address Peer Cluster      Connection Status Quorum Status
-----
172.31.49.237    peer2                unreachable      true

peer1::> snapmirror mediator remove -mediator-address 172.31.49.237
-peer-cluster peer2

Info: [Job 39] 'mediator remove' job queued

peer1::> job show -id 39

Job ID Name                      Owing
Vserver      Node                      State
-----
39    mediator remove    peer1    peer1-node1    Success
Description: Removing entry in mediator

peer1::> security certificate show -common-name ONTAPMediatorCA
Vserver      Serial Number  Certificate Name
Type
-----
peer1
4A790360081F41145E14C5D7CE721DC6C210007F
ONTAPMediatorCA
server-ca
Certificate Authority: ONTAP Mediator CA
Expiration Date: Mon Apr 17 10:27:54 2013

peer1::> security certificate delete -common-name ONTAPMediatorCA *
1 entry was deleted.

peer1::> security certificate install -type server-ca -vserver
peer1

Please enter Certificate: Press <Enter> when done
..<snip ONTAP Mediator CA public key>..

You should keep a copy of the CA-signed digital certificate for
future reference.
```

The installed certificate's CA and serial number for reference:

CA: ONTAP Mediator CA

serial: 44786524464C5113D5EC966779D3002135EA4254

The certificate's generated name for reference: ONTAPMediatorCA

```
peer2::> security certificate delete -common-name ONTAPMediatorCA *  
1 entry was deleted.
```

```
peer2::> security certificate install -type server-ca -vserver peer2
```

```
  Please enter Certificate: Press <Enter> when done  
  ..<snip ONTAP Mediator CA public key>..
```

You should keep a copy of the CA-signed digital certificate for future reference.

The installed certificate's CA and serial number for reference:

CA: ONTAP Mediator CA

serial: 44786524464C5113D5EC966779D3002135EA4254

The certificate's generated name for reference: ONTAPMediatorCA

```
peer1::> snapmirror mediator add -mediator-address 172.31.49.237  
-peer-cluster peer2 -username mediatoradmin
```

Notice: Enter the mediator password.

Enter the password:

Enter the password again:

Info: [Job: 43] 'mediator add' job queued

```
peer1::> job show -id 43
```

| Job ID                                 | Name         | Owning<br>Vserver | Node        | State   |
|--|--------------|-------------------|-------------|---------|
| 43                                     | mediator add | peer1             | peer1-node2 | Success |
| Description: Creating a mediator entry |              |                   |             |         |

```
peer1::> snapmirror mediator show
```

| Mediator Address | Peer Cluster | Connection Status | Quorum Status |
|------------------|--------------|-------------------|---------------|
| 172.31.49.237    | peer2        | connected         | true          |

```
peer1::>
```

## Enable access to the repositories

You should enable access to repositories so ONTAP Mediator can access the required packages during the installation process

### Steps

1. Determine which repositories must be accessed, as shown in the following table:

| If your operating system is... | You must provide access to these repositories...   |
|--------------------------------|--|
| RHEL 7.x                       | <ul style="list-style-type: none"><li>• rhel-7-server-optional-rpms</li></ul>  |
| RHEL 8.x                       | <ul style="list-style-type: none"><li>• rhel-8-for-x86_64-baseos-rpms</li><li>• rhel-8-for-x86_64-appstream-rpms</li></ul> |
| RHEL 9.x                       | <ul style="list-style-type: none"><li>• rhel-9-for-x86_64-baseos-rpms</li><li>• rhel-9-for-x86_64-appstream-rpms</li></ul> |
| CentOS 7.x                     | <ul style="list-style-type: none"><li>• C7.6.1810 - Base repository</li></ul>  |
| Rocky Linux 8                  | <ul style="list-style-type: none"><li>• appstream</li><li>• baseos</li></ul>   |
| Rocky Linux 9                  | <ul style="list-style-type: none"><li>• appstream</li><li>• baseos</li></ul>   |

2. Use one of the following procedures to enable access to the repositories listed above so ONTAP Mediator can access the required packages during the installation process.

## Procedure for RHEL 7.x operating system

Use this procedure if your operating system is **RHEL 7.x** to enable access to repositories:

### Steps

1. Subscribe to the required repository:

```
subscription-manager repos --enable rhel-7-server-optional-rpms
```

The following example shows the execution of this command:

```
[root@localhost ~]# subscription-manager repos --enable rhel-7-  
server-optional-rpms  
Repository 'rhel-7-server-optional-rpms' is enabled for this system.
```

2. Run the `yum repolist` command.

The following example shows the execution of this command. The "rhel-7-server-optional-rpms" repository should appear in the list.

```
[root@localhost ~]# yum repolist  
Loaded plugins: product-id, search-disabled-repos, subscription-  
manager  
rhel-7-server-optional-rpms | 3.2 kB  00:00:00  
rhel-7-server-rpms | 3.5 kB  00:00:00  
(1/3): rhel-7-server-optional-rpms/7Server/x86_64/group  
| 26 kB  00:00:00  
(2/3): rhel-7-server-optional-rpms/7Server/x86_64/updateinfo  
| 2.5 MB  00:00:00  
(3/3): rhel-7-server-optional-rpms/7Server/x86_64/primary_db  
| 8.3 MB  00:00:01  
repo id                                repo name  
status  
rhel-7-server-optional-rpms/7Server/x86_64  Red Hat Enterprise  
Linux 7 Server - Optional (RPMs)  19,447  
rhel-7-server-rpms/7Server/x86_64          Red Hat Enterprise  
Linux 7 Server (RPMs)              26,758  
repolist: 46,205  
[root@localhost ~]#
```



## Procedure for RHEL 8.x operating system

Use this procedure if your operating system is **RHEL 8.x** to enable access to repositories:

### Steps

1. Subscribe to the required repository:

```
subscription-manager repos --enable rhel-8-for-x86_64-baseos-rpms
```

```
subscription-manager repos --enable rhel-8-for-x86_64-appstream-rpms
```

The following example shows the execution of this command:

```
[root@localhost ~]# subscription-manager repos --enable rhel-8-for-x86_64-baseos-rpms
Repository 'rhel-8-for-x86_64-baseos-rpms' is enabled for this system.
[root@localhost ~]# subscription-manager repos --enable rhel-8-for-x86_64-appstream-rpms
Repository 'rhel-8-for-x86_64-appstream-rpms' is enabled for this system.
```

2. Run the `yum repolist` command.

The newly subscribed repositories should appear in the list.

## Procedure for RHEL 9.x operating system

Use this procedure if your operating system is **RHEL 9.x** to enable access to repositories:

### Steps

1. Subscribe to the required repository:

```
subscription-manager repos --enable rhel-9-for-x86_64-baseos-rpms
```

```
subscription-manager repos --enable rhel-9-for-x86_64-appstream-rpms
```

The following example shows the execution of this command:

```
[root@localhost ~]# subscription-manager repos --enable rhel-9-for-
x86_64-baseos-rpms
Repository 'rhel-9-for-x86_64-baseos-rpms' is enabled for this
system.
[root@localhost ~]# subscription-manager repos --enable rhel-9-for-
x86_64-appstream-rpms
Repository 'rhel-9-for-x86_64-appstream-rpms' is enabled for this
system.
```

2. Run the `yum repolist` command.

The newly subscribed repositories should appear in the list.

## Procedure for CentOS 7.x operating system

Use this procedure if your operating system is **CentOS 7.x** to enable access to repositories:



The following examples are showing a repository for CentOS 7.6 and might not work for other CentOS versions. Use the base repository for your version of CentOS.

### Steps

1. Add the C7.6.1810 - Base repository. The C7.6.1810 - Base vault repository contains the "kernel-devel" package needed for ONTAP Mediator.
2. Add the following lines to /etc/yum.repos.d/CentOS-Vault.repo.

```
[C7.6.1810-base]
name=CentOS-7.6.1810 - Base
baseurl=http://vault.centos.org/7.6.1810/os/$basearch/
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7
enabled=1
```

3. Run the `yum repolist` command.

The following example shows the execution of this command. The CentOS-7.6.1810 - Base repository should appear in the list.

```
Loaded plugins: fastestmirror
Loading mirror speeds from cached hostfile
* base: distro.ibiblio.org
* extras: distro.ibiblio.org
* updates: ewr.edge.kernel.org
C7.6.1810-base | 3.6 kB 00:00:00
(1/2): C7.6.1810-base/x86_64/group_gz | 166 kB 00:00:00
(2/2): C7.6.1810-base/x86_64/primary_db | 6.0 MB 00:00:04
repo id repo name status
C7.6.1810-base/x86_64 CentOS-7.6.1810 - Base 10,019
base/7/x86_64 CentOS-7 - Base 10,097
extras/7/x86_64 CentOS-7 - Extras 307
updates/7/x86_64 CentOS-7 - Updates 1,010
repolist: 21,433
[root@localhost ~]#
```

## Procedure for Rocky Linux 8 or 9 operating systems

Use this procedure if your operating system is **Rocky Linux 8** or **Rocky Linux 9** to enable access to repositories:

### Steps

1. Subscribe to the required repositories:

```
dnf config-manager --set-enabled baseos  
  
dnf config-manager --set-enabled appstream
```

2. Perform a clean operation:

```
dnf clean all
```

3. Verify the list of repositories:

