Technical Report

FlexPod Datacenter with ONTAP 9.8, ONTAP Storage Connector for Cisco Intersight, and Cisco Intersight Managed Mode

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Abstract

FlexPod Datacenter with NetApp® ONTAP® 9.8, ONTAP Storage Connector for Cisco Intersight, and Cisco Intersight Managed Mode (IMM) brings the full value and simplicity of Intersight SaaS management to FlexPod and ONTAP data storage environments. Enterprise SAN and NAS workloads can benefit equally from the integrated management solution.

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Introduction

FlexPod is an industry-leading converged infrastructure solution from Cisco and NetApp. The FlexPod solution is always at the forefront of data center innovations. It provides a trusted and versatile platform that supports businesses and enable service providers.

The FlexPod solution delivers an integrated architecture that incorporates Cisco Unified Computing System (Cisco UCS), NetApp ONTAP storage, and Cisco Nexus or MDS network to design and implement best practices for minimizing IT risks by validating the integrated architecture and ensuring compatibility between various components. The FlexPod solution addresses IT pain points by providing documented design guidance, deployment guidance, and solution support that can be used in various stages (planning, designing, and implementation) of a deployment. The FlexPod solution can be easily scaled as requirements and demands change. The unit can be scaled both up (adding resources to a FlexPod unit) and out (adding more FlexPod units). A hybrid cloud model provides organizations the flexibility to leverage the right blend of public and private cloud services, while addressing the availability, performance, and security challenges.

To overcome the challenges of constant technology changes, NetApp and Cisco partnered to provide a single pane view of the FlexPod ecosystem. This integration simplifies and allows unified management platform for all components in the FlexPod infrastructure and FlexPod solution. This solution allows you to monitor NetApp storage, Cisco compute, and VMware inventory from Cisco Intersight. It also allows you to orchestrate or automate workflows to accomplish storage and virtualization tasks in tandem.

NetApp ONTAP 9.8

ONTAP is the industry-leading flagship data management software from NetApp that enables you to seamlessly manage and protect your data wherever it lives, whether on-premises, at the edge, or in the cloud.

Here is a summary of the new features and enhancements released in ONTAP 9.8 that are relevant to FlexPod:

- Improvement in the user interface:
  - Firmware updates via Active IQ System Manager
  - File System Analysis via Active IQ System Manager
- Data fabric enhancements:
  - S3 protocol integration in ONTAP, so it possible to use conventional FAS system as Fabric Pool target starting with ONTAP 9.8.
  - HDDs can also benefit from Fabric Pool functionality.
  - Snap Mirror backup to a cloud target at object level (S3) is now possible.
- NetApp ONTAP FlexGroup support:
  - FlexGroup datastore support for VMware
  - FlexGroup support for the Virtual Storage Console
  - NetApp SnapCenter® backup support to the FlexGroup volume
  - There are now also 1,023 NetApp Snapshot™ copies supported in the FlexGroup volumes
- Data protection enhancements:
  - NVE support for root volume encryption to protect root volume
  - New unspecified retention period for the volume
  - SnapMirror Cloud using qualified vendor applications
  - Increased concurrent SnapMirror transfer limits

  - SnapLock, the WORM function of ONTAP, now also supports a volume move. This allows you to move compliance protected volumes to another aggregate without having to make a second copy.
- NetApp MetroCluster updates:
  - Unmirrored aggregates are now officially supported. From now on, you can only protect really business-critical data with the MetroCluster feature. Data that is not so valuable for you can only be on one side of the MetroCluster feature.
- File access protocol enhancements:
  - ONTAP auditing schema reference
  - Support for SHA-2 LDAP password hashes
  - Encryption support between ONTAP and domain controllers
  - Improved NFSv4.1 performance with nconnect support
  - Support for NFSv4.2
- Hardware support updates:
  - Expanded platform support for NS224 drive shelves
  - Support for the AFF A250 platform
  - Support for the FAS500f platform
  - Support for the ASA AFF A800 platform
  - Support for the Nexus 3232C 100GbE switch (X190100 and X190100R) as a storage switch to connect NS224 NVMe drive shelves to additional platforms.

For more information about enhancements and new features, see the ONTAP 9 Release Notes.

Cisco Intersight

Cisco Intersight is a software-as-a-service (SaaS) infrastructure lifecycle management platform that delivers simplified configuration, deployment, maintenance, and support. With Cisco Intersight, customers get all of the benefits of SaaS delivery and full lifecycle management of distributed Intersight-connected servers and third-party storage systems such as NetApp across data centers, remote sites, branch offices, and edge environments. Figure 1 is a high-level overview of the Cisco Intersight platform.

Figure 1) Cisco Intersight.

Cisco Intersight capabilities include Intuitive experience, enhanced support, proactive guidance, secure and extensible SaaS. Through Device Connector technology, Cisco Intersight extends these capabilities to third-party devices. VMWare Integrations are already available in Cisco Intersight using this technology. NetApp ONTAP Connector is integrated with Cisco Intersight Assist, to extend these capabilities for NetApp ONTAP storage environment. Cisco Intersight Assist can be deployed in one of the following three modes:

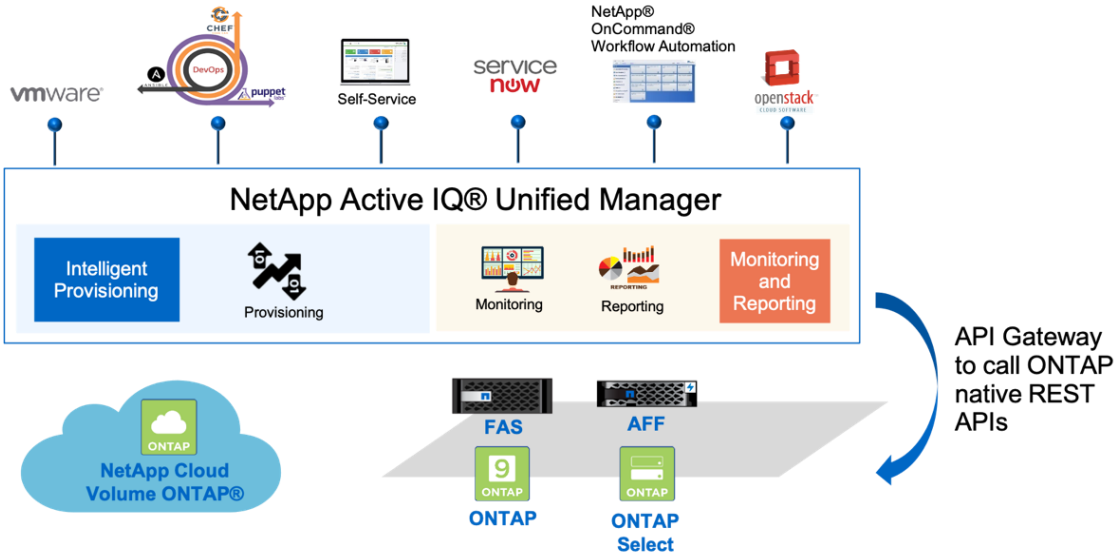
- Intersight Connected Virtual Appliance
- Intersight Private Virtual Appliance
- Intersight Assist

Concepts and Components

NetApp Active IQ Unified Manager

NetApp Active IQ Unified Manager is a centralized, multisystem storage management software that provides comprehensive monitoring, reporting and management capabilities for storage systems that run ONTAP software. Active IQ Unified Manager simplifies automation and operations management for ONTAP deployments It is feature-rich and powerful, enabling IT generalists as well as storage administrators to use it for data-center wide monitoring and management.

Figure 2) Single management across data fabric endpoints.



Active IQ Unified Manager provides REST API service Interfaces for third party integrations. It provides a Single endpoint to manage ONTAP clusters from Active IQ Unified Manager. All the APIs are divided into Data center, Administration, Gateway and Security APIs. Active IQ Unified Manager collects cluster information, stores the data in the database, and analyzes the data to see if there are any cluster issues.

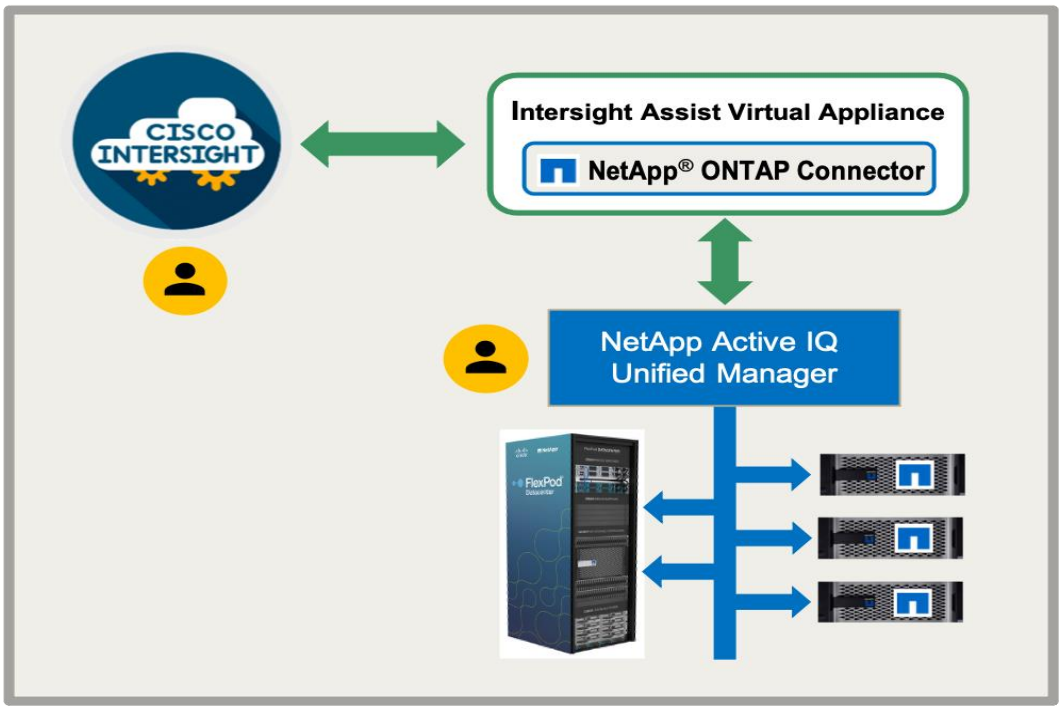
With the integration of NSLM we now have SLO APIs in Unified Manager as well, extending the use cases to monitoring as well as provisioning. For ONTAP features which are not available for management via UM APIs, Unified Manager allows tunneling/proxy of rest ONTAP URL so that you can fulfil the direct management of those ONTAP features. You can execute the ONTAP rest endpoints by knowing just the Unified Manager authentication details and then redirect to the correct cluster for executing the provided request.

NetApp ONTAP Device Connector

Cisco Intersight and NetApp Active IQ Unified Manager integrate to deliver the best in-class user experience for FlexPod Datacenter. This integration is possible because of the NetApp Device Connector support in Cisco Intersight Assist Virtual Appliance.

Device Connector is a hosting element that resides in the firmware of Cisco devices and connects the devices to Cisco Intersight. Cisco Intersight sends commands to infrastructure devices through the Device Connector. It offers a secure and encrypted link to Intersight.

Figure 3) NetApp ONTAP Device Connector.

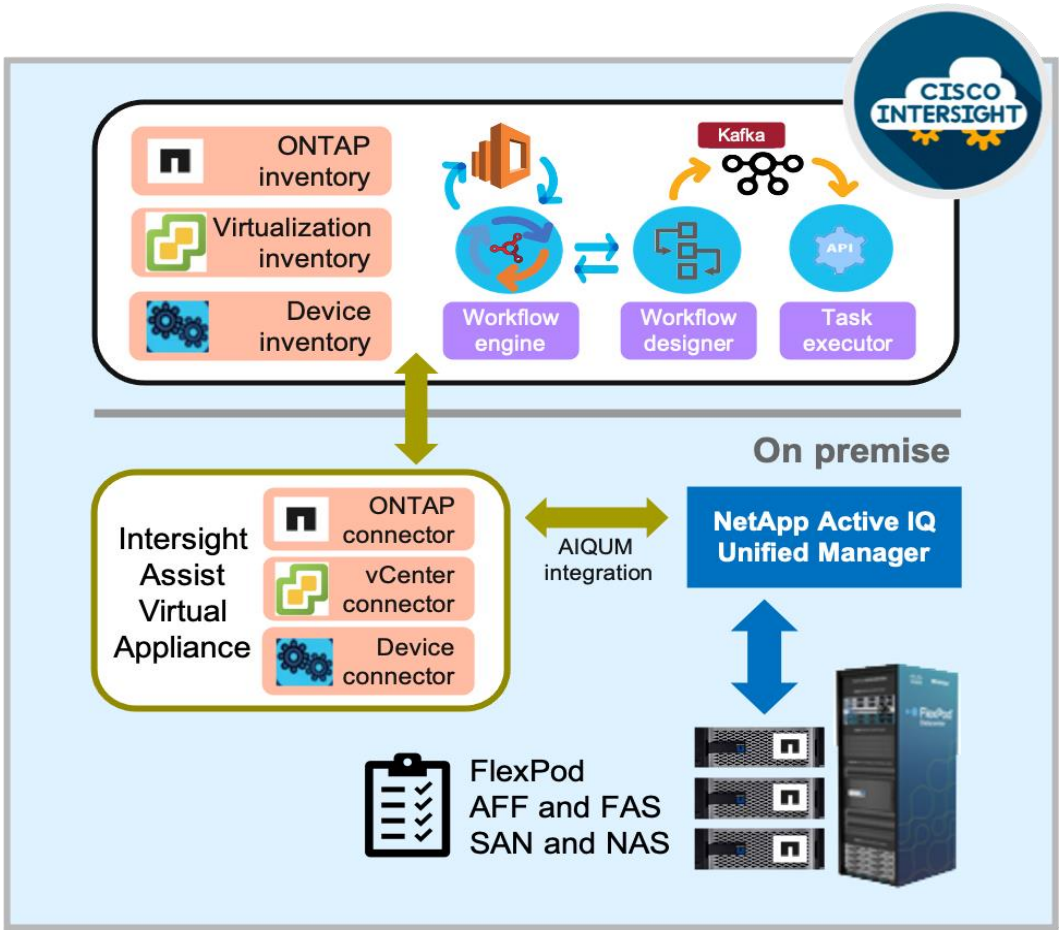


Through Device Connector Technology Cisco Intersight extends its capabilities to third party devices. VMware Integrations are already available in Cisco Intersight using this technology. Cisco Intersight Assist Virtual Appliance provides the connection mechanism to Cisco Intersight, and helps you add data center devices into it. NetApp ONTAP Connector is integrated with Cisco Intersight Assist, to extend these capabilities for NetApp ONTAP storage environment. NetApp Device Connector provides a proxy connection between Cisco Intersight and NetApp storage through Active IQ Unified Manager. The Rest APIs provided by Active IQ Unified Manager are used to streamline monitoring and management of ONTAP storage systems.

Cisco Intersight and NetApp ONTAP Integration Architecture

The architecture of the integration starts with the Active IQ Unified Manager instance deployed in your data center to manage one or more ONTAP clusters. Cisco Intersight assists with the ONTAP Connector deployed as a virtual appliance on-premises. This ONTAP Connector acts as your onsite data collector to transmit data to the cloud. The ONTAP Connector is really mapping the Intersight APIs to that of Active IQ Unified Manager and your ONTAP storage by following NetApp's latest REST API standards and object representations. So once your storage data is up there with Intersight, UI-SDK (built for NetApp storage Inventory) enables you to get full access to the key attributes of the NetApp storage from Intersight Inventory view. The workflow engine in the Cisco Intersight will enable the orchestration of the ONTAP storage tasks and workflows.

Figure 4) Cisco Intersight and NetApp ONTAP storage Integration.



Cisco Intersight and NetApp ONTAP integration features

Table 1 lists the new NetApp ONTAP features offered from Cisco Intersight.

Table 1) New NetApp ONTAP storage features in Cisco Intersight.

Supports SAN (FC, iSCSI) and NAS (NFS) Protocols			
Monitoring Storage Widgets	**Monitoring** Storage Inventory	**Orchestration** Reference Workflows	**Orchestration** Storage Tasks
• Storage Array Version summary • Storage Array Model Details – Top 5 Arrays by Utilization • Top 5 Storage Volumes - Top Volumes by Utilization	• ONTAP clusters model, version, storage capacity, summary of the storage objects • Physical Objects: Nodes, Disks, Ports • Logical Objects: SVMs, volumes, LUNs, SAN initiator groups, export policies, Snapshot copies, aggregates, licenses	• New, Update, and Remove Hypervisor Datastore • New, Update, and Remove Storage Host or initiator Group from NetApp Storage • New or Remove Export Policy from NetApp Storage • New Storage Virtual Machine	• New Storage Virtual Machine, IP and FC Logical Interfaces, Volume, LUN, igroup, Export Policy • Expand Storage Volume, LUN • Add Export Policy to Volume, • Add Initiators to igroup • Map/Unmap igroup to LUN

Supports SAN (FC, iSCSI) and NAS (NFS) Protocols			
		• New Storage Logical Interfaces • New Virtual Machine	• Remove Volume, LUN, Export Policy, igroup

Support for SAN and NAS storage protocols.

- Both SAN and NAS objects can be now monitored and managed from Cisco Intersight.
- NetApp storage Widgets available from the Cisco Intersight Monitor Dashboard
  - A Widget to view the summary of all the ONTAP storage arrays connected via the Active IQ Unified Manager and claimed from the cisco Intersight.
  - List of the top 5 ONTAP storage Arrays based on utilization
  - List of the top 5 ONTAP storage volumes across all the ONTAP clusters in the storage inventory listed based on Utilization.
- There is a more detailed view of the ONTAP clusters from the Cisco Intersight storage inventory view:
  - Details about the ONTAP version, model, capacity, and summary of the physical and logical artifacts for the ONTAP cluster are provided.
  - The Hardware section in the Inventory provides a view of the Physical storage objects like the Nodes, Disks, Ports.
  - The Logical Section helps view the storage virtual machines (SVMs), volumes, LUN, aggregates SAN initiator groups (igroups), Export policies and Licenses.
- There are 14 reference workflows available out-of-box to allow customers to manage NetApp storage objects and manage NetApp storage for VMware NFS and VMware Virtual Machine File System (VMFS) datastores.
- Apart from the reference workflows, NetApp ONTAP storage tasks to create, manage, remove, storage objects are now available in the storage Library from Cisco Intersight.
- Storage administrators can use these tasks to build custom-defined workflows according to their operational needs.

To benefit from all these features in Cisco Intersight, use your existing NetApp Active IQ Unified Manager 9.8 instance and connect to Cisco Intersight.

NetApp storage API integration with Cisco Intersight for automation

NetApp storage APIs for Intersight are integrated with the Cisco Intersight REST APIs. This means that NetApp storage in Intersight can be configured and managed as a code. The APIs and SDK are available for Python, PowerShell, Postman, or Ansible. You can leverage the APIs to take advantage of the following features:

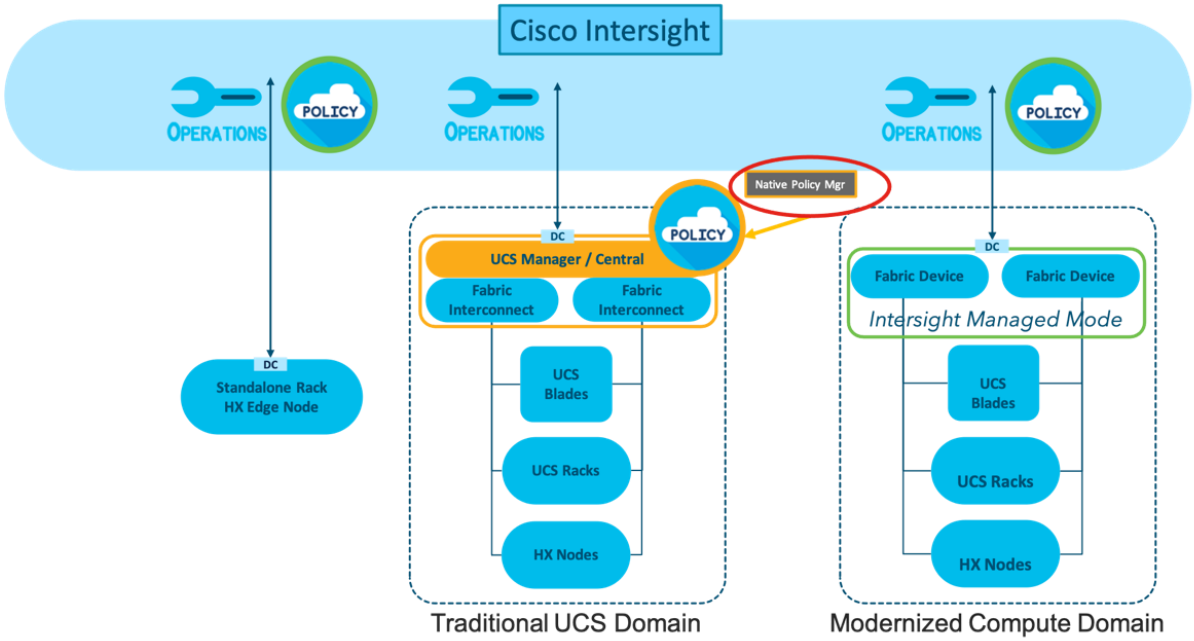
- Automate workflows for deployment and management tasks
- Audit and report on storage resources in the inventory
- Integrate with third-party applications (for reporting, ticket management, and so on)

Cisco Intersight Managed Mode

Cisco Intersight Managed Mode (also referred to as Cisco IMM or Intersight Managed Mode) is a new architecture that manages Cisco UCS Fabric Interconnect-attached systems through a Redfish-based standard model. Cisco IMM combines the capabilities of Cisco UCS and the cloud-based flexibility of the Cisco Intersight platform, thereby unifying the management experience for both standalone and fabric interconnect-attached systems. Cisco IMM standardizes both policy and operational management for fourth-generation fabric interconnects and Cisco UCS M5 servers. The modular nature of the Cisco

Intersight platform provides an easy upgrade path to additional services such as workload optimization and Kubernetes.

Figure 5) Cisco IMM.



The Cisco UCS functions previously configured in a FlexPod environment using Cisco UCS Manager are now delivered through the Cisco Intersight portal, which provides global visibility into the infrastructure health and status as well as advanced management and support capabilities. To deploy Cisco IMM for FlexPod Environments, see Configure Cisco Intersight Managed Mode for FlexPod: Technical Preview Release white paper.

Note: Cisco IMM is currently a technical preview release feature, and this initial technical preview release contains features and functions that are not meant for use in a production or commercial operating environment or with live data. Cisco recommends using this software on a test network or system. Not all the functions and features in Cisco UCS Manager are supported in the Cisco IMM technical preview release.

Hardware, software, and licensing requirements

Minimum hardware and software requirements

Table 2 lists the hardware and software components that are required to implement the solution. The components that are used in any particular implementation of the solution might vary based on customer requirements.

Table 2) NetApp hardware and software requirements.

Component	Requirement details
NetApp ONTAP	ONTAP 9.7P1 and later
NetApp Active IQ Unified Manager	NetApp Active IQ Unified Manager 9.8P1 and later
NetApp Storage Array	All ONTAP AFF and FAS storage array supported for ONTAP 9.7P1 and later

Component	Requirement details
Virtualization Hypervisor	vSphere 6.7 and later

Note: For the minimum requirements of Cisco UCS Compute Components and UCSM version, see the FlexPod Intersight Managed Mode white paper.

Cisco Intersight licensing requirements

Cisco Intersight is licensed on a subscription basis with multiple license editions from which to choose. Capabilities increase with the different license types. You can purchase a subscription duration of one, three, or five years and choose the required Cisco UCS Server volume tier for the selected subscription duration. Each Cisco endpoint automatically includes a Cisco Intersight Base at no additional cost when you access the Cisco Intersight portal and claim a device. You can purchase any of the following higher tier Intersight licenses using the Cisco ordering tool:

- **Cisco Intersight Essentials.** Essentials includes all functionality of Base with the additional features including Cisco UCS Central and Cisco IMC Supervisor entitlement, policy-based configuration with Service Profiles, firmware management, and evaluation of compatibility with the Hardware Compatibility List (HCL).
- **Cisco Intersight Advantage.** Advantage offers all features and functionality of the Base and Essentials tiers. It includes storage widgets, storage inventory, storage capacity, and storage utilization, and cross-domain inventory correlation across physical compute, physical storage, and virtual environments (VMware ESXi).
- **Cisco Intersight Premier.** In addition to the capabilities provided in the Advantage tier, Cisco Intersight Premier offers Private Cloud Infrastructure-as-a-Service (IaaS) orchestration across Cisco UCS, and third-party systems, including virtual machines (VMs) (VMware vCenter) and physical storage (NetApp storage).

For more information about the features covered by various licensing tiers, see the Cisco Licensing page.

Deployment and configuration

Table 3 lists the hardware and software components that were implemented in the lab.

Table 3) Lab components and configuration details.

Component	Requirement details
NetApp ONTAP	ONTAP 9.8
NetApp Active IQ Unified Manager	NetApp Active IQ Unified Manager 9.8P1
NetApp Storage Array	AFF A400
Virtualization Hypervisor	vSphere 7.0U1
Cisco UCSM	4.1(2a)
VSC	9.7.1P1
UCS Compute	• Cisco UCS B200 M5 • Cisco UCS C220 M5
UCS Fabric Interconnect	Cisco UCS FI 6454

To monitor and orchestrate NetApp storage from Cisco Intersight, implement the steps provided in this section.

Cisco Intersight Assist Virtual Appliance

Cisco Intersight Assist is available within the Cisco Intersight Virtual Appliance, which is distributed as a deployable VM contained within an Open Virtual Appliance (OVA) file format. You can install the appliance on an ESXi server.

You can deploy Cisco Intersight Virtual Appliance in one of the following modes:

- **Intersight Connected Virtual Appliance.** This deployment requires a connection back to Cisco and Intersight services for updates and access required services for full functionality of intersight.com.
- **Intersight Private Virtual Appliance.** This deployment is intended for an environment where you operate data centers in a disconnected (air gap) mode.
- **Intersight Assist.** This deployment enables SaaS model to connect to Cisco Intersight.

Before you begin

Before you begin the deployment, complete the following tasks:

1. Make sure that you have downloaded the Cisco Intersight Virtual Appliance package from the URL provided by your Cisco representative or a location accessible from your setup, such as a local hard drive, a network share, or a CD/DVD drive.
2. Configure DNS with A/PTR and CNAME Alias records.
3. Sample A/PTR record: Intersight Assist (ip.address)
4. Sample CNAME Alias record: dc-FQDN host name

For detailed guidance on the Intersight Assist deployment and configuration procedure, see the Cisco Intersight Assist Getting Started Guide.

Claim a target in Cisco Intersight

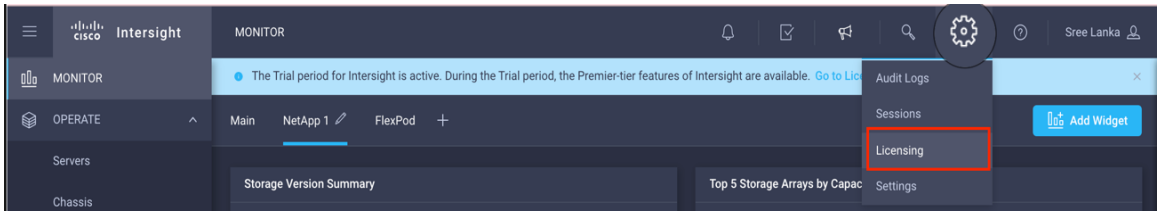
To claim NetApp ONTAP storage, the Advantage tier is the minimum requirement to monitor ONTAP storage inventory, widgets, capacity, and utilization. To benefit from the storage and virtualization orchestration task and workflow libraries, a minimum of the Premium tier is required.

Note: This TR validation used the Premier tier license.

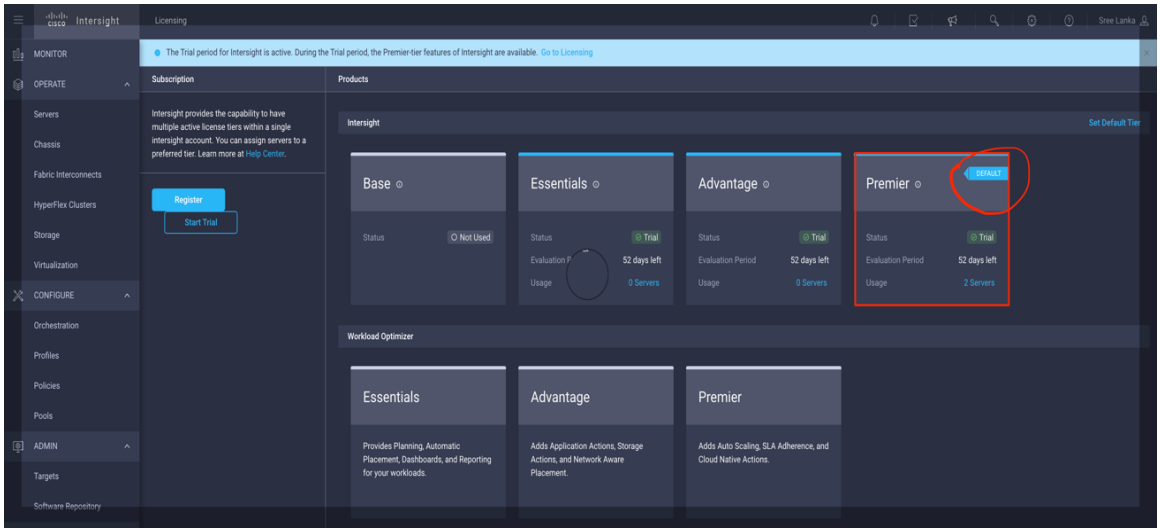
For more information about the features covered by various licensing tiers, see the Cisco licensing requirements.

To verify the default license tier, complete the following steps:

1. Log in to Cisco Intersight.
2. In the top right corner, select Settings.



3. Make sure that the Premier tier is set to Default.



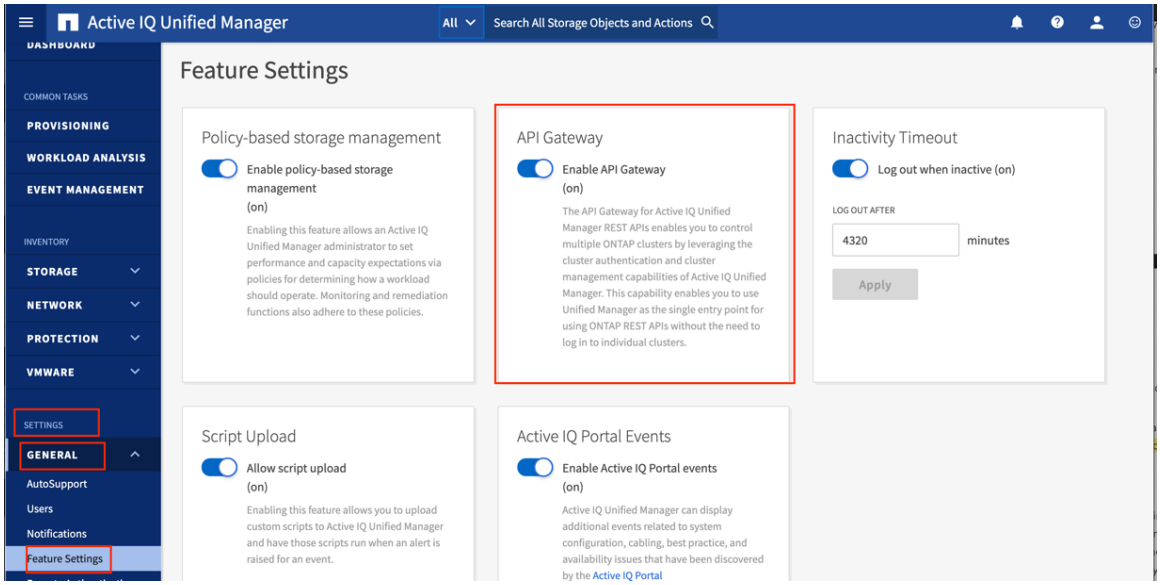
Claim target devices from Cisco Intersight Assist

This section describes how to claim NetApp Active IQ Unified Manager and VMware vCenter from Cisco Intersight.

