

HP Operations Orchestration

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HP Storage Essentials (version 6.00) Integration

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The title page of this document contains the following identifying information:

- Software Version number, which indicates the software version.
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Overview

Use cases and scenarios

The flows listed below can be used to provision storage to any host or to update volume ACL on any array, provided that the host is connected to a fabric that has some storage arrays as well and discovered in Storage Essentials.

Flows and Operations

Flow: Add or Remove HBA from volume ACL

This workflow adds or removes a Host HBA port WWN to Storage Volume ACL. The workflow uses the underlying HP Storage Essentials infrastructure, which manages the SAN environment.

NOTE:

1. The flow supports HP Storage Essentials in Standalone mode and Integrated with HP Systems Insight Manager.
2. The flow supports only the elements and configurations supported by HP Storage Essentials. For more details on supported configurations, please refer to the HP Storage Essentials version 6.0 support matrix.
3. Currently, the flow supports HP MSA, HP EVA, XP family of arrays, LSI, HDS, EMC CLARiiON, EMC Symmetrix DMX arrays. There are no specific platform restrictions on the hosts to which storage can be assigned. Again, this is limited by the support matrix of HP Storage Essentials.

The user will need to provide the following inputs:

1. The Storage Essentials Central Management Server (CMS) details, including:
 - SE CMS name/IP address
 - Username
 - Password

Note:

- a. The HP Storage Essentials user should have enough permission to access the necessary resources (Hosts, Arrays, Fabric) and perform the provisioning actions on them.
 - b. If HP Storage Essentials CMS is integrated with HP SIM then the Username in the flow execution should be given in the same case as "Login Name" of Security -> Users Tab in HP Storage Essentials GUI.
2. IP address or Server name of the Managed Host (which has the HBA to be added/removed) in SE
 3. HBA Port WWN to be added/removed

4. Name of the Managed StorageSystem in SE (which has the volume to be mapped/unmapped)
5. Name of the StorageVolume in the StorageSystem.
6. Operation to be performed. ("Add" or "Remove")

On successful completion of the flow, the input Storage Volume will be mapped/unmapped to the input Host HBA.

The flow returns failure in case of error.

Flow: Create Change Ticket - Add or Remove HBA from volume ACL

This workflow logs a change ticket in HP Service Manager with all the inputs provided by the user requesting to add/remove a Host HBA port WWN to/from Storage Volume ACL.

NOTE:

1. The flow supports HP Storage Essentials in Standalone mode and Integrated with HP Systems Insight Manager.
2. The flow supports only the elements and configurations supported by HP Storage Essentials. For more details on supported configurations, please refer to the HP Storage Essentials version 6.0 support matrix.
3. Currently, the flow supports HP MSA, HP EVA, XP family of arrays, LSI, HDS, EMC CLARiiON, EMC Symmetrix DMX arrays. There are no specific platform restrictions on the hosts to which storage can be assigned. Again, this is limited by the support matrix of HP Storage Essentials.

The user will need to provide the following inputs:

1. HP Service Manager server details
 - SM server name/IP address
 - Protocol type (HTTPS/HTTP)
 - TCP Port (default ports for SM are 13443/13080)
 - Username
 - Password

Note:

- a. HP Service Manager user should have enough permission to access the necessary resources to perform the actions.
2. The Storage Essentials Central Management Server (CMS) details, including:
 - SE CMS name/IP address
 - Username
 - Password.

Note:

- a. The HP Storage Essentials user should have enough permission to access the necessary resources (Hosts, Arrays, Fabric) and perform the provisioning actions on them.
 - b. If HP Storage Essentials CMS is integrated with HP SIM then the Username in the flow execution should be given in the same case as "Login Name" of Security -> Users Tab in HP Storage Essentials GUI.
3. IP address or Server name of the Managed Host (which has the HBA to be added/removed)
 4. HBA Port WWN to be added/removed
 5. Name of the Managed StorageSystem (which has the volume to be mapped/unmapped)
 6. Name of the StorageVolume in the StorageSystem.
 7. Operation to be performed. ("Add" or "Remove")

Flow: Add or Remove HBA from volume ACL - using Change Ticket

This flow integrates add/remove HBA operation with Change Management functionality of HP Service Manager. This workflow adds or removes a Host HBA port WWN to Storage Volume ACL, using the information provided in an the approved change ticket of Service Manager, created by the above flow (Create Change Ticket - Add or Remove HBA from volume ACL).

