

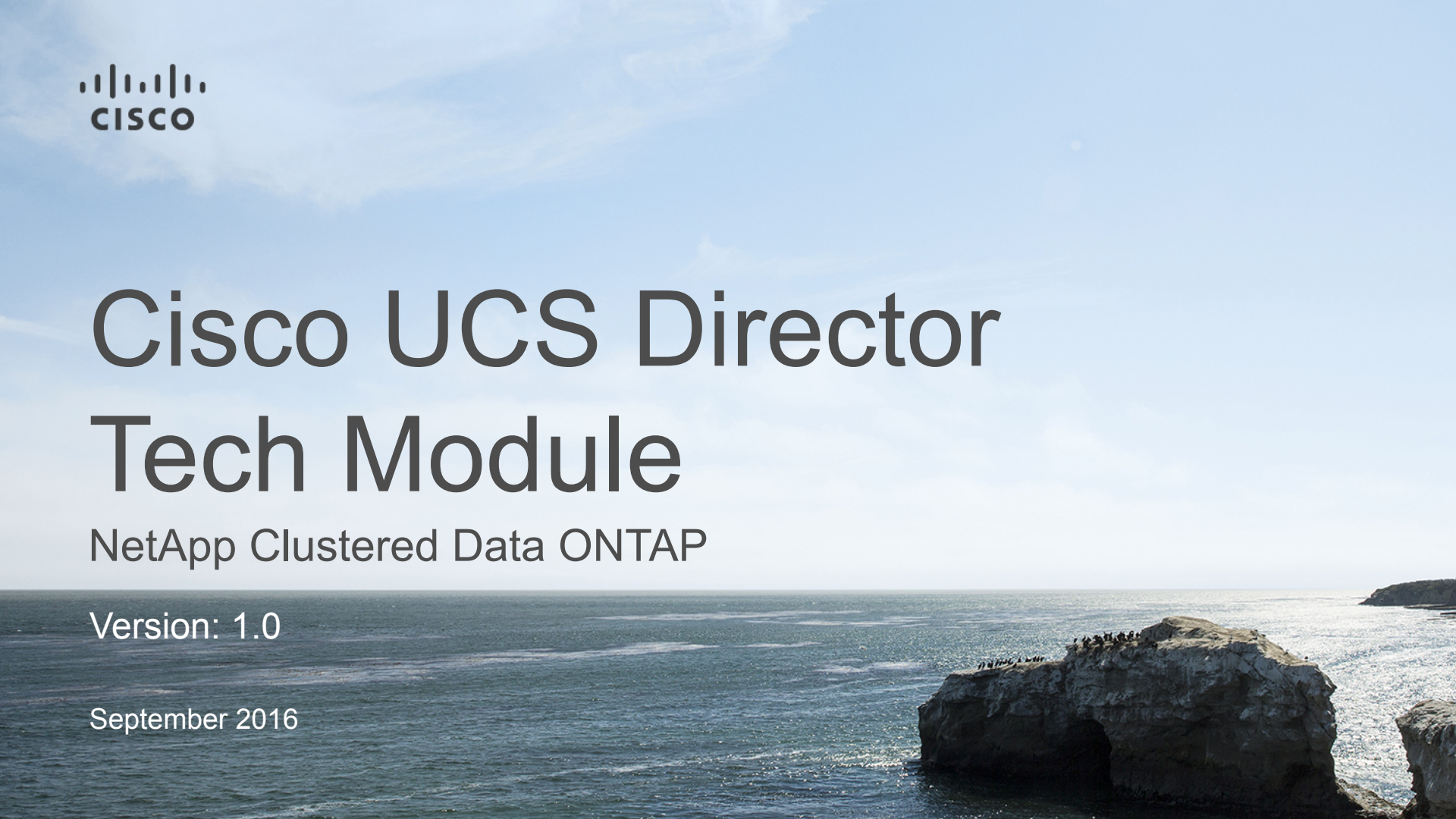


# Cisco UCS Director Tech Module

NetApp Clustered Data ONTAP

Version: 1.0

September 2016



# Agenda

- Overview & Architecture
- Hardware & Software Compatibility
- Licensing
- Orchestration Capabilities
- Reports
- Example Use-Cases



# Overview & Architecture

# NetApp Data ONTAP

- NetApp offers multiple Enterprise-level storage array platforms
  - NetApp FAS, E-Series, SolidFire, etc.
- UCS Director currently supports only the NetApp FAS storage family of arrays
- The entire family of NetApp FAS arrays run the same operating system called NetApp “Data ONTAP” or “ONTAP” for short