Claim NetApp Active IQ Unified Manager

To claim NetApp Active IQ Unified Manager, complete the following steps:

1. Use your existing NetApp Active IQ Unified Manager that is monitoring the ONTAP clusters, or deploy a new NetApp Active IQ Unified Management virtual appliance on the VMware vCenter.
2. Add the ONTAP clusters to NetApp Active IQ Unified Manager. Log in into the NetApp Active IQ Unified Manager and make sure that the API Gateway is enabled: select Settings > General > Feature Settings > Enable API Gateway.

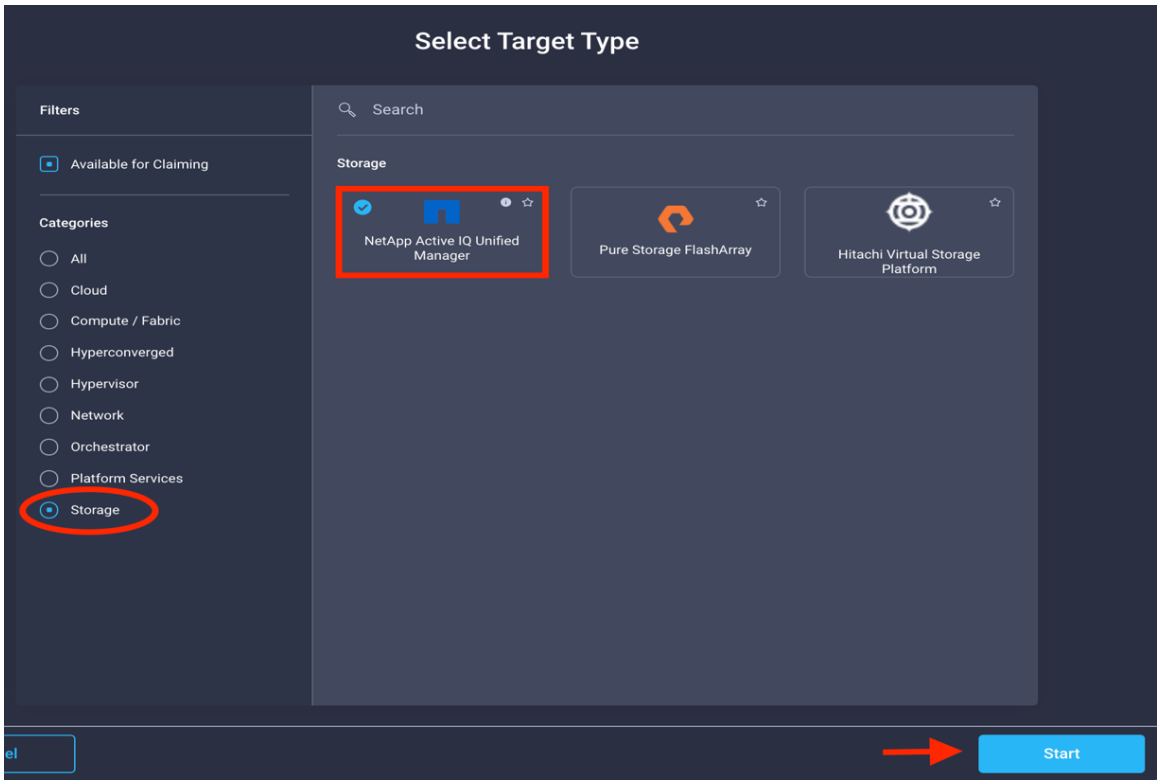


Claim Cisco Intersight account

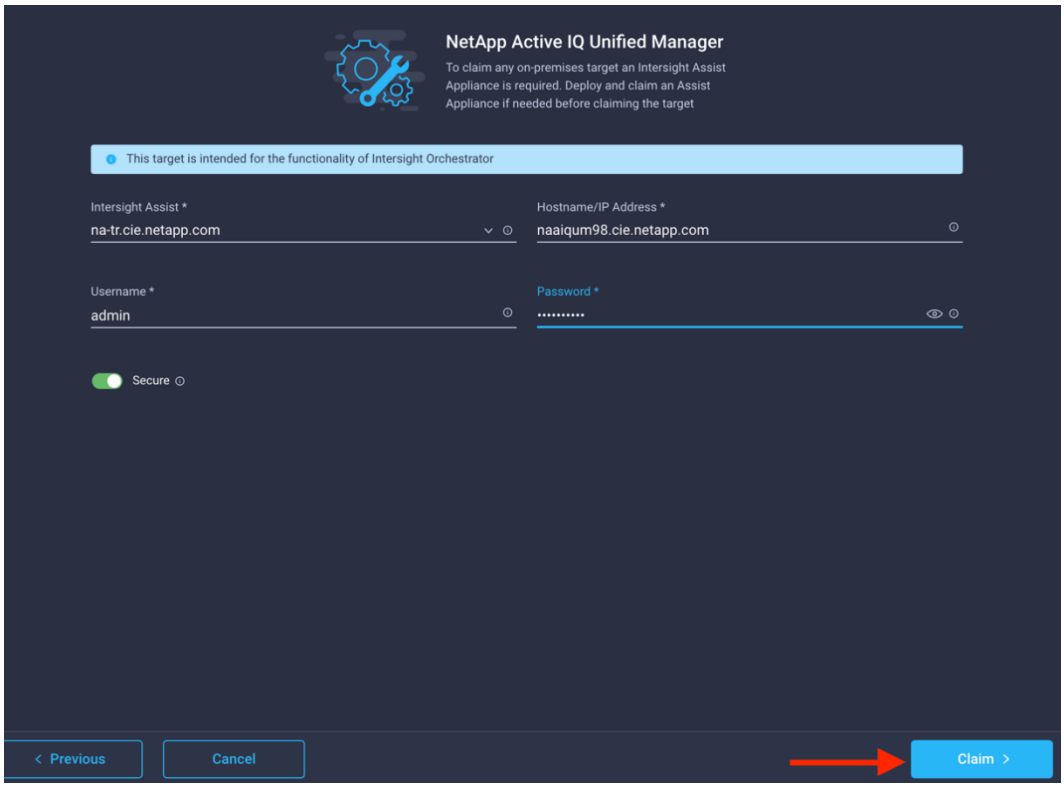
1. Log in to the Cisco Intersight account.

2. Under Admin, select Targets. All the targets claimed by this Cisco Intersight account are displayed.
3. To claim a new NetApp Active IQ Unified Manager target, select Claim Target.

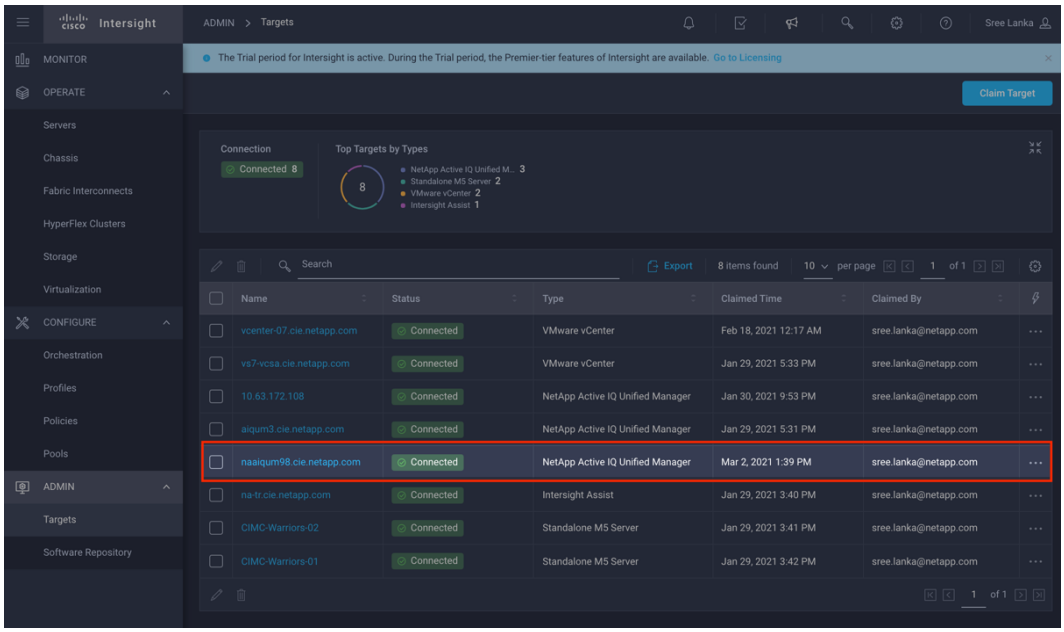
4. Select Storage > NetApp Active IQ Unified Manager, then click Start.



5. Select the Intersight Assist Virtual Appliance. Enter the Active IQ Unified Manager host name/IP address and user credentials. Click Claim.

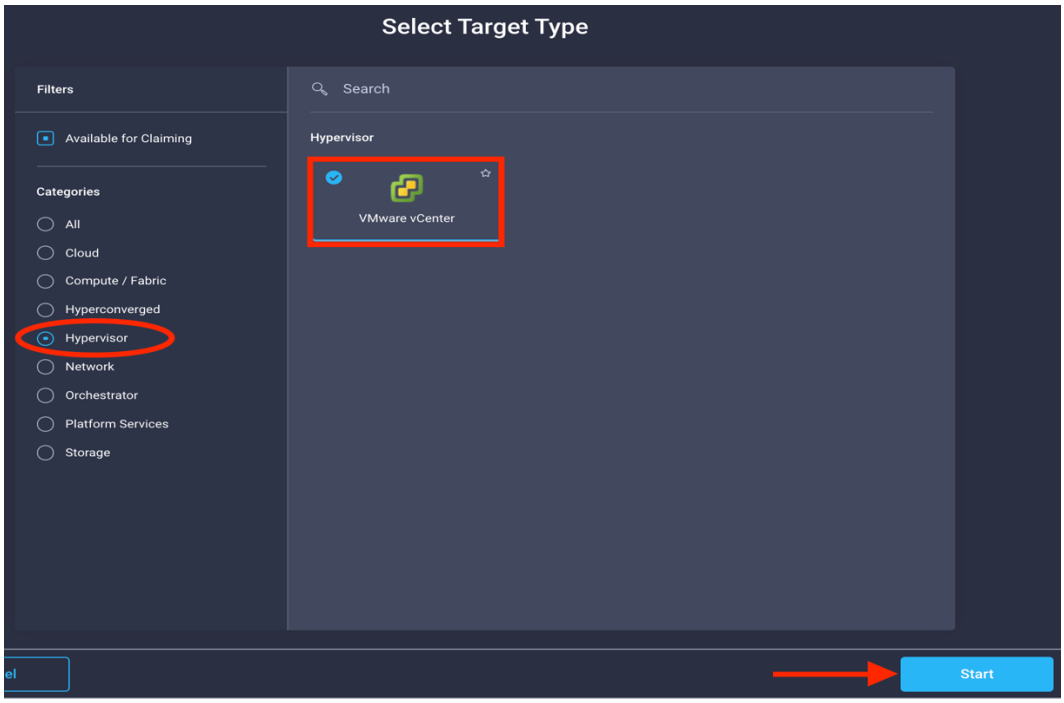


After the device is connected, the status show as Connected.

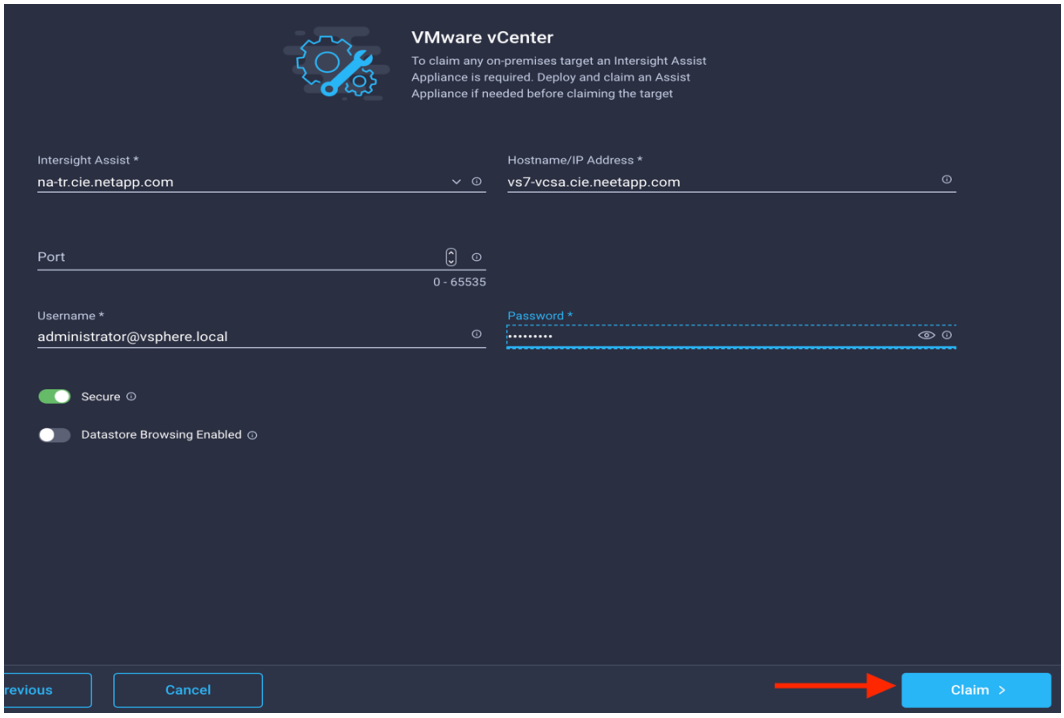


NetApp Active IQ Unified Manager is claimed successfully.

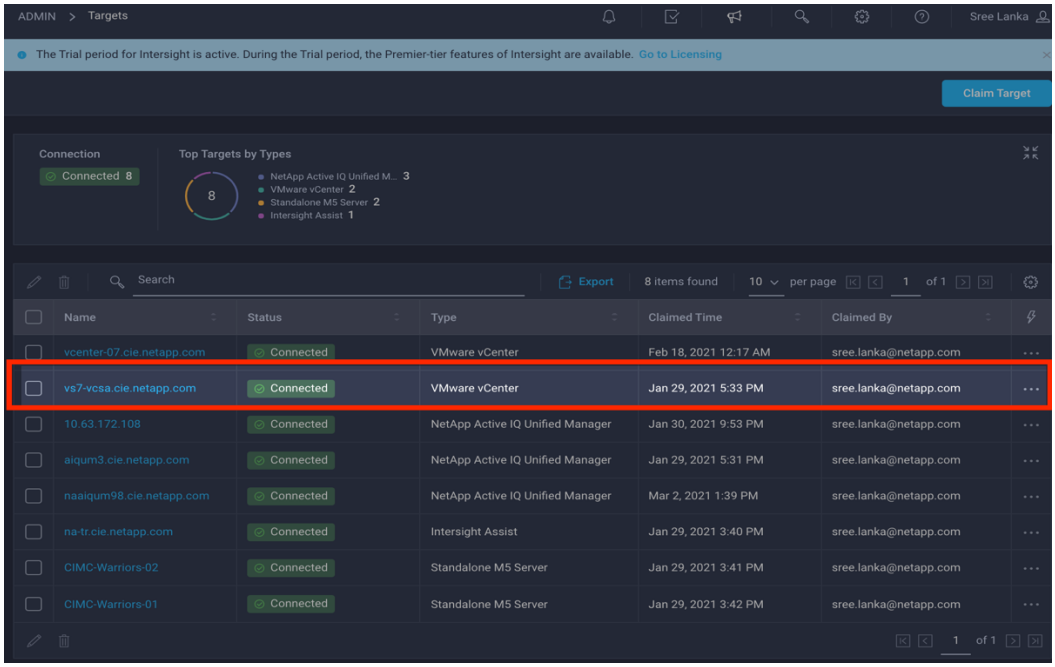
6. To claim a VMware vCenter device, repeat steps 2 and 3.
7. Select Hypervisor > VMware vCenter, and then click Start.



8. Select Intersight Assist, enter the vCenter information, and click Claim.



After the device is connected, the status displays as Connected.



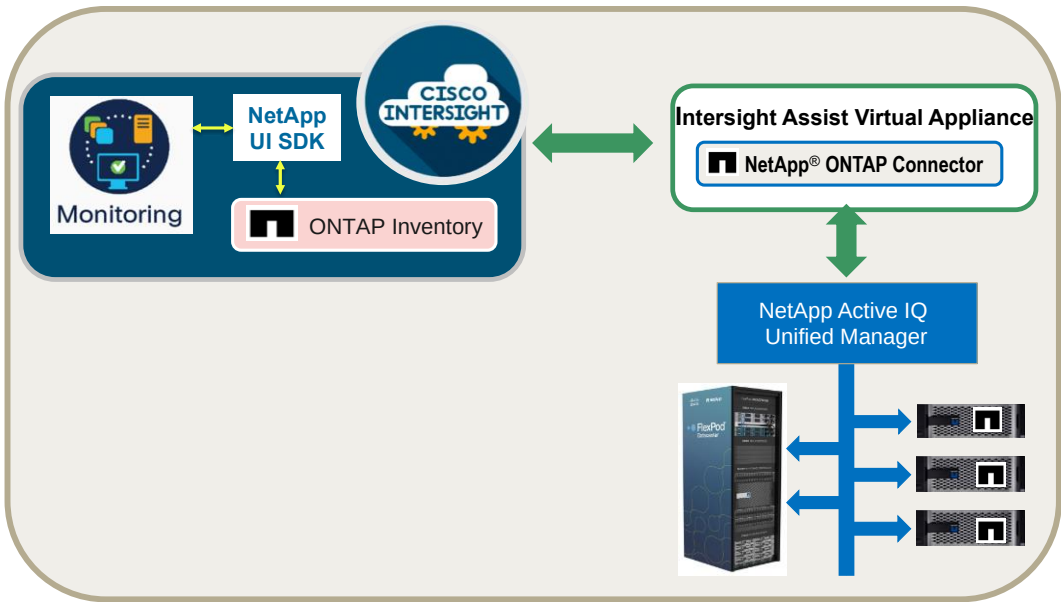
Monitoring ONTAP storage

To monitor NetApp ONTAP storage from Cisco Intersight, a minimum of the Advantage tier license must be configured in Cisco Intersight. To learn more about the Cisco Intersight licensing requirements, see the Cisco licensing requirements.

After the NetApp Active IQ Unified Manager device is claimed by Cisco Intersight, all the ONTAP clusters connected to the Active IQ Unified Manager device are polled by the ONTAP Connector in the Cisco Intersight Assist Virtual Appliance and populated in the ONTAP inventory of Cisco Intersight. The poll interval is set to 60 minutes; this interval is currently not configurable.

Figure 6 is an architecture overview of monitoring ONTAP storage from Cisco Intersight,

Figure 6) Architecture for monitoring ONTAP storage from Cisco Intersight.

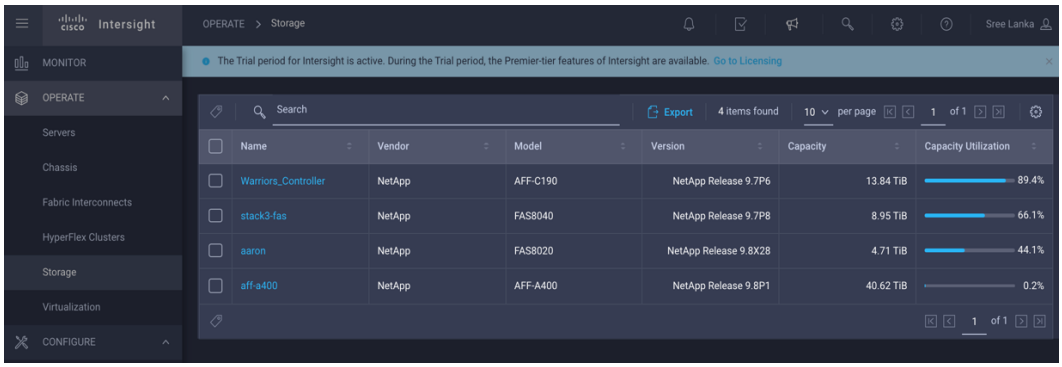


The GUI software development kit (SDK) built for NetApp ONTAP storage in Cisco Intersight processes the storage objects in the NetApp ONTAP inventory and presents it in a viewable format through storage inventory and monitoring widgets in the dashboard.

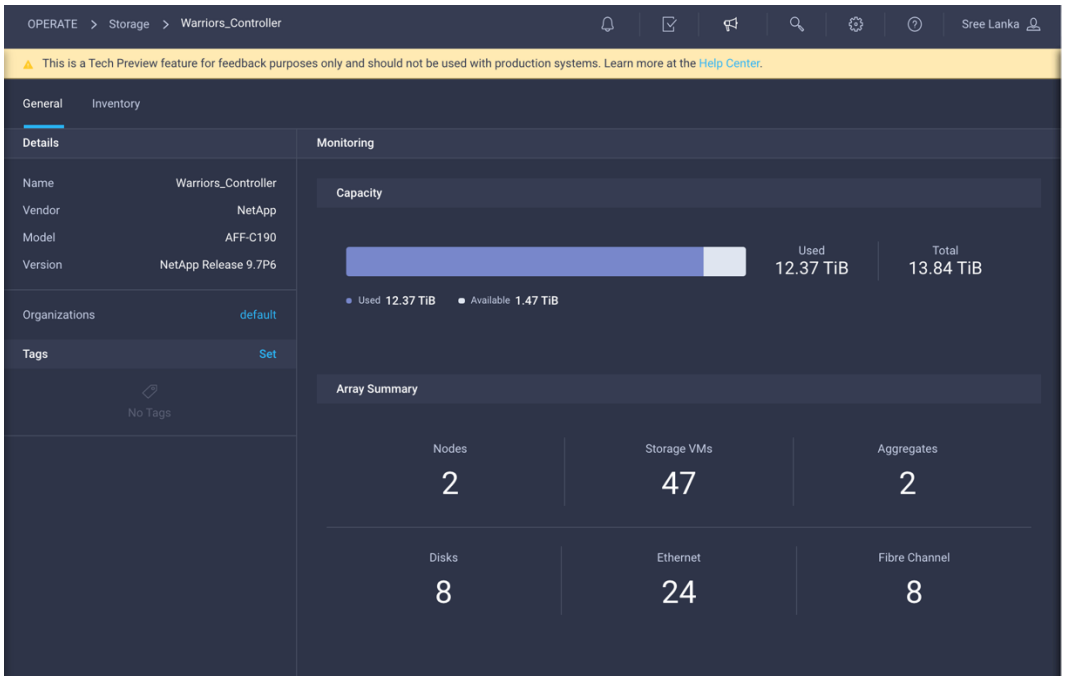
This section provides a closer look at the NetApp ONTAP storage inventory and the monitoring dashboard widgets.

Cisco Intersight storage inventory

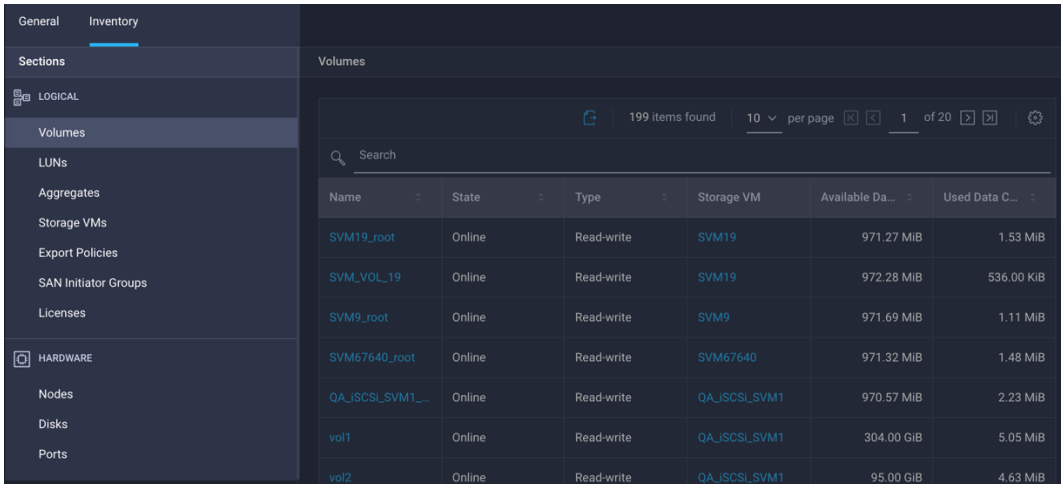
1. Select the Storage Inventory tab in Cisco Intersight to view the list of all the NetApp ONTAP storage clusters connected to all the NetApp Active IQ Unified Manager targets and claimed by Cisco Intersight.



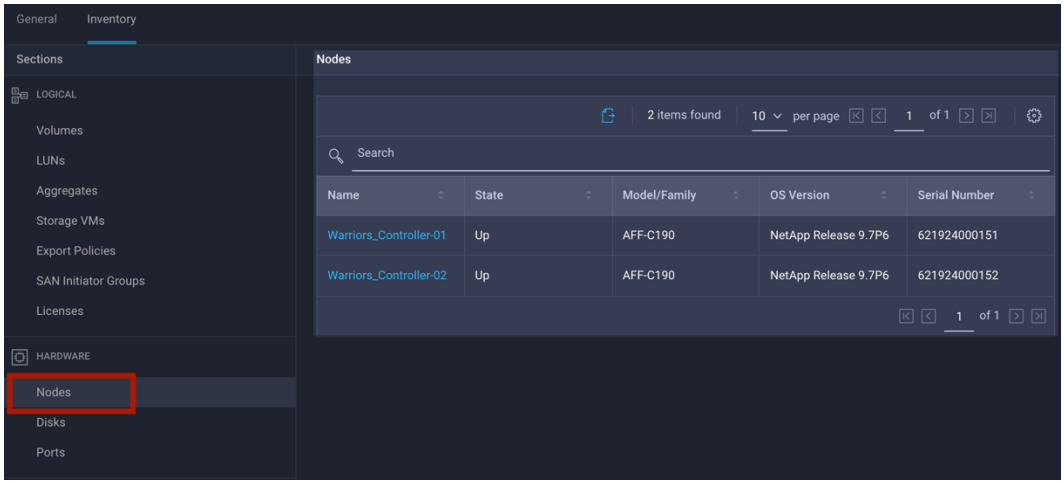
2. Select any ONTAP cluster to view more details. Details about the NetApp ONTAP version, model, capacity, and summary of the physical and logical artifacts for the ONTAP cluster are provided here.



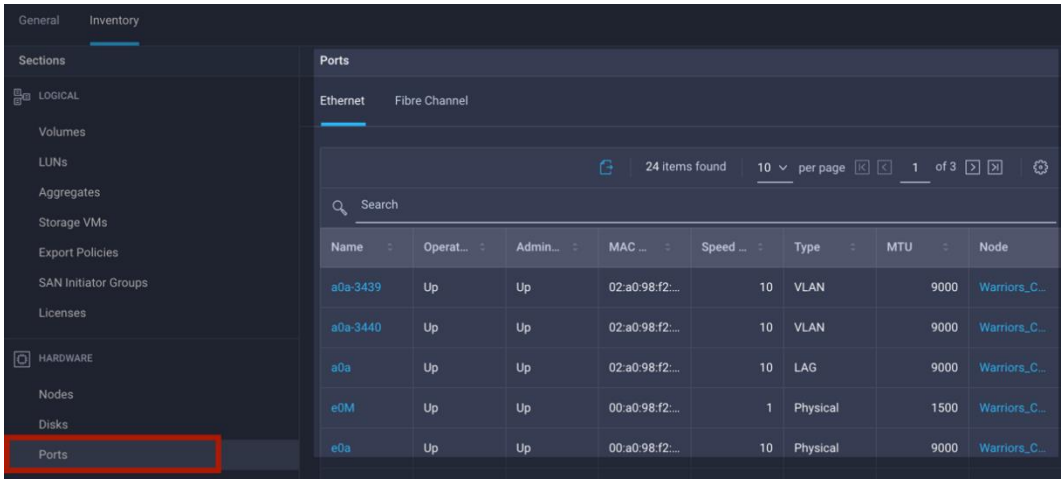
3. Select the Inventory tab to view a more detailed storage inventory. All the storage objects are classified as logical and physical sections.



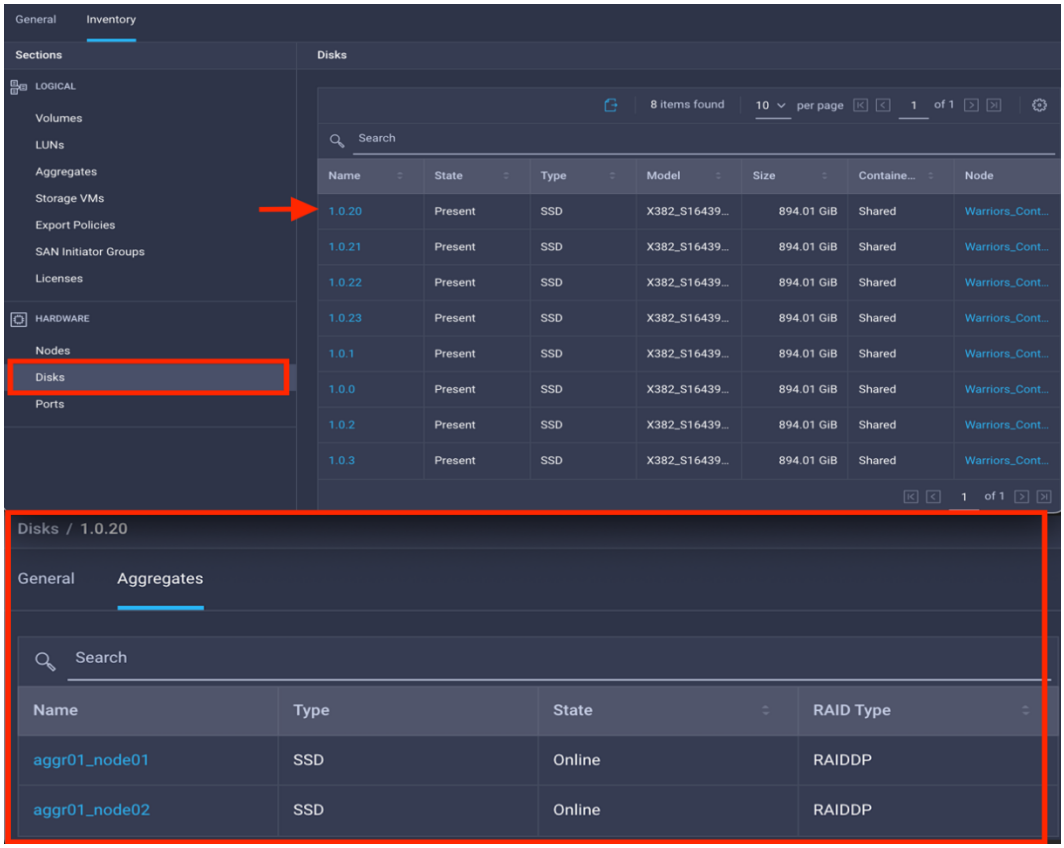
4. The Hardware section displays the physical storage objects such as the node, disks, and ports.
   - The Nodes option lists all the physical nodes for the ONTAP cluster.