The workflow uses the underlying HP Storage Essentials infrastructure, which manages the SAN environment.

NOTE:

1. The flow supports HP Storage Essentials in Standalone mode and Integrated with HP Systems Insight Manager.
2. The flow supports only the elements and configurations supported by HP Storage Essentials. For more details on supported configurations, please refer to the HP Storage Essentials version 6.0 support matrix.
3. Currently, the flow supports HP MSA, HP EVA, XP family of arrays, LSI, HDS, EMC CLARiiON, EMC Symmetrix DMX arrays. There are no specific platform restrictions on the hosts to which storage can be assigned. Again, this is limited by the support matrix of HP Storage Essentials.

The user will need to provide the following inputs:

1. HP Service Manager server details
 - SM server name/IP address
 - Protocol type (HTTPS/HTTP)
 - TCP Port (default ports for SM are 13443/13080)
 - Username
 - Password
 - Contact
 - Coordinator

- Requested By

Note:

- a. HP Service Manager user should have enough permission to access the necessary resources to perform the actions.
2. The change ticket ID (Ticket should be approved)
3. The Storage Essentials Central Management Server (CMS) details, including:
 - SE CMS name/IP address
 - Username
 - Password

Note:

- a. The HP Storage Essentials user should have enough permission to access the necessary resources (Hosts, Arrays, Fabric) and perform the provisioning actions on them.
- b. If HP Storage Essentials CMS is integrated with HP SIM then the Username in the flow execution should be given in the same case as "Login Name" of Security -> Users Tab in HP Storage Essentials GUI.
4. IP address of the Managed Host (which has the HBA to be added/removed) in SE
5. HBA Port WWN to be added/removed
6. Name of the Managed StorageSystem in SE (which has the volume to be mapped/unmapped)
7. Name of the StorageVolume in the StorageSystem.
8. Operation to be performed. ("Add" or "Remove")

On successful completion of the flow, the input Storage Volume will be mapped/unmapped to the input Host HBA.

The flow returns failure in case of error.

Flow: Provision Storage for a server using Storage Essentials

This workflow allows provisioning of Storage Volumes to Hosts from Storage Arrays in a SAN environment. The provisioning operation is done using the underlying Storage Essentials infrastructure, which manages the SAN environment.

NOTE:

1. The flow supports HP Storage Essentials in Standalone mode and Integrated with HP Systems Insight Manager.
2. The flow supports only the elements and configurations supported by HP Storage Essentials. For more details on supported configurations, please refer to the HP Storage Essentials version 6.0 support matrix.

3. Currently, the flow supports HP MSA, HP EVA, XP family of arrays, LSI, HDS, EMC CLARiiON, EMC Symmetrix DMX arrays. There are no specific platform restrictions on the hosts to which storage can be assigned. Again, this is limited by the support matrix of HP Storage Essentials.

The user will need to provide the following inputs:

1. The user will need to provide the Storage Essentials Central Management Server (CMS) details, including:
 - SE CMS name/IP address
 - Username
 - Password

Note:

- a. The HP Storage Essentials user should have enough permission to access the necessary resources (Hosts, Arrays, Fabric) and perform the provisioning actions on them.
 - b. If HP Storage Essentials CMS is integrated with HP SIM then the Username in the flow execution should be given in the same case as "Login Name" of Security -> Users Tab in HP Storage Essentials GUI.
2. The Host for which Storage needs to be provisioned
 3. A name for the volume - this will be ignored by HP MSA, XP arrays, HDS and EMC Symmetrix DMX; as the array will assign the volume name.
 4. Size of the volume
 5. Desired redundancy level: The flow prompts for 3 levels:
 - ✓ Non-redundant Striped Volumes (RAID0)
 - ✓ Redundant Parity Based Volumes (RAID5)
 - ✓ Redundant Mirrored Volumes (RAID1)

Based on the desired volume characteristics, the flow intelligently finds an array in the SAN which can provide the volume with the desired characteristics and then provisions the storage volume to the host.

Once the flow completes, the user needs to do hardware refresh operation on the host (for e.g. rescan disks on Windows, ioscan on hpux) and then start using the storage volume.

In case the flow is not able to provision storage, it will try to revert all the changes it committed in the SAN environment as part of intermediate steps (for e.g. volume, zones and HSG's created). This ensures that the flow tries to exit gracefully in case the provisioning operation is not successful (also known as flow rollback).