```
dnf repolist
```

### Example for Rocky Linux 8

```
[root@localhost ~]# dnf config-manager --set-enabled baseos  
[root@localhost ~]# dnf config-manager --set-enabled appstream  
[root@localhost ~]# dnf clean all  
[root@localhost ~]# dnf repolist  
repo id                                repo name  
appstream                             Rocky Linux 8 - AppStream  
baseos                                Rocky Linux 8 - BaseOS  
[root@localhost ~]#
```

### Example for Rocky Linux 9

```
[root@localhost ~]# dnf config-manager --set-enabled baseos  
[root@localhost ~]# dnf config-manager --set-enabled appstream  
[root@localhost ~]# dnf clean all  
[root@localhost ~]# dnf repolist  
repo id                                repo name  
appstream                             Rocky Linux 9 - AppStream  
baseos                                Rocky Linux 9 - BaseOS  
[root@localhost ~]#
```

## Download the Mediator installation package

Download the Mediator installation package as part of the installation process.

### Steps

1. Download the Mediator installation package from the ONTAP Mediator page.

[ONTAP Mediator download page](#)

2. Confirm that the Mediator installation package is in the current working directory:

```
ls
```

```
[root@mediator-host ~]#ls
ontap-mediator-1.5.0.tgz
```



For ONTAP Mediator versions 1.4 and earlier, the installer is named `ontap-mediator`.

If you are at a location without access to the internet, you must ensure that the installer has access to the required packages.

3. If necessary, move the Mediator installation package from the download directory to the installation directory on the Linux Mediator host.
4. Unzip the installer package:

```
tar xvfz ontap-mediator-1.6.0.tgz
```

```
[root@scs000099753 ~]# tar xvfz ontap-mediator-1.6.0.tgz
ontap-mediator-1.6.0/
ontap-mediator-1.6.0/ONTAP-Mediator-production.pub
ontap-mediator-1.6.0/tsa-prod-chain-ONTAP-Mediator.pem
ontap-mediator-1.6.0/tsa-prod-ONTAP-Mediator.pem
ontap-mediator-1.6.0/csc-prod-ONTAP-Mediator.pem
ontap-mediator-1.6.0/csc-prod-chain-ONTAP-Mediator.pem
ontap-mediator-1.6.0/ontap-mediator-1.6.0
ontap-mediator-1.6.0/ontap-mediator-1.6.0.sig.tsr
ontap-mediator-1.6.0/ontap-mediator-1.6.0.tsr
ontap-mediator-1.6.0/ontap-mediator-1.6.0.sig
```

## Verify the ONTAP Mediator code signature

You should verify the ONTAP Mediator code signature before installing the Mediator installation package.

### Before you begin

Before verifying the Mediator code signature, your system must meet the following requirements.

- openssl versions 1.0.2 to 3.0 for basic verification
- openssl version 1.1.0 or later for Time Stamping Authority (TSA) operations
- Public internet access for OCSP verification



The following files are included in the download package:

| File                              | Description   |
|-----------------------------------|---|
| ONTAP-Mediator-development.pub    | The public key used to verify the signature   |
| csc-prod-chain-ONTAP-Mediator.pem | The public certification CA chain of trust  |
| csc-prod-ONTAP-Mediator.pem       | The certificate used to generate the key  |
| ontap-mediator-1.6.0              | The product installation executable for version 1.6.0                                   |
| ontap-mediator-1.6.0.sig          | The SHA-256 hashed, then RSA-signed using the csc-prod key, signature for the installer |
| ontap-mediator-1.6.0.sig.tsr      | The revocation request for use by OCSCP for the installer's signature                   |
| tsc-prod-ONTAP-Mediator.pem       | The public certificate for the TSR  |
| tsc-prod-chain-ONTAP-Mediator.pem | The public certificate CA Chain for the TSR   |

## Steps

1. Perform the revocation check on `csc-prod-ONTAP-Mediator.pem` by using Online Certificate Status Protocol (OCSP).
  - a. Find the OCSP URL used to register the certificate because developer certificates might not provide a uri.

```
openssl x509 -noout -ocsp_uri -in csc-prod-chain-ONTAP-Mediator.pem
```

- b. Generate an OCSP request for the certificate.

```
openssl ocsp -issuer csc-prod-chain-ONTAP-Mediator.pem -CAfile csc-prod-chain-ONTAP-Mediator.pem -cert csc-prod-ONTAP-Mediator.pem -reqout req.der
```

- c. Connect to the OCSP Manager to send the OCSP request:

```
openssl ocsp -issuer csc-prod-chain-ONTAP-Mediator.pem -CAfile csc-prod-chain-ONTAP-Mediator.pem -cert csc-prod-ONTAP-Mediator.pem -url ${ocsp_uri} -resp_text -respout resp.der -verify_other csc-prod-chain-ONTAP-Mediator.pem
```

2. Verify the trust chain of the CSC and expiration dates against the local host:

```
openssl verify
```



The openssl version from the PATH must have a valid cert.pem (not self-signed).

```
openssl verify -untrusted csc-prod-chain-ONTAP-Mediator.pem -CApath  
${OPENSSLDIR} csc-prod-ONTAP-Mediator.pem # Failure action: The Code-  
Signature-Check certificate has expired or is invalid. Download a newer  
version of the ONTAP Mediator.  
openssl verify -untrusted tsa-prod-chain-ONTAP-Mediator.pem -CApath  
${OPENSSLDIR} tsa-prod-ONTAP-Mediator.pem # Failure action: The Time-  
Stamp certificate has expired or is invalid. Download a newer version of  
the ONTAP Mediator.
```

3. Verify the ontap-mediator-1.5.0.sig.tsr and ontap-mediator-1.6.0.tsr files using the associated certificates:

```
openssl ts -verify
```



.tsr files contain the time stamp response associated with the installer and the code signature. Processing confirms that the time stamp has a valid signature from TSA and that your input file has not changed. The verification is performed locally on your machine. Independently, there is no need to access TSA servers.

```
openssl ts -verify -data ontap-mediator-1.6.0.sig -in ontap-mediator-  
1.6.0.sig.tsr -CAfile tsa-prod-chain-ONTAP-Mediator.pem -untrusted tsa-  
prod-ONTAP-Mediator.pem  
openssl ts -verify -data ontap-mediator-1.6.0 -in ontap-mediator-  
1.6.0.tsr -CAfile tsa-prod-chain-ONTAP-Mediator.pem -untrusted tsa-prod-  
ONTAP-Mediator.pem
```

4. Verify signatures against the key:

```
openssl dgst -verify
```

```
openssl dgst -sha256 -verify ONTAP-Mediator-production.pub -signature  
ontap-mediator-1.6.0.sig ontap-mediator-1.6.0
```

## Example of Verifying the ONTAP Mediator code signature (console output)