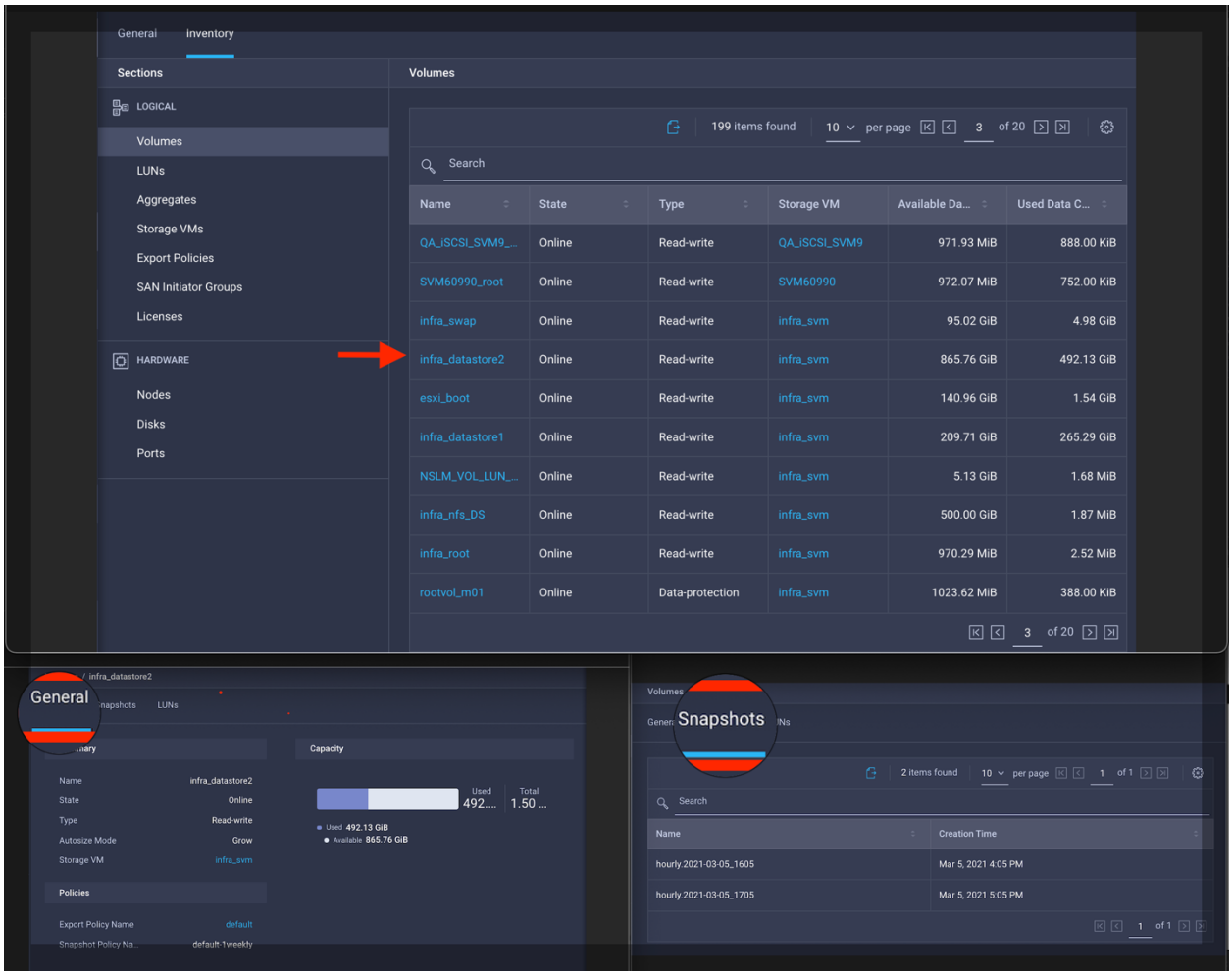
   - The Ports option lists the physical Ethernet and FC ports on the nodes. The attributes listed include the Operations and Admin states of the physical device.



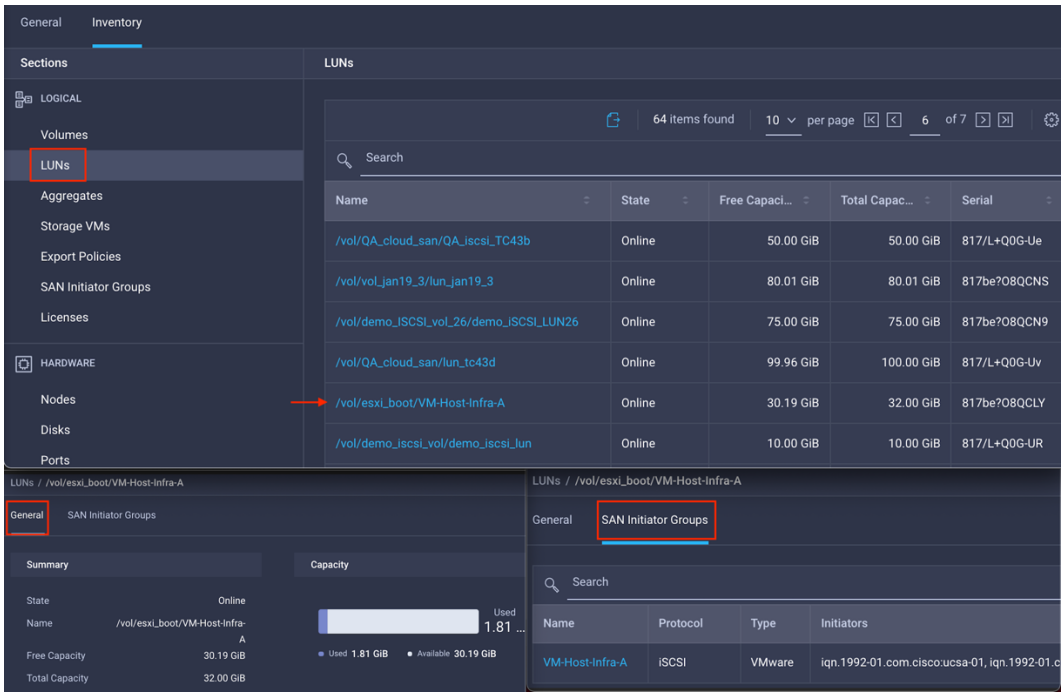
- The Disks option list all the storage disks and its attributes for the storage device. Select a disk to view the aggregates to which the disk is attached.



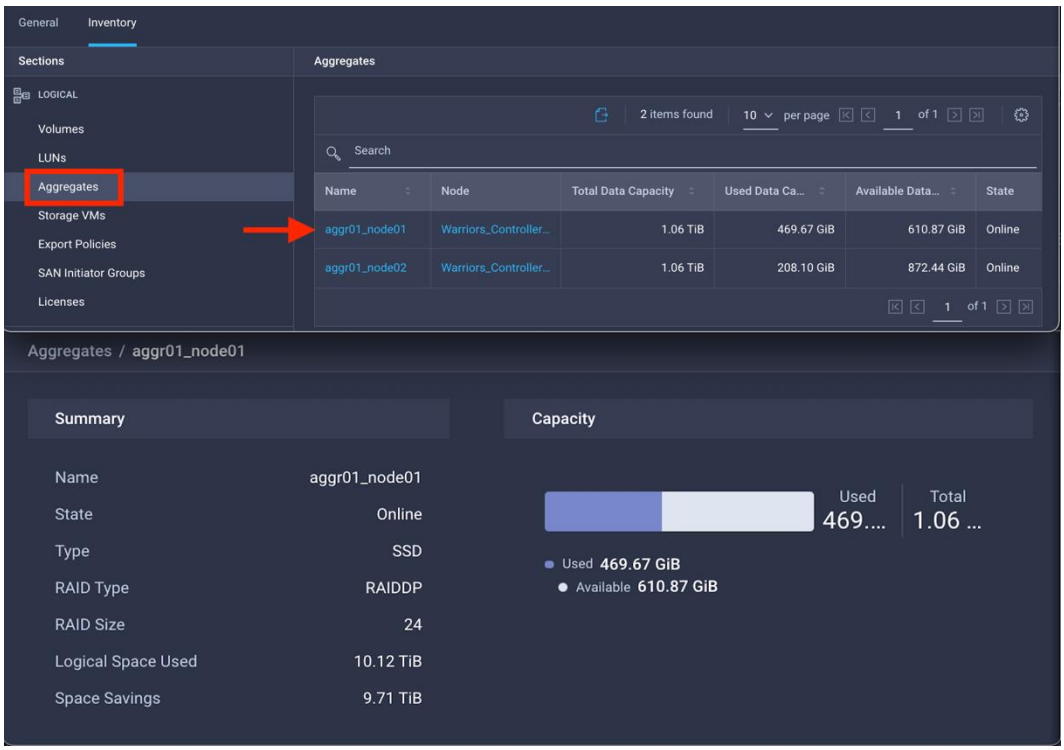
5. The Logical section lists all the logical objects of the storage device.
   - The Volumes option lists all the volumes for the storage device. Select a volume to see details about the volume. The General tab in the Volume view lists the general attributes of the volume, the policies, and the Capacity view. The Snapshots tab lists all the Snapshot copies for the volume. The LUNs tab lists the LUNs for a SAN volume.



6. The LUN option lists all the LUNs for the storage device. Select a LUN to see details about the LUN. The General tab in the LUN view lists the attributes of the LUN, parent object details, and capacity. The SAN Initiator Groups tab lists the igroup that the LUN is mapped with and lists the WWPNs or iSCSI Qualified Name (IQNs) of the host.

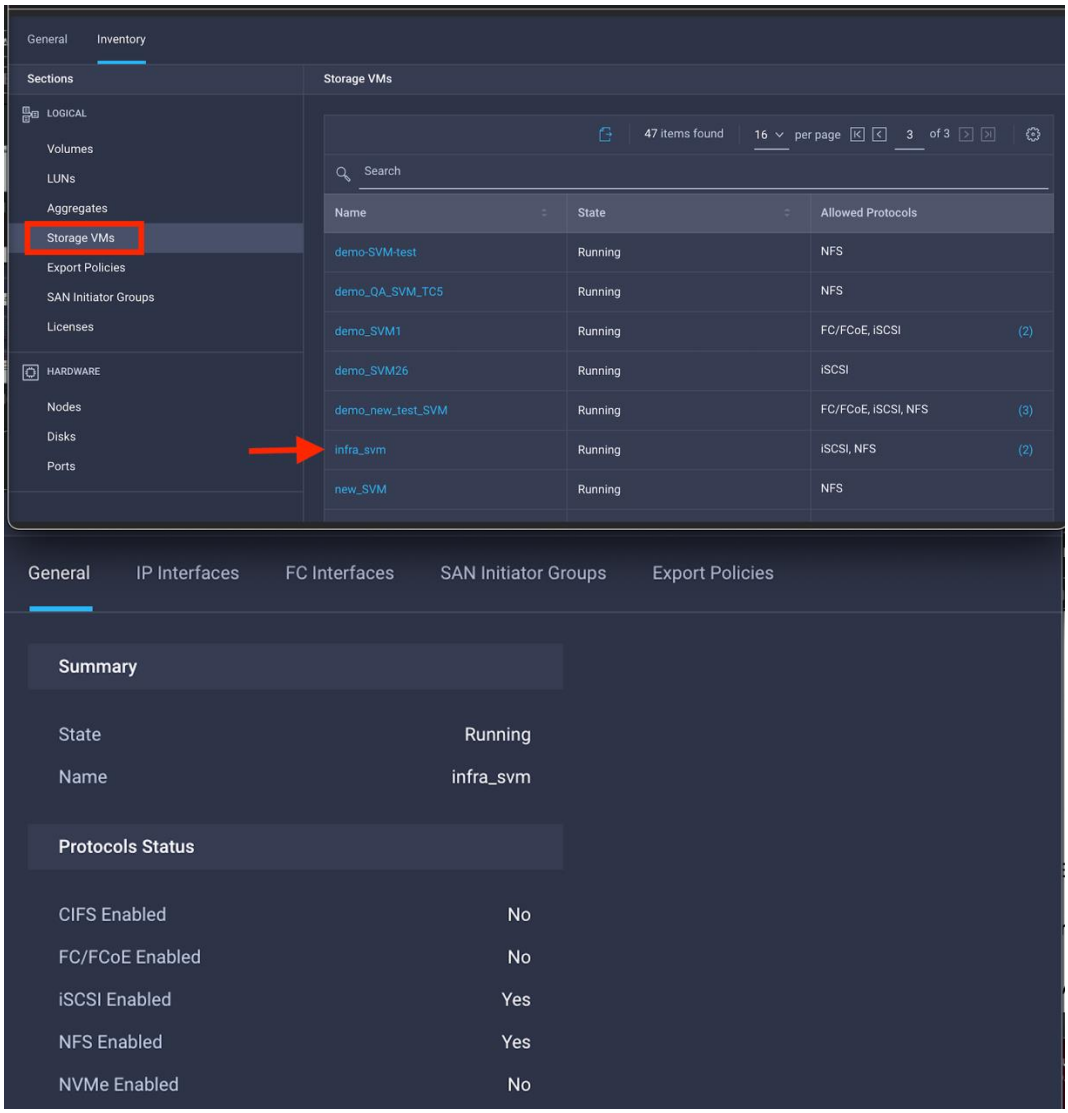


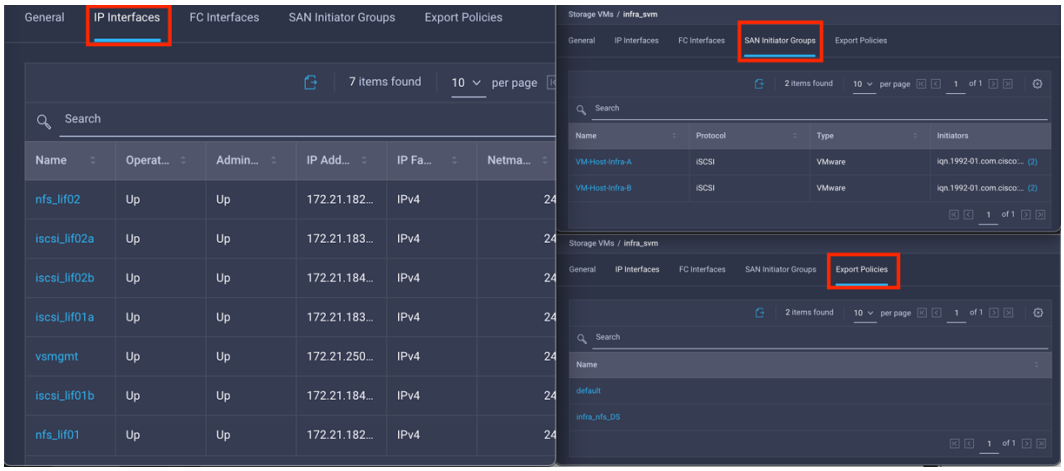
7. The Aggregates option lists all the aggregates for the storage device. Select an aggregate to see details about the aggregate. In the Aggregate Summary tab, the aggregate attributes are listed, including the logical space used and space savings. The capacity graphic shows a view of the used and available data capacity.



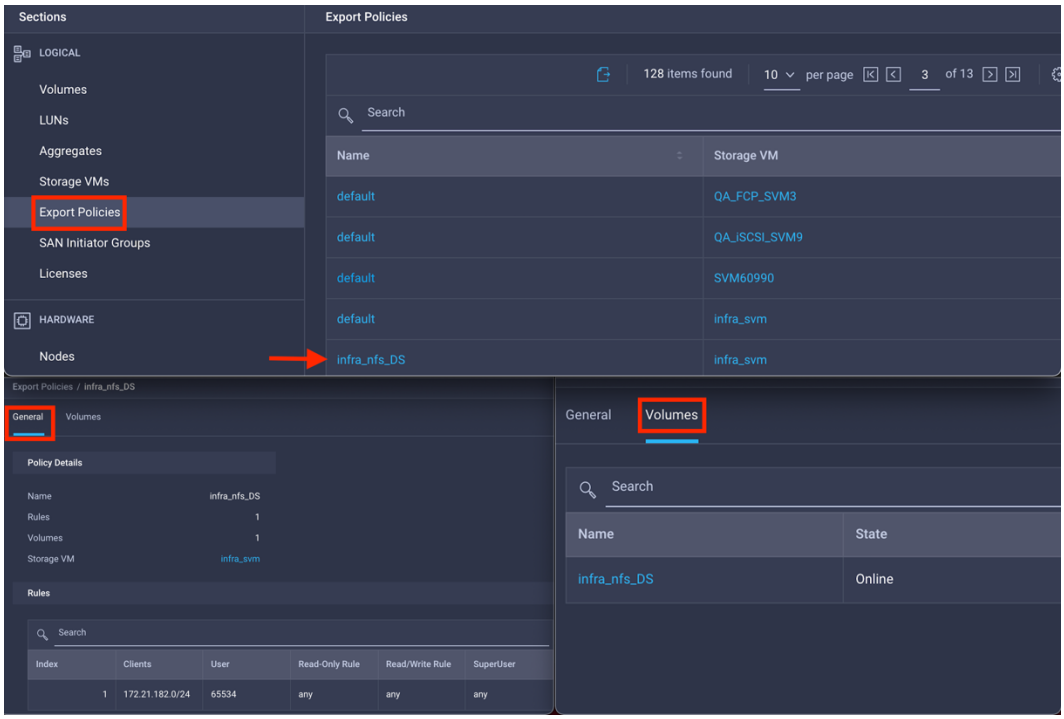
8. The Storage VM option lists all the SVMs for the storage device. Select an SVM to view details about the SVM. The SVM General page lists the service status summary and protocols enabled for the

SVM. The logical IP and FC interfaces configured for the SVM are listed in the IP and FC Interface tab. The SAN igroup and export policies configured for the SVM are listed in their respective tabs.

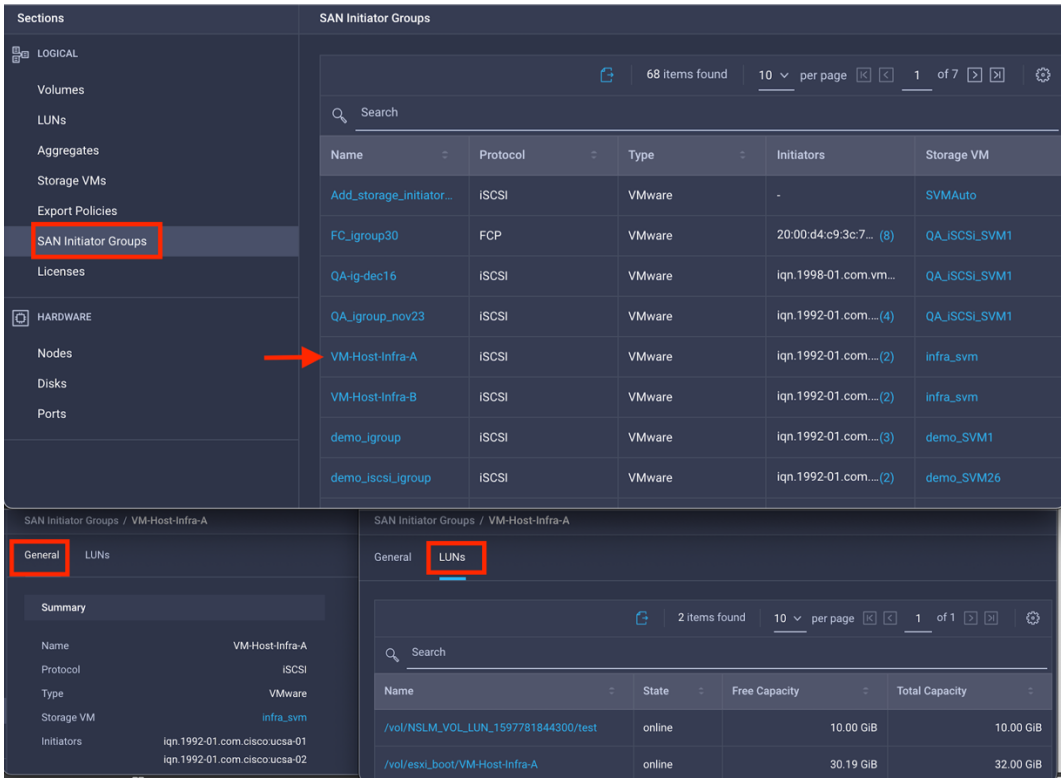




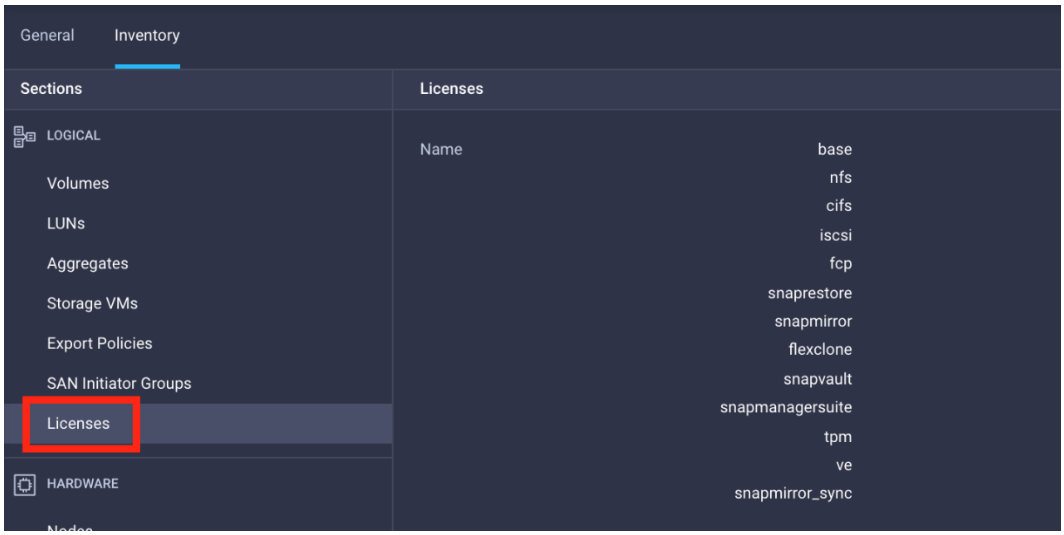
9. The Export Policies option lists all the Export policies for the storage device. Select an export policy to view the specific rules configured for the export policy and the volumes the export policy is mapped with.



10. The SAN igroups option lists all the igroups for the storage device. Select an igroup to view details about the igroup. The General tab lists the summary of the attributes, including the SVM name where the SAN igroup is created and the host initiators WWPNs and IQNs. The LUNs tab lists the LUNs that the SAN igroup is mapped with.



11. The Licenses option lists all the ONTAP feature licenses configured for the storage device.



Cisco Intersight Monitoring Dashboard- storage widgets

This section describes the three NetApp ONTAP storage monitoring widgets built into Cisco Intersight.

Storage Version Summary widget

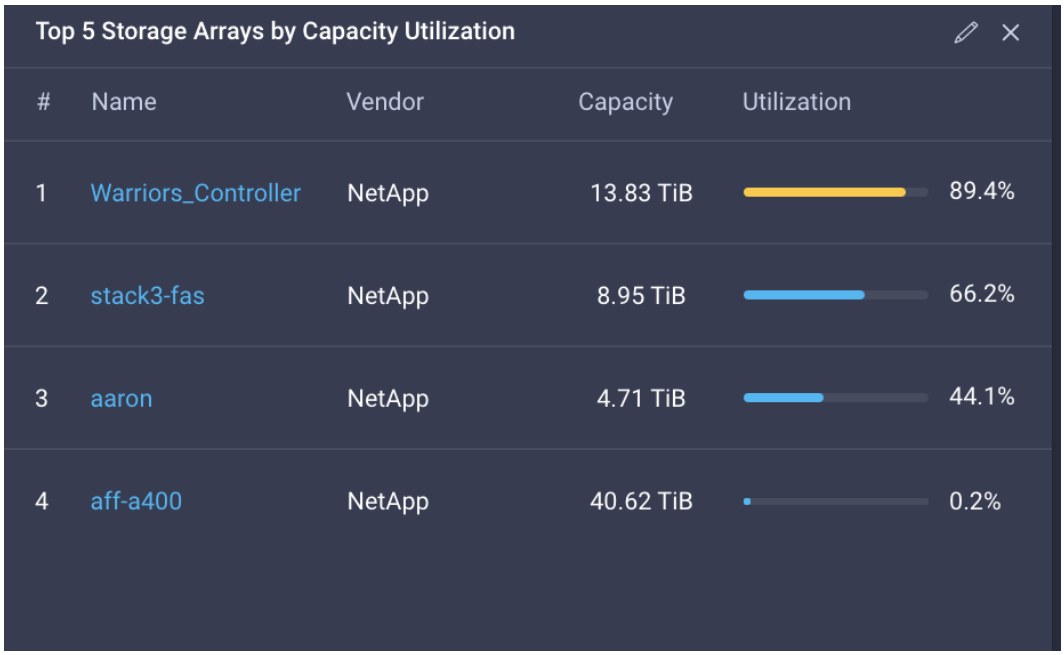
The Storage Version Summary widget (Figure 7) monitors and allows you to view the ONTAP model and version the summary of all the ONTAP storage arrays connected through Active IQ Unified Manager.

Figure 7) Storage Version Summary widget.

Top 5 Storage Arrays by Capacity Utilization widget

The Top 5 Storage Arrays by Capacity Utilization widget (Figure 8) monitors and lists the top five ONTAP storage arrays based on capacity utilization.

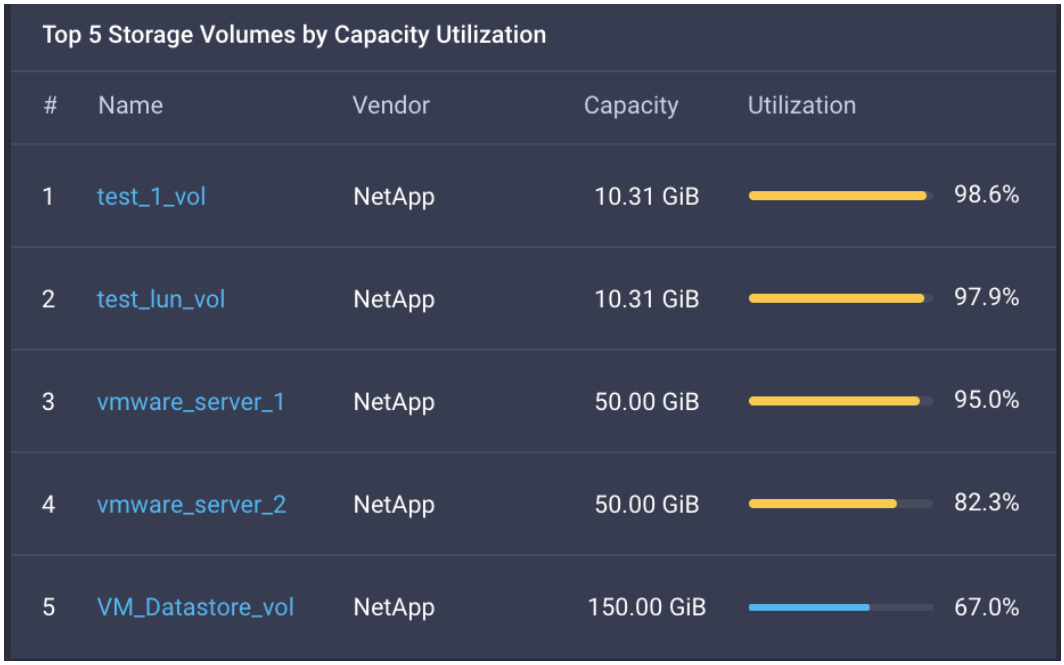
Figure 8) Top 5 Storage Arrays by Capacity Utilization widget.



Top 5 Storage Volumes by Capacity Utilization widget

The Top 5 Storage volumes by Capacity Utilization widget (Figure 9) monitors and lists the top five ONTAP storage volumes across all the ONTAP clusters in the storage inventory based on capacity utilization.

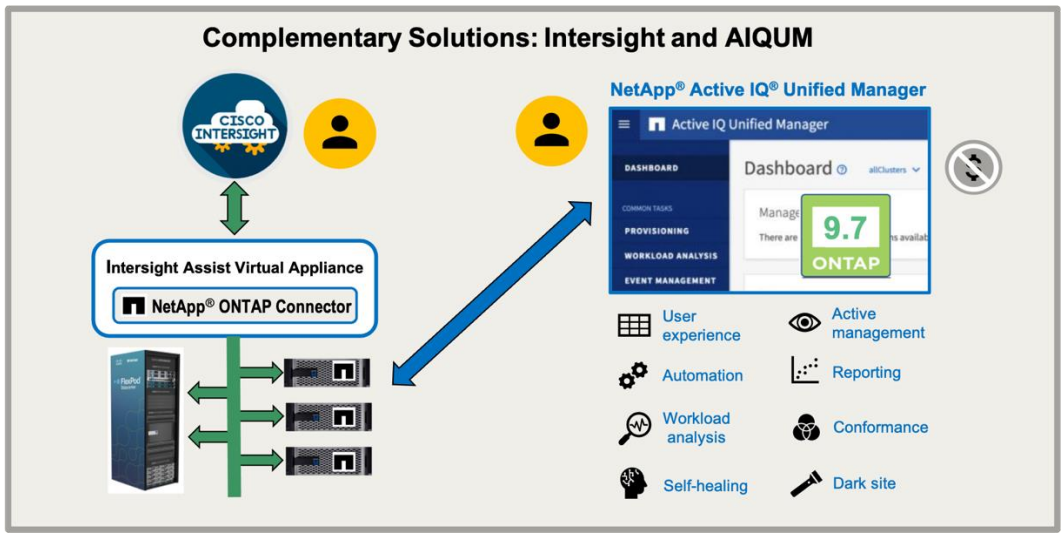
Figure 9) Storage Volumes by Capacity Utilization widget.



Orchestration

ONTAP storage orchestration (Figure 10) can be performed from Cisco Intersight. NetApp Active IQ Unified Manager Rest API interfaces are accessed through NetApp ONTAP Connector in the Intersight Assist Virtual Appliance from Cisco Intersight.

Figure 10) ONTAP storage orchestration.



ONTAP storage tasks are built into the Cisco Intersight storage task library. These tasks allow you to create, manage, and remove storage objects from Cisco Intersight.

Table 4) ONTAP storage task from Cisco Intersight.

ONTAP task	Task description
Add Storage Export Policy to Volume	Export policies determine access to volumes for NFS. For volume access to be possible, a volume must be associated with an export policy, and that policy must have a rule that determines access.
Connect initiators to Storage Host (igroup)	This task adds initiators to an existing igroup (igroup).
Expand Storage LUN	This task resizes the LUN; it Changes the size of the LUN to the input value size.
Expand Storage Volume	This task resizes the volume. When your volume reaches nearly full capacity, you can increase the size of the volume.
Find NetApp igroup LUN Map	This task helps determine the LUN and igroup to which it is mapped.
Find Storage LUN by ID	This task helps determine the LUN path. This task is used in tandem with the Virtualization task. It receives the NAAID from the VMFS datastore and determines the storage LUN path for the datastore.
Find Storage Volume by ID	This task helps determine the volume name. This task is used in tandem with Virtualization task. It receives the NAAID from the NFS datastore and determines the storage volume name for the datastore.
New Storage Export Policy	This task helps create a new storage export policy. Export policies determine access to volumes for NFS for NetApp ONTAP. For volume access to be possible, a volume must be associated with an export policy, and that policy must have a rule that determines access.
New Storage FC Interface	This task helps create a new storage logical FC interface and associate it with the physical port.
New Storage Host	This task creates new storage igroups for the SAN initiators.
New Storage IP Interface	This task helps to create a new storage logical IP interface and associate it with the physical port.
New Storage LUN	This task creates a storage LUN with inputs such as LUN name, volume name, operating system name, SVM name, and size of the LUN. After successful execution of the LUN path, NAAID and LUN capacity are generated as outputs.
New Storage LUN ID	This task maps a LUN to all of the initiators in an igroup. After you map the LUN, the LUN is visible to all initiators in the igroup.

