Stage 5. Install and boot node4

Upgrade controllers

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During Stage 5, you install and boot node4, check that the cluster and node-management ports from node2 come online on node4, and verify the node4 installation. You also move the NAS data LIFs owned by node2 from node3 to node4 and relocate node2's aggregates from node3 to node4.

Steps

1. Install and boot node4
2. Set the FC or UTA/UTA2 configuration on node4
3. Verify the node4 installation
4. Restore key-manager configuration on node4
5. Move non-root aggregates and NAS data LIFs owned by node2 from node3 to node4

Install and boot node4

You must install node4 in the rack, transfer node2's connections to node4, boot node4, and install ONTAP. You must then reassign any of node2's spare disks, any disks belonging to the root volume, and any non-root aggregates that were not relocated to node3 earlier in the process, as outlined in this section.

About this task

The relocation operation is paused at the beginning of this stage. This process is mostly automated; the operation pauses to enable you to check its status. You must manually resume the operation.

You need to netboot node4 if it does not have the same version of ONTAP 9 that is installed on node2. After you install node4, boot it from the ONTAP 9 image stored on the web server. You can then download the correct files to the boot media device for subsequent system boots, by following the instructions in Prepare for netboot.

Important:

- If you are upgrading a V-Series system connected to storage arrays or a system with FlexArray Virtualization software that is connected to storage arrays, you must complete Step 1 through Step 21, then leave this section and follow instructions to Configure FC ports on node4 and to Check and configure UTA/UTA2 ports on node4, entering commands in Maintenance mode. You must then return to this section and resume with Step 23.
- However, if you are upgrading a system with storage disks, you must complete this entire section and then proceed to Set the FC or UTA/UTA2 configuration on node4, entering commands at the cluster prompt.

Steps

1. Make sure that node4 has sufficient rack space.

   If node4 is in a separate chassis from node2, you can put node4 in the same location as node3. If node2 and node4 are in the same chassis, then node4 is already in its appropriate rack location.

2. Install node4 in the rack, following the instructions in the *Installation and Setup Instructions* for the node model.
3. Cable node4, moving the connections from node2 to node4.

   Cable the following connections, using the instructions in the *Installation and Setup Instructions* or the *FlexArray Virtualization Installation Requirements and Reference* for the node4 platform, the appropriate disk shelf document, and *High Availability management*.

   Refer to References to link to the *FlexArray Virtualization Installation Requirements and Reference* and *High Availability management*.

   - Console (remote management port)
   - Cluster ports
   - Data ports
   - Cluster and node management ports
   - Storage
   - SAN configurations: iSCSI Ethernet and FC switch ports

   > You might not need to move the interconnect card/FC-VI card or interconnect/FC-VI cable connection from node2 to node4 because most platform models have unique interconnect card models.
   > For the MetroCluster configuration, you must move the FC-VI cable connections from node2 to node4. If the new host does not have an FC-VI card, you might need to move the FC-VI card.

4. Turn on the power to node4, and then interrupt the boot process by pressing `Ctrl-C` at the console terminal to access the boot environment prompt.

   When you boot node4, you might see the following warning message:

   ```
   WARNING: The battery is unfit to retain data during a power outage. This
   is likely
            because the battery is discharged but could be due to other
   temporary
            conditions.
            When the battery is ready, the boot process will complete
            and services will be engaged. To override this delay, press 'c'
   followed
            by 'Enter'
   ```

5. If you see the warning message in Step 4, take the following actions:
   a. Check for any console messages that might indicate a problem other than a low NVRAM battery, and, if necessary, take any required corrective action.
   b. Allow the battery to charge and the boot process to complete.

Attention: Do not override the delay; failure to allow the battery to charge could result in a loss of data.

Refer to Prepare for netboot.

6. Configure the netboot connection by choosing one of the following actions.

You must use the management port and IP as the netboot connection. Do not use a data LIF IP or a data outage might occur while the upgrade is being performed.

If Dynamic Host Configuration Protocol (DHCP) is…	Then…
Running	Configure the connection automatically by using the following command at the boot environment prompt: `ifconfig e0M -auto`
Not running	Manually configure the connection by entering the following command at the boot environment prompt: `ifconfig e0M -addr=`*`filer_addr`* `-mask=`*`netmask`* `-gw=`*`gateway`* `-dns=`*`dns_addr`* `-domain=`*`dns_domain`* *`filer_addr`* is the IP address of the storage system. *`netmask`* is the network mask of the storage system. *`gateway`* is the gateway for the storage system. *`dns_addr`* is the IP address of a name server on your network. This parameter is optional. *`dns_domain`* is the DNS domain name. This parameter is optional. **Note**: Other parameters might be necessary for your interface. Enter `help ifconfig` at the firmware prompt for details.