```
[root@scspa2695423001 ontap-mediator-1.6.0]# pwd
/root/ontap-mediator-1.6.0
[root@scspa2695423001 ontap-mediator-1.6.0]# ls -l
total 63660
-r--r--r-- 1 root root      8582 Feb 19 15:02 csc-prod-chain-ONTAP-
Mediator.pem
-r--r--r-- 1 root root      2373 Feb 19 15:02 csc-prod-ONTAP-
Mediator.pem
-r-xr-xr-- 1 root root 65132818 Feb 20 15:17 ontap-mediator-1.6.0
-rw-r--r-- 1 root root      384 Feb 20 15:17 ontap-mediator-1.6.0.sig
-rw-r--r-- 1 root root      5437 Feb 20 15:17 ontap-mediator-
1.6.0.sig.tsr
-rw-r--r-- 1 root root      5436 Feb 20 15:17 ontap-mediator-1.6.0.tsr
-r--r--r-- 1 root root      625 Feb 19 15:02 ONTAP-Mediator-
production.pub
-r--r--r-- 1 root root      3323 Feb 19 15:02 tsa-prod-chain-ONTAP-
Mediator.pem
-r--r--r-- 1 root root      1740 Feb 19 15:02 tsa-prod-ONTAP-
Mediator.pem
[root@scspa2695423001 ontap-mediator-1.6.0]#
[root@scspa2695423001 ontap-mediator-1.6.0]#
/root/verify_ontap_mediator_signatures.sh
++ openssl version -d
++ cut -d '"' -f2
+ OPENSSLDIR=/etc/pki/tls
+ openssl version
OpenSSL 1.1.1k  FIPS 25 Mar 2021
++ openssl x509 -noout -ocsp_uri -in csc-prod-chain-ONTAP-Mediator.pem
+ ocsp_uri=http://ocsp.entrust.net
+ echo http://ocsp.entrust.net
http://ocsp.entrust.net
+ openssl ocsp -issuer csc-prod-chain-ONTAP-Mediator.pem -CAfile csc-
prod-chain-ONTAP-Mediator.pem -cert csc-prod-ONTAP-Mediator.pem -reqout
req.der
+ openssl ocsp -issuer csc-prod-chain-ONTAP-Mediator.pem -CAfile csc-
prod-chain-ONTAP-Mediator.pem -cert csc-prod-ONTAP-Mediator.pem -url
http://ocsp.entrust.net -resp_text -respout resp.der -verify_other csc-
prod-chain-ONTAP-Mediator.pem
OCSP Response Data:
    OCSP Response Status: successful (0x0)
    Response Type: Basic OCSP Response
    Version: 1 (0x0)
    Responder Id: C = US, O = "Entrust, Inc.", CN = Entrust Extended
Validation Code Signing CA - EVCS2
```



Produced At: Feb 28 05:01:00 2023 GMT

Responses:

Certificate ID:

Hash Algorithm: sha1

Issuer Name Hash: 69FA640329AB84E27220FE0927647B8194B91F2A

Issuer Key Hash: CE894F8251AA15A28462CA312361D261F8FE78

Serial Number: 511A542B57522AEB7295A640DC6200E5

Cert Status: good

This Update: Feb 28 05:00:00 2023 GMT

Next Update: Mar 4 04:59:59 2023 GMT

Signature Algorithm: sha512WithRSAEncryption

3c:1d:49:b0:93:62:37:3e:c7:38:e3:9f:9f:62:82:73:ed:f4:  
ea:00:6b:f1:01:cd:79:57:92:f1:9d:5d:85:9b:60:59:f8:6c:  
e6:f4:50:51:f3:4c:8a:51:dd:50:68:16:8f:20:24:7e:39:b0:  
44:94:8d:b0:61:da:b9:08:36:74:2d:44:55:62:fb:92:be:4a:  
e7:6c:8c:49:dd:0c:fd:d8:ce:20:08:0d:0f:5a:29:a3:19:03:  
9f:d3:df:41:f4:89:0f:73:18:3f:ac:bb:a7:a3:96:7d:c5:70:  
4c:57:cd:17:17:c6:8a:60:d1:37:c9:2d:81:07:2a:d7:a6:02:  
ee:ce:88:16:22:db:e3:43:64:1e:9b:0d:4d:31:66:fa:ab:a5:  
52:99:94:4a:4a:d0:52:c5:34:f5:18:c7:15:5b:ce:74:c2:fc:  
61:ea:55:aa:f1:2f:82:a3:6a:95:8d:7e:2b:38:49:4f:bf:b1:  
68:7b:1b:24:8b:1f:4d:c5:77:f0:71:af:9c:34:c8:7a:82:50:  
09:a2:19:6e:c6:30:4f:da:a2:79:08:f9:d0:ff:85:d9:2a:84:  
cf:0c:aa:75:8f:72:c9:a7:a2:83:e8:8b:cf:ed:0c:69:75:b6:  
2a:7b:6b:58:99:01:d8:34:ad:e1:89:25:27:1b:fa:d9:6d:32:  
97:3a:0b:0a:8e:a3:9e:e3:f4:e0:d6:1a:c9:b5:14:8c:3e:54:  
3b:37:17:1a:93:44:84:8b:4a:87:97:1e:76:43:3e:d3:ec:8b:  
7e:56:4a:3f:01:31:c0:e5:58:fb:50:ce:6f:b1:e7:35:f9:b7:  
a3:ef:6b:3b:21:95:37:a6:5b:8f:f0:15:18:36:65:89:a1:9c:  
9b:69:00:b4:b1:65:6a:bc:11:2d:d4:9b:b4:97:cc:cb:7a:0c:  
16:11:c1:75:58:7e:13:ab:56:3c:3f:93:5b:95:24:c6:54:52:  
1f:86:a9:16:ce:d9:ea:8b:3a:f3:4f:c4:8f:ad:de:e8:3e:3c:  
d2:51:51:ad:33:7f:d8:c5:33:24:26:f1:2d:9d:0e:9f:55:d0:  
68:bf:af:bd:68:4a:40:08:bc:92:a0:62:54:7d:16:7b:36:29:  
15:b1:cd:58:8e:fb:4a:f2:3e:94:8b:fe:56:95:cc:24:32:af:  
5f:71:99:18:ed:0c:64:94:f7:54:48:87:48:d0:6d:b3:42:04:  
96:03:73:a2:8e:8a:6a:b2:af:ee:56:19:a1:c6:35:12:59:ad:  
19:6a:fe:e0:f1:27:cc:96:4e:f0:4f:fb:6a:bd:ce:05:2c:aa:  
79:7c:df:02:5c:ca:53:7d:60:12:88:7c:ce:15:c7:d4:02:27:  
c1:ab:cf:71:30:1e:14:ba

WARNING: no nonce in response

Response verify OK

csc-prod-ONTAP-Mediator.pem: good

This Update: Feb 28 05:00:00 2023 GMT

Next Update: Mar 4 04:59:59 2023 GMT

```

+ openssl verify -untrusted csc-prod-chain-ONTAP-Mediator.pem -CApath
/etc/pki/tls csc-prod-ONTAP-Mediator.pem
csc-prod-ONTAP-Mediator.pem: OK
+ openssl verify -untrusted tsa-prod-chain-ONTAP-Mediator.pem -CApath
/etc/pki/tls tsa-prod-ONTAP-Mediator.pem
tsa-prod-ONTAP-Mediator.pem: OK
+ openssl ts -verify -data ontap-mediator-1.6.0.sig -in ontap-mediator-
1.6.0.sig.tsr -CAfile tsa-prod-chain-ONTAP-Mediator.pem -untrusted tsa-
prod-ONTAP-Mediator.pem
Using configuration from /etc/pki/tls/openssl.cnf
Verification: OK
+ openssl ts -verify -data ontap-mediator-1.6.0 -in ontap-mediator-
1.6.0.tsr -CAfile tsa-prod-chain-ONTAP-Mediator.pem -untrusted tsa-
prod-ONTAP-Mediator.pem
Using configuration from /etc/pki/tls/openssl.cnf
Verification: OK
+ openssl dgst -sha256 -verify ONTAP-Mediator-production.pub -signature
ontap-mediator-1.6.0.sig ontap-mediator-1.6.0
Verified OK
[root@scspa2695423001 ontap-mediator-1.6.0]#

```

## Install the ONTAP Mediator installation package

To install the ONTAP Mediator service, you must get the installation package and run the installer on the host.

### About this task

- Beginning with ONTAP Mediator 1.4, the Secure Boot mechanism is enabled on UEFI systems. When Secure Boot is enabled, you must take additional steps to register the security key after installation:
  - Follow instructions in the README file to sign the SCST kernel module.:

```
/opt/netapp/lib/ontap_mediator/ontap_mediator/SCST_mod_keys/README.module-
signing
```

- Locate the required keys:

```
/opt/netapp/lib/ontap_mediator/ontap_mediator/SCST_mod_keys
```



After installation, the README files and key location are also provided in the system output.

### Steps

- Run the installer and respond to the prompts as required:

```
./ontap-mediator-1.6.0/ontap-mediator-1.6.0 -y
```

```
[root@scs000099753 ~]# ./ontap-mediator-1.5.0/ontap-mediator-1.6.0 -y
```

The installation process proceeds to create the required accounts and install required packages. If you have a previous version of Mediator installed on the host, you will be prompted to confirm that you want to upgrade.

## Example of ONTAP Mediator 1.5 installation (console output)

```
[root@scs000099753 ~]# ./ontap-mediator-1.6.0/ontap-mediator-1.6.0 -y
ONTAP Mediator: Self Extracting Installer

+ Extracting the ONTAP Mediator installation/upgrade archive
+ Performing the ONTAP Mediator run-time code signature check
  Using openssl from the path: /usr/bin/openssl configured for
CApath:/etc/pki/tls

+ Unpacking the ONTAP Mediator installer
ONTAP Mediator requires two user accounts. One for the service
(netapp), and one for use by ONTAP to the mediator API (mediatoradmin).
Using default account names: netapp + mediatoradmin

Enter ONTAP Mediator user account (mediatoradmin) password:

Re-Enter ONTAP Mediator user account (mediatoradmin) password:

+ Checking if SELinux is in enforcing mode

+ Checking for default Linux firewall
success
success
success

#####
Preparing for installation of ONTAP Mediator packages.

+ Installing required packages.

Last metadata expiration check: 0:25:24 ago on Fri 21 Oct 2022 04:00:13
PM EDT.
Package openssl-1:1.1.1k-4.el8.x86_64 is already installed.
Package gcc-8.4.1-1.el8.x86_64 is already installed.
Package python36-3.6.8-2.module+el8.1.0+3334+5cb623d7.x86_64 is already
installed.
Package libselinux-utils-2.9-5.el8.x86_64 is already installed.
Package perl-Data-Dumper-2.167-399.el8.x86_64 is already installed.
Package efibootmgr-16-1.el8.x86_64 is already installed.
Package mokutil-1:0.3.0-11.el8.x86_64 is already installed.
```

Package python3-pip-9.0.3-19.el8.noarch is already installed.  
 Package polycoreutils-python-utils-2.9-14.el8.noarch is already installed.  
 Dependencies resolved.