ONTAP task	Task description
New SVM	This task enable you to create a new SVM and enable protocols for SAN and NAS configurations.
New Storage Volume	This task creates a storage volume with the volume name and volume size as inputs. It generates the volume name and volume size as outputs.
Remove Storage Export Policy	This task removes a storage export policy with the export policy name and SVM name as the inputs. After successful execution, the name of the removed export policy is generated as output.
Remove Storage Host	This task removes the storage host, or in NetApp terminology, removes the igroup. After successful execution, the deleted igroup name is generated as output.
Remove Storage LUN	This task removes a LUN with the LUN path and SVM name as the inputs. After successful execution, the path for the removed LUN is generated as output.
Remove Storage LUN ID	This is a LUN unmap task. It disconnects the storage LUN from an igroup with the LUN name and igroup name as inputs. After successful execution, the igroup name and the LUN path are generated as outputs.
Remove Storage Volume	This task removes a storage volume the with volume name as input. After successful execution, the deleted volume name is generated as output.

Appendix A: ONTAP storage tasks in Cisco Intersight explains each of the tasks listed in Table 4.

Cisco Intersight workflow orchestration

You can orchestrate or automate a workflow from Cisco Intersight by using the readily available reference workflows, or you can create your own custom-defined workflow based on the use case.

Table 5 lists the 14 out-of-box reference workflows that you can use to manage NetApp storage objects and manage NetApp storage for VMware NFS and VMFS datastores.

Table 5) Reference workflows for ONTAP orchestration.

Reference workflows	Workflow description
New Storage Interface	Creates a storage IP or FC interface.
New VMFS Datastore	Creates a storage volume and builds the VMFS datastore on the volume.
Update VMFS Datastore	Expands a datastore on hypervisor manager by extending the backing storage volume to specified capacity, and then grow the datastore to utilize the additional capacity.
Remove VMFS Datastore	Removes VMFS datastore and removes the backing volume from the storage device.

Reference workflows	Workflow description
New NAS Datastore	Creates an NFS storage volume and builds NAS datastores on the volume.
Update NAS Datastore	Updates NAS datastores by expanding the capacity of the underlying NFS volume.
Remove NAS Datastore	Removes the NAS datastore and the underlying NFS storage volume.
New Storage Host	Creates a new storage host. If host group is provided as input, then the host is added to the host group.
Update Storage Host	Updates the storage host details. If the inputs for a task are provided, then the task is run; otherwise, it is skipped.
Remove Storage Host	Removes the storage host. If the host group name is provided as input, the workflow also removes the host from the host group.
New Export Policy	Creates a storage export policy and adds the created policy to an NFS volume.
Remove Export Policy	Removes the NFS volume and the export policy attached to the volume.
New SVM	Creates an SVM.
New Virtual Machine	Creates a new VM on the hypervisor from an OVA or OVF file. The Datastore, Host/Cluster, and Image URL input fields are mandatory. All other inputs are optional.

For more information about each of the workflows listed in Table 5, see, “Appendix B: Reference workflows.”

You can also combine the storage tasks listed in Table 5 with the reference workflows to create your own custom workflow.

For more information and examples of each of the custom-defined workflows, see, “*Required input parameters.

Appendix C: Custom-defined workflows.”

Conclusion

The enhanced FlexPod management experience from centralized Cisco Intersight management plane is brought to you from the tight collaboration between NetApp and Cisco. Integration of Intersight with NetApp ONTAP storage is possible by using NetApp Active IQ Unified Manager REST API services and connecting to Cisco Intersight through Cisco Intersight Assist Virtual Appliance. The integration provides monitoring and orchestration of NetApp ONTAP SAN and NAS workloads. Cisco Intersight complements Active IQ Unified Manager for advance ONTAP storage management.

Note: The NetApp ONTAP storage connector with Cisco Intersight Technical Preview program started in February 2021.

Note: The Cisco IMM for FlexPod Technical Preview program started in September 2020.

Appendix A: ONTAP storage tasks in Cisco Intersight

Task #1: Add Storage Export Policy to Volume

Task description: Export policies determine access to volumes for NFS. To access a volume, a volume must be associated with an export policy, and that policy must have a rule that determines access.

Task details: Add an export policy to a volume with an SVM name, volume name, and export policy name as the inputs. After successful execution, the added volume name and export policy are generated as outputs.

Figure 11) Task #1: Add Storage Export Policy to Volume.

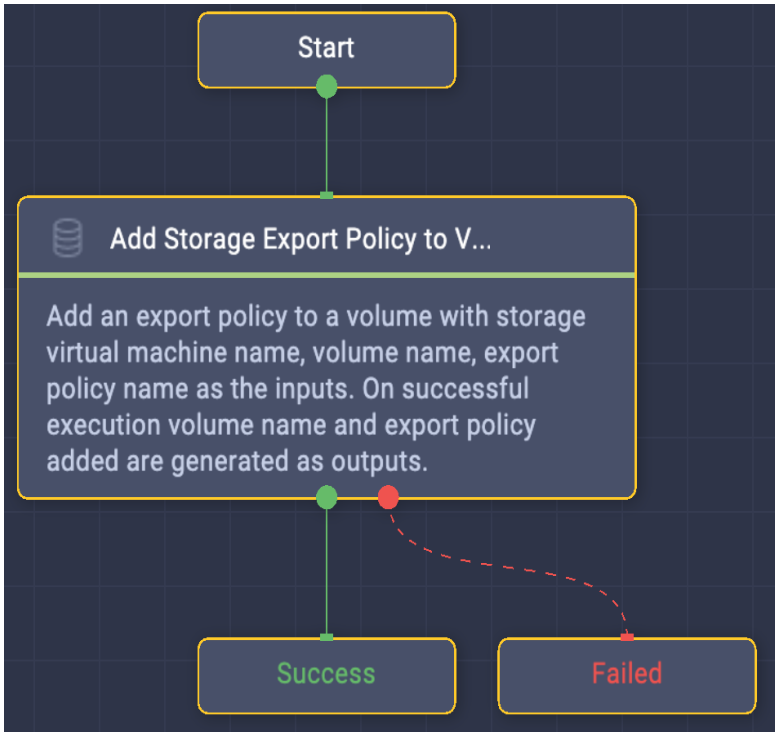


Table 6) Add Storage Export Policy to Volume: task input.

Parameter name	Input description
Storage Device*	The NetApp ONTAP cluster name where the volume resides.
Storage Vendor Virtual Machine*	The SVM name where the volume and export policy reside.
Volume*	The storage volume name that you want to map with export policy.
Export Policy*	The export policy name that will be mapped to the given volume.

*Required input parameters.

Table 7) Add Storage Export Policy to Volume: task output.

Parameter name	Output description
Volume	The storage volume name where the export policy is successfully mapped.
Export Policy*	The export policy name that is successfully mapped to the storage volume.

*Required output parameters.

Note: Access to a volume requires access permission through the export policy rules of that volume, as well as all parent volumes in the junction path. This is why the recommended SVM/vServer root volume policy rule allows at least read access to all clients on the network with a client match of `0.0.0.0/0`. If a client is only allowed access through the policy associated with a volume, but the policy of parent volumes in the junction path do not at least allow read access for this client, the client still cannot access the relevant volume.

Task #2: Connect Initiators to Storage Host (igroup)

Task description: This task adds initiators to an existing igroup.

Task details: Connect a worldwide name (WWN) or IQN list to a storage host. The storage host is the entity used to associate initiators to storage and expose as LUNs. The host can map to different terms for storage vendors. For NetApp ONTAP storage, this maps to the igroup. Inputs are the host name and the list of WWNs or IQNs. The generated outputs are the host name created, and the IQN or WWN list associated with the host. This task can be used with either WWNs or IQNs. For NetApp ONTAP storage devices, if both inputs are provided, then both initiators are added. For other vendors, if both inputs are provided, then the WWNs are assigned priority and added.

Figure 12) Task #2: Connect Initiators to Storage Host (igroup).

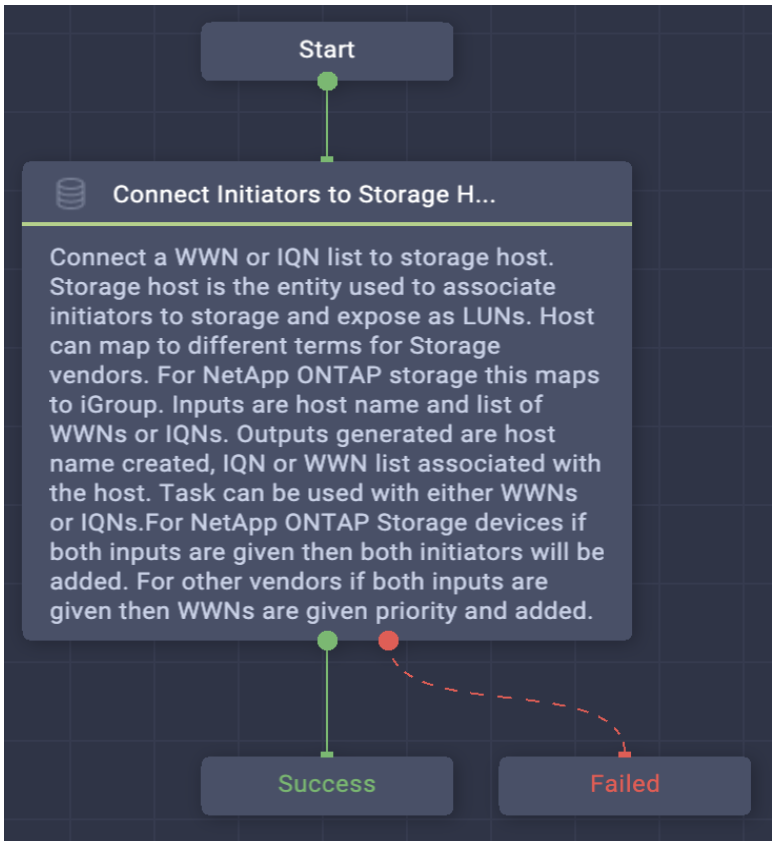


Table 8) Connect Initiators to a Storage Host (igroup): task input.

Parameter name	Input description
Storage Device*	The NetApp ONTAP cluster where the underlying igroup object is present.
Host*	The igroup name to which you want to add the initiators
Storage Vendor Host Identifier*	Platform type: NetApp Active IQ Unified Manager
List of WWNs	The list of FC WWNs for the host.
List of IQNs	The list of iSCSI qualified names for the host initiators.
Storage Vendor Virtual Machine*	The SVM name where the igroup resides.

*Required input parameters.

Table 9) Connect Initiators to a Storage Host (igroup): task output.

Parameter name	Output description
Host	The igroup name to which the initiators are added.
List of WWNs	The list of FC WWNs added to the igroup.
List of IQNs	The list of iSCSI qualified names added to the igroup.

Note: You can add an initiator to an igroup only if there are no LUN mapping conflicts. Mapping conflicts occur when an initiator is already paired with a LUN. If you attempt to run this command and there are LUN mapping conflicts, the command returns an error.

Task #3: Expand Storage LUN

Task description: This task resizes the LUN. It changes the size of the LUN to the input value size.

Task details: Expand a storage LUN with LUN path, SVM name, and LUN size as the inputs. After successful execution, the path and size of the expanded LUN are generated as outputs.

Figure 13) Task #3: Expand Storage LUN.

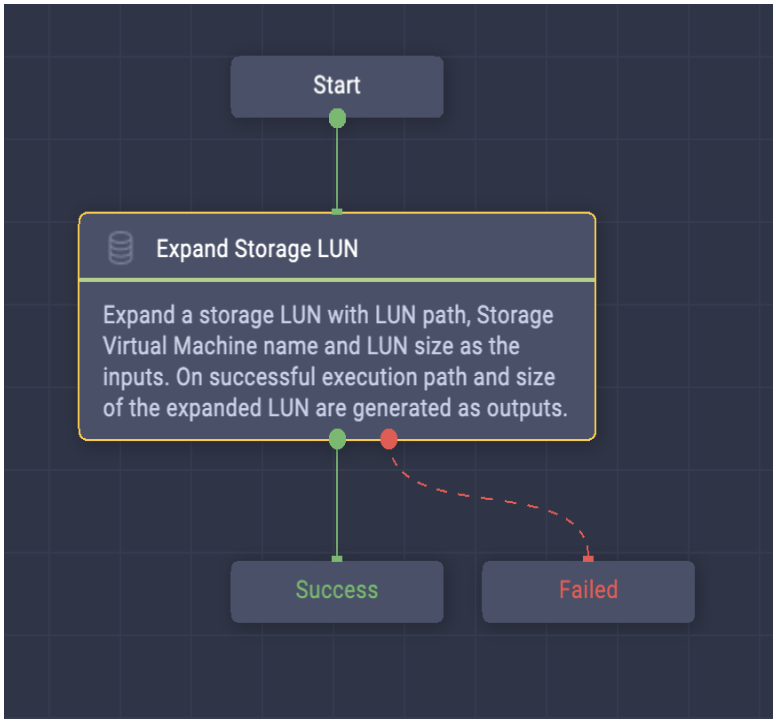


Table 10) Expand Storage LUN: task input.

Parameter name	Input description
Storage Device*	The NetApp ONTAP cluster name where the LUN resides.
Storage Vendor Virtual Machine*	The SVM name where the LUN resides.
LUN Path*	The LUN name with a full path that you want to resize.
LUN Capacity*	The new size of the LUN.

*Required input parameters.

Table 11) Expand Storage LUN: task output.

Parameter name	Output description
LUN Path*	The LUN name with full path that is resize.
LUN Capacity*	The new size or capacity of the LUN.

*Required output parameters.

Task #4: Expand Storage Volume

Task description: This task resizes the volume. When your volume reaches near-full capacity, you can increase the size of the volume.

Task details: Expand a volume with the volume name and the size as inputs. After successful execution, the volume name and size are generated as outputs.

Figure 14) Task #4: Expand Storage Volume.

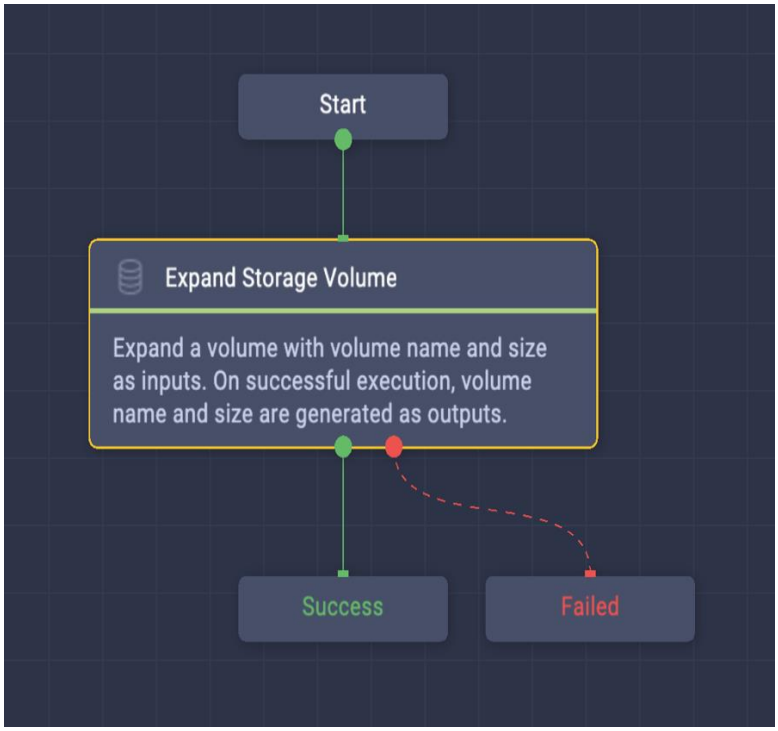


Table 12) Expand Storage Volume: task input.

Parameter name	Input description
Storage Device*	The NetApp ONTAP cluster where the underlying volume object is present.
Storage Vendor Virtual Machine*	The SVM name where the volume reside.
Volume*	The storage volume name that you want to resize.
Storage Vendor Expand Volume Capacity*	• Platform type: NetApp Active IQ Unified Manager • Capacity: New volume size

*Required input parameters.

Table 13) Expand Storage Volume: task output.

Parameter name	Output description
Volume	The storage volume name that has been successfully resized.
Volume Capacity	The new volume size.

Task #5: Find NetApp igroup LUN Map

Task description: This task helps determine the LUN and igroup it is mapped to. For the Remove LUN Storage or Remove Storage Host or igroup task, validate that the LUN does not have an igroup mapped before deleting.

Task details: Determine whether an igroup is mapped to a LUN with the given igroup name, SVM name as the inputs. If the igroup is mapped to any LUNs, then the igroup name and the list of LUN names are

generated as outputs; otherwise, the task will fail with an error message No LUN mapped to the Initiator Group.

Figure 15) Task #5: Find NetApp igroup LUN map.

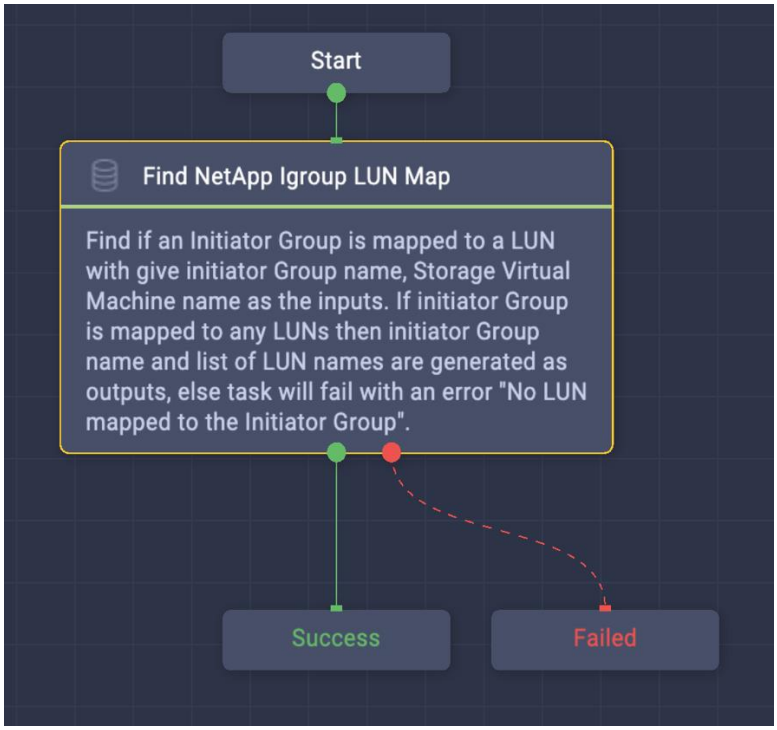


Table 14) Find NetApp igroup LUN map: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the underlying igroup object is present.
Storage Vendor Virtual Machine*	SVM name where the igroup reside.
Initiator Group*	igroup name to validate if it is mapped to a storage LUN

*Required input parameters.

Table 15) Find NetApp igroup LUN map: task output.

Parameter name	Output description
Initiator Group	igroup name that is validated.
LUN Path List*	List of LUNs that the igroup is mapped to, if any.

*Required output parameters.

Task #6: Find Storage LUN by ID

Task description: This task helps determine the LUN path. This task is used in tandem with Virtualization task. It receives the NAAID from the VMFS datastore and determines the storage LUN path for the datastore.

Task details: Find a LUN using its serial number with NAAID as the input. If LUN exist with given serial number, then LUN path, and SVM name are generated as outputs.

Figure 16) Task #6: Find storage LUN by ID.

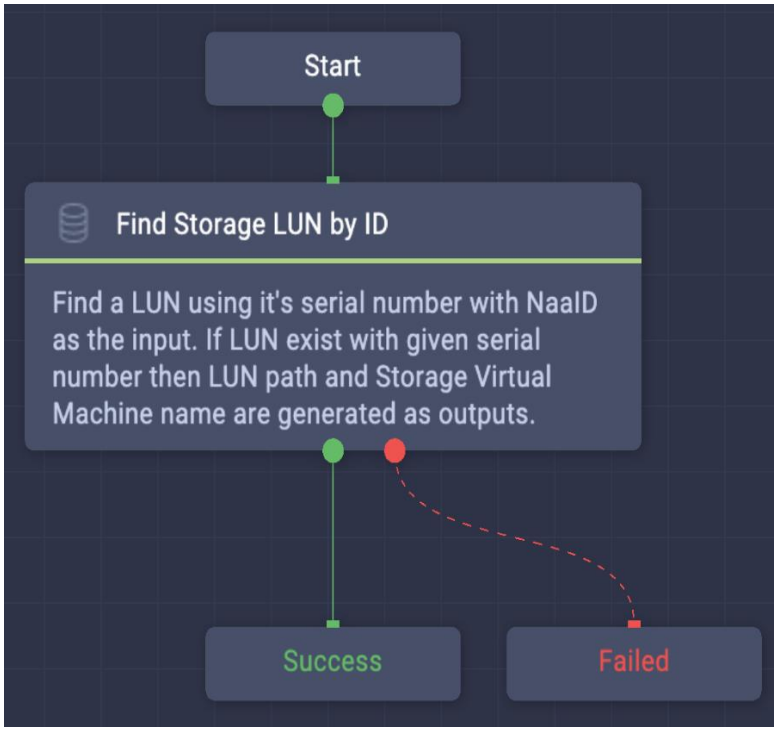


Table 16) Find storage LUN by ID: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the underlying LUN object is present.
LUN ID*	The NAAID of the VMFS datastore.

*Required input parameters.

Table 17) Find storage LUN by ID: task output.

Parameter name	Output description
Storage Vendor LUN Options*	The storage LUN name with Path for the VMFS datastore.
Storage Vendor Virtual Machine	The SVM name for the LUN.

*Required output parameters.

Task #7: Find Storage Volume by ID

Task description: This task helps determine the volume name. This task is used in tandem with Virtualization task. It receives the NAAID from the NFS datastore and determines the storage volume name for the datastore.

Task details: Find details of a storage volume given the volume identifier like NAAID or EUI Id. Generates as output volume details associated with the storage device.

Figure 17) Task #7: Find storage volume by ID.

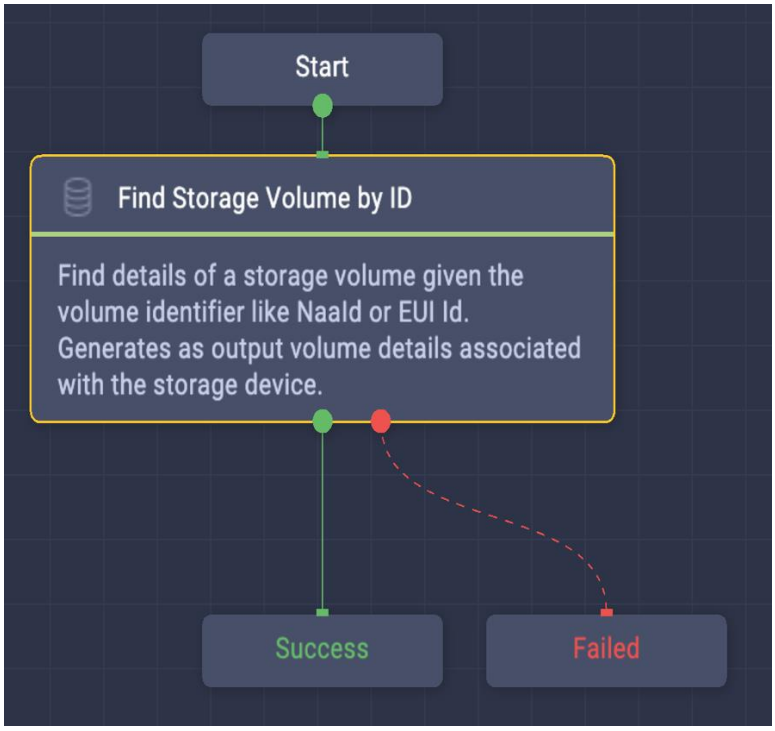


Table 18) Find storage volume by ID: task input.

Parameter name	Input description
Storage Device*	ONTAP cluster where the underlying volume object is present.
Volume ID	The NAAID for the NFS datastore
Server IP Address	The NFS storage Server IP address
Mount Path	Mount path for the NAS/NFS volume

*Required input parameters.

Table 19) Find storage volume by ID: task output.

Parameter name	Output description
Volume	The storage volume name for the NFS datastore
Volume Size	The storage volume size for the NFS datastore
Volume ID	The NAAID for the NFS datastore
Storage Virtual Machine	The SVM name where the volume resides.

Task #8: New Storage Export Policy

Task description: This task helps you create a new storage export policy. Export policies determine access to volumes for NFS for NetApp ONTAP. For volume access to be possible, a volume needs to be associated with an export-policy and that policy needs to have a rule that determines access.

Task details: Create a storage export policy with SVM name, export policy name, Client Match List, Superuser Security Type, list of protocols, list of Read Only export policy rules, list of Read Write export policy rules as the inputs. On successful execution name of the export policy created is generated as output.

Figure 18) Task #8: New storage export policy.

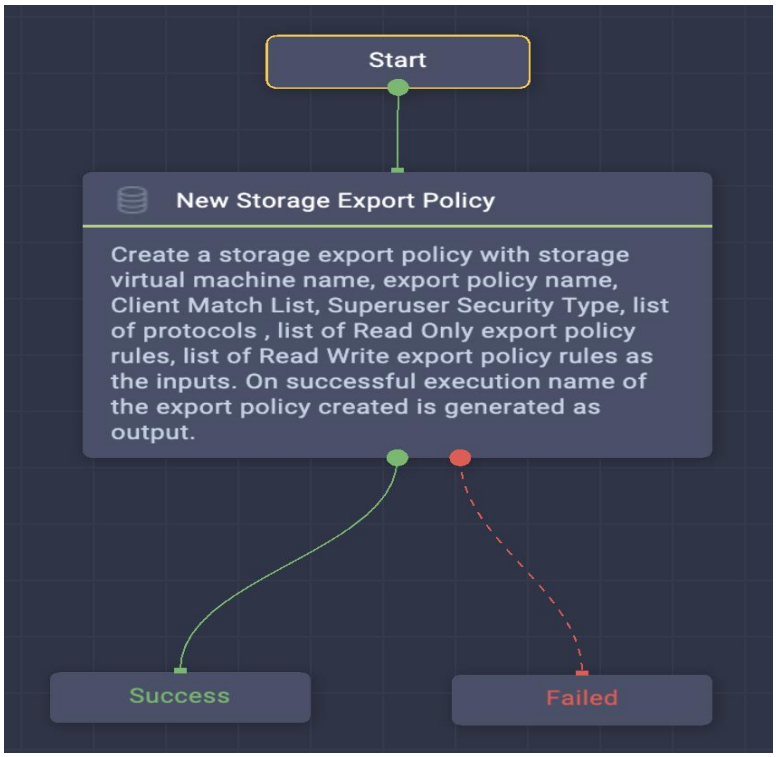


Table 20) New storage export policy: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster name where the underlying volume object is present.
Storage Vendor Virtual Machine*	SVM name where the export policy will be created.
Export Policy*	The new export policy name.
Export Policy Protocols*	List of protocols for which you want to apply the export rule
Client Match List*	The Client Match List is either a specific address or a subnet, like `10.0.3.212` or `192.168.5.0/24`, a hostname, or a netgroup, like @netgroup. If you want an export policy to apply to all possible IP4 addresses, set the client match to 0.0.0.0/0. You can specify multiple client match list.
Superuser Security Type*	The superuser option allows you to specify for which security style root users are allowed to stay root.
Read Only Policy Rules*	The ro-rule specifies for which security styles you want to allow read-only access for the clients relevant, specified in the client match. You can specify multiple security styles.

Parameter name	Input description
Read Write Policy Rules*	The rw-rule specifies for which security styles you want to allow write access for the clients relevant, specified in the client match. You can specify multiple security styles.

*Required input parameters.

Table 21) New storage export policy: task output.

Parameter name	Output description
Export Policy*	The new export policy name created by the task.

*Required output parameters.

Task #9: New Storage Fibre Channel Interface

Task description: This task helps create a new storage Logical FC Interface and associate it with the physical port.

Task details: Create a FC interface with interface name, SVM name, Data Protocol and location properties as the inputs. On successful execution Interface name, WWNN, WWPN are generated as outputs.

Figure 19) Task #9: New storage Fibre Channel Interface.

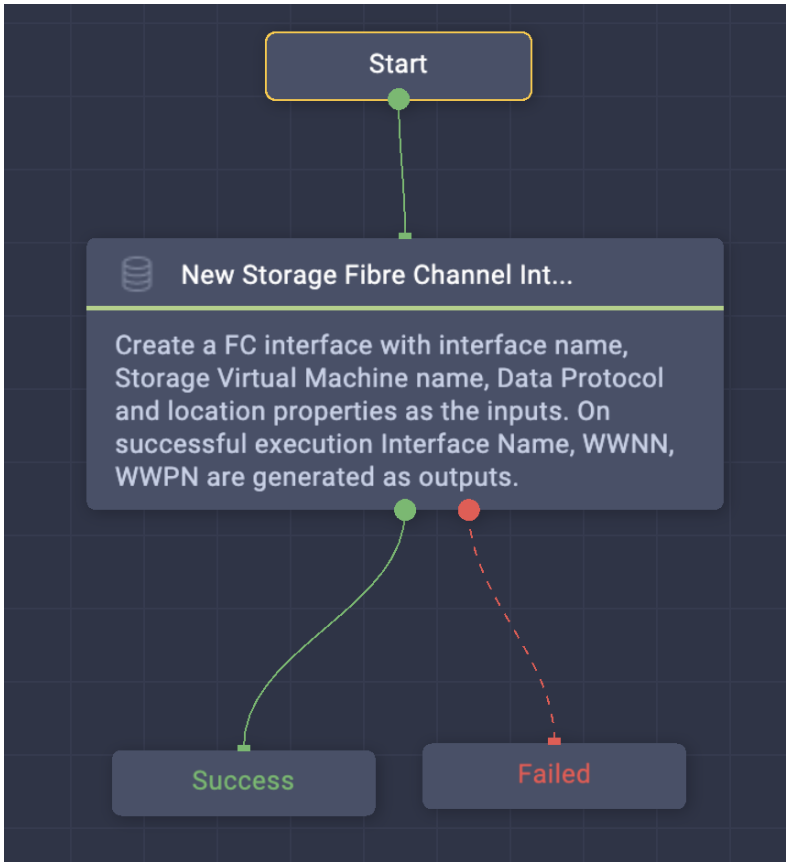


Table 22) New Storage Fibre Channel Interface: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the FC Logical Interface will be created.
Storage Vendor Virtual Machine*	SVM name where the FC Logical Interface will be created on.
Interface Name*	Name of the FC logical interface
Storage Vendor FC Interface Options*	• Platform type: NetApp Active IQ Unified Manager • Data protocol: Select FC • Location port name: The underlying physical port name • Location port node name: The underlying physical port node name

*Required input parameters.

Table 23) New Storage Fibre Channel Interface: task output.

Parameter name	Output description
Interface Name*	The new created FC logical interface name
WWNN, WWPN	List of WWNN or WWPN for the FC LIF.

*Required output parameters.

Task #10: New Storage Host

Task description: This task creates new storage igroups for the SAN Initiators.

Task details: Create a storage host with host name and list of WWNs and IQNs to be associated with it as input. Storage host is the entity used to associate initiators to storage and expose as LUNs. Host can map to different terms for storage vendors. For NetApp ONTAP storage this maps to igroup. Outputs are host name, and associated IQN or WWN list.

Figure 20) Task #10: New storage host.