Flow: Create Change Ticket - Provision Storage for a Server

This workflow creates a change ticket in HP Service Manager with all the inputs provided by the user requesting to provision Storage Volumes to Hosts.

The user will need to provide the following inputs:

1. The user will need to provide the Storage Essentials Central Management Server (CMS) details, including:
 - SE CMS name/IP address
 - Username
 - Password.

Note:

- a. The HP Storage Essentials user should have enough permission to access the necessary resources (Hosts, Arrays, Fabric) and perform the provisioning actions on them.
 - b. If HP Storage Essentials CMS is integrated with HP SIM then the Username in the flow execution should be given in the same case as "Login Name" of Security -> Users Tab in HP Storage Essentials GUI.
2. The Host name or IP address for which Storage needs to be provisioned
 3. A name for the volume - this will be ignored by HP MSA, XP arrays, HDS and EMC Symmetrix DMX; as the array will assign the volume name.
 4. Size of the volume
 5. Desired redundancy level: The flow prompts for 3 levels:
 - ✓ Non-redundant Striped Volumes (RAID0)
 - ✓ Redundant Parity Based Volumes (RAID5)
 - ✓ Redundant Mirrored Volumes (RAID1)
 6. For creation of the ticket, the user needs to provide the Service Manager server information including:
 - SM server name/IP address
 - Username
 - Password
 - Protocol type (HTTPS/HTTP)
 - TCP Port (default ports for SM are 13443/13080)
 - Contact
 - Coordinator
 - Requested By

Flow: Provision Storage for a server using Storage Essentials - using Change Ticket

This flow integrates provisioning operation with Change Management functionality of HP Service Manager. This workflow provisions Storage Volumes to Hosts from Storage Arrays in a SAN environment using the information provided in the approved change ticket of Service Manager, created by the above flow (Create Change Ticket - Provision Storage for a Server). The

provisioning operation is done using the underlying Storage Essentials infrastructure, which manages the SAN environment.

NOTE:

1. The flow supports HP Storage Essentials in Standalone mode and Integrated with HP Systems Insight Manager.
2. The flow supports only the elements and configurations supported by HP Storage Essentials. For more details on supported configurations, please refer to the HP Storage Essentials version 6.0 support matrix.
3. Currently, the flow supports HP MSA, HP EVA, XP family of arrays, LSI, HDS, EMC CLARiiON, EMC Symmetrix DMX arrays. There are no specific platform restrictions on the hosts to which storage can be assigned. Again, this is limited by the support matrix of HP Storage Essentials.

The user will need to provide the following inputs:

1. SM server details
 - SM server name/IP address
 - Username
 - Password
 - Protocol type (HTTPS/HTTP)
 - TCP Port (default ports for SM are 13443/13080)
 - Contact
 - Coordinator
 - Requested By
2. The change ticket ID (Ticket should be approved)
3. The Storage Essentials Central Management Server (CMS) details, including:
 - Username
 - Password.

Note:

- a. The Storage Essentials user should have enough permission to access the necessary resources (Hosts, Arrays, Fabric) and perform the provisioning actions on them.
- b. If Storage Essentials CMS is integrated with HP SIM then the Username in the flow execution should be given in the same case as "Login Name" of Security -> Users Tab in Storage Essentials GUI.

Based on the desired volume characteristics obtained from the change ticket, the flow intelligently finds an array in the SAN which can provide the volume with the desired characteristics and then provisions the requested Storage to the host.

In case the flow is not able to provision storage, it will try to revert all the changes it committed in the SAN environment as part of intermediate steps (for e.g. volume, zones and HSG's created). This ensures that the flow tries to exit gracefully in case the provisioning operation is not successful.

Once the flow completes successfully, the user needs to do hardware refresh operation on the host (for e.g. rescan disks on Windows, ioscan on hpux) and then start using the storage. Also, the change ticket will be updated and closed.

Versions and components

HP Operations Orchestration Version 7.20

HP Storage Essentials Enterprise Edition version 6.0

HP Systems Insight Manager (HP SIM) version 5.1

Operations provided with the integration

The operations provided with this accelerator pack need the JRAS service to be running on the OO Central server.

Operation: Validate SE CMS

What the operation does

This operation connects to SE using the inputs provided to validate the SE connection/credentials.

How the operation works

The operation uses the JRAS service framework and connects to the Storage Essentials CMS, using the specified credentials.

How to implement the operation

To implement the operation, the target Storage Essentials CMS should be running and the JRAS service should be running on the OO Central server.