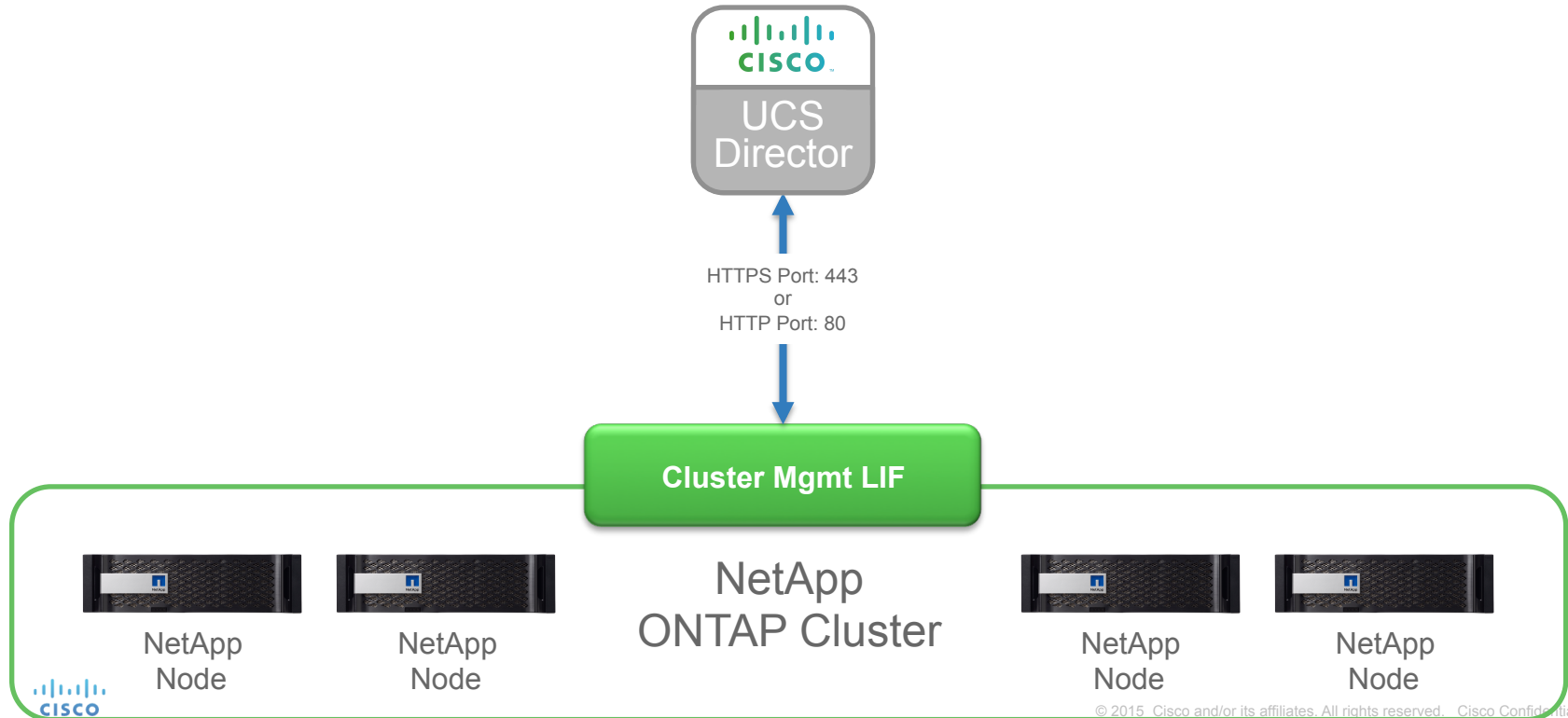


# NetApp Data ONTAP Modes

- There are two modes of operation for ONTAP...
  1. **Data ONTAP 7-Mode** – legacy mode which has been phased out as of ONTAP 8.3
  2. **Clustered Data ONTAP** – newer version of ONTAP, future of NetApp FAS arrays moving forward

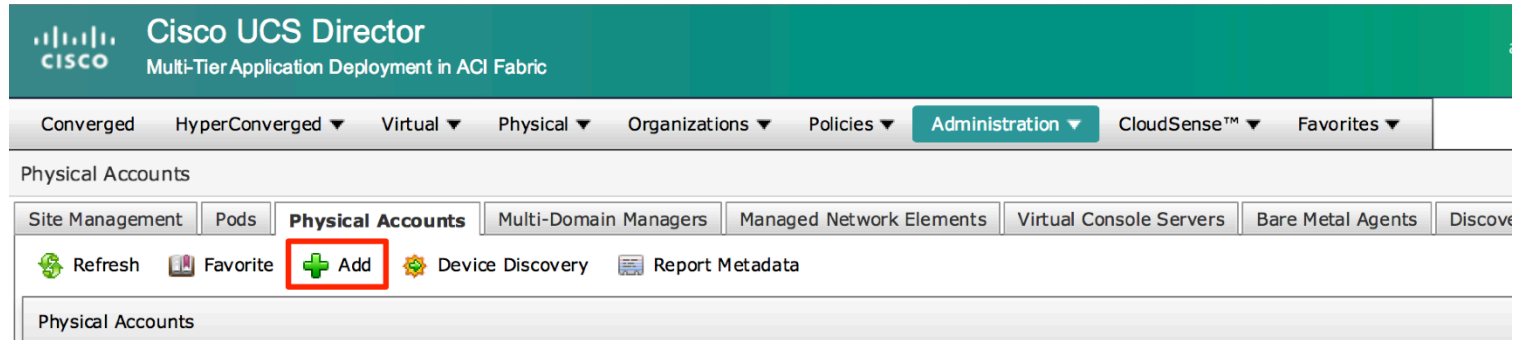
*UCS Director supports both ONTAP modes, however this tech module focuses solely on NetApp Clustered Data ONTAP*

# UCS Director and NetApp Clustered Data ONTAP Integration



# Adding a NetApp Cluster Account

- Navigate to **Administration** → **Physical Accounts**, choose the **Physical Accounts** tab and click **Add**



The screenshot displays the Cisco UCS Director web interface. At the top, the header shows the Cisco logo and the text "Cisco UCS Director Multi-Tier Application Deployment in ACI Fabric". Below the header is a navigation bar with tabs for "Converged", "HyperConverged", "Virtual", "Physical", "Organizations", "Policies", "Administration", "CloudSense™", and "Favorites". The "Administration" tab is selected. Underneath, there is a sub-section for "Physical Accounts" with several tabs: "Site Management", "Pods", "Physical Accounts", "Multi-Domain Managers", "Managed Network Elements", "Virtual Console Servers", "Bare Metal Agents", and "Discover". The "Physical Accounts" tab is active. Below the tabs, there is a toolbar with icons for "Refresh", "Favorite", "Add", "Device Discovery", and "Report Metadata". The "Add" button, represented by a green plus sign icon, is highlighted with a red square. Below the toolbar, the main content area is titled "Physical Accounts".

# Adding a NetApp Cluster Account

- Select the appropriate **Pod**
- Set **Category** to **Storage**
- Set **Account Type** to **NetApp ONTAP**

**Add Account**

Pod  \*

Category  \*

Account Type  \*



# Adding a NetApp Cluster Account

- Enter the information about the NetApp Cluster system to add the account

**Add Account**

Pod: Default Pod

Category: Storage

Account Type: NetApp ONTAP

Account Name: NetApp\_CDOT

Server Address: 172.31.241.74

Use Credential Policy

User ID: admin

Password: \*\*\*\*\*

Transport Type: https

Port: 443

Description:

Contact Email:

Location:

Service Provider:

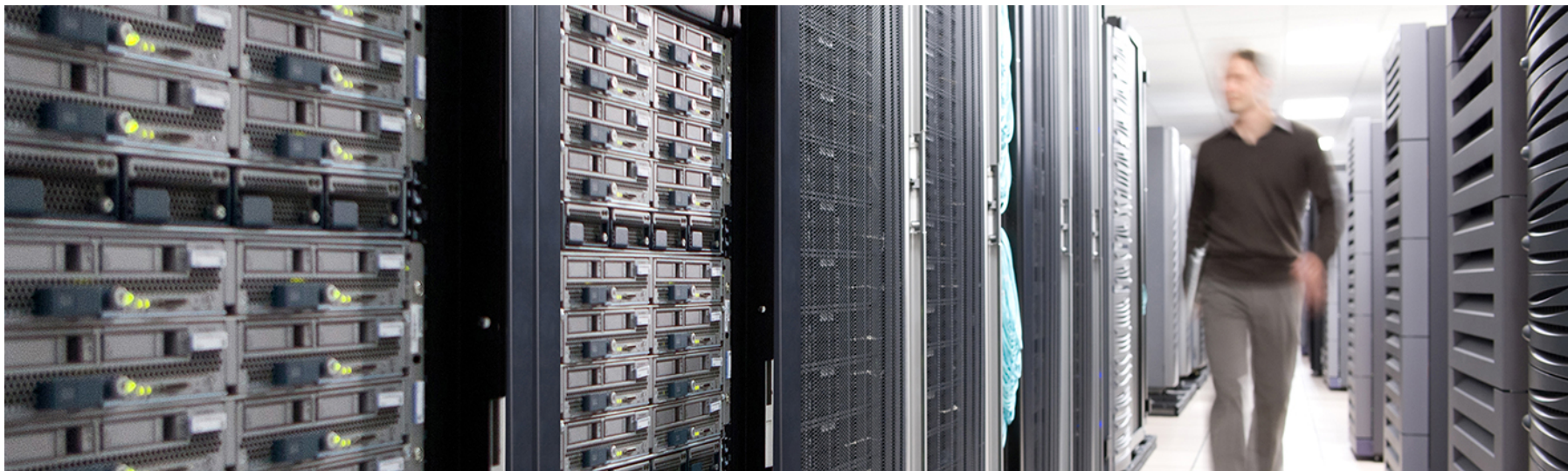
Converged HyperConverged Virtual Physical Organizations Policies Administration CloudSense™ Favorites

Physical Accounts

Site Management Pods Physical Accounts Multi-Domain Managers Managed Network Elements Virtual Console Servers Bare Metal Agents Discovered Devices

Refresh Favorite Add Device Discovery View Edit Delete Test Connection Manage Tag Add Tags Delete Tags

Account Name	Account Type	Connection St	Pod	Contact	Location	Server / Filer	Description
ACI-UCSM	UCSM	Success	myPOD			172.31.241.1 [myPOD]	
ACI_NetApp	NetApp ONTAP	Success	myPOD			172.31.241.74 [myPOD]	
NTAP-7-Mode-A	NetApp ONTAP	Success	Default Pod			172.31.240.118 [Default Pod]	



# Hardware & Software Compatibility

# IMPORTANT!!

- The following slide featuring support information may be out of date
- **ALWAYS** check the most up to date version of the UCS Director Compatibility Matrix
- The latest Compatibility Matrix and other supporting UCS Director documentation can be found at the following location:

[http://www.cisco.com/c/en/us/td/docs/unified\\_computing/ucs/ucs-director/doc-roadmap/b\\_UCSDirectorDocRoadmap.html](http://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/ucs-director/doc-roadmap/b_UCSDirectorDocRoadmap.html)

# UCS Director Clustered Data ONTAP Support

*(As of UCS Director 6.0)*

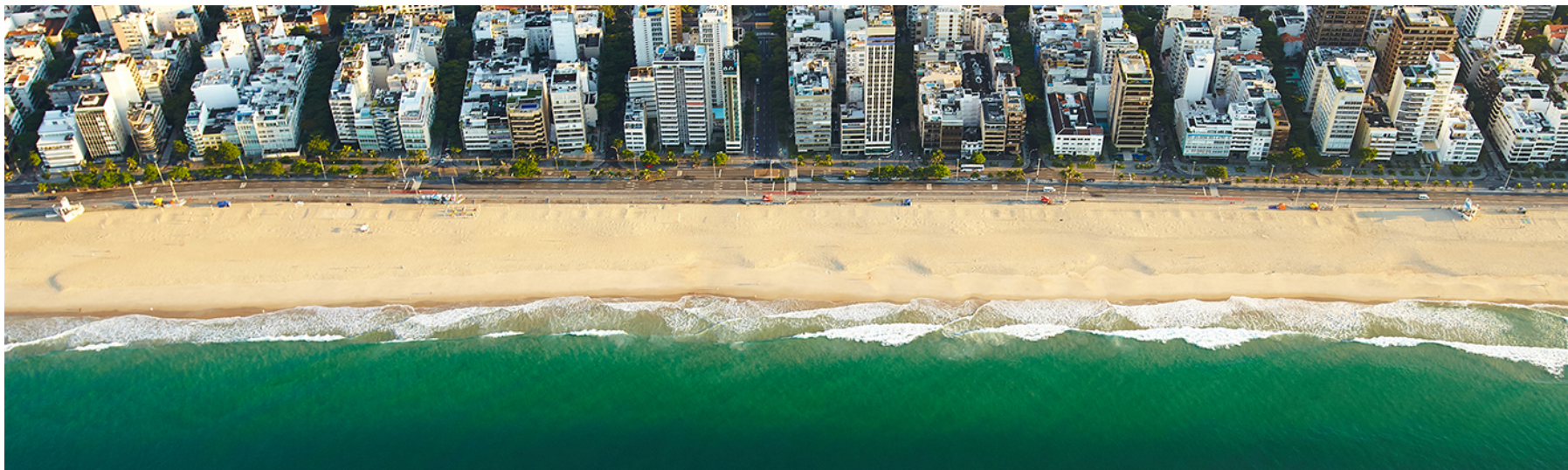
## Supported NetApp Storage Hardware Platforms

- Support all NetApp hardware platforms running a supported version of Clustered Data ONTAP software
- Support adding a Storage Virtual Machine (Vserver) as a storage device to UCS Director