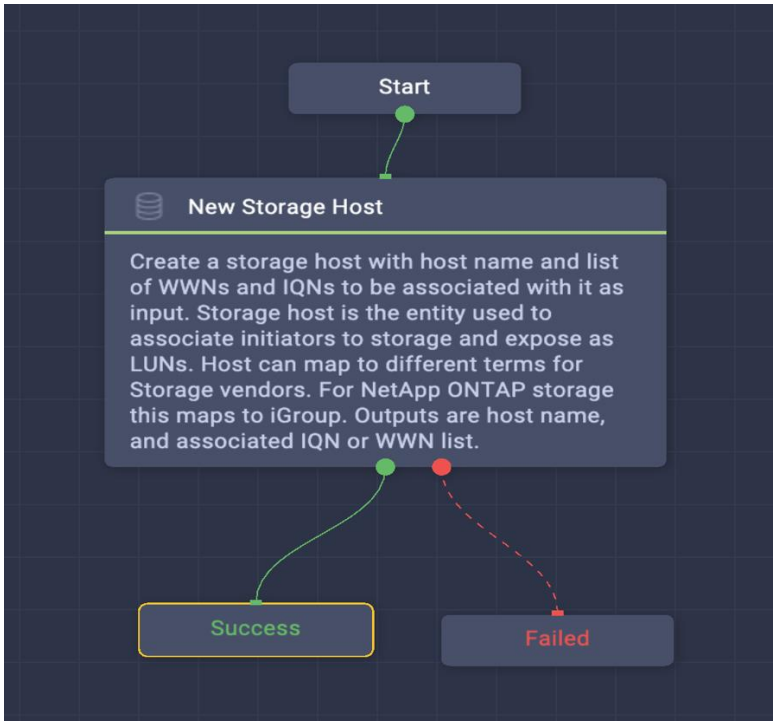


Table 24) New storage host: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the igroup will be created.
Host*	igroup name to be created
Storage Vendor Host Identifier*	Platform Type: NetApp Active IQ Unified Manger
Storage Vendor Virtual Machine	The SVM name where the igroup will be created.
List of WWNs	List of FC WWNs for the new host
List of IQNs	List of ISCSI qualified names (IQNs) for the new host
Storage Vendor Host Options*	• NetApp igroup options • Protocol: SAN protocols • Operating system: Host OS type

*Required input parameters.

Table 25) New storage host: task output.

Parameter name	Output description
Host	igroup name just created.
List of WWNs	List of FC WWNs

Parameter name	Output description
List of IQNs	List of ISCSI qualified names (IQNs)
Storage Vendor Host Identifier	SVM name where the igroup is created.

Task #11: New storage IP interface

Task description: This task helps create a new storage Logical IP Interface and associate it with the physical port.

Task details: Create a storage IP interface with IP interface name, interface IP address, interface netmask, IPSpace name, SVM name and location properties as the inputs. On successful execution interface name, interface IP address, interface netmask is generated as outputs.

Figure 21) Task #11: New storage IP interface.

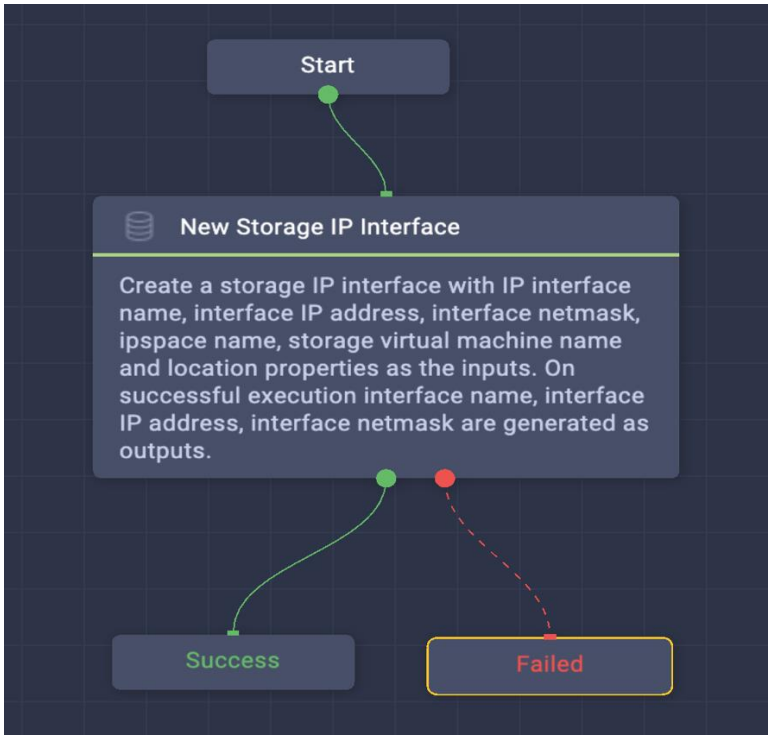


Table 26) New storage IP interface: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the IP logical interface will be created.
Storage Vendor Virtual Machine*	SVM name where the IP Logical Interface will be created on.
IP Interface Name*	Name of the IP logical interface
Storage Vendor IP Interface Options*	• Platform type: NetApp Active IQ Unified Manager • Location home port: It is the port to which the LIF returns when the network interface revert command is run

Parameter name	Input description
	• Location home node name: It is the node to which the LIF returns when the network interface revert command is run Location broadcast Domain: It contains the home port of the logical interface SVM protocol: choose the IP protocol here.
Interface IP Address*	IP Address of the Interface
Interface Netmask*	Netmask for the interface.

*Required input parameters.

Table 27) New storage IP interface: task output.

Parameter name	Output description
IP Interface Name*	The newly created IP Interface name
Interface IP Address*	The IP address for the newly created IP Interface.
Interface Netmask*	The Interface netmask for the newly created IP Interface.

*Required output parameters.

Task #12: New storage LUN

Task description: This task helps to create a new LUN with a specific size.

Task details: Create a storage LUN with inputs as LUN name, volume name, Operating System name, SVM name, size of LUN. On successful execution LUN path, NAAID and LUN capacity are generated as outputs.

Figure 22) Task #12: New storage LUN.

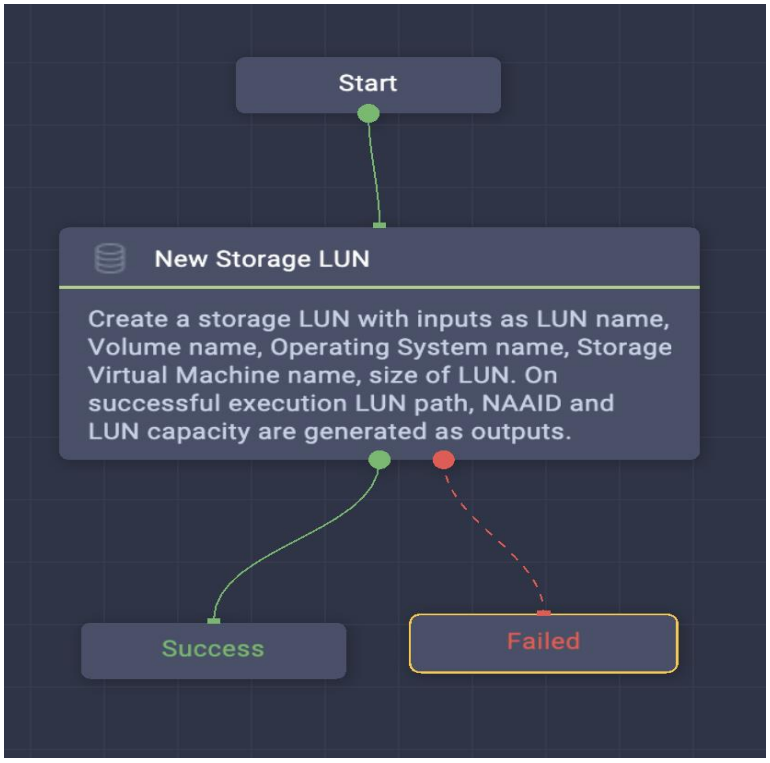


Table 28) New storage LUN: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the new LUN will be created.
Storage Vendor Virtual Machine*	Storage VM name where the new LUN will be created
LUN Prefix*	New LUN name to be created.
Volume*	The storage volume name in which the LUN will be created.
LUN Capacity*	The LUN size for the new LUN
Operating System*	Host Operating System type

*Required input parameters.

Table 29) New storage LUN: task output.

Parameter name	Output description
Storage Vendor LUN options	Storage VM name and LUN Path for the new LUN
NAAID	Storage LUN NAAID
LUN Capacity	The LUN Capacity for the newly created LUN.

Task #13: New storage LUN ID

Task description: This task maps a LUN to all of the initiators in an initiator group (igroup). After you map the LUN, the LUN is visible to all initiators in the igroup.

Task details: Connect storage to a host with host name and details needed to create LUN ID. On successful execution, host name, details of the LUN ID are generated. For NetApp ONTAP storage, connect storage LUN to an igroup with Inputs as LUN name and igroup name. igroup is referred as Host for input. On successful execution igroup name, LUN name and LUN number are generated as outputs.

Figure 23) Task #13: New storage LUN ID.

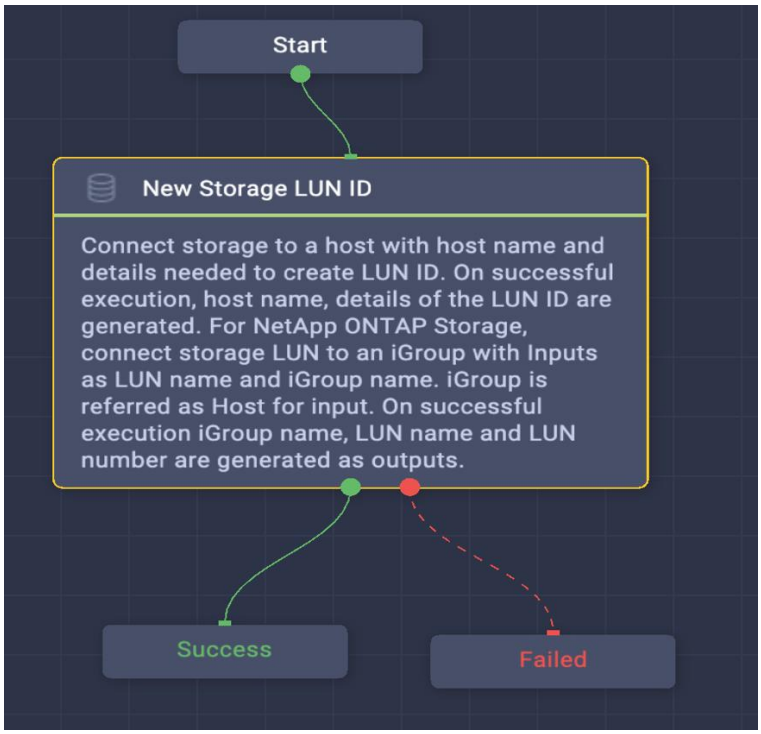


Table 30) New storage LUN ID: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the LUN object is present.
Storage Vendor Virtual Machine*	SVM name where the LUN and igroup are present.
Host*	igroup name that you want to map.
Storage Vendor Host Identifier*	Platform Type: NetApp Active IQ Unified Manager
Storage Vendor LUN Options*	LUN Path details to map the LUN

*Required input parameters.

Table 31) New storage LUN ID: task output.

Parameter name	Output description
Host	igroup name

Parameter name	Output description
Volume	Volume for the LUN just mapped
LUN number	LUN ID
Volume ID*	The NAAID for the volume
LUN Path	Full LUN Path

*Required output parameters.

Task #14: New Storage Virtual Machine

Task description: This task will enable you to create a new SVM and enable protocols for SAN and NAS configurations.

Task details: Create an SVM with the SVM name and list of protocols to be enabled as inputs. Optional parameters for the Management interface include Interface name, Interface IP address, Interface Netmask, Broadcast Domain, location Node name as the inputs. On successful execution SVM name, SVM root volume name, Management IP address, Protocols enabled are generated as outputs.

Figure 24) Task #14: New Storage Virtual Machine.

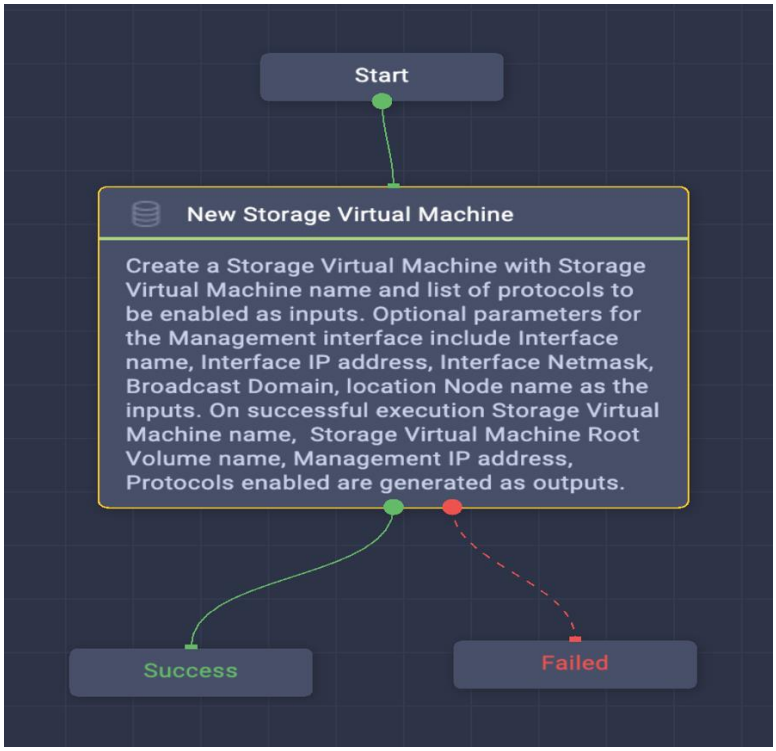


Table 32) New Storage Virtual Machine: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the SVM will be created.
Storage Vendor Virtual Machine*	The new SVM name

Parameter name	Input description
Storage Vendor Virtual Machine Options*	• Platform type: NetApp Active IQ Unified Manager • Storage VM protocols: IP/FC; you can add multiple options here. • Management interface details: This is optional.

*Required input parameters.

Table 33) New Storage Virtual Machine: task output.

Parameter name	Output description
Storage Virtual Machine	The newly created SVM name
Storage Virtual Machine Name Root Volume	The root volume name for the SVM
Management Interface IP Address	If the Management Interface is created using this task the Management IP address will be available in output.
Storage VM Protocols	The SVM Protocols created for the SVM will be listed here.

Task #15: New storage volume

Task description: This task enables to create a new storage volume. For a NFS volume you can specify the junction point and other properties.

Task details: Create a storage volume with volume name and volume size as inputs. Generates the volume name and volume size as outputs.

Figure 25) Task #15: New storage volume.

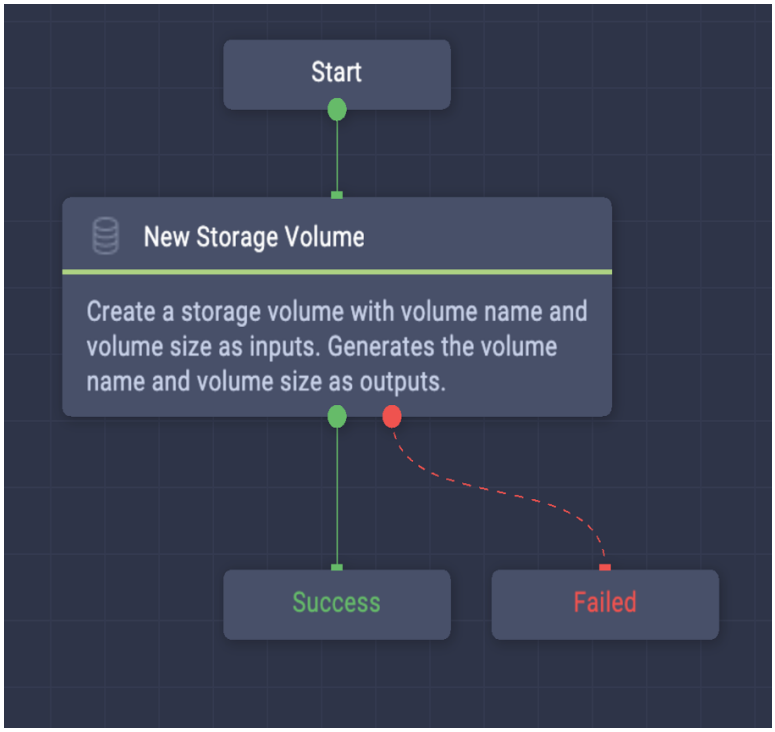


Table 34) New storage volume: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the volume will be created.
Storage Vendor Virtual Machine*	SVM name where the volume will be created.
Storage Vendor Aggregate*	Storage aggregate name where the volume will be hosted.
Storage Vendor Volume Options*	• Platform type: NetApp Active IQ Unified Manager • volume name • NFS options: If set to True, NFS volume is created. If set to False, SAN volume is created.
Volume Capacity*	The size of the volume

*Required input parameters.

Table 35) New storage volume: task output.

Parameter name	Output description
Volume	The new volume name created
Volume Capacity	The new volume size created
Volume ID	The volume NAAID

Task #16: Remove storage export policy

Task description: This task enables to remove an export policy. Removing an export policy will disable the access rules to the volumes associated with the export policy.

Task details: Remove a storage export policy with export policy name and SVM name as the inputs. On successful execution name of the export policy removed is generated as output.

Figure 26) Task #16: Remove storage export policy.

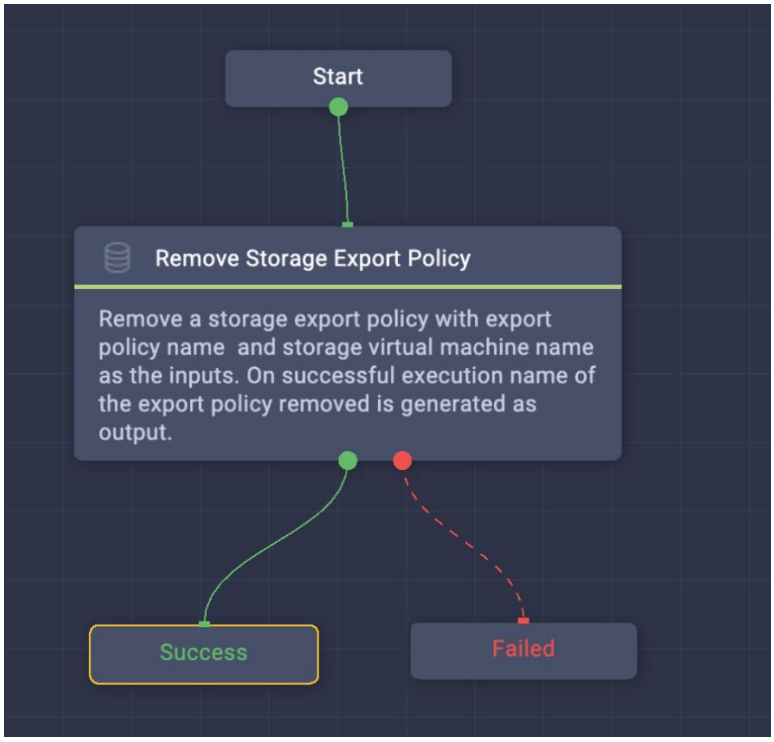


Table 36) Remove storage export policy: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the underlying export policy object is present.
Storage Vendor Virtual Machine*	SVM name where the export policy resides
Export Policy*	Export policy name to be removed

*Required input parameters.

Table 37) Remove storage export policy: task output.

Parameter name	Output description
Export Policy*	Export policy name removed by the task.

*Required output parameters.

Task #17: Remove storage host

Task description: This Task enables to remove the Initiator group. The Initiator group should be unmapped from the LUN before removing it.

Task details: Remove a storage host with host name as input. storage host or igroup is the entity used to associate initiators to storage and expose as LUNs. Host can map to different terms for storage vendors. For NetApp ONTAP storage this maps to igroup. On successful execution, the host name deleted is generated as output.

Figure 27) Task #17: Remove storage host.

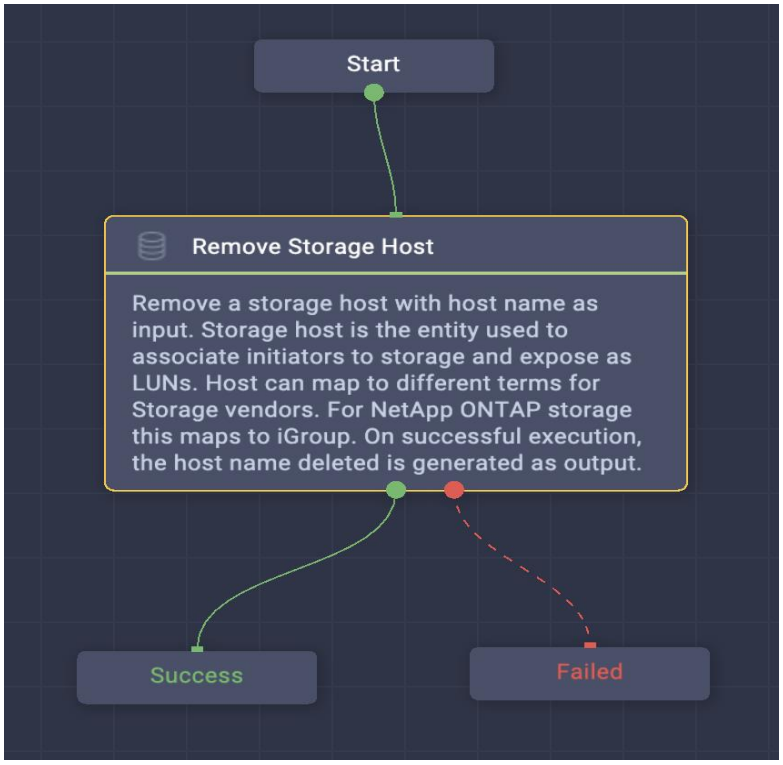


Table 38) Remove storage host: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the underlying igroup object is present.
Storage Vendor Virtual Machine*	Storage VM name where the igroup object is present.
Host*	igroup name to be removed
Storage Vendor Host Identifier*	Platform Type: NetApp Active IQ Unified Manager.

*Required input parameters.

Table 39) Remove storage host: task output.

Parameter name	Output description
Host	igroup name removed by the task.
Storage Vendor Host Identifier	Storage platform type

Task #18: Remove storage LUN

Task description: This task enables to remove a LUN from storage if no longer needed. The LUN should be unmapped from igroup before deleting.

Task details: Remove a LUN with LUN path and SVM name as the inputs. On successful execution the path for the LUN removed is generated as output.

Figure 28) Task #18: Remove storage LUN.

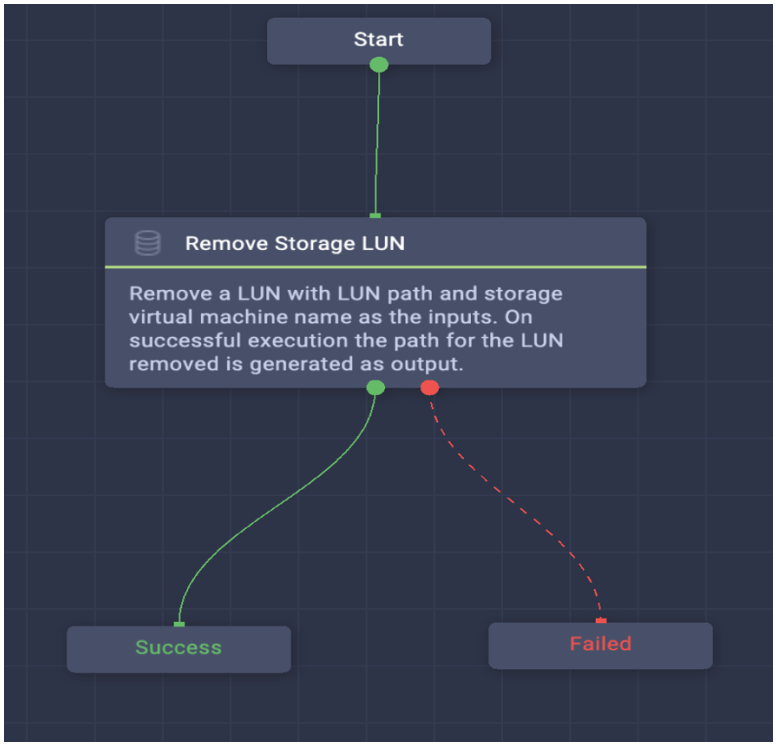


Table 40) Remove storage LUN: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the LUN object is present.
Storage Vendor Virtual Machine*	SVM name where the LUN object is present.
LUN Path*	The LUN name with full path that will be removed.

*Required input parameters.

Table 41) Remove storage LUN: task output.

Parameter name	Output description
LUN Path*	The LUN name with full path that is removed by the task.

*Required output parameters.

Task #19: Remove storage LUN ID

Task description: This Task enables to UNMAP a LUN from an initiator group.

Task details: Disconnect storage from Host and hence remove the LUN ID. Storage host is the entity used to associate initiators to storage and expose as LUNs. Host can map to different terms for storage vendors. For NetApp ONTAP storage, disconnect storage LUN from an igroup with LUN name and igroup name as inputs. On successful execution igroup name and the LUN Path are generated as outputs.

Figure 29) Task #19: Remove storage LUN ID.

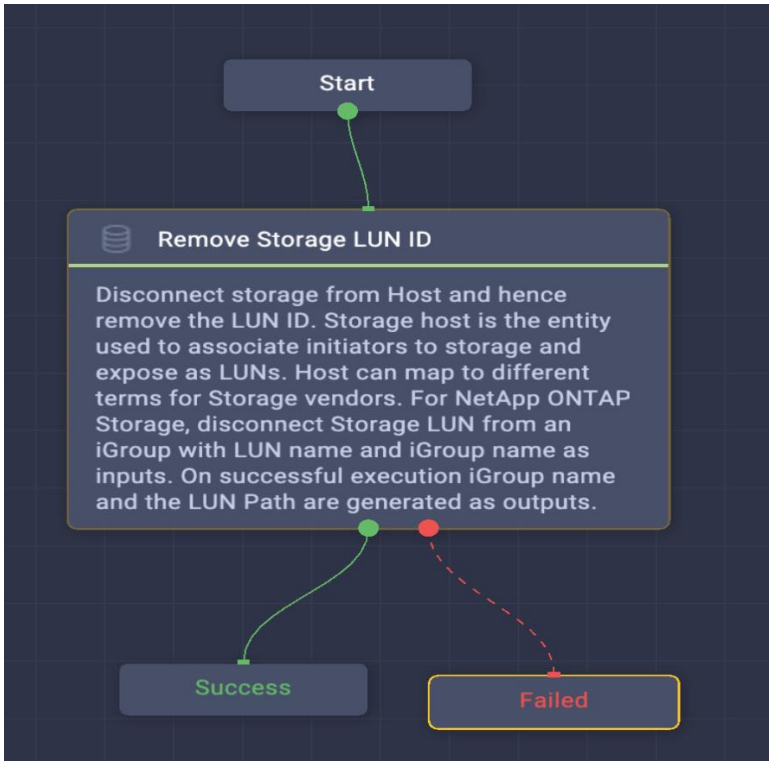


Table 42) Remove storage LUN ID: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the LUN object is present.
Storage Vendor Virtual Machine*	Storage VM name where the LUN object is present.
Storage Vendor Host Identifier*	Platform Type: NetApp Active IQ Unified Manager
Host*	igroup name that will be unmapped from the LUN
Storage Vendor LUN number*	LUN Path for the LUN that will be unmapped

*Required input parameters.

Table 43) Remove storage LUN ID: task output.

Parameter name	Output description
Host	igroup name that is unmapped
Volume	Volume name for the LUN that is unmapped
LUN number	The LUN Map ID
LUN Path	The LUN Path for the LUN that is unmapped.

Task #20: Remove storage volume

Task description: This task enables to delete a volume that is no longer needed. When a volume is deleted, all the data in the volume is destroyed and cannot be recovered.

Task details: Remove storage volume with volume name as input. On successful execution, the deleted volume name is generated as output.

Figure 30) Task #20: Remove storage volume.

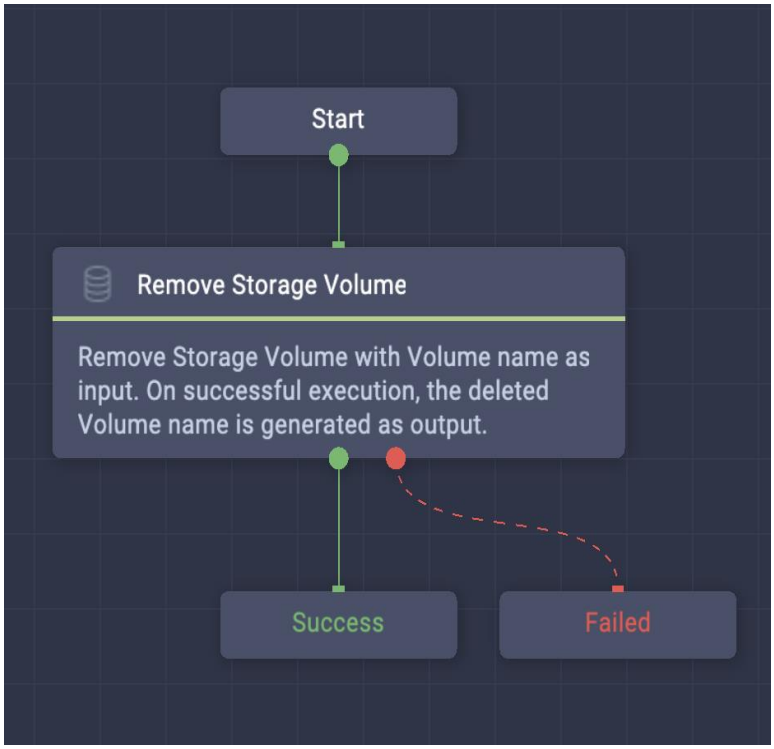


Table 44) Remove storage volume: task input.

Parameter name	Input description
Storage Device*	NetApp ONTAP cluster where the volume object is present.
Storage Vendor Virtual Machine*	Storage VM name where the volume object is present.
Volume*	The volume name that will be removed.
Storage Vendor Volume Delete Options	Platform Type: NetApp Active IQ Unified Manager

*Required input parameters.

Table 45) Remove storage volume: task output.

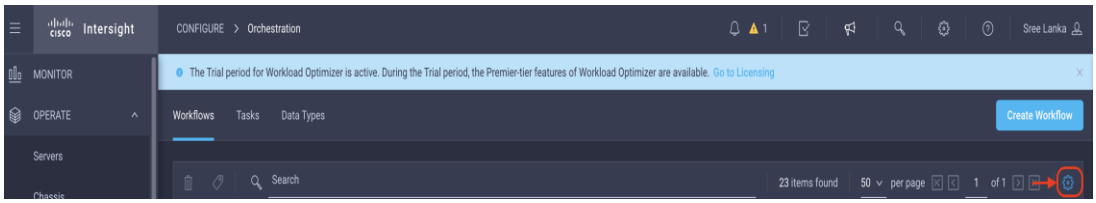
Parameter name	Output description
Volume	The volume name removed by the task.

