Configure onboard key management

ONTAP 9

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Enable onboard key management in ONTAP 9.6 and later

You can use the Onboard Key Manager to authenticate cluster nodes to a FIPS drive or SED. The Onboard Key Manager is a built-in tool that serves authentication keys to nodes from the same storage system as your data. The Onboard Key Manager is FIPS-140-2 level 1 compliant.

You can use the Onboard Key Manager to secure the keys that the cluster uses to access encrypted data. You must enable Onboard Key Manager on each cluster that accesses an encrypted volume or a self-encrypting disk.

What you'll need

- If you are using NSE with an external key management (KMIP) server, you must have deleted the external key manager database.

  Transitioning to onboard key management from external key management

- You must be a cluster administrator to perform this task.
- You must configure the MetroCluster environment before the Onboard Key Manager is configured.

About this task

You must run the `security key-manager onboard enable` command each time you add a node to the cluster. In MetroCluster configurations, you must run `security key-manager onboard enable` on the local cluster first, then run `security key-manager onboard sync` on the remote cluster, using the same passphrase on each.

By default, you are not required to enter the key manager passphrase when a node is rebooted. Except in MetroCluster, you can use the `cc-mode-enabled=yes` option to require that users enter the passphrase after a reboot.

When the Onboard Key Manager is enabled in Common Criteria mode (`cc-mode-enabled=yes`), system behavior is changed in the following ways:

- The system monitors for consecutive failed cluster passphrase attempts when operating in Common Criteria mode.

  If NetApp Storage Encryption (NSE) is enabled and you fail to enter the correct cluster passphrase at boot, the system cannot authenticate to its drives and automatically reboots. To correct this, you must enter the correct cluster passphrase at the boot prompt. Once booted, the system allows up to 5 consecutive attempts to correctly enter the cluster passphrase in a 24-hour period for any command that requires the cluster passphrase as a parameter. If the limit is reached (for example, you have failed to correctly enter the cluster passphrase 5 times in a row) then you must either wait for the 24-hour timeout period to elapse, or you must reboot the node, in order to reset the limit.

- System image updates use the NetApp RSA-3072 code signing certificate together with SHA-384 code signed digests to check the image integrity instead of the usual NetApp RSA-2048 code signing certificate and SHA-256 code signed digests.

  The upgrade command verifies that the image contents have not been altered or corrupted by checking various digital signatures. The image update process proceeds to the next step if validation succeeds; otherwise, the image update fails. See the “cluster image” man page for information concerning system updates.

The Onboard Key Manager stores keys in volatile memory. Volatile memory contents are cleared when the system is rebooted or halted. Under normal operating conditions, volatile memory contents will be cleared within 30s when a system is halted.

Steps

1. Start the key manager setup command:

   ```
   security key-manager onboard enable -cc-mode-enabled yes|no
   ```

   Set `cc-mode-enabled=yes` to require that users enter the key manager passphrase after a reboot. The `- cc-mode-enabled` option is not supported in MetroCluster configurations. The `security key-manager onboard enable` command replaces the `security key-manager setup` command.

   The following example starts the key manager setup command on cluster1 without requiring that the passphrase be entered after every reboot:

   ```
   cluster1::> security key-manager onboard enable

   Enter the cluster-wide passphrase for onboard key management in Vserver
   "cluster1"::    <32..256 ASCII characters long text>
   Reenter the cluster-wide passphrase:    <32..256 ASCII characters long
   text>
   ```

2. At the passphrase prompt, enter a passphrase between 32 and 256 characters, or for “cc-mode”, a

passphrase between 64 and 256 characters.

> If the specified “cc-mode” passphrase is less than 64 characters, there is a five-second delay before the key manager setup operation displays the passphrase prompt again.

3. At the passphrase confirmation prompt, reenter the passphrase.
4. Verify that the authentication keys have been created:

```
security key-manager key query -node node
```

> The `security key-manager key query` command replaces the `security key-manager query key` command. For complete command syntax, see the man page.

The following example verifies that authentication keys have been created for `cluster1`:

```
cluster1::> security key-manager key query
       Vserver: cluster1
   Key Manager: onboard
          Node: node1

Key Tag                                  Key Type  Restored
---------------------------------------  --------  --------
node1                                    NSE-AK    yes
    Key ID:
000000000000000002000000000001000c11b3863f78c2273343d7ec5a67762e00000000
00000000
node1                                    NSE-AK    yes
    Key ID:
000000000000000002000000000001006f4e2513353a674305872a4c9f3bf79700000000
00000000

       Vserver: cluster1
   Key Manager: onboard
          Node: node2

Key Tag                                  Key Type  Restored
---------------------------------------  --------  --------
node1                                    NSE-AK    yes
    Key ID:
000000000000000002000000000001000c11b3863f78c2273343d7ec5a67762e00000000
00000000
node2                                    NSE-AK    yes
    Key ID:
000000000000000002000000000001006f4e2513353a674305872a4c9f3bf79700000000
00000000
```

After you finish

Copy the passphrase to a secure location outside the storage system for future use.

All key management information is automatically backed up to the replicated database (RDB) for the cluster. You should also back up the information manually for use in case of a disaster.

Enable onboard key management in ONTAP 9.5 and earlier

You can use the Onboard Key Manager to authenticate cluster nodes to a FIPS drive or SED. The Onboard Key Manager is a built-in tool that serves authentication keys to nodes from the same storage system as your data. The Onboard Key Manager is FIPS-140-2 level 1 compliant.