7. Perform netboot on node4:

For…	Then…
FAS/AFF8000 series systems	`netboot http://<web_server_ip/path_to_web-accessible_directory>/netboot/kernel`
All other systems	`netboot http://<web_server_ip/path_to_web-accessible_directory>/<ontap_version>_image.tgz`

The `<path_to_the_web-accessible_directory>` should lead to where you downloaded the `<ontap_version>_image.tgz` in Step 1 in the section Prepare for netboot.

Do not interrupt the boot.

8. From the boot menu, select option `(7) Install new software first`.

This menu option downloads and installs the new ONTAP image to the boot device.

> Disregard the following message: `This procedure is not supported for Non-Disruptive Upgrade on an HA pair`
> The note applies to nondisruptive upgrades of ONTAP, and not upgrades of controllers. Always use netboot to update the new node to the desired image. If you use another method to install the image on the new controller, the wrong image might install. This issue applies to all ONTAP releases.

9. If you are prompted to continue the procedure, enter `y`, and when prompted for the package, enter the URL:

   `http://<web_server_ip/path_to_web-accessible_directory>/<ontap_version>_image.tgz`

10. Complete the following substeps to reboot the controller module:

    a. Enter `n` to skip the backup recovery when you see the following prompt:

    ```
    Do you want to restore the backup configuration now? {y|n}
    ```

    b. Reboot by entering `y` when you see the following prompt:

    ```
    The node must be rebooted to start using the newly installed
    software. Do you want to reboot now? {y|n}
    ```

    The controller module reboots but stops at the boot menu because the boot device was reformatted, and the configuration data must be restored.

11. Select maintenance mode `5` from the boot menu and enter `y` when you are prompted to continue with the boot.
12. Verify that the controller and chassis are configured as HA:

    `ha-config show`

    The following example shows the output of the `ha-config show` command:

    ```
    Chassis HA configuration: ha
    Controller HA configuration: ha
    ```

    > System records in a PROM whether they are in an HA pair or stand-alone configuration. The state must be the same on all components within the stand-alone system or HA pair.

13. If the controller and chassis are not configured as HA, use the following commands to correct the configuration:

    `ha-config modify controller ha`

```
ha-config modify chassis ha
```

If you have a MetroCluster configuration, use the following commands to modify the controller and chassis:

```
ha-config modify controller mcc
```

```
ha-config modify chassis mcc
```

14. Exit maintenance mode:

```
halt
```

Interrupt the autoboot by pressing Ctrl-C at the boot environment prompt.

15. On node3, check the system date, time, and time zone:

```
date
```

16. On node4, check the date by using the following command at the boot environment prompt:

```
show date
```

17. If necessary, set the date on node4:

```
set date mm/dd/yyyy
```

18. On node4, check the time by using the following command at the boot environment prompt:

```
show time
```

19. If necessary, set the time on node4:

```
set time hh:mm:ss
```

20. If necessary, set the partner system ID on node4:

```
setenv partner-sysid node2_sysid
```

a. Save the settings:

```
saveenv
```

21. On the new node, in boot loader, the `partner-sysid` parameter must be set. For node4, `partner-sysid` must be that of node3. Verify the `partner-sysid` for node3:

```
printenv partner-sysid
```

22. Take one of the following actions:

If your system…	Then…
Has disks and no back-end storage	Go to Step 23.

If your system…	Then…
Is a V-Series system or a system with FlexArray Virtualization software connected to storage arrays	a. Go to section Set the FC or UTA/UTA2 configuration on node4 and complete the subsections in this section. b. Return to this section and complete the remaining steps, beginning with Step 23. **Important**: You must reconfigure FC onboard ports, CNA onboard ports, and CNA cards before you boot ONTAP on the V-Series or system with FlexArray Virtualization software.

23. Add the FC initiator ports of the new node to the switch zones.

    If your system has a tape SAN, then you need zoning for the initiators. If required, modify the onboard ports to initiator by referring to the Configure FC ports on node4. See your storage array and zoning documentation for further instructions on zoning.

24. Add the FC initiator ports to the storage array as new hosts, mapping the array LUNs to the new hosts.

    See your storage array and zoning documentation for instructions.

25. Modify the worldwide port name (WWPN) values in the host or volume groups associated with array LUNs on the storage array.

    Installing a new controller module changes the WWPN values associated with each onboard FC port.

26. If your configuration uses switch-based zoning, adjust the zoning to reflect the new WWPN values.

27. If NetApp Storage Encryption (NSE) is in use on this configuration, the `setenv bootarg.storageencryption.support` command must be set to `true`, and the `kmip.init.maxwait` variable must be set to `off` to avoid a boot loop after the node2 configuration is loaded:

    ```
    setenv bootarg.storageencryption.support true

    setenv kmip.init.maxwait off
    ```

28. Boot node into boot menu:

    ```
    boot_ontap menu
    ```

    If you do not have an FC or UTA/UTA2 configuration, execute Check and configure UTA/UTA2 ports on node4, Step 15 so that node4 can recognize node2's disks.

29. For MetroCluster configuration, V-Series systems and systems with FlexArray Virtualization software connected to storage arrays you must set and configure the FC or UTA/UTA2 ports on node4 to detect the disks attached to the node.
    To complete this task, go to section Set the FC or UTA/UT2 configuration on node4.

