NetApp

Manage and configure

OnCommand Workflow Automation

NetApp
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Table of Contents

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Overview of OnCommand Workflow Automation

OnCommand Workflow Automation (WFA) is a software solution that helps to automate storage management tasks, such as provisioning, migration, decommissioning, data protection configurations, and cloning storage. You can use WFA to build workflows to complete tasks that are specified by your processes.

A workflow is a repetitive and procedural task that consists of sequential steps, including the following types of tasks:

- Provisioning, migrating, or decommissioning storage for databases or file systems
- Setting up a new virtualization environment, including storage switches and datastores
- Setting up storage for an application as part of an end-to-end orchestration process

Storage architects can define workflows to follow best practices and meet organizational requirements, such as the following:

- Using required naming conventions
- Setting unique options for storage objects
- Selecting resources
- Integrating internal configuration management database (CMDB) and ticketing applications

WFA features

- Workflow design portal to build workflows

  The workflow design portal includes several building blocks, such as commands, templates, finders, filters, and functions, that are used to create workflows. The designer enables you to include advanced capabilities to workflows such as automated resource selection, row repetition (looping), and approval points.

  The workflow design portal also includes building blocks, such as dictionary entries, cache queries, and data source types, for caching data from external systems.

- Execution portal to execute workflows, verify status of workflow execution, and access logs
- Administration/Settings option for tasks such as setting up WFA, connecting to data sources, and configuring user credentials
- Web service interfaces to invoke workflows from external portals and data center orchestration software
- Storage Automation Store to download WFA packs

WFA license information

No license is required for using the OnCommand Workflow Automation server.

Create local users

OnCommand Workflow Automation (WFA) enables you to create and manage local WFA users with specific permissions for various roles, such as guest, operator, approver, architect, admin, and backup.

What you'll need

You must have installed WFA and logged in as an admin.

About this task

WFA enables you to create users for the following roles:

- **Guest**

  This user can view the portal and the status of a workflow execution, and can be notified of a change in the status of a workflow execution.

- **Operator**

  This user is allowed to preview and execute workflows for which the user is given access.

- **Approver**

  This user is allowed to preview, execute, approve, and reject workflows for which the user is given access.

  > (i) It is recommended to provide the email ID of the approver. If there are multiple approvers, you can provide a group email ID in the **E-mail** field.

- **Architect**

  This user has full access to create workflows, but is restricted from modifying global WFA server settings.

- **Admin**

  This user has complete access to the WFA server.

- **Backup**

  This is the only user who can remotely generate backups of the WFA server. However, the user is restricted from all other access.

Steps

1. Click **Settings**, and under **Management** click **Users**.
2. Create a new user by clicking ![icon] on the toolbar.
3. Enter the required information in the **New User** dialog box.
4. Click **Save**.

Configuring OnCommand Workflow Automation

OnCommand Workflow Automation (WFA) enables you to configure various settings - for example, AutoSupport and notifications.

When configuring WFA, you can set up one or more of the following, as required:

- AutoSupport for sending AutoSupport messages to technical support
- Microsoft Active Directory Lightweight Directory Access Protocol (LDAP) server for LDAP authentication and authorization for WFA users
- Mail for email notifications about workflow operations and sending AutoSupport messages
- Simple Network Management Protocol (SNMP) for notifications about workflow operations
- Syslog for remote data logging

Configure authentication settings

You can configure OnCommand Workflow Automation (WFA) to use a Microsoft Active Directory (AD) Lightweight Directory Access Protocol (LDAP) server for authentication and authorization.

What you'll need

You must have configured a Microsoft AD LDAP server in your environment.

About this task

Only Microsoft AD LDAP authentication is supported for WFA. You cannot use any other LDAP authentication methods, including Microsoft AD Lightweight Directory Services (AD LDS) or Microsoft Global Catalog.

ⓘ During communication, LDAP sends the user name and password in plain text. However, LDAPS (LDAP secure) communication is encrypted and secure.

Steps

1. Log in to WFA through a web browser as an admin.
2. Click **Settings**, and under **Setup** click **Authentication**.
3. Select the **Enable Active Directory** check box.
4. Enter the required information in the fields:

   a. **Optional:** If you want to use the *user@domain* format for domain users, replace `sAMAccountName` with `userPrincipalName` in the **User name attribute** field.

   b. **Optional:** If unique values are required for your environment, edit the required fields.

   c. Enter the AD server URI as follows:
      Example: `ldap://active_directory_server_address\[:port\]`

      `ldap://NB-T01.example.com[:389]`

      If you have enabled LDAP over SSL, you can use the following URI format:
      `ldaps://active_directory_server_address\[:port\]`

d. Add a list of AD group names the required roles.

> ⓘ You can add a list of AD group names to the required roles in the Active Directory Groups Window.

5. Click **Save**.

Configure email notifications

You can configure OnCommand Workflow Automation (WFA) to send you email notifications about workflow operations—for example, workflow started or workflow failed.

What you'll need

You must have configured a mail host in your environment.

Steps

1. Log in to WFA through a web browser as an admin.
2. Click **Settings**, and under **Setup** click **Mail**.
3. Enter the required information in the fields.
4. **Optional:** Test the mail settings by performing the following steps:
   a. Click **Send test mail**.
   b. In the **Test Connection** dialog box, enter the email address to which you want to send the email.
   c. Click **Test**.
5. Click **Save**.

Configure SNMP

You can configure OnCommand Workflow Automation (WFA) to send Simple Network Management Protocol (SNMP) traps about the status of workflow operations.

About this task

WFA now supports SNMP v1 and SNMP v3 protocols. SNMP v3 provides additional security features.

The WFA `.mib` file provides information about the traps that are sent by the WFA server. The `.mib` file is located in the `<WFA_install_location>\wfa\bin\wfa.mib` directory on the WFA server.

> ⓘ The WFA server sends all the trap notifications with a generic object identifier (1.3.6.1.4.1.789.1.1.12.0).

You cannot use SNMP community strings such as `community_string@SNMP_host` for SNMP configuration.

Configure SNMP Version 1

Steps

1. Log in to WFA through a web browser as an admin user, and then access the WFA server.
2. Click **Settings**, and under **Setup** click **SNMP**.

3. Select the **Enable SNMP** check box.

4. In the **Version** drop-down list, select **Version 1**.

5. Enter an IPv4 or IPv6 address or the host name, and the port number of the management host.

   WFA sends SNMP traps to the specified port number. The default port number is 162.

6. In the **Notify On** section, select one or more of the following check boxes:

   ◦ Workflow execution started

   ◦ Workflow execution completed successfully

   ◦ Workflow execution failed/partially successful

   ◦ Workflow execution waiting for approval

   ◦ Acquisition failure

7. Click **Send Test Notification** to verify the settings.

8. Click **Save**.

Configure SNMP Version 3

You can also configure OnCommand Workflow Automation (WFA) to send Simple Network Management Protocol (SNMP) Version 3 traps about the status of workflow operations.

About this task

Version 3 offers two additional security options:

- Version 3 with Authentication

  Traps are sent unencrypted over the network. SNMP management applications, which are configured by the same authentication parameters as SNMP trap messages, can receive traps.

- Version 3 with Authentication and Encryption

  Traps are sent encrypted over the network. To receive and decrypt these traps, you must configure SNMP management applications with the same authentication parameters and encryption key as the SNMP traps.

Steps

1. Log in to WFA through a web browser as an admin user, and then access the WFA server.

2. Click **Settings**, and under **Setup** click **SNMP**.

3. Select the **Enable SNMP** check box.

4. In the **Version** drop-down list, select one of the following options:

   ◦ Version 3

   ◦ Version 3 with Authentication

   ◦ Version 3 with Authentication and Encryption

5. Select the SNMP configuration options that correspond to the specific SNMP Version 3 option you chose in Step 4.

6. Enter an IPv4 or IPv6 address or the host name, and the port number of the management host. WFA sends SNMP traps to the specified port number. The default port number is 162.

7. In the **Notify On** section, select one or more of the following check boxes:

   ◦ Workflow planning started/failed/completed

   ◦ Workflow execution started

   ◦ Workflow execution completed successfully

   ◦ Workflow execution failed/ partially successful

   ◦ Workflow execution waiting for approval

   ◦ Acquisition failure

8. Click **Send Test Notification** to verify the settings.

9. Click **Save**.

Configure Syslog

You can configure OnCommand Workflow Automation (WFA) to send log data to a specific Syslog server for purposes such as event logging and log information analysis.

What you'll need

You must have configured the Syslog server to accept data from the WFA server.

Steps

1. Log in to WFA through a web browser as an admin.

2. Click **Settings**, and under **Maintenance** click **Syslog**.

3. Select the **Enable Syslog** check box.

4. Enter the Syslog host name and select the Syslog log level.

5. Click **Save**.

Configure AutoSupport

You can configure several AutoSupport settings such as the schedule, content of the AutoSupport messages, and the proxy server. AutoSupport sends weekly logs of the content that you selected to technical support for archiving and issue analysis.

Steps

1. Log in to WFA through a web browser as an admin.

2. Click **Settings**, and under **Setup** click **AutoSupport**.

3. Ensure that the **Enable AutoSupport** box is selected.

4. Enter the required information.

5. Select one of the following from the **Content** list:

If you want to include…	Then choose this option…
Only configuration details such as users, workflows, and commands of your WFA installation	send only configuration data
WFA configuration details and data in WFA cache tables such as the scheme	send configuration and cache data (default)
WFA configuration details, data in WFA cache tables, and data in the installation directory	send configuration and cache extended data

> ℹ️ The password of any WFA user is *not* included in the AutoSupport data.

6. **Optional:** Test that you can download an AutoSupport message:

   a. Click **Download**.

   b. In the dialog box that opens, select the location to save the `.7z` file.

7. **Optional:** Test the sending of an AutoSupport message to the specified destination by clicking **Send Now**.

8. Click **Save**.

Configure email notifications for data source acquisition failures

You can control the notifications that are generated in OnCommand Workflow Automation (WFA) when a data source acquisition fails. You can configure the threshold and interval factor for the notifications.

What you'll need

You must have configured email notifications in OnCommand Workflow Automation (WFA).

Steps

1. Log in to WFA through a web browser as an administrator.

2. Configure the notification threshold:

   a. Click **Settings**, and under **Setup** click **Workflow Settings**.

   b. Scroll down to the **Advanced** section.

   c. In the **Acquisition notification threshold** field, enter the required value.

      The default value is 2.

      If the value specified is 2, then WFA waits for two consecutive data source acquisition failures before sending an email notification.

3. Click **Save**.

4. Configure the notification interval factor:

   a. Click **Settings**, and under **Setup** click **Data Sources**.

   b. Note the interval specified for the required data source.

The default value is 30. You can edit the data source to modify the interval time.

    c. Click **Settings**, and under **Setup** click **Workflow Settings**.

    d. Scroll down to the **Advanced** section.

    e. In the **Acquisition notification interval factor** field, enter the required value.

The default value is 6.

If the interval specified for a data source is 30 minutes and the multiplication factor is 6, then an email notification is sent when data source acquisition for the data source does not occur for 180 minutes.

> ⓘ If you specify 12 hours or more as the acquisition interval for a data source, WFA considers the interval factor as 1 and sends a notification after the specified acquisition interval for the data source.

5. Click **Save**.

Configure resource reservation for workflows

You can configure the resource reservation capability for OnCommand Workflow Automation (WFA) workflows to ensure that the required resources are available for successful execution of workflows.

Steps

1. Log in to WFA through a web browser as an administrator.

2. Click **Settings**, and under **Setup** click **Workflow Settings**.

3. Ensure that the **Enable reservation for commands** check box is selected.

4. In the **Reservation expiration (H)** field, enter the required value.

The default is 4.

5. Click **Save**.

6. Enable resource reservation in each required workflow:

    a. Click **Workflow > Details** of the required workflow.

        `Workflow` is the workflow that requires resource reservation.

    b. Select **Consider Reserved Elements**.

Configure the credentials of a target system

You can configure the credentials of a target system in OnCommand Workflow Automation (WFA) and use the credentials to connect to that specific system and execute commands.

About this task

After initial data acquisition, you must configure the credentials for the arrays on which the commands are run. PowerShell WFA controller connection works in two modes:

- With credentials

  WFA tries to establish a connection using HTTPS first, and then tries using HTTP. You can also use Microsoft Active Directory LDAP authentication to connect to arrays without defining credentials in WFA. To use Active Directory LDAP, you must configure the array to perform authentication with the same Active Directory LDAP server.

- Without credentials (for storage systems operating in 7-Mode)

  WFA tries to establish a connection using domain authentication. This mode uses the remote procedure call protocol, which is secured using the NTLM protocol.

- WFA checks the Secure Sockets Layer (SSL) certificate for ONTAP systems. Users might be prompted to review and accept/deny the connection to ONTAP systems if the SSL certificate is not trusted.

- You must reenter the credentials for ONTAP, NetApp Active IQ and Lightweight Directory Access Protocol (LDAP) after you restore a backup or complete an in-place upgrade.

Steps

1. Log in to WFA through a web browser as an admin.

2. Click **Settings**, and under **Setup** click **Credentials**.

3. Click on the toolbar.

4. In the **New Credentials** dialog box, select one of the following options from the **Match** list:

   - **Exact**

     Credentials for a specific IP address or host name

   - **Pattern**

     Credentials for the entire subnet or IP range

     You can use regular expression syntax for this option.

5. Select the remote system type from the **Type** list.

6. Enter either the host name or the IPv4 or IPv6 address of the resource, the user name, and the password.

7. Test the connectivity by performing the following action:

If you selected the following match type…	Then…
Exact	Click **Test**.
Pattern	Save the credentials and choose one of the following: • Select the credential and click on the toolbar. • Right-click and select **Test Connectivity**.

8. Click **Save**.

Configure protocols for connecting to remote systems

You can configure the protocol used by OnCommand Workflow Automation (WFA) to connect to remote systems. You can configure the protocol based on your organization's security requirements and the protocol supported by the remote system.

Steps

1. Log in to WFA through a web browser as an admin.

2. Click **Data Source Design** > **Remote System Types**.

3. Perform one of the following actions:

If you want to…	Do this…
Configure a protocol for a new remote system	a. Click . b. In the New Remote System Type dialog box, specify the details such as name, description, and version.
Modify the protocol configuration of an existing remote system	a. Select and double-click the remote system that you want to modify. b. Click .

4. From the **Connection Protocol** list, select one of the following:
   - HTTPS with fallback to HTTP (default)
   - HTTPS only
   - HTTP only
   - Custom

5. Specify the details for the protocol, default port, and default timeout.

6. Click **Save**.

OnCommand Workflow Automation Designer features

OnCommand Workflow Automation includes various features to help you design storage workflows.

For more information about the features, see the next topics.

How repeat row works

A workflow contains commands and command details arranged in rows. You can specify the commands in a row to be repeated for a fixed number of iterations or dynamic number of iterations based on the results of search criteria.

The command details in a row can be specified to repeat a certain number of times or when the workflow is designed. The workflow can also be designed such that the number of times the row must repeat can be

specified when the workflow is executed or scheduled for an execution. You can specify search criteria for an object and the commands in a row can be set to repeat as many times as the objects are returned by the search criteria. Rows can also be set to repeat when certain conditions are met.

Row repetition variables

You can specify variables in the variable list that can be manipulated during the row iterations. For the variables, you can specify a name, a value with which the variables are initialized, and an MVFLEX Expression Language (MVEL) expression that is evaluated after every iteration of the row repetition.

The following illustration shows the repeat row options and an example of a row repetition variable:

Row repetition with approval points

When you have specified iterations of repeat rows for commands and included approval points, all the iterations of the commands before an approval point are executed. After you approve the approval point, the execution of all iterations of the successive commands continues until the next approval point.

The following illustration shows how the iterations of repeat rows are executed when an approval point is included in a workflow:
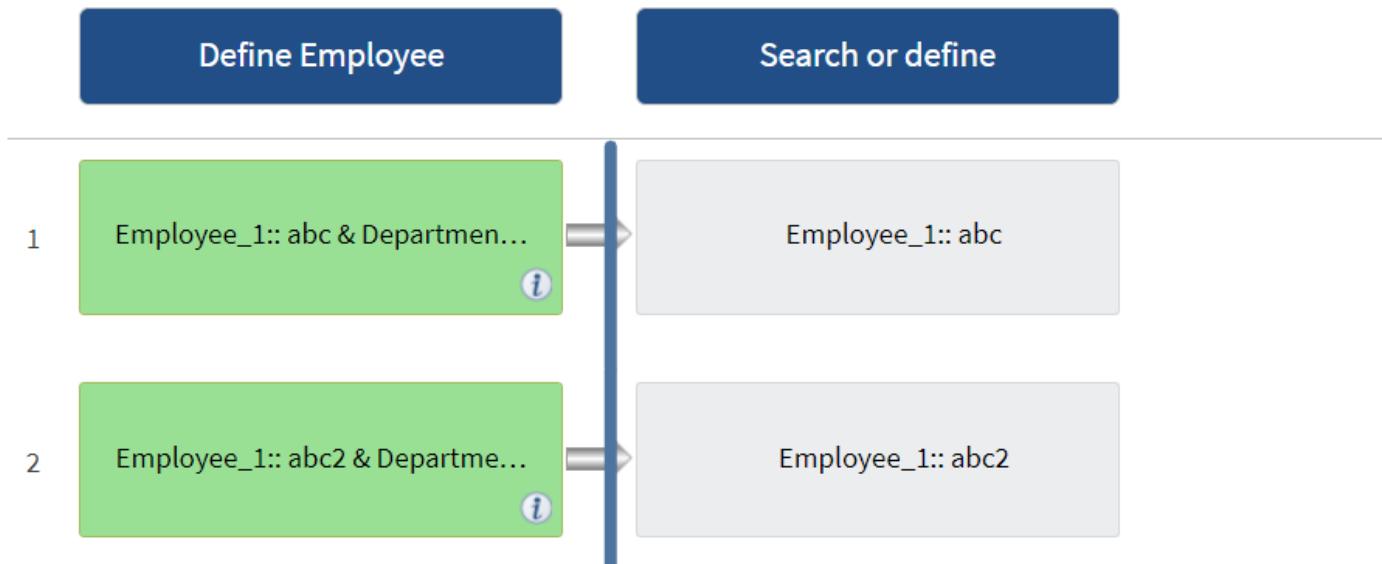
Repeat row examples in predefined workflows

You can open the following predefined workflows in the Designer to understand how repeat rows are used:

- Create a Clustered Data ONTAP NFS Volume
- Create VMware NFS Datastore on Clustered Data ONTAP Storage
- Establish Cluster Peering
- Remove a Clustered Data ONTAP Volume

What approval points are

Approval points are check points used in a workflow to pause the workflow execution and resume it based on a user approval.

The blue vertical bar shown in the following illustration is an approval point:
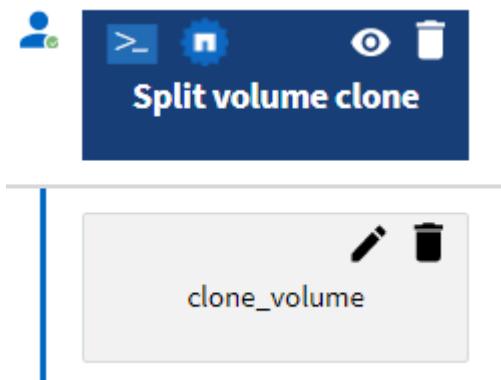
You can use approval points for incremental execution of a workflow, where sections of the workflow should be executed only after a certain condition is met. For example, when the next section has to be approved or when successful execution of the first section is validated. Approval points do not handle any process between pausing and resuming of a workflow. Email and SNMP notifications are sent, as specified in the WFA configuration, and the storage operator can be asked to perform certain actions upon receiving the workflow pause notification. For example, the storage operator can send planning details to admin, approver, or operator

for approval and resume the workflow when the approval is received.

Approvals might not be required at all times. In some scenarios, the approval might be required only if a particular condition is met and the conditions can be configured when an approval point is added. For example, consider a workflow that is designed to increase the size of a volume. You can add an approval point at the beginning of the workflow for the storage operator to obtain approval from the managers when the increase in the volume size results in an 85% usage of the space in the aggregate that contains the volume. During the workflow execution and on selecting a volume that results in this condition, the execution is stopped until it is approved.

The condition that is set up for the approval point can have one of the following options:

- Without any condition

- When the variable you have specified is found

- When the variable you have specified is not found

- When the expression you have specified evaluates to true

There is no limitation on the number of approval points in a workflow. You can insert approval points before commands in a workflow and set the commands after the approval point to wait for approval before execution. Approval points provide information, such as time of change, user, and comments, allowing you to see when and why the workflow execution was paused or resumed. The approval point comments can include MVEL expressions.

Approval point examples in predefined workflows

You can open the following predefined workflows in the Designer to understand how approval points are used:

- Remove a Clustered Data ONTAP Volume

- Controller and shelf upgrade of an HA pair

- Migrate Volumes

How continue on failure works

The continue on failure feature helps you to configure a step in a workflow so that the workflow execution can continue even if the step fails. You can address the failed steps and resolve the issue that caused the step to fail by accessing the `wfa.log` file or by clicking the ⓘ icon.

A workflow that has one or more such failed steps is in the Partially Successful state after the execution is complete. You can configure a step so that the workflow execution continues even if the step fails by selecting the required option in the Advanced tab of the Parameters for <command_name> dialog box.

If a step is not configured to continue on failure, the workflow execution is aborted if the step fails.

If a step that is configured to continue on failure fails, you can set the workflow to be executed by using one of the following options:

- Abort workflow execution (default option)

- Continue execution from the next step

- Continue execution from the next row

How resource selection works

OnCommand Workflow Automation (WFA) uses search algorithms to select storage resources for workflow execution. You should understand how resource selection works in order to design workflows efficiently.

WFA selects dictionary entry resources—such as vFiler units, aggregates, and virtual machines—using search algorithms. The selected resources are then used for executing the workflow. The WFA search algorithms are part of the WFA building blocks, and include finders and filters. To locate and select the required resources, the search algorithms search through the data that is cached from different repositories, such as Active IQ Unified Manager, VMware vCenter Server, and a database. By default, a filter is available for every dictionary entry for searching a resource based on its natural keys.

You should define the resource selection criteria for each command in your workflow. In addition, you can use a finder to define the resource selection criteria in each row of your workflow. For example, when you are creating a volume that requires a specific amount of storage space, you can use the "Find aggregate by available capacity" finder in the "Create Volume" command, which selects an aggregate with a specific amount of available space and creates the volume on it.

You can define a set of filter rules for dictionary entry resources, such as vFiler units, aggregates, and virtual machines. Filter rules can contain one or more groups of rules. A rule consists of a dictionary entry attribute, an operator, and a value. The attribute can also include attributes of its references. For example, you can specify a rule for aggregates as follows: List all aggregates that have names starting with the string "aggr" and have more than 5 GB of available space. The first rule in the group is the attribute "name", with the operator "starts-with", and the value "aggr". The second rule for the same group is the attribute "available_size_mb", with the operator ">", and the value "5000". You can define a set of filter rules along with public filters. The Define filter rules option is disabled if you have selected a finder. The Save as Finder option is disabled if you have selected the Define filter rules check box.

In addition to the filters and finders, you can use a search or define command to search for available resources. The search or define command is the preferred option over the No-op commands. The search and define command can be used to define resources of both the certified dictionary entry type and the custom dictionary entry type. The search or define command searches for resources but does not perform any action on the resource. However, when a finder is used to search for resources, it is used in the context of a command, and the actions defined by the command are executed on the resources. The resources returned by a search or define command are used as variables for the other commands in the workflow.

The following illustration shows that a filter is used for resource selection:
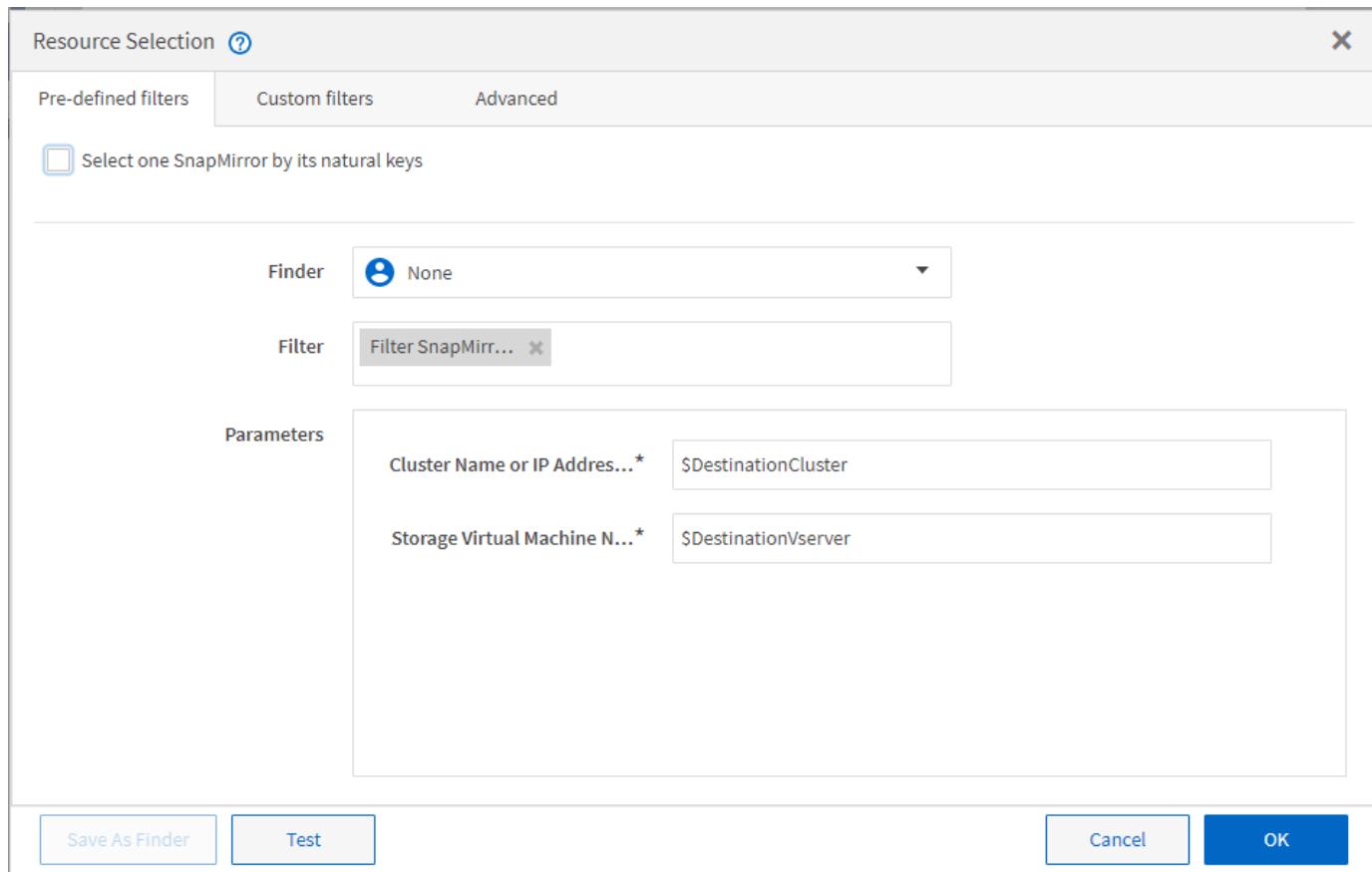
Resource selection examples in predefined workflows

You can open the command details of the following predefined workflows in the Designer to understand how resource selection options are used:

- Create a Clustered Data ONTAP NFS Volume
- Establish Cluster Peering
- Remove a Clustered Data ONTAP Volume

How reservation works

OnCommand Workflow Automation resource reservation capability reserves the required resources to ensure that the resources are available for successful execution of workflows.

WFA commands can reserve the required resources and remove the reservation after the resource is available in the WFA cache database, typically after a cache acquisition. The reservation capability ensures that the reserved resources are available for the workflow until the reservation expiration period that you have configured in the WFA configuration settings.

You can use the reservation capability to exclude resources reserved by other workflows during resource selection. For example, if a workflow that has reserved 100 GB of space on an aggregate is scheduled for execution after a week, and you are executing another workflow that uses the **Create Volume** command, the workflow that is executing does not consume the space reserved by the scheduled workflow to create a new volume. In addition, the reservation capability enables workflows to be executed in parallel.

When previewing a workflow for execution, the WFA planner considers all the reserved objects, including the existing objects in the cache database. If you have enabled reservation, the effects of the scheduled workflows and the workflows that are executing in parallel, and the existence of storage elements are considered when planning the workflow.