Appendix B: Reference workflows

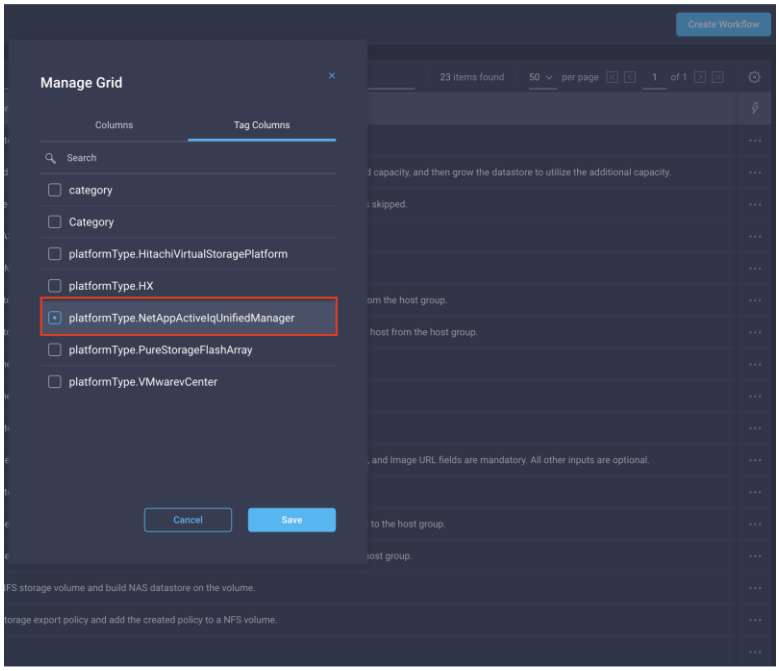
Reference workflows are readily available out-of-box for you to manage NetApp storage tasks and hypervisor virtualization tasks.

To find the reference workflows applicable for NetApp storage in Cisco Intersight, complete the following steps:

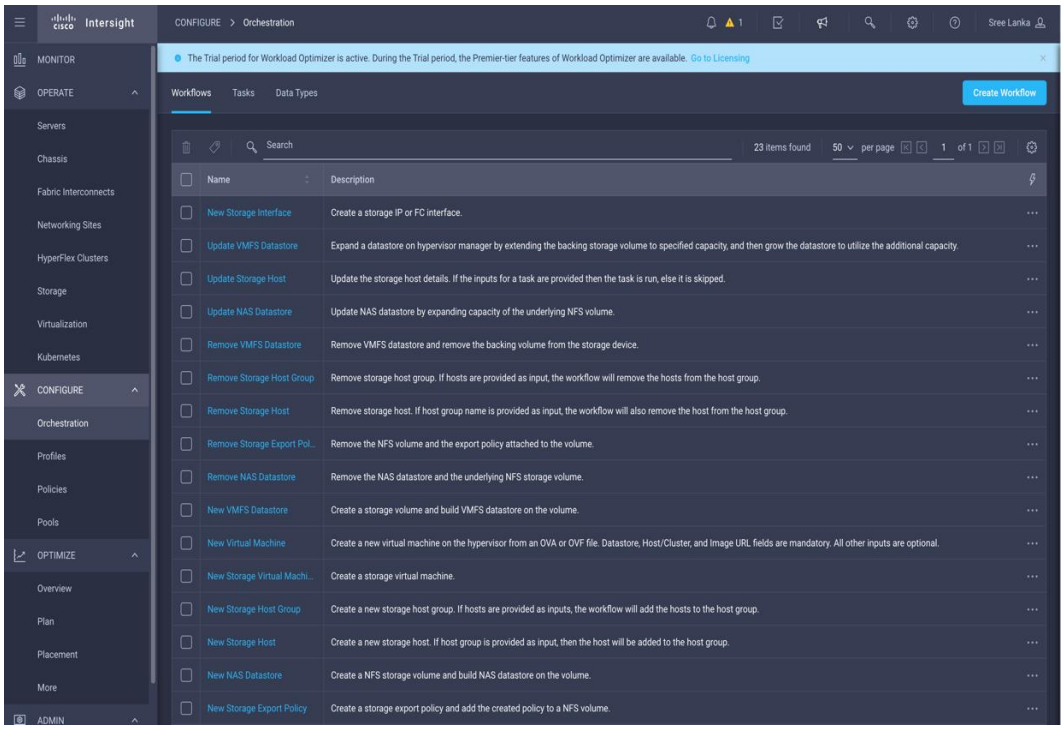
1. Select Configure > Orchestration.
2. Click the Grid wheel on the right side of the page, below Create WorkFlow.



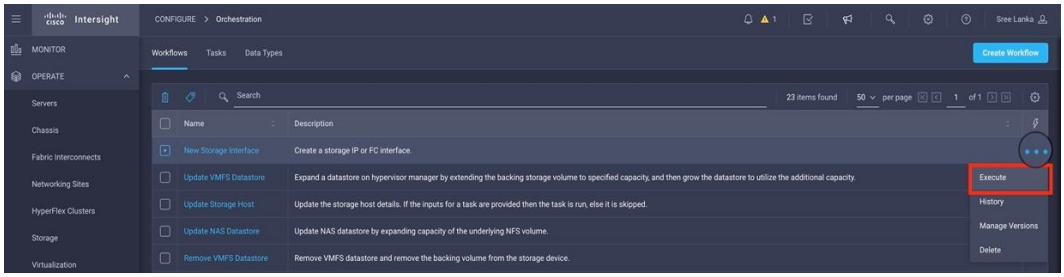
3. Under Manage Grid, select Tag Columns and then select platformTypeNetAppActiveIqUnifiedManger. Click Save.



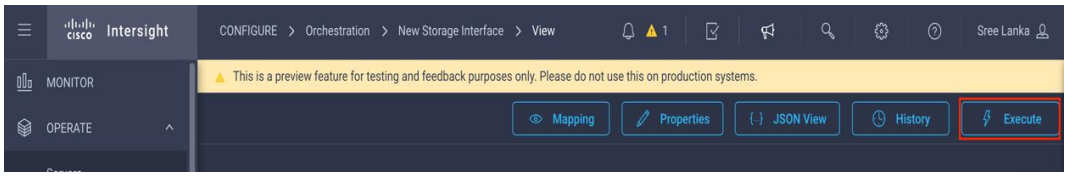
4. A list of readily available out-of-box reference workflows is displayed.



5. To execute a reference workflow, complete the following steps:
   a. Select the workflow, click the three dots in the far-right column, and select Execute.



   b. The other option is to click on the workflow and select Execute on the top-right side.



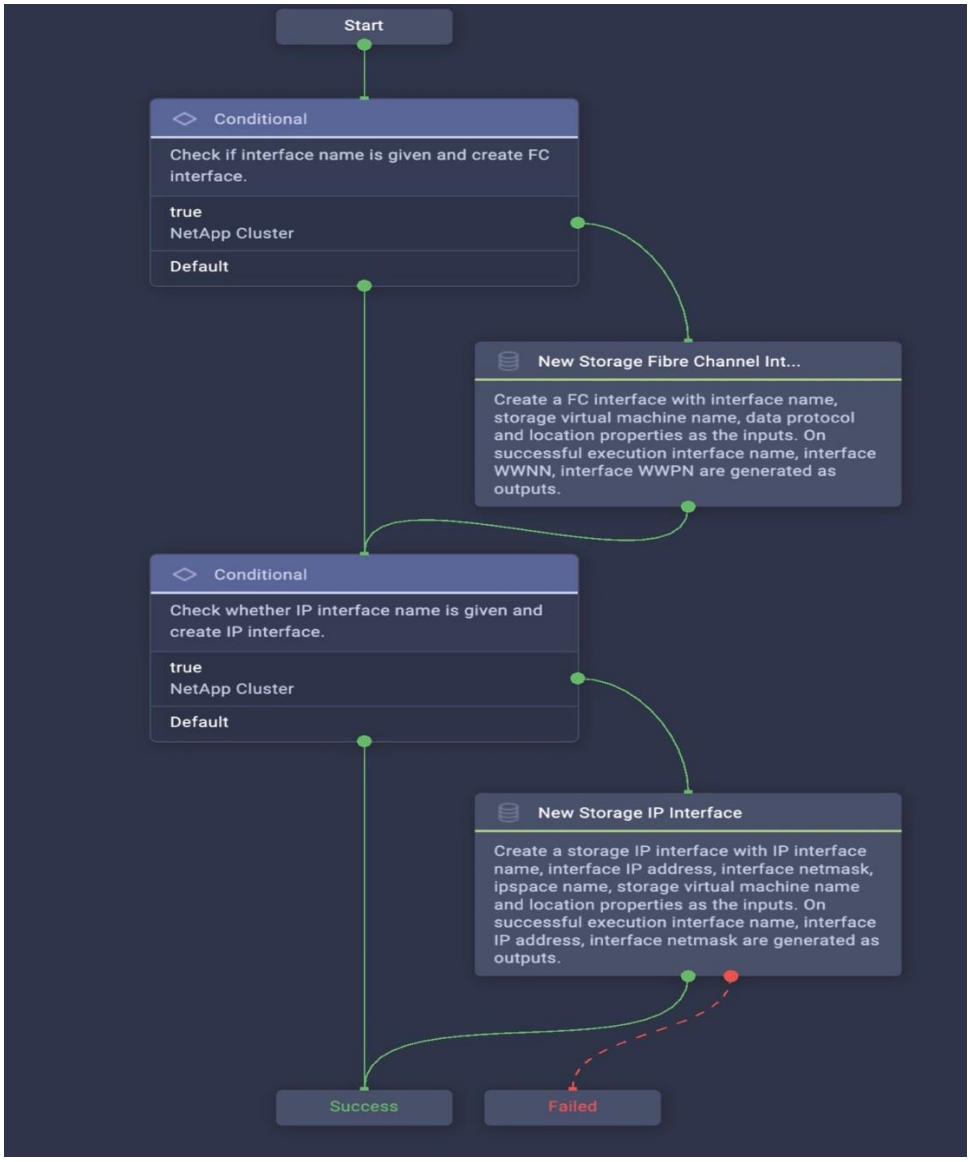
The following subsections describe each of these reference workflows.

Reference workflow #1: New Storage Interface

Workflow description: Create a storage IP or FC interface.

Workflow details: This workflow allows you to create both FC and IP logical interfaces for an SVM. The logical interfaces in an SVM enable the storage VM to provide management and data network connectivity.

Figure 31) Reference workflow #1: New Storage Interface.



The New Storage Interface workflow includes the following steps:

1. The Select Interface input parameter determines the execution flow conditions.
2. The condition task is executed first to verify and create the FC interface:
   a. If an FC interface name is provided, the New Storage FC Interface task is executed and then continues to the second condition in the workflow.
   b. Otherwise, the execution flows to the second condition in the workflow.
3. The second condition task is executed to verify and create the IP interface:
   a. If IP interface name is given, the New Storage IP Interface task is executed, and the workflow moves to the Terminal state.
   b. Otherwise, the execution moves to the Terminal state.

4. The Execution Terminal status can be seen in the output as a success or failure. In the event of a failure, the error message is provided in the output. If the workflows successfully execute, the storage IP or FC interfaces can be viewed from the storage inventory in the Cisco Intersight.

Table 46) New storage interface: workflow input.

Parameter name	Input description
Organization	The organization in which the workflow will be executed.
Workflow Instance Name	Use the existing name or create a new workflow instance name.
Storage Device*	The NetApp ONTAP cluster name.
Storage Vendor Virtual Machine*	The SVM name.
Select Interface	The IP interface or FC interface (or both interfaces).
IP Interface options	Provide the IP interface options if the IP interface or both were selected for Select Interface.
FC Interface options	Provide the FC interface options if the FC interface or both were selected for Select Interface.

*Required input parameters.

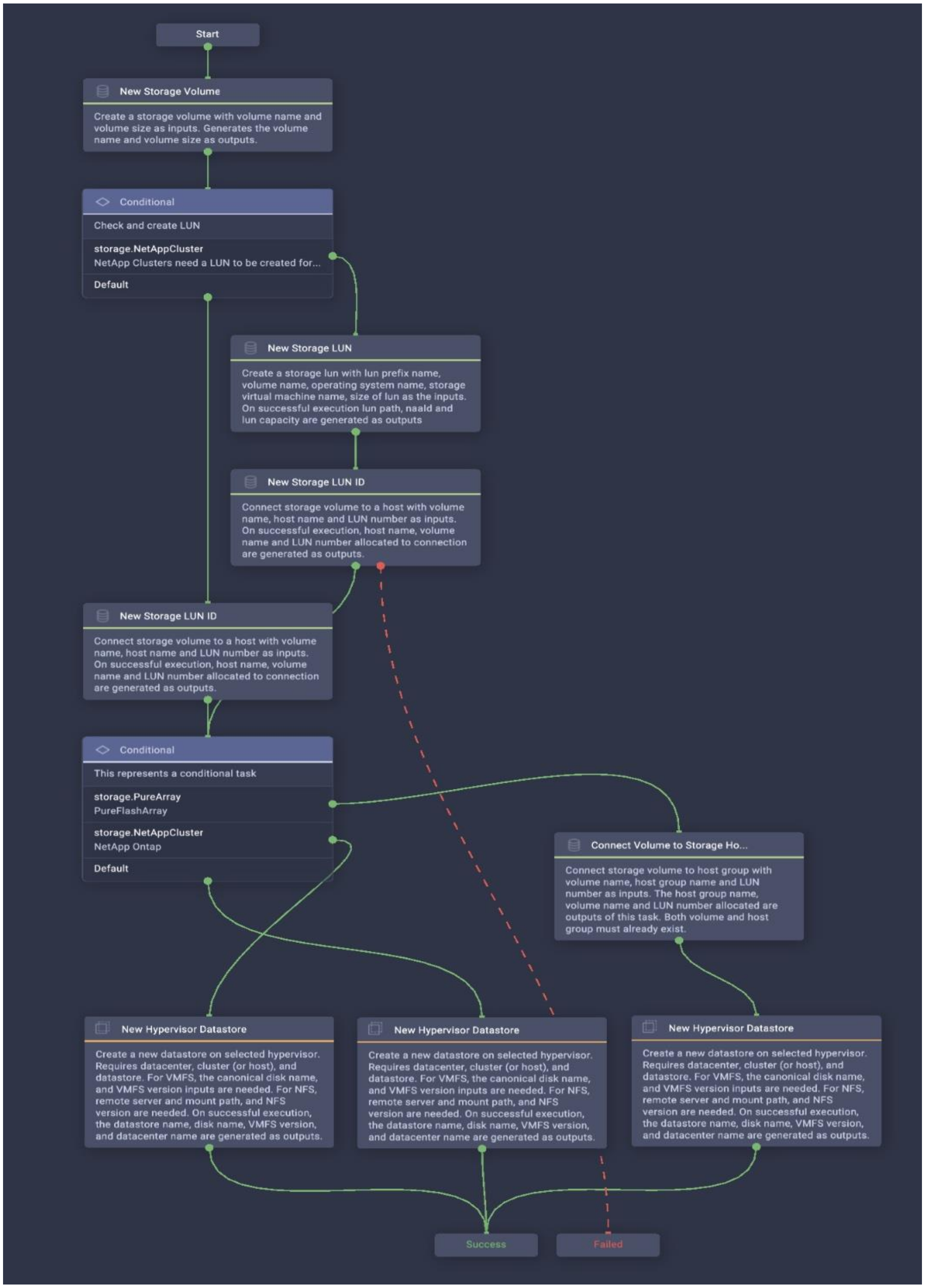
Note: For more information about the input parameters, see Appendix D: Task input parameter.

Reference workflow #2: New VMFS Datastore

Workflow description: Create a storage volume and build the VMFS datastore on the volume.

Workflow details: This workflow enables you to create a SAN storage LUN by using the NetApp storage tasks. Then it uses the New Hypervisor Datastore task to create the datastore on the virtualization hypervisor.

Figure 32) Reference workflow #2: New VMFS Datastore.



The New VMFS Datastore workflow includes the following steps:

1. Create an ONTAP storage volume with the volume name and volume size as inputs. This generates the volume name and volume size as outputs.

2. Create a storage LUN with the LUN name and size as inputs. The LUN is created in the volume that was created in the step 1.
3. Connect the storage LUN to the igroup that was provided as input.
4. The New Hypervisor Datastore task takes the LUN details from the step 3 as input and creates a VMFS datastore on the VMware vSphere Hypervisor.
5. The workflow terminates with a success or failure:
    a. If successfully executed, a new NetApp storage volume and LUN is created in the SVM and mapped to the igroup. This can be validated in the NetApp storage inventory from Cisco Intersight. A new VMFS Hypervisor datastore is created. This can be validated in the virtualization inventory from Cisco Intersight.
    b. In the event of failure, the output in the execution pane displays the error message.

Table 47) New VMFS Datastore: task input.

Parameter name	Input description
Organization	Organization in which the workflow will be executed.
Workflow Instance Name	Use the existing name or create a new workflow instance name.
Storage Device*	The NetApp ONTAP cluster name.
Storage Vendor Virtual Machine*	The SVM name.
LUN Prefix*	The LUN name.
Operating System*	The host operating system type.
LUN Capacity *	The LUN size.
Aggregate*	The storage aggregate name where the volume will be created.
Volume*	The volume name.
NFS Volume option	This option should be unchecked or left blank for a VMFS datastore.
Volume Capacity*	The volume size.
Storage Host*	The igroup name.
Hypervisor Manager*	The hypervisor manager for this workflow execution.
Datacenter*	The data center associated with the new datastore.
Cluster	The cluster on which the datastore will be hosted.
Host	The host on which the datastore will be hosted. If you provide a cluster, then the host will be ignored.
Datastore Name*	The name of the datastore that will be created on the hypervisor.
Datastore Type*	The VMFS datastore type.

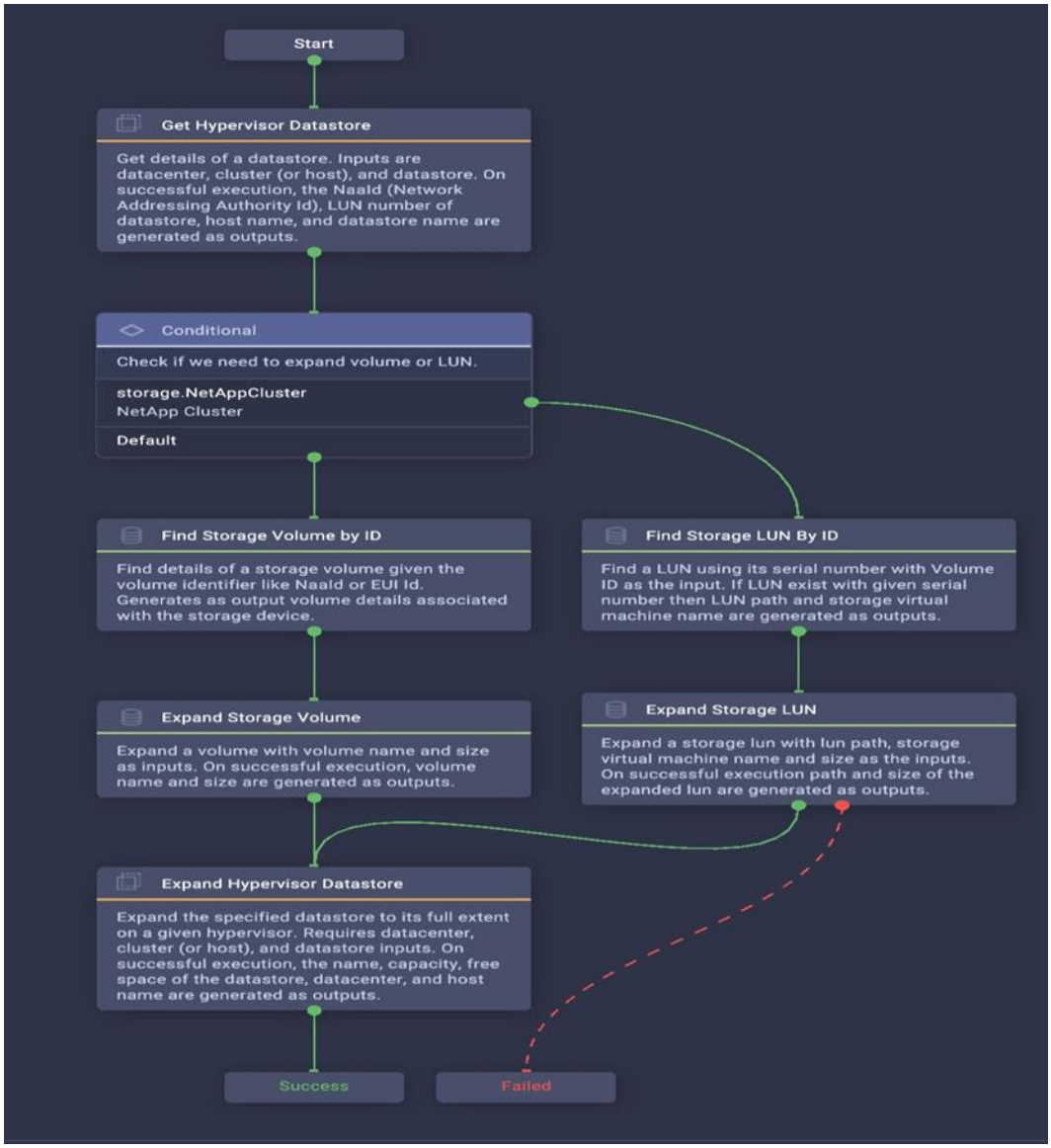
*Required input parameters.

Reference workflow #3: Update VMFS Datastore

Workflow description: Expand a datastore on hypervisor manager by extending the backing storage volume to specified capacity, and then grow the datastore to utilize the additional capacity.

Workflow details: This workflow enables single click execution from Cisco Intersight to execute VMware hypervisor and NetApp ONTAP storage tasks and enable you to expand the VMFS or SAN datastore.

Figure 33) Reference workflow #3: Update VMFS datastore.



The Update VMFS Datastore workflow includes the following steps:

1. Obtain the hypervisor datastore details with datastore name as input. When successfully executed, this hypervisor generates the NAAID of the datastore as output.
2. The NetApp Find Storage LUN by ID task uses the NAAID from the step 1 as input and generates the serial number for the LUN. This task finds the LUN path and the SVM name based on the serial number.
3. Using the LUN details from the Find Storage LUN by ID task as input, the NetApp Expand Storage LUN task resizes the LUN based on the workflow input.
4. The virtualization task Expand Hypervisor Datastore expands the hypervisor datastore to the full extent.
5. The workflow terminates with a success or failure:
   a. If successfully executed, a new NetApp storage LUN is resized or expanded as provided in the input. This can be validated in the NetApp storage Inventory from Cisco Intersight. The VMFS

Hypervisor datastore also reflects the new size. This can be validated in the virtualization inventory from Cisco Intersight.

b. In the event of failure, the output in the execution pane displays the error message.

Table 48) Update VMFS Datastore: task input.

Parameter name	Input description
Organization	The organization in which the workflow will be executed.
Workflow Instance Name	Use the existing name or create a new workflow instance name
Storage Device*	The NetApp ONTAP cluster name.
Storage Vendor Virtual Machine*	The SVM name.
Hypervisor Manager*	The hypervisor manager for this workflow execution.
Datacenter*	The data center associated with the datastore.
Cluster	The cluster on which the datastore is hosted.
Host	The host on which the datastore is hosted. If you provide a cluster, then the host will be ignored.
Datastore Name*	The name of the datastore for which the size is being updated.

*Required input parameters.

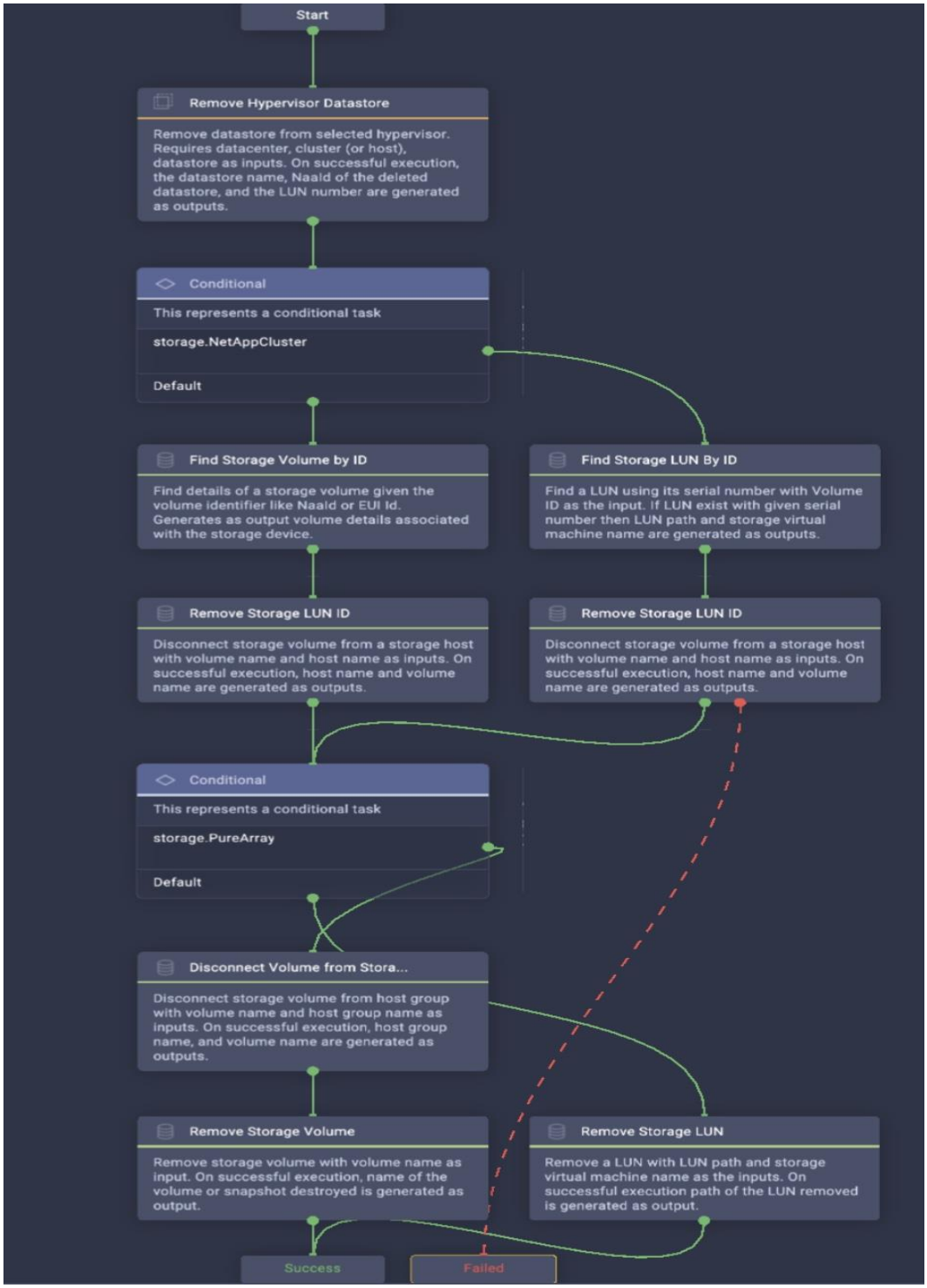
Reference workflow #4: Remove VMFS Datastore

Workflow description: Remove the VMFS datastore and remove the backing volume from the storage device.

Workflow details: This workflow enables you to delete or remove a VMFS datastore from the hypervisor and seamlessly remove the SAN LUN associated with the datastore on the ONTAP storage.

Note: If you remove the LUN, all the data in the LUN is destroyed and cannot be recovered.

Figure 34) Reference workflow #4: Remove VMFS Datastore.



The Remove VMFS Datastore workflow includes the following steps:

1. The Remove Hypervisor Datastore task enables you to delete the datastore provided as input. When successfully executed, this hypervisor task generates the NAAID of the deleted datastore as output.

2. The NetApp task “Find Storage LUN by ID” uses the NAAID from the step 1 as input and generates the serial number for the LUN. It finds the LUN path and the SVM name based on the serial number.
3. Using the LUN details from the Find Storage LUN by ID task as input, the NetApp task Remove Storage LUN ID unmaps the storage host igroup from the LUN.
4. Using the LUN details from step 2, the NetApp task Remove Storage LUN removes the LUN from the SVM.
5. The workflow terminates with a success or failure:
    a. If successfully executed, the Hypervisor VMFS datastore and its equivalent NetApp storage LUN are removed. This can be validated in the NetApp storage inventory for the NetApp LUN and virtualization inventory for VMFS Hypervisor datastore from Cisco Intersight.
    b. In the event of failure, the output in the execution pane displays the error message.

Table 49) Remove VMFS Datastore: task input.

Parameter name	Input description
Organization	The organization in which the workflow will be executed.
Workflow Instance Name	Use the existing name or create a new workflow instance name.
Storage Device*	The NetApp ONTAP cluster name.
Storage Vendor Virtual Machine*	The SVM name.
Hypervisor Manager*	The hypervisor manager for this workflow execution.
Datacenter*	The data center associated with the datastore.
Cluster	The cluster on which the datastore is hosted.
Host	The host on which the datastore is hosted. If you provide a cluster, then the host will be ignored.
Datastore Name*	The name of the datastore to be removed.
Storage Host*	The igroup name of the storage device to which the LUN is mapped.

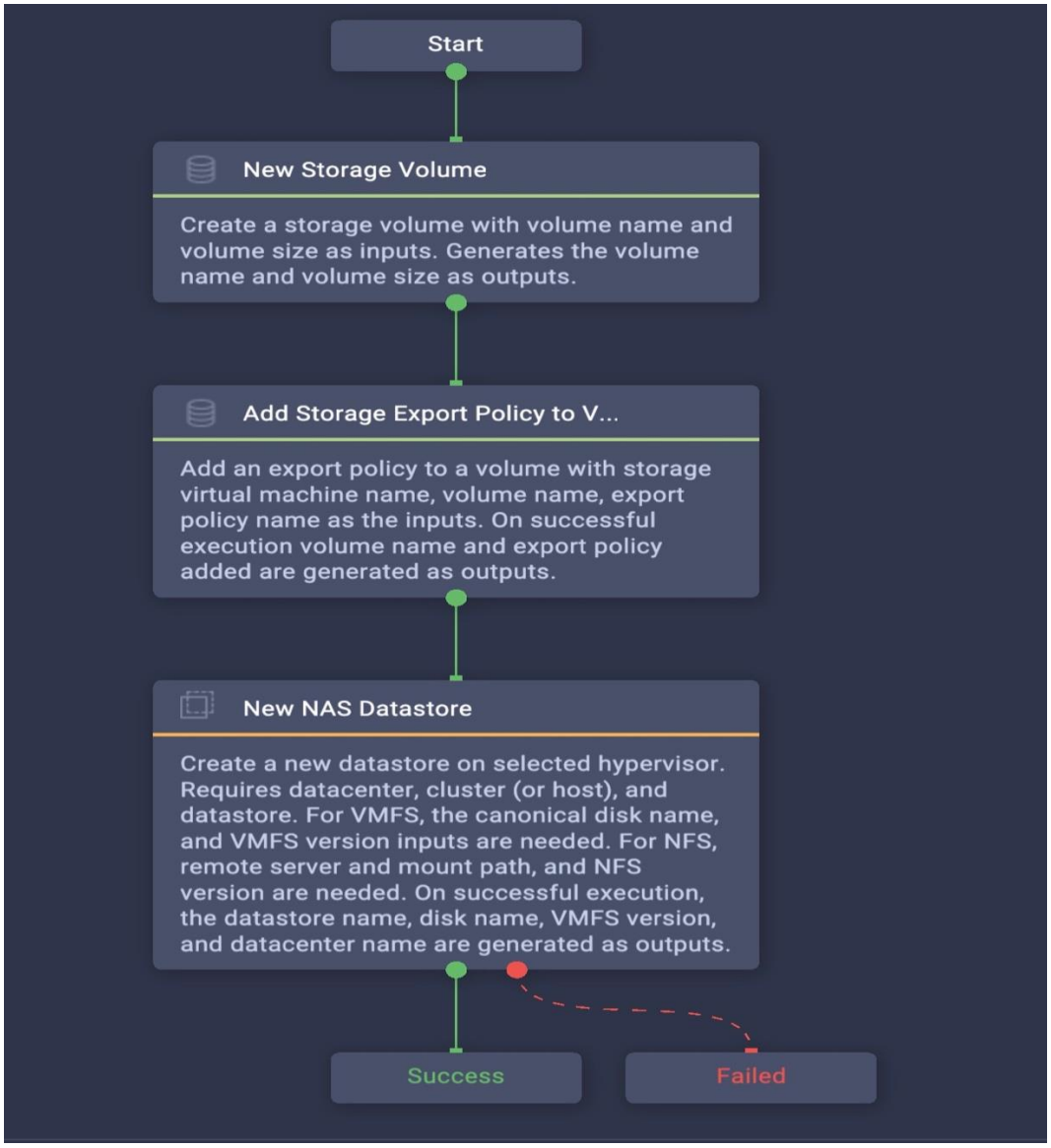
*Required input parameters.