Set the FC or UTA/UTA2 configuration on node4

If node4 has onboard FC ports, onboard unified target adapter (UTA/UTA2) ports, or a

UTA/UTA2 card, you must configure the settings before completing the rest of the procedure.

About this task

You might need to complete the Configure FC ports on node4 section, the Check and configure UTA/UTA2 ports on node4, or both sections.

> If node4 does not have onboard FC ports, onboard UTA/UTA2 ports, or a UTA/UTA2 card, and you are upgrading a system with storage disks, you can skip to Verify the node4 installation. However, if you have a V-Series system or have FlexArray Virtualization Software and are connected to storage arrays, and node4 does not have onboard FC ports, onboard UTA/ UTA2 ports, or a UTA/UTA2 card, you must return to the section *Install and boot node4* section and resume at Step 22. Make sure that node4 has sufficient rack space. If node4 is in a separate chassis from node2, you can put node4 in the same location as node3. If node2 and node4 are in the same chassis, then node4 is already in its appropriate rack location.

Choices

- Configure FC ports on node4
- Check and configure UTA/UTA2 ports on node4

Configure FC ports on node4

If node4 has FC ports, either onboard or on an FC adapter, you must set port configurations on the node before you bring it into service because the ports are not preconfigured. If the ports are not configured, you might experience a disruption in service.

Before you begin

You must have the values of the FC port settings from node2 that you saved in the section Prepare the nodes for upgrade.

About this task

You can skip this section if your system does not have FC configurations. If your system has onboard UTA/UTA2 ports or a UTA/UTA2 adapter, you configure them in Check and configure UTA/UTA2 ports on node4.

Important: If your system has storage disks, you must enter the commands in this section at the cluster prompt. If you have a V-Series system or a system with FlexArray Virtualization Software connected to storage arrays, you enter commands in this section in Maintenance mode.

Steps

1. Take one of the following actions:

If the system that you are upgrading…	Then…
Has storage disks	`system node hardware unified-connect show`
Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays	`ucadmin show`

The system displays information about all FC and converged network adapters on the system.

2. Compare the FC settings on node4 with the settings that you captured earlier from node1.
3. Take one of the following actions:

If the system that you are upgrading…	Then…

Has storage disks	Modify the FC ports on node4 as needed:
	• To program target ports:
	`ucadmin modify -m fc -t target adapter`
	• To program initiator ports:
	`ucadmin modify -m fc -t initiator adapter`
	`-t` is the FC4 type: target or initiator.

Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays	Modify the FC ports on node4 as needed: `ucadmin modify -m fc -t initiator -f adapter_port_name` `-t` is the FC4 type, target or initiator. **Note**: The FC ports must be programmed as initiators.

4. Exit Maintenance mode:

   `halt`

5. Boot the system from loader prompt:

   `boot_ontap menu`

6. After you enter the command, wait until the system stops at the boot environment prompt.
7. Select option `5` from the boot menu for maintenance mode.
8. Take one of the following actions:

If the system that you are upgrading…	Then…
Has storage disks	• Skip this section and go to Verify the node4 installation if node4 does not have a UTA/UTA2 card or UTA/UTA2 onboard ports.

If the system that you are upgrading…	Then…
Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays	• Go to Check and configure UTA/UTA2 ports on node4 if node4 has a UTA/UTA2 card or UTA/UTA2 onboard ports. • Skip the section *Check and configure UTA/UTA2 ports on node4* if node4 does not have a UTA/UTA2 card or UTA/UTA2 onboard ports, return to the section *Install and boot node4*, and resume at Step 23.

Check and configure UTA/UTA2 ports on node4

If node4 has onboard UTA/UTA2 ports or a UTA/UTA2A card, you must check the configuration of the ports and configure them, depending on how you want to use the upgraded system.

Before you begin

You must have the correct SFP+ modules for the UTA/UTA2 ports.

About this task

UTA/UTA2 ports can be configured into native FC mode or UTA/UTA2A mode. FC mode supports FC initiator and FC target; UTA/UTA2 mode allows concurrent NIC and FCoE traffic to share the same 10GbE SFP+ interface and supports FC target.

NetApp marketing materials might use the term UTA2 to refer to CNA adapters and ports. However, the CLI uses the term CNA.

UTA/UTA2 ports might be on an adapter or on the controller with the following configurations:

- UTA/UTA2 cards ordered at the same time as the controller are configured before shipment to have the personality you requested.
- UTA/UTA2 cards ordered separately from the controller are shipped with the default FC target personality.
- Onboard UTA/UTA2 ports on new controllers are configured (before shipment) to have the personality you requested.

However, you should check the configuration of the UTA/UTA2 ports on node4 and change it, if necessary.

Attention: If your system has storage disks, you enter the commands in this section at the cluster prompt unless directed to enter Maintenance mode. If you have a MetroCluster FC system, V-Series system or a system with FlexArray Virtualization software that is connected to storage arrays, you must be in Maintenance mode to configure UTA/UTA2 ports.