Data flow

When the operation is a flow, flow inputs to create

The flow inputs required for the operation are:

- secmsip – Storage Essentials (SE) Central Management Server(CMS) IP address
- seuser - CMS User Name
- sepassword - CMS Password

Which results to create

A step based on this operation can create the following results.

- status: The return status of the operation.

Typical result should assign the above results to a flow variable, with the assignment action being 'OVERWRITE'.

Troubleshooting

General troubleshooting procedures

- Failed to establish connection to Storage Essentials server.

Solution:

1. Storage Essentials IP/Server name or Username or Password may not be valid.

Operation: Get Hosts Managed by Storage Essentials CMS

What the operation does

This operation collects the list of all managed hosts from all fabrics in SE

How the operation works

The operation uses the JRAS service framework and connects to the Storage Essentials CMS, using the specified credentials.

After establishing connection with SE CMS, it gets a '|' separated list of all managed hosts from all fabrics in SE.

How to implement the operation

To implement the operation, the target Storage Essentials CMS should be running and the JRAS service should be running on the OO Central server.

Data flow

When the operation is a flow, flow inputs to create

The flow inputs required for the operation are:

- secmsip – Storage Essentials (SE) Central Management Server(CMS) IP address
- seuser - CMS User Name
- sepassword - CMS Password

Which results to create

A step based on this operation can create the following results.

- hostlist: '|' separated list of all managed hosts from all fabrics in SE.
- status: The return status of the operation.

Typical result should assign the above results to a flow variable, with the assignment action being 'OVERWRITE'.

Troubleshooting

General troubleshooting procedures

- Failed to get the list of hosts.

Solution:

1. Check the operation's result 'status' for more details on the possible reasons for failure.
2. The specified Storage Essentials CMS may no longer be managing any hosts in the discovered fabrics.
3. Failed to connect to Storage Essentials server.

Operation: Get HBA Ports for Host

What the operation does

This operation collects the list of HBA port WWN on the given host

How the operation works

The operation uses the JRAS service framework and connects to the Storage Essentials CMS, using the specified credentials.

After establishing connection with SE CMS, it gets a '|' separated list of all HBA port WWN on the given host.

How to implement the operation

To implement the operation, the target Storage Essentials CMS should be running and the JRAS service should be running on the OO Central server.

Data flow

When the operation is a flow, flow inputs to create

The flow inputs required for the operation are:

- secmsip – Storage Essentials (SE) Central Management Server(CMS) IP address
- seuser - CMS User Name
- sepassword - CMS Password
- hostip - IP address of the Managed Host in SE

Which results to create

A step based on this operation can create the following results.

- portlist: '|' separated list of all HBA port WWN on the given host.
- status: The return status of the operation.

Typical result should assign the above results to a flow variable, with the assignment action being 'OVERWRITE'.

Troubleshooting

General troubleshooting procedures

- Failed to get the list of HBA port WWN 'portlist' from the given host.

Solution:

1. Check the operation's result 'status' for more details on the possible reasons for failure.
2. The specified Storage Essentials CMS may no longer be managing specified host in the discovered fabrics.
3. Host may not have the HBAs connected.
4. Failed to connect to Storage Essentials server.

Operation: Get Storage Systems connected to HBA port

What the operation does

This operation collects the list of Storage Systems from the fabric based on the 'visibility' of the Storage System from the HBA port.

How the operation works

The operation uses the JRAS service framework and connects to the Storage Essentials CMS, using the specified credentials.

After establishing connection with SE CMS, '|' separated names of Storage Systems will be retrieved based on the 'visibility' option selected by the user.

How to implement the operation

To implement the operation, the target Storage Essentials CMS should be running and the JRAS service should be running on the OO Central server.

Data flow

When the operation is a flow, flow inputs to create

The flow inputs required for the operation are:

- secmsip – Storage Essentials (SE) Central Management Server(CMS) IP address
- seuser - CMS User Name
- sepassword - CMS Password

- initiatorwwn - HBA Port WWN
- visibility – It can be any one of the values in the Selection List 'SE-VisibilityOptions'
 - Visible*: Collect the list of Storage Systems with 'initiatorwwn' in their HSG
 - NonVisible*: Collect the list of Storage Systems without 'initiatorwwn' in their HSG
 - All*: Collect the list of Storage Systems from the same fabric as 'initiatorwwn'.

Which results to create

A step based on this operation can create the following results.