The arrow in the following illustration shows that reservation is enabled for the workflow:

Reservation examples in predefined workflows

You can open the following predefined workflows in the Designer to understand how reservation is used:

- Clone Environment
- Create a Clustered Data ONTAP Volume
- Establish Cluster Peering
- Remove a Clustered Data ONTAP Volume

What incremental naming is

Incremental naming is an algorithm that enables you to name the attributes in a workflow based on the search results for a parameter. You can name the attributes based on an incremental value or a custom expression. The incremental naming functionality helps you implement a naming convention based on your requirement.

You can use the incremental naming functionality when designing workflows to dynamically name the objects created by the workflow. The functionality enables you to specify search criteria for an object using the resource selection feature and the value returned by the search criteria is used for the object's attribute. In addition, you can specify a value for the attribute if no object was found with the specified search criteria.

You can use one of the following options for naming the attributes:

- Providing an increment value and suffix

  You can provide a value that should be used along with the value of the object found by the search criteria and increment with the number you specify. For example, if you want to create volumes with the naming convention of `filer name_unique number_environment,` you can use a finder to find the last volume by its name prefix and increment the unique number by 1, as well as add the suffix name to the volume name. If the last volume name prefix found was *vf_023_prod* and you are creating three volumes, the names for the volumes created are *vf_024_prod, vf_025_prod,* and *vf_026_prod.*

- Providing a custom expression

  You can provide a value that should be used along with the value of the object found by the search criteria and add additional values based on the expression you enter. For example, if you want to create a volume with the naming convention of `last volume name_environment name padded with 1,` you can enter the expression `last_volume.name + '' + nextName("lab1").` If the last volume name found was `_vf_023,` the name for the volume created is *vf_023_lab2.*

The following illustration shows how a custom expression can be provided to specify a naming convention:

Incremental Naming Wizard for Volume : name ⑦   ✕

The Incremental Naming wizard allows you to define the value of **name**
based on a search for an existing **Volume**

Search criteria for existing Volume   **Volume Name : $VolumeName, Cluster Name or IP Address : $...**

Enter a value for **name** if no **Volume** matches the above search criteria

> PRE_8_2_CLUSTER

if **Volume** was found using above search criteria, set value for **name** by

> providing a custom expression ▼

Custom expression   last_volume.name

Cancel   Save

What conditional execution is

Conditional execution helps you to design workflows that can execute commands when specified conditions are met.

Execution of commands in a workflow can be dynamic. You can specify a condition for the execution of each command or a row of commands in your workflow. For example, you might want the "Add volume to dataset" command to be executed only when a specific dataset is found and you do not want the workflow to fail if the dataset is not found. In this case, you can enable the "Add volume to dataset" command to search for a specific dataset and if it is not found, you can disable the command in the workflow.

Options for conditional execution of commands are available in the `Dictionary object` tab and the Advanced tab of the Parameters for `commands` dialog box.

You can abort a workflow or disable a specific command in the workflow. In addition, you can set a command to be executed using one of the following options:

- Without any condition
- When the variables you have specified are found
- When the variables you have specified are not found
- When the expression you have specified is true

You can also set a command to wait for a specific time interval.

Conditional execution examples in predefined workflows

You can open the command details of the following predefined workflows in the Designer to understand how conditional execution of commands are used:

- Create a basic Clustered Data ONTAP Volume
- Create a Clustered Data ONTAP NFS Volume

How return parameters work

Return parameters are parameters that are available after the planning phase of a workflow. The values returned by these parameters are useful in debugging a workflow. You should understand how return parameters work and what parameters can be used as return parameters to debug workflows.

You can designate a set of parameters, such as variable attributes, expressions, and user input values, in a workflow as return parameters. During workflow execution, the values of the designated parameters are populated in the planning phase and execution of the workflow starts. The values of these parameters are then returned the way they were calculated in that specific execution of the workflow. If you want to debug the workflow, you can refer to the values that were returned by the parameters.

You can specify the required return parameters in a workflow when you want to see what are the calculated or selected values for those parameters. For example, when using resource selection logic to select an aggregate in a workflow, you can specify `aggregate` as the return parameter so that you can see which aggregate was selected during the planning of the workflow.

Before referring to the values of the return parameters for debugging your workflow, you should confirm that

the execution of the workflow is complete. The return parameter values are set for each workflow execution. If you have added a return parameter after several executions of a workflow, the value of that parameter is available only for executions after the addition of the parameter.

Parameters that can be used as return parameters

Return parameters	Example
Variable attributes that are scalar	`volume1.name`, which is an attribute of the "volume name" variable
Constants	MAX_VOLUME_SIZE
User inputs	$clusterName
MVEL expressions that involve variable attributes, constants, and user inputs	volume1.name+'-'+$clusterName
The return parameter that a command adds during execution	The `$volumeUUID` parameter is added as a return parameter when you use the following line in a PowerShell command: `Add-WfaWorkflowParameter -Name "VolumeUUID" -Value "12345" -AddAsReturnParameter $true`.

Examples of return parameters in predefined workflows

If you want to understand how return parameters are specified, you can open the following predefined workflows in the Designer and review the specified return parameters:

- Create an NFS Volume in a vFiler
- Create a Qtree CIFS Share in a vFiler
- Create a Clustered Data ONTAP Volume CIFS Share

What schemes are

A scheme represents the data model for a system. A data model is a collection of dictionary entries. You can define a scheme and then define a data source type. The data source defines how the data is acquired and the scheme is populated. For example, a vc scheme acquires data about your virtual environment, such as virtual machines, hosts, and datastores.

Schemes can also be populated directly with data through workflows that are customized to solve specific problems.

Dictionary entries are associated with an existing scheme when the dictionary entries are created. Dictionary entries are also associated with cache queries, and cache queries include SQL queries.

Schemes can acquire data using either script based data source type or SQL data source type. The scripts are

defined while creating the data source type and SQL queries are defined in the cache queries.

The following schemes are included in WFA:

- **7-Mode (storage)**

  Scheme to acquire data through Active IQ Unified Manager from Data ONTAP operating in 7-Mode.

- **Clustered Data ONTAP (cm_storage)**

  Scheme to acquire data through Active IQ Unified Manager from clustered Data ONTAP.

- **7-Mode Performance (performance)**

  Scheme to acquire performance data of Data ONTAP operating in 7-Mode through Performance Advisor.

- **Clustered Data ONTAP Performance (cm_performance)**

  Scheme to acquire performance data of clustered Data ONTAP through Performance Advisor.

- **VMware vCenter (vc)**

  Scheme to acquire data from VMware vCenter.

- **Playground (playground)**

  Scheme that can directly populate with data.

What remote system types are

OnCommand Workflow Automation (WFA) communicates with remote system types. A remote system type specifies the type of remote systems with which WFA can communicate. You can configure remote system types in WFA. For example, Data ONTAP system can be configured as a remote system type.

A remote system type has the following attributes:

- Name
- Description
- Version
- Protocol
- Port
- Timeout

You can have a Perl script for each remote system type to validate the credentials of the remote system. You can store the credentials for the remote systems configured on WFA. You can add or edit a new custom remote system type. You can also clone an existing remote system type. You can delete a remote system type only if no systems are associated with it.

How entity versioning works

The OnCommand Workflow Automation (WFA) entities, such as commands and workflows, are versioned. You can use the version numbers to easily manage changes to the WFA entities.

Each WFA entity includes a version number in the `major.minor.revision` format—for example, 1.1.20. You can include up to three digits in each part of the version number.

Before modifying the version number of a WFA entity, you must be aware of the following rules:

- Version numbers cannot be changed from the current version to an earlier version.
- Each part of the version must be a number from 0 through 999.
- New WFA entities are versioned as 1.0.0, by default.
- An entity's version number is retained when cloning or using **Save As** to save a copy of the entity.
- Multiple versions of an entity cannot exist in a WFA installation.

When you update the version of a WFA entity, the version of its immediate parent entity is updated automatically. For example, updating the version of the **Create Volume** command updates the **Create an NFS Volume** workflow, because the **Create an NFS Volume** workflow is an immediate parent entity of the **Create Volume** command. The automatic update to versions is applied as follows:

- Modifying the major version of an entity updates the minor version of its immediate parent entities.
- Modifying the minor version of an entity updates the revision version of its immediate parent entities.
- Modifying the revision version of an entity does not update any part of the version of its immediate parent entities.

The following table lists the WFA entities and their immediate parent entities:

Entity	Immediate parent entity
Cache query	• Data source type
Template	• Workflow
Function	• Workflow • Template ⓘ If a function contains special or mixed case characters, the version of its immediate parent entities might not be updated.

Entity	Immediate parent entity
Dictionary	• Template • Filter • Cache query • Command • Data source types which are using script method
Command	• Workflow
Filter	• Finder • Workflow
Finder	• Workflow
Data source type	None
Workflow	None

You can search for an entity in WFA either using the parts of the version number or the complete version number.

If you delete a parent entity, the child entities are retained and their version is not updated for the deletion.

How versioning works when importing entities

If you import entities from versions earlier than Workflow Automation 2.2, the entities are versioned as 1.0.0, by default. If the imported entity is already present in the WFA server, the existing entity is overwritten with the imported entity.

The following are the potential changes to WFA entities during an import:

• Upgrade of entities

  The entities are replaced with a later version.

• Rollback of entities

  The entities are replaced with an earlier version.

  > (i) When you perform a rollback of an entity, the version of its immediate parent entities are updated.

• Import of new entities

  > (i) You cannot selectively import entities from a `.dar` file.

If a later version of an entity is imported, the version of its immediate parent entities is updated.

If there are multiple child entities to the imported parent entity, only the highest degree of change (major, minor, or revision) to the child entities is applied to the parent entity. The following examples explain how this rule works:

- For an imported parent entity, if there is one child entity with a minor change and another child entity with a revision change, the minor change is applied to the parent entity.

  The revision part of the parent's version is incremented.

- For an imported parent entity, if there is one child entity with a major change and another child entity with a minor change, the major change is applied to the parent entity.

  The minor part of the parent's version is incremented.

Example of how the versions of imported child entities affect the parent's version

Consider the following workflow in WFA: "Create Volume and export using NFS - Custom" 1.0.0.

The existing commands included in the workflow are as follows:

- "Create Export Policy - Custom" 1.0.0
- "Create Volume - Custom" 1.0.0

The commands included in the .dar file, which is to be imported, are as follows:

- "Create Export Policy - Custom" 1.1.0
- "Create Volume - Custom" 2.0.0

When you import this .dar file, the minor version of the "Create Volume and export using NFS - Custom" workflow is incremented to 1.1.0.

How you define workflows

You must break down the goal of a workflow into the steps that should be executed by the workflow. You can then arrange the steps to complete your workflow.

A workflow is an algorithm that includes a series of steps that are required to complete an end-to-end process. The scope of the process might vary, depending on the goal of the workflow. The goal of a workflow might be defined to handle only storage operations or more complex processes such as handling networking, virtualization, IT systems, and other applications as part of a single process. OnCommand Workflow Automation (WFA) workflows are designed by storage architects and are executed by storage operators.

Defining your workflow includes breaking down the goal of your workflow into a series of steps—for example, creating an NFS volume includes the following steps:

1. Creating a volume object
2. Creating a new export policy and associating the policy with the volume

You can use a WFA command or a workflow for each step in your workflow. WFA includes predefined commands and workflows, which are based on common storage use cases. If you do not find a predefined command or workflow that can be used for a particular step, you can do one of the following:

- Choose a predefined command or workflow that closely matches the step, and then clone and modify the predefined command or workflow according to your requirements.

- Create a new command or workflow.

You can then arrange the commands or workflows in a new workflow to create the workflow that accomplishes your goal.

At the beginning of the workflow execution, WFA plans the execution and verifies that the workflow can be executed using the input to the workflow and the commands. When planning the workflow, all resource selection and user input are resolved to create an execution plan. After planning is completed, WFA executes the execution plan, which consists of a set of WFA commands with applicable parameters.

How you map command parameters

The parameters in Workflow Automation (WFA) commands are mapped to specific attributes and dictionary entry references based on certain rules. You must be aware of the rules to map command parameters when you create or edit a WFA command.

Command parameter mapping defines how command details are defined in the workflows. Mapped command parameters of a command are displayed in tabs when you are specifying the command details for commands in workflows. The tabs are named based on the group name specified in the Object Name column of the Parameters Mapping tab. The parameters that are not mapped are displayed in the Other Parameters tab when you are specifying the command details in workflows.

The rules for command parameter mapping are applicable based on the command category and how the commands are represented in the workflow editor.

The following are the command categories:

- Commands that create objects

- Commands that update objects

- Commands that remove objects

- Commands that deal with optional parent and child objects

- Commands that update associations between objects

The rules are listed below for each category:

All command categories

When mapping a command parameter, you should use the natural path based on how the command is used in workflows.

The following examples show how you can define a natural path:

- For the `ArrayIP` parameter, depending on the command, you should use the `aggregate.array.ip` attribute of the `Volume` dictionary entry and not the `array.ip` attribute.

  This is important when a workflow creates a volume and then performs an additional step with the created volume by referring to it. The following are similar examples:

  ◦ `volume.aggregate.array.ip` of the `Qtree` dictionary entry

- ◦ `volume.aggregate.array.ip` of the `LUN` dictionary entry
- For `Cluster` used in commands, you should use one of the following:
  - ◦ `vserver.cluster.primary_address` of the `Volume` dictionary entry
  - ◦ `volume.vserver.cluster.primary_address` of the `Qtree` dictionary entry

Commands that create objects

This category of commands is used for one of the following:

- Finding a parent object and defining new objects
- Searching for an object and creating the object if the object does not exist

You should use the following parameter mapping rules for this category of commands:

- Map the relevant parameters of the object that is created to the object's dictionary entry.
- Map the parent object through the references of the dictionary entry that is created.
- Ensure that the relevant attribute is present in the dictionary entry when adding a new parameter.

  The following are the exception scenarios for this rule:

  - ◦ Some objects that are created do not have a corresponding dictionary entry and only the parent object is mapped to the relevant parent dictionary entry—for example, the **Create VIF** command—in which only an array can be mapped to array dictionary entry.
  - ◦ Parameter mapping is not required

    For example, the `ExecutionTimeout` parameter in the **Create or resize aggregate** command is an unmapped parameter.

The following certified commands are examples for this category:

- Create Volume
- Create LUN

Commands that update objects

This category of commands is used to find an object and update the attributes.

You should use the following parameter mapping rules for this category of commands:

- Map the objects that are updated to the dictionary entry.
- Do not map the parameters that are updated for the object.

  For example, in the **Set Volume State** command, the `Volume` parameter is mapped but the new `State` is unmapped.

Commands that remove objects

This category of commands is used to find an object and delete it.

You should map the object that is deleted by the command to its dictionary entry. For example, in the **Remove Volume** command, the `Volume` to be deleted is mapped to the relevant attributes and references of the `Volume` dictionary entry.

Commands that deal with optional parent and child objects

You should use the following parameter mapping rules for this category of commands:

- Do not map any mandatory parameter of a command as a reference from an optional parameter of the command.

  This rule is more relevant when a command deals with optional child objects of a specific parent object. In this case, the child and parent object should be mapped explicitly. For example, in the **Stop Deduplication Jobs** command, the command stops a running deduplication job on a specific volume when specified along with `Array` or on all volumes of the given `Array`. In this case, the array parameter should be mapped directly to the `array` dictionary entry and not to `Volume.Array` because `Volume` is an optional parameter in this command.

- If a parent and child relationship exists between dictionary entries at the logical level but not between the actual instances in a specific command, then those objects should be mapped separately.

  For example, in the **Move Volume** command, `Volume` is moved from its current parent aggregate to a new destination aggregate. Therefore, `Volume` parameters are mapped to a `Volume` dictionary entry and the destination aggregate parameters are mapped separately to the `Aggregate` dictionary entry but not as `volume.aggregate.name`.

Commands that update associations between objects

For this category of commands, you should map both the association and the objects to relevant dictionary entries. For example, in the `Add Volume to vFiler` command, the `Volume` and `vFiler` parameters are mapped to the relevant attributes of the `Volume` and `vFiler` dictionary entries.

How user inputs are defined

The OnCommand Workflow Automation (WFA) user inputs are data input options that are available during the execution of workflows. You must define the user input parameters for your workflows to enhance the flexibility and usability of your workflows.

User inputs are shown as input fields, which can be filled out with relevant data when previewing or executing workflows. You can create a user input field when specifying the command details in a workflow by prefixing a label or variable with the dollar sign ($). For example, `$VolumeName` creates a `Volume Name` user input field. WFA automatically populates the User Inputs tab in the Workflow <workflow name> window with the user input labels that you have created. You can also define the type of the user input and customize the input fields by modifying the user input attributes, such as type, display name, default values, and validation values.

User input type options

- **String**

  You can use a regular expression for valid values—for example, a*.

  Strings, such as `0d` and `0f`, are evaluated as numbers similar to `0d` evaluated as 0 of type double.

- **Number**

  You can define a numerical range that can be selected—for example, 1 through15.

- **Enum**

  You can create enumeration values that can be selected when filling the user input field using the enum type. You can optionally lock the enum values that you have created to ensure that only the values you have created are selected for the user input.

- **Query**

  You can select the query type when you want the user input to be selected from the values available in the WFA cache. For example, you can use the following query to automatically populate the user input fields with the IP address and name values from the WFA cache: `SELECT ip, name FROM storage.array`. You can optionally lock the values retrieved by a query so that only the results retried by the query are selected.

- **Query (multi-select)**

  The query (multi-select) type, which is similar to the query type, enables the selection of multiple values during the execution of the workflow. For example, users can select multiple volumes or a volume together with its shares and exports. You can allow the users to select multiple rows, or restrict the selection to a single row. Selecting a row selects the values from all the columns of the selected row.

  You can use the following functions when using the query (multi-select) type of user input:

  - getSize
  - getValueAt
  - getValueAt2D
  - getValueFrom2DByRowKey

- **Boolean**

  You can use the Boolean type to display a check box in the user input dialog box. You must use the Boolean type for user inputs that have "true" and "false" as the possible values.

- **Table**

  You can use the table type of user input to specify the column headers of a table that can be used to enter multiple values during the execution of the workflow. For example, a table that can be used to specify a list of node names and port names. You can also specify one of the following user input types for the column headers to validate the values that are entered during run time:

  - String
  - Number
  - Enum
  - Boolean
  - Query

String is the default user input type for the column headers. You must double-click the Type column to specify a different user input type.

You can open the Create SnapMirror policy and rules workflow in the Designer to see how the user input types are used in the "SnapMirrorPolicyRule" user input.

You can use the following functions when using the table type of user input:

- getSize
- getValueAt
- getValueAt2D
- getValueFrom2DByRowKey

You can open the **Create and configure a Storage Virtual Machine with Infinite Volume** workflow in the Designer to see how the table type is used.

- **Password**

  You can use the password type for user inputs that are meant for entering passwords. The password entered by the user is encrypted and displayed as a sequence of asterisk characters across the WFA application and in the log files. You can use the following functions to decrypt the password, which can then be used by the command:

  - For Perl commands: WFAUtil::getWfaInputPassword ($password)
  - For PowerShell commands: Get-WfaInputPassword -EncryptedPassword $password

    Here, $password is the encrypted password that is passed by WFA to the command.

- **Dictionary**

  You can add the table data for the selected dictionary entry. The dictionary entry attribute selects the attribute that is to be returned. You can select a single value or multiple values while executing the workflow. For example, you can select a single volume or multiple volumes. By default, single values are selected. You can also select Rules for filtering. A rule consists of a dictionary entry attribute, an operator, and a value. The attribute can also include attributes of its references.

  For example, you can specify a rule for aggregates by listing all aggregates with name starting with the string "aggr" and have an available size greater than 5 GB. The first rule in the group is the attribute `name`, with the operator `starts-with`, and the value aggr. The second rule for the same group is the attribute `available_size_mb`, with the operator `>` and the value 5000.

The following table lists the options that you can apply to the user input types:

Option	Description
Validating	You can validate the user inputs type so that only valid values are entered by users: • The string and number types of user input can be validated with the values entered during run time of the workflow. • The string type can also be validated with a regular expression. • The number type is a numeric floating-point field and can be validated using a specified numeric range.
Locking values	You can lock the values of the query and enum types to prevent the user from overwriting the drop-down values and to enable the selection of only the displayed values.
Marking as mandatory	You can mark user inputs as mandatory so that the users must enter certain user inputs in order to continue with the execution of the workflow.
Grouping	You can group related user inputs and provide a name for the user input group. The groups can be expanded and collapsed in the user input dialog box. You can select a group that should be expanded by default.
Applying conditions	With the conditional user input capability, you can set the value of a user input based on the value that is entered for another user input. For example, in a workflow that configures the NAS protocol, you can specify the required user input for protocol as NFS to enable the "Read/Write host lists" user input.

How you define constants

You can create and use constants to define a value, which can be used across a single workflow. Constants are defined at a workflow level.

The constants used in the workflow and their value are displayed in the monitoring window of the workflow during planning and execution. You must use unique names for constants.

You can use the following naming conventions to define constants:

• Uppercase for the first letter of each word, without underscores or spaces between words

  All terms and abbreviations should use upper case—for example, `ActualVolumeSizeInMB`.

- Uppercase for all letters

  You can use underscores to separate words—for example, `AGGREGATE_USED_SPACE_THRESHOLD`.

You can include the following as values for workflow constants:

- Numbers
- Strings
- MVEL expressions

  Expressions are evaluated during the planning and execution phases of the workflows. In the expressions, you must not reference variables that are defined in a loop.

- User inputs
- Variables

How you use REST APIs

You can use REST APIs provided by Workflow Automation (WFA) to invoke workflows from external portals and the data center orchestration software. WFA supports XML and JSON content types for all REST APIs.

WFA allows external services to access various resource collections, such as workflows, users, filters, and finders, through URI paths. The external services can use HTTP methods, such as GET, PUT, POST, and DELETE, on these URIs to perform CRUD operations on the resources.

You can perform several actions through the WFA REST APIs, including the following:

- Access workflow definitions and metadata.
- Execute workflows and monitor their execution.
- View users and roles, and change passwords.
- Execute and test resource selection filters.
- Execute and test resource finders.
- Manage credentials of storage or other data center objects.
- View data sources and data source types.

REST documentation has more information about REST APIs:

https://`wfa_server_ip:port/rest/docs` *wfa_server_ip* is the IP address of your WFA server and `port` is the TCP port number you have used for the WFA server during installation.

Set up a data source

You must set up a connection with a data source in OnCommand Workflow Automation (WFA) to acquire data from the data source.

What you'll need

- For Active IQ Unified Manager6.0 and later, you must have created a database user account on the Unified Manager server.

  See the *OnCommand Unified Manager Online Help* for details.

- The TCP port for incoming connections on the Unified Manager server must be open.

  See the documentation on your firewall for details.

  The following are the default TCP port numbers:

TCP port number	Unified Manager server version	Description
3306	6.x	MySQL database server

- For Performance Advisor, you must have created an Active IQ Unified Manager user account with a minimum role of GlobalRead.

  See the *OnCommand Unified Manager Online Help* for details.

- The TCP port for incoming connections on the VMware vCenter Server must be open.

  The default TCP port number is 443. See the documentation on your firewall for details.

About this task

You can add multiple Unified Manager server data sources to WFA using this procedure. However, you must not use this procedure if you want to pair Unified Manager server 6.3 and later with WFA and use the protection functionality in Unified Manager server.

For more information about pairing WFA with Unified Manager server 6.x, see the *OnCommand Unified Manager Online Help*.

> While setting up a data source with WFA, you must be aware that Active IQ Unified Manager 6.0, 6.1, and 6.2 data source types are deprecated in the WFA 4.0 release, and these data source types will not be supported in future releases.

Steps

1. Access WFA using a web browser.
2. Click **Settings**, and under **Setup** click **Data Sources**.
3. Choose the appropriate action:

To…	Do this…
Create a new data source	Click ▣ on the toolbar.
Edit a restored data source if you have upgraded WFA	Select the existing data source entry, and click ▣ on the toolbar.

If you have added a Unified Manager server data source to WFA and then upgraded the version of the Unified Manager server, WFA will not recognize the upgraded version of the Unified Manager server. You

must delete the previous version of the Unified Manager server and then add the upgraded version of the Unified Manager server to WFA.

4. In the **New Data Source** dialog box, select the required data source type, and enter a name for the data source and the host name.

   Based on the selected data source type, the port, user name, password, and timeout fields might be automatically populated with the default data, if available. You can edit these entries as required.

5. Choose an appropriate action:

For…	Do this…
Active IQ Unified Manager 6.3 and later	Enter the credentials of the Database User account that you created on the Unified Manager server. See *OnCommand Unified Manager Online Help* for details on creating a database user account. ⓘ You must not provide the credentials of an Active IQ Unified Manager Database User account that was created using the command-line interface or the ocsetup tool.

6. Click **Save**.

7. **Optional:** In the Data Sources table, select the data source, and click 🔧 on the toolbar.

8. Verify the status of the data acquisition process.

Configure a database user by running ocsetup on Windows

You can run the `ocsetup` file on the DataFabric Manager 5.x server to configure read-only access of the DataFabric Manager 5.x database to OnCommand Workflow Automation.

1. Download the `wfa_ocsetup.exe` file to a directory in the DataFabric Manager 5.x server from the following location:

   https://WFA_Server_IP/download/wfa_ocsetup.exe.

   WFA_Server_IP is the IP address (IPv4 or IPv6 address) of your WFA server.

   If you have specified a non-default port for WFA, you must include the port number as follows:

   https://wfa_server_ip:port/download/wfa_ocsetup.exe.

   port is the TCP port number that you have used for the WFA server during installation.

   If you are specifying an IPv6 address, you must enclose it with square brackets.

2. Double-click the `wfa_ocsetup.exe` file.

3. Read the information in the setup wizard and click **Next**.

4. Browse or type the OpenJDK location and click **Next**.

5. Enter a user name and password to override the default credentials.

   A new database user account is created with access to the DataFabric Manager 5.x database.

   > ⓘ   If you do not create a user account, the default credentials are used. You must create a user account for security purposes.

6. Click **Next** and review the results.

7. Click **Next**, and then click **Finish** to complete the wizard.

Configure a database user by running ocsetup on Linux

You can run the `ocsetup` file on the DataFabric Manager 5.x server to configure read-only access of the DataFabric Manager 5.x database to OnCommand Workflow Automation.

Steps

1. Download the `wfa_ocsetup.sh` file to your home directory on the DataFabric Manager 5.x server using the following command in the terminal:

   `wget https://WFA_Server_IP/download/wfa_ocsetup.sh`

   WFA_Server_IP is the IP address (IPv4 or IPv6 address) of your WFA server.

   If you have specified a non-default port for WFA, you must include the port number as follows:

   `wget https://wfa_server_ip:port/download/wfa_ocsetup.sh`

   port is the TCP port number that you have used for the WFA server during installation.

   If you are specifying an IPv6 address, you must enclose it with square brackets.

2. Use the following command in the terminal to change the `wfa_ocsetup.sh` file to an executable:

   ```
   `chmod +x wfa_ocsetup.sh`
   ```

3. Run the script by entering the following in the terminal:

   `./wfa_ocsetup.sh OpenJDK_path`

   OpenJDK_path is the path to OpenJDK.

   Example

   `/opt/NTAPdfm/java`

   The following output is displayed in the terminal, indicating a successful setup:

```
Verifying archive integrity... All good.
Uncompressing WFA OnCommand Setup.....
*** Welcome to OnCommand Setup Utility for Linux ***
    <Help information>
*** Please override the default credentials below ***
Override DB Username [wfa] :
```

4. Enter a user name and password to override the default credentials.

A new database user account is created with access to the DataFabric Manager 5.x database.

> (i) If you do not create a user account, the default credentials are used. You must create a user
> account for security purposes.

The following output is displayed in the terminal, indicating a successful setup:

```
***** Start of response from the database *****
>>> Connecting to database
<<< Connected
*** Dropped existing 'wfa' user
=== Created user 'username'
>>> Granting access
<<< Granted access
***** End of response from the database *****
***** End of Setup *****
```

Configure a database user on Active IQ Unified Manager

You must create a database user on Active IQ Unified Manager to configure read-only
access of the Active IQ Unified Manager database to OnCommand Workflow Automation.

Steps

1. Log in to Active IQ Unified Manager with administrator credentials.

2. Click **Settings** > **Users**.

3. Click **Add a New User**.

4. Select **Database User** as the type of user.

The same user should be used in OnCommand Workflow Automation while adding Active IQ Unified
Manager as a data source in OnCommand Workflow Automation.

Create workflow help content

OnCommand Workflow Automation (WFA) admins and architects who design workflows
can create help content for the workflows and include it in the workflow.

What you'll need

You must be aware of how to create web pages using HTML.

About this task

The help should provide information about the workflow and the user inputs for the workflow to the storage operator who executes the workflow.