## Supported Clustered ONTAP Software Versions

- 8.2.2P1
- 8.2.0
- 8.2.1
- 7.3.x
- 8.3GA
- 8.3RC2
- 8.3.1GA
- 8.3.2





# Licensing

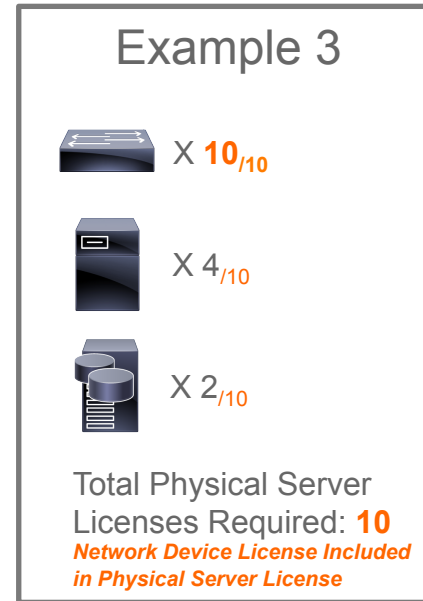
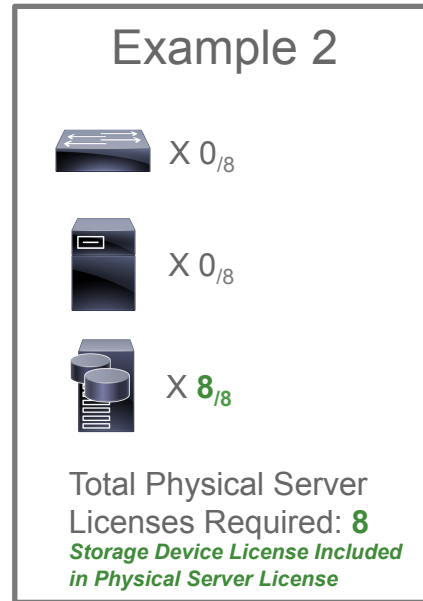
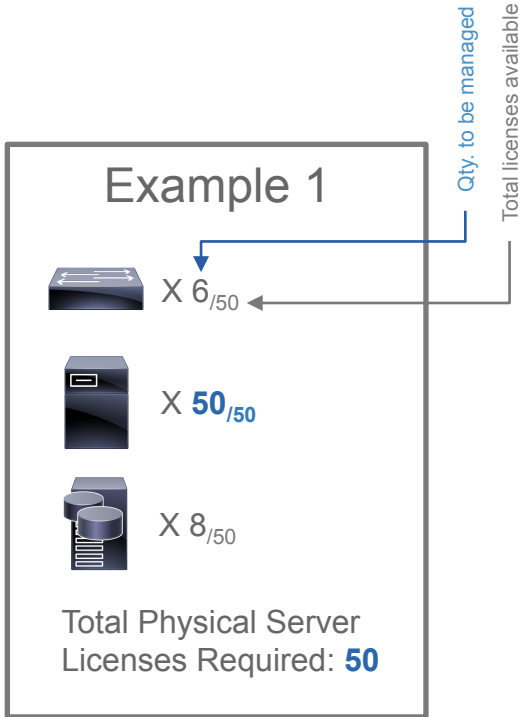
# Licensing Information

- UCS Director licensing is purchased solely in the form of physical server licenses
- However, included in each physical server license purchased is a storage device license and a network device license
- In addition to physical server tracking and licensing, UCS Director tracks the number of storage and network devices being managed against the number of licenses available
- If additional storage and/or network device licenses are required, they can be acquired by purchasing additional physical server licenses

# Licensing Information

- Each storage node (aka “controller”) in the Clustered Data ONTAP cluster requires a UCS Director storage device license
- **NOTE!:** storage device licenses are included in and solely available by purchasing additional physical server licenses

# Licensing Examples







# Orchestration Capabilities

# Orchestration Capabilities

## At ONTAP Cluster Level

### Storage Virtual Machine (SVM)

- Create Cluster SVM
- Modify Cluster SVM
- Destroy Cluster SVM

### Licensing

- Add License to Cluster
- Delete License from Cluster

### Aggregates

- Create Cluster Aggregate
- Delete Cluster Aggregate
- Add Disk to Cluster Aggregate

### CIFS

- Setup CIFS on SVM
- Modify CIFS on SVM
- Delete CIFS on SVM

### Broadcast Domains

- Create SVM Broadcast Domain
- Delete Cluster Broadcast Domain

### Routing Groups

- Create SVM Routing Group Route
- Delete SVM Routing Group Route

### SnapMirror

- Create SnapMirror Relationship
- Modify SnapMirror Relationship
- Delete SnapMirror Relationship
- Actions on SnapMirror Relationship
- Create SnapMirror Policy
- Modify SnapMirror Policy
- Delete SnapMirror Policy
- Add SnapMirror Policy Rule
- Modify SnapMirror Policy Rule
- Remove SnapMirror Policy Rule

### SIS Policy

- Create SVM SIS Policy
- Modify SVM SIS Policy
- Delete SVM SIS Policy

### NFS

- Create Cluster NFS Service
- Modify Cluster NFS Service
- Destroy Cluster NFS Service

### FCP

- Create Cluster FCP Service
- Destroy FCP Service
- Set FCP Port Name
- Start/Stop SVM FCP Service

### SVM Users

- Enable SVM User
- Modify SVM User
- Disable SVM User

### VLAN Interfaces

- Create Cluster VLAN Interface
- Delete Cluster VLAN Interface

### Deduplication

- Enable Dedupe on Cluster Flexible Volume
- Disable Dedupe on Cluster Flexible Volume

### Flexible Volumes

- Move Cluster Volume
- Clone Cluster Flexible Volume

### IPSpaces

- Create NetApp Cluster IPSpace
- Rename NetApp Cluster IPSpace
- Delete NetApp Cluster IPSpace

### Cluster Peering

- Create Cluster Peer
- Modify Cluster Peer
- Delete Cluster Peer

### Failover Groups

- Create Failover Group
- Delete Failover Group

# Orchestration Capabilities Cont...

## *At ONTAP Cluster Level*

### **Cluster SVM Peering**

- Create Cluster SVM Peer
- Delete Cluster SVM Peer
- Accept Cluster SVM Peer
- Reject Cluster SVM Peer

### **Interface Groups**

- Create Cluster Interface Group
- Delete Cluster Interface Group
- Add Port to Cluster Interface Group
- Remove Port from Cluster Interface Group

### **iSCSI**

- Create Cluster iSCSI Service
- Destroy Cluster iSCSI Service
- Start/Stop SVM iSCSI Service

### **Cron Job Schedule**

- Create Cluster Cron Job Schedule
- Modify Cluster Cron Job Schedule
- Delete Cluster Cron Job Schedule

### **Other**

- Associate Cluster Volume as NFS Datastore
- Execute NetApp Cluster CLI

### **Logical Interfaces (LIFs)**

- Create Cluster Logical Interface
- Migrate Cluster Logical Interface
- Destroy Cluster Logical Interface

# Orchestration Capabilities

## At Storage Virtual Machine (Vserver) Level

### Flexible Volumes

- Create Cluster Flexible Volume
- Modify Cluster Flexible Volume
- Destroy Cluster Flexible Volume
- Resize Cluster Volume
- Mount Cluster Volume
- Unmount Cluster Volume

### Export Policies

- Create Cluster Export Policy
- Modify Cluster Export Policy(Rename)
- Delete Cluster Export Policy
- Create Cluster Export Rule
- Modify Cluster Export Rule
- Delete Cluster Export Rule

### Initiator Groups (iGroups)

- Create Cluster Initiator Group
- Modify Cluster Initiator Group (Rename)
- Destroy Cluster Initiator Group
- Add Initiator to Cluster Initiator Group
- Remove Initiator from Cluster Initiator Group
- Add Existing Initiator to Cluster iGroup
- Map Cluster LUN to iGroup
- Unmap Cluster LUN from iGroup