Steps

1. Check how the ports are currently configured by using one of the following commands on node4:

If the system…	Then…
Has storage disks	`system node hardware unified-connect show`

If the system…	Then…
Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays	`ucadmin show`

The system displays output similar to the following example:

```
*> ucadmin show
                Current  Current    Pending   Pending   Admin
Node   Adapter  Mode     Type       Mode      Type      Status
----   -------  ---      ---------  -------   --------  -------
f-a    0e       fc       initiator  -          -        online
f-a    0f       fc       initiator  -          -        online
f-a    0g       cna      target     -          -        online
f-a    0h       cna      target     -          -        online
f-a    0e       fc       initiator  -          -        online
f-a    0f       fc       initiator  -          -        online
f-a    0g       cna      target     -          -        online
f-a    0h       cna      target     -          -        online
*>
```

2. If the current SFP+ module does not match the desired use, replace it with the correct SFP+ module.

   Contact your NetApp representative to obtain the correct SFP+ module.

3. Examine the output of the `ucadmin show` command and determine whether the UTA/UTA2 ports have the personality you want.
4. Take one of the following actions:

If the CNA ports…	Then…
Do not have the personality that you want	Go to Step 5.
Have the personality that you want	Skip Step 5 through Step 12 and go to Step 13.

5. Take one of the following actions:

If you are configuring…	Then…
Ports on a UTA/UTA2 card	Go to Step 7
Onboard UTA/UTA2 ports	Skip Step 7 and go to Step 8.

6. If the adapter is in initiator mode, and if the UTA/UTA2 port is online, take the UTA/UTA2 port offline:

   `storage disable adapter` *`adapter_name`*

Adapters in target mode are automatically offline in Maintenance mode.

7. If the current configuration does not match the desired use, change the configuration as needed:

   `ucadmin modify -m fc|cna -t initiator|target adapter_name`

   - `-m` is the personality mode, FC or 10GbE UTA.
   - `-t` is the FC4 type, `target` or `initiator`.

   > You must use FC initiator for tape drives, FlexArray Virtualization systems, and MetroCluster configurations. You must use the FC target for SAN clients.

8. Verify the settings by using the following command and examining its output:

   `ucadmin show`

9. Verify the settings:

If the system…	Then…
Has storage disks	`ucadmin show`
Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays	`ucadmin show`

   The output in the following examples shows that the FC4 type of adapter "1b" is changing to `initiator` and that the mode of adapters "2a" and "2b" is changing to `cna`:

```
*> ucadmin show
Node  Adapter  Current Mode  Current Type  Pending Mode  Pending Type
Admin Status
----  -------  ------------  ------------  ------------  ------------
------------
f-a   1a       fc             initiator    -             -
online
f-a   1b       fc             target       -             initiator
online
f-a   2a       fc             target       cna           -
online
f-a   2b       fc             target       cna           -
online
4 entries were displayed.
*>
```

10. Place any target ports online by entering one of the following commands, once for each port:

If the system…	Then…
Has storage disks	`network fcp adapter modify -node node_name -adapter adapter_name -state up`
Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays	`fcp config adapter_name up`

11. Cable the port.

12. Take one of the following actions:

If the system…	Then…
Has storage disks	Go to Verify the node4 installation.
Is a V-Series system or has FlexArray Virtualization Software and is connected to storage arrays	Return to the section *Install and boot node4*, and resume at Step 23.

13. Exit Maintenance mode:

```
halt
```

14. Boot node into boot menu:

```
boot_ontap menu.
```

If you are upgrading to an A800, go to Step 23

15. On node4, go to the boot menu and using 22/7 and select the hidden option `boot_after_controller_replacement`. At the prompt, enter node2 to reassign the disks of node2 to node4, as per the following example.