- sslist: '|' separated names of all Storage Systems in the same fabric as 'initiatorwwn', based on the input 'visibility' option.
- status: The return status of the operation.

Typical result should assign the above results to a flow variable, with the assignment action being 'OVERWRITE'.

Troubleshooting

General troubleshooting procedures

- Failed to get the list of Storage Systems 'sslis' from the same fabric as 'initiatorwwn'

Solution:

1. Check the operation's result 'status' for more details on the possible reasons for failure.
2. The specified Storage Essentials CMS may no longer be managing any Storage Systems in the selected host fabrics.
3. Failed to connect to Storage Essentials server.

Operation: Get Storage Volumes for HBA port

What the operation does

This operation collects the list of Storage Volumes in the Storage System, based on the 'visibility' option of Storage Volume to the HBA port

How the operation works

The operation uses the JRAS service framework and connects to the Storage Essentials CMS, using the specified credentials.

After establishing connection with SE CMS, it gets a '|' separated list of all Storage Volumes in the Storage System based on the 'visibility' option of Storage Volume to the HBA port.

How to implement the operation

To implement the operation, the target Storage Essentials CMS should be running and the JRAS service should be running on the OO Central server.

Data flow

When the operation is a flow, flow inputs to create

The flow inputs required for the operation are:

- secmsip – Storage Essentials (SE) Central Management Server(CMS) IP address
- seuser - CMS User Name
- sepassword - CMS Password
- initiatorwwn - HBA Port WWN
- storagesystemname - Name of the Managed StorageSystem in SE
- visibility - It can be any one of the values in the Selection List 'SE-VisibilityOptions'

Visible: Collect the list of Storage Volumes in the Storage System, which are mapped to the 'initiatorwwn'

NonVisible: Collect the list of Storage Volumes in the Storage System, which are not mapped to the 'initiatorwwn'

All: Collect the list of all Storage Volumes in the Storage System

Which results to create

A step based on this operation can create the following results.

- svlist: '|' separated list of all Storage Volumes in the Storage System, based on the selected 'visibility' option.
- status: The return status of the operation.

Typical result should assign the above results to a flow variable, with the assignment action being 'OVERWRITE'.

Troubleshooting

General troubleshooting procedures

- Failed to get list of Storage Volumes 'svlist' in the Storage System, based on the selected 'visibility' option.

Solution:

1. Check the operation's result 'status' for more details on the possible reasons for failure.
2. The specified Storage System in Storage Essentials CMS may not have the storage volumes.
3. Failed to connect to Storage Essentials server.

Operation: Manage ACLs for HBA Port

What the operation does

This operation adds or removes HBA port WWN from a Storage Volume's ACL

How the operation works

The operation uses the JRAS service framework and connects to the Storage Essentials CMS, using the specified credentials.

After establishing connection with SE CMS, the operation adds or removes the HBA port WWN from a Storage Volume's ACL. When adding an HBA port WWN to the Storage Volume's ACL, it also makes changes to the Zone settings so as to make the volume accessible to the HBA port WWN.

How to implement the operation

To implement the operation, the target Storage Essentials CMS should be running and the JRAS service should be running on the OO Central server.

Data flow

When the operation is a flow, flow inputs to create

The flow inputs required for the operation are:

- secmsip – Storage Essentials (SE) Central Management Server(CMS) IP address
- seuser - CMS User Name
- sepassword - CMS Password
- initiatorwwn - HBA Port WWN
- storagesystemname - Name of the Managed Storage System in SE
- storagevolumename - Name of the Storage Volume in the Storage System 'storagesystemname'
- operationtype - It can be any one of the values in the Selection List 'SE-AddOrRemove'
 - Add:* Add the 'initiatorwwn' to the Storage Volume 'storagevolumename' ACL
 - Remove:* Remove the 'initiatorwwn' from the Storage Volume 'storagevolumename'

ACL

Which results to create

A step based on this operation can create the following results.

- status: The return status of the operation.

Typical result should assign the above results to a flow variable, with the assignment action being 'OVERWRITE'.

Troubleshooting

General troubleshooting procedures

- Failed to add/remove HBA port WWN from Volume's ACL.

Solution:

1. Check the operation's result 'status' for more details on the possible reasons for failure.
2. The specified Storage Essentials CMS may no longer be managing the specified initiator WWN or Storage system in the discovered fabrics.
3. The specified Storage Volume may not exist in Storage system in the discovered fabrics.
4. Failed to connect to Storage Essentials server.