```
=====
```

| Package                                | Architecture | Repository  |
|--|--------------|-------------|
| Version                                |              |             |
| Size                                   |              |             |
| =====                                  |              |             |
| =====                                  |              |             |
| Installing:                            |              |             |
| bzip2                                  | x86_64       |             |
| 1.0.6-26.el8                           |              | rhel-8-for- |
| x86_64-baseos-rpms                     | 60 k         |             |
| elfutils-libelf-devel                  | x86_64       |             |
| 0.186-1.el8                            |              | rhel-8-for- |
| x86_64-baseos-rpms                     | 60 k         |             |
| kernel-devel                           | x86_64       |             |
| 4.18.0-348.el8                         |              | rhel-8-for- |
| x86_64-baseos-rpms                     | 20 M         |             |
| make                                   | x86_64       |             |
| 1:4.2.1-11.el8                         |              | rhel-8-for- |
| x86_64-baseos-rpms                     | 498 k        |             |
| openssl-devel                          | x86_64       |             |
| 1:1.1.1k-7.el8_6                       |              | rhel-8-for- |
| x86_64-baseos-rpms                     | 2.3 M        |             |
| patch                                  | x86_64       |             |
| 2.7.6-11.el8                           |              | rhel-8-for- |
| x86_64-baseos-rpms                     | 138 k        |             |
| perl-ExtUtils-MakeMaker                | noarch       |             |
| 1:7.34-1.el8                           |              | rhel-8-for- |
| x86_64-appstream-rpms                  | 301 k        |             |
| python36-devel                         | x86_64       |             |
| 3.6.8-38.module+el8.5.0+12207+5c5719bc |              | rhel-8-for- |
| x86_64-appstream-rpms                  | 17 k         |             |
| redhat-lsb-core                        | x86_64       |             |
| 4.1-47.el8                             |              | rhel-8-for- |
| x86_64-appstream-rpms                  | 45 k         |             |
| Upgrading:                             |              |             |
| cpp                                    | x86_64       |             |
| 8.5.0-10.1.el8_6                       |              | rhel-8-for- |
| x86_64-appstream-rpms                  | 10 M         |             |
| elfutils-libelf                        | x86_64       |             |

|  |       |        |             |
|--|-------|--------|-------------|
| 0.186-1.el8                            |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 229 k |        |             |
| elfutils-libs                          |       | x86_64 |             |
| 0.186-1.el8                            |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 295 k |        |             |
| gcc                                    |       | x86_64 |             |
| 8.5.0-10.1.el8_6                       |       |        | rhel-8-for- |
| x86_64-appstream-rpms                  | 23 M  |        |             |
| libgcc                                 |       | x86_64 |             |
| 8.5.0-10.1.el8_6                       |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 80 k  |        |             |
| libgomp                                |       | x86_64 |             |
| 8.5.0-10.1.el8_6                       |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 207 k |        |             |
| libsemanage                            |       | x86_64 |             |
| 2.9-8.el8                              |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 168 k |        |             |
| mokutil                                |       | x86_64 |             |
| 1:0.3.0-11.el8_6.1                     |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 46 k  |        |             |
| openssl                                |       | x86_64 |             |
| 1:1.1.1k-7.el8_6                       |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 709 k |        |             |
| openssl-libs                           |       | x86_64 |             |
| 1:1.1.1k-7.el8_6                       |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 1.5 M |        |             |
| platform-python-pip                    |       | noarch |             |
| 9.0.3-22.el8                           |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 1.6 M |        |             |
| policycoreutils                        |       | x86_64 |             |
| 2.9-19.el8                             |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 374 k |        |             |
| policycoreutils-python-utils           |       | noarch |             |
| 2.9-19.el8                             |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 253 k |        |             |
| python3-libsemanage                    |       | x86_64 |             |
| 2.9-8.el8                              |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 128 k |        |             |
| python3-pip                            |       | noarch |             |
| 9.0.3-22.el8                           |       |        | rhel-8-for- |
| x86_64-appstream-rpms                  | 20 k  |        |             |
| python3-policycoreutils                |       | noarch |             |
| 2.9-19.el8                             |       |        | rhel-8-for- |
| x86_64-baseos-rpms                     | 2.2 M |        |             |
| python36                               |       | x86_64 |             |
| 3.6.8-38.module+el8.5.0+12207+5c5719bc |       |        | rhel-8-for- |

```

x86_64-appstream-rpms                19 k
Installing dependencies:
  annobin                             x86_64
10.29-3.el8                           rhel-8-for-
x86_64-appstream-rpms                117 k
  at                                  x86_64
3.1.20-11.el8                         rhel-8-for-
x86_64-baseos-rpms                   81 k
  bc                                  x86_64
1.07.1-5.el8                         rhel-8-for-
x86_64-baseos-rpms                   129 k
  cups-client                        x86_64
1:2.2.6-38.el8                       rhel-8-for-
x86_64-appstream-rpms                169 k
  dwz                                x86_64
0.12-10.el8                          rhel-8-for-
x86_64-appstream-rpms                109 k
  ed                                  x86_64
1.14.2-4.el8                         rhel-8-for-
x86_64-baseos-rpms                   82 k
  efi-srpm-macros                   noarch
3-3.el8                              rhel-8-for-
x86_64-appstream-rpms                22 k
  esmtplib                           x86_64
1.2-15.el8                           EPEL-8
57 k
  glibc-srpm-macros                 noarch
1.4.2-7.el8                          rhel-8-for-
x86_64-appstream-rpms                9.4 k
  go-srpm-macros                    noarch
2-17.el8                             rhel-8-for-
x86_64-appstream-rpms                13 k
  keyutils-libs-devel               x86_64
1.5.10-6.el8                        rhel-8-for-
x86_64-baseos-rpms                   48 k
  krb5-devel                        x86_64
1.18.2-14.el8                      rhel-8-for-
x86_64-baseos-rpms                   560 k
  libcom_err-devel                  x86_64
1.45.6-2.el8                       rhel-8-for-
x86_64-baseos-rpms                   38 k
  libesmtplib                       x86_64
1.0.6-18.el8                       EPEL-8
70 k
  libkadm5                          x86_64
1.18.2-14.el8                      rhel-8-for-

```

|                       |       |        |             |
|-----------------------|-------|--------|-------------|
| x86_64-baseos-rpms    | 187 k |        |             |
| libblockfile          |       | x86_64 |             |
| 1.14-1.el8            |       |        | rhel-8-for- |
| x86_64-appstream-rpms | 32 k  |        |             |
| libselinux-devel      |       | x86_64 |             |
| 2.9-5.el8             |       |        | rhel-8-for- |
| x86_64-baseos-rpms    | 200 k |        |             |
| libsepol-devel        |       | x86_64 |             |
| 2.9-3.el8             |       |        | rhel-8-for- |
| x86_64-baseos-rpms    | 87 k  |        |             |
| libverto-devel        |       | x86_64 |             |
| 0.3.0-5.el8           |       |        | rhel-8-for- |
| x86_64-baseos-rpms    | 18 k  |        |             |
| m4                    |       | x86_64 |             |
| 1.4.18-7.el8          |       |        | rhel-8-for- |
| x86_64-baseos-rpms    | 223 k |        |             |
| mailx                 |       | x86_64 |             |
| 12.5-29.el8           |       |        | rhel-8-for- |
| x86_64-baseos-rpms    | 257 k |        |             |
| ncurses-compat-libs   |       | x86_64 |             |
| 6.1-9.20180224.el8    |       |        | rhel-8-for- |
| x86_64-baseos-rpms    | 328 k |        |             |
| ocaml-srpm-macros     |       | noarch |             |
| 5-4.el8               |       |        | rhel-8-for- |
| x86_64-appstream-rpms | 9.5 k |        |             |
| openblas-srpm-macros  |       | noarch |             |
| 2-2.el8               |       |        | rhel-8-for- |
| x86_64-appstream-rpms | 8.0 k |        |             |
| pcre2-devel           |       | x86_64 |             |
| 10.32-2.el8           |       |        | rhel-8-for- |
| x86_64-baseos-rpms    | 605 k |        |             |
| pcre2-utf16           |       | x86_64 |             |
| 10.32-2.el8           |       |        | rhel-8-for- |
| x86_64-baseos-rpms    | 229 k |        |             |
| pcre2-utf32           |       | x86_64 |             |
| 10.32-2.el8           |       |        | rhel-8-for- |
| x86_64-baseos-rpms    | 220 k |        |             |
| perl-CPAN-Meta-YAML   |       | noarch |             |
| 0.018-397.el8         |       |        | rhel-8-for- |
| x86_64-appstream-rpms | 34 k  |        |             |
| perl-ExtUtils-Command |       | noarch |             |
| 1:7.34-1.el8          |       |        | rhel-8-for- |
| x86_64-appstream-rpms | 19 k  |        |             |
| perl-ExtUtils-Install |       | noarch |             |
| 2.14-4.el8            |       |        | rhel-8-for- |
| x86_64-appstream-rpms | 46 k  |        |             |



|                        |       |        |             |
|------------------------|-------|--------|-------------|
| perl-ExtUtils-Manifest |       | noarch |             |
| 1.70-395.el8           |       |        | rhel-8-for- |
| x86_64-appstream-rpms  | 37 k  |        |             |
| perl-ExtUtils-ParseXS  |       | noarch |             |
| 1:3.35-2.el8           |       |        | rhel-8-for- |
| x86_64-appstream-rpms  | 83 k  |        |             |
| perl-JSON-PP           |       | noarch |             |
| 1:2.97.001-3.el8       |       |        | rhel-8-for- |
| x86_64-appstream-rpms  | 68 k  |        |             |
| perl-Math-BigInt       |       | noarch |             |
| 1:1.9998.11-7.el8      |       |        | rhel-8-for- |
| x86_64-baseos-rpms     | 196 k |        |             |
| perl-Math-Complex      |       | noarch |             |
| 1.59-421.el8           |       |        | rhel-8-for- |
| x86_64-baseos-rpms     | 109 k |        |             |
| perl-Test-Harness      |       | noarch |             |
| 1:3.42-1.el8           |       |        | rhel-8-for- |
| x86_64-appstream-rpms  | 279 k |        |             |
| perl-devel             |       | x86_64 |             |
| 4:5.26.3-419.el8_4.1   |       |        | rhel-8-for- |
| x86_64-appstream-rpms  | 599 k |        |             |
| perl-srpm-macros       |       | noarch |             |
| 1-25.el8               |       |        | rhel-8-for- |
| x86_64-appstream-rpms  | 11 k  |        |             |
| perl-version           |       | x86_64 |             |
| 6:0.99.24-1.el8        |       |        | rhel-8-for- |
| x86_64-appstream-rpms  | 67 k  |        |             |
| platform-python-devel  |       | x86_64 |             |
| 3.6.8-41.el8           |       |        | rhel-8-for- |
| x86_64-appstream-rpms  | 249 k |        |             |
| python-rpm-macros      |       | noarch |             |
| 3-41.el8               |       |        | rhel-8-for- |
| x86_64-appstream-rpms  | 15 k  |        |             |
| python-srpm-macros     |       | noarch |             |
| 3-41.el8               |       |        | rhel-8-for- |
| x86_64-appstream-rpms  | 15 k  |        |             |
| python3-pyparsing      |       | noarch |             |
| 2.1.10-7.el8           |       |        | rhel-8-for- |
| x86_64-baseos-rpms     | 142 k |        |             |
| python3-rpm-generators |       | noarch |             |
| 5-7.el8                |       |        | rhel-8-for- |
| x86_64-appstream-rpms  | 25 k  |        |             |
| python3-rpm-macros     |       | noarch |             |
| 3-41.el8               |       |        | rhel-8-for- |
| x86_64-appstream-rpms  | 14 k  |        |             |
| qt5-srpm-macros        |       | noarch |             |

|                                      |       |        |             |
|--------------------------------------|-------|--------|-------------|
| 5.15.2-1.el8                         |       |        | rhel-8-for- |
| x86_64-appstream-rpms                | 11 k  |        |             |
| redhat-lsb-submod-security           |       | x86_64 |             |
| 4.1-47.el8                           |       |        | rhel-8-for- |
| x86_64-appstream-rpms                | 22 k  |        |             |
| redhat-rpm-config                    |       | noarch |             |
| 125-1.el8                            |       |        | rhel-8-for- |
| x86_64-appstream-rpms                | 87 k  |        |             |
| rust-srpm-macros                     |       | noarch |             |
| 5-2.el8                              |       |        | rhel-8-for- |
| x86_64-appstream-rpms                | 9.3 k |        |             |
| spax                                 |       | x86_64 |             |
| 1.5.3-13.el8                         |       |        | rhel-8-for- |
| x86_64-baseos-rpms                   | 217 k |        |             |
| systemtap-sdt-devel                  |       | x86_64 |             |
| 4.6-4.el8                            |       |        | rhel-8-for- |
| x86_64-appstream-rpms                | 86 k  |        |             |
| time                                 |       | x86_64 |             |
| 1.9-3.el8                            |       |        | rhel-8-for- |
| x86_64-baseos-rpms                   | 54 k  |        |             |
| unzip                                |       | x86_64 |             |
| 6.0-46.el8                           |       |        | rhel-8-for- |
| x86_64-baseos-rpms                   | 196 k |        |             |
| util-linux-user                      |       | x86_64 |             |
| 2.32.1-28.el8                        |       |        | rhel-8-for- |
| x86_64-baseos-rpms                   | 100 k |        |             |
| zip                                  |       | x86_64 |             |
| 3.0-23.el8                           |       |        | rhel-8-for- |
| x86_64-baseos-rpms                   | 270 k |        |             |
| zlib-devel                           |       | x86_64 |             |
| 1.2.11-17.el8                        |       |        | rhel-8-for- |
| x86_64-baseos-rpms                   | 58 k  |        |             |
| Installing weak dependencies:        |       |        |             |
| perl-CPAN-Meta                       |       | noarch |             |
| 2.150010-396.el8                     |       |        | rhel-8-for- |
| x86_64-appstream-rpms                | 191 k |        |             |
| perl-CPAN-Meta-Requirements          |       | noarch |             |
| 2.140-396.el8                        |       |        | rhel-8-for- |
| x86_64-appstream-rpms                | 37 k  |        |             |
| perl-Encode-Locale                   |       | noarch |             |
| 1.05-10.module+el8.3.0+6498+9eecfe51 |       |        | rhel-8-for- |
| x86_64-appstream-rpms                | 22 k  |        |             |
| perl-Time-HiRes                      |       | x86_64 |             |
| 4:1.9758-2.el8                       |       |        | rhel-8-for- |
| x86_64-appstream-rpms                | 61 k  |        |             |

## Transaction Summary

Install 69 Packages

Upgrade 17 Packages

Total download size: 72 M

Is this ok [y/N]: y

Downloading Packages:

(1/86): perl-ExtUtils-Install-2.14-4.el8.noarch.rpm

735 kB/s | 46 kB 00:00

(2/86): libesmtplib-1.0.6-18.el8.x86\_64.rpm

1.0 MB/s | 70 kB 00:00

(3/86): esmtplib-1.2-15.el8.x86\_64.rpm

747 kB/s | 57 kB 00:00

(4/86): rust-srpm-macros-5-2.el8.noarch.rpm

308 kB/s | 9.3 kB 00:00

(5/86): perl-ExtUtils-Manifest-1.70-395.el8.noarch.rpm

781 kB/s | 37 kB 00:00

(6/86): perl-CPAN-Meta-2.150010-396.el8.noarch.rpm

2.7 MB/s | 191 kB 00:00

(7/86): ocaml-srpm-macros-5-4.el8.noarch.rpm

214 kB/s | 9.5 kB 00:00

(8/86): perl-JSON-PP-2.97.001-3.el8.noarch.rpm

1.2 MB/s | 68 kB 00:00

(9/86): perl-ExtUtils-MakeMaker-7.34-1.el8.noarch.rpm

5.8 MB/s | 301 kB 00:00

(10/86): ghc-srpm-macros-1.4.2-7.el8.noarch.rpm

317 kB/s | 9.4 kB 00:00

(11/86): perl-Test-Harness-3.42-1.el8.noarch.rpm

4.5 MB/s | 279 kB 00:00

(12/86): perl-ExtUtils-Command-7.34-1.el8.noarch.rpm

520 kB/s | 19 kB 00:00

...

15 MB/s | 1.5 MB 00:00

Total

35 MB/s | 72 MB 00:02

Running transaction check

Transaction check succeeded.

Running transaction test