Steps

1. Create a folder with the following name: workflow-help.

2. Author the help content using an HTML editor or a text editor and save it as an `index.htm` file in the `workflow-help` folder.

   You must not include JavaScript files as part of the help content. The following are the supported file extensions:

   ◦ `.jpg`

   ◦ `.jpeg`

   ◦ `.gif`

   ◦ `.png`

   ◦ `.xml`

   ◦ `.thmx`

   ◦ `.htm`

   ◦ `.html`

   ◦ `.css`

   You can also include the `Thumbs.db` file, which is created by Windows.

3. Verify that the `index.htm` file and other files associated with the help content, such as images, are available in the `workflow-help` folder.

4. Create a `.zip` file of the folder and ensure that the size of the `.zip` file is not more than 2 MB.

   Example: `Create an NFS volume-help.zip`

5. Edit the workflow for which you have created the help content, and then click **Setup** > **Help Content** > **Browse** to upload the `.zip` file.

Reserved words

OnCommand Workflow Automation (WFA) includes some reserved words. You must not use the reserved words in workflows for any attribute or parameters such as variable names, user input, constants, and return parameters.

The following is a list of the reserved words in WFA:

• and	• Float	• proto
• Array	• float	• return
• assert	• for	• Runtime
• Boolean	• foreach	• SecurityManager
• boolean	• function	• Short
• Byte	• if	• short
• byte	• import	• soundslike
• char	• import_static	• StrictMath
• Character	• in	• String
• CharSequence	• instanceof	• StringBuffer
• Class	• int	• StringBuilder
• ClassLoader	• Integer	• strsim
• Compiler	• is	• switch
• contains	• isdef	• System
• convertable_to	• Long	• Thread
• def	• long	• ThreadLocal
• do	• Math	• true
• Double	• new	• until
• double	• null	• var
• else	• Number	• Void
• empty	• Object	• while
• false	• or	• with

Where to find information about MVEL

You can use the *MVEL Language Guide* to learn more about MVFLEX Expression Language (MVEL).

MVEL is an expression language based on Java syntax. You can use MVEL expression syntaxes in OnCommand Workflow Automation (WFA) workflows—for example, in functions and variables.

MVEL-enabled fields in OnCommand Workflow Automation

Several fields in OnCommand Workflow Automation (WFA) are enabled for MVFLEX Expression Language (MVEL). You can use MVEL syntaxes in these fields while designing workflows.

The following table explains when and where you can use MVEL syntaxes in the WFA interface:

When…	Where to use…
Creating or editing a workflow	• ***Workflow*** › *Details* › *Return Parameters* › *Parameter Value* • ***Workflow*** › *Details* › *Constants* › *Value*
Creating or editing command details in a workflow	• **Commands › Parameters for *parameter_name* › Enter search criteria › Resource Selection › Finder › Parameters** • **Commands › Parameters for *parameter_name* › Enter search criteria › Resource Selection › Advanced › Execute search only when the following expression evaluates to TRUE** • **Commands › Parameters for *parameter_name* › Advanced › If the following expression is TRUE** • **Commands › Parameters for *parameter_name* › Other Parameters** • **Commands › *parameter_name* › Attributes**
Creating or editing a command	• **Commands › Command Definition *command_name* › Properties › String Representation**
Creating or editing a function	• **Functions › Function *function_name* › Function definition**
Creating or editing a template	• **Template › Parameters for *parameter_name* › Template *template_name* › Attributes › Value**
Editing a row	• ***Workflow*** › *Workflow* › *Repeat row* › *Repeats* › *Number of times* • ***Workflow*** › *Workflow* › *Repeat row* › *Variables* › *Variables for initial_value and expression* • ***Workflow*** › *Workflow* › *Repeat row* › *Repeats* › *For every resource in a group* › *Resource Search Criteria* › *Parameters to filter* • ***Workflow*** › *Workflow* › *Add condition* › *If the following expression is TRUE*

Examples of MVEL syntax

MVFLEX Expression Language (MVEL) syntaxes are used in several OnCommand Workflow Automation (WFA) sample workflows. You should review some sample MVEL

syntaxes to learn how to use MVEL in WFA.

The following sections provide some examples of MVEL syntaxes used in WFA.

Conditional execution

The following MVEL expression is used for conditional execution of a command when the number of volumes found is lesser than 4:

```
$NoOfVolumes < 4
```

Incremental naming

The following MVEL expression is used for incremental naming of an object:

```
last_volume.name+last_volume.state
```

This MVEL expression uses the last created volume name and the state of the last created volume for naming.

String representation in commands

The following MVEL syntax is used as a string representation:

```
DestinationCluster + ":" + DestinationVserver + "/" + DestinationVolume
```

Templates

The following MVEL syntax is used in a template:

```
calculateSnapReserveSize(calculateVolumeSizeFromDataSize((int)($fs_size*1.
01),$snap_space),$snap_space)
```

This MVEL syntax is used to calculate the percentage of volume capacity to be reserved for Snapshot copies.

Command details

The following MVEL function is used in the attributes section of a parameters:

```
actualVolumeSize($VolumeSizeInGB * 1024, volume.snapshot_reserved_percent)
```

The following MVEL syntax is used in the attributes section of a parameter:

```
$VolumeName+'test001'
```

Workflow constants

The following MVEL syntaxes are used for constants in workflows:

```
convertNullToZero(infinite_volume.max_namespace_constituent_size_mb)
```

```
$Size_TB*1048576L
```

Return parameters

The following MVEL syntax is use to validate whether the requested size can be allocated:

```
size_remaining == 0 ? '' : throwException('Not sufficient space in
capacity_class_aggregate or data constituent of size less than 1 TB can
not be created: Total size requested='+$Size_TB+'TB'+' ,Size
remaining='+size_remaining/TB_TO_MB+'TB'+', Infinite volume
name='+infinite_volume.name+', Storage class='+CAPACITY_CLASS_LABEL)
```

Function definition

The following MVEL syntax is used in a function definition, which is used to convert null to zero:

```
def convertNullToZero (data)
{
  if(data == null)
  {
    return 0;
  }
  else
  {
    return data;
  }
}
```

Repetition of a specific row

The following MVEL expression uses a user input to indicate the number of times a row has to be repeated to create LUNs:

```
$NumberOfLunsToBeCreated
```

Conditional expressions for a row

The following MVEL expression uses a user input to indicate if the row will be executed:

```
$SetupSnapMirror
```

References to learning material

You should be aware of certain scripting and programming practices to create advanced Workflow Automation (WFA) workflows. You can use reference material to learn about the required options before creating WFA building blocks or workflows.

Windows PowerShell

WFA uses PowerShell scripts for workflow operations. The following table includes references to learning material for PowerShell:

Getting Started with Windows PowerShell	http://msdn.microsoft.com/en-us/library/windows/desktop/aa973757(v=vs.85).aspx
PowerShell Development — Integrated Scripting Environment (ISE)	https://docs.microsoft.com/en-us/powershell/scripting/windows-powershell/ise/introducing-the-windows-powershell-ise?view=powershell-7.2
.NET Framework Naming Guidelines	http://msdn.microsoft.com/en-us/library/xzf533w0%28v=vs.71%29.aspx
PowerShell code style	http://get-powershell.com/post/2011/04/13/Extra-Points-for-Style-when-writing-PowerShell-Code.aspx
PowerShell Try/Catch Finally	http://technet.microsoft.com/en-us/library/dd315350.aspx
PowerShell Automatic Variables	http://technet.microsoft.com/en-us/library/dd347675.aspx
PowerShell Error Reporting	https://docs.microsoft.com/en-us/powershell/scripting/developer/cmdlet/error-reporting-concepts?view=powershell-7.2
PowerShell Common Parameters	https://docs.microsoft.com/en-us/powershell/module/microsoft.powershell.core/about/about_commonparameters?view=powershell-7.2

Data ONTAP PowerShell toolkit

The Data ONTAP PowerShell toolkit is bundled along with WFA. You can use the PowerShell toolkit cmdlets to invoke Data ONTAP commands from a PowerShell script. For more information, see the *Data ONTAP PowerShell Toolkit Help*, which you can access from the following location: `WFA_install_location\WFA\PoSH\Modules\DataONTAP\webhelp\index.html`.

WFA_install_location is the WFA installation directory, and `C:\Program Files\NetApp` is the default installation directory.

The following table includes references to information about the Data ONTAP PowerShell toolkit:

ONTAP PowerShell Toolkit Articles	https://community.netapp.com/t5/Tech-OnTap-Articles/The-Data-ONTAP-PowerShell-Toolkit/ta-p/85933
ONTAP PowerShell Toolkit NetApp Community	https://community.netapp.com/t5/forums/filteredbylabelpage/board-id/microsoft-cloud-and-virtualization-discussions/label-name/powershell%20toolkit

Perl

WFA supports Perl commands for workflow operations. When you install WFA, the required Perl and Perl modules are installed on the WFA server.

ActivePerl User Guide

You can also access the *ActivePerl User Guide* from the following location: `WFA_install_location\WFA\Perl64\html\index.html`.

WFA_install_location is the WFA installation directory, and `C:\Program Files\NetApp is the default installation directory.` `WFA uses Perl scripts for workflow operations. The following table includes references to learning material for Perl:

Modern Perl: 2014	http://modernperlbooks.com/books/modern_perl_2014/index.html
Perl programming documentation	http://perldoc.perl.org/
Perl programming language	http://www.perl.org/

NetApp Manageability SDK

The required Perl modules of the NetApp Manageability SDK are bundled along with WFA. These Perl modules are required for using the Perl commands in WFA. For more information, see the NetApp Manageability SDK documentation, which you can access from the following location: `WFA_install_location\WFA\perl\NMSDK\html`.

`WFA_install_location` is the WFA installation directory, and `C:\Program Files\NetApp` is the default installation directory.

Structured Query Language (SQL)

The SQL SELECT syntax is used in filters and to populate user inputs.

MySQL SELECT syntax

MVFLEX Expression Language (MVEL)

You can use MVEL expression syntaxes in WFA workflows—for example, in functions and variables.

For more information, see the *MVEL Language Guide*.

Regular expressions

You can use regular expression (regex) in WFA.

ActionScript 3.0 Using regular expressions

Supported workflows in ONTAP

You must be aware of the workflows that are supported when OnCommand Workflow Automation (WFA) is paired with different versions of the Unified Manager server.

The following table lists the workflows that are supported for different Unified Manager server versions.

Workflow name	Supported in Unified Manager server 6.3 and higher	Supported in Unified Manager server 5.x
Abort SnapMirror Relationship	Yes	No
Add or expand capacity storage class to Infinite Volume	Yes	No
Add or expand performance storage class to Infinite Volume	Yes	No
Break SnapMirror Relationship	Yes	No
CIFS/SMB Server Configuration	Yes	No
Controller and shelf upgrade of an HA pair	Yes	Yes Supported only for clusters running versions earlier than Data ONTAP 8.3.
Create a basic Clustered Data ONTAP Volume	Yes	Yes

Workflow name	Supported in Unified Manager server 6.3 and higher	Supported in Unified Manager server 5.x
Create a Clustered Data ONTAP NFS Volume	Yes	Yes
Create a Clustered Data ONTAP Qtree CIFS Share	Yes	Yes
Create a Clustered Data ONTAP Volume	Yes	Yes
Create a Clustered Data ONTAP Volume CIFS Share	Yes	Yes
Create a Clustered Data ONTAP Volume with QoS Policy Group	Yes	No
Create a Cron Schedule	Yes	Yes
Create and configure a Storage Virtual Machine with Infinite Volume	Yes	No
Create and configure NAS Storage Virtual Machine	Yes	Yes Supported only for clusters running versions earlier than Data ONTAP 8.3.
Create and configure SAN Storage Virtual Machine	Yes	Yes Supported only for clusters running versions earlier than Data ONTAP 8.3.
Create Clustered Data ONTAP SnapMirror Relationship on 8.1.x	Yes	No
Create Schedules and Policies	Yes	No
Create SnapMirror Relationship	Yes	No
Create Schedules and Policies	Yes	No
Create SnapMirror then SnapMirror cascade	Yes	No

Workflow name	Supported in Unified Manager server 6.3 and higher	Supported in Unified Manager server 5.x
Create SnapMirror then SnapVault cascade	Yes	No
Create SnapVault Relationship	Yes	No
Create SnapVault then SnapMirror cascade	Yes	No
Create VMware NFS Datastore on Clustered Data ONTAP Storage	Yes	Yes
Create, map, and protect Clustered Data ONTAP LUNs with SnapMirror Relationship	Yes	No
Establish Cluster Peering	Yes	No
Expand an Infinite Volume without storage classes	Yes	No
Modify SnapMirror Relationship	Yes	No
Move a Clustered Data ONTAP Volume	Yes	Yes
Multiprotocol File Access	Yes	No
Multiprotocol Server Configuration	Yes	No
NFSv3 File Access	Yes	No
NFSv3 Server Configuration	Yes	No
Protect volume with SnapMirror Relationship	Yes	No
Protect volume with SnapVault Relationship	Yes	No
Quiesce SnapMirror Relationship	Yes	No
Remove a Clustered Data ONTAP Volume	Yes	Yes

Workflow name	Supported in Unified Manager server 6.3 and higher	Supported in Unified Manager server 5.x
Remove SnapMirror Relationship	Yes	No
Resume SnapMirror Relationship	Yes	No
Resync SnapMirror Relationship	Yes	No
Reverse Resync SnapMirror Relationship	Yes	No
Setup Data Protection for an Infinite Volume	Yes	No
SMB File Access	Yes	No
Storage Virtual Machine Peering	Yes	No
Storage Virtual Machine Root Volume Promotion	Yes	No
Storage Virtual Machine Root Volume Protection	Yes	No
Transfer SnapMirror Relationship	Yes	No

Related information

Interoperability Matrix Tool

Import OnCommand Workflow Automation content

You can import user-created OnCommand Workflow Automation (WFA) content such as workflows, finders, and commands. You can also import content that is exported from another WFA installation, content that is downloaded from the Storage Automation Store or the WFA community, as well as packs, including Data ONTAP PowerShell toolkits and Perl NMSDK toolkits.

What you'll need

- You must have access to the WFA content that you want to import.
- The content that you want to import must have been created on a system that is running the same version or an earlier version of WFA.

  For example, if you are running WFA 2.2, you cannot import content that was created using WFA 3.0.

- You can import content developed on N-2 versions of WFA only into WFA 5.1.

- If the `.dar` file references NetApp-certified content, the NetApp-certified content packs must be imported.

  The NetApp-certified content packs can be downloaded from the Storage Automation Store. You must refer to the documentation of the pack to verify that all requirements are met.

Steps

1. Log in to WFA through a web browser.
2. Click **Settings**, and under **Maintenance** click **Import Workflows**.
3. Click **Choose File** to select the `.dar` file that you want to import, and then click **Import**.
4. In the Import Success dialog box, click **OK**.

Related information

NetApp community: OnCommand Workflow Automation

Considerations while importing OnCommand Workflow Automation content

You must be aware of certain considerations when you import user-created content, content that is exported from another OnCommand Workflow Automation (WFA) installation, or content that is downloaded from the Storage Automation Store or the WFA community.

- WFA content is saved as a `.dar` file and can include the entire user-created content from another system or specific items such as workflows, finders, commands, and dictionary terms.
- When an existing category is imported from a `.dar` file, the imported content is merged with the existing content in the category.

  For example, consider there are two workflows WF1 and WF2 in category A in the WFA server. If workflows WF3 and WF4 in category A are imported to the WFA server, category A will contain workflows WF1, WF2, WF3, and WF4 after the import.
- If the `.dar` file contains dictionary entries, then the cache tables corresponding to the dictionary entries are automatically updated.

  If the cache tables are not updated automatically, an error message is logged in the `wfa.log` file.
- When importing a `.dar` file that has a dependency on a pack that is not present in the WFA server, WFA tries to identify whether all the dependencies on the entities are met.
  - If one or more entities are missing or if a lower version of an entity is found, the import fails and an error message is displayed.

    The error message provides details of the packs that should be installed in order to meet the dependencies.
  - If a higher version of an entity is found or if the certification has changed, a generic dialog box about the version mismatch is displayed, and the import is completed.

    The version mismatch details are logged in a `wfa.log` file.

- Questions and support requests for the following must be directed to the WFA community:
  - Any content downloaded from the WFA community
  - Custom WFA content that you have created
  - WFA content that you have modified

Export OnCommand Workflow Automation content

You can save user-created OnCommand Workflow Automation (WFA) content as a `.dar` file and share the content with other users. The WFA content can include the entire user-created content or specific items such as workflows, finders, commands, and dictionary terms.

What you'll need

- You must have access to the WFA content that you want to export.
- If content that is to be exported contains references to certified content, the corresponding certified content packs must be available on the system when the content is imported.

  These packs can be downloaded from the Storage Automation Store.

About this task

- You cannot export the following types of certified content:
  - - NetApp-certified content
  - - content developed by Professional Services (PS), which is available only on custom installations made by PS
  - - packs developed by users
- All of the objects that are dependent on the exported object are also exported.

  For example, exporting a workflow also exports the dependent commands, filters, and finders for the workflow.

- You can export locked objects.

  The objects remain in the locked state when they are imported by other users.

Steps

1. Log in to WFA through a web browser.
2. Export the necessary content:

If you want to…	Do this…
Export all user-created content as a single .dar file	a. Click **Settings**, and under **Maintenance** click **Export All Workflows**. b. Specify a file name for the `.dar` file, and then click **Export**.

If you want to…	Do this…
Export specific content	a. Navigate to the window from which you want to export content.
	b. Select one or more items from the window, and then click ![icon].
	c. In the Export As dialog box, specify a file name for the `.dar` file, and then click **Export**.

3. In the Save As dialog box, specify the location where you want to save the `.dar` file, and then click **Save**.

Disable cache acquisition for dictionary entries

When it is not necessary to cache dictionary objects in OnCommand Workflow Automation (WFA), you can disable the caching of these objects. Disabling the caching of unwanted objects can reduce the time taken by WFA to complete data source acquisitions.

Steps

1. Click **Data Source Design** > **Dictionary**.

2. Select the dictionary entry for which you want to disable data acquisition.

3. Click ![icon] on the toolbar, and then click **Yes**.

4. If you see the error message `Cache acquisition for the dictionary entry cannot be disabled,` disable the cache acquisition for the dictionary entries listed in the error message, and then retry disabling the cache acquisition for the current dictionary object.

Create WFA workflow packs

You can create workflow packs on OnCommand Workflow Automation (WFA) for your storage automation and integration requirements.

Steps

1. Log in to the **WFA** window through a web browser.

2. Click **Content Management** > **Packs**.

3. Click the **New Pack** icon.

4. In the **New Pack** dialog box, enter values for the **Name**, **Author**, **Version**, and **Description** fields.

5. Click **Save**.

6. Verify that the new pack is created in the **Packs** window.

Delete OnCommand Workflow Automation packs

You can delete a pack from OnCommand Workflow Automation (WFA) if you no longer require it. If you delete a pack, all the entities associated with the pack are deleted.

About this task

- You cannot delete a pack if there are any dependencies on the entities that are part of the pack.

  For example, if you attempt to delete a pack that includes a command that is part of a custom workflow, the delete operation will fail because the custom workflow is dependent on the pack. You can delete the pack only after you delete the custom workflow.

- Entities that are part of a pack cannot be deleted individually.

  To delete an entity that is part of a pack, you must delete the pack containing that entity. If an entity is part of multiple packs, the entity will be deleted from the WFA server only when all the packs containing that entity are deleted.

Steps

1. Log in to WFA through a web browser as an admin.
2. Click **Content Management** > **Packs**.
3. Select the pack you want to delete and click ▣.
4. In the **Delete Pack** confirmation dialog box, click **OK**.

Add approval points

You can add an approval point as a checkpoint in a workflow to pause the workflow execution and resume it based on your approval. You can use approval points for incremental execution of a workflow, where sections of the workflow are executed only after a certain condition is met—for example, when the next section has to be approved or when successful execution of the first section is validated.

Steps

1. Log in to WFA through a web browser as an architect or an admin.
2. Click **Workflow Design** > **Workflows**.
3. In the **Workflows** window, double-click the workflow that you want to modify.
4. In the **Workflow <workflow name>** window, click the 👤 icon to the left of the step for which you want to add the approval point.

   You can add approval points for one or more steps.

5. In the **New Approval Point** dialog box, provide the comment and condition details.
6. Click **OK**.

Define filter rules

You can define a set of rules for filtering dictionary entry resources such as vFiler units, aggregates, and virtual machines. You can customize the rules for existing workflows and for new workflows while you are creating them.

Steps

1. Log in to WFA through a web browser as an admin.

2. Click **Workflow Design** > **Workflows**.

3. In the **Workflows** window, double-click the workflow that you want to modify.

   The Workflow <workflow name> window is displayed.

4. Define a set of rules by choosing one of the following options:

If you want to…	Then do this…
Search for resources when the commands in a row are repeated	a. Click a row number and select **Repeat row**. b. In the Row Repetitions dialog box, select the **For every resource in the group** option from the **Repeats** drop-down list. c. Select a resource type. d. Click the **Enter search criteria** link.
Search for resources required in command inputs	a. Click ⊞. b. In the Parameters for <command_name> dialog box, select the **by searching for an existing <dictionary object>** option from the **Define <dictionary object>** drop-down list. c. Click the **Enter search criteria** link.
Search for resources referenced by variables in command inputs	a. Click ⊞. b. In the Parameters for <command_name> dialog box, select the **by filling in attributes** option from the **Define <dictionary object>** drop-down list. c. Click ⋯ for a field marked with ⓡ.
Name command inputs of String type	a. Click ⊞. b. In the Parameters for <command_name> dialog box, select the **by filling in attributes** option from the **Define <dictionary object>** drop-down list. c. Click ⋯ for a string field.

5. In the **Resource Selection** dialog box, select the **Define filter rules** check box.

   If you have selected one of the options from the Finder drop-down of Resource Selection dialog box, the Define filter rules check box is disabled. The value for the finder must be set to "None" for the Define filter rules to be enabled.

6. Enter the attribute, operator, and value for the rule.

   The value must be provided within single quotation marks. The filter rules can contain one or more groups.

7. Click **OK**.

Create a scheme

You must create a scheme when data has to be cached from a new data source type or when data has to be stored by workflows directly in the database.

What you'll need

- You must have installed WFA.
- You must have administrator privileges or architect credentials for WFA.

About this task

By default, WFA supports two types of schemes: Data Source Acquisition and Other.

- Data Source Acquisition schemes: The tables in these schemes are cached by data sources defined to acquire data from remote systems.
- Other schemes: The tables in these schemes are populated with data through workflows that are customized to solve specific problems.

Steps

1. Log in to WFA through a web browser as an administrator or architect.
2. Click **Data Source Design** > **Schemes**.
3. Create a new scheme by clicking ![icon] on the toolbar.
4. Enter the required information such as the name, type, description, and entity version of the scheme in the **New Schemes** dialog box.
5. Click **Save**.

Edit a scheme

You can edit the display name, description, and entity version of a scheme that you created.

What you'll need

- You must have installed WFA.
- You must have administrator privileges or architect credentials for WFA.

About this task

You cannot modify predefined schemes.

Steps

1. Log in to WFA through a web browser as an administrator or architect.
2. Click **Data Source Design** > **Schemes**.
3. Select the scheme that you want to modify and then click ![icon] on the toolbar.

4. Modify the required information in the **Schemes <SchemeName>** dialog box.

5. Click **Save**.

Delete a scheme

You can delete a scheme that you created from OnCommand Workflow Automation (WFA) if you no longer require it.

What you'll need

- You must have installed WFA.
- You must have administrator privileges or architect credentials for WFA.

About this task

You cannot delete predefined schemes.

Steps

1. Log in to WFA through a web browser as an administrator or architect.

2. Click **Data Source Design** > **Schemes**.

3. Select the scheme that you want to delete and then click on the toolbar.

4. In the **Delete Scheme** confirmation dialog box, click **Yes**.

Add a new remote system type

You can add a new remote system type to OnCommand Workflow Automation (WFA) if a predefined system type does not meet your requirement or if you want to change the configuration of a predefined system type.

What you'll need

- You must have installed WFA.
- You must have administrator privileges or architect credentials for WFA.

Steps

1. Log in to WFA through a web browser as an administrator or architect.

2. Click **Data Source Design** > **Remote System Types**.

3. Create a new remote system type by clicking on the toolbar.

4. Enter the required information such as the name, type, description, and entity version of the remote system type in the **New Remote System Types** dialog box.

5. Click **Save**.

Log Viewer window

The Log Viewer window lists all of the logs available in OnCommand Workflow Automation. You can access this window by selecting **Settings**, and under **Maintenance**

click **Log Viewer**.

The Log Viewer window lists the log files (in alphabetical order) and includes the file size and date when each file was generated.

> ⓘ   This feature is not supported on Microsoft Windows Server 2003.

Backup and Restore window

The Backup and Restore window enables you to back up the OnCommand Workflow Automation (WFA) database, which contains the system configuration settings, cache information, and core packs that include PowerShell toolkits and Perl toolkits. You can also restore the saved database when you upgrade or reinstall WFA.

Backup section

You can access this window by selecting **Settings**, and under **Maintenance** click **Backup & Restore**.

- **Backup**

  Opens the File Download dialog box, which enables you to save the current database as a compressed file to a specified location.

Restore section

- **Choose File**

  Enables you to search for the backup database file.

- **Restore**

  Enables you to reinstate the configuration settings and cache information from the backup database file to the current WFA configuration, if applicable.

  The latest version of the toolkits and core packs are available after a restore operation.

  > ⓘ   If backup includes newer packs than the packs present on the system, the after restore the newer packs from backup are available.

  You must stop any workflows that are running before you import a core pack.

Users Window

The Users window enables you to view, create, edit, and delete the OnCommand Workflow Automation (WFA) users. You can access this window by selecting **Settings**, and under **Management** click **Users**.

> ⓘ   Depending on your role and account privileges, this window might not be displayed.

Users table

The Users window displays existing users. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- 🔻 enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.

- Double-clicking 🔻 clears and resets the filtering selections.

- ▼ on each column header enables you to filter based on the content of the columns. Clicking ▼ in a column allows you to filter on a specific item from the drop-down list or on all available items.

- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).

- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.

- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The following table lists the supported operators for alphabetic and numeric columns in the Users table, available from the **Search** filter text box.

Alphabetic	Numeric
• Contains • Does not contain • Starts with • Ends with • Equals • Does not equal • Reset	• Equals • Does not equal • Less than • Greater than • Less than or equal to • Greater than or equal to • Between • Reset

The Users table contains the following columns:

- **Username**

  Displays the user name for the account.

- **Role**

  Displays the assigned role for the user. Roles can include any of the following:

  - **Guest**

    This user can only view the status of a workflow execution or can be notified of a change in the status of a workflow execution.

  - **Operator**

    This user is allowed to preview and execute workflows for which the user is provided access.

◦ **Approver**

This user is allowed to preview, execute, approve, and reject workflows for which the user is provided access.

> You must provide the email ID of the approver and the status of the workflow that is to be notified to the approver. If there are multiple approvers, you can provide a group email ID in the **E-mail** field.

◦ **Architect**

This user has full access to create workflows, but is restricted from modifying global WFA server settings.

◦ **Admin**

This user has complete access to the WFA server.

> You must configure at least one admin user.

◦ **Backup**

This is the only user who can remotely generate backups of the WFA server; however, this user is restricted from all other access.

• **Categories**

Displays the workflow category assigned to an operator, which provides workflow authorization and privileges to the designated operator.

You can set this authorization setting by clicking **Content Management** > **Categories**.

• **E-mail**

Displays the email address for the user. You can use this email for notification about the workflow status.

• **Notifications Enabled**

Indicates whether the user can receive email notifications (true or false) about the status of workflow executions that were triggered by that user.

• **LDAP**

Indicates whether the user is provisioned through the External Active Directory server accessed by LDAP (true or false).

• **Active Directory Group**

Indicates whether the user is a part of LDAP or Active Directory groups.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(New)**

  Opens the New User dialog box, which enables you to add a new user account.

- **(Edit)**

  Opens the Edit User dialog box, which enables you to edit the selected user account.

- **(Delete)**

  Opens the Delete User confirmation dialog box, which enables you to delete the selected user account.

New User dialog box

The New User dialog box enables you to create a new user account.

- **Username**

  Specifies the user name.

- **Role**

  Enables you to select one of the following user roles:

  - Guest: This user can only view the status of a workflow execution or can be notified about a change in the status of a workflow execution.
  - Operator: This user is allowed to preview and execute workflows for which the user is provided access.
  - Architect: This user has full access to create workflows, but is restricted from modifying global WFA server settings.
  - Admin: This user has complete access to the WFA server.
  - Backup: This user is the only user who can remotely generate backups of the WFA server; however, the user is restricted from all other access.