### CIFS

- Create CIFS Share
- Modify CIFS Share
- Delete CIFS Share
- Create CIFS Share Access
- Modify CIFS Share Access
- Delete CIFS Share Access

### LUNs

- Create Cluster LUN
- Clone Cluster LUN
- Resize Cluster LUN
- Move Cluster LUN
- Destroy Cluster LUN

### Snapshots

- Create Cluster Snapshot Policy
- Modify Cluster Snapshot Policy
- Delete Cluster Snapshot Policy
- Add Cluster Snapshot Policy Schedule
- Modify Cluster Snapshot Policy Schedule
- Remove Cluster Snapshot Policy Schedule
- Create Cluster Volume Snapshot
- Delete Cluster Volume Snapshot
- Create Multi-Volume Snapshot
- Cluster Volume Set Snapshot Reserve
- Cluster Volume Snapshot Partial Restore File
- Cluster Volume Snapshot Restore
- Cluster Volume Snapshot Restore File

### Quotas

- Add Cluster Quota
- Modify Cluster Quota
- Delete Cluster Quota

### Qtrees

- Create Cluster Qtree
- Modify Cluster Qtree
- Destroy Cluster Qtree

### Portsets

- Create Cluster Portset
- Destroy Cluster Portset
- Add Cluster Port to Portset
- Remove Cluster Port from Portset
- Bind Cluster Initiator Group to Portset
- Unbind Cluster Initiator Group from Portset

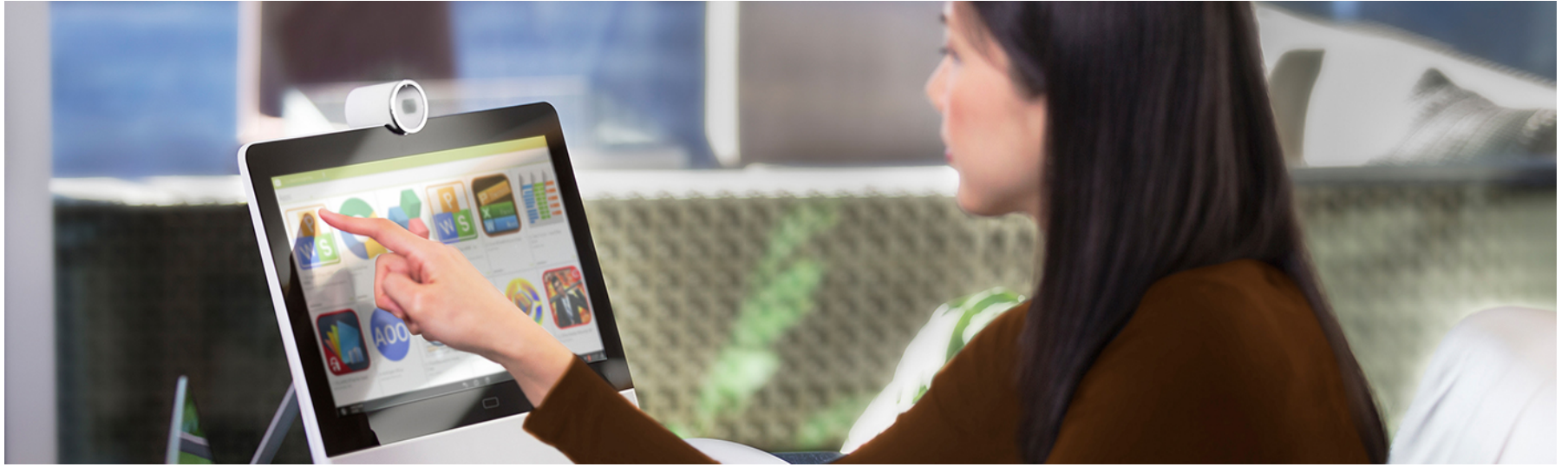
### WWPN Alias

- Create Cluster WWPN Alias
- Modify Cluster WWPN Alias
- Delete Cluster WWPN Alias

### DNS/Hosts

- Create DNS for SVM
- Modify DNS for SVM
- Create a New IP to Host Names Mapping
- Modify Hostnames to IP Mapping
- Delete IP to Host Names Mapping





# Reports

# Tabular Reports and Information

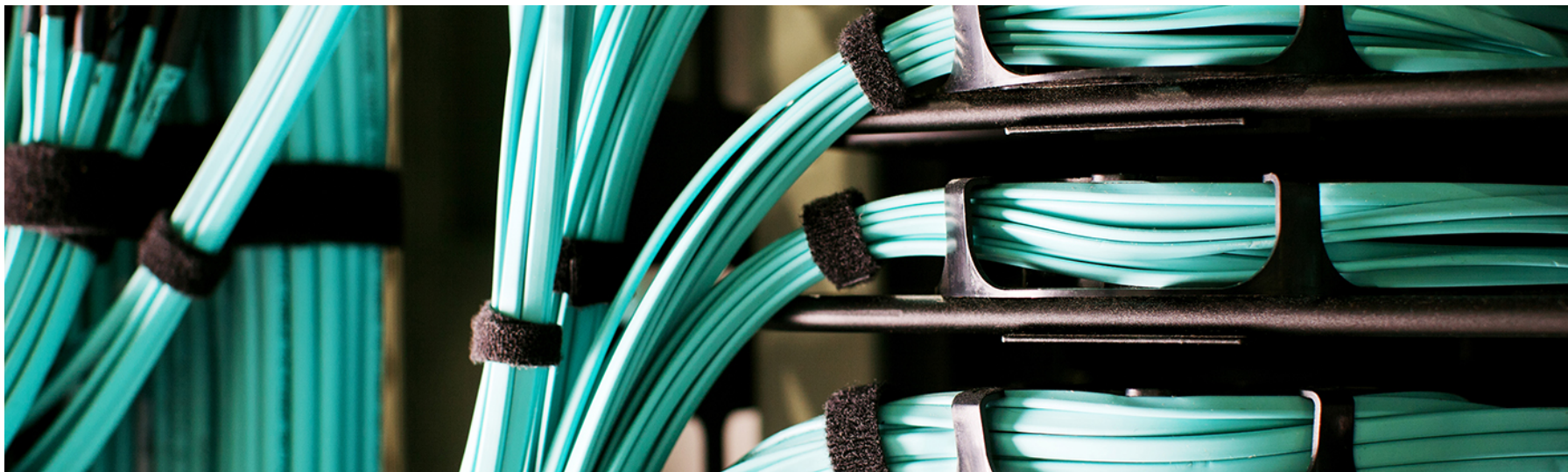
## *At ONTAP Cluster Level*

- Nodes
- Vservers
- Aggregates
- Vserver Peer
- Cluster Peer
- SnapMirrors
- SnapMirror Policies
- Jobs
- Failover Groups
- Disks
- FC Adapters
- Snapshot Policies
- Routing Group Routes
- Logical Interfaces
- Ports
- Interface Groups
- vLANs
- Licenses
- Cron Job Schedules
- NFS Services
- FCP Services
- System Tasks