```

Transaction test succeeded.
Running transaction
  Preparing      :
1/1
  Running scriptlet: openssl-libs-1:1.1.1k-7.el8_6.x86_64
1/1
  Upgrading       : openssl-libs-1:1.1.1k-7.el8_6.x86_64
1/103
  Running scriptlet: openssl-libs-1:1.1.1k-7.el8_6.x86_64
1/103
  Upgrading       : libgcc-8.5.0-10.1.el8_6.x86_64
2/103
  Running scriptlet: libgcc-8.5.0-10.1.el8_6.x86_64
2/103
  Upgrading       : elfutils-libelf-0.186-1.el8.x86_64
3/103
  Installing      : perl-version-6:0.99.24-1.el8.x86_64
4/103
  Installing      : perl-CPAN-Meta-Requirements-2.140-396.el8.noarch
5/103
  Upgrading       : libsemanage-2.9-8.el8.x86_64
6/103
  Installing      : zlib-devel-1.2.11-17.el8.x86_64
7/103
  Installing      : python-srpm-macros-3-41.el8.noarch
8/103
  Installing      : python-rpm-macros-3-41.el8.noarch
9/103
  Installing      : python3-rpm-macros-3-41.el8.noarch
10/103
  Installing      : perl-Time-HiRes-4:1.9758-2.el8.x86_64
11/103
  Installing      : perl-ExtUtils-ParseXS-1:3.35-2.el8.noarch
12/103
  Installing      : perl-Test-Harness-1:3.42-1.el8.noarch
13/103
  Upgrading       : python3-libsemanage-2.9-8.el8.x86_64
14/103
  Upgrading       : polycoreutils-2.9-19.el8.x86_64
15/103
  Running scriptlet: polycoreutils-2.9-19.el8.x86_64
15/103
  Upgrading       : python3-polycoreutils-2.9-19.el8.noarch
16/103
  Installing      : dwz-0.12-10.el8.x86_64
17/103

```

```

Installing      : ncurses-compat-libs-6.1-9.20180224.el8.x86_64
18/103
Installing      : libesmtplib-1.0.6-18.el8.x86_64
19/103
Installing      : mailx-12.5-29.el8.x86_64
20/103
Installing      : libkadm5-1.18.2-14.el8.x86_64
21/103
Upgrading       : libgomp-8.5.0-10.1.el8_6.x86_64
22/103
Running scriptlet: libgomp-8.5.0-10.1.el8_6.x86_64
22/103
Upgrading       : platform-python-pip-9.0.3-22.el8.noarch
23/103
Upgrading       : python3-pip-9.0.3-22.el8.noarch
24/103
Upgrading       : python36-3.6.8-
38.module+el8.5.0+12207+5c5719bc.x86_64
25/103
Running scriptlet: python36-3.6.8-
38.module+el8.5.0+12207+5c5719bc.x86_64
25/103
Upgrading       : cpp-8.5.0-10.1.el8_6.x86_64
26/103
Running scriptlet: cpp-8.5.0-10.1.el8_6.x86_64
26/103
Upgrading       : gcc-8.5.0-10.1.el8_6.x86_64
27/103
Running scriptlet: gcc-8.5.0-10.1.el8_6.x86_64
27/103
Installing      : annobin-10.29-3.el8.x86_64
28/103
Installing      : unzip-6.0-46.el8.x86_64
29/103
Installing      : zip-3.0-23.el8.x86_64
30/103
Installing      : perl-Math-Complex-1.59-421.el8.noarch
31/103
Installing      : perl-Math-BigInt-1:1.9998.11-7.el8.noarch
32/103
Installing      : perl-JSON-PP-1:2.97.001-3.el8.noarch
33/103
Installing      : make-1:4.2.1-11.el8.x86_64
34/103
Running scriptlet: make-1:4.2.1-11.el8.x86_64
34/103

```