Expand the console output example

```
LOADER-A> boot_ontap menu
.
.
<output truncated>
.
All rights reserved.
*******************************
*                             *
* Press Ctrl-C for Boot Menu. *
*                             *
*******************************
.
<output truncated>
.
Please choose one of the following:
(1)  Normal Boot.
(2)  Boot without /etc/rc.
(3)  Change password.
(4)  Clean configuration and initialize all disks.
(5)  Maintenance mode boot.
(6)  Update flash from backup config.
(7)  Install new software first.
(8)  Reboot node.
(9)  Configure Advanced Drive Partitioning.
(10) Set Onboard Key Manager recovery secrets.
(11) Configure node for external key management.
Selection (1-11)? 22/7
(22/7)                          Print this secret List
(25/6)                          Force boot with multiple filesystem
disks missing.
(25/7)                          Boot w/ disk labels forced to clean.
(29/7)                          Bypass media errors.
(44/4a)                         Zero disks if needed and create new
flexible root volume.
(44/7)                          Assign all disks, Initialize all
disks as SPARE, write DDR labels
.
.
<output truncated>
.
.
(wipeconfig)                        Clean all configuration on boot
device
(boot_after_controller_replacement) Boot after controller upgrade
```

```
(boot_after_mcc_transition)         Boot after MCC transition
(9a)                                Unpartition all disks and remove
their ownership information.
(9b)                                Clean configuration and
initialize node with partitioned disks.
(9c)                                Clean configuration and
initialize node with whole disks.
(9d)                                Reboot the node.
(9e)                                Return to main boot menu.
The boot device has changed. System configuration information could
be lost. Use option (6) to
restore the system configuration, or option (4) to initialize all
disks and setup a new system.
Normal Boot is prohibited.
Please choose one of the following:
(1)  Normal Boot.
(2)  Boot without /etc/rc.
(3)  Change password.
(4)  Clean configuration and initialize all disks.
(5)  Maintenance mode boot.
(6)  Update flash from backup config.
(7)  Install new software first.
(8)  Reboot node.
(9)  Configure Advanced Drive Partitioning.
(10) Set Onboard Key Manager recovery secrets.
(11) Configure node for external key management.
Selection (1-11)? boot_after_controller_replacement
This will replace all flash-based configuration with the last backup
to disks. Are you sure
you want to continue?: yes
.
.
<output truncated>
.
.
Controller Replacement: Provide name of the node you would like to
replace:
<nodename of the node being replaced>
Changing sysid of node node2 disks.
Fetched sanown old_owner_sysid = 536940063 and calculated old sys id
= 536940063
Partner sysid = 4294967295, owner sysid = 536940063
.
.
<output truncated>
.
```

```
.
varfs_backup_restore: restore using /mroot/etc/varfs.tgz
varfs_backup_restore: attempting to restore /var/kmip to the boot
device
varfs_backup_restore: failed to restore /var/kmip to the boot device
varfs_backup_restore: attempting to restore env file to the boot
device
varfs_backup_restore: successfully restored env file to the boot
device wrote
    key file "/tmp/rndc.key"
varfs_backup_restore: timeout waiting for login
varfs_backup_restore: Rebooting to load the new varfs
Terminated
<node reboots>
System rebooting...
.
.
Restoring env file from boot media...
copy_env_file:scenario = head upgrade
Successfully restored env file from boot media...
Rebooting to load the restored env file...
.
System rebooting...
.
.
.
<output truncated>
.
.
.
.
WARNING: System ID mismatch. This usually occurs when replacing a
boot device or NVRAM cards!
Override system ID? {y|n} y
.
.
.
.
Login:
```

In the above console output example, ONTAP will prompt you for the partner node name if the system uses Advanced Disk Partitioning (ADP) disks.

16. If the system goes into a reboot loop with the message `no disks found`, it indicates that the system has reset the FC or UTA/UTA2 ports back to the target mode and therefore is unable to see any disks. To

resolve this, continue with Step 17 to Step 22 or go to section Verify the node4 installation.

17. Press `Ctrl-C` during autoboot to stop the node at the `LOADER>` prompt.
18. At the loader prompt, enter maintenance mode:

    ```
    boot_ontap maint
    ```

19. In maintenance mode, display all the previously set initiator ports that are now in target mode:

    ```
    ucadmin show
    ```

    Change the ports back to initiator mode:

    ```
    ucadmin modify -m fc -t initiator -f adapter name
    ```

20. Verify that the ports have been changed to initiator mode:

    ```
    ucadmin show
    ```

21. Exit maintenance mode:

    ```
    halt
    ```

    > If you are upgrading from a system that supports external disks to a system that also supports external disks, go to Step 22.
    >
    > If you are upgrading from a system that uses external disks to a system that supports both internal and external disks, for example, an AFF A800 system, go to Step 23.

22. At the loader prompt, boot up:

    ```
    boot_ontap
    ```

    Now, on booting, the node can detect all the disks that were previously assigned to it and can boot up as expected.

23. If you are upgrading from a system with external disks to a system that supports internal and external disks (AFF A800 systems, for example), set the node2 aggregate as the root aggregate to ensure node4 boots from the root aggregate of node2. To set the root aggregate, go to the boot menu and select option `5` to enter maintenance mode.

    > **You must perform the following substeps in the exact order shown; failure to do so might cause an outage or even data loss.**

    The following procedure sets node4 to boot from the root aggregate of node2:

    a. Enter maintenance mode:

       ```
       boot_ontap maint
       ```

    b. Check the RAID, plex, and checksum information for the node2 aggregate:

       ```
       aggr status -r
       ```

c. Check the status of the node2 aggregate:

```
aggr status
```

d. If necessary, bring the node2 aggregate online:

```
aggr_online root_aggr_from_node2
```

e. Prevent the node4 from booting from its original root aggregate:

```
aggr offline root_aggr_on_node4
```

f. Set the node2 root aggregate as the new root aggregate for node4:

```
aggr options aggr_from_node2 root
```

g. Verify that the root aggregate of node4 is offline and the root aggregate for the disks brought over from node2 is online and set to root:

```
aggr status
```

> Failing to perform the previous substep might cause node4 to boot from the internal root aggregate, or it might cause the system to assume a new cluster configuration exists or prompt you to identify one.