- **E-mail**

  Enables you to specify the user's email address to which notifications are sent if the Notify On option is selected.

- **Password**

  Specifies the password for the user.

- **Confirm**

  Specifies the password again.

- **Notify On**

  Enables you to select when the account user should be notified by email. The workflow execution status notifications are specific to the workflows executed by the user. You can select any combination of the following options:

  - Workflow execution started: Notifies the user when the workflow execution begins.

◦ Workflow execution failed/partially successful: Notifies the user if the workflow execution fails or if workflow has been successfully executed even if one or more steps have failed.

The execution is completed because the failed steps have been configured such that the workflow execution continues even when the step has failed.

◦ Workflow execution completed successfully: Notifies the user when the workflow execution is completed successfully.

◦ Workflow execution waiting for approval: Notifies the user if the workflow execution is waiting for approval from either an Operator or Architect user, depending on the WFA configuration setting.

◦ Acquisition failure: Notifies the user when data acquisition for data sources fails.

This option is enabled only for Admin and Architect users.

Command buttons

• **Save**

Saves the configuration settings and closes the dialog box.

• **Cancel**

Cancels changes, if any, and closes the dialog box.

Edit User dialog box

The Edit User dialog box enables you to view and modify user account settings.

Depending on your account privileges and role, you might not have access to the Users window. However, you can edit the settings for your account by selecting **Settings**, and under **Management** click **Account Settings**.

> The fields that are available to you for editing depend on your assigned role and account privileges.

• **Name**

Displays the user name for the user account.

• **Role**

Displays the assigned role for the user account.

• **E-mail**

Specifies the email for the user account to which notifications are sent if a Notify On option is selected.

• **Change password**

Enables you to change the current password for the user account. When this check box is selected, the following fields are required:

◦ **New Password**--Specifies the new password.

- **Confirm**--Specifies the new password again.

- **Notify On**

  Enables you to select when the account user should be notified by email during the workflow execution. When this check box is selected, you can select any combination of the following options:

  - Workflow execution started: Notifies the user when the workflow execution begins.

  - Workflow execution failed/partially successful: Notifies the user if the workflow execution fails or if workflow has been successfully executed even if one or more steps have failed.

    The execution is completed because the failed steps have been configured such that the workflow execution continues even when the step has failed.

  - Workflow execution completed successfully: Notifies the user when the workflow execution is completed successfully.

  - Workflow execution waiting for approval: Notifies the user if the workflow execution is waiting for approval from either an Operator or Architect user, depending on the WFA configuration setting.

  - Acquisition failure: Notifies the user when data acquisition for data sources fails.

    This option is enabled only for Admin and Architect users.

Command buttons

- **Save**

  Saves the configuration settings and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Preferences window

The Preferences window enables you to view and modify the refresh and logging options for all of the clients associated with the specific Workflow Automation (WFA) server. You can access this window by selecting **Settings**, and under **Setup** click **Preferences**.

- **Enable Auto Refresh**

  Enables you to choose the automatic refresh of the client, which is triggered by the server. This option is selected by default. When selected, the following WFA tables are refreshed automatically:

  - Execution Status

  - Data Sources

  - Reservations

If not selected, the tables are not updated until you click **Refresh**. This check box is selected by default.

- **Refresh Interval (seconds)**

Enables you to select the refresh interval. The default value is 3 seconds.

- **Max number of rows to display**

  Enables you to click the value in the **Max Size** column and modify the number of rows that the server retrieves and displays to the user per list type.

  For example, the **Workflow Execution** setting displays the number of past history executions to the user. The following are the default values:

  - Workflow Execution: 100
  - Acquisition History: 30
  - Reservations: 100
  - Add inventory rows: 1000

    Enables you to specify the maximum number of results that should be obtained by inventory. The default value is 1000.

Command button

- **Save**

  Saves the configuration settings.

Active Directory Groups window

The Active Directory Groups window enables you to view, create, edit, and delete the OnCommand Workflow Automation (WFA) Active Directory groups. You can access this window by selecting **Settings**, and under **Management** click **Active Directory Groups**.

> ⓘ Depending on your role and account privileges, this window might not be displayed.

- Active Directory groups table
- Toolbar

Active Directory Groups table

The Active Directory Groups window displays existing Active Directory groups. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- ⏳ enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking ⏳ clears and resets the filtering selections.
- ▼ on each column header enables you to filter based on the content of the columns. Clicking ▼ in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order.

However, you cannot hide or delete any of these columns.

- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The following table lists the supported operators for alphabetic and numeric columns in the Active Directory Groups table, available from the **Search** filter text box.

Alphabetic	Numeric
• Contains • Does not contain • Starts with • Ends with • Equals • Does not equal • Reset	• Equals • Does not equal • Less than • Greater than • Less than or equal to • Greater than or equal to • Between • Reset

The Active Directory Groups table contains the following columns:

- **Group Name**

  Displays the group name for the Active Directory.

- **Role**

  Displays the assigned role for the group. Roles can include any of the following:

  ◦ **Guest**

    This group can only view the status of a workflow execution or be notified of a change in the status of a workflow execution.

  ◦ **Operator**

    This group is allowed to preview and execute workflows for which the group is provided access.

  ◦ **Approver**

    This group is allowed to preview, execute, approve, and reject workflows for which the group is provided access.

    > ⓘ You must provide the email ID of the approver and the status of the workflow that is to be notified to the approver. If there are multiple approvers, you can provide a group email ID in the **E-mail** field.

  ◦ **Architect**

    This group has full access to create workflows, but is restricted from modifying global WFA server settings.

◦ **Admin**

This group has complete access to the WFA server.

- **Categories**

Displays the workflow category assigned to an operator, which provides workflow authorization and privileges to the designated operator.

You can set this authorization setting by clicking **Content Management** > **Categories**.

- **E-mail**

Displays the email address for the group. You can use this email for notification about the workflow status.

- **Notifications Enabled**

Indicates whether the group can receive email notifications (true or false) about the status of workflow executions that were triggered by that group.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(New)**

Opens the New Active Directory Group dialog box, which enables you to add a new Active Directory group.

> Before adding the Active Directory group, you need to enable or configure the Active Directory group.

- **(Edit)**

Opens the Edit Active Directory Group dialog box, which enables you to edit the selected Active Directory group.

- **(Delete)**

Opens the Delete Active Directory Group dialog box confirmation dialog box, which enables you to delete the selected Active Directory group.

New Active Directory Group dialog box

The New Active Directory Group dialog box enables you to create a new OnCommand Workflow Automation Active Directory group.

- **Group Name**

Specifies the group name.

- **Role**

Enables you to select one of the following group roles:

- **Guest**

  This group can only view the status of a workflow execution or be notified about a change in the status of a workflow execution.

- **Operator**

  This group is allowed to preview and execute workflows for which the group is provided access.

- **Approver**

  This group is allowed to preview, execute, approve, and reject workflows for which the group is provided access.

  > ℹ️ You must provide the email ID of the approver and the status of the workflow that is to be notified to the approver. If there are multiple approvers, you can provide a group email ID in the **E-mail** field.

- **Architect**

  This group has full access to create workflows, but is restricted from modifying global WFA server settings.

- **Admin**

  This group has complete access to the WFA server.

  > ℹ️ You must configure at least one admin group.

- **E-mail**

  Enables you to specify the group's email address to which notifications are sent if the **Notify On** option is selected.

- **Notify On**

  Enables you to select when the active directory group should be notified by email. The workflow execution status notifications are specific to the workflows executed by the group. You can select any combination of the following options:

  - Workflow execution started: Notifies the group when the workflow execution begins.
  - Workflow execution failed/partially successful: Notifies the group if the workflow execution fails or if the workflow was successfully executed even though one or more steps failed.

    The execution is completed because the failed steps were configured to allow the workflow execution to continue even when the step fails.

  - Workflow execution completed successfully: Notifies the group when the workflow execution is completed successfully.
  - Workflow execution waiting for approval: Notifies the group if the workflow execution is waiting for approval from the Approver, Architect, or Operator group, depending on the WFA configuration setting.

Command buttons

- **Save**

  Saves the configuration settings and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Edit Active Directory Group dialog box

The Edit Active Directory Group dialog box enables you to view and modify the OnCommand Workflow Automation Active Directory group settings.

Depending on your Active Directory group privileges and role, you might not have access to the Active Directory Groups window. However, you can edit the settings for your Active Directory group by selecting **Settings**, and under **Management** click **Active Directory Groups**.

> ⓘ The fields that are available to you for editing depend on your Active Directory group privileges.

- **Group Name**

  Displays the group name for the Active Directory group.

- **Role**

  Displays the assigned role for the user account.

  Displays one of the following group roles assigned for the Active Directory group:

  - **Guest**

    This group can only view the status of a workflow execution or be notified about a change in the status of a workflow execution.

  - **Operator**

    This group is allowed to preview and execute the workflows for which the group is provided access.

  - **Approver**

    This group is allowed to preview, execute, approve, and reject the workflows for which the group is provided access.

    > ⓘ You must provide the email ID of the approver and the status of the workflow that is to be notified to the approver. If there are multiple approvers, you can provide a group email ID in the **E-mail** field.

  - **Architect**

    This group has full access to create workflows, but is restricted from modifying global WFA server settings.

◦ **Admin**

This group has complete access to the WFA server.

ℹ️ You must configure at least one admin group.

- **E-mail**

Specifies the email for the Active Directory group to which notifications are sent if the **Notify On** option is selected.

- **Notify On**

Enables you to select when the active directory group should be notified by email during the workflow execution triggered by that active directory group. You can select any combination of the following options:

◦ Workflow execution started: Notifies the user when the workflow execution begins.

◦ Workflow execution failed/partially successful: Notifies the user if the workflow execution fails or if the workflow was successfully executed even though one or more steps failed.

The execution is completed because the failed steps were configured to allow the workflow execution to continue even when the step fails.

◦ Workflow execution completed successfully: Notifies the user when the workflow execution is completed successfully.

◦ Workflow execution waiting for approval: Notifies the user if the workflow execution is waiting for approval from either an Operator or Architect user, depending on the WFA configuration setting.

Command buttons

- **Save**

Saves the configuration settings and closes the dialog box.

- **Cancel**

Cancels changes, if any, and closes the dialog box.

Approval Portal window

The Approval Portal window enables you to approve or reject a workflow.

You can log in to the Approval Portal window from the link provided in the email notification for the approval of the workflow.

- **Return to WFA**

Takes you back to the WFA application from the Approval Portal window.

Approval Portal

- **Enter Comment**

Enables you to enter your comment for the approval or rejection of the workflow.

Command buttons

- **Approve & Resume**

    Enables you to approve the workflow, which resumes the workflow.

- **Reject & Abort**

    Enables you to reject the workflow, which aborts the workflow.

Data Sources window

The Data Sources window enables you to view, edit, and delete existing data sources, create new data sources, and acquire a data source. You can access this window by selecting **Settings**, and under **Setup** click **Data Sources**.

A data source is a read-only data structure that contains information about where the data in a specific database originates from. Data sources must be defined before environments can be polled. For example, a data source can be either an Active IQ Unified Manager database that contains information about a storage environment or a VMware database with information about a data center.

- Data Sources table
- History table
- Toolbar

Data Sources table

The Data Sources table lists the existing data sources. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking clears and resets the filtering selections.
- on each column header enables you to filter based on the content of the columns. Clicking in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (for ascending and for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The following table lists the supported operators for alphabetic and numeric columns in the Data Sources table, available from the **Search** filter text box.

Alphabetic	Numeric
• Contains • Does not contain • Starts with • Ends with • Equals • Does not equal • Reset	• Equals • Does not equal • Less than • Greater than • Less than or equal to • Greater than or equal to • Between • Reset

The Data Sources table contains the following columns:

• **Name**

Displays the name of the data source.

• **Data Source Type**

Displays the data source type.

• **Host Name**

Displays the host name or IP address of the data source.

• **Scheme**

Displays the caching scheme associated with the data source. For example, a VM caching scheme contains data that is relevant to your virtual environment such as virtual machines, hosts, and datastores. The relevant scheme information is obtained from the data source.

• **Interval (minutes)**

Displays the interval (in minutes) between two consecutive acquisitions of a data source.

• **Start Time**

Displays the date and time when the data acquisition process was started.

Click the calendar icon in the **Search** filter text box to search for data sources with a specific start date.

• **Duration (seconds)**

Displays the time (in seconds) that it takes to process the last data acquisition from the data source.

• **Status**

Displays the status of the current data acquisition process (if any) or the last data acquisition process. The status options include the following:

◦ All

- Aborting

- Canceled

- Completed

- Failed

- NoAcquisition

- Obsolete

- Pending

- Executing

- Scheduled

- **Message**

  Displays an error message when the data acquisition process encounters and error and stops.

History table

The History table displays in the header the name of the data source that was selected in the Data Source table, and lists the details of each data acquisition process for the selected data source. The list of processes is updated dynamically, as the data acquisition processes occur. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.

- Double-clicking clears and resets the filtering selections.

- on each column header enables you to filter based on the content of the columns. Clicking in a column allows you to filter on a specific item from the drop-down list or on all available items.

- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (for ascending and for descending).

- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.

- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The following table lists the supported operators for alphabetic and numeric columns in the History table, available from the **Search** filter text box.

Alphabetic	Numeric
• Contains • Does not contain • Starts with • Ends with • Equals • Does not equal • Reset	• Equals • Does not equal • Less than • Greater than • Less than or equal to • Greater than or equal to • Between • Reset

The History table contains the following columns:

- **ID**

  Displays the identification number of the data acquisition process.

  The identification number is unique and is assigned by the server when it starts the data acquisition process.

- **Start Time**

  Displays the date and time when the data acquisition process was started.

  Click the calendar icon in the **Search** filter text box to search for data acquisition processes started on a specific date.

- **Duration (seconds)**

  Displays the length of time (in seconds) of the last acquisition process from the data source.

- **Planned Acquisition**

  Displays the scheduled date and time for the data acquisition process.

  Click the calendar icon in the **Search** filter text box to search for data acquisitions scheduled for a specific date.

- **Scheduling Type**

  Displays the type of schedule. The schedule types include the following:

  - All
  - Immediate
  - Recurring
  - Unknown

- **Status**

  Displays the status of the current data acquisition process (if any) or the last data acquisition process. The

status options include the following:

- All
- Aborting
- Canceled
- Completed
- Failed
- Obsolete
- Pending
- Executing
- Scheduled
- NoAcquisition

- **Message**

  Displays a message about the error that was encountered during the data acquisition process, when the process stopped and could not continue.

Toolbar

The toolbar is located above the column headers of the Data Sources table. You can use the icons in the toolbar to perform various actions. You can also perform these actions by using the right-click menu in the window.

- (New)

  Opens the New Data Source dialog box, which enables you to add a new data source.

- (Edit)

  Opens the Edit Data Source dialog box, which enables you to edit the selected data source.

- (Delete)

  Opens the Delete Data Source confirmation dialog box, which enables you to delete the selected data source.

- (Acquire Now)

  Initiates the acquisition process for the selected data source.

- (Reset Scheme)

  Opens the Reset Scheme confirmation dialog box. This dialog box enables you to reset the cache storage for the selected scheme. The cache is reset during the next data acquisition process.

  > The reset process deletes all the cached data, including all the tables. The entire cache is built from start during the next data acquisition process.

New Data Source dialog box

The New Data Source dialog box enables you to add a new data source.

Data Source Configuration properties

- **Name**

  Enables you to specify a name for the data source.

- **Data source type**

  Enables you to select the data source type—for example, Active IQ Unified Manager - 6.0 (MYSQL).

  When you select a data source type, the port, scheme, user name, password, interval (minutes), and timeout (sec) fields are populated with data.

  > ⓘ If you want to execute OnCommand Workflow Automation (WFA) data protection workflows from an Active IQ Unified Manager server, you must set up WFA in the Active IQ Unified Manager server.

  For more information, see the *OnCommand Unified Manager Online Help*.

- **Host name**

  Enables you to specify the host name or IP address (IPv4 or IPv6) for the data source.

  > ⓘ The Active IQ Unified Manager data source type does not support IPv6 addresses.

- **Port**

  Displays the associated port number, if any, for the selected data source type.

  You can change the default port and specify a different port for the data source.

- **Scheme**

  Displays the scheme associated with the selected data source type—for example *cm_storage* for Active IQ Unified Manager - 6.0 (MYSQL).

  This property cannot be modified.

- **User name**

  Displays the associated user name, if any, for the selected data source type.

  You must specify the appropriate user name for this data source to override the default user name:

  - For Active IQ Unified Manager 6.0 and later, you must enter the user name of the database user account that you created on the Active IQ Unified Manager server.

  - For Performance Advisor, you must enter the user name of an Active IQ Unified Manager user with a minimum role of GlobalRead.

- **Password**

Enables you to specify a password for the selected data source type.

You must specify a password to override the default password for the user name of this data source:

- For Active IQ Unified Manager 6.0 and later, you must enter the password of the database user account that you created on the Active IQ Unified Manager server.
- For Performance Advisor, you must enter the password of an Active IQ Unified Manager user with a minimum role of GlobalRead.

- **Database**
- **Interval (minutes)**

Enables you to click the value and select an interval (in minutes) using the up and down arrows.

> ⓘ If the interval is set to zero (0), automatic sampling is disabled.

The default interval for data sampling is:

- Script-based data source type: 1440 (performance and vc)
- SQL-based data source type: 30 (cm_storage, storage, and cm_performance)

- **See Setup Instruction Guide**

Opens the Setup Instruction Guide dialog box, which enables you to specify the instructions for setting up the data source.

Command buttons

- **Save**

Saves the configurations settings and closes the dialog box.

- **Cancel**

Cancels changes, if any, and closes the dialog box.

Edit Data Source dialog box

The Edit Data Source dialog box enables you to modify an existing data source.

Data Source Configuration properties

- **Name**

Enables you to modify the name of the data source.

- **Data source type**

Displays the data source type for the data source. You cannot modify this field.

- **Host name**

Enables you to specify the host name or IP address (IPv4 or IPv6) for the data source.

(i)　　The Active IQ Unified Manager data source type does not support IPv6 addresses.

- **Port**

  Displays the associated port number, if any, for the selected data source type. You can change the default port number for the data source.

- **Scheme**

  Displays the scheme associated with the selected data source type—for example *cm_storage* for Unified Manager - 6.0 (MYSQL).

  You cannot modify this property.

- **User name**

  Displays the associated user name, if any, for the selected data source type.

  You must specify the appropriate user name for this data source to override the default user name:

  - For Unified Manager 6.0 and later, you must enter the user name of the database user account that you created on the Unified Manager server.
  - For Performance Advisor, you must enter the user name of an Active IQ Unified Manager user with a minimum role of GlobalRead.

- **Password**

  Enables you to specify a password for the selected data source type.

  You must specify a password to override the default password for the user name of this data source:

  - For Unified Manager 6.0 and later, you must enter the password of the database user account that you created on the server.
  - For Performance Advisor, you must enter the password of an Unified Manager user with a minimum role of GlobalRead.

- **Database**

  Displays the associated database name, if any, for the selected data source type.

- **Interval (minutes)**

  Enables you to click the value and select an interval (in minutes) using the up and down arrows.

  (i)　　If the interval is set to zero (0), automatic sampling is disabled.

  The default interval for data sampling is:

  - Script based data source type: 1440 (performance and vc)
  - SQL based data source type: 30 (cm_storage, storage, and cm_performance)

- **See Setup Instruction Guide**

  Opens the Setup Instruction Guide dialog box, which outlines the steps for setting up the data source.

Command buttons

- **Reset Scheme**

  Opens the Reset Scheme confirmation dialog box. This dialog box enables you to reset the cache storage for the selected scheme, which occurs during the next data acquisition.

  > (i) The reset process deletes all the cached data, including all the tables. The entire cache is built from start during the next data acquisition.

- **Save**

  Saves the configurations settings and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Credentials window

The Credentials window enables you to view, create, edit, and delete credentials. You can access this window by selecting **Settings** > **Setup** > **Credentials**.

Credentials are information (such as IP address or host name, user name and password) that is stored on a target system (server or controller) and is used to connect to that specific system and to execute commands.

- Credentials table
- Toolbar

Credentials table

The Credentials window displays existing credentials in a table format. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking clears and resets the filtering selections.
- on each column header enables you to filter based on the content of the columns. Clicking in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (for ascending and for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The following table lists the supported operators for alphabetic and numeric columns in the Credentials table, available from the **Search** filter text box.

Alphabetic	Numeric
• Contains • Does not contain • Starts with • Ends with • Equals • Does not equal • Reset	• Equals • Does not equal • Less than • Greater than • Less than or equal to • Greater than or equal to • Between • Reset

The Credentials table contains the following columns:

- **Type**

  Displays the type of credential.

- **Name/IP Address**

  Displays the IP address for the credential.

- **Host Name**

  Displays the host name for the credential.

- **Login**

  Displays the user name associated with the credential.

- **Match**

  Displays the match type for the credential. Match types are as follows:

  ◦ Exact: defines credentials for a specific IP address or host name

  ◦ Pattern: defines credentials for the entire subnet or IP range, or host name range

    Pattern is a regular expression that is used for matching a string—for example, `10.10.10.` matches any IP address in the range `10.10.10.0` through `10.10.10.255,` and host matches host names starting with the string `host`.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(Test Connectivity)**

  Opens the Test Connectivity dialog box, which enables you to test the credentials.

- **(New)**

74

Opens the New Credentials dialog box, which enables you to create a new credential.

- (Edit)

  Opens the Edit Credentials dialog box, which enables you to edit the selected credential.

- (Delete)

  Opens the Delete Credentials confirmation dialog box, which enables you to delete the selected credential.

Test Connectivity dialog box

The Test Connectivity dialog box enables you to test the connection to the system associated with a credential. The test connectivity operation triggers the search path and first looks for an exact match, then for a pattern match, and finally for LDAP service authentication.

The Internet Control Message Protocol (ICMP) is used to check if the system is running before testing for connectivity.

Test Connectivity parameters

- **Type**

  Enables you to select the type of credential from the drop-down list.

- **Name/IP**

  Enables you to specify the host name or IP address for the credential.

Command buttons

- **Test**

  Opens a connection attempt to the host name or IP address.

- **Close**

  Cancels changes, if any, and closes the dialog box.

New Credentials dialog box

The New Credentials dialog box enables you to create a new credential.

Credential parameters

You can set the following parameters for the newly created credential:

- **Match**

  Enables you to select the match type of the credential, which defines the credential for either a specific IP address or host name, or an entire subnet or IP range. You can select one of the following options:

◦ Exact: defines credentials for a specific IP or host name

◦ Pattern: defines credentials for the host name range or the entire subnet or IP range

Pattern is a regular expression that is used for matching a string. For example, `10.10.10.` matches any IP in the range 10.10.10.0 through 10.10.10.255, and `host` matches all host names starting with `host`.

- **Type**

Enables you to select the host type from the drop-down list.

> ℹ️ VMware vCenter is not supported for Linux.

- **Name/IP**

Enables you to specify the host name or IP address for the credential.

- **User Name**

Enables you to specify a user name for the credential.

- **Password**

Enables you to specify a password for the user name that you created for the credential.

- **Overwrite Default Values**

Enables you to overwrite the default values of the protocol, port, and timeout that are associated with the selected remote system type for the credential.

By default, this check box is not selected. You must select the check box if you want to overwrite the default values.

Command buttons

- **Test**

Enables you to test the connection to the host or IP address by logging in using the required credentials.

- **Save**

Saves the configuration settings and closes the dialog box.

- **Cancel**

Cancels changes, if any, and closes the dialog box.

Edit Credentials dialog box

The Edit Credentials dialog box enables you to modify an existing credential.

Credential parameters

- **Match**

  Enables you to select the match type of the credential, which defines the credential for either a specific IP address or host name, or an entire subnet or IP range. Available options include the following:

  - Exact: defines a specific IP address or host name
  - Pattern: defines an entire subnet or IP range

- **Type**

  Enables you to select the type of credential from the drop-down list.

  VMware vCenter is not supported for Linux.

- **Name/IP**

  Enables you to specify the host name or IP address for the credential.

- **User Name**

  Enables you to specify the user name for the credential.

- **Password**

  Enables you to specify the password for the user name.

- **Overwrite Default Values**

  Enables you to overwrite the default values of the protocol, port, and timeout that are associated with the selected remote system type for the credential.

  By default, this check box is not selected. You must select the check box if you want to overwrite the default values.

Protocol table

The protocol table displays the port numbers and timeout limits (in seconds) for protocols associated with the selected remote system for the credential.

Command buttons

- **Test**

  Enables you to test the connection to the host name or IP address by logging in using the required credentials.

- **Save**

  Saves the configuration settings and closes the dialog box.

- **Cancel**

  Cancels the changes, if any, and closes the dialog box.

About dialog box

The About dialog box displays details about the current version of the installed WFA application.

WFA version information

- **Version**

  Displays the current version number of the installed WFA application.

  The version number has the following format: `A.B.C.`

  `A.B.C` reflects the Major.Minor.Maintenance release numbers.

  For example: `2.0.0.`

- **System ID**

  Identifies the WFA system installation for tracking and AutoSupport purposes.

  This is a unique system-generated identifier.

Workflows Window

The Workflows window displays the workflows that are marked ready for production. You can edit or execute the workflows for which you have authorization. You can access this window by clicking the Workflows tab.

Category pane

The category pane enables you to search for workflows by categories. A workflow that is not assigned to any category is listed under "No Category". To the right of the category heading, the total number of workflows within that category is displayed. This number includes the workflows that are marked ready for production. For example, "Data Protection (7)" indicates that seven workflows are ready for production in the "Data Protection" category.

Schemes

The Schemes menu enables you to select the schemes.

The schemes that are displayed are based on the selection made by the administrator in the Show content for schemes option under **Settings** > **Setup** > **Workflow Settings**. You can select the schemes that you want to be displayed by selecting or clearing the check boxes. This selection is valid only for the current session.

Workflow pane

Workflows that are marked ready for production are displayed as gray boxes on the Workflow pane. The workflow boxes include the name of the workflow and an icon to indicate that the mode is supported by the workflow. You can execute a workflow by clicking the workflow box.

If you are an administrator or an architect, you can edit a workflow by clicking the ![edit icon] icon. The ![info icon] icon provides more information about the workflow.

Executions window

The Executions window displays the status of the execution process for each workflow that has been submitted for execution. The window enables you to view details of the execution process and control the execution of a workflow. You can access this window by selecting **Execution** > **Executions**.

- Workflow table
- Toolbar

Workflow table

The Workflow table lists the workflows submitted for execution. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- ![filter icon] enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking ![filter icon] clears and resets the filtering selections.
- ![funnel icon] on each column header enables you to filter based on the content of the columns. Clicking ![funnel icon] in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The following table outlines the supported operators for alphabetic and numeric columns in the Workflow table, available in the **Search** filter text box.

Alphabetic	Numeric
- Contains - Does not contain - Starts with - Ends with - Equals - Does not equal - Reset	- Equals - Does not equal - Less than - Greater than - Less than or equal to - Greater than or equal to - Between - Reset

The Workflow table contains the following columns:

- **Job #**

  Displays the identification number of the job.

  The job identification number is unique and is assigned by the server when it starts the job.

- **Name**

  Displays the name of the workflow.

- **Start Time**

  Displays the date and time when the workflow was started.

  Click the calendar icon in the Search filter text box to search for workflows with a specific start date.

- **End Time**

  Displays the date and time when the workflow ended.

  Click the calendar icon in the Search filter text box to search for workflows with a specific end date.

- **Status**

  Displays the running status of the job. The status can be one of the following:

  - Failed

    Indicates that the workflow failed during execution. Based on the time that has elapsed since the execution of the workflow, you can resume the workflow from the failed command.

  - Executing

    Indicates that the workflow is being executed. The workflow executes the plan that was created in the planning phase, which precedes any other execution.

  - Successful

    Indicates that the workflow has been successfully executed.

  - Canceled

    Indicates that the workflow has been canceled by a user.

  - Waiting for Approval

    Indicates that an approval point is part of the workflow. The workflow remains in this state until the specified user approves the workflow execution.

  - Scheduled

    Indicates that the planning of the workflow is complete and the workflow is scheduled for execution.

  - Aborting

    Indicates that the workflow is being aborted. An aborted workflow does not continue with the execution;

any previously completed part of the workflow remains completed.

 ◦ Obsolete

 Indicates that the scheduled workflow has not been executed within the specified time per the
 schedule.

 ◦ Planning

 Indicates the resolution of the workflow design, location of all resources, verification of design viability,
 and formulation of the execution plan. Planning can be a stand-alone action, part of the design
 verification, or part of execution because every execution starts with a fresh planning.

 ◦ Pending

 Indicates that the workflow is in the planning queue. This is an internal status. The workflow is retrieved
 for planning from this status.