# Tabular Reports and Information

## *At Storage Virtual Machine (Vserver) Level*

- Volumes
- Volume LIF Association
- LUNs
- Qtrees
- Quotas
- Initiator Groups
- Initiators
- CIFS Shares
- DNS
- IP Hostname
- SIS Policies
- Export Rules
- Snapshot Policies
- Portsets
- WWPN Aliases



# Example Use-Cases

# Example Use-Cases

- Use-Case #1: Create Cluster Storage Virtual Machine (vServer)
- Use-Case #2: Create Flexible Volume, Export via NFS and Mount on ESXi Cluster
- Use-Case #3: Create Flexible Volume and Create Mountable CIFS Share

# Use Case #1: Create Cluster Storage Virtual Machine (vServer)

- The following use case example highlights how to automate the provisioning and configuration of a new NetApp Storage Virtual Machine (vServer) with UCS Director

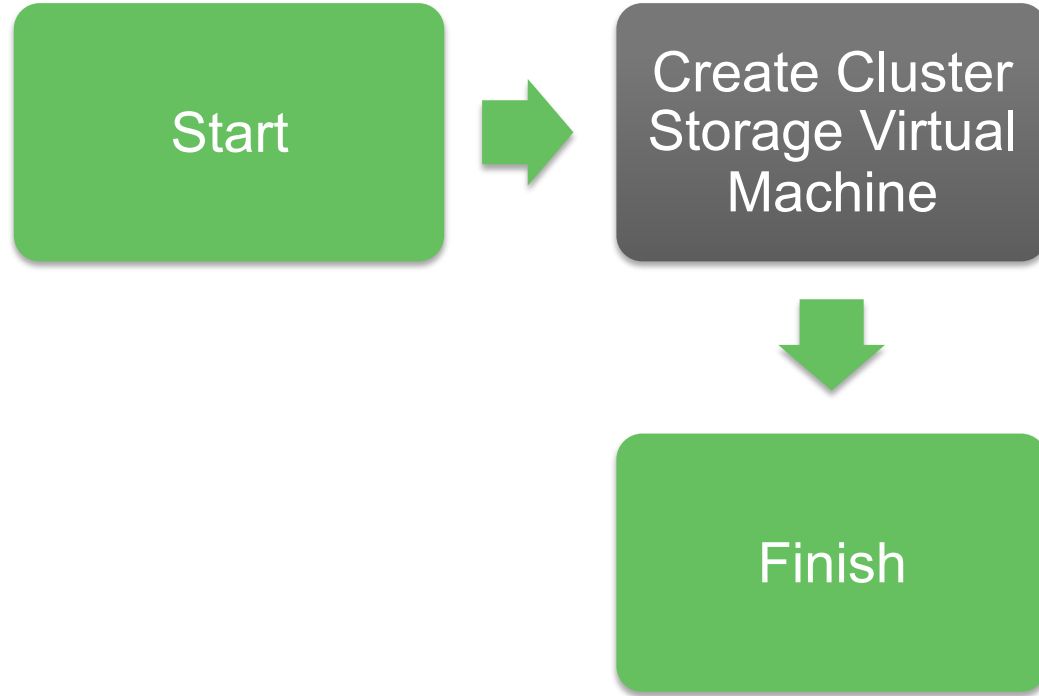
# Use Case #1: Create Cluster Storage Virtual Machine (vServer)

Pre-requisites for Use-Case #1:

- NetApp ONTAP Cluster already added to UCS Director as a storage account

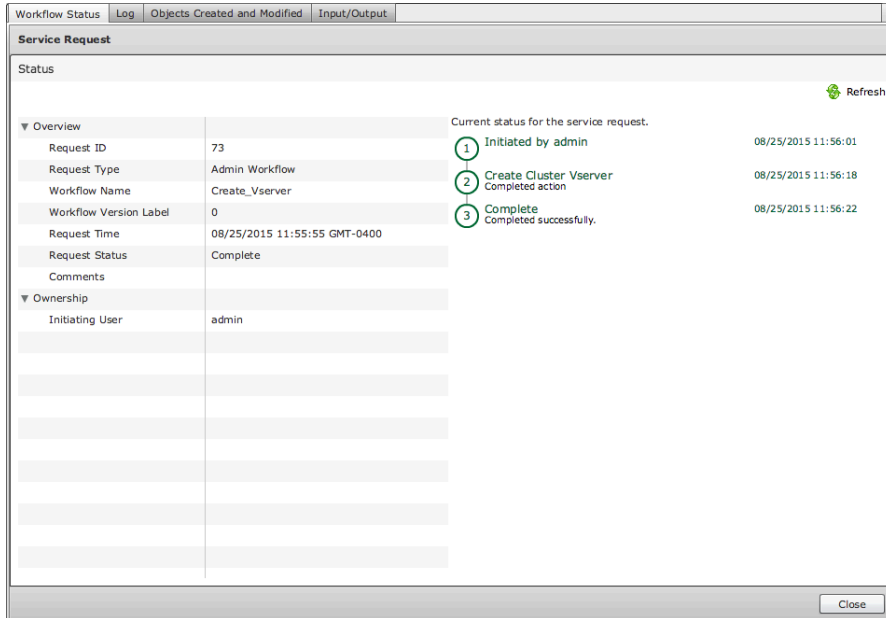


# Use Case #1: Create Cluster Storage Virtual Machine (vServer)



# Use Case #1: Create Cluster Storage Virtual Machine (vServer)

- Vserver creation successfully completed



The screenshot shows a web interface for a Service Request. The request ID is 73, initiated by admin on 08/25/2015 11:56:01. The workflow name is 'Create\_Vserver', and the status is 'Complete'. The request was completed successfully on 08/25/2015 11:56:22. The initiating user is admin.