The following shows an example of the command output:

```
-------------------------------------------------------------------
Aggr State                      Status              Options
aggr 0_nst_fas8080_15 online    raid_dp, aggr       root, nosnap=on
                                fast zeroed
                                64-bit
aggr0 offline                   raid_dp, aggr       diskroot
                                fast zeroed`
                                64-bit
-------------------------------------------------------------------
```

Verify the node4 installation

You must verify that the physical ports from node2 map correctly to the physical ports on node4. This will enable node4 to communicate with other nodes in the cluster and with the network after the upgrade.

About this task

Refer to References to link to the *Hardware Universe* to capture information about the ports on the new nodes. You will use the information later in this section.

Physical port layout might vary, depending on the model of the nodes. When the new node boots up, ONTAP will try to determine which ports should host cluster LIFs in order to automatically come into quorum.

If the physical ports on node2 do not map directly to the physical ports on node4, the subsequent section Restore network configuration on node4 must be used to repair network connectivity.

After you install and boot node4, you must verify that it is installed correctly. You must wait for node4 to join quorum and then resume the relocation operation.

At this point in the procedure, the operation will have paused as node4 joins quorum.

Steps

1. Verify that node4 has joined quorum:

   ```
   cluster show -node node4 -fields health
   ```

   The output of the `health` field should be `true`.

2. Verify that node4 is part of the same cluster as node3 and that it is healthy:

   ```
   cluster show
   ```

3. Each cluster LIF must be listening on port 7700. Verify that the cluster LIFs are listening on port 7700:

   ```
   ::> network connections listening show -vserver Cluster
   ```

   Port 7700 listening on cluster ports is the expected outcome as shown in the following example for a two-node cluster:

   ```
   Cluster::> network connections listening show -vserver Cluster
   Vserver Name     Interface Name:Local Port     Protocol/Service
   ---------------- ----------------------------  -------------------
   Node: NodeA
   Cluster          NodeA_clus1:7700               TCP/ctlopcp
   Cluster          NodeA_clus2:7700               TCP/ctlopcp
   Node: NodeB
   Cluster          NodeB_clus1:7700               TCP/ctlopcp
   Cluster          NodeB_clus2:7700               TCP/ctlopcp
   4 entries were displayed.
   ```

4. If necessary, for each cluster LIF that is not listening on port 7700, set the administrative status of the LIF to `down` and then `up`:

   ```
   ::> net int modify -vserver Cluster -lif cluster-lif -status-admin down; net
   int modify -vserver Cluster -lif cluster-lif -status-admin up
   ```

   Repeat Step 3 to verify that the cluster LIF is now listening on port 7700.

5. Switch to advanced privilege mode:

   ```
   set advanced
   ```

6. Check the status of the controller replacement operation and verify that it is in a paused state and in the same state it was in before node2 was halted to perform the physical tasks of installing new controllers and

moving cables:

```
system controller replace show

system controller replace show-details
```

7. If you are working on a MetroCluster system, verify that the replaced controller is configured correctly for the MetroCluster configuration; the MetroCluster configuration should be in a healthy state. Refer to Verify the health of the MetroCluster configuration.

   Reconfigure the intercluster LIFs on MetroCluster node node4, and check cluster peering to restore communication between the MetroCluster nodes before proceeding to Step 6.

   Check the MetroCluster node status:

   ```
   metrocluster node show
   ```

8. Resume the controller replacement operation:

   ```
   system controller replace resume
   ```

9. Controller replacement will pause for intervention with the following message:

```
Cluster::*> system controller replace show
Node             Status                        Error-Action
---------------- ------------------------
-----------------------------------
Node2(now node4) Paused-for-intervention      Follow the instructions
given in
                                               Step Details
Node2

Step Details:
-------------------------------------------
To complete the Network Reachability task, the ONTAP network
configuration must be
manually adjusted to match the new physical network configuration of the
hardware.
This includes:

1. Re-create the interface group, if needed, before restoring VLANs. For
detailed
commands and instructions, refer to the "Re-creating VLANs, ifgrps, and
broadcast
domains" section of the upgrade controller hardware guide for the ONTAP
version
running on the new controllers.
2. Run the command "cluster controller-replacement network displaced-
vlans show"
to check if any VLAN is displaced.
3. If any VLAN is displaced, run the command "cluster controller-
replacement
network displaced-vlans restore" to restore the VLAN on the desired
port.
2 entries were displayed.
```

In this procedure, section *Re-creating VLANs, ifgrps, and broadcast domains* has been renamed *Restoring network configuration on node4*.

10. With the controller replacement in a paused state, proceed to the next section of this document to restore network configuration on the node.

Restore network configuration on node4

After you confirm that node4 is in quorum and can communicate with node3, verify that node2's VLANs, interface groups and broadcast domains are seen on node4. Also, verify that all node4 network ports are configured in their correct broadcast domains.