 ◦ Partially Successful

 Indicates that although the workflow has been successfully executed, there are one or more steps that
 have failed. The execution is completed because the failed steps have been configured such that the
 workflow execution continues even when the step has failed.

- **Completed**

  Displays the number of steps that are completed of the total number of steps for the selected workflow.

- **Submitted By**

  Displays the user name of the user who submitted the workflow.

- **Submitted At**

  Displays the date and time that the workflow was submitted.

  Click the calendar icon in the Search filter text box to search for workflows with a specific submitted at date.

- **Execution Comment**

  Displays the comment specified for the workflow execution.

- **Scheduled For**

  Displays the scheduled date and time for the execution of the workflow.

  Click the calendar icon in the Search filter text box to search for workflows with a specific scheduled for
  date.When a filter to view the jobs at a later date is applied on the column, jobs with "Job # zero" might be
  displayed. This indicates that the job is not yet created and will be created at the scheduled time.

- **Recurring ID**

  Displays the identifier of the recurring schedule.

- **Schedule Name**

Displays the name of the schedule.

- **Last Status Change**

  Displays the time when a status was changed.

  Click the calendar icon in the Search filter text box to search for workflows with a specific last status change date.

- **Approval Point Comment**

  Indicates the message that is displayed to the user at the last approval point, if applicable, during the execution of the workflow.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- ![Details icon] **(Details)**

  Opens the Monitoring window for the selected workflow, which contains the following tabs for detailed information about the workflow:

  - Flow
  - Execution Plan
  - User Inputs
  - Return Parameters
  - History

You can also double-click an entry in the table to open the Monitoring window to view detailed information.

- ![Abort icon] **(Abort)**

  Stops the execution process from continuing. This option is enabled for workflows that are in execution mode.

- ![Reschedule icon] **(Reschedule)**

  Opens a Reschedule Workflow dialog box, which enables you to change the time of execution for the workflow. The option is enabled for workflows that are in the Scheduled state.

- ![Resume icon] **(Resume)**

  Opens a Resume Workflow dialog box, which enables you to resume the execution of the workflow after modifying environment issues (for example, wrong credentials to an array, missing licenses, or array is down). The option is enabled for workflows that are in the `Failed` state.

- ![Approve & Resume icon] **(Approve & Resume)**

  Enables you to approve the execution of the workflow and continue the execution process. This option is enabled for workflows that are in the `Waiting For Approval state`.

- ![Reject & Abort icon] **(Reject & Abort)**

  Enables you to reject the execution of the workflow and stop the execution process. This option is enabled for workflows that are in the `Waiting For Approval` state.

- ![Clean Reservation icon] **(Clean Reservation)**

  Enables you to clean the resource reservation made for a workflow from the local cache. Clean reservation is available only for scheduled, failed, and partially successful workflows. You cannot resume reservation after it is cleaned.

- ![Refresh icon] **(Refresh)**

  Refreshes the list of workflows. The view refreshes automatically. You can toggle auto refresh on and off by clicking ![icon] in the status bar.

Recurring Executions window

The **Recurring Executions** window enables you to suspend, resume, or delete a recurring execution that is associated with a workflow. A workflow that has a recurring execution is executed on a recurring basis at a specified frequency. You can access this window by selecting **Execution** > **Recurring Executions**.

- Recurring Executions table
- Toolbar

Recurring Executions table

The Recurring Schedules table lists the existing recurring schedules that are associated with a workflow in a table format. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- ![filter icon] enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking ![filter icon] clears and resets the filtering selections.
- ![filter icon] on each column header enables you to filter based on the content of the columns. Clicking ![filter icon] in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The following table outlines the supported operators for alphabetic and numeric columns in the Recurring Executions table, available in the **Search** filter text box.

Alphabetic	Numeric
• Contains	• Equals
• Does not contain	• Does not equal
• Starts with	• Less than
• Ends with	• Greater than
• Equals	• Less than or equal to
• Does not equal	• Greater than or equal to
• Reset	• Between
	• Reset

The Recurring Schedules table contains the following columns:

• **ID**

Displays the identifier of the schedule.

• **Workflow Name**

Displays the name of the workflow.

• **User Inputs**

Displays the names and values of the user inputs associated with the workflow.

• **Schedule**

Displays the name of the schedule associated with the workflow.

• **Status**

Displays the status of the schedule. The possible values are Active and Suspended.

• **Next Execution Date**

Displays the date and time when the workflow associated with the schedule will be executed next.

You can search for a schedule by entering the date and time of execution in the **Search** filter text box.

• **Updated At**

Displays the date and time when the association of the workflow with the schedule was updated.

Click the calendar icon in the **Search** filter text box to search for recurring schedules on a specific date.

• **Updated By**

Displays the name of the user who modified the association of the workflow with the schedule.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(Suspend)**

  Opens the Suspend Recurring Execution dialog box, which enables you to suspend the execution of an active workflow.

- **(Resume)**

  Resumes the execution of a suspended workflow.

- **(Delete)**

  Opens the Delete Recurring Execution confirmation dialog box, which enables you to delete the selected schedule.

Reservations window

The Reservations window displays each workflow that is marked for reservation, and enables you to manage the reservations. You can access this window by selecting **Execution** > **Reservations**.

A reservation helps ensure that a selected resource is available for a specific scheduled workflow when that workflow is executed.

- Reservations table
- Toolbar

Reservations table

The Reservations table lists the workflows that are submitted for reservation. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking clears and resets the filtering selections.
- on each column header enables you to filter based on the content of the columns. Clicking in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (for ascending and for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The following table lists the supported operators for alphabetic and numeric columns in the Reservations table,

available from the **Search** filter text box.

Alphabetic	Numeric
• Contains • Does not contain • Starts with • Ends with • Equals • Does not equal • Reset	• Equals • Does not equal • Less than • Greater than • Less than or equal to • Greater than or equal to • Between • Reset

The Reservations table contains the following columns:

• **Job #**

Displays the identification number of the job.

The job identification number is unique and is assigned by the server when it starts the job.

• **Workflow**

Displays the workflow name.

• **Time of Execution**

Displays the time when the job is scheduled to run or when the job was executed.

Click the calendar icon in the **Search** filter text box to search for a specific execution date.

• **Time of reservation**

Displays the time when the job was scheduled, which is the time when the reservation was created.

Click the calendar icon in the **Search** filter text box to search for a specific reservation date.

• **Command Name**

Displays the command for which the reservation was made. For example, for a workflow executing the command `Create Volume myVolume of size 20MB`, Create Volume is displayed.

• **Reservation**

Displays the description of the reservation, which is generated from the string representation of the command.

• **Workflow Status**

Displays the status of the workflow execution job. The status options are as follows:

- ◦ All

- ◦ Failed

- ◦ Executing

- ◦ Successful

- ◦ Canceled

- ◦ Waiting for Approval

- ◦ Scheduled

- ◦ Aborting

- ◦ Obsolete

- ◦ Planning

- ◦ Pending

- ◦ Partially Successful

- **Cache Updated**

  Displays whether the reservation has been verified and reflected in the cached data (YES or NO). This cache update is performed by the data acquisition process.

- **Last Error**

  Displays the error message that is generated when the reservation is simulated.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(Delete)**

  Opens the Delete Reservations confirmation dialog box, which enables you to delete the selected reservation.

- **(Refresh)**

  Refreshes the contents of the Reservations table.

Schedules window

The Schedules window enables you to create, edit, and delete the schedule of a workflow. You can schedule a workflow to be executed at a particular date and time. You can access this window by selecting **Execution** > **Schedules**.

- Schedules table
- Toolbar

Schedules table

The Schedules table lists the existing schedules for workflow execution in a table format. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- ⛉ enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking ⛉ clears and resets the filtering selections.
- ▼ on each column header enables you to filter based on the content of the columns. Clicking ▼ in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The following table lists the supported operators for alphabetic and numeric columns in the Schedules table, available from the **Search** filter text box.

Alphabetic	Numeric
- Contains - Does not contain - Starts with - Ends with - Equals - Does not equal - Reset	- Equals - Does not equal - Less than - Greater than - Less than or equal to - Greater than or equal to - Between - Reset

The Schedules table contains the following columns:

- **ID**

  Displays the identifier of the schedule.

- **Name**

  Displays the name of the schedule.

- **Description**

  Displays the description of the schedule.

- **Association Count**

  Displays the number of workflows that are associated with the schedule.

- **Updated At**

  Displays the date and time at which the schedule was modified.

  Click the calendar icon in the **Search** filter text box to search for schedules updated on a specific date.

- **Updated By**

  Displays the name of the user who modified the schedule.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(New)**

  Opens the New Schedule dialog box, which enables you to add a new schedule.

- **(Edit)**

  Opens the Edit Schedule dialog box, which enables you to edit the selected schedule.

- **(Delete)**

  Opens the Delete Schedule confirmation dialog box, which enables you to delete the selected schedule.

New Schedule dialog box

You can use the New Schedule dialog box to create a new schedule for any workflow so that the workflow is executed on a specified frequency. For example, you can schedule a workflow to be executed every Monday.

New Schedule Configuration properties

- **Name**

  Enables you to specify a name for the schedule.

- **Description**

  Enables you to enter a description for the schedule.

- **Frequency**

  Enables you to specify the frequency at which the workflow associated with the schedule must be executed. The Hourly option is selected by default. Frequency can be Hourly, Daily, Weekly, or Monthly.

  For example, if you want a workflow to be executed every Tuesday at 9 A.M., you must select the weekly option and enter the time as `9:00` and day as `Tuesday`. You must use a colon when you specify the time.

  The 24-hour time format is supported. The entered data will be based on the server time.

Command buttons

- **OK**

  Saves the configurations settings and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Workflows window

The Workflows window displays all of the available workflows, in alphabetical order. You can access this window by selecting **Workflow Design** > **Workflows**.

Depending on your role and account privileges, this window might not be displayed.

- Workflows table
- Toolbar

Workflows table

The Workflows table lists the available workflows. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking clears and resets the filtering selections.
- on each column header enables you to filter based on the content of the columns. Clicking in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The Workflows table contains the following columns:

- **Certification**

  Indicates whether the workflow is user-created ( ), PS ( ), community ( ), user-locked ( ), or NetApp-certified ( ).

  You can search for workflows by selecting the required option check boxes from the filter list.

- **Name**

  Displays the name of the workflow.

  You can search for a workflow by entering its name in the **Search** filter text box.

- **Scheme**

  Displays the schemes associated with workflows. A scheme represents the data model for a system. For example, a vc scheme contains data relevant to your virtual environment, such as virtual machines, hosts, and datastores.

  You can search for a workflow by entering one of its schemes in the **Search** filter text box.

- **Entity Version**

  Displays the version number of the object in `major.minor.revision` format—for example, 1.0.0.

  You can search for a workflow by entering the version number in the **Search** filter text box.

- **Description**

  Displays the description of the workflow.

  You can search for a workflow by entering its description in the **Search** filter text box.

- **OS Compatibility**

  Indicates whether the workflow is compatible with the host operating system.

- **Min. Software Versions**

  Specifies the minimum versions of the software that is required to execute the workflow. For example, the software can be clustered Data ONTAP 8.2.0 and vCenter 6.0. The versions are displayed as comma-separated values.

- **Categories**

  Displays the user-defined labels associated with workflows.

  You can use the categories to organize collections of workflows. For example, to help distinguish workflows, there might be a separate category for provisioning tasks, a category for maintenance tasks, and a category for decommissioning tasks. In addition, categories are used to restrict workflow execution for specific operators.

  You can search for workflows by entering a category in the **Search** filter text box.

- **Last Updated On**

  Displays the date and time that the workflow was last updated.

  You can search for workflows by selecting the required time category from the filter drop-down list.

- **Updated By**

  Displays the name of the user who updated the workflow.

  You can search for workflows by entering the user name in the **Search** filter text box.

- **Locked By**

  Displays the name of the user who locked the workflow.

You can search for workflows by entering the user name in the **Search** filter text box.

- **Ready for production**

  Identifies whether the workflow is marked ready for production (true or false).

  You can search for workflows by selecting the required production option check box from the filter list.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- (New)

  Opens the New Workflow window, which enables you to enter the details for the new workflow.

- (Edit)

  Opens the workflow editor for the selected workflow, which enables you to edit the workflow. You can also double-click the workflow to open the workflow editor.

- (Clone)

  Opens the New Workflow <selected_workflow_name> - copy window, which enables you to create a clone or a copy of the selected workflow.

- (Lock)

  Opens the Lock Workflow confirmation dialog box, which enables you to lock the selected workflow. This option is enabled only for the workflows that you have created.

- (Unlock)

  Opens the Unlock Workflow confirmation dialog box, which enables you to unlock the selected workflow. This option is enabled only for the workflows locked by you. However, administrators can unlock workflows locked by other users.

- (Delete)

  Opens the Delete Workflow confirmation dialog box, which enables you to delete the selected workflow. This option is enabled only for the workflows that you have created.

- (Export)

  Opens the File Download dialog box, which enables you to save the selected workflow as a .dar file. This option is enabled only for the workflows that you have created.

- (Execute)

  Opens the Execute Workflow <selected_workflow_name> dialog box for the selected workflow, which enables you to execute the workflow.

- (Add To Pack)

Opens the Add To Pack Workflow dialog box, which enables you to add the workflow and its dependable entities to a pack, which is editable.

> ⓘ The Add To Pack feature is enabled only for workflows for which the certification is set to **None.**

- 🗑 **(Remove From Pack)**

Opens the Remove From Pack Workflow dialog box for the selected workflow, which enables you to delete or remove the workflow from the pack.

> ⓘ The Remove From Pack feature is enabled only for workflow for which the certification is set to **None.**

New Workflow window

The **New Workflow** window displays a newly created workflow and its associated commands.

New Workflow

The **New Workflow** window displays the name of the workflow in the header of the window. The associated commands are displayed as blue boxes in columns that are presented in the sequential order of execution—read left to right, top to bottom. The variables and objects for each command are displayed as gray boxes in the column of the command.

- **Insert a row**

  Adds a new row above or below the selected row in the workflow.

  You can click ➕ to add a row below the last available row.

- **Copy row**

  Copies the selected row from the workflow and saves it to the clipboard. Copying a row does not copy the repetition details set for the row.

- **Paste row**

  Places the last item saved to the clipboard in a new row below the selected row. Unique names are used for variables; however, variables in expressions are not changed.

- **Repeat row**

  Opens the **Row Repetition Details** dialog box.

- **Edit row repetition**

  Opens the **Row Repetition Details** dialog box, which enables you to modify the **Repeat Row** action set for the selected row.

- **Remove row repetition**

Cancels the **Repeat Row** action set in the **Row Repetition Details** dialog box for the selected row.

- **Add condition**

  Opens the Conditions for row <row number> dialog box, which enables you to select a condition. The selected condition is applicable to all the commands in the row. All commands in the row will be executed only if the selected condition is met.

- **Remove row**

  Deletes the selected row from the workflow.

- **New Approval Point**

  You can click to open the **New Approval Point** dialog box, which enables you to add an approval point before the execution of the command.

- **Edit Approval Point**

  You can click to open the **Edit Approval Point** dialog box, which enables you to edit the approval point comment.

- **Add Command Parameters**

  Adds parameters for a command in the selected row.

  You can place your cursor below the selected command, at the required row, and click to open the Parameters for <command_name> dialog box.

- **Edit Command Parameters**

  Opens the Parameters for <command_name> dialog box to enable you to modify the selected parameters for a command.

  You can place your cursor over the gray box that you want to edit and click to open the Parameters for <command_name> dialog box.

- **Delete Command Parameters**

  Removes the parameter.

  You can move the cursor over the gray box that you want to delete and click the "X" on the upper-right corner of the gray box.

Command buttons

The command buttons are available at the bottom of the workflow window. The commands can also be accessed from the right-click menu in the window.

- **Preview**

  Opens the **Preview Workflow** dialog box, which enables you to specify user input attributes.

- **Save As**

  Enables you to save the workflow with a new name.

- **Save**

  Saves the workflow.

- **Close**

  Closes the window. In the process, if any changes were made to the configuration, a **Save Changes confirmation** dialog box is opened, prompting you to either save the changes, close the window without saving changes, or cancel the closing action.

Parameters for commands dialog box

You can specify parameters and other settings for the execution of commands through the Parameters for commands dialog box.

The dialog box displays one or more dictionary object tabs and the following tabs:

- Other parameters
- Advanced

<Dictionary objects> tabs

- **Define <dictionary object>**

  Enables you to specify the command parameters that are mapped to the dictionary object by specifying attributes, using a previously defined object, or searching for an existing object.

  - **by filling-in attributes**

    Enables you to enter attributes for this variable. You can use the Resource Selection dialog box for fields marked with ⓡ. Optionally, you can use a template that includes predefined values for certain attributes of the object. You can view and use additional attributes by clearing the **Show only attributes used by <dictionary object>** check box. The box next to **Define <dictionary object>** displays the default name of the selected variable. You can edit the name of the variable. The mandatory attributes are marked with an asterisk (*) and red border for the box.

  - **by using a previously defined <dictionary object>**

    Enables you to select a previously defined variable. You can select the previously defined dictionary object in the box next to **Define <dictionary object>**.

  - **by searching for an existing <dictionary object>**

    Enables you to define a variable by searching for an existing dictionary object. You can specify the search criteria for the dictionary object. You can specify one of the following action if the dictionary object is found:

    - Abort workflow
    - Disable the command
    - Fill-in attributes for the <dictionary object> and execute the command

      ⓘ   This option is similar to the **by filling-in attributes** option.

Other Parameters

Enables you to specify the command parameters that are not mapped to any dictionary object for the execution of the command.

Advanced

Enables you to specify conditions for the execution of the command and provide a description. You can also configure the workflow so that the workflow execution continues even if one or more commands in the workflow have failed.

- **Execute this command**

  - **Always**

    Executes the command unconditionally.

  - **If the following variable was found**

    Enables you to execute a command only when the specified variable is found. You can specify the variable in the adjacent box.

  - **If the following variable was not found**

    Enables you to execute a command only when the specified variable is not found. You can specify the variable in the adjacent box.

  - **If the following expression is TRUE**

    Enables you to execute a command only when the specified MVFLEX Expression Language (MVEL) expression is "true". You can specify the expression in the adjacent box.

- **Description**

  Enables you to enter a description for the command.

- **If execution fails**

  - **Abort workflow execution**

    Enables you to end the workflow execution.

  - **Continue execution from the next step**

    Enables you to continue the workflow execution from the next step.

  - **Continue execution from the next row**

    Enables you to continue the workflow execution from the next row.

Resource Selection dialog box

The Resource Selection dialog box enables you to search for resources and map the resources to a command.

- Select <dictionary object> by tab

- Advanced tab

Select <dictionary object> by tab

This tab enables you specify a finder or filters as the search criteria and enter attributes for the selected search criteria. You can also save the selected filters as a finder.

- **Define filter rules**

  Enables you to define a set of rules for dictionary entry resources, such as vFiler units, aggregates, and virtual machines.

  The filter rules can contain one or more groups of rules.

  A rule consists of a dictionary entry attribute, an operator, and a value. The attribute can also include attributes of its references. For example, you can specify a rule for aggregates as follows: List all aggregates with name starting with the string "aggr" and have an available size greater than 5 GB. The first rule in the group is the attribute "name", with the operator "starts-with", and the value "aggr". The second rule for the same group is the attribute "available_size_mb", with the operator ">" and the value "5000".

  The **Define filter rules** option is disabled if you have selected a finder.

  You can clear the values specified by clicking the **Reset** button.

- **Select one resource by its natural keys**

  Enables you to select a resource based on the natural keys of the resource.

- **Finder**

  Enables you to select a finder from the list. **None** is selected by default.

  Filters are displayed below the finder list. You cannot select filters if you have selected a finder.

- **Parameters**

  Enables you to enter the values for the selected finder or filters. You must enter all the required values to complete the search criteria.

- **Command buttons**
  - **Save As Finder**

    Saves the selected filters as a finder.

  - **Test**

    Enables you to test the parameters for the selected filters before specifying the values in the Parameters area.

  - **OK**

    Saves the configurations settings and closes the dialog box.

  - **Cancel**

Cancels changes, if any, and closes the dialog box.

Advanced tab

This tab enables you to specify when the search should be performed and allows you to sort the resource attributes and the status of the resource attributes.

- **Execute this search always**

  Executes the search without any restriction when the command is executed.

- **Execute search only when the following expression evaluates to TRUE**

  Executes the search only when the value of the optional attribute specified in the box is "true". You can use MVFLEX Expression Language (MVEL) syntax to specify the optional attribute.

- **Sorting table**

  Displays the attributes and the sort order for the filters selected in the **Select <dictionary object> by** tab. The sort order is significant for resource selection—for example, if you selected descending as the sort order for aggregates, the aggregate with maximum `available_space` is selected as the resource. To change the sort order for an attribute, you can click the status column of the attribute and select the required sort order from the list.

- **Command buttons**

  - **Up**

    Moves the selected entry up one row in the Sorting table.

  - **Down**

    Moves the selected entry down one row in the Sorting table.

Incremental Naming Wizard

The Incremental Naming Wizard enables you to define the value of an attribute based on a search for an existing parameter.

- **Search criteria for existing <dictionary object>**

  Opens the **Resource Selection** dialog box, which enables you to specify search criteria for the dictionary object.

- **Enter a value for <attribute> if no <dictionary object> matches the above search criteria**

  Enables you to specify a value for the <attribute> when the <dictionary object> is not found using the specified search criteria.

- **If <dictionary object> was found using above search criteria, set value for <attribute> by**

  Enables you to specify a value for the <attribute> when the <dictionary object> is not found using the specified search criteria.

- **Enter a value for <attribute> if no <dictionary object> matches the above search criteria**

Enables you to select a method for setting the value for the <attribute> if the <dictionary object> is found using the specified search criteria.

- ◦ **providing an increment value and suffix**

  Enables you to enter a numeric value for the increments and optionally enter a suffix of the attribute name.

- ◦ **providing a custom expression**

  Enables you to enter a custom expression for the value of the attribute. You can use MVFLEX Expression Language (MVEL) syntax to specify the value.

Row Repetition Details dialog box

The Row Repetition Details dialog box enables you to specify how the parameters in the row should be repeated.

Repeats

Enables you to select the required type of repeat option. The **Number of times** option is selected by default.

- • **Number of times**

  Enables you to specify the following:

  - ◦ The number of times the specific row should be executed
  - ◦ Index Variable
  - ◦ Variables
  - ◦ **Number of Times**

    Enables you to specify a numeral for the number of times the specific row should be executed.

  - ◦ **Index Variable**

    Enables you to specify the name of the index variable for row repetition.

  - ◦ **Variables**

    Enables you to include additional variables that have to be used during row repetition.

    - ▪ **Add**

      Adds a new row in the variables table.

    - ▪ **Remove**

      Removes the selected row from the variables table.

- • **For every resource in a group**

  Enables you to specify the following:

- Resource Type
- Resource Search Criteria
- Resource Variable
- Index Variable
- Group Size Variable
- Variables

- **Resource Type**

  Enables you to select the resource type.

- **Resource Search Criteria**

  Opens the Resource Selection dialog box, which enables you to specify the criteria for searching resources of the selected resource type. The loop is executed for each searched resource based on the specified criteria.

- **Resource Variable**

  Enables you to enter a name for the resource variable.

- **Index Variable**

  Enables you to specify the index for row repetition.

- **Group Size Variable**

  Enables you to enter a name for the group size variable.

- **Variables**

  Enables you to include additional variables that have to be used during row repetition.

- **Command buttons**
  - **OK**

    Saves the settings and closes the dialog box.

  - **Cancel**

    Does not save any changes, if any, and closes the dialog box.

Workflow <workflow name> window

The Workflow <workflow name> window displays the selected workflow and its associated commands and parameters. The commands associated with the workflow are displayed as blue boxes in columns that are arranged in the sequential order of execution—left to right. The variables and objects for each command are displayed as gray boxes below the command.

Workflow tab

The Workflow tab enables you to select and use child workflows and commands, and customize the display name.

- **Available Steps**

  Provides a list of available child workflows and commands that you can add to your workflow.

  You can search for child workflows or commands by using the name, scheme, and minimum software version as search strings in the text box.

  You can customize the workflow display by rearranging the order of the commands. To rearrange the commands, you can drag and drop commands in the required order. Double-clicking a command moves that command to the end of the list. You can modify the display name by double-clicking the display name of the command in the blue box. You can delete a command by moving the cursor over the blue box, and then clicking "X" on the upper-right corner.

  You can click the row number to perform various functions on the row.

  - **Insert a row**

    Inserts a new row above or below the selected row in the workflow.

  - **Copy row**

    Copies the selected row from the workflow and saves it to the clipboard. The repetition details set for the row is copied when a row is copied.

  - **Repeat row**

    Opens the Row Repetition Details dialog box, which enables you to specify the type of repetition.

  - **Add condition**

    Opens the Condition for row <row number> dialog box, which enables you to select a condition. The selected condition is applicable to all the commands in the row. All commands in the row will be executed only if the selected condition is met.

  - **Remove row**

    Deletes the selected row from the workflow.

- **Paste Row**

  Pastes the copied row above or below the selected row. This option is available after selecting the Copy row function.

Details tab

The Details tab enables you to provide general information about the workflow.

- **Workflow name**

  Enables you to specify the name of the workflow using an alphanumeric string.

- **Entity Version**

  Enables you to enter a version number for the workflow in the `major.minor.revision` format—for example, 1.0.0.

- **Categories**

  Displays the associated category for the workflow. You can assign a workflow to a category from the Category window.

- **Workflow Description**

  Enables you to enter a description of the workflow. You can click in the field to open the Edit Description dialog box.

- **Ready for production**

  Enables you to mark the workflow ready for production, which allows the workflow to be executed and listed in the Workflows window.

- **Consider Reserved Elements**

  Enables you to use the reservation feature for the workflow, when selected resources are available for the workflow until the reservation expiration period you have configured. The reservation feature enables you to exclude resources reserved by other workflows during resource selection.

  > ⓘ You must not select this check box if you require the filters to search only the contents of the persistent cache without considering reservations set by other workflows.

- **Enable element existence validation**

  Enables you to validate the existence of elements and avoid failure of certain actions during the execution of workflows. For example, you can avoid creating a new volume in an array with the same name as that of an existing volume.

- **Minimum Software Versions**

  Specifies the minimum versions of the software that is required to execute the workflow. For example, the software can be clustered Data ONTAP 8.2.0 and vCenter 6.0. The versions are displayed as comma-separated values.

User Inputs tab

The User Inputs tab enables you to view and edit the user input attributes that you created when you defined the workflow objects and created user inputs. The values for the user input attributes are filled when you preview or execute the workflow.

You can double-click the user input that you want to edit, which opens the Edit Variable: <user_input> dialog box, enabling you to edit the user input.

You can customize the table display by rearranging the column order. To rearrange the columns, you can drag and drop columns in the required order. However, you cannot hide or delete any of these columns.

- **Name**

Displays the name of the user input attribute.

- **Display Name**

  Displays the name that is displayed to the workflow user.

- **Type**

  Displays the user input type, such as string, query, boolean, table, or password.

- **Values**

  Displays the allowed values for the user input—for example, range for numbers and regular expression for strings.

- **Default Value**

  Displays the default value of the user input.

- **Input Dependency**

  Displays another user input from the list that provides a value to the selected user input.

- **Group**

  Displays the name of the group for the user input attributes.

- **Mandatory**

  Displays the status of the user input. If the check box is displayed as selected, the user input attributes are mandatory for the execution of the workflow.

- **Command buttons**

  - **Up**

    Moves the selected entry up one row in the table.

  - **Down**

    Moves the selected entry down one row in the table.

Constants tab

The Constants tab enables you to define the value of the constants that can be used multiple times in the workflow. You can specify the following as the value of constants:

- Numbers
- Strings
- MVEL expressions
- Functions
- User inputs
- Variables

You can customize the table display by sorting each column, as well as by rearranging the column order.

- **Name**

  Displays the name of the constant.

- **Description**

  Enables you to specify a description for the constant.

- **Value**

  Enables you to specify a value for the constant.

- **Command buttons**

  - **Add**

    Adds a new row in the Constants table.

  - **Remove**

    Deletes the selected row from the Constants table.

  You can also right-click the constants to use the copy and paste functionality.

Return Parameters tab

The Return Parameters tab enables you to define and provide a description of the return parameters for the workflow that can be viewed from the Monitoring window or from web services.

- **Parameter Value**

  Enables you to specify the parameter value.

- **Parameter Name**

  Enables you to specify the parameter name.

- **Description**

  Enables you to specify a description for the selected parameter.

- **Command buttons**

  - **Add Row**

    Adds a new row in the Return Parameters table.