Request ID	73	1	Initiated by admin	08/25/2015 11:56:01
Request Type	Admin Workflow	2	Create Cluster Vserver	08/25/2015 11:56:18
Workflow Name	Create_Vserver		Completed action	
Workflow Version Label	0	3	Complete	08/25/2015 11:56:22
Request Time	08/25/2015 11:55:55 GMT-0400		Completed successfully.	
Request Status	Complete			
Comments				
Ownership				
Initiating User	admin			

```
TME04-27-22-FAS8020-CLSTR::> vservers show -instance myvserver

Vserver: myvserver
Vserver Type: data
Vserver UUID: 320b29a6-4b19-11e5-a536-123478563412
Root Volume: _root
Aggregate: TME04_27_22_FAS8020_CLSTR_02_AGGR_SATA_2TB_01
Name Service Switch: file
Name Mapping Switch: file
NIS Domain: -
Root Volume Security Style: unix
LDAP Client: -
Default Volume Language Code: C.UTF-8
Snapshot Policy: default
Comment:
Quota Policy: default
List of Aggregates Assigned: -
Limit on Maximum Number of Volumes allowed: unlimited
Vserver Admin State: running
Allowed Protocols: nfs
Disallowed Protocols: cifs, fcp, iscsi, ndmp
Is Vserver with Infinite Volume: false
QoS Policy Group: -
```

# Use Case #2 : Create Flexible Volume, Export via NFS and Mount on ESXi Cluster

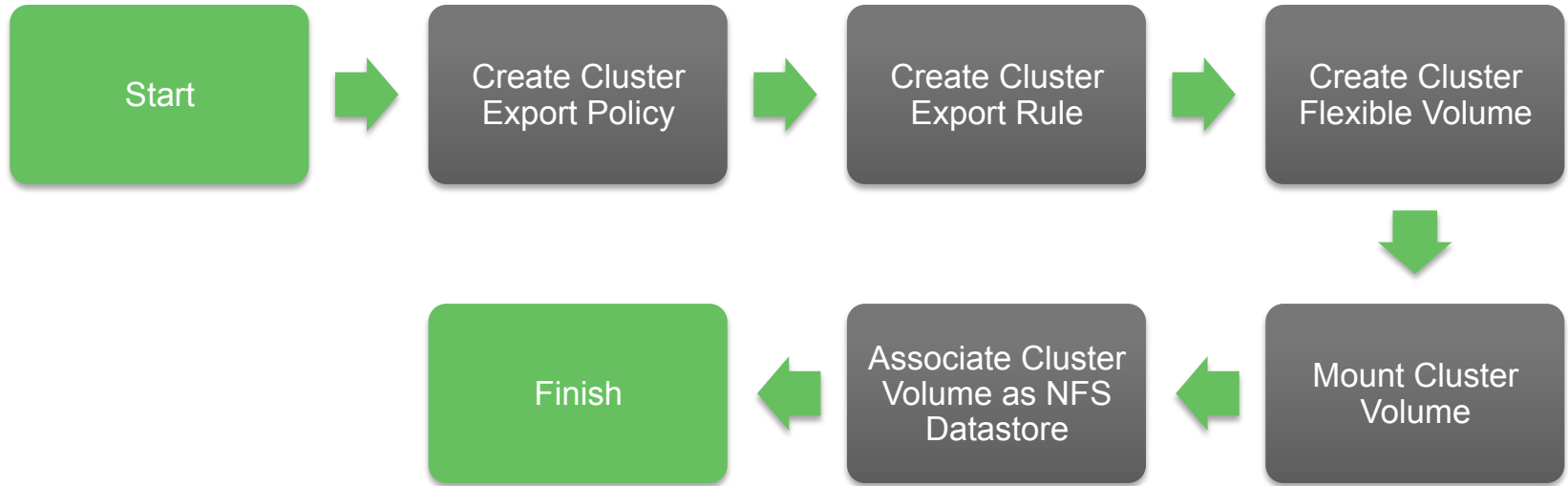
- The following use case example highlights how to automate the provisioning and configuration of a new NetApp Flexible Volume and export the Flexible Volume via NFS with UCS Director. The Flexible Volume can also further be mounted in VMware vSphere as an NFS datastore by UCS Director.

# Use Case #2 : Create Flexible Volume, Export via NFS and Mount on ESXi Cluster

Pre-requisites for Use-Case #2:

- NetApp ONTAP Cluster already added to UCS Director as a storage account
- NetApp Storage Virtual Machine already exists or created (can be automated)
- NFS Server is setup and configured on NetApp Storage Virtual Machine (can be automated)
- One or more Logical Interfaces (LIFs) already exist and are configured with network connectivity to the VMkernel ports on the ESXi hosts in the target VMware Cluster (can be automated)

# Use Case #2 : Create Flexible Volume, Export via NFS and Mount on ESXi Cluster



# Use Case #2 : Create Flexible Volume, Export via NFS and Mount on ESXi Cluster

- Datastore creation successfully completed

### Service Request

Status Refresh

▼ Overview

Request ID	853	1	Initiated by admin	08/01/2016 14:21:44
Request Type	Admin Workflow	2	Create Cluster Export Policy	08/01/2016 14:21:49
Workflow Name	Create_NetApp_Cluster_NFS_Datastore	3	Create Cluster Export Rule	08/01/2016 14:21:52
Workflow Version Label	0	4	Create Cluster Flexible Volume	08/01/2016 14:22:01
Request Time	08/01/2016 14:21:41 GMT-0400	5	Mount Cluster Volume	08/01/2016 14:22:04
Request Status	Complete	6	Associate Cluster Volume as NFS Datastore	08/01/2016 14:22:56
Comments		7	Complete	08/01/2016 14:22:57

▼ Ownership

Initiating User	admin	Completed successfully.	
-----------------	-------	-------------------------	--

The screenshot displays the VMware vCenter interface. On the left, a tree view shows the infrastructure hierarchy. The main pane shows the configuration for a datastore named 'myds01' on a host '172.31.241.76'. The 'Datastores' table lists several datastores, with 'myds01' highlighted. Below the table, the 'Datastore Details' for 'myds01' are shown, including its capacity and usage. At the bottom, the 'Recent Tasks' table shows two successful tasks: 'Create NAS datastore'.

Identification	Status	Device	Drive Type	Capacity	Free	Type	Last Update	Alarm Actions
datastore1	Normal	Local WD Disk (naa.50000c0f02d0d620)3	Non-SSD	272.00 GB	271.05 GB	VMFS5	8/1/2016 10:42:03 AM	Enabled
demo_infra_ds_1	Normal	192.168.254.10/demo_infra_ds_1	Unknown	475.00 GB	454.28 GB	NFS	8/1/2016 10:41:34 AM	Enabled
myds01	Normal	192.168.254.10/myds01	Unknown	50.00 GB	50.00 GB	NFS	8/1/2016 10:37:43 AM	Enabled
used_nas_shared_datastore	Normal	192.168.254.10/used_nas_shared_datastore	Unknown	500.00 GB	481.14 GB	NFS	8/1/2016 10:41:33 AM	Enabled