Reference workflow #5: New NAS Datastore

Workflow description: Create an NFS storage volume and build an NAS datastore on the volume.

Workflow details: This workflow allows you to create an NAS or NFS storage volume by using NetApp storage tasks. Then it uses the New NAS Datastore task to create the NFS datastore on the virtualization hypervisor.

Figure 35) Reference workflow #5: New NAS Datastore.



The New NAS Datastore workflow includes the following steps:

1. Create an ONTAP storage volume with details and NFS options such as the mount path as input. This generates the volume name and volume size as outputs.
2. Connect the storage volume to the export policy provided as input.
3. The New NAS Datastore task takes the NFS input options and hypervisor inputs and creates an NFS datastore on the VMware vSphere Hypervisor.
4. The workflow terminates with a success or failure:
    a. If successfully executed, a new NetApp storage volume is created in the SVM and is then mapped to an export policy. This can be validated in the NetApp storage inventory from Cisco Intersight. A new NFS datastore is created, which can be validated in the virtualization inventory from Cisco Intersight.
    b. In the event of failure, the output in the execution pane displays the error message.

Table 50) New NAS Datastore: task input.

Parameter name	Input description
Organization	The organization in which the workflow will be executed.
Workflow Instance Name	Use the existing or create new workflow instance name
Storage Device*	The NetApp ONTAP cluster name.
Storage Vendor Virtual Machine*	The SVM name.
Aggregate*	The aggregate name.
Export Policy*	The export policy name to associate the new storage volume with.
Volume*	The volume name.
Volume Capacity*	The volume size.
Mount path*	The mount path for the NFS volume.
Hypervisor Manager*	The hypervisor manager for this workflow execution.
Datacenter*	The data center associated with the datastore.
Cluster	The cluster on which the datastore is hosted.
Host	The host on which the datastore will be hosted. If you provide the cluster, then the host is ignored.
Datastore Name*	The name of the NFS datastore to be created.
Datastore Type*	The NFS datastore type.
Remote Host Names*	The NFS server IP address. Multiple IP addresses can be provided as a list.
Access Mode	The access mode for the NFS server. Select Read-Only if the volume is exported as read-only.
Security Type	Security for the NFS datastore. The default is the basic AUTH_SYS security.

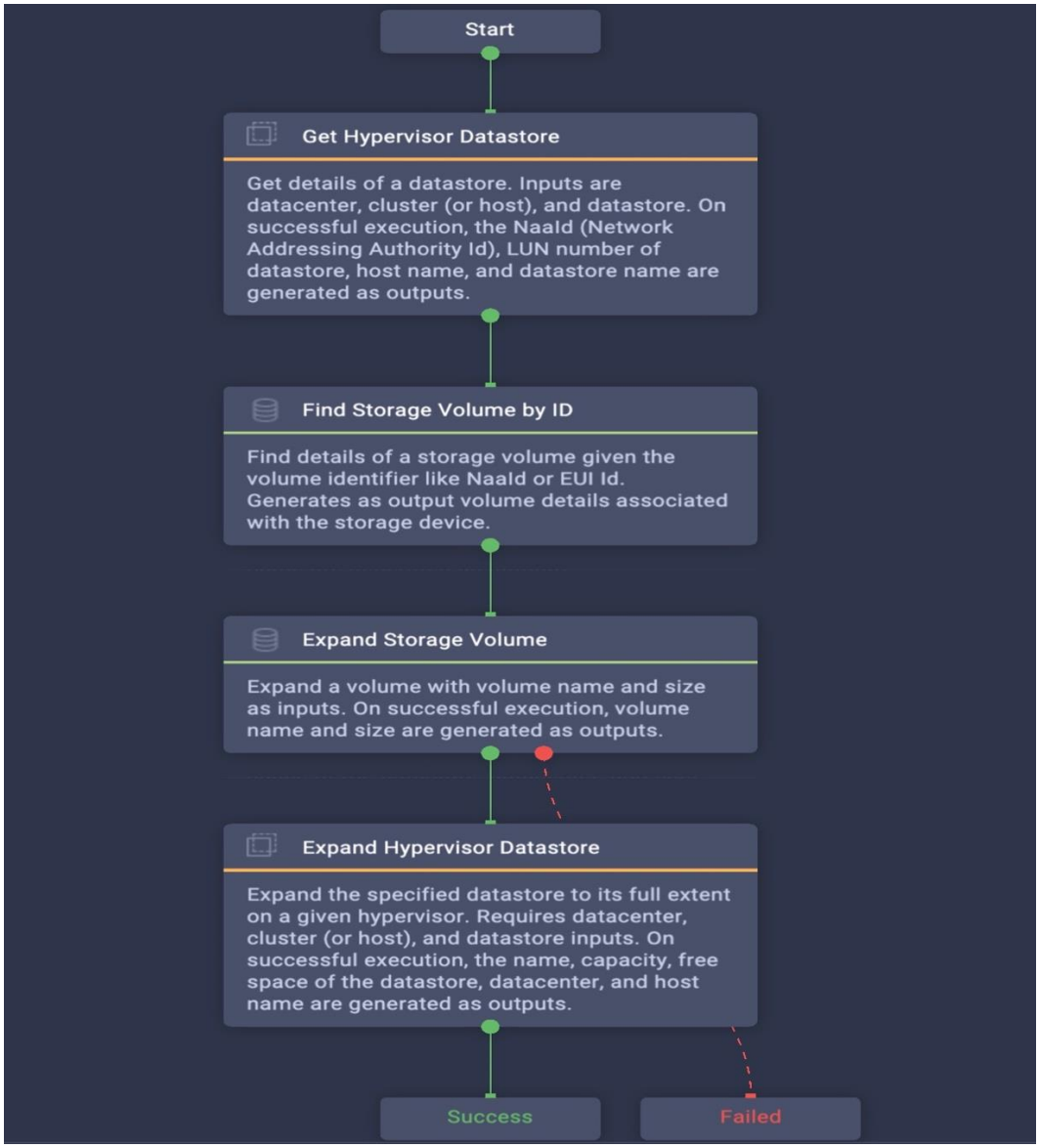
*Required input parameters.

Reference workflow #6: Update NAS Datastore

Workflow description: Update the NAS datastore by expanding the capacity of the underlying NFS volume.

Workflow details: This workflow enables a single-click execution from Cisco Intersight to execute the VMware vSphere Hypervisor and NetApp ONTAP storage tasks. It enables you to expand the NFS or NAS datastore.

Figure 36) Reference workflow #6: Update NAS Datastore.



The Update NAS Datastore workflow includes the following steps:

1. Obtain the hypervisor datastore details with the datastore name as input. When successfully executed, this hypervisor task generates the NAAID of the datastore as output.
2. The NetApp task Find Storage Volume by ID uses the NAAID from the step 1 as input and generates the volume details associated with the storage device.
3. Using the volume details from the Find Storage Volume by ID task as input, the NetApp task Expand Storage Volume resizes the volume based on the workflow input.
4. The virtualization task Expand Hypervisor Datastore expands the hypervisor datastore to the full extent.
5. The workflow terminates with a success or failure:
    a. If successfully executed, a new NetApp storage volume is resized or expanded as provided in the input. This can be validated in the NetApp storage inventory from Cisco Intersight. The NFS

datastore also reflects the new size. This can be validated in the virtualization inventory from Cisco Intersight.

b. In the event of failure, the output in the execution pane displays the error message.

Table 51) Update NAS Datastore: task input.

Parameter name	Input description
Organization	The organization in which the workflow will be executed.
Workflow Instance Name	Use the existing name or create a new workflow instance name.
Storage Device*	The NetApp ONTAP cluster name.
Hypervisor Manager*	The hypervisor manager for this workflow execution.
Datacenter*	The data center associated with the datastore.
Cluster	The cluster on which the datastore is hosted.
Host	The host on which the datastore is hosted. If you provide a cluster, then the host will be ignored.
Datastore Name*	The name of the datastore for which size is being updated.
Volume Capacity*	The new volume size.

*Required input parameters.

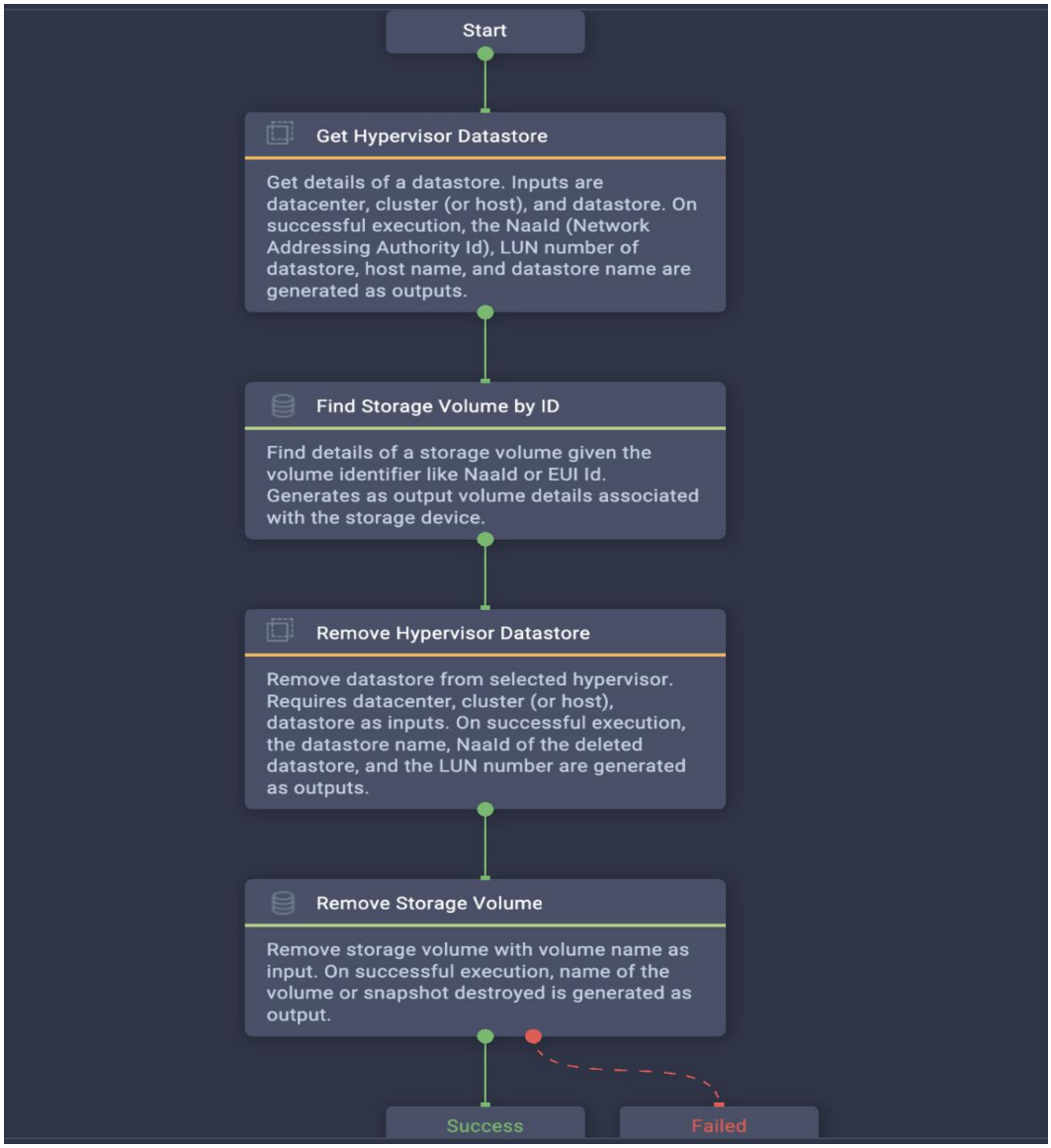
Reference workflow #7: Remove NFS Datastore

Workflow description: Remove the NAS datastore and the underlying NFS storage volume.

Workflow details: This workflow allows you to delete or remove an NFS datastore from the hypervisor and seamlessly remove the NAS volume associated with the datastore on the ONTAP storage.

Note: If you remove the volume, all the data in the volume is destroyed and cannot be recovered.

Figure 37) Reference workflow #7: Remove NFS Datastore.



The Remove NFS Datastore workflow includes the following steps:

1. The NetApp Remove Hypervisor Datastore task allows you to delete the datastore given as input. When successfully executed, this hypervisor task generates the NAAID of the deleted datastore as output.
2. The virtualization Find Storage Volume by ID task uses the NAAID from the step1 as input and generates the volume name and SVM name as output.
3. The Remove Hypervisor Datastore task removes the NFS datastore on the VMware vSphere Hypervisor.
4. Using the volume details from step 2 as input, the NetApp Remove Storage Volume task removes the volume from the SVM.
5. The workflow terminates with a success or failure:

a. If successfully executed, the hypervisor NFS datastore and its equivalent NetApp storage volume is removed. This can be validated in the NetApp storage inventory for the NetApp LUN and virtualization inventory for VMFS Hypervisor datastore from Cisco Intersight.
b. In the event of failure, the output in the execution pane displays the error message.

Table 52) Remove NFS Datastore: task input.

Parameter name	Input description
Organization	The organization in which the workflow will be executed.
Workflow Instance Name	Use the existing or create new workflow instance name
Storage Device*	The NetApp ONTAP cluster name.
Hypervisor Manager*	The hypervisor manager for this workflow execution.
Datacenter*	The data center associated with the datastore.
Cluster	The cluster on which the datastore is hosted.
Host	The host on which the datastore is hosted. If you provide the cluster, then the host is ignored.
Datastore Name*	The name of the datastore to be removed.

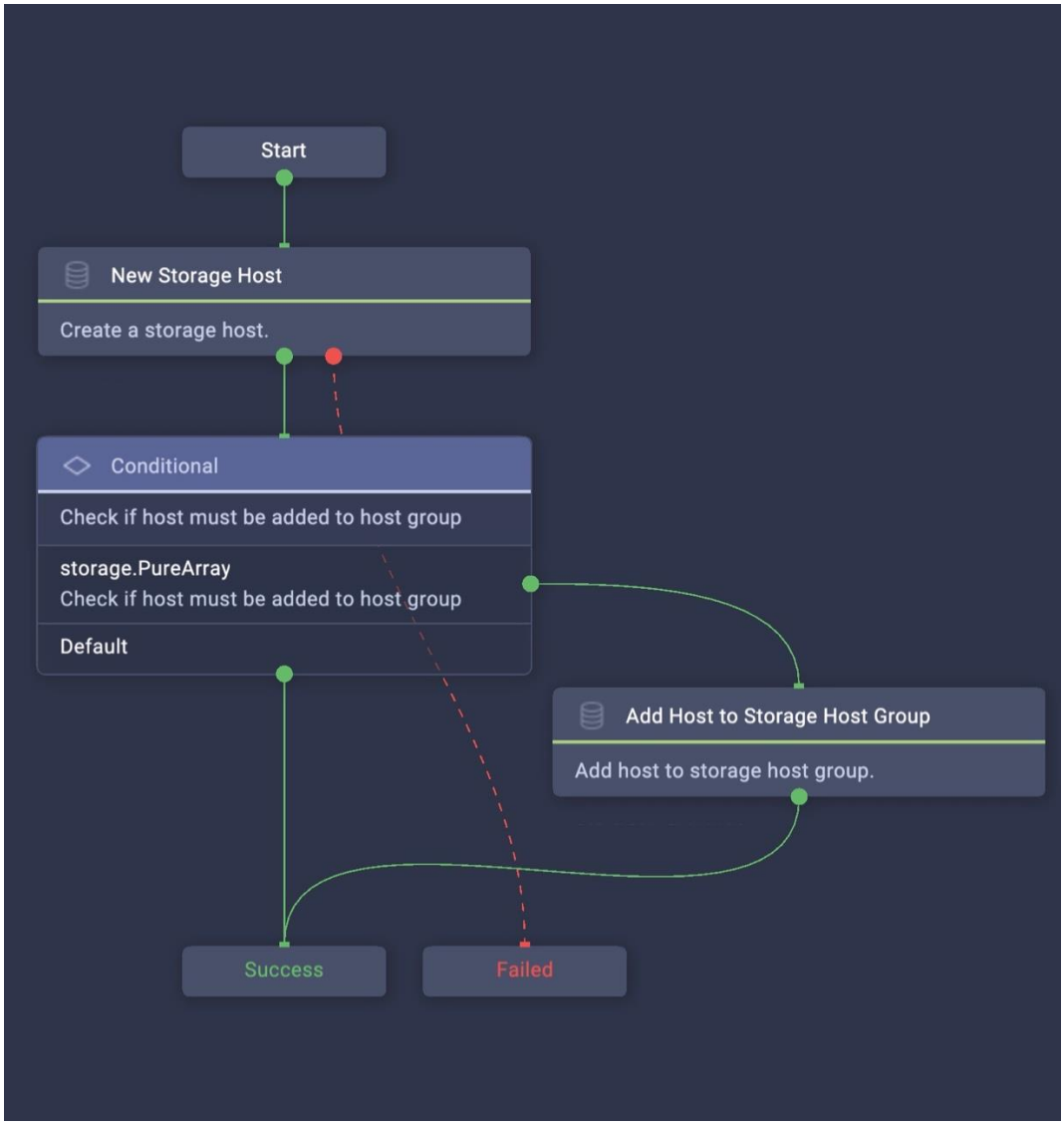
*Required input parameters.

Reference workflow #8: New Storage Host

Workflow description: Create a new storage host. If the host group is provided as input, then the host is added to the host group.

Workflow details: The workflow allows you to create a new igroup and add SAN initiators for the host to the igroup.

Figure 38) Reference workflow #8: New Storage Host.



The New Storage Host workflow includes the following steps:

1. Create a storage host with a host name and a list of WWNs and IQNs to be associated with it as input. The storage host or igroup is the entity used to associate initiators to storage and expose as LUNs. Outputs are the host name and the associated IQN or WWN list.
2. The workflow terminates with a success or failure:
   a. If successfully executed, the storage host or igroup is created on the NetApp storage. This can be validated in the NetApp storage inventory.
   b. In the event of failure, the output in the execution pane displays the error message.

Table 53) New Storage Host: task input.

Parameter name	Input description
Organization	The organization in which the workflow will be executed.

Parameter name	Input description
Workflow Instance Name	Use the existing instance name or create a new workflow instance name.
Storage Device*	The NetApp ONTAP cluster name.
Storage Vendor Virtual Machine*	The SVM name.
WWNs	The list of WWNs.
IQNs	The list of IQNs.
Protocol	One or more igroup protocol details.
Operating System	The host OS type.

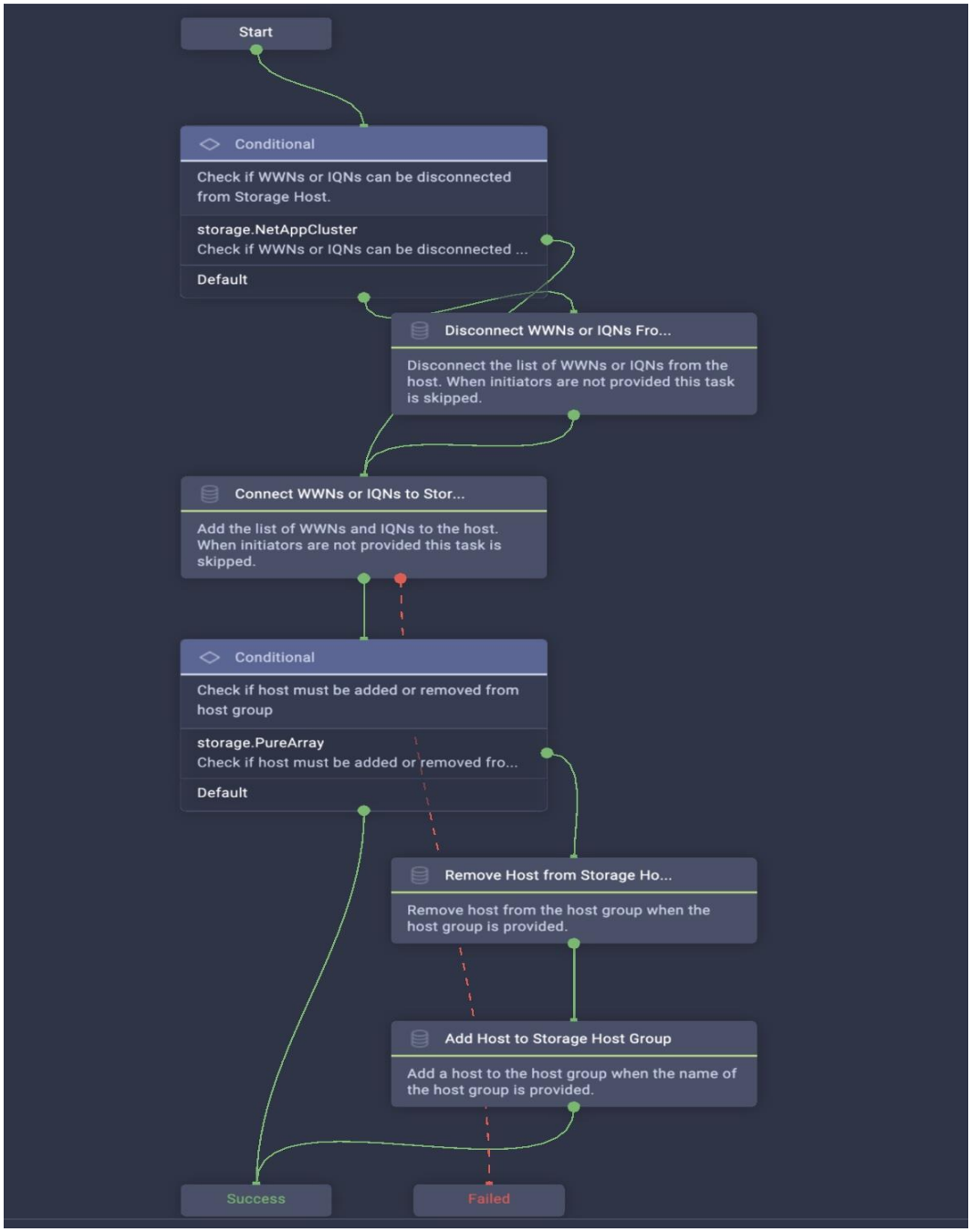
*Required input parameters.

Reference workflow #9: Update Storage Host

Workflow description: Update the storage host details. If the inputs for a task are provided, then the task is run; otherwise, it is skipped.

Workflow details: The workflow allows you to add new initiators for the host in igroup.

Figure 39) Reference workflow #9: Update Storage Host.



The Update Storage Host workflow includes the following steps:

1. The NetApp storage Connect Initiators to Storage Host or igroup task allows you to add new SAN host initiators to the existing igroup.
2. The workflow terminates with a success or failure.
   a. If successfully executed, the new SAN initiators are listed in the storage host or igroup. This can be validated in the NetApp storage inventory.
   b. In the event of failure, the output in the execution pane displays the error message.

Table 54) Update Storage Host: task input.

Parameter name	Input description
Organization	The organization in which the workflow will be executed.
Workflow Instance Name	Use the existing name or create a new workflow instance name.
Storage Device*	The NetApp ONTAP cluster name.
Storage Vendor Virtual Machine*	The SVM name.
Host*	The storage host or igroup that needs to be updated.
WWNs	The list of WWNs.
IQNs	The list of IQNs.

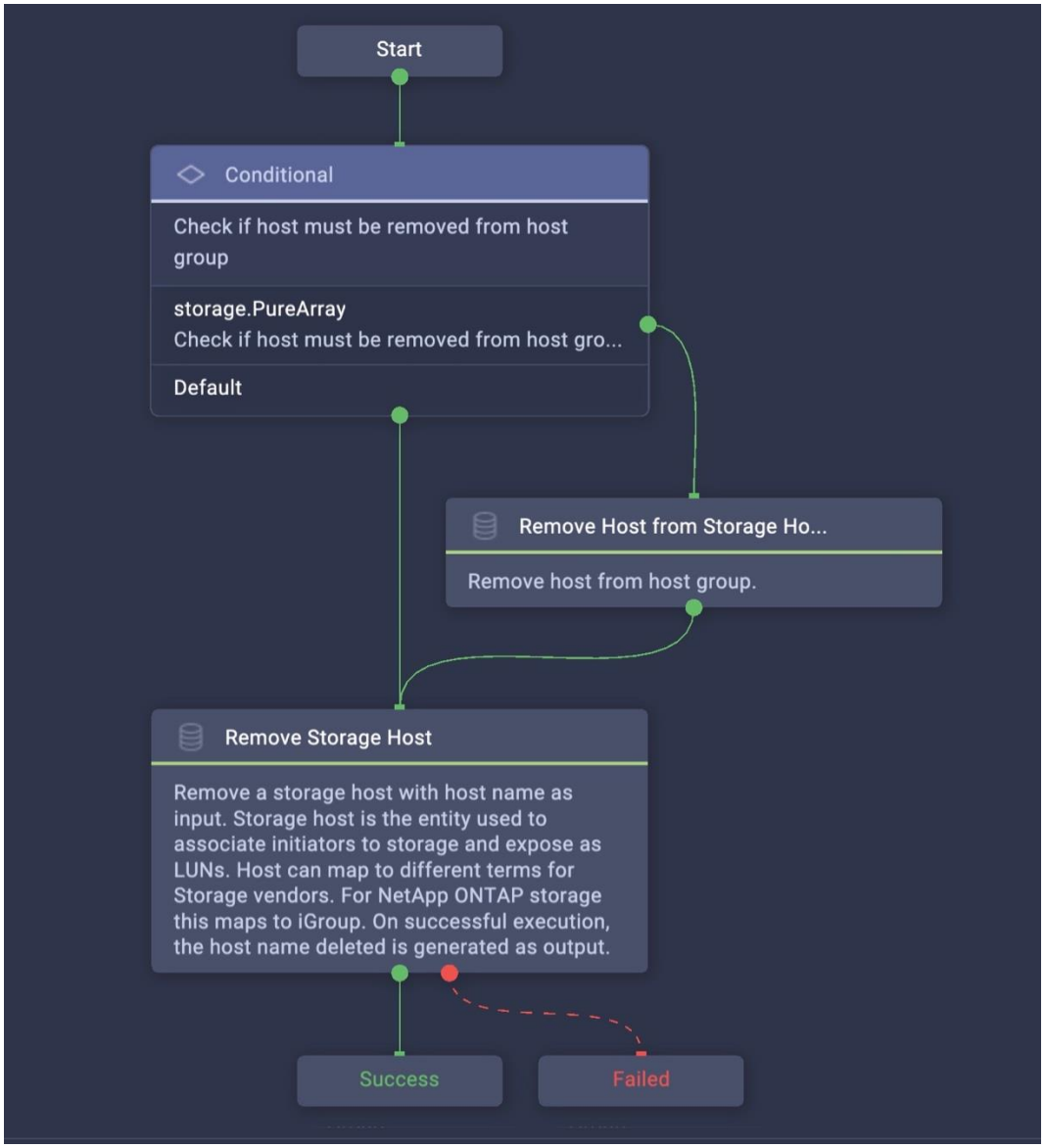
*Required input parameters.

Reference workflow #10: Remove Storage Host

Workflow description: Removes the storage host. If a host group name is provided as input, the workflow also removes the host from the host group.

Workflow details: This workflow allows you to delete a SAN initiator group.

Figure 40) Reference workflow #10: Remove Storage Host.



The Remove Storage Host workflow includes the following steps:

1. Remove a storage host with the host name as input. The storage host is the entity used to associate initiators to storage and expose it as LUNs. A host can map to different terms for storage vendors. For NetApp ONTAP storage, this maps to igroup. After successful execution, the deleted host name is generated as output.

Table 55) Remove Storage Host: task input.

Parameter name	Input description
Organization	The organization in which the workflow will be executed.
Workflow Instance Name	Use the existing name or create a new workflow instance name.
Storage Device*	The NetApp ONTAP cluster name.

Parameter name	Input description
Storage Vendor Virtual Machine*	The SVM name.
Host*	The storage host or igroup to be updated.

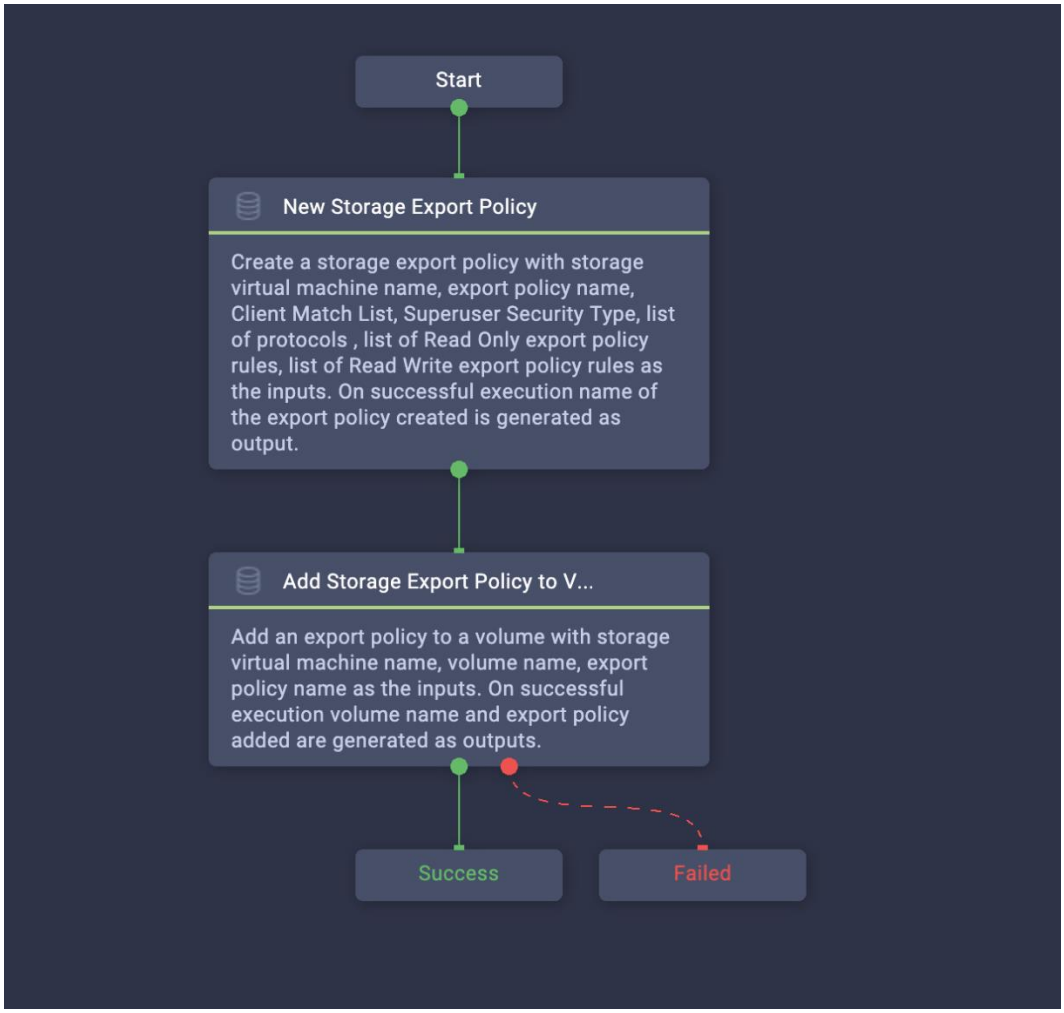
*Required input parameters.