Operation: Change Approval Decision Operation for Add or Remove HBA

What the operation does

This operation checks and returns success only if the input Change Ticked Id is open and approved and belongs to subcategory "Add or Remove HBA".

How to implement the operation

To implement the operation, the JRAS service should be running on the OO Central server.

Data flow

When the operation is a flow, flow inputs to create

The flow inputs required for the operation are:

- decisionValue - It can be any one of the values in the Selection List "Yes-No"
- openTicket – It can be any one of the values in the Selection List "Boolean"

Which responses to expect

A step based on this operation will return

- "success" if "openTicket" is *true* and "decisionValue" is *Yes* and subcategory is "Add or Remove HBA"
- "failure" otherwise

Operation: Change Approval Decision Operation for Storage Provisioning

What the operation does

This operation checks and returns success only if the input Change Ticked Id is open and approved and belongs to subcategory "StorageProvisioning".

How to implement the operation

To implement the operation, the JRAS service should be running on the OO Central server.

Data flow

When the operation is a flow, flow inputs to create

The flow inputs required for the operation are:

- decisionValue - It can be any one of the values in the Selection List "Yes-No"
- openTicket – It can be any one of the values in the Selection List "Boolean"

Which responses to expect

A step based on this operation will return

- "success" if "openTicket" is *true* and "decisionValue" is *Yes* and subCategory is "Storage Provisioning".
- "failure" otherwise

Operation: Provision Storage to a Host

What the operation does

This operation tries to create a volume with the specified characteristics (size, redundancy) and assign it to the host.

How the operation works

This operation tries to select the most suitable storage arrays, and to provide the storage on one array using the following criteria:

1. The Storage Array having the capability to provide the necessary size and redundancy level for the volume
2. As far as possible, the operation will select a Storage Array in the same zone as the host port(s), to avoid creation of zones, unless it is absolutely essential.
3. Create volume or meta-volume on the selected array
4. Create Host Security Group on the selected device
5. Create a Zone in the fabric to establish connectivity between the host and the storage, on a need basis.

6. It will try to provision other arrays in host fabric if provision fails on one.

How to implement the operation

To implement the operation, the target Storage Essentials CMS should be running and the JRAS service should be running on the OO Central server.

Data flow

When the operation is a flow, flow inputs to create

The flow inputs required for the operation are:

- cms: Name/IP address of the Storage Essentials CMS
- user: Storage Essentials user
- password: Password
- server: Name/IP Address of the server for which storage needs to be provisioned
- name: Name of the volume which will be created on the array. This value will be ignored for HP MSA, XP, HDS, EMC Symmetrix arrays, as the array will assign the name to the volume. Special characters other than hyphen (-) and underscore (_) is not allowed in the name.
- size: Size of the volume. If decimal numbers are specified, then they will be converted to an integer value using the 'ceil' operation.
- redundancy: This will be the redundancy of the array as required. This can be any of the following 3 values:
 - Non-redundant Striped Volumes (RAID0)
 - Redundant Parity Based Volumes (RAID5)
 - Redundant Mirrored Volumes (RAID1)

Which results to create

A step based on this operation can create the following results:

- name: will be the name of the volume that was created on the array. In case the array assigns the volume name, this will overwrite the value specified by the user.
- storageArray: The name of the array from which the storage was provisioned.
- HSGs: The names of the Host Security Groups (HSG) which needs to be deleted in the rollback. In case HSG was created on multiple arrays, this will be a '|' separated string of the individual HSG name. In case multiple HSGs were created on single array, this will be a ';' separated string of the individual HSG name.
- arraysForHSGCreated: The names of the arrays on which HSG(s) were created. In case HSG were created on multiple arrays, this will be a '|' separated string of the individual array name.
- Volumes: The name of the volumes that was created on storage arrays but couldn't provisioned to host. In case multiple volumes created on different arrays, this will be a '|' separated string of the individual volume names.

- **arraysForVolumeCreated:** The name of the storage arrays in which volume created but couldn't provisioned to host. In case multiple volumes created on different arrays, this will be a '|' separated string of the individual storage array names.
- **zone:** The name of the zone that was created to establish connectivity between the host and the storage, if any. In case multiple zones were created, this will be a '|' separated string of the individual zone names.
- **fabric:** The name of the fabric to which the host and storage array belong and zone activation failed.
- **provisionSuccess:** If able to provision one of the arrays from host fabric then value would be "YES" otherwise "NO".