  - **Remove Row**

    Deletes the selected row from the Return Parameters table.

Help Content tab

The Help Content tab enables you to add, view, and remove the Help content for the workflow. The workflow Help content provides information about the workflow for storage operators.

Advanced tab

The Advanced tab enables you to configure a custom URI path for workflow execution through API calls. Each segment in the URI path can be a string or a valid name of the user input of the workflow in brackets.

For example, /devops/{ProjectName}/clone. The workflow can be invoked as a call to *https:*//WFA-Server:HTTPS_PORT/rest/devops/Project1/clone/jobs.

Command buttons

The command buttons are available at the bottom of the workflow window. The commands can also be accessed from the right-click menu in the window.

- **Preview**

  Opens the Preview Workflow dialog box, which enables you to specify user input attributes.

- **Save As**

  Enables you to save the workflow with a new name.

- **Save**

  Saves the configurations settings.

Execute Workflow dialog box

The Execute Workflow dialog box enables you to specify the required user inputs, time for execution, and execution comment for a workflow.

User Inputs

Enables you to specify the inputs for the workflow. The mandatory attributes are marked with an asterisk (*) and the border for the boxes are in red.

Options

Enables you to specify the time for the workflow execution.

- **Execute now**

  Enables you to execute the workflow immediately.

- **Execute recurrently**

  Enables you to set the workflow to recur periodically. This option is displayed only when a schedule has been created.

- **Execute once**

Enables you to schedule the execution of the workflow.

Execution Comment

Enables you to specify a comment for the workflow execution. This comment is displayed in the Execution Status window.

Edit Variable dialog box

The Edit Variable: <UserInputName> dialog box enables you to edit the user input attributes of a workflow.

Properties

- **Variable Name**

  Enables you to edit the name of the user input. Renaming the user input updates all the references to the user input in the workflow.

- **Display Name**

  Enables you to specify or edit the display name for the user input. You can specify a unique display name if you have created user input attributes with a similar name.

- **Description**

  Enables you to specify or edit a description for the user input. The description appears as a tooltip when you execute or preview the workflow.

- **Type**

  Enables you to select the type of user input. Fields or a link to a dialog box is displayed based on the selected options. Available options include the following:

  - String: Enables you to enter a regular expression for valid values in the RegEx field—for example, a*.
  - Number: Enables you to enter a numerical range in the Range field—for example, 1 to 15.
  - Enum: Enables you to enter a closed list of values in the Enum Values field.
  - Query: Enables you to enter a simple SQL query to obtain the result.

    Users can select only the values from the first column of the result.

  - Query (Multi-select): Enables you to enter an SQL query that obtains a list of values.

    Users can select a single value or multiple values while executing the workflow—for example, you can select a single volume, multiple volumes, or volumes with their shares and exports.

    You can select values from any column displayed in the result. Selecting a row selects the values from all the columns of the selected row.

  - Boolean: Enables you to display a check box in the User Inputs dialog box.
  - Table: Enables you to specify the column headers of the table that can be used to enter multiple values during the execution of the workflow—for example, a table that can be used to specify a list of node

names and port names.

You can also configure the type of column user input and the properties associated with the column user input. A dialog box is displayed based on the selected user input type. Available options include the following:

- String: Enables you to enter a regular expression for valid values in the RegEx field—for example, a*.
- Number: Enables you to enter a numerical range in the Range field—for example, 1 to 15.
- Enum: Enables you to enter a closed list of values in the Enum Values field.
- Query: Enables you to enter a simple SQL query to obtain the result.

  Users can select only the values from the first column of the result. A query within the column of the table user input cannot reference other user inputs within the query.

- Boolean: Enables you to select "true" or "false" as the boolean value from the drop-down list.

○ Password: Enables you to encrypt a password that is provided as an input by the user.

When encrypted, the password is displayed as a sequence of asterisk characters across the WFA application and in the log files.

○ Dictionary: Enables you to add the table data for the selected dictionary entry.

The dictionary entry attribute selects the attribute that is to be returned. You can select a single value or multiple values while executing the workflow. For example, you can select a single volume, multiple volumes, or volumes with their shares and exports. By default, single values are selected. You can also select Rules for filtering. A rule consists of a dictionary entry attribute, an operator, and a value. The attribute can also include attributes of its references. For example, you can specify a rule for aggregates by listing all aggregates with name starting with the string "aggr" and have an available size greater than 5 GB. The first rule in the group is the attribute `name`, with the operator `starts-with`, and the value kaggr. The second rule for the same group is the attribute `available_size_mb`, with the operator > and the value 5000.

- **Lock Values**

  Enables you to specify whether the user is allowed to input a value other than the query-returned values. Selecting the check box does not allow the user to provide a value; only the query-returned values can be selected. This option is used with the Enum and Query type options.

- **Default Value**

  Enables you to set the default value of the user input.

- **Mandatory**

  Enables you to specify whether user input is mandatory for the execution of the workflow.

Group

- **Group Name**

  Enables you to group the related user input attributes together. The user input attributes are displayed in groups that you have defined when previewing or executing the workflow. For example, you can group the

user input attributes related to Volume Details together.

- **Expand group by default**

  Enables you to display all the user input attributes specified in a group as an expanded list. If the check box is not selected, the user input group appears collapsed.

Dependency

Enables you to enable a user input based on the value entered for another user input. For example, in a workflow that configures the NAS protocol, you can specify the required user input for protocol as "NFS" to enable the "read-write host lists" user input or "CIFS" to enable "CIFS ACL configuration".

- **Choose user input to depend on**

  Enables you to select the user input required to enable the user input displayed in the Variable Name field.

- **Applicable values (comma separated)**

  Enables you to specify the value of the conditional user input that enables the user input displayed in the Variable Name field.

Preview Workflow dialog box

The Preview Workflow dialog box enables you to specify values for user inputs associated with a workflow and then to preview the execution of that workflow with the specified values.

User Inputs values

The Preview Workflow dialog box displays the user inputs associated with the selected workflow and enables you to set the values for user inputs.

Command buttons

- **Preview**

  Opens the Monitoring window for the associated workflow.

- **Cancel**

  Closes the dialog box.

Monitoring window

The Monitoring window displays details about results of the planning or execution phase of the workflow. The tabs in the window display read-only content. You can access this window from various areas of the WFA application when selecting the **Details**, **Preview**, or **Execute** options.

- Status area

- Flow tab
- Details tab
- Execution Plan tab
- User Inputs
- Return Parameters tab
- History tab

Status area

The Status area above the tabs displays detailed information about the result of the planning or execution process.

- **Workflow status**

  At the top of the window, a color-coded header displays the result of the planning or execution process:

  - Green indicates a successful action—for example, Planning Completed or Execution Completed.
  - Red indicates failure—for example, Planning Failed or Execution Failed.

- **Less/More info action**

  This action link is available when the preview or execution process fails. You can toggle between **Less info** and **More info** using the action link. Depending on the action, the link opens or closes the information box to show more or less information about the failed result.

- **Detailed status**

  This box is available when the preview or execution process fails. It displays details about the planning or execution process. When a process fails, this box is open by default and provides details of the cause of the failure.

Flow tab
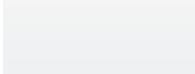
The Flow tab provides a graphical presentation of the workflow.

Commands and child workflows are displayed in the top row with their objects and variables displayed below. The status of the command details and child workflows during preview or execution is displayed using various colors.

The following table shows the following:

- The color scheme used to display the status of the command or workflow execution
- The icons used in the window

Color scheme and icon	Status
	Execution is successful

Color scheme and icon	Status
	Execution failed
	Execution is in progress
	Execution skipped
	Child workflow header
	Opens the logs
	The child workflow includes an approval point

Details tab

The Details tab provides more detailed information about the workflow. The information is provided in table format, with the commands in the header row and the associated objects and variables listed below. This tab provides each command with all of its arguments and parameters.

This tab is useful for debugging a failed preview or execution of the workflow.

Execution Plan tab

The Execution Plan tab provides a translated list of the workflow commands and their arguments that are being executed (scripts or commands).

You can use this tab for debugging a failed preview or execution of the workflow.

User Inputs tab

The User Inputs tab displays values entered by users during the preview or execution of the workflow.

You can use the sort arrows (▼ or ▲) in the column header to sort the column entries in ascending or descending order.

Return Parameters tab

The Return Parameters tab lists the output of the workflow, by parameter name and parameter value.

You can access these return parameters by using web services.

History tab

The History tab lists changes in the statuses for the workflow, when the status change occurred, who initiated the action, and the message associated with the status change.

Command buttons

- **Download Logs**

    Enables you to download a `zip` file of all the log files, including the specific execution logs.

- **Column Visibility**

    Enables you to show or hide columns in the Details tab.

- **OK**

    Closes the Monitoring window.

New Approval Point dialog box

The New Approval Point dialog box enables you to add an approval point as a checkpoint in a workflow to pause the workflow execution and resume it based on your approval.

- **Enter comment (optional)**

    Enables you to provide information, such as time of change, user, and comments, which enables you to see when and why the workflow execution was paused or resumed.

    The approval point comments can include MVFLEX Expression Language (MVEL) expressions.

- **Enter the execution condition (if any)**

    Enables you to specify conditions for the execution of a command:

    ◦ Always

      Executes the command unconditionally.

    ◦ If the following variable was found

      Enables you to execute a command only when the specified variable is found. You can specify the variable in the box.

    ◦ If the following variable was not found

      Enables you to execute a command only when the specified variable is not found. You can specify the variable in the box.

    ◦ If the following expression is TRUE

      Enables you to execute a command only when the specified MVEL expression is "true". You can specify the expression in the box.

Command buttons

- **OK**

    Enables you to add the approval point.

* **Cancel**

  Cancels changes, if any, and closes the dialog box.

Edit Approval Point dialog box

The Edit Approval Point dialog box enables you to modify an approval point that was added as a check point in a workflow to pause the workflow execution and resume it based on your approval.

* **Enter comment (optional)**

  Enables you to provide information, such as time of change, user, and comments, which enables you to see when and why the workflow execution was paused or resumed.

  The approval point comments can include MVFLEX Expression Language (MVEL) expressions.

* **Enter the execution condition (if any)**

  Enables you to specify the following conditions for the execution of a command:

  ◦ Always

    Executes the command unconditionally.

  ◦ If the following variable was found

    Enables you to execute a command only when the specified variable is found. You can specify the variable in the box.

  ◦ If the following variable was not found

    Enables you to execute a command only when the specified variable is not found. You can specify the variable in the box.

  ◦ If the following expression is TRUE

    Enables you to execute a command only when the specified MVEL expression is "true". You can specify the expression in the box.

Command buttons

* **Remove Approval**

  Enables you to remove the approval point before the command is executed.

* **OK**

  Enables you to modify the changes to the approval point settings.

* **Cancel**

  Cancels changes, if any, and closes the dialog box.

Finders window

The Finders window displays the available finders in alphabetical order. You can access this window by selecting **Workflow Design** > **Finders**.

> ⓘ Depending on your role and account privileges, this window might not be displayed.

A finder is a search operation for locating resources. A finder consists of filtering rules that remove irrelevant resources. Finders search for information about WFA objects in the WFA-cached repositories.

- Finders table
- Toolbar

Finders table

The Finders table lists the available finders.

Each entry is identified as one of the following:

- (icon) - content created by users
- (icon) - content developed by Professional Services (PS), which is available only on custom installations made by PS
- (icon) - packs developed by users
- (icon) - content created by users that is locked
- (icon) - NetApp-certified content

You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- (icon) enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking (icon) clears and resets the filtering selections.
- (icon) on each column header enables you to filter based on the content of the columns. Clicking (icon) in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The Finders table contains the following columns:

- **Certification**

  Indicates whether the finder is user-created ((icon)), PS ((icon)), community ((icon)), user-locked ((icon)), or NetApp-certified ((icon)).

  You can search for finders by selecting the required check boxes from the filter list.

- **Name**

  Displays the name of the finder.

  You can search for a finder by entering its name in the Search filter text box.

- **Scheme**

  Displays the scheme associated with the finders. A scheme represents the data model for a system. For example, a vc scheme contains data relevant to your virtual environment, such as virtual machines, hosts, and datastores.

  You can search for a finder by entering its scheme in the Search filter text box.

- **Type**

  Displays the dictionary object type of the finder (for example, aggregate array or CIFS).

  You can search for finders by entering the type in the Search filter text box.

- **Entity Version**

  Displays the version number of the object in `major.minor.revision` format—for example, 1.0.0.

  You can search for a finder by entering the version number in the Search filter text box.

- **Description**

  Displays the description of the finder.

  You can search for a finder by entering its description in the Search filter text box.

- **Last Updated On**

  Displays the date and time when the finder was last updated.

  You can search for finders by selecting the time category from the filter drop-down list.

- **Updated By**

  Displays the user who updated the finder.

  You can search for finders by entering the user name in the Search filter text box.

- **Locked By**

  Displays the user who locked the finder.

  You can search for finders by entering the user name in the Search filter text box.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- ![New icon] **(New)**

  Opens the New Finder window, which enables you to create a finder.

- ![Edit icon] **(Edit)**

  Opens the Finder <finder_name> window for the selected finder, which enables you to edit the finder.

  You can also double-click the finder to open the Edit Finder window.

- ![Clone icon] **(Clone)**

  Opens the New Finder <finder_name> - copy window, which enables you to create a copy of the selected finder.

- ![Lock icon] **(Lock)**

  Opens the Lock Finder confirmation dialog box, which enables you to lock the selected finder.

- ![Unlock icon] **(Unlock)**

  Opens the Unlock Finder confirmation dialog box, which enables you to unlock the selected finder.

  This option is enabled only for the finders that you have locked. Administrators can unlock finders that were locked by other users.

- ![Delete icon] **(Delete)**

  Opens the Delete Finder confirmation dialog box, which enables you to delete the selected user-created finder.

  > ℹ️ You cannot delete a WFA finder, PS finder, or sample finder.

- ![Export icon] **(Export)**

  Enables you to export the selected user-created finder.

  > ℹ️ You cannot export a WFA finder, PS finder, or sample finder.

- ![Test icon] **(Test)**

  Opens the Test Finder dialog box, which enables you to test the selected finder.

- ![Add To Pack icon] **(Add To Pack)**

  Opens the Add To Pack Finders dialog box, which enables you to add the finder and its dependable entities to a pack, which is editable.

  > ℹ️ The Add To Pack feature is enabled only for finders for which the certification is set to **None.**

- ![Remove From Pack icon] **(Remove From Pack)**

  Opens the Remove From Pack Finders dialog box for the selected finder, which enables you to delete or

remove the finder from the pack.

> ⓘ The Remove From Pack feature is enabled only for finders for which the certification is set to
> **None.**

New Finder dialog box

The New Finder dialog box enables you to create new finders.

- Properties tab
- Filters
- Returned Attributes tab

Properties tab

The **Properties** tab enables you to specify a name for the finder, select the type of WFA dictionary object, and
enter a description for the finder. The tab also displays the input parameters after a filter is selected in the
Filters tab.

- **Name**

  Enables you to enter a name for the finder.

- **Type**

  Enables you to select the type of object from the list such as aggregate, igroup, and cluster. The filters for
  the selected object are displayed in the **Filters** tab.

- **Entity Version**

  Enables you to enter the version number for the finder in `major.minor.revision` format—for example,
  `1.0.0`.

- **Description**

  Enables you to enter a description for the finder.

- **Input Parameters table**

  Displays the input parameters for the selected filters.

Filters tab

Enables you to select the required filters from the available list of filters.

- **Available Filters**

  Displays the list of available filters for the selected object in the **Properties** tab.

- **Selected Filters**

  Displays the list of filters selected from the available filters.

- **Selection buttons**

  Moves the selected entry from one box to another.

Returned Attributes tab

Enables you to see details about the available filters, select the required attributes of the available filters, and specify the sort order for the attributes.

- **Available**

  Displays the available filters and the attributes for the filters.

- **Selected**

  Displays the selected filters and the attributes, the aliases, and the sort order for the selected filters.

- **Command buttons**

  ◦ **Up**

    Moves the selected entry up one row in the Selected table.

  ◦ **Down**

    Moves the selected entry down one row in the Selected table.

  ◦ **Selection buttons**

    Moves the selected entry from one table to another.

Command buttons

- **Test**

  Enables you to test the finder that you have defined.

- **Save**

  Saves the finder and closes the dialog box.

- **Cancel**

  Does not save the finder and closes the dialog box.

Edit Finder dialog box

The Edit Finder dialog box enables you to edit the finder.

- Properties tab
- Filters
- Returned Attributes tab

Properties tab

The **Properties** tab enables you to edit the name of the finder, the type of WFA dictionary object, and the description for the finder. The tab also displays the input parameters of the filter used in the finder.

- **Name**

  Enables you to edit the name of the finder.

- **Type**

  Enables you to select the type of WFA dictionary object from the list such as aggregate, igroup, and cluster. The filters for the selected object are displayed in the **Filters** tab.

- **Entity Version**

  Enables you to enter the version number for the finder in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Enables you to edit the description for the finder.

- **Input Parameters table**

  Displays the input parameters of the selected filters.

Filters tab

Enables you to select the required filters from the available list of filters.

- **Available Filters**

  Displays the list of available filters for the selected object in the **Properties** tab.

- **Selected Filters**

  Displays the list of filters selected from the available filters.

- **Selection buttons**

  Moves the selected entry from one box to another.

Returned Attributes tab

Enables you to see details about the available filters, select the required attributes of the available filters, and specify the sort order for the attributes.

- **Available**

  Displays the available filters and the attributes for the filters.

- **Selected**

  Displays the selected filters and the attributes, the aliases, and the sort order for the selected filters.

- **Command buttons**

  - **Up**

    Moves the selected entry up one row in the Selected table.

  - **Down**

    Moves the selected entry down one row in the Selected table.

  - **Selection buttons**

    Moves the selected entry from one table to another.

Command buttons

- **Test**

  Enables you to test the finder that you have selected to edit.

- **Save**

  Saves the changes and closes the dialog box.

- **Cancel**

  Does not save the changes, if any, and closes the dialog box.

Clone Finder dialog box

The Clone Finder dialog box enables you to create a copy of the finder and edit the cloned finder.

- Properties tab
- Filters
- Returned Attributes tab

Properties tab

The Properties tab enables you to edit the name of the finder, the type of object, and the description for the finder. The tab also displays the input parameters of the filter used in the finder.

- **Name**

  Enables you to edit the name of the finder. The name of the finder you have selected to clone is used as the name for the clone and appended with – `copy` by default.

- **Type**

  Enables you to select the type of object from the list. The filters for the selected object are displayed in the Filters tab.

- **Entity Version**

Enables you to enter the version number for the finder in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Enables you to edit the description for the finder.

- **Input Parameters table**

  Displays the input parameters of the selected filters.

Filters tab

Enables you to select the required filters from the available list of filters.

- **Available Filters**

  Displays the list of available filters for the selected object in the Properties tab.

- **Selected Filters**

  Displays the list of filters selected from the available filters.

- **Selection buttons**

  Enables you to move the selected entry from one box to another.

Returned Attributes tab

Enables you to see the details of the available filters, select the required attributes of available filters, and specify the sort order for the attributes.

- **Available**

  Displays the available filters and the attributes for the filters.

- **Selected**

  Displays the selected filters and the attributes, the aliases, and the sort order for the selected filters.

- **Command buttons**
  - **Up**

    Moves the selected entry up one row in the Selected table.

  - **Down**

    Moves the selected entry down one row in the Selected table.

  - **Selection buttons**

    Moves the selected entry from one table to another.

Command buttons

- **Test**

  Enables you to test the finder that you have selected to clone.

- **Save**

  Saves the finder and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Filters window

The Filters window displays the available filters in alphabetical order. You can access this window by selecting **Workflow Design** > **Filters**.

> ℹ️ Depending on your role and account privileges, this window might not be displayed.

Filters are query rules that remove irrelevant resources during the query-based search for locating resources. Filters are used to develop a finder.

- Filters table
- Toolbar

Filters table

The Filters table lists the available filters. Each entry is identified as one of the following:

- 👤 - content created by users
- 🛠️ - content developed by Professional Services (PS), which is available only on custom installations made by PS
- 👤 - packs developed by users
- 🔒 - content created by users that is locked
- 🟦 - NetApp-certified content

You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- 🔍 enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking 🔍 clears and resets the filtering selections.
- ▼ on each column header enables you to filter based on the content of the columns. Clicking ▼ in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.

- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The Filters table contains the following columns:

- **Certification**

  Indicates whether the filter is user-created ( ), PS ( ), community ( ), user-locked ( ), or NetApp-certified ( ).

  You can search for filters by selecting the one or more check boxes from the filter list.

- **Name**

  Displays the name of the filter.

  You can search for a filter by entering its name in the Search filter text box.

- **Scheme**

  Displays the scheme associated with the filters. A scheme represents the data model for a system. For example, a vc scheme contains data relevant to your virtual environment, such as virtual machines, hosts, and datastores.

  You can search for a filter by entering its scheme in the Search filter text box.

- **Type**

  Displays the dictionary object type of the filter (for example, aggregate array or CIFS).

  You can search for filters by entering the type in the Search filter text box.

- **Entity Version**

  Displays the version number of the object in `major.minor.revision` format—for example, 1.0.0.

  You can search for a filter by entering the version number in the Search filter text box.

- **Description**

  Displays the description of the filter.

  You can search for a filter by entering its description in the Search filter text box.

- **Last Updated On**

  Displays the date and time when the filter was last updated.

  You can search for filters by selecting the time category from the filter drop-down list.

- **Updated By**

  Displays the user who updated the filter.

  You can search for filters by entering the user name in the Search filter text box.

- **Locked By**

  Displays the user who locked the filter.

  You can search for filters by entering the user name in the Search filter text box.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- ![New icon] **(New)**

  Opens the New Filter window, which enables you to create a filter.

- ![Edit icon] **(Edit)**

  Opens the Filter <filter_name> window for the selected filter, which enables you to edit the filter.

  You can also double-click the filter to open the Edit Filter window.

- ![Clone icon] **(Clone)**

  Opens the New Filter <filter_name>_copy window, which enables you to create a copy of the selected filter.

- ![Lock icon] **(Lock)**

  Opens the Lock Filter confirmation dialog box, which enables you to lock the selected filter.

- ![Unlock icon] **(Unlock)**

  Opens the Unlock Filter confirmation dialog box, which enables you to unlock the selected filter.

  This option is enabled only for the filters that you have locked. Administrators can unlock filters that were locked by other users.

- ![Delete icon] **(Delete)**

  Opens the Delete Filter confirmation dialog box, which enables you to delete the selected user-created filter.

  > ℹ️ You cannot delete a WFA filter, PS filter, or sample filter.

- ![Export icon] **(Export)**

  Enables you to export the selected user-created filter.

  > ℹ️ You cannot export a WFA filter, PS filter, or sample filter.

- ![Test icon] **(Test)**

  Opens the Test Filter dialog box, which enables you to test the selected filter.

- **(Add To Pack)**

    Opens the Add To Pack Filters dialog box, which enables you to add the filter and its dependable entities to a pack, which is editable.

    > ℹ️ The Add To Pack feature is enabled only for filters for which the certification is set to None.

- **(Remove From Pack)**

    Opens the Remove From Pack Filters dialog box for the selected filter, which enables you to delete or remove the filter from the pack.

    > ℹ️ The Remove From Pack feature is enabled only for filters for which the certification is set to None.

New Filter dialog box

You can use the New Filter dialog box to create a new filter. You can use the filter to develop finders.

- Properties tab
- Query tab

Properties tab

The **Properties** tab enables you to specify a name for the filter, select a dictionary object, and enter a description for the filter.

- **Name**

    Enables you to enter a name for the filter.

- **Type**

    Enables you to select a dictionary object from the list.

- **Entity Version**

    Enables you to enter the version number for the filter in `major.minor.revision` format—for example, 1.0.0.

- **Description**

    Enables you to enter a description for the filter.

Query tab

Enables you to enter an SQL query, and edit the label and the description for the attributes.

- **SQL Query**

    Enables you to enter an SQL query for the filter.

- **Input Parameters table**

  Displays the list of parameters from the SQL query that you have entered which require user input when the filter is used. You can click the **Label** or the **Description** column of a parameter to edit the label or enter a description.

- **Returned Attributes table**

  Displays the list of returned attributes from the SQL query.

Command buttons

- **Test**

  Enables you to test the filter that you have defined.

- **Refresh**

  Populates the **Input Parameters** table and the **Returned Attributes** table with changed values, if any.

- **Save**

  Saves the filter and closes the dialog box.

- **Cancel**

  Does not save the filter and closes the dialog box.

Edit Filter dialog box

The Edit Filter dialog box enables you to edit a filter.

- Properties tab
- Query tab

Properties tab

The **Properties** tab enables you to edit the name of the filter, select a dictionary object, and edit the description for the filter.

- **Name**

  Enables you to edit the name of the filter.

- **Type**

  Enables you to select a dictionary object from the list.

- **Entity Version**

  Enables you to enter the version number for the filter in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Enables you to edit the description for the filter.

Query tab

Enables you to edit the SQL query, the label, and the description for the attributes.

- **SQL Query**

  Enables you to edit the SQL query of the filter.

- **Input Parameters table**

  Displays the list of parameters from the SQL query that you have entered which require user input when the filter is used. You can click the **Label** or the **Description** column of a parameter to edit the label or the description.

- **Returned Attributes table**

  Displays the list of returned attributes from the SQL query.

Command buttons

- **Test**

  Enables you to test the filter.

- **Refresh**

  Populates the **Input Parameters** table and the **Returned Attributes** table with changed values, if any.

- **Save**

  Saves the filter and closes the dialog box.

- **Cancel**

  Does not save the changes, if any, and closes the dialog box.

Clone Filter dialog box

The Clone Filter dialog box enables you to copy a filter and edit the filter.

- Properties tab
- Query tab

Properties tab

The **Properties** tab enables you to edit the name of the filter, select a dictionary object, and edit the description for the filter.

- **Name**

Enables you to edit the name of the filter. The name of the filter you have selected to clone is used as the name for the clone and appended with _copy by default.

- **Dictionary type**

  Enables you to select a dictionary object from the list.

- **Entity Version**

  Enables you to enter the version number for the filter in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Enables you to edit the description for the filter.

Query tab

Enables you to edit the SQL query, the label, and the description for the attributes.

- **SQL Query**

  Enables you to edit the SQL query of the filter.

- **Input Parameters table**

  Displays the list of parameters from the SQL query that you have entered which require user input when the filter is used. You can click the **Label** or the **Description** column of a parameter to edit the label or the description.

- **Returned Attributes table**

  Displays the list of returned attributes from the SQL query.

Command buttons

- **Test**

  Enables you to test the filter.

- **Refresh**

  Populates the **Input Parameters** table and the **Returned Attributes** table with changed values, if any.

- **Save**

  Saves the filter and closes the dialog box.

- **Cancel**

  Does not save the filter and closes the dialog box.

Commands window

The Commands window displays the available commands, in alphabetical order. You can access this window by selecting **Workflow Design** > **Commands**.

> ⓘ   Depending on your role and account privileges, this window might not be displayed.

A command is defined as an action taken as part of a workflow.

- Commands table
- Toolbar

Commands table

The Commands table lists the available commands.

You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- 🏷️ enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking 🏷️ clears and resets the filtering selections.
- ▼ on each column header enables you to filter based on the content of the columns. Clicking ▼ in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The Commands table contains the following columns:

- **Certification**

  Indicates whether the command is user-created (👤), PS (⚙️), community (👤), user-locked (🔒), or NetApp-certified (🔲).

- **Name**

  Displays the name of the command.

- **Scheme**

  Displays the scheme associated with commands. A scheme represents the data model for a system. For example, a vc scheme contains data relevant to your virtual environment, such as virtual machines, hosts, and datastores.

- **Entity Version**

  Displays the version number of the object in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Displays the description of the command.

  You can search for commands by entering the description in the **Search** filter text box.

- **OS Compatibility**

  Indicates whether the command is compatible with the host operating system.

- **Last Updated On**

  Displays the date and time when the command was last updated.

- **Updated By**

  Displays the user who updated the command.

- **Locked By**

  Displays the user who locked the command.

  You can search for commands by entering the user name in the **Search** filter text box.

- **Command Language**

  Displays the programming language in which the command is written (Perl or PowerShell).

- **Min. Software Versions**

  Specifies the minimum versions of the software that is required to execute the workflow. For example, the software can be clustered Data ONTAP 8.2.0 and vCenter 6.0. The versions are displayed as comma-separated values.

- **Mandatory Parameters**

  Displays the parameters selected as mandatory for the command.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(New)**

  Opens the New Command Definition window, which enables you to create a command.

- **(Edit)**

  Opens the Edit Command Definition window for the selected command, which enables you to edit the command. You can also double-click the command to open the Edit Command Definition window.