Name	Target	Status	Details	Initiated by	vCenter Server	Requested Start Time	Start Time	Completed Time
Create NAS datastore	172.31.241.77	Completed		root	aci-demo-prod	8/1/2016 10:41:33 AM	8/1/2016 10:41:33 AM	8/1/2016 10:41:34 AM
Create NAS datastore	172.31.241.76	Completed		root	aci-demo-prod	8/1/2016 10:41:32 AM	8/1/2016 10:41:32 AM	8/1/2016 10:41:33 AM

# Use Case #2 : Create Flexible Volume, Export via NFS and Mount on ESXi Cluster

- Use Case #2 workflow can be downloaded from the UCS Director community site here:  
<https://communities.cisco.com/docs/DOC-68946>
- The UCS Director community site also includes other workflows, custom tasks and information



# Use Case #3 : Create Flexible Volume and Create Mountable CIFS Share

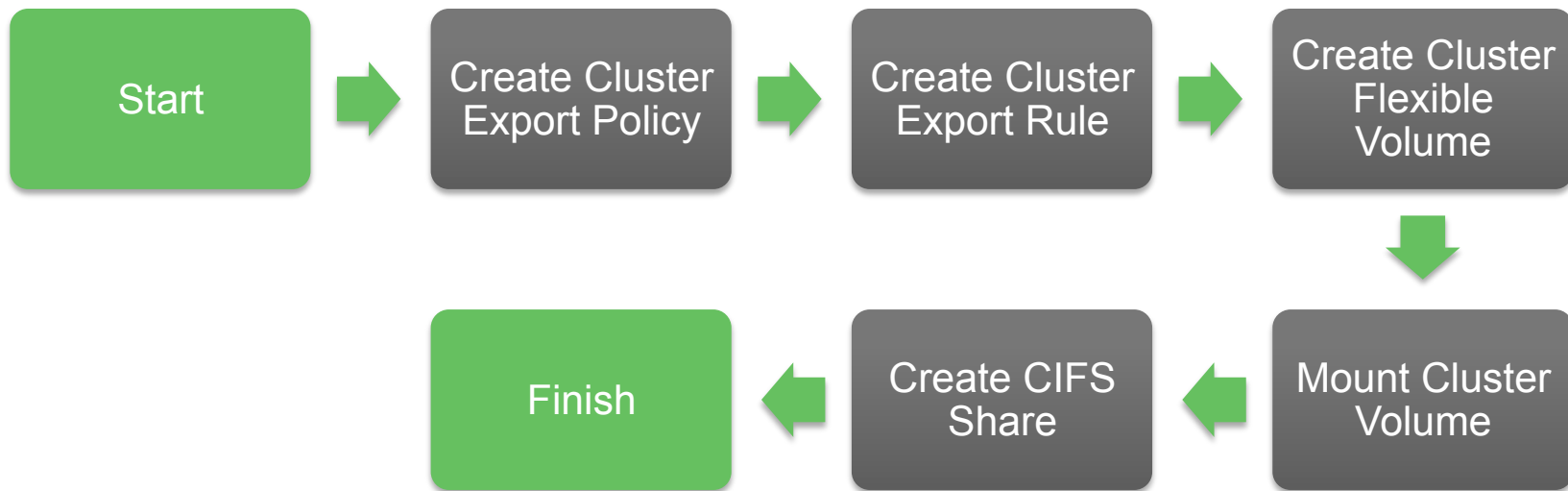
- The following use case example highlights how to automate the provisioning and configuration of a new NetApp Flexible Volume and export the Flexible Volume via CIFS as an accessible/mountable CIFS Share with UCS Director.

# Use Case #3 : Create Flexible Volume and Create Mountable CIFS Share

Pre-requisites for Use-Case #2:

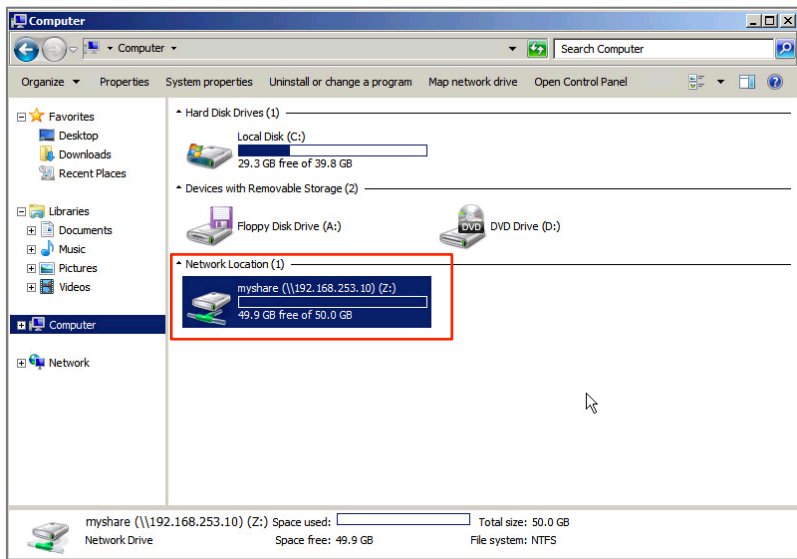
- NetApp ONTAP Cluster already added to UCS Director as a storage account
- NetApp Storage Virtual Machine already exists or created (can be automated)
- CIFS Server is setup and configured on NetApp Storage Virtual Machine (can be automated)
- One or more Logical Interfaces (LIFs) already exist and are configured with network connectivity to the required CIFS client machines

# Use Case #3 : Create Flexible Volume and Create Mountable CIFS Share



# Use Case #3 : Create Flexible Volume and Create Mountable CIFS Share

- Mountable CIFS shared created successfully



Service Request			
Status			
		Refresh	
▼ Overview		Current status for the service request.	
Request ID	867	1	Initiated by admin 09/01/2016 12:46:03
Request Type	Admin Workflow	2	Create Cluster Export Policy 09/01/2016 12:46:10
Workflow Name	Create_NetApp_Cluster_CIFS_Share	3	Create Cluster Export Rule 09/01/2016 12:46:14
Workflow Version Label	0	4	Create Cluster Flexible Volume 09/01/2016 12:46:19
Request Time	09/01/2016 12:46:00 GMT-0400	5	Mount Cluster Volume 09/01/2016 12:46:23
Request Status	Complete	6	Create CIFS Share 09/01/2016 12:46:31
Comments		7	Completed action
▼ Ownership			Complete 09/01/2016 12:46:33
Initiating User	admin		Completed successfully.
Close			

# Use Case #3 : Create Flexible Volume and Create Mountable CIFS Share

- Use Case #3 workflow can be downloaded from the UCS Director community site here:

<https://communities.cisco.com/docs/DOC-69431>

- The UCS Director community site also includes other workflows, custom tasks and information



**CISCO**

*TOMORROW starts here.*