Troubleshooting

General troubleshooting procedures

- **Provisioning Failure:** This will be the response when the provisioning operation fails
- **Provisioning Successful:** This will be the response when the provisioning operation succeeds on first storage array.
- **ProvisionSuccess_RollbackRequired:** This will be the response when provisioning operation succeeds on one of the storage array in host fabric but tried to provision on more than one arrays.
- **Failure:** This will be the response for one of the failures listed below.

If pool not available, because there are no storage arrays available to create the volume with required size and redundancy.

If invalid volume information when the user provides invalid size or name of the volume.
e.g. non-numeric characters

Solution:

Contact your Storage Administrator to check the following

1. Check that the Storage Arrays are connected to the same fabric as host selected by user.
2. Check that the enough space is available in the Storage Array Pools.
3. Specify valid size which contains only numeric values.
4. Specify valid name which contains alphanumeric and/or special characters hyphen (-) or underscore (_). Any other special characters are not allowed.
5. The specified Storage Essentials CMS may not be managing the arrays connected to a fabric. You may try discovering the arrays connected to one of the fabrics managed by Storage Essentials CMS.
6. Check if SE CMS specified has the permission for provisioning on the array

Operation: Rollback Provisioned Objects

What the operation does

This operation tries to delete specified zone(s), HSG(s) and volume(s) in a SAN environment. Currently, this operation is designed to rollback already provisioned objects (volumes, HSGs, zones) in case the operation tried to provision on more than one storage array or it fails.

How the operation works

1. Delete all specified HSG(s) in specified array(s).
2. Delete all specified volume(s) in specified array(s).
3. Delete all specified zone(s) in specified fabric(s).

How to implement the operation

To implement the operation, the target Storage Essentials CMS should be running and the JRAS service should be running on the OO Central server.

Data flow

When the operation is a flow, flow inputs to create

The flow inputs required for this step are:

- cms: Name/IP address of the Storage Essentials CMS
- user: Storage Essentials user
- password: Password
- provisionSuccess: This will indicate the provisioning was successful or not.
Value- YES/NO
- zone: The name of the zone that was created to establish connectivity between the host and the storage but zone activation failed, if any. In case multiple zones were created, this will be a '|' separated string of the individual zone names.
- fabric: The name of the fabric to which the host and storage array belong and zone activation failed.
- volumes: The name of the volumes that was created on storage arrays but couldn't provisioned to host. In case multiple volumes created on different arrays, this will be a '|' separated string of the individual volume names.
- arraysForVolumeCreated: The name of the storage arrays in which volume created but couldn't provisioned to host.
In case volumes created on multiple arrays, this will be a '|' separated string of the individual volume names.
- HSGs: The name of the Host Security Groups which will provide access to the volume that was created but couldn't use to provisioned the host.

In case HSG created on multiple arrays, this will be a '|' separated string of the individual storage HSG names. In case multiple HSGs created on same array, this will be a ';' separated string of the individual HSG names.

- `arraysForHSGCreated`: The name of the storage arrays in which HSGs created but couldn't use to provisioned the host.

In case HSG created on multiple arrays, this will be a '|' separated string of the individual storage array names.

Which results to create

- `status`: This will give the detailed message of the rollback operation.

Troubleshooting

General troubleshooting procedures

- `provisionSuccess_RollbackSuccess`: This means that the objects provisioned by the flow were successfully deleted when it was able to provision successfully
- `provisionSuccess_RollbackFailed`: This means that the objects provisioned by the flow could not be deleted when it was able to provision successfully
- `provisionFailed_RollbackSuccess`: This means that the objects provisioned by the flow were successfully deleted when it couldn't provision successfully
- `provisionFailed_RollbackFailed`: This means that the objects provisioned by the flow could not be deleted when it couldn't provision successfully,

Solution :

1. The specified Storage Essentials CMS may no longer be managing fabric. You may try re-discovering the fabric.
2. The specified Storage Essentials CMS may no longer be managing the storage array. You may try re-discovering the array specified.
3. Check if Storage Essentials server has the capability to provision on the fabric, by referring to the Support Matrix
4. Check if the volume(s) specified is already deleted.
5. Check if the HSG(s) specified is already deleted.
6. Check if the zone(s) specified is already deleted.
7. The user may need to manually delete these objects, if the response is `provisionSuccess_RollbackFailed` or `provisionFailed_RollbackFailed`.