```
Installing      : libcom_err-devel-1.45.6-2.el8.x86_64
35/103
Installing      : util-linux-user-2.32.1-28.el8.x86_64
36/103
Installing      : libsepol-devel-2.9-3.el8.x86_64
37/103
Installing      : pcre2-utf32-10.32-2.el8.x86_64
38/103
Installing      : pcre2-utf16-10.32-2.el8.x86_64
39/103
Installing      : pcre2-devel-10.32-2.el8.x86_64
40/103
Installing      : libselinux-devel-2.9-5.el8.x86_64
41/103
Installing      : patch-2.7.6-11.el8.x86_64
42/103
Installing      : python3-pyparsing-2.1.10-7.el8.noarch
43/103
Installing      : systemtap-sdt-devel-4.6-4.el8.x86_64
44/103
Installing      : spax-1.5.3-13.el8.x86_64
45/103
Running scriptlet: spax-1.5.3-13.el8.x86_64
45/103
Installing      : m4-1.4.18-7.el8.x86_64
46/103
Running scriptlet: m4-1.4.18-7.el8.x86_64
46/103
Installing      : libverto-devel-0.3.0-5.el8.x86_64
47/103
Installing      : bc-1.07.1-5.el8.x86_64
48/103
Running scriptlet: bc-1.07.1-5.el8.x86_64
48/103
Installing      : at-3.1.20-11.el8.x86_64
49/103
Running scriptlet: at-3.1.20-11.el8.x86_64
49/103
Installing      : keyutils-libs-devel-1.5.10-6.el8.x86_64
50/103
Installing      : krb5-devel-1.18.2-14.el8.x86_64
51/103
Installing      : time-1.9-3.el8.x86_64
52/103
Running scriptlet: time-1.9-3.el8.x86_64
52/103
```

```

Upgrading      : polycoreutils-python-utils-2.9-19.el8.noarch
80/103
Installing     : elfutils-libelf-devel-0.186-1.el8.x86_64
81/103
Upgrading      : elfutils-libs-0.186-1.el8.x86_64
82/103
Upgrading      : mokutil-1:0.3.0-11.el8_6.1.x86_64
83/103
Upgrading      : openssl-1:1.1.1k-7.el8_6.x86_64
84/103
Installing     : kernel-devel-4.18.0-348.el8.x86_64
85/103
Running scriptlet: kernel-devel-4.18.0-348.el8.x86_64

...

85/103
Installing     : bzip2-1.0.6-26.el8.x86_64
86/103
Cleanup        : polycoreutils-python-utils-2.9-14.el8.noarch
87/103
Cleanup        : python3-polycoreutils-2.9-14.el8.noarch
88/103
Cleanup        : python36-3.6.8-
2.module+el8.1.0+3334+5cb623d7.x86_64
89/103
Running scriptlet: python36-3.6.8-
2.module+el8.1.0+3334+5cb623d7.x86_64
89/103
Cleanup        : elfutils-libs-0.185-1.el8.x86_64
90/103
Cleanup        : openssl-1:1.1.1k-4.el8.x86_64
91/103
Cleanup        : python3-libsemanage-2.9-6.el8.x86_64
92/103
Running scriptlet: gcc-8.4.1-1.el8.x86_64
93/103
Cleanup        : gcc-8.4.1-1.el8.x86_64
93/103
Running scriptlet: polycoreutils-2.9-14.el8.x86_64
94/103
Cleanup        : polycoreutils-2.9-14.el8.x86_64
94/103
Cleanup        : mokutil-1:0.3.0-11.el8.x86_64
95/103

```

```

Cleanup      : python3-pip-9.0.3-19.el8.noarch
96/103
Cleanup      : platform-python-pip-9.0.3-19.el8.noarch
97/103
Cleanup      : openssl-libs-1:1.1.1k-4.el8.x86_64
98/103
Running scriptlet: openssl-libs-1:1.1.1k-4.el8.x86_64
98/103
Cleanup      : libsemanage-2.9-6.el8.x86_64
99/103
Running scriptlet: cpp-8.4.1-1.el8.x86_64
100/103
Cleanup      : cpp-8.4.1-1.el8.x86_64
100/103
Cleanup      : libgcc-8.5.0-3.el8.x86_64
101/103
Running scriptlet: libgcc-8.5.0-3.el8.x86_64
101/103
Running scriptlet: libgomp-8.4.1-1.el8.x86_64
102/103
Cleanup      : libgomp-8.4.1-1.el8.x86_64
102/103
Running scriptlet: libgomp-8.4.1-1.el8.x86_64
102/103
Cleanup      : elfutils-libelf-0.185-1.el8.x86_64
103/103
Running scriptlet: elfutils-libelf-0.185-1.el8.x86_64
103/103
Verifying    : esmtp-1.2-15.el8.x86_64
1/103
Verifying    : libesmtp-1.0.6-18.el8.x86_64

...

Upgraded:
  cpp-8.5.0-10.1.el8_6.x86_64                                elfutils-
libelf-0.186-1.el8.x86_64      elfutils-libs-0.186-1.el8.x86_64
gcc-8.5.0-10.1.el8_6.x86_64
  libgcc-8.5.0-10.1.el8_6.x86_64                                libgomp-
8.5.0-10.1.el8_6.x86_64      libsemanage-2.9-8.el8.x86_64
mokutil-1:0.3.0-11.el8_6.1.x86_64
  openssl-1:1.1.1k-7.el8_6.x86_64                                openssl-
libs-1:1.1.1k-7.el8_6.x86_64      platform-python-pip-9.0.3-22.el8.noarch
policycoreutils-2.9-19.el8.x86_64
  policycoreutils-python-utils-2.9-19.el8.noarch                python3-
libsemanage-2.9-8.el8.x86_64      python3-pip-9.0.3-22.el8.noarch

```



```

python3-policycoreutils-2.9-19.el8.noarch
python36-3.6.8-38.module+el8.5.0+12207+5c5719bc.x86_64
Installed:
annobin-10.29-3.el8.x86_64 at-
3.1.20-11.el8.x86_64 bc-1.07.1-5.el8.x86_64
bzip2-1.0.6-26.el8.x86_64
cups-client-1:2.2.6-38.el8.x86_64 dwz-0.12-
10.el8.x86_64
ed-1.14.2-4.el8.x86_64
efi-srpm-macros-3-3.el8.noarch elfutils-libelf-
devel-0.186-1.el8.x86_64
esmtplib-1.2-15.el8.x86_64
ghc-srpm-macros-1.4.2-7.el8.noarch go-srpm-macros-2-
17.el8.noarch
kernel-devel-4.18.0-348.el8.x86_64
keyutils-libs-devel-1.5.10-6.el8.x86_64 krb5-devel-1.18.2-
14.el8.x86_64
libcom_err-devel-1.45.6-2.el8.x86_64
libesmtplib-1.0.6-18.el8.x86_64 libkadm5-1.18.2-
14.el8.x86_64
libblockfile-1.14-1.el8.x86_64
libselinux-devel-2.9-5.el8.x86_64 libsepol-devel-2.9-
3.el8.x86_64
libverto-devel-0.3.0-5.el8.x86_64 m4-
1.4.18-7.el8.x86_64 mailx-12.5-
29.el8.x86_64
make-1:4.2.1-11.el8.x86_64
ncurses-compat-libs-6.1-9.20180224.el8.x86_64 ocaml-srpm-macros-
5-4.el8.noarch
openblas-srpm-macros-2-2.el8.noarch
openssl-devel-1:1.1.1k-7.el8_6.x86_64 patch-2.7.6-
11.el8.x86_64
pcre2-devel-10.32-2.el8.x86_64
pcre2-utf16-10.32-2.el8.x86_64 pcre2-utf32-10.32-
2.el8.x86_64
perl-CPAN-Meta-2.150010-396.el8.noarch
perl-CPAN-Meta-Requirements-2.140-396.el8.noarch perl-CPAN-Meta-
YAML-0.018-397.el8.noarch
perl-Encode-Locale-1.05-10.module+el8.3.0+6498+9eecfe51.noarch
perl-ExtUtils-Command-1:7.34-1.el8.noarch perl-ExtUtils-
Install-2.14-4.el8.noarch
perl-ExtUtils-MakeMaker-1:7.34-1.el8.noarch
perl-ExtUtils-Manifest-1.70-395.el8.noarch perl-ExtUtils-
ParseXS-1:3.35-2.el8.noarch
perl-JSON-PP-1:2.97.001-3.el8.noarch
perl-Math-BigInt-1:1.9998.11-7.el8.noarch perl-Math-Complex-

```