- **(Clone)**

Opens the Edit Command Definition <command_name> - copy window, which enables you to create a clone or copy of the selected command.

- 🔒 **(Lock)**

Opens the Lock Command confirmation dialog box, which enables you to lock the selected command. This option is enabled only for the commands you have created.

- 🔓 **(Unlock)**

Opens the Unlock Command confirmation dialog box, which enables you to unlock the selected command. This option is enabled only for the commands locked by you. However, administrators can unlock commands locked by other users.

- ❌ **(Delete)**

Opens the Delete Command confirmation dialog box, which enables you to delete the selected user-created command.

ℹ️	You cannot delete a WFA or PS command.

- ➡️ **(Export)**

Enables you to export the selected user-created command.

ℹ️	You cannot export a WFA or PS command.

- ✅ **(Test)**

Opens the Testing Command <CommandName> in <ScriptLanguage> dialog box, which enables you to test the selected command.

- ➕ **(Add To Pack)**

Opens the Add To Pack Command dialog box, which enables you to add the command and its dependable entities to a pack, which is editable.

ℹ️	The Add To Pack feature is enabled only for commands for which the certification is set to **None.**

- ❌ **(Remove From Pack)**

Opens the Remove From Pack Command dialog box for the selected command, which enables you to delete or remove the command from the pack.

ℹ️	The Remove From Pack feature is enabled only for commands for which the certification is set to **None.**

New Command Definition dialog box

The New Command Definition dialog box enables you to define a new command. You can create new commands for your workflows if the predefined commands do not meet

your requirements.

- Properties tab
- Code tab
- Parameters Definition tab
- Parameters Mapping tab
- Reservation tab
- Verification tab

Properties tab

Enables you to specify the properties of the command, such as the name, description, and entity version.

- **Name**

  Enables you to specify a name for the command. You must specify a name in order to save the command.

- **Entity Version**

  Enables you to specify the version number for the command in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Enables you to enter a description for the command.

- **String Representation**

  Enables you to specify a string representation for the command using MVFLEX Expression Language (MVEL) syntax.

  You must specify the string representation in order to save the command. The string representation is used to display the details of the command in the workflow design during planning and execution. You must use only the parameters of a command in the string representation for that command.

- **Timeout (s)**

  Enables you to specify the timeout value (in seconds) for the command. The default value is 600 seconds.

- **Command Type**

  Enables you to specify the type of execution for the command.

  - **Standard execution**

    Enables the command to be executed without any waiting period. Standard execution is selected by default.

  - **Wait for condition**

    Enables you to specify the time (in seconds) for which the command has to wait before execution. The default value is 60 seconds.

- **Minimum Software Versions**

  Specifies the minimum versions of the software that are required for the command to operate. For example, the software can be clustered Data ONTAP 8.2.0 and vCenter 6.0. The versions are displayed as comma-separated values.

Code tab

Enables you to enter the code for the command in the selected scripting language. You can add a new scripting language by selecting the required language from the Script language drop-down list.

- **Discover Parameters**

  Copies the parameters defined in the PowerShell code to the Parameters Definition table and the Parameters Mapping table.

Parameters Definition tab

Displays the parameters defined in the code that you entered in the Code tab.

- **Name**

  Displays the name of the parameter.

- **Description**

  Displays the description of the parameter.

- **Mandatory**

  Displays a selected check box for the mandatory parameters.

- **Type**

  Displays the type of the parameter, such as string, enum, array, or password.

- **Values**

  Displays the value that is set for the parameter.

- **Add Parameter**

  Enables you to add a parameter to the command if the selected scripting language is Perl.

- **Remove Parameter**

  Enables you to remove a parameter from the command if the selected scripting language is Perl.

Parameters Mapping tab

Enables you to map the parameters to dictionary objects and to specify the attribute and object name.

- **Name**

Displays the name of the parameter.

- **Type**

  Enables you to select a dictionary object for the parameter.

- **Attribute**

  Enables you to specify the required attribute. You can either select the attribute (if available), or enter the attribute.

- **Object Name**

  Enables you to specify a name for the dictionary object.

Reservation tab

Enables you to reserve the resources that are required by the command.

- **Reservation Script**

  Enables you to enter an SQL query to reserve the resources that are required by the command. This helps ensure that the resources are available during a scheduled workflow execution.

- **Reservation Representation**

  Enables you to specify a string representation for the reservation using MVEL syntax. The string representation is used to display the details of the reservation in the Reservations window.

Verification tab

Enables you to verify a reservation and remove the reservation after the command is executed.

- **Verification Script**

  Enables you to enter an SQL query to verify the usage of the resources that were reserved by the reservation script. The verification script also verifies whether the WFA cache is updated, and removes the reservation after a cache acquisition.

- **Test Verification**

  Opens the Verification dialog box, which enables you to test the parameters of the verification script.

Command buttons

- **Test**

  Opens the Testing Command <CommandName> in <ScriptLanguage> dialog box, which enables you to test the command.

- **Save**

  Saves the command and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Edit Command Definition dialog box

The **Edit Command Definition** dialog box enables you to edit the selected command.

- Properties tab
- Code tab
- Parameters Definition tab
- Parameters Mapping tab
- Reservation tab
- Verification tab

Properties tab

The Properties tab enables you to edit the properties of the command, such as the name, description, and scripting language.

- **Name**

  Enables you to edit the name of the command. You must enter a name to save the command.

- **Entity Version**

  Enables you to enter the version number for the command in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Enables you to edit the description for the command.

- **String Representation**

  Enables you to specify a string representation for the command using MVEL syntax. You must specify the string representation to save the command.

- **Timeout (s)**

  Enables you to specify the timeout value (in seconds) for the command. The default value is 600 seconds.

- **Command Type**

  Enables you to specify the type of execution for the command.

  - **Standard execution**

    Enables the command to be executed without any waiting period. Standard execution is selected by default.

  - **Wait for condition**

Enables you to specify the time (in seconds) for the command to wait before execution. The default value is 60 seconds.

- **Minimum Software Versions**

  Specifies the minimum versions of the software that is required for the command to operate. For example, the software can be clustered Data ONTAP 8.2.0 and vCenter 6.0. The versions are displayed as comma-separated values.

Code tab

This tab enables you to edit the code for the command in Perl, PowerShell, or both. You can add a new scripting language by clicking [+] and then selecting the required language from the Script language drop-down list.

- **Test**

  Opens the Verification dialog box, which enables you to test the parameters for the specified verification script.

- **Discover Parameters**

  Copies the parameters defined in the PowerShell code to the Parameters Definition table and the Parameters Mapping table. The Discover Parameters button is disabled for the Perl codes.

Parameters Definition tab

This tab displays the parameters defined in the code that you have entered in the Code tab.

- **Name**

  Displays the name of the parameter.

- **Description**

  Displays the description of the parameter.

- **Mandatory**

  Displays a selected check box for the mandatory parameters.

- **Type**

  Displays the type of the parameter, such as string and enum.

- **Values**

  Displays the value that is set for the parameter.

- **Add Parameter**

  Enables you to add a parameter to the command if the selected scripting language is Perl.

- **Remove Parameter**

Enables you to remove a parameter from the command if the selected scripting language is Perl.

Parameters Mapping tab

This tab enables you to map the parameters to dictionary objects and to specify the attribute and object name.

- **Name**

  Displays the name of the parameter.

- **Type**

  Enables you to select the dictionary object for the parameter.

- **Attribute**

  Enables you to specify the required attribute. You can select the attribute, if available, or enter the attribute.

- **Object Name**

  Enables you to enter a name for the object.

Reservation tab

This tab enables you to reserve resources that are required by the command. For more information about reservations, see the *OnCommand Workflow Automation Workflow Developer's Guide*.

- **Reservation Script**

  Enables you to enter an SQL query to reserve resources required by the command. This ensures that the resources are available during a scheduled workflow execution.

- **Reservation Representation**

  Enables you to specify a string representation for the reservation using MVEL syntax. The string representation is used to display the details of the reservation in the Reservations window.

Verification tab

This tab enables you to verify a reservation and remove the reservation after the execution of the command is completed. For more information about verifying reservations, see the *OnCommand Workflow Automation Workflow Developer's Guide*.

- **Verification Script**

  Enables you to enter an SQL query to verify the usage of resources that were reserved by the reservation script. It also verifies if the WFA cache is updated and removes the reservation after a cache acquisition.

Command buttons

- **Save**

  Saves the changes and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Clone Command Definition dialog box

The Clone Command Definition dialog box enables you to copy a command and edit the cloned command.

- Properties tab
- Code tab
- Parameters Definition tab
- Parameters Mapping tab
- Reservation tab
- Verification tab

Properties tab

Enables you to edit the properties of the cloned command, such as the name, description, and entity version.

- **Name**

  Enables you to edit the name of the cloned command. By default, the name of the command that you have selected to clone is used as the name for the clone, appended with "- copy".

- **Entity Version**

  Enables you to edit the version number of the command in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Enables you to edit the description of the command.

- **String Representation**

  Enables you to specify a string representation for the command using MVFLEX Expression Language (MVEL) syntax. You must specify the string representation in order to save the command.

- **Timeout (s)**

  Enables you to specify the timeout value (in seconds) for the command. The default value is 600 seconds.

- **Command Type**

  Enables you to specify the type of execution for the command.

  - **Standard execution**

    Enables the command to be executed without any waiting period. Standard execution is selected by default.

◦ **Wait for condition**

Enables you to specify the time (in seconds) for which the command has to wait before execution. The default value is 60 seconds.

• **Minimum Software Versions**

Specifies the minimum versions of the software that are required for the command to operate. For example, the software can be clustered Data ONTAP 8.2.0 and vCenter 6.0. The versions are displayed as comma-separated values.

• **Retain reservation and verification scripts from original command**

Enables you to retain the reservation and verification scripts that were originally specified for the command that you want to clone.

Code tab

Enables you to edit the code for the command.

• **Discover Parameters**

Copies the parameters defined in the PowerShell code to the Parameters Definition table and the Parameters Mapping table.

Parameters Definition tab

Displays the parameters defined in the code that you entered in the Code tab.

• **Name**

Displays the name of the parameter.

• **Description**

Displays the description of the parameter.

• **Mandatory**

Displays a selected check box for the mandatory parameters.

• **Type**

Displays the type of the parameter, such as string or enum.

• **Values**

Displays the values that are set for the parameter.

• **Add Parameter**

Enables you to add a parameter to the command if the selected scripting language is Perl.

• **Remove Parameter**

Enables you to remove a parameter from the command if the selected scripting language is Perl.

Parameters Mapping tab

Enables you to map the parameters to dictionary objects and to specify the attribute and object name.

- **Name**

Displays the name of the parameter.

- **Type**

Enables you to select a dictionary object for the parameter.

- **Attribute**

Enables you to specify the required attribute. You can either select the attribute (if available), or enter the name of the attribute.

- **Object Name**

Enables you to specify a name for the dictionary object.

Reservation tab

Enables you to reserve the resources that are required by the command.

- **Reservation Script**

Enables you to enter an SQL query to reserve the resources that are required by the command. This helps ensure that the required resources are available during a scheduled workflow execution.

- **Reservation Representation**

Enables you to specify a string representation for the reservation using MVEL syntax. The string representation is used to display the details of the reservation in the Reservations window.

Verification tab

Enables you to verify a reservation and remove the reservation after the command is executed.

- **Verification Script**

Enables you to enter an SQL query to verify the usage of the resources that were reserved by the reservation script. The verification script also verifies whether the WFA cache is updated, and removes the reservation after a cache acquisition.

- **Test Verification**

Opens the Verification dialog box, which enables you to test the parameters of the verification script.

Command buttons

- **Test**

  Opens the Testing Command <CommandName> in <ScriptLanguage> dialog box, which enables you to test the command.

- **Save**

  Saves the command and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Functions window

The Functions window displays the available OnCommand Workflow Automation (WFA) functions and enables you to manage these functions.

Functions are complementary tools for performing significant or black-boxed operations that are required for planning workflow executions. Functions are processed during the planning phase. Functions can be used to complete repetitive and complex tasks, such as defining a complex naming convention. Functions run in their own sandbox and might use other functions during execution. Functions are written in MVFLEX Expression Language (MVEL).

Functions table

The Functions table lists the available WFA functions. Each entry is identified as one of the following:

- 👤 - content created by users
- ⚙ - content developed by Professional Services (PS), which is available only on custom installations made by PS
- 👤 - packs developed by users
- 🔒 - content created by users that is locked
- 🔷 - NetApp-certified content

You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- 🔽 enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking 🔽 clears and resets the filtering selections.
- ▼ on each column header enables you to filter based on the content of the columns. Clicking ▼ in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search

using supported operators for the applicable column type, Alphabetic or Numeric.

The Functions table contains the following columns:

- **Certification**

  Indicates whether the function is user-created (), PS (), community (), user-locked (), or NetApp-certified ().

- **Name**

  Displays the name of the function.

- **Entity Version**

  Displays the version number of the object in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Displays the description of the functions.

- **Last Updated On**

  Displays the date and time when the function was last updated.

- **Updated By**

  Displays the user who updated the function.

- **Locked By**

  Displays the user who locked the function.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(New)**

  Opens the New Function window, which enables you to create a new function.

- **(Edit)**

  Opens the Function <EntryName> window for the selected function, which enables you to edit the function.

- **(Clone)**

  Opens the New Function <EntryName>_copy window, which enables you to create a copy of the selected function.

- **(Lock)**

  Opens the Lock the Function confirmation dialog box, which enables you to lock the selected function. This

option is enabled only for the functions that you have created.

- 🔓 **(Unlock)**

  Opens the Unlock the Function confirmation dialog box, which enables you to unlock the selected function.

  This option is enabled only for the functions that you have locked. Administrators can unlock functions that were locked by other users.

- 🗑 **(Delete)**

  Opens the Delete Function confirmation dialog box, which enables you to delete the selected user-created function.

  > ⓘ | You cannot delete a WFA or PS function.

- 📤 **(Export)**

  Enables you to export the selected user-created function.

  > ⓘ | You cannot export a WFA or PS function.

- ✅ **(Test)**

  Opens the Test dialog box, which enables you to test the selected function.

- ➕ **(Add To Pack)**

  Opens the Add To Pack Functions dialog box, which enables you to add the function and its dependable entities to a pack, which is editable.

  > ⓘ | The Add To Pack feature is enabled for functions with certification set to None and Lock.

- ❌ **(Remove From Pack)**

  Opens the Remove From Pack Functions dialog box for the selected function, which enables you to delete or remove the function from the pack.

  > ⓘ | The Remove From Pack feature is enabled for functions with certification set to None and Lock.

Templates window

The Templates window displays the available templates in alphabetical order. A template is a collection of settings that can be used when creating workflows. You can use templates to create workflows quickly.

> ⓘ | Depending on your role and account privileges, this window might not be displayed.

- Templates table

- Toolbar

Templates table

The Templates table lists the available templates. Each entry is identified as one of the following:

- 👤 - content created by users
- ⚙ - content developed by Professional Services (PS), which is available only on custom installations made by PS
- 👤 - packs developed by users
- 🔒 - content created by users that is locked
- 🔷 - NetApp-certified content

You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- 🔽 enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking 🔽 clears and resets the filtering selections.
- ▼ on each column header enables you to filter based on the content of the columns. Clicking ▼ in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The Templates table contains the following columns:

- **Certification**

  Indicates whether the template is user-created (👤), PS (⚙), community (👤), user-locked (🔒), or NetApp-certified (🔷).

  You can search for templates by selecting the required check boxes from the filter list.

- **Name**

  Displays the name of the template.

- **Scheme**

  Displays the scheme associated with the template. A scheme represents the data model for a system. For example, a vc scheme contains data relevant to your virtual environment, such as virtual machines, hosts, and datastores.

- **Type**

  Displays the dictionary object type of the template—for example, volume and Snapshot_Policy.

- **Entity Version**

Displays the version number of the object in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Displays the description of the template.

- **Last Updated On**

  Displays the date and time when the template was last updated.

- **Updated By**

  Displays the name of the user who updated the template.

- **Locked By**

  Displays the name of the user who locked the template.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(New)**

  Opens the New Template dialog box, which enables you to create a new template.

- **(Edit)**

  Opens the Template <template_name> dialog box, which enables you to modify the settings of the selected template. You can also double-click the template to open the Template <template_name> dialog box.

- **(Clone)**

  Opens the New Template <template_name> - copy dialog box, which enables you to create a clone or copy of the selected template.

- **(Lock)**

  Opens the Lock Template confirmation dialog box, which enables you to lock the selected template. This option is enabled only for the templates that you have created.

- **(Unlock)**

  Opens the Unlock Template confirmation dialog box, which enables you to unlock the selected template. This option is enabled only for the templates that is locked by you. However, administrators can unlock templates that were locked by other users.

- **(Delete)**

  Opens the Delete Template confirmation dialog box, which enables you to delete the selected user-created template.

(i) You cannot delete a sample template.

- **(Export)**

Enables you to export the selected user-created template.

(i) You cannot export a sample template.

- **(Add To Pack)**

Opens the Add To Pack Templates dialog box, which enables you to add the template and its dependable entities to a pack, which is editable.

(i) The Add To Pack feature is enabled only for templates for which the certification is set to **None.**

- **(Remove From Pack)**

Opens the Remove From Pack Templates dialog box for the selected template, which enables you to delete or remove the template.

(i) The Remove From Pack feature is enabled only for templates for which the certification is set to **None.**

New Template dialog box

The New Template dialog box enables you to create a new template.

- **Name**

Enables you to enter a name for the template.

- **Type**

Enables you to select a dictionary object from the list.

- **Entity Version**

Enables you to enter the version number for the template in `major.minor.revision` format—for example, 1.0.0.

- **Description**

Enables you to enter a description for the template.

- **Attributes**

Displays the attributes for the selected dictionary object and enables you to enter a value for each attribute, such as enum and function.

Command buttons

- **Save**

  Saves the template and closes the dialog box.

- **Cancel**

  Does not save the template and closes the dialog box.

Edit Template dialog box

The Edit Template dialog box enables you to edit a template.

- **Name**

  Enables you to edit the name of the template.

- **Type**

  Enables you to select a dictionary object from the list.

- **Entity Version**

  Enables you to enter the version number for the template in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Enables you to edit the description for the template.

- **Attributes**

  Displays the attributes for the selected dictionary object and enables you to enter a value for each attribute, such as enum and function.

Command buttons

- **Save**

  Saves the changes and closes the dialog box.

- **Cancel**

  Does not save the changes, if any, and closes the dialog box.

Clone Template dialog box

The Clone Template dialog box enables you to create a copy of the template and edit the template.

- **Name**

Enables you to edit the name of the template.

- **Type**

  Enables you to select a dictionary object from the list. The name of the template you have selected to clone is used as the name for the clone and appended with - copy by default.

- **Entity Version**

  Enables you to enter the version number for the template in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Enables you to edit the description for the template.

- **Attributes**

  Displays the attributes for the selected dictionary object and enables you to enter a value for each attribute, such as enum and function.

Command buttons

- **Save**

  Saves the template and closes the dialog box.

- **Cancel**

  Does not save the template and closes the dialog box.

Schemes window

The Schemes window displays the available schemes and enables you to manage the schemes. OnCommand Workflow Automation (WFA) uses schemes to acquire data relevant to an environment.

A scheme represents the data model for a system. The data model is a collection of dictionary entries. You can define a scheme and then define a data source type. The data source defines how the data is acquired and the scheme is populated. For example, a *vc scheme* contains data relevant to your virtual environment, such as virtual machines, hosts, and datastores.

Schemes table

The Schemes table lists the available scheme entries. Each entry is identified as one of the following:

- - content created by users
- - content developed by Professional Services (PS), which is available only on custom installations made by PS
- - packs developed by users
- - content created by users that is locked

- - NetApp-certified content

You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking clears and resets the filtering selections.
- on each column header enables you to filter based on the content of the columns. Clicking in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The Schemes table contains the following columns:

- **Certification**

  Indicates whether the scheme is user-created (), PS (), community (), user-locked (), or NetApp-certified ().

- **Name**

  Displays the name of the scheme.

  You can search for a scheme by entering its name in the **Search** filter text box.

- **Display Name**

  Displays the name of the scheme.

  You can search for a scheme by entering its name in the **Search** filter text box.

- **Entity Version**

  Displays the version number of the object in `major.minor.revision` format—for example, 1.0.0.

  You can search for a scheme by entering the version number in the **Search** filter text box.

- **Description**

  Displays the description of the scheme.

  You can search for a scheme by entering its description in the **Search** filter text box.

- **Type**

  Indicates whether the scheme is used to acquire data from a remote system or directly from workflows or commands. Possible values are Data Source Acquisition and Other.

  You can search for schemes by entering the type in the **Search** filter text box.

- **Reset Flag**

  Indicates whether the scheme is reset during the next data acquisition cycle. Possible values are true and false.

- **Last Updated On**

  Displays the date and time when the scheme was last updated.

  You can search for schemes by selecting the required time category from the filter drop-down list.

- **Updated By**

  Displays the name of the user who updated the scheme.

  You can search for schemes by entering the user name in the **Search** filter text box.

- **Locked By**

  Displays the name of the user who locked the scheme.

  You can search for schemes by entering the user name in the **Search** filter text box.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(New)**

  Opens the New Schemes dialog box, which enables you to create a new scheme.

- **(Edit)**

  Opens the Scheme <SchemeName> dialog box for the selected scheme, which enables you to edit the scheme.

- **(Lock)**

  Opens the Lock the Scheme confirmation dialog box, which enables you to lock the selected scheme. This option is enabled only for the schemes that you created.

- **(Unlock)**

  Opens the Unlock the Scheme confirmation dialog box, which enables you to unlock the selected scheme. This option is enabled only for the schemes that you locked. Administrators can unlock schemes that are locked by other users.

- **(Delete)**

  Opens the Delete Scheme confirmation dialog box, which enables you to delete the selected user-created schemes.

  > (i) You cannot delete a WFA or PS scheme.

- **(Export)**

    Enables you to export the selected user-created scheme.

    > You cannot export a WFA or PS scheme.

- **(Reset Scheme)**

    Enables you to reset the scheme during the next data acquisition cycle.

- **(Add To Pack)**

    Opens the Add To Pack Schemes dialog box, which enables you to add the scheme and its dependable entities to a pack, which is editable.

    > The Add To Pack feature is enabled only for schemes for which the certification is set to **None.**

- **(Remove From Pack)**

    Opens the Remove From Pack Schemes dialog box for the selected scheme, which enables you to delete or remove the scheme from the pack.

    > The Remove From Pack feature is enabled only for schemes for which the certification is set to **None.**

Dictionary window

The Dictionary window displays the available dictionary entries in alphabetical order.

A dictionary entry is the definition of an object type that is supported by OnCommand Workflow Automation (WFA). Each dictionary entry represents an object type and its relationships in the storage and storage-related environments. Dictionary entries are converted to tables in the databases.

> Depending on your role and account privileges, this window might not be displayed.

Dictionary table

The Dictionary table lists the available dictionary entries. Each entry is identified as one of the following:

- - content created by users
- - content developed by Professional Services (PS), which is available only on custom installations made by PS
- - packs developed by users
- - content created by users that is locked
- - NetApp-certified content

You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- ![filter icon] enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.

- Double-clicking ![filter icon] clears and resets the filtering selections.

- ![filter icon] on each column header enables you to filter based on the content of the columns. Clicking ![filter icon] in a column allows you to filter on a specific item from the drop-down list or on all available items.

- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).

- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.

- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The Dictionary table contains the following columns:

- **Certification**

  Indicates whether the dictionary entry is user-created (![icon]), PS (![icon]), community (![icon]), user-locked (![icon]), or NetApp-certified (![icon]).

- **Name**

  Displays the name of the dictionary entry.

- **Scheme**

  Displays the scheme associated with the dictionary entries. A scheme is a collection of dictionary entries that contain data relevant to your environment. (For example, a vc scheme contains data relevant to your virtual environment, such as virtual machines, hosts, and datastores.)

- **Entity Version**

  Displays the version number of the object in `major.minor.revision` format—for example, 1.0.0.

- **Description**

  Displays the description of the dictionary entry.

- **Acquisition Enabled**

  Displays a check mark for the dictionary entries that are enabled for data acquisition.

- **Last Updated On**

  Displays the date and time when the dictionary entry was last updated.

- **Updated By**

  Displays the name of the user who updated the dictionary entry.

- **Locked By**

  Displays the name of the user who locked the dictionary entry.

- **Natural Keys**

Displays the natural keys associated with the dictionary entries.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- (New)

  Opens the New Dictionary Entry window, which enables you to create a new dictionary entry.

- (Edit)

  Opens the Dictionary Entry <EntryName> window for the selected dictionary entry, which enables you to edit the dictionary entry.

- (Clone)

  Opens the New Dictionary Entry <EntryName>_copy window, which enables you to create a copy of the selected dictionary entry.

- (Lock)

  Opens the Lock the Dictionary Entry confirmation dialog box, which enables you to lock the selected dictionary entry.

  This option is enabled only for the dictionary entries that you have created.

- (Unlock)

  Opens the Unlock the Dictionary Entry confirmation dialog box, which enables you to unlock the selected dictionary entry.

  This option is enabled only for the dictionary entries that you have locked. Administrators can unlock dictionary entries that were locked by other users.

- (Delete)

  Opens the Delete Dictionary Entry confirmation dialog box, which enables you to delete the selected user-created dictionary entry.

  > ⓘ You cannot delete a WFA dictionary entry or PS dictionary entry.

- (Export)

  Enables you to export the selected user-created dictionary entry.

  > ⓘ You cannot export a WFA dictionary entry or PS dictionary entry.

- (Enable Acquisition)

  Provides the option to enable cache acquisition for the selected dictionary entry.

- **(Disable Acquisition)**

  Enables you to disable cache acquisition for the selected dictionary entry.

- **(Reset Scheme)**

  Enables you to reset the scheme associated with the selected dictionary entry.

- **(Add To Pack)**

  Opens the Add To Pack Dictionary dialog box, which enables you to add the dictionary entry and its dependable entities to a pack, which is editable.

  > The Add To Pack feature is enabled only for the dictionary entries for which the certification is set to **None.**

- **(Remove From Pack)**

  Opens the Remove From Pack Dictionary dialog box for the selected dictionary entry, which enables you to delete or remove the dictionary entry from the pack.

  > The Remove From Pack feature is enabled only for dictionary entries for which the certification is set to **None.**

- **(Inventory)**

  Opens the Inventory dialog box for the selected dictionary entry, which enables you to see the table data.

New Dictionary Entry dialog box

The New Dictionary Entry dialog box enables you to create a new dictionary object and specify a definition for the object.

- **Name of object type**

  Enables you to specify a name for the dictionary object.

- **Description**

  Enables you to provide a description for the dictionary object.

- **Scheme**

  Enables you to select a scheme that should be associated with the object. You can add custom dictionary entries to the certified schemes.

- **Entity Version**

  Enables you to enter the version number for the dictionary entry in `major.minor.revision` format—for example, 1.0.0.

Attribute table

Enables you to specify a list of attributes that define the dictionary object.

- **Name**

  Enables you to enter a name for the attribute.

- **Type**

  Enables you to select the type of the attribute—such as string, boolean, and integer—for type checking. You can also reference a dictionary entry from the selected scheme.

- **String length**

  Enables you to specify the length of the string in numerals, if string type is selected for the attribute.

- **Values**

  Enables you to specify a list of comma-separated values, if enum type is selected for the attribute.

- **Natural key**

  Enables you to specify whether the dictionary attribute is part of the dictionary object's natural key.

  A natural key is the unique identifier of a dictionary object. For example, qtrees are identified by the qtree name, the volume name, and the array IP address.

- **To be Cached**

  Enables you to specify whether the attribute should be cached.

  A dictionary entry can include both attributes that are cached and attributes that are not cached. A cache table is created and populated with the attributes that are marked for caching during the cache acquisition of the scheme. A cache table is created for a dictionary object when at least one attribute is selected to be cached.

- **Can be Null**

  Enables you to specify whether the value of the attribute can be null. This setting is valid only for attributes that are selected to be cached.

- **Description**

  Enables you to specify a description for the attribute.

- **Values in natural key columns are case sensitive**

  Enables you to specify that the natural keys are case-sensitive.

- **Command buttons**
  - **Add row**

    Enables you to add a row to the table that is used to specify an attribute.

  - **Remove row**

Enables you to delete the selected row.

Edit Dictionary Entry dialog box

The Dictionary Entry <EntryName> dialog box enables you to edit a dictionary object and its definition.

- **Name of object type**

  Enables you to specify a name for the dictionary object.

- **Description**

  Enables you to provide a description for the dictionary object.

- **Scheme**

  You must not edit the scheme of a dictionary object. If you change the scheme, saving the dictionary entry fails. You can clone the dictionary entry to edit its scheme.