Operation: Validate Volume Details for Creation

What the operation does

This operation validates the inputs provided for creation of a volume on a Storage Array.

How the operation works

Given the Volume name and size, this operation:

- checks that the name does not contain special characters for a volume name other than “-” and “_”
- checks that non-numeric or negative numbers are not specified for size of the volume

It generates the following responses:

- success - Volume inputs successfully validated
- failure - Input validation failed

How to implement the operation

This operation does not make any remote Java or WMI connections. It just does plain validation of the inputs provided.

Data flow

When the operation is a flow, flow inputs to create

size - Checks against non-numeric or negative numeric inputs

name - Checks against invalid characters in the name. Valid characters for volume name are: numbers, alphabets, “-” and “_”

Which results to create

status - Operation Status Message

Troubleshooting

General troubleshooting procedures

Failure: The status message will specify why the operation failed. If it is because of an invalid name format, please specify only alphanumeric characters, “-” and “_” in the volume name. If it is because of invalid size, please specify only positive numbers.

Customizing the Integration

None

Launching flows through URL or as Subflows

1. All the flows can be manually launched from the flow library after logging on to the OO central website. The flow can be found under Flow Library tab : Library -> Accelerator Packs -> Storage Automation

2. **To create a linked URL that can start a flow run** Click the **Flow Library** tab, navigate to the flow, and click the flow name to open the preview of the flow. Under **Execution Links**, select the URL in the text box of the desired type of run (either **Guided Run** or **Run All**).

Refer to the below example (Add or Remove HBA from volume ACL - using Change Ticket) for providing inputs in the URL to the flow.

[https://<OO Central IP>:<port>/PAS/app?service=RCLinkService/FlowLinkDispatch&sp=SNEWRUNALL&sp=S8f783bfe-2101-45e8-9f22-5554404ec3b2&sp=L0&smserverip=<smserverip>&smuser=<smuser>&smpassword=<s,password>""&changeid=<changeid>&secmsip=<secmsip>&seuser=<seuser>&sepassword=<sepassword>&hostip=<hostip>&initiatorwwn=<initiatorwwn>&storagesystemname=<storagesystemname>&storageevolumename=<storageevolumename>&AddOrRemove=<AddOrRemove>](https://<OO Central IP>:<port>/PAS/app?service=RCLinkService/FlowLinkDispatch&sp=SNEWRUNALL&sp=S8f783bfe-2101-45e8-9f22-5554404ec3b2&sp=L0&smserverip=<smserverip>&smuser=<smuser>&smpassword=<s,password>)

Where:

<OO Central IP>:port are the IP address and the port on which the OO Central is running

Parameters are:

- smserverip - SM server name/IP address
- smuser - SM username
- smpassword – SM password
- changeid - The ticket ID for “Add or Remove HBA WWN from Volume’s ACL” change created on the Service Manager
- secmsip – Storage Essentials (SE) Central Management Server(CMS) IP address
- seuser - CMS User Name
- sepassword - CMS Password
- initiatorwwn - HBA Port WWN
- storagesystemname - Name of the Managed Storage System in SE
- storageevolumename - Name of the Storage Volume in the Storage System 'storagesystemname'
- AddOrRemove - It can be any one of the values in the Selection List 'SE-AddOrRemove'
 - Add:* Add the 'initiatorwwn' to the Storage Volume 'storageevolumename' ACL
 - Remove:* Remove the 'initiatorwwn' from the Storage Volume 'storageevolumename'

ACL

Security

The flows which are not integrated with Service Manager Change Management process can only be seen and executed by OO user who has admin privileges.

Limitation

1. RAID 0 GROUP mapping to host in HDS array will result in error.

However RAID 1 and RAID 5 are supported in HDS through Storage Essentials.

2. If the host is connected to 2 switches in the same fabric and EMC CLARiiON array is connected to only one of the switches, then HSG creation fails.
3. If the Zone does not exist between EMC Symmetrix DMX array and the host for which storage needs to be assigned, then there is a possibility that Flows stop with RAS timeout error.

In such cases the current step would succeed. However the flow will not continue, which implies that the rollback will not happen in Provisioning work flow in case of any error in current step. The status of the operations need to be checked using HP Storage Essentials.

4. In SIM/SE integrated environment when the flow is executed and if the same user is logged in the SIM/SE GUI then that user will be logged off from the GUI.\

It is advisable to use a different set of users for workflow execution to avoid this issue.

5. Mapping a volume to multiple Initiators on LSI Array fails.