```

1.59-421.el8.noarch
perl-Test-Harness-1:3.42-1.el8.noarch
perl-Time-HiRes-4:1.9758-2.el8.x86_64 perl-devel-
4:5.26.3-419.el8_4.1.x86_64
perl-srpm-macros-1-25.el8.noarch
perl-version-6:0.99.24-1.el8.x86_64 platform-python-
devel-3.6.8-41.el8.x86_64
python-rpm-macros-3-41.el8.noarch
python-srpm-macros-3-41.el8.noarch python3-pyparsing-
2.1.10-7.el8.noarch
python3-rpm-generators-5-7.el8.noarch
python3-rpm-macros-3-41.el8.noarch python36-devel-
3.6.8-38.module+el8.5.0+12207+5c5719bc.x86_64
qt5-srpm-macros-5.15.2-1.el8.noarch
redhat-lsb-core-4.1-47.el8.x86_64 redhat-lsb-submod-
security-4.1-47.el8.x86_64
redhat-rpm-config-125-1.el8.noarch
rust-srpm-macros-5-2.el8.noarch spax-1.5.3-
13.el8.x86_64
systemtap-sdt-devel-4.6-4.el8.x86_64
time-1.9-3.el8.x86_64 unzip-6.0-
46.el8.x86_64
util-linux-user-2.32.1-28.el8.x86_64
zip-3.0-23.el8.x86_64 zlib-devel-1.2.11-
17.el8.x86_64

```

Complete!

OS package installations finished

+ Installing ONTAP Mediator. (Log: /tmp/ontap\_mediator.JixKGP/ontap-mediator-1.6.0/ontap-mediator-1.6.0/install\_20221021155929.log)

This step will take several minutes. Use the log file to view progress.

Sudoer config verified

ONTAP Mediator rsyslog and logging rotation enabled

+ Install successful. (Moving log to /opt/netapp/lib/ontap\_mediator/log/install\_20221021155929.log)

+ WARNING: This system supports UEFI

Secure Boot (SB) is currently disabled on this system.

If SB is enabled in the future, SCST will not work unless the following action is taken:

Using the keys in

/opt/netapp/lib/ontap\_mediator/ontap\_mediator/SCST\_mod\_keys follow instructions in

/opt/netapp/lib/ontap\_mediator/ontap\_mediator/SCST\_mod\_keys/README.module-signing

to sign the SCST kernel module. Note that reboot will be

needed.

SCST will not start automatically when Secure Boot is enabled and not configured properly.

+ Note: ONTAP Mediator uses a kernel module compiled specifically for the current

OS. Using 'yum update' to upgrade the kernel might cause service interruption.

For more information, see /opt/netapp/lib/ontap\_mediator/README  
[root@scs000099753 ~]# cat /etc/redhat-release  
Red Hat Enterprise Linux release 8.5 (Ootpa)  
[root@scs000099753 ~]#

## Verify the installation

After the ONTAP Mediator has been installed, you should verify that the ONTAP Mediator services are running.

### Steps

1. View the status of the ONTAP Mediator services:

- a. `systemctl status ontap_mediator`

```
[root@scspr1915530002 ~]# systemctl status ontap_mediator

ontap_mediator.service - ONTAP Mediator
Loaded: loaded (/etc/systemd/system/ontap_mediator.service; enabled;
vendor preset: disabled)
Active: active (running) since Mon 2022-04-18 10:41:49 EDT; 1 weeks 0
days ago
Process: 286710 ExecStop=/bin/kill -s INT $MAINPID (code=exited,
status=0/SUCCESS)
Main PID: 286712 (uwsgi)
Status: "uWSGI is ready"
Tasks: 3 (limit: 49473)
Memory: 139.2M
CGroup: /system.slice/ontap_mediator.service
├─286712 /opt/netapp/lib/ontap_mediator/pyenv/bin/uwsgi --ini
/opt/netapp/lib/ontap_mediator/uwsgi/ontap_mediator.ini
├─286716 /opt/netapp/lib/ontap_mediator/pyenv/bin/uwsgi --ini
/opt/netapp/lib/ontap_mediator/uwsgi/ontap_mediator.ini
└─286717 /opt/netapp/lib/ontap_mediator/pyenv/bin/uwsgi --ini
/opt/netapp/lib/ontap_mediator/uwsgi/ontap_mediator.ini

[root@scspr1915530002 ~]#
```

b. `systemctl status mediator-scst`

```
[root@scspr1915530002 ~]# systemctl status mediator-scst
Loaded: loaded (/etc/systemd/system/mediator-scst.service;
enabled; vendor preset: disabled)
Active: active (running) since Mon 2022-04-18 10:41:47 EDT; 1
weeks 0 days ago
Process: 286595 ExecStart=/etc/init.d/scst start (code=exited,
status=0/SUCCESS)
Main PID: 286662 (iscsi-scstd)
Tasks: 1 (limit: 49473)
Memory: 1.2M
CGroup: /system.slice/mediator-scst.service
└─286662 /usr/local/sbin/iscsi-scstd

[root@scspr1915530002 ~]#
```

2. Confirm the ports that are used by the ONTAP Mediator service:

`netstat`

```
[root@scspr1905507001 ~]# netstat -anlt | grep -E '3260|31784'

tcp        0      0 0.0.0.0:31784        0.0.0.0:*            LISTEN
tcp        0      0 0.0.0.0:3260        0.0.0.0:*            LISTEN
tcp6       0      0 :::3260             :::*                  LISTEN
```

## Post-installation configuration

After the ONTAP Mediator service is installed and running, additional configuration tasks must be performed in the ONTAP storage system to use the Mediator features:

- To use the ONTAP Mediator service in a MetroCluster IP configuration, see [Configuring the ONTAP Mediator service from a MetroCluster IP configuration](#).
- To use SnapMirror Business Continuity, see [Install ONTAP Mediator Service and confirm the ONTAP cluster configuration](#).

### Configure ONTAP Mediator security policies

The ONTAP Mediator server supports several configurable security settings. The default values for all settings are provide in a `low_space_threshold_mib: 10` read-only file:

```
/opt/netapp/lib/ontap_mediator/server_config/ontap_mediator.user_config.yaml
```

All values that are placed in the `ontap_mediator.user_config.yaml` will override the default values and be maintained across all ONTAP Mediator upgrades.

After you modify `ontap_mediator.user_config.yaml`, restart the ONTAP Mediator service:

```
systemctl restart ontap_mediator
```

The following attributes can be configured: NOTE: Other default values in the `ontap_mediator.config.yaml` should not be modified.

- **Settings used to install third-party SSL certificates as replacements for the default self-signed certificates**

```
cert_path:
  '/opt/netapp/lib/ontap_mediator/ontap_mediator/server_config/ontap_medi
tor_server.crt'
key_path:
  '/opt/netapp/lib/ontap_mediator/ontap_mediator/server_config/ontap_medi
tor_server.key'
ca_cert_path:
  '/opt/netapp/lib/ontap_mediator/ontap_mediator/server_config/ca.crt'
ca_key_path:
  '/opt/netapp/lib/ontap_mediator/ontap_mediator/server_config/ca.key'
ca_serial_path:
  '/opt/netapp/lib/ontap_mediator/ontap_mediator/server_config/ca.srl'
cert_valid_days: '1095'                # Used to set the expiration
on client certs to 3 years
x509_passin_pwd: 'pass:ontap'          # passphrase for the signed
client cert
```

- **Settings that provide protections against brute-force password guessing attacks**

To enable the feature, set a value for the `window_seconds` and the `retry_limit`

Examples:

- Provide a 5-minute window for guesses, and then reset the count to zero failures:

```
authentication_lock_window_seconds: 300
```

- Lock the account if five failures occur within the window timeframe:

```
authentication_retry_limit: 5
```

- Reduce the impact of brute-force password guessing attacks by setting a delay that occurs prior to rejecting each attempt, which slows the attacks.

```
authentication_failure_delay_seconds: 5
```

```
authentication_failure_delay_seconds: 0    # seconds (float) to delay
failed auth attempts prior to response, 0 = no delay
authentication_lock_window_seconds: null   # seconds (int) since the
oldest failure before resetting the retry counter, null = no window
authentication_retry_limit: null           # number of retries to
allow before locking API access, null = unlimited
```

- **Fields that control the password complexity rules of the ONTAP Mediator API user account**

```
password_min_length: 8

password_max_length: 64

password_uppercase_chars: 0    # min. uppercase characters
password_lowercase_chars: 1    # min. lowercase character
password_special_chars: 1      # min. non-letter, non-digit
password_nonletter_chars: 2    # min. non-letter characters (digits,
specials, anything)
```

- **Setting that controls the required free space on the `/opt/netapp/lib/ontap_mediator` disk.**

If the space is lower than the set threshold, the service will issue a warning event.

```
low_space_threshold_mib: 10
```

## Manage the ONTAP mediator service

After you have installed ONTAP Mediator service, you may change the user name or password. You may also uninstall the ONTAP Mediator Service.

### Change the user name

#### About these tasks

These task is performed on the Linux host on which the ONTAP Mediator service is installed.

If you are unable to reach this command, you might need to run the command using the full path as shown in the following example:

```
/usr/local/bin/mediator_username
```

#### Procedure

Change the username by choosing one of the following options:

- Run the command `mediator_change_user` and respond to the prompts as shown in the following example:

```
[root@mediator-host ~]# mediator_change_user
Modify the Mediator API username by entering the following values:
  Mediator API User Name: mediatoradmin
      Password:
New Mediator API User Name: mediator
The account username has been modified successfully.
[root@mediator-host ~]#
```

- Run the following command:

```
MEDIATOR_USERNAME=mediator MEDIATOR_PASSWORD=mediator2
MEDIATOR_NEW_USERNAME=mediatoradmin mediator_change_user
```

```
[root@mediator-host ~]# MEDIATOR_USERNAME= mediator
MEDIATOR_PASSWORD='mediator2' MEDIATOR_NEW_USERNAME= mediatoradmin
mediator_change_user
The account username has been modified successfully.
[root@mediator-host ~]#
```

## Change the password

### About this task

This task is performed on the Linux host on which the ONTAP Mediator service is installed.

If you are unable to reach this command, you might need to run the command using the full path as shown in the following example:

```
/usr/local/bin/mediator_change_password
```

### Procedure

Change the password by choosing one of the following options:

- Run the `mediator_change_password` command and respond to the prompts as shown in the following example:

```
[root@mediator-host ~]# mediator_change_password
Change the Mediator API password by entering the following values:
  Mediator API User Name: mediatoradmin
    Old Password:
    New Password:
    Confirm Password:
The password has been updated successfully.
[root@mediator-host ~]#
```

- Run the following command:

```
MEDIATOR_USERNAME= mediatoradmin MEDIATOR_PASSWORD=mediator1
MEDIATOR_NEW_PASSWORD=mediator2 mediator_change_password
```

The example shows the password is changed from "mediator1" to "mediator2".