- **Entity Version**

  Enables you to enter the version number for the dictionary entry in `major.minor.revision` format—for example, 1.0.0.

Attribute table

Enables you to specify a list of attributes that define the dictionary object.

- **Name**

  Enables you to enter the name of the attribute.

- **Type**

  Enables you to select the type of the attribute—such as string, boolean, and integer—for type checking. You can also reference a dictionary entry from the selected scheme.

- **String length**

  Enables you to specify the length of the string in numerals, if string type is selected for the attribute.

- **Values**

  Enables you to specify a list of comma-separated values, if enum type is selected for the attribute.

- **Natural key**

  Enables you to specify whether the dictionary attribute is part of the dictionary object's natural key.

  A natural key is the unique identifier of a dictionary object. For example, qtrees are identified by the qtree name, the volume name, and the array IP address.

- **To be Cached**

Enables you to specify whether the attribute should be cached.

A dictionary entry can include both attributes that are cached and attributes that are not cached. A cache table is created and populated with the attributes that are marked for caching during the cache acquisition of the scheme. A cache table is created for a dictionary object when at least one attribute is selected to be cached.

- **Can be Null**

  Enables you to specify whether the value of the attribute can be null. This setting is valid only for attributes that are selected to be cached.

- **Description**

  Enables you to specify a description for the attribute.

- **Values in natural key columns are case sensitive**

  Enables you to specify that the natural keys are case-sensitive.

- **Command buttons**

  - **Add row**

    Enables you to add a row to the table that is used to specify an attribute.

  - **Remove row**

    Enables you to delete the selected row.

Clone Dictionary Entry dialog box

The New Dictionary Entry <EntryName_copy> dialog box enables you to copy a dictionary object and edit the definition of the cloned dictionary object.

- **Name of object type**

  Enables you to specify a name for the cloned dictionary object.

- **Description**

  Enables you to provide a description for the cloned dictionary object.

- **Scheme**

  Enables you to select a scheme that should be associated with the cloned dictionary object. You can add custom dictionary entries to the certified schemes.

- **Entity Version**

  Enables you to enter the version number for the cloned dictionary entry in `major.minor.revision` format—for example, 1.0.0.

Attribute table

Enables you to specify a list of attributes that define the cloned dictionary object.

- **Name**

  Enables you to enter the name of the attribute.

- **Type**

  Enables you to select the type of the attribute—such as string, boolean, and integer—for type checking. You can also reference a dictionary entry from the selected scheme.

- **String length**

  Enables you to specify the length of the string in numerals, if string type is selected for the attribute.

- **Values**

  Enables you to specify a list of comma-separated values, if enum type is selected for the attribute.

- **Natural key**

  Enables you to specify whether the dictionary attribute is part of the dictionary object's natural key.

  A natural key is the unique identifier of a dictionary object. For example, qtrees are identified by the qtree name, the volume name, and the array IP address.

- **To be Cached**

  Enables you to specify whether the attribute should be cached.

  A dictionary entry can include both attributes that are cached and attributes that are not cached. A cache table is created and populated with the attributes that are marked for caching during the cache acquisition of the scheme. A cache table is created for a dictionary object when at least one attribute is selected to be cached.

- **Can be Null**

  Enables you to specify whether the value of the attribute can be null. This setting is valid only for attributes that are selected to be cached.

- **Description**

  Enables you to specify a description for the attribute.

- **Values in natural key columns are case sensitive**

  Enables you to specify that the natural keys are case-sensitive.

- **Command buttons**
  - **Add row**

    Enables you to add a row to the table that is used to specify an attribute.

  - **Remove row**

Enables you to delete the selected row.

Data Source Types window

The Data Source Types window displays the available data source types. You can manage the data source types from this window.

A data source type is used to define a data source, which contains information about where the data in a specific database originates from and the method used to acquire data from the data source. For example, a data source can be either an Active IQ Unified Manager database that contains information about a storage environment or a VMware database with information about a data center.

Data Source Types table

The Data Source Types table lists the available data source types. Each entry is identified as one of the following:

- 👤 - content created by users
- 🐞 - content developed by Professional Services (PS), which is available only on custom installations made by PS
- 👤 - packs developed by users
- 🔒 - content created by users that is locked
- ⚙ - NetApp-certified content

You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- ▽ enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking ▽ clears and resets the filtering selections.
- ▼ on each column header enables you to filter based on the content of the columns. Clicking ▼ in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The Data Source Types table contains the following columns:

- **Certification**

  Indicates whether the data source type is user-created (👤), PS (🐞), community (👤), user-locked (🔒), or NetApp-certified (⚙).

- **Data Source**

  Displays the name of the data source type.

- **Scheme**

  Displays the scheme associated with the data source type. A scheme represents the data model for a system. For example, a vc scheme contains data relevant to your virtual environment, such as virtual machines, hosts, and datastores.

  The following are the default schemes that are selected by default:

  - cm_performance
  - cm_storage
  - performance
  - storage
  - vc

- **Entity Version**

  Displays the version number of the object in `major.minor.revision` format—for example, 1.0.0.

- **OS Compatibility**

  Indicates whether the data source type is compatible with the host operating system.

- **Last Updated On**

  Displays the date and time when the data source type was last updated.

- **Updated By**

  Displays the user who updated the data source type.

- **Data Source Version**

  Displays the version of the data source that is associated with the data source type.

- **Data Source Driver**

  Displays the driver type that is used to acquire data from the data source.

- **Method**

  Displays the method that is used to acquire data from the data source, such as SQL and script.

- **Script Language**

  Displays the scripting language that is used by the data source type.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(New)**

  Opens the New Data Source Type window, which enables you to create a new data source type.

- ![Edit icon] **(Edit)**

  Opens the Data Source Type <EntryName> window for the selected data source type, which enables you to edit the data source type.

- ![Clone icon] **(Clone)**

  Opens the New Data Source Type <EntryName> window, which enables you to create a copy of the selected data source type.

- ![Lock icon] **(Lock)**

  Opens the Lock the Data Source Type confirmation dialog box, which enables you to lock the selected user-created source data type.

- ![Unlock icon] **(Unlock)**

  Opens the Unlock the Data Source Type confirmation dialog box, which enables you to unlock the selected data source type. This option is enabled only for the data source types that you locked. Administrators can unlock data source types that are locked by other users.

- ![Delete icon] **(Delete)**

  Opens the Delete Data Source Type confirmation dialog box, which enables you to delete the selected user-created data source type.

  > ⓘ You cannot delete a WFA or PS data source type.

- ![Export icon] **(Export)**

  Enables you to export the selected user-created data source type.

  > ⓘ You cannot export a WFA or PS data source type.

- ![Add To Pack icon] **(Add To Pack)**

  Opens the Add To Pack Data Source Type dialog box, which enables you to add the data source type and its dependable entities to a pack, which is editable.

  > ⓘ The Add To Pack feature is enabled only for data source types for which the certification is set to None.

- ![Remove From Pack icon] **(Remove From Pack)**

  Opens the Remove From Pack Data Source dialog box for the selected data source type, which enables you to delete or remove the data source type from the pack.

  > ⓘ The Remove From Pack feature is enabled only for data sources types for which the certification is set to None.

Remote System Types window

The Remote System Types window displays the type of remote systems that OnCommand Workflow Automation (WFA) can work with. The remote systems include clustered Data ONTAP, Cloud Manager, Active IQ Unified Manager, DataFabric Manager server, and E-Series systems.

- Remote System Types table
- Toolbar

Remote System Types table

The remote system types table lists in tabular format the remote systems that WFA can work with. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- ⛁ enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking ⛁ clears and resets the filtering selections.
- ▼ on each column header enables you to filter based on the content of the columns. Clicking ▼ in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The remote system types table contains the following columns:

- **Name**

  Displays the name of the remote system type.

  You can search for a remote system type by entering its name in the **Search** filter text box.

- **Entity Version**

  Displays the current version of the remote system type in `major.minor.revision` format—for example, 1.0.0.

  You can search for a remote system type by entering the version number in the **Search** filter text box.

- **Description**

  Displays the description of the remote system type.

  You can search for a remote system type by entering its description in the **Search** filter text box.

- **Last Updated On**

  Displays the date and time when the remote system type was last updated.

You can search for remote system types by selecting the required time category from the filter drop-down list.

- **Updated By**

  Displays the name of the user who updated the remote system type.

  You can search for remote system types by entering the user name in the **Search** filter text box.

- **Locked By**

  Displays the name of the user who locked the remote system type.

  You can search for remote system types by entering the user name in the **Search** filter text box.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- (New)

  Opens the New Remote System Type dialog box, which enables you to enter the details to add a new remote system type to WFA.

- (Edit)

  Opens the Remote System Type <RemoteSystemTypeName> dialog box for the selected remote system type, which enables you to edit the remote system type.

- (Clone)

  Opens the New Remote System Type <RemoteSystemTypeName> - copy dialog box, which enables you to create a clone or copy of the selected remote system type.

- (Lock)

  Opens the Lock Remote System Type confirmation dialog box, which enables you to lock the selected remote system type. This option is enabled only for the remote system types that you created.

- (Unlock)

  Opens the Unlock Remote System Type confirmation dialog box, which enables you to unlock the selected remote system type. This option is enabled only for the remote system types that you locked. Administrators can unlock remote system types that are locked by other users.

- (Delete)

  Opens the Delete Remote System Type confirmation dialog box, which enables you to delete the selected remote system type.

- (Export)

  Enables you to export the selected remote system type.

- **(Add To Pack)**

    Opens the Add To Pack Remote System Types dialog box, which enables you to add the remote system type and its dependable entities to a pack, which is editable.

     The Add To Pack feature is enabled only for remote system types for which the certification is set to **None.**

- **(Remove From Pack)**

    Opens the Remove From Pack Remote System Types dialog box for the selected remote system type, which enables you to delete or remove the remote system type from the pack.

     The Remove From Pack feature is enabled only for remote system types for which the certification is set to **None.**

New Remote System Type dialog box

The New Remote System Type dialog box enables you to add a new remote system type to OnCommand Workflow Automation (WFA) if a predefined system type does not meet your requirement or if you want to change the configuration of a predefined system type.

- Details tab
- Validation Script tab

Details tab

Enables you to specify the details of the remote system type, such as the name, description, version, and connection protocol.

- **Name**

    Enables you to specify a name for the remote system type. You must specify a name in order to save the remote system type.

- **Description**

    Enables you to enter a description for the remote system type.

- **Version**

    Enables you to specify the version number for the remote system type in `major.minor.revision` format—for example, 1.0.0.

- **Connection Protocol**

    Enables you to select one of the following protocols that should be used by WFA when connecting to the remote system:

    ◦ HTTPS with fallback to HTTP

        The connection primarily uses HTTPS. If connection through HTTPS fails, HTTP is used. If connection

through HTTP also fails, the connection attempt is dropped.

- ◦ HTTPS Only
- ◦ HTTP Only
- ◦ Custom

When you select a connection protocol, the protocol, default port, and default timeout (sec) fields are populated with data.

Validation Script tab

Enables you to test the connectivity of the selected protocol with the remote system type.

You can click **Test Perl Script** to run the script for testing the connectivity.

Command buttons

- **Save**

  Saves the configuration settings of the remote system type and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Edit Remote System Type dialog box

The Edit Remote System Type dialog box enables you to modify the name, description, version, protocol, default port, and default timeout of an existing remote system type. You cannot modify a NetApp-certified remote system type.

- Details tab
- Validation Script tab

Details tab

Enables you to edit the details of the remote system type, such as the name, description, version, and connection protocol.

- **Name**

  Enables you to edit the name of the remote system type.

- **Description**

  Enables you to modify the description of the remote system type.

- **Version**

  Enables you to edit the version number of the remote system type in `major.minor.revision` format— for example, 1.0.0.

- **Connection Protocol**

  Enables you to select one of the following protocols that should be used by OnCommand Workflow Automation (WFA) when connecting to the remote system:

  - ◦ HTTPS with fallback to HTTP

    The connection primarily uses HTTPS. If connection through HTTPS fails, HTTP is used. If connection through HTTP also fails, the connection attempt is dropped.

  - ◦ HTTPS Only

  - ◦ HTTP Only

  - ◦ Custom

When you select a connection protocol, the protocol, default port, and default timeout (sec) fields are populated with data.

Validation Script tab

Enables you to provide a validation script to test the connectivity of the remote system. The validation script must be written in Perl and must include the following function: checkCredentials (`$host`, `$user`, `$password`, `$protocol`, `$port`, `$timeout`). During validation, WFA calls the checkCredentials function with the values that are configured for the remote system type and the connection protocol. The function returns the value "1" on successful validation of connectivity or "0" on failure of connection validation.

You can click **Test Perl Script** to run the script for testing the connectivity.

Command buttons

- **Save**

  Saves the modified configuration settings of the remote system type and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Cache Queries window

The Cache Queries window enables you to manage cache queries for the WFA dictionary entries and their associated data source types.

A cache query is an SQL query that retrieves the required data from the table specified in the query. A cache query is associated with a dictionary entry and one or more data source types. You can define a cache query when you want retrieve some information, such as volume from a table of a data source OnCommand Unified Manager 6.0 into the WFA cache.

- Cache Queries table
- Toolbar

Cache Queries list

The Cache Queries table lists the dictionary entries and their associated data source types. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking clears and resets the filtering selections.
- on each column header enables you to filter based on the content of the columns. Clicking in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The Cache Queries table contains the following columns:

- **Certification**

  Indicates whether the cache query is user-created (), PS (), community (), user-locked (), or NetApp-certified ().

- **Scheme**

  Indicates a scheme name (schema) that contains data that is relevant to your environment. For example, a **cm_storage** caching scheme contains data relevant to clustered Data ONTAP. The relevant scheme information is obtained from the data source.

- **Dictionary Entry**

  Displays the dictionary entry associated with the scheme.

- **Entity Version**

  Displays the version number of the object in `major.minor.revision` format—for example, 1.0.0.

- **Data Source Types**

  Displays the data source type associated with the dictionary entry.

- **Last Updated On**

  Displays the date and time when the cache query was last updated.

- **Updated By**

  Displays the user who updated the cache query.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(New)**

  Opens the Add Cache Query dialog box, which enables you to create a cache query.

- **(Edit)**

  Opens the Edit Cache Query dialog box for the selected cache query, which enables you to edit the cache query.

- **(Clone)**

  Opens the Add Cache Query dialog box, which enables you to create a clone or copy of the selected cache query.

- **(Lock)**

  Opens the confirmation dialog box, which enables you to lock the selected cache query.

- **(Unlock)**

  Opens the confirmation dialog box, which enables you to unlock the selected cache query. This option is enabled only for the cache queries that are locked by you. However, administrators can unlock cache queries locked by other users.

- **(Delete)**

  Opens the confirmation dialog box, which enables you to delete the selected user-created cache query.

  > ⓘ   You cannot delete a WFA, PS, or sample cache queries.

- **(Export)**

  Opens the confirmation dialog box, which enables you to export the selected user-created cache query.

  > ⓘ   You cannot export a WFA, PS, or sample cache queries.

- **(Test)**

  Opens the Test Cache Query dialog box, which enables you to test the selected cache query.

- **(Add To Pack)**

  Opens the Add To Pack Cache Query dialog box, which enables you to add the cache query and its dependable entities to a pack, which is editable.

  > ⓘ   The Add To Pack feature is enabled only for the cache query for which the certification is set to **None.**

- **(Remove From Pack)**

  Opens the Remove From Pack Cache Query dialog box for the selected cache query, which enables you to delete or remove the cache query from the pack.

  > The Remove From Pack feature is enabled only for cache query for which the certification is set to **None.**

Add Cache Query dialog box

The Add Cache Query dialog box enables you to create a new cache query for a dictionary entry and associate the query with a data provide type, such as a specific Active IQ Unified Manager version.

- **Dictionary Entry**

  Enables you to select a dictionary entry for which you want to create a cache query.

- **Entity Version**

  Enables you to enter the version number for the cache query in `major.minor.revision` format—for example, 1.0.0.

- **Data Source Types**

  Enables you to select the data source types you want to associate with the cache query—for example, Active IQ Unified Manager_6.0.

Table Structure

- **Attributes tab**

  Displays the attributes associated with the dictionary entry.

- **Create Table SQL tab**

  Displays the Create Table script for that dictionary entry.

SQL select query

Enables you to enter the SQL select query that retrieves data from the table of the specified data provider.

Command buttons

- **Test**

  Enables you to test the SQL query entered in the **SQL select query** field.

- **Save**

  Saves the cache query and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Edit Cache Query dialog box

The Edit Cache Query dialog box enables you to edit a cache query associated with a dictionary entry.

- **Dictionary Entry**

  Specifies a dictionary entry associated with the cache query.

- **Entity Version**

  Enables you to enter the version number for the cache query in `major.minor.revision` format—for example, 1.0.0.

- **Data Source Types**

  Specifies the data source type associated with the cache query.

Table Structure

Displays the attributes and the SQL syntax associated with the dictionary entry.

- **SQL select query**

  Enables you to edit the SQL query associated with the dictionary entry and the selected data provider type.

Command buttons

- **Test**

  Enables you to test the SQL query entered in the **SQL select query** field.

- **Save**

  Saves the cache query and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Clone Cache Query dialog box

The Edit Cache Query dialog box enables you to edit a cache query associated with a dictionary entry.

- **Dictionary Entry**

  Specifies a dictionary entry associated with the cache query.

- **Entity Version**

  Enables you to enter the version number for the cache query in `major.minor.revision` format—for example, 1.0.0.

- **Data Source Types**

  Specifies the data source type associated with the cache query.

Table Structure

Displays the attributes and the SQL syntax associated with the dictionary entry.

- **SQL select query**

  Specifies the SQL query associated with the dictionary entry and the selected data provider type.

Command buttons

- **Test**

  Enables you to test the SQL query entered in the SQL select query field.

- **Save**

  Saves the cache query as a new entry in the Cache Queries table and closes the dialog box.

- **Cancel**

  Cancels changes, if any, and closes the dialog box.

Packs window

The Packs window displays the OnCommand Workflow Automation WFA packs that are imported and available in the WFA server. Each pack contains the pack information file and WFA content, such as workflows, commands, filters, functions, finders, and templates.

- Packs table
- Toolbar

Packs table

The packs table lists in tabular format the WFA packs that are available in the WFA server. You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking clears and resets the filtering selections.
- on each column header enables you to filter based on the content of the columns. Clicking in a

column allows you to filter on a specific item from the drop-down list or on all available items.

- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The packs table contains the following columns:

- **Certification**

  Indicates whether the pack is user-created ( ), PS ( ), community ( ), user-locked ( ), or NetApp-certified ( )

  You can search for packs by selecting the required option check boxes from the filter list.

- **Name**

  Displays the name of the pack.

  You can search for a pack by entering its name in the **Search** filter text box.

- **Description**

  Displays the description of the pack.

  You can search for a pack by entering its description in the **Search** filter text box.

- **Entity Version**

  Displays the version number of the pack in `major.minor.revision` format—for example, 1.0.0.

- **Last Updated On**

  Displays the date and time when the pack was updated.

  You can search for packs by selecting the required time category from the filter drop-down list.

- **Updated By**

  Displays the name of the user who updated the pack.

  You can search for a pack by entering the user name in the **Search** filter text box.

- **Details**

  Displays the details of the pack in the Storage Automation Store website.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- **(New)**

  Opens the New Pack dialog box, which enables you to create a new pack.

- **(Edit)**

  Opens the Pack Contents dialog box, which contains the following tabs for detailed information about the contents of the packs:

  - Workflows
  - Finders
  - Filters
  - Commands
  - Functions
  - Templates
  - Dictionary
  - Schemes
  - Cache Queries
  - SQL Data Source Types
  - Script Data Source Types
  - Remote System Types
  - Categories

- **(Delete)**

  Opens the Delete Pack confirmation dialog box, which enables you to delete the selected pack.

- **(Unlock)**

  Opens the Unlock Pack confirmation dialog box, which enables you to unlock the selected pack. This option is enabled only for the packs locked by you. However, administrators can unlock packs locked by other users.

- **(Export)**

  Opens the Export dialog box, which enables you to export the selected pack.

- **(Import From Server Folder)**

  Opens the Import From Server Folder dialog box, which enables you to import the pack from the selected folder location in the server system.

- **(Export To Server Folder)**

  Opens the Export To Server Folder dialog box, which enables you to export the pack to the selected folder location in the server system.

New Pack dialog box

The New Pack dialog box enables you to create a new pack.

- **Name**

  Enables you to enter a name and save the pack.

- **Version**

  Enables you to enter a version and save the pack.

- **Author**

  Enables you to enter author's name and save the pack.

- **Description**

  Enables you to enter a description and save the pack.

Command buttons

- **Save**

  Saves the pack and closes the dialog box.

- **Cancel**

  Closes the dialog box without saving.

Edit Pack dialog box

The Edit Pack dialog box enables you to edit the pack.

- Details tab
- Pack Contents tab

Details tab

- **Name**

  Enables you to enter a name and save the pack.

- **Version**

  Enables you to enter a version and save the pack.

- **Author**

  Enables you to enter author's name and save the pack.

- **Description**

  Enables you to enter a description and save the pack.

Pack Contents tab

- **Workflow**

  The **Workflow** option enables you to view the **Name** and **Entity Version** of the workflow.

- **Finders**

  The **Finders** option enables you to view the **Name** and **Entity Version** of the finder.

- **Filters**

  The **Filters** option enables you to view the **Name** and **Entity Version** of the filter.

- **Commands**

  The **Commands** option enables you to view the **Name** and **Entity Version** of the command.

- **Functions**

  The **Functions** option enables you to view the **Name** and **Entity Version** of the function.

- **Templates**

  The **Templates** option enables you to view the **Name** and **Entity Version** of the template.

- **Dictionary**

  The **Dictionary** option enables you to view the **Name** and **Entity Version** of the dictionary.

- **Schemes**

  The **Schemes** option enables you to view the **Name** and **Entity Version** of the scheme.

- **Cache Queries**

  The **Cache Queries** option enables you to view the **Name** and **Entity Version** of the cache query.

- **SQL Data Source Types**

  The **SQL Data Source Types** option enables you to view the **Name** and **Entity Version** of the SQL data source type.

- **Script Data Source Types**

  The **Script Data Source Types** option enables you to view the **Name** and **Entity Version** of the script data source type.

- **Categories**

  The **Categories** option enables you to view the **Name** and **Entity Version** of the category.

- **Remote System Types**

  The **Remote System Types** option enables you to view the **Name** and **Entity Version** of the remote system type.

Command buttons

- **Save**

  Saves the pack and closes the dialog box.

- **Cancel**

  Closes the dialog box without saving.

Categories window

The Categories window enables you to manage the workflow categories.

ⓘ   Depending on your role and account privileges, this window might not be displayed.

- Categories table
- Toolbar

A category is a set of workflows that enables you to complete a task. You can create a category by grouping a set of related workflows. You can also grant access to specific users to operate a category.

Categories table

The Categories table lists the workflow categories. The categories are identified by one of the following:

- 🔵 - content created by users
- 🔷 - content developed by Professional Services (PS), which is available only on custom installations made by PS
- 🔵 - packs developed by users
- 🔒 - content created by users that is locked
- 🟦 - NetApp-certified content

You can customize the table display by using the filtering and sorting features available for each column, as well as by rearranging the column order.

- 🔻 enables or disables filtering for the entire table. A red "x" appears over the icon if filtering is disabled.
- Double-clicking 🔻 clears and resets the filtering selections.
- 🔻 on each column header enables you to filter based on the content of the columns. Clicking 🔻 in a column allows you to filter on a specific item from the drop-down list or on all available items.
- Clicking the column header toggles between ascending and descending order of sorting. You can identify the applied sort order by the sort arrows (▲ for ascending and ▼ for descending).
- To rearrange the location of columns, you can drag and drop columns to place them in any required order. However, you cannot hide or delete any of these columns.
- Clicking the **Search** filter text box allows you to search for specific content. In addition, you can search using supported operators for the applicable column type, Alphabetic or Numeric.

The Categories table contains the following columns:

- **Certification**

  Indicates whether the category is user-created (![icon]( )), PS (![icon]( )), community (![icon]( )), user-locked (![icon]( )), or NetApp-certified (![icon]( )).

- **Name**

  Displays the name of the category.

- **Description**

  Displays a description of the category.

- **Workflows**

  Displays the workflows that are available in the category.

- **Used for workflow authorization**

  - Displays "true" for the categories that are restricted to certain users with operator role.
  - Displays "false" for the categories that are available for all users with operator role.

- **Users**

  Displays the name of the user with approver or operator role who is authorized to execute the category.

- **Active Directory Group**

  Indicates the name of the Active Directory group who is authorized to execute the category.

  You can search for a group by entering the group name in the **Search** filter text box.

- **Last Updated On**

  Displays the date and time when the category was last updated.

- **Updated By**

  Displays the name of the user who updated the category.

Toolbar

The toolbar is located above the column header. You can use the icons in the toolbar to perform various actions. These actions can also be accessed from the right-click menu in the window.

- ![icon] **(New)**

  Opens the New Category dialog box, which enables you to create a new category.

- ![icon] **(Edit)**

  Opens the Category <category_name> dialog box, which enables you to edit the selected category. You can also double-click the category to open the Category <category_name> dialog box.

- ![icon] **(Clone)**

Opens the New Category <category_name> - copy dialog box, which enables you to create a clone or copy of the selected category.

- **(Delete)**

Opens the Delete Category confirmation dialog box, which enables you to delete the selected category.

- **(Export)**

Enables you to export the selected category.

- **(Add To Pack)**

Opens the Add To Pack Categories dialog box, which enables you to add the category and its dependable entities to a pack, which is editable.

> ℹ️ The Add To Pack feature is enabled only for categories for which the certification is set to **None.**

- **(Remove From Pack)**

Opens the Remove From Pack Categories dialog box for the selected category, which enables you to delete or remove the category from the pack.

> ℹ️ The Remove From Pack feature is enabled only for categories for which the certification is set to **None.**

New Category dialog box

The New Category dialog box enables you to create a new workflow category.

- **Name**

Enables you to enter a name for the category. You must enter a name to save the category.

- **Description**

Enables you to enter a description for the category.

- **Available Workflows**

Displays all the available workflows that are not moved to the **Selected Workflows** box.

- **Selected Workflows**

Displays all the workflows that are selected for the category.

- **Category Used for Workflow Authorization**

Enables you to select users with operator role who can execute the category. By default, the check box is not selected and the category is available for all users.

- **Restrict access to workflows in this category to the following users and Active Directory groups**

Enables you to restrict access to workflows in the selected category to selected users and Active Directory groups.

- **Available Approvers and Operators**

  Displays all users with approver and operator roles.

- **Selected Approvers and Operators**

  Displays the users who are allowed to execute the category.

- **Available Approver and Operator Groups**

  Displays all groups with approver and operator roles.

- **Selected Approver and Operator Groups**

  Displays the groups that are allowed to execute the category.

Command buttons

- **Selection buttons**

  Enables you to move the selected entry from one box to another.

- **Save**

  Saves the category and closes the dialog box.

- **Cancel**

  Does not save the category and closes the dialog box.

Edit Category dialog box

The Edit Category dialog box enables you to edit a workflow category.

- **Name**

  Enables you to edit the name of the category.

- **Description**

  Enables you to edit the description for the category.

- **Available Workflows**

  Displays all the available workflows that are not moved to the Selected Workflows box.

- **Selected Workflows**

  Displays all the workflows that are selected for the category.

- **Category Used for Workflow Authorization**

Enables you to grant access to users with operator role to execute the category. The check box is not selected by default.

- **Available Operators**

Displays all the users with operator role who do not have access to the category.

- **Selected Operators**

Displays the users who are granted access to the category.

Command buttons

- **Selection buttons**

Moves the selected entry from one box to another.

- **Save**

Saves the category and closes the dialog box.

- **Cancel**

Does not save the category and closes the dialog box.

Clone Category dialog box

The Clone Category dialog box enables you to copy a workflow category and edit the category.

- **Name**

Enables you to edit the name for the category. The name of the category you have selected to clone is used as the name for the clone and appended with - copy by default.

- **Description**

Enables you to enter a description for the category.

- **Available Workflows**

Displays all the available workflows that are not moved to the Selected Workflows box.

- **Selected Workflows**

Displays all the workflows you have selected for the category.

- **Category Used for Workflow Authorization**

Enables you to select users with operator role who can execute the category. By default, the check box is not selected and the category is available for all users.

- **Available Operators**

Displays all the users with operator role.

- **Selected Operators**

Displays the users who are allowed to execute the category.

Command buttons

- **Selection buttons**

Enables you to move the selected entry from one box to another.

- **Save**

Saves the category and closes the dialog box.

- **Cancel**

Does not save the category and closes the dialog box.