About this task

For more information on creating and re-creating VLANs, interface groups, and broadcast domains, refer to References to link to *Network Management*.

Steps

1. List all the physical ports that are on upgraded node2 (referred to as node4):

   ```
   network port show -node node4
   ```

   All physical network ports, VLAN ports and interface group ports on the node are displayed. From this output you can see any physical ports that have been moved into the `Cluster` broadcast domain by ONTAP. You can use this output to aid in deciding which ports should be used as interface group member ports, VLAN base ports or standalone physical ports for hosting LIFs.

2. List the broadcast domains on the cluster:

   ```
   broadcast-domain show
   ```

3. List the network port reachability of all ports on node4:

   ```
   network port reachability show
   ```

   The output from the command looks similar to the following example:

```
clusterA::*> reachability show -node node2_node4
  (network port reachability show)
Node         Port       Expected Reachability       Reachability Status
---------    --------  --------------------------
---------------------
node2_node4
             a0a        Default:Default            no-reachability
             a0a-822    Default:822                no-reachability
             a0a-823    Default:823                no-reachability
             e0M        Default:Mgmt               ok
             e0a        Cluster:Cluster            misconfigured-
reachability
             e0b        Cluster:Cluster            no-reachability
             e0c        Cluster:Cluster            no-reachability
             e0d        Cluster:Cluster            no-reachability
             e0e        Cluster:Cluster            ok
             e0e-822    -                          no-reachability
             e0e-823    -                          no-reachability
             e0f        Default:Default            no-reachability
             e0f-822    Default:822                no-reachability
             e0f-823    Default:823                no-reachability
             e0g        Default:Default            misconfigured-
reachability
             e0h        Default:Default            ok
             e0h-822    Default:822                ok
             e0h-823    Default:823                ok
18 entries were displayed.
```

In the above example, node2_node4 is just booted after controller replacement. It has several ports that have no reachability and are pending a reachability scan.

4. Repair the reachability for each of the ports on node4 with a reachability status other than `ok`. Run the following command, first on any physical ports, then on any VLAN ports, one at a time:

   `network port reachability repair -node` *`node_name`* `-port` *`port_name`*

   The output looks like the following example:

```
Cluster ::> reachability repair -node node2_node4 -port e0h
```

```
Warning: Repairing port "node2_node4: e0h" may cause it to move into a
different broadcast domain, which can cause LIFs to be re-homed away
from the port. Are you sure you want to continue? {y|n}:
```

A warning message, as shown above, is expected for ports with a reachability status that might be different from the reachability status of the broadcast domain where it is currently located.

Review the connectivity of the port and answer `y` or `n` as appropriate.

Verify that all physical ports have their expected reachability:

```
network port reachability show
```

As the reachability repair is performed, ONTAP attempts to place the ports in the correct broadcast domains. However, if a port's reachability cannot be determined and does not belong to any of the existing broadcast domains, ONTAP will create new broadcast domains for these ports.

5. If interface group configuration does not match the new controller physical port layout, modify it by using the following steps.
   a. You must first remove physical ports that should be interface group member ports from their broadcast domain membership. You can do this by using the following command:

      ```
      network port broadcast-domain remove-ports -broadcast-domain
      broadcast_domain_name -ports node_name:port_name
      ```

   b. Add a member port to an interface group:

      ```
      network port ifgrp add-port -node node_name -ifgrp ifgrp -port port_name
      ```

   c. The interface group is automatically added to the broadcast domain about a minute after the first member port is added.
   d. Verify that the interface group was added to the appropriate broadcast domain:

      ```
      network port reachability show -node node_name -port ifgrp
      ```

      If the interface group's reachability status is not `ok`, assign it to the appropriate broadcast domain:

      ```
      network port broadcast-domain add-ports -broadcast-domain
      broadcast_domain_name -ports node:port
      ```

6. Assign appropriate physical ports to the `Cluster` broadcast domain:
   a. Determine which ports have reachability to the `Cluster` broadcast domain:

      ```
      network port reachability show -reachable-broadcast-domains Cluster:Cluster
      ```

   b. Repair any port with reachability to the `Cluster` broadcast domain, if its reachability status is not `ok`:

      ```
      network port reachability repair -node node_name -port port_name
      ```

7. Move the remaining physical ports into their correct broadcast domains by using one of the following commands:

   ```
   network port reachability repair -node node_name -port port_name
   ```

   ```
   network port broadcast-domain remove-port
   ```

`network port broadcast-domain add-port`

Verify that there are no unreachable or unexpected ports present. Check the reachability status for all physical ports by using the following command and examining the output to confirm the status is `ok`:

`network port reachability show -detail`

8. Restore any VLANs that might have become displaced by using the following steps:
   a. List displaced VLANs:

      `cluster controller-replacement network displaced-vlans show`

      Output like the following should display:

      ```
      Cluster::*> displaced-vlans show
      (cluster controller-replacement network displaced-vlans show)
                  Original
      Node        Base Port     VLANs
      ---------   ---------
      ------------------------------------------------------
      Node1       a0a           822, 823
                  e0e           822, 823
      ```

   b. Restore VLANs that were displaced from their previous base ports:

      `cluster controller-replacement network displaced-vlans restore`

      The following is an example of restoring VLANs that have been displaced from interface group a0a back onto the same interface group:

      ```
      Cluster::*> displaced-vlans restore -node node2_node4 -port a0a
      -destination-port a0a
      ```

      The following is an example of restoring displaced VLANs on port "e0e" to "e0h":

      ```
      Cluster::*> displaced-vlans restore -node node2_node4 -port e0e
      -destination-port e0h
      ```

      When a VLAN restore is successful, the displaced VLANs are created on the specified destination port. The VLAN restore fails if the destination port is a member of an interface group, or if the destination port is down.

      Wait about one minute for newly restored VLANs to be placed into their appropriate broadcast domains.

   c. Create new VLAN ports as needed for VLAN ports that are not in the `cluster controller-replacement network displaced-vlans show` output but should be configured on other

physical ports.

9. Delete any empty broadcast domains after all port repairs have been completed:

   `broadcast-domain delete -broadcast-domain` *`broadcast_domain_name`*

10. Verify port reachability:

    `network port reachability show`

    When all ports are correctly configured and added to the correct broadcast domains, the `network port reachability show` command should report the reachability status as `ok` for all connected ports, and the status as `no-reachability` for ports with no physical connectivity. If any ports report a status other than these two, perform the reachability repair and add or remove ports from their broadcast domains as instructed in Step 4.

11. Verify that all ports have been placed into broadcast domains:

    `network port show`

12. Verify that all ports in the broadcast domains have the correct maximum transmission unit (MTU) configured:

    `network port broadcast-domain show`

13. Restore LIF home ports, specifying the Vserver(s) and LIF(s) home ports, if any, that need to be restored:
    a. List any LIFs that are displaced:

       `displaced-interface show`

    b. Restore LIF home ports:

       `displaced-interface restore-home-node -node` *`node_name`* `-vserver` *`vserver_name`* `-lif-name` *`LIF_name`*

14. Verify that all LIFs have a home port and are administratively up:

    `network interface show -fields home-port, status-admin`

Restore key-manager configuration on node4

If you are using NetApp Volume Encryption (NVE) to encrypt volumes on the system you are upgrading, the encryption configuration must be synchronized to the new nodes. If you do not restore key-manager, when you relocate the node2 aggregates from node3 to node4 by using ARL, encrypted volumes will be taken offline.

About this task

Synchronize the encryption configuration to the new nodes by performing the following steps:

Steps

1. Synchronize the encryption configuration for Onboard Key Manager (OKM) by using the following command at the cluster prompt:

```
security key-manager onboard sync
```

2. Enter the cluster-wide passphrase for the OKM.

Move non-root aggregates and NAS data LIFs owned by node2 from node3 to node4

After you verify network configuration on node4 and before you relocate aggregates from node3 to node4, you must verify that the NAS data LIFs belonging to node2 that are currently on node3 are relocated from node3 to node4. You must also verify that the SAN LIFs exist on node4.

About this task

Remote LIFs handle traffic to SAN LUNs during the upgrade procedure. Moving SAN LIFs is not necessary for cluster or service health during the upgrade. SAN LIFs are not moved unless they need to be mapped to new ports. You will verify that the LIFs are healthy and located on appropriate ports after you bring node4 online.

Steps

1. Resume the relocation operation:

   ```
   system controller replace resume
   ```

   The system performs the following tasks:

   - Cluster quorum check
   - System ID check
   - Image version check
   - Target platform check
   - Network reachability check

   The operation pauses at this stage in the network reachability check.

2. Resume the relocation operation:

   ```
   system controller replace resume
   ```

   The system performs the following checks:

   - Cluster health check
   - Cluster LIF status check

   After performing these checks, the system relocates the non-root aggregates and NAS data LIFs owned by node2 to the new controller, node4.
   The controller replacement operation pauses after the resource relocation is complete.

3. Check the status of the aggregate relocation and NAS data LIF move operations:

   ```
   system controller replace show-details
   ```

   If the controller replacement procedure is paused, check and correct the error, if any, and then issue `resume` to continue the operation.

4. If necessary, restore and revert any displaced LIFs. List any displaced LIFs:

   ```
   cluster controller-replacement network displaced-interface show
   ```

   If any LIFs are displaced, restore the home node back to node4:

   ```
   cluster controller-replacement network displaced-interface restore-home-node
   ```

5. Resume the operation to prompt the system to perform the required post-checks:

   ```
   system controller replace resume
   ```

   The system performs the following post-checks:

   - Cluster quorum check
   - Cluster health check
   - Aggregates reconstruction check
   - Aggregate status check
   - Disk status check
   - Cluster LIF status check
   - Volume check

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