You can use the Onboard Key Manager to secure the keys that the cluster uses to access encrypted data. You must enable Onboard Key Manager on each cluster that accesses an encrypted volume or a self-encrypting disk.

What you'll need

- If you are using NSE with an external key management (KMIP) server, you must have deleted the external key manager database.

  Transitioning to onboard key management from external key management

- You must be a cluster administrator to perform this task.
- You must configure the MetroCluster environment before the Onboard Key Manager is configured.

About this task

You must run the `security key-manager setup` command each time you add a node to the cluster.

If you have a MetroCluster configuration, review these guidelines:

- In ONTAP 9.5, you must run `security key-manager setup` on the local cluster and `security key-manager setup -sync-metrocluster-config yes` on the remote cluster, using the same passphrase on each.
- Prior to ONTAP 9.5, you must run `security key-manager setup` on the local cluster, wait approximately 20 seconds, and then run `security key-manager setup` on the remote cluster, using the same passphrase on each.

By default, you are not required to enter the key manager passphrase when a node is rebooted. Beginning with ONTAP 9.4, you can use the `-enable-cc-mode yes` option to require that users enter the passphrase after a reboot.

For NVE, if you set `-enable-cc-mode yes`, volumes you create with the `volume create` and `volume move start` commands are automatically encrypted. For `volume create`, you need not specify `-encrypt true`. For `volume move start`, you need not specify `-encrypt-destination true`.

After a failed passphrase attempt, you must reboot the node again.

Steps

1. Start the key manager setup:

```
security key-manager setup -enable-cc-mode yes|no
```

> Beginning with ONTAP 9.4, you can use the `-enable-cc-mode yes` option to require that users enter the key manager passphrase after a reboot. For NVE, if you set `-enable-cc-mode yes`, volumes you create with the `volume create` and `volume move start` commands are automatically encrypted.

The following example starts setting up the key manager on cluster1 without requiring that the passphrase be entered after every reboot:

```
cluster1::> security key-manager setup
Welcome to the key manager setup wizard, which will lead you through
the steps to add boot information.

...

Would you like to use onboard key-management? {yes, no} [yes]:
Enter the cluster-wide passphrase:    <32..256 ASCII characters long
text>
Reenter the cluster-wide passphrase:    <32..256 ASCII characters long
text>
```

2. Enter `yes` at the prompt to configure onboard key management.
3. At the passphrase prompt, enter a passphrase between 32 and 256 characters, or for “cc-mode”, a passphrase between 64 and 256 characters.

> If the specified “cc-mode” passphrase is less than 64 characters, there is a five-second delay before the key manager setup operation displays the passphrase prompt again.

4. At the passphrase confirmation prompt, reenter the passphrase.
5. Verify that keys are configured for all nodes:

   ```
   security key-manager key show
   ```

   For the complete command syntax, see the man page.

```
cluster1::> security key-manager key show

Node: node1
Key Store: onboard
Key ID                                                                   Used By
-------------------------------------------------------------------------
--------
000000000000000002000000000001059851742AF2703FC91369B7DB47C4722 NSE-AK
000000000000000002000000000001008C07CC0AF1EF49E0105300EFC83004BF NSE-AK

Node: node2
Key Store: onboard
Key ID                                                                   Used By
-------------------------------------------------------------------------
--------
000000000000000002000000000001059851742AF2703FC91369B7DB47C4722 NSE-AK
000000000000000002000000000001008C07CC0AF1EF49E0105300EFC83004BF NSE-AK
```

After you finish

All key management information is automatically backed up to the replicated database (RDB) for the cluster.

Whenever you configure the Onboard Key Manager passphrase, you should also back up the information manually to a secure location outside the storage system for use in case of a disaster. See Back up onboard key management information manually.

Assign a data authentication key to a FIPS drive or SED (onboard key management)

You can use the `storage encryption disk modify` command to assign a data authentication key to a FIPS drive or SED. Cluster nodes use this key to access data on the drive.

What you'll need

You must be a cluster administrator to perform this task.

About this task

A self-encrypting drive is protected from unauthorized access only if its authentication key ID is set to a non-default value. The manufacturer secure ID (MSID), which has key ID 0x0, is the standard default value for SAS drives. For NVMe drives, the standard default value is a null key, represented as a blank key ID. When you assign the key ID to a self-encrypting drive, the system changes its authentication key ID to a non-default value.

Steps

1. Assign a data authentication key to a FIPS drive or SED:

   `storage encryption disk modify -disk` *`disk_ID`* `-data-key-id` *`key_ID`*

For complete command syntax, see the man page for the command.

> You can use the `security key-manager key query -key-type NSE-AK` command to view key IDs.

```
cluster1::> storage encryption disk modify -disk 0.10.* -data-key-id
000000000000000002000000000010019215b9738bc7b43d4698c80246db1f4

Info: Starting modify on 14 disks.
      View the status of the operation by using the
      storage encryption disk show-status command.
```

2. Verify that the authentication keys have been assigned:

   `storage encryption disk show`

   For complete command syntax, see the man page.

```
cluster1::> storage encryption disk show
Disk    Mode Data Key ID
-----   ----
------------------------------------------------------------------
0.0.0   data
000000000000000002000000000010019215b9738bc7b43d4698c80246db1f4
0.0.1   data
000000000000000002000000000010059851742AF2703FC91369B7DB47C4722
[...]
```

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