Reference workflow #11: New Storage Export Policy

Workflow description: Create a storage export policy and add the created policy to a NFS volume.

Workflow details: This workflow allows you to create a new storage export policy. Export policies determine access to volumes for NFS for NetApp ONTAP. To access a volume, the volume must be associated with an export policy and that policy must have a rule that determines access.

Figure 41) Reference workflow #11: New Storage Export Policy.



The New Storage Export Policy workflow includes the following steps:

1. Create a storage export policy with the SVM name, export policy name, client match list, super user security type, list of protocols, a list of read-only export policy rules, and a list of read/write export policy rules as the inputs. After successful execution, the name of the created export policy is generated as output.

2. Add an export policy to a volume with the SVM name, volume name, and export policy name as the inputs. After successful execution, the added volume name and export policy are generated as outputs.

Table 56) New Storage Export Policy: task input.

Parameter name	Input description
Organization	the organization in which the workflow will be executed.
Workflow Instance Name	Use the existing name or create a new workflow instance name.
Storage Device*	The NetApp ONTAP cluster name.
Storage Vendor Virtual Machine*	The SVM name.
Export Policy Name*	The storage export policy name that will be deleted.
Volume*	The volume name to be deleted.
Export Policy Protocols	The NFS protocol type.
Client Match List*	The client match list is either a specific address or a subnet, such as `10.0.3.212` or `192.168.5.0/24`, a host name, or a netgroup, such as @netgroup. If you want an export policy to apply to all possible IP4 addresses, set the client match to `0.0.0.0/0`. You can specify multiple client match lists.
Superuser Security Type*	The Superuser option allows you to specify which security style root users are allowed to stay root.
Read Only Policy Rules*	The ro-rule specifies for which security styles you want to allow read-only access for the clients relevant, specified in the client match. You can specify multiple security styles.
Read Write Policy Rules*	The rw-rule specifies for which security styles you want to allow write access for the clients relevant, specified in the client match. You can specify multiple security styles.

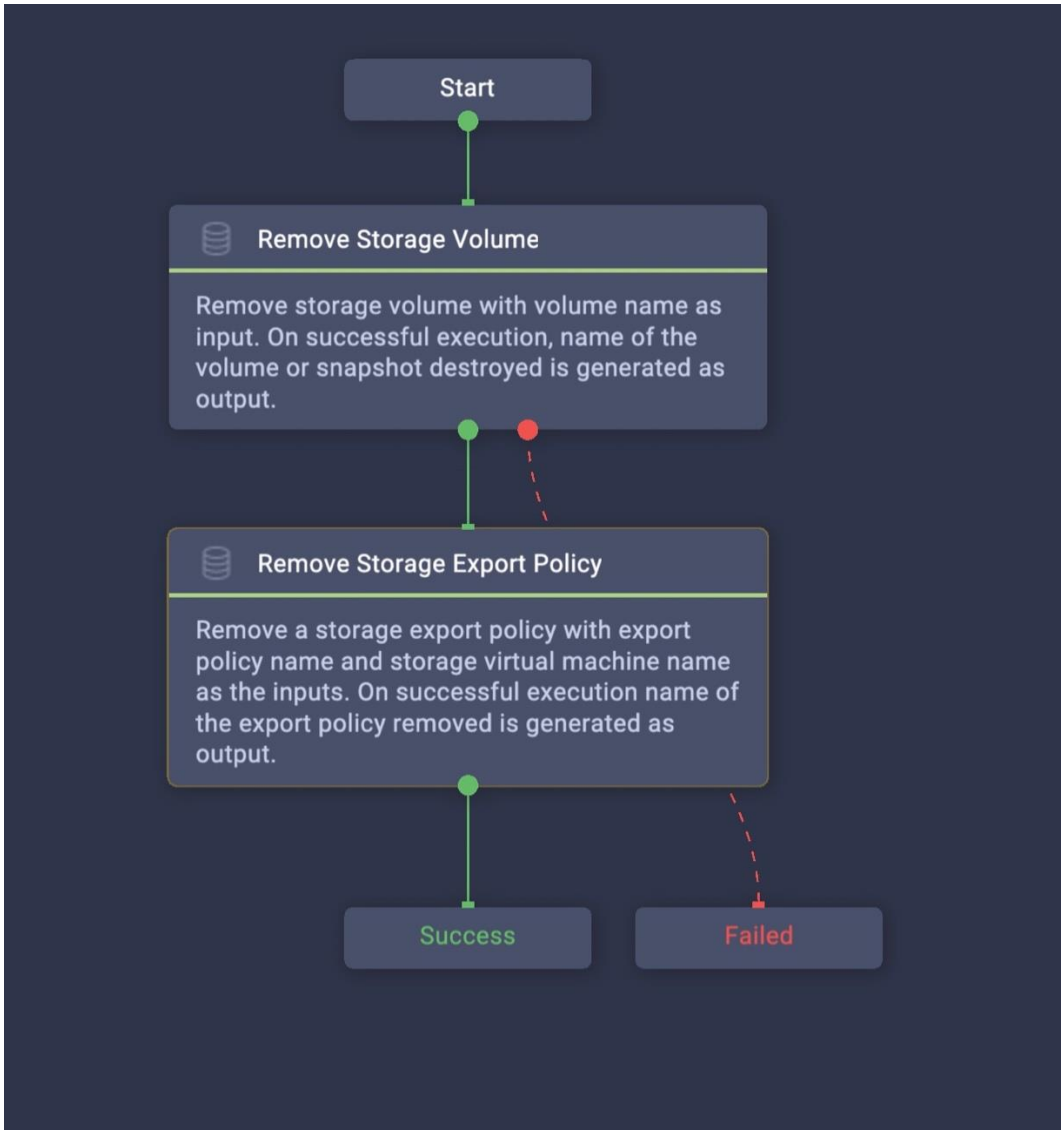
*Required input parameters.

Reference workflow #12: Remove Storage Export Policy

Workflow description: Remove the NFS volume and the export policy attached to the volume.

Workflow details: The workflow allows you to delete the storage volume and the export policy with which it is associated.

Figure 42) Reference workflow #12: Remove Storage Export Policy.



The Remove Storage Export Policy workflow includes the following steps:

1. Remove the storage volume with volume name as input. After successful execution, the deleted volume name is generated as output.
2. Remove a storage export policy with the export policy name and the SVM name as the inputs. After successful execution, the name of the removed export policy is generated as output.

Table 57) Remove Storage Export Policy: task input.

Parameter name	Input description
Organization	The organization in which the workflow will be executed.
Workflow Instance Name	Use the existing name or create a new workflow instance name.
Storage Device*	The NetApp ONTAP cluster name.
Storage Vendor Virtual Machine*	The SVM name.
Export Policy Name*	The storage export policy name that will be deleted.

Parameter name	Input description
Volume*	The volume name to be deleted.

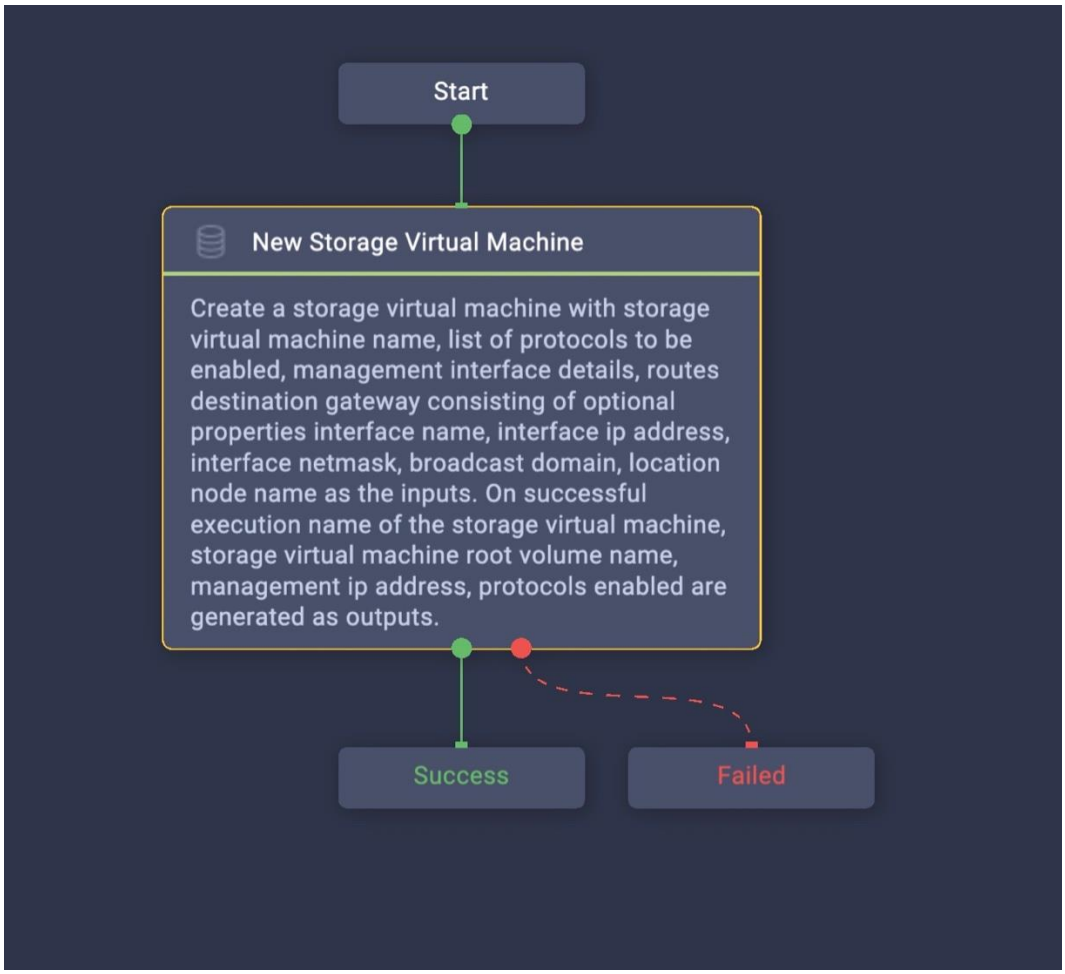
*Required input parameters.

Reference workflow #13: New Storage Virtual Machine

Workflow description: Create an SVM.

Workflow details: This workflow allows you to create an SVM with an SVM name and a list of protocols to be enabled as inputs.

Figure 43) Reference workflow #13: New Storage Virtual Machine.



The New Storage Virtual Machine workflow includes the following steps:

1. Provide the SVM name and the list of protocols as input. The NetApp storage task New Storage VM allows the creation of a new SVM on a storage device.

Table 58) New Storage Virtual Machine: task input.

Parameter name	Input description
Organization	The organization in which the workflow will be executed.
Workflow Instance Name	Use the existing name or create a new workflow instance name.

Parameter name	Input description
Storage Device*	The NetApp ONTAP cluster where the SVM will be created.
Storage Vendor Virtual Machine*	The new SVM name.
Storage Vendor Virtual Machine Options*	• Platform type: NetApp Active IQ Unified Manager • Storage VM protocols: IP/FC; you can add multiple options • Management interface details: This is optional

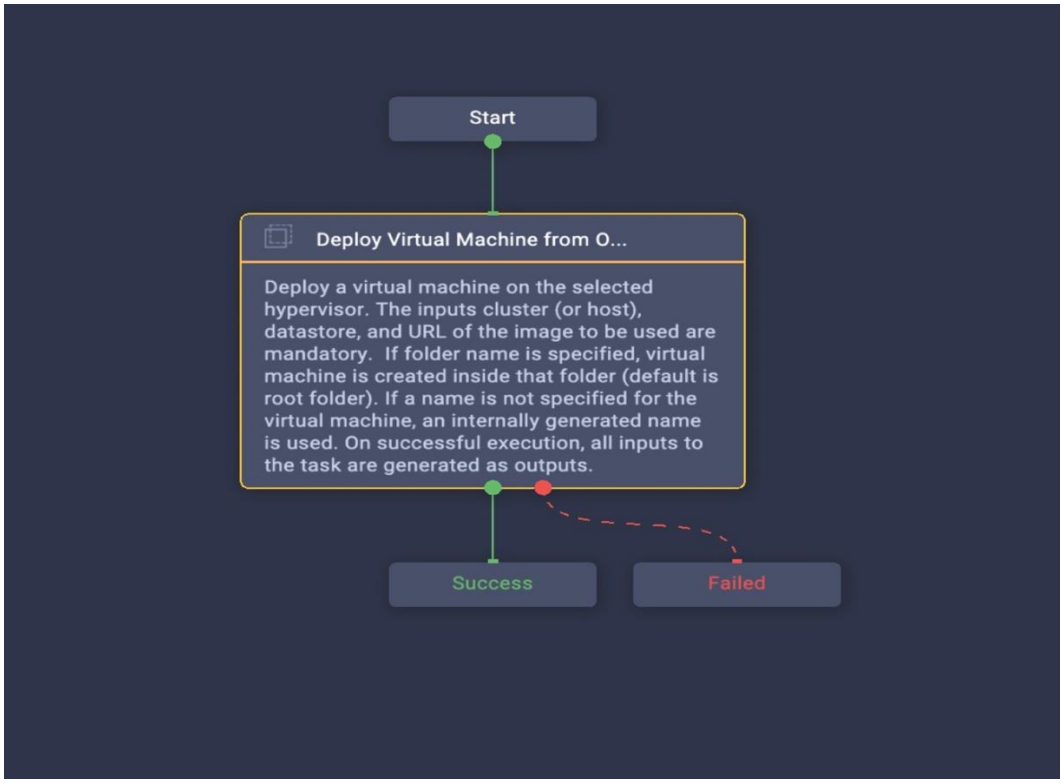
*Required input parameters.

Reference workflow #14: New Virtual Machine

Workflow description: Create a new VM on the hypervisor from an OVA or OVF file. The Datastore, Host/Cluster, and Image URL fields are mandatory. All other inputs are optional.

Workflow details: This workflow allows you to create a new VM on a NetApp storage associated an NFS or VMFS datastore.

Figure 44) Reference workflow #14: New Virtual Machine.



The New Virtual Machine workflow includes the following steps:

1. The virtualization task “Create New VM” is executed in this workflow. The inputs include the datastore name on which the VM will be deployed. The datastore name can be an NFS or VMFS.

Table 59) New Virtual Machine: task input.

Parameter name	Input description
Organization	The organization in which the workflow will be executed.
Workflow Instance Name	Use the existing or create new workflow instance name
Hypervisor Manager*	The hypervisor manager for this workflow execution.
Image URL*	The location from which to download the VM image. Only HTTP and HTTPS URLs are supported.
VM Name	The name of the new VM.
Datacenter*	The data center associated with the datastore.
Cluster	The cluster on which the datastore is hosted.
Host	The host on which the datastore is hosted. If you provide a cluster, then the host will be ignored.
Resource Pool	The resource pool for the VM.
Datastore Name*	The name of the datastore on which the VM will be created.
CPUs	The number of CPUs to allocate for the new VM.
Memory	The memory allocation for this VM (in MB).
Folder	The folder in which the new VM will reside.
Power ON VM	If selected, the VM is powered on after creation.

*Required input parameters.

Appendix C: Custom-defined workflows

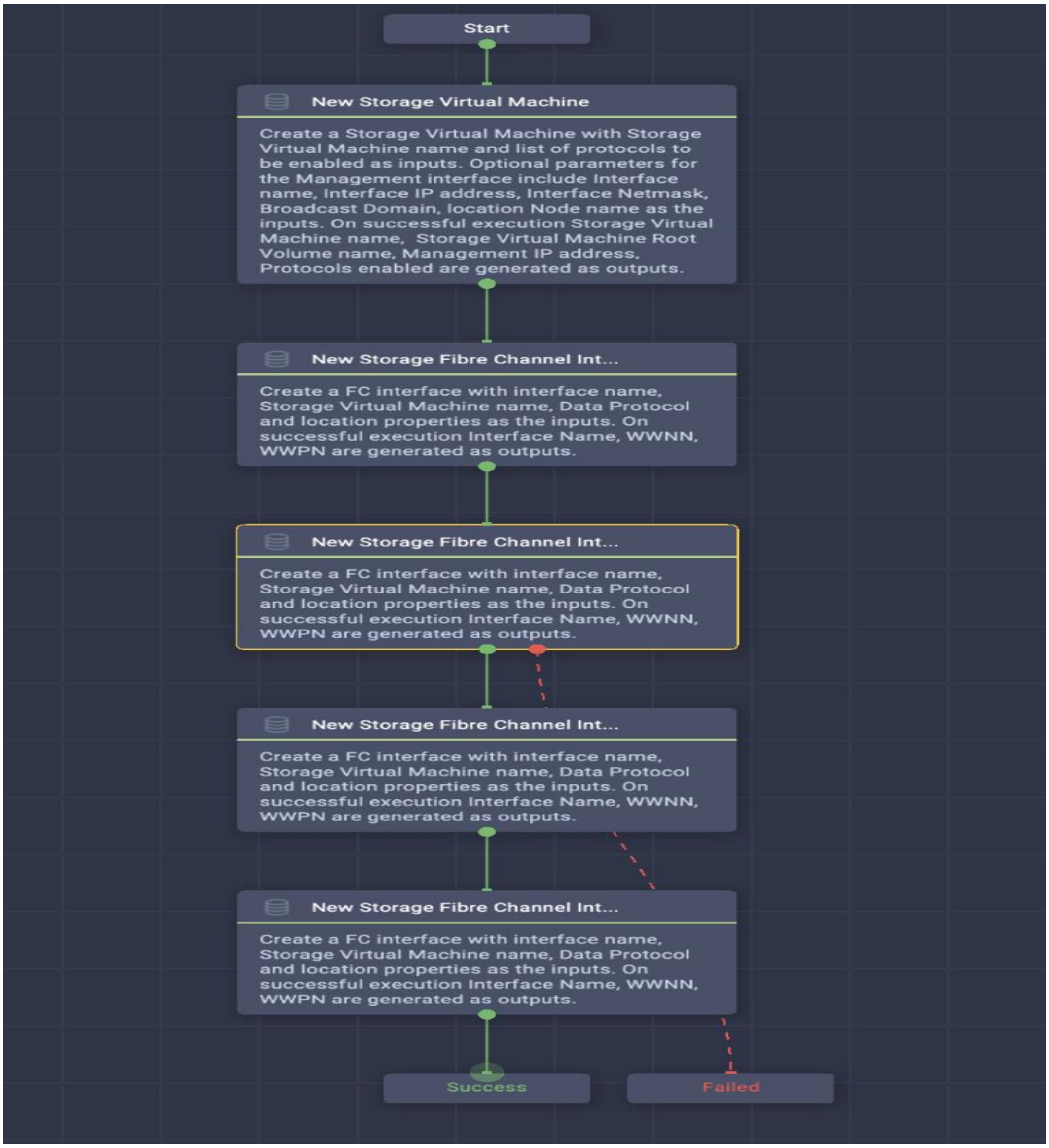
Custom-defined workflow #1: Create a new SVM with multiple FC interfaces for no single point of failure

This section provides an example of a custom-defined workflow using multiple NetApp storage tasks.

The custom-defined workflow #1 includes the following steps:

1. Task #1: Create a New Storage VM
2. Task #2: Create a New Storage FC Interface- fclif1
3. Task #3: Create a New Storage FC Interface -fclif2
4. Task #4: Create a New Storage FC Interface- fclif1
5. Task #5: Create a New Storage FC Interface -fclif2

Figure 45) Custom-defined workflow #1.



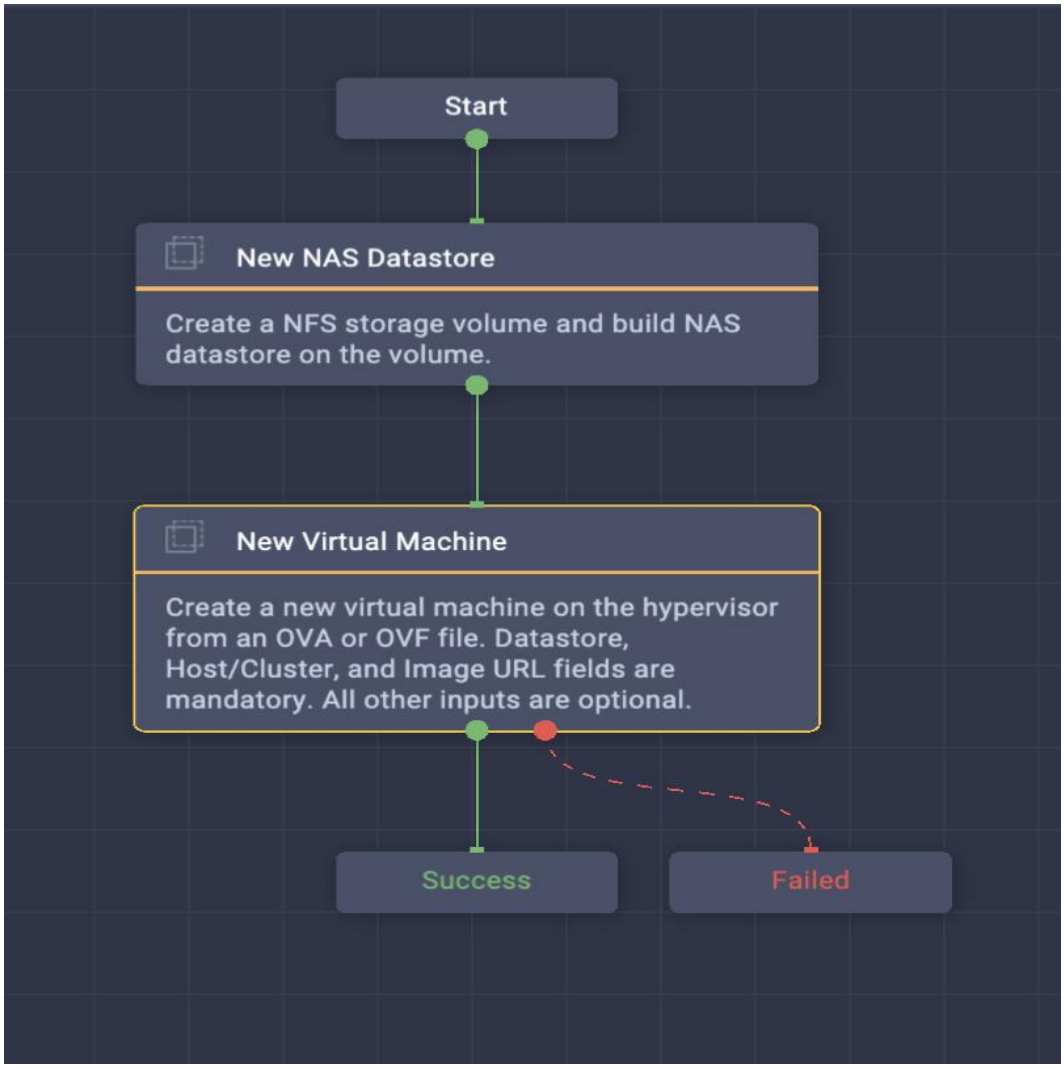
Custom-defined workflow #2: Create a new NFS datastore and create a new VM in the datastore

This section provides an example of a custom-defined workflow using multiple reference workflows.

The custom-defined workflow #2 includes the following steps:

1. Reference workflow #1: Create a New NAS Datastore
2. Reference workflow #2: Deploy a New Virtual Machine
3. Task #3: Create a New Storage FC Interface -fclif2
4. Task #4: Create a New Storage FC Interface- fclif1
5. Task #5: Create a New Storage FC Interface -fclif2

Figure 46) Custom-defined workflow #2.



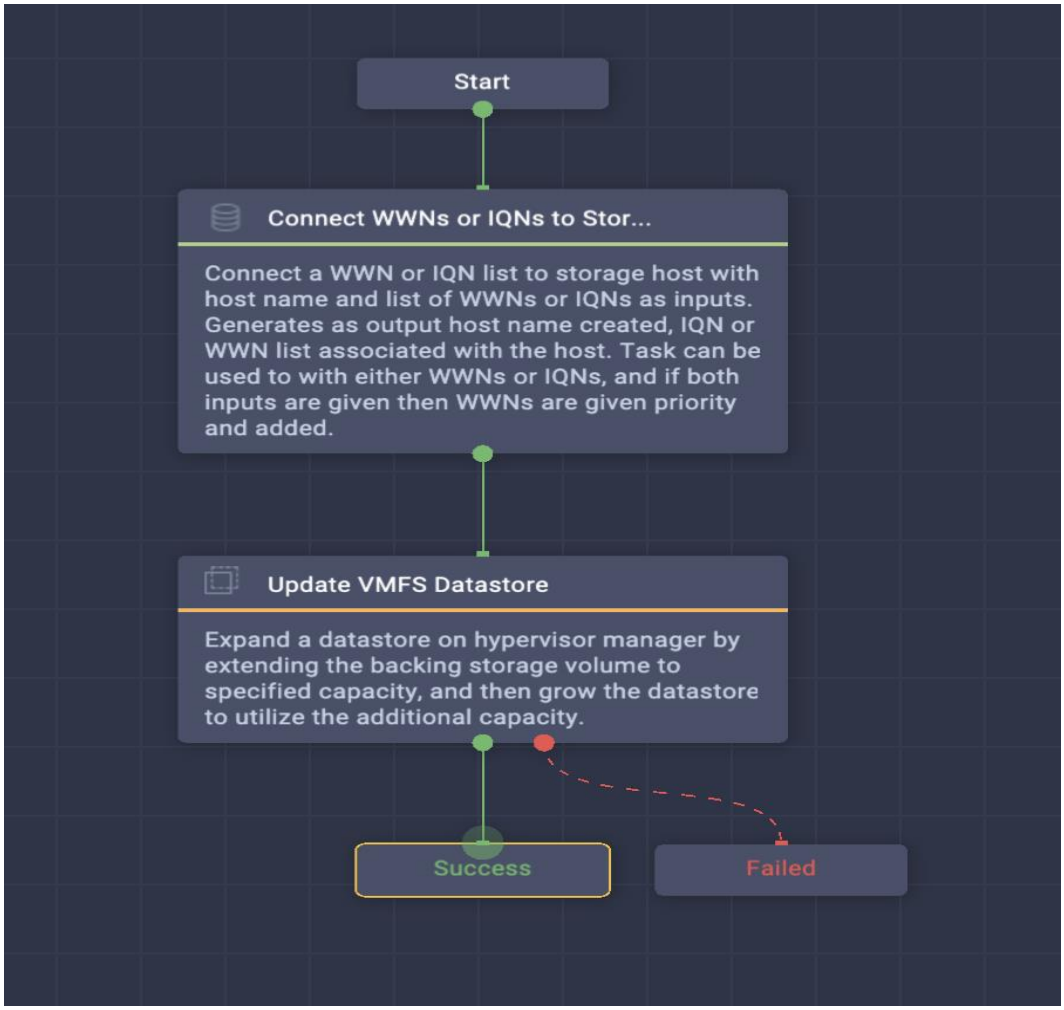
Custom-defined workflow #3: Add SAN initiators to an igroup and expand the VMFS datastore

This section provides an example of a custom-defined workflow that uses NetApp tasks and a virtualization workflow.

The custom-defined workflow #3 includes the following steps:

1. Task #1: Add Host SAN Initiator to the igroup or Storage Host by using the Connect WWNs or IQNs to Storage Host task.
2. Reference workflow #2: Expand the VMFS Datastore and the underlying SAN LUN object by using the Update VMFS workflow.

Figure 47) Custom-defined workflow #3.



Appendix D: Task input parameters

The task input parameters can be provided to a workflow by using the following possible methods:

- Create a workflow input with parameter specified. The input is saved as a macro variable and can be reused for multiple tasks in the workflow.
- Create a workflow input with the parameter requested at the time of execution. The input is requested dynamically at the time of execution and saved as a macro. It can be reused for multiple tasks in the workflow.
- Custom workflow Input. The custom workflow input is provided statically at the time of the workflow creation.

Table 60) Task Input Parameter descriptions.

Parameter name	Parameter input description
Platform Type	For NetApp ONTAP storage, select NetApp Active IQ Unified Manager.
Storage Device	The NetApp ONTAP cluster name.
Storage Virtual Machine	The NetApp SVM name.

Parameter name	Parameter input description
Storage Vendor Virtual Machine Options	• Platform type: NetApp Active IQ Unified Manager • Storage VM protocols: IP/FC; you can add multiple options here. • Management interface details: This parameter is optional.
Interface Name (FC)	The name of the FC logical interface.
Storage Vendor FC Interface Options	• Platform type: NetApp Active IQ Unified Manager • Data protocol: Choose FC • Location port name: The underlying physical port name • Location port node name: The underlying physical port node name
IP Interface Name	The name of the IP logical interface.
Storage Vendor IP Interface Options	• Platform type: NetApp Active IQ Unified Manager • Location home port: The port to which the LIF returns when the network interface revert command is run • Location home node name: The node to which the LIF returns when the network interface revert command is run • Location broadcast domain: Contains the home port of the logical interface • SVM protocol: select the IP protocol
Interface IP Address	The IP address of the interface.
Interface Netmask	The netmask for the interface.
LUN Prefix	The LUN name.
Volume	The storage volume name.
LUN Capacity	The new size of the LUN.
Operating System	The host operating system type.
Export Policy	The export policy name.
Export Policy Protocols	The list of protocols for which you want to apply the export rule.
Client Match List	The Client Match List is either a specific address or a subnet, such as `10.0.3.212` or `192.168.5.0/24`, a host name, or a netgroup, such as @netgroup. If you want an export policy to apply to all possible IP4 addresses, set the client match to 0.0.
Superuser Security Type	This option allows you to specify for which security style the root users are allowed to stay root.
Read Only Policy Rules	The ro-rule specifies for which security style(s) you want to allow read-only access for the clients relevant, specified in the client match. You can specify multiple security styles.
Read Write Policy Rules	The rw-rule specifies for which security style(s) you want to allow write access for the clients relevant, specified in the client match. You can specify multiple security styles.
Host (igroup)	igroup name.
Storage Vendor Host Identifier	Platform type: NetApp Active IQ Unified Manager
Storage Vendor LUN Options	The storage LUN name with the path for the VMFS datastore.
Storage Vendor Aggregate	Storage aggregate name where the volume will be hosted.

Parameter name	Parameter input description
Storage Vendor Volume Options	• Platform type: NetApp Active IQ Unified Manager • Capacity: New volume size
Volume Capacity	The new size of the volume.
List of WWNs	The list of FC WWNs for the host.
List of IQNs	The list of iSCSI qualified names for the host initiators.
Initiator Group	The igroup name.
LUN Path	The LUN name with a full path.
LUN ID	The NAAID of the hypervisor datastore.
Volume ID	The NAAID of the hypervisor datastore.

Where to find additional information

To learn more about the information that is described in this document, review the following documents and/or websites:

- ONTAP 9 Documentation Center
  https://docs.netapp.com/ontap-9/index.jsp
- ONTAP & ONTAP System Manager documentation resources
  https://www.netapp.com/data-management/oncommand-system-documentation/
- NetApp Product Documentation
  https://www.netapp.com/support-and-training/documentation/
- Cisco Intersight Managed Mode for FlexPod
  https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/flexpod/cisco-imm-for-flexpod.html
- Cisco Intersight Virtual Appliance
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Version history

Version	Date	Document version history
Version 1.0	March 2021	Initial release.

Refer to the Interoperability Matrix Tool (IMT) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.

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