```
[root@mediator-host ~]# MEDIATOR_USERNAME=mediatoradmin
MEDIATOR_PASSWORD=mediator1 MEDIATOR_NEW_PASSWORD=mediator2
mediator_change_password
The password has been updated successfully.
[root@mediator-host ~]#
```

## Stop the ONTAP Mediator service

To stop the ONTAP Mediator service, perform the following steps:

### Steps

1. Stop the ONTAP Mediator.

```
systemctl stop ontap_mediator
```

2. Stop SCST.

```
systemctl stop mediator-scst
```

3. Disable the ONTAP Mediator and SCST.

```
systemctl disable ontap_mediator mediator-scst
```

## Re-enable the ONTAP Mediator service

To re-enable the ONTAP Mediator service, perform the following steps:

### Steps

1. Enable the ONTAP Mediator and SCST.

```
systemctl enable ontap_mediator mediator-scst
```



## 2. Start SCST.

```
systemctl start mediator-scst
```

## 3. Start ONTAP Mediator.

```
systemctl start ontap_mediator
```

## Verify the ONTAP Mediator is healthy

After the ONTAP Mediator has been installed, you should verify that the ONTAP Mediator services are running.

### Steps

#### 1. View the status of the ONTAP Mediator services:

##### a. `systemctl status ontap_mediator`

```
[root@scspr1915530002 ~]# systemctl status ontap_mediator

ontap_mediator.service - ONTAP Mediator
Loaded: loaded (/etc/systemd/system/ontap_mediator.service; enabled;
vendor preset: disabled)
Active: active (running) since Mon 2022-04-18 10:41:49 EDT; 1 weeks 0
days ago
Process: 286710 ExecStop=/bin/kill -s INT $MAINPID (code=exited,
status=0/SUCCESS)
Main PID: 286712 (uwsgi)
Status: "uWSGI is ready"
Tasks: 3 (limit: 49473)
Memory: 139.2M
CGroup: /system.slice/ontap_mediator.service
├─286712 /opt/netapp/lib/ontap_mediator/pyenv/bin/uwsgi --ini
/opt/netapp/lib/ontap_mediator/uwsgi/ontap_mediator.ini
├─286716 /opt/netapp/lib/ontap_mediator/pyenv/bin/uwsgi --ini
/opt/netapp/lib/ontap_mediator/uwsgi/ontap_mediator.ini
└─286717 /opt/netapp/lib/ontap_mediator/pyenv/bin/uwsgi --ini
/opt/netapp/lib/ontap_mediator/uwsgi/ontap_mediator.ini

[root@scspr1915530002 ~]#
```

##### b. `systemctl status mediator-scst`

```
[root@scspr1915530002 ~]# systemctl status mediator-scst
Loaded: loaded (/etc/systemd/system/mediator-scst.service;
enabled; vendor preset: disabled)
Active: active (running) since Mon 2022-04-18 10:41:47 EDT; 1
weeks 0 days ago
Process: 286595 ExecStart=/etc/init.d/scst start (code=exited,
status=0/SUCCESS)
Main PID: 286662 (iscsi-scstd)
Tasks: 1 (limit: 49473)
Memory: 1.2M
CGroup: /system.slice/mediator-scst.service
└─286662 /usr/local/sbin/iscsi-scstd

[root@scspr1915530002 ~]#
```

## 2. Confirm the ports that are used by the ONTAP Mediator service:

netstat

```
[root@scspr1905507001 ~]# netstat -anlt | grep -E '3260|31784'

tcp    0    0 0.0.0.0:31784    0.0.0.0:*        LISTEN
tcp    0    0 0.0.0.0:3260    0.0.0.0:*        LISTEN
tcp6   0    0 :::3260         :::*             LISTEN
```

## Manually uninstall SCST to perform host maintenance

To uninstall SCST, you need the SCST tar bundle that is used for the installed version of ONTAP Mediator.

### Steps

1. Download the appropriate SCST bundle (as shown in the following table) and untar it.

| For this version ... | Use this tar bundle... |
|----------------------|------------------------|
| ONTAP Mediator 1.0   | scst-3.3.0.tar.bz2     |
| ONTAP Mediator 1.1   | scst-3.4.0.tar.bz2     |
| ONTAP Mediator 1.2   | scst-3.4.0.tar.bz2     |
| ONTAP Mediator 1.3   | scst-3.5.0.tar.bz2     |

|                    |                    |
|--------------------|--------------------|
| ONTAP Mediator 1.4 | scst-3.6.0.tar.bz2 |
| ONTAP Mediator 1.5 | scst-3.6.0.tar.bz2 |
| ONTAP Mediator 1.6 | scst-3.7.0.tar.bz2 |

2. Issue the following commands in the "scst" directory:

- a. `systemctl stop mediator-scst`
- b. `make scstadm_uninstall`
- c. `make iscsi_uninstall`
- d. `make usr_uninstall`
- e. `make scst_uninstall`
- f. `depmod`

## Manually install SCST to perform host maintenance

To manually install SCST, you need the SCST tar bundle that is used for the installed version of ONTAP Mediator (see the [table above](#)).

1. Issue the following commands in the "scst" directory:

- a. `make 2release`
- b. `make scst_install`
- c. `make usr_install`
- d. `make iscsi_install`
- e. `make scstadm_install`
- f. `depmod`
- g. `cp scst/src/certs/scst_module_key.der /opt/netapp/lib/ontap_mediator/ontap_mediator/SCST_mod_keys/.`
- h. `cp scst/src/certs/scst_module_key.der /opt/netapp/lib/ontap_mediator/ontap_mediator/SCST_mod_keys/.`
- i. `patch /etc/init.d/scst < /opt/netapp/lib/ontap_mediator/systemd/scst.patch`

2. (Optional) If Secure Boot is enabled, before you reboot, perform the following steps:

- a. Determine each file name for "scst\_vdisk", "scst", and "iscsi\_scst" modules.

```
[root@localhost ~]# modinfo -n scst_vdisk
[root@localhost ~]# modinfo -n scst
[root@localhost ~]# modinfo -n iscsi_scst_vdisk
```

- b. Determine the kernel release.

```
[root@localhost ~]# uname -r
```

c. Sign each file with the kernel.

```
[root@localhost ~]# /usr/src/kernels/<KERNEL-RELEASE>/scripts/sign-  
file \sha256 \  
/opt/netapp/lib/ontap_mediator/ontap_mediator/SCST_mod_keys/scst_modu  
le_key.priv \  
/opt/netapp/lib/ontap_mediator/ontap_mediator/SCST_mod_keys/scst_modu  
le_key.der \  
_module-filename_
```

d. Install correct key with the UEFI firmware.

Instructions for installing the UEFI key are located at:

```
/opt/netapp/lib/ontap_mediator/ontap_mediator/SCST_mod_keys/README.module-  
signing
```

The generated UEFI key is located at:

```
/opt/netapp/lib/ontap_mediator/ontap_mediator/SCST_mod_keys/scst_module_key.  
der
```

3. Perform a reboot.

```
reboot
```

## Uninstall the ONTAP Mediator service

### Before you begin

If necessary, you can remove the ONTAP Mediator service. The Mediator must be disconnected from ONTAP before you remove the Mediator service.

### About this task

This task is performed on the Linux host on which the ONTAP Mediator service is installed.

If you are unable to reach this command, you might need to run the command using the full path as shown in the following example:

```
/usr/local/bin/uninstall_ontap_mediator
```

### Step

1. Uninstall the ONTAP Mediator service:

```
uninstall_ontap_mediator
```

```
[root@mediator-host ~]# uninstall_ontap_mediator

ONTAP Mediator: Self Extracting Uninstaller

+ Removing ONTAP Mediator. (Log:
/tmp/ontap_mediator.GmRGdA/uninstall_ontap_mediator/remove.log)
+ Remove successful.
[root@mediator-host ~]#
```

## Maintain OS host for ONTAP Mediator

For optimal performance, you should maintain the host OS for ONTAP Mediator on a regular basis.

### Reboot the host

Reboot the host when the clusters are healthy. While the ONTAP Mediator is offline, the clusters are at risk of not being able to react properly to failures. A service window is recommended if a reboot is required.

ONTAP Mediator will automatically resume during a reboot and will re-enter the relationships that were previously configured with ONTAP clusters.

### Host package updates

Any library or yum packages (except the kernel) can be safely updated but might require a reboot to take effect. A service window is recommended if a reboot is required.

If you install the `yum-utils` package, use the `needs-restarting` command to detect if any package changes require a reboot.

You should reboot if any of the ONTAP Mediator dependencies are updated because they will not take immediate effect on running processes.

### Host OS minor kernel upgrades

SCST must be compiled for the kernel that is being used. To update the OS, a maintenance window is required.

#### Steps

Perform the following steps to upgrade the host OS kernel.

1. Stop the ONTAP Mediator
2. Uninstall the SCST package. (SCST doesn't provide an upgrade mechanism.)
3. Upgrade the OS, and reboot.
4. Re-install the SCST package.
5. Re-enable the ONTAP Mediator services.

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