Universal Controller 7.3.x

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Functions

The information on these pages also is located in the Universal Controller 7.2.x Resources.pdf.

Other Overview

Universal Controller resources are records that both define your Universal Automation Center system and that you set up to help facilitate operations:

Credentials	Allow the Controller to log in to remote machines and execute jobs.
Email Templates	Allow you to construct information that can be copied to create Email tasks.
Scripts	Allow you to execute scripts stored in the Controller database.
Variables and Functions	Allow you to embed values into free-text fields of tasks and workflows.
Virtual Resources	Allow you to create throttling schemes for tasks.

Credentials

Overview

Credentials are the user ID and password under which an Agent runs tasks on the machine where the Agent resides.

By default, an Agent will run tasks under the same Credentials used to install the Agent. However, via the Controller user interface, you also can define Credentials and assign them to any task or Agent.

When prompted for Credentials, the Agent looks in the following locations, in this order, for a user ID and password:

1. If the task specifies Credentials, the Agent uses those Credentials.
2. If the task does not specify Credentials, the Agent uses the Credentials specified in its Agent Details record.
3. If the Agent Details does not specify Credentials, the Agent uses the Credentials used to install the Agent.

Types of Credentials

There are four types of Credentials:

Standard	Runtime user name and runtime password of a user.
Resolvable	Runtime user name and runtime password of a user that you can embed into a task or script without exposing the password in clear text.
Web Service	Runtime user name and runtime password of a user running a Web Service task.
Email	Runtime user name and runtime password of a user connecting to an incoming mail server (IMAP).

Note

Unless Credentials must be embedded, we recommend defining Standard Credentials. If required, you can always convert a Standard Credential to a Resolvable Credential at a future time.

Converting Credential Types

You can convert a Credential from any type to any type.

To convert a Credential type from Standard to Resolvable, Web Service, or Email, the Resolvable Credentials Permitted, Web Service Credentials Permitted, or Email Credentials Permitted Universal Controller system property, respectively, must be set to true.

To convert a Credential, either:

- Click the **Convert...** button in the Credential Details.
- Select **Convert...** in the Credentials Details action menu.
- Select **Convert...** for a specific Credential in the Credentials List action menu.

When you convert a Credential, you must provide a new password. The Controller will not convert an encrypted password of one Credential type to an encrypted password of a different Credential type.

Note

Converting a Credential type does not create a new version of the Credential. Also, you cannot restore a Credential to an older version if the Credential type of the current version is not the same Credential type as the older version.

Credentials Compatibility

As of Universal Controller 6.4.x, the Credential Runtime Passwords, along with the LDAP Settings Bind Password, Email Connection Passwords, Promotion Target Passwords, and Promotion Schedule Promotion Passwords, now are encrypted using AES with 128-bit keys.

Additionally, Standard and Resolvable Credentials are encrypted using separate keys; therefore, an encrypted password for a Standard Credential cannot be decrypted by the Resolvable Credential framework.

Under the following circumstances, conversion from the old encryption to the new encryption will be automatic. Furthermore, all pre-6.4.x credentials will be recognized as Standard credentials.

- Apply maintenance to a pre-6.4.x release of Universal Controller to increase it to a 7.2.x release.
- Perform a bulk import or list import from a pre-6.4.x release of Universal Controller to a 7.2.x release.
- Promote from a pre-6.4.x release of Universal Controller to a 7.2.x release.

Under the following circumstance, conversion from the new encryption to the old encryption will be automatic.

- Promote from a 7.2.x release of Universal Controller to a compatible pre-6.4.x release. However, any attempt to promote a Resolvable Credential from a 7.2.x release of Universal Controller to a compatible pre-6.4.x release will fail.

Pre-6.4.0.0 releases cannot decrypt anything encrypted by a 7.2.x release, with the exception of promotion (noted above), which is fully backwards compatible.

Please note the following backwards compatibility constraints with respect to List Import, Bulk Import, and the Universal Controller Start-up Properties (opswise.properties).

- Any attempt to List Import or Bulk Import XML (containing a password encrypted by a 7.2.x release) into a pre-6.4.0.0 release will result in an encrypted value that cannot be decrypted by the pre-6.4.0.0 release.
- Any encrypted passwords within the Universal Controller Start-up Properties will be re-encrypted using the new algorithm when the 7.2.x Controller initializes at start-up. Once converted, that Universal Controller Start-up Properties will no longer be compatible with a pre-6.4.0.0 release.

Resolvable Credentials

Resolvable Credentials are meant to be used with scripts and commands specified in tasks, and resolved when the script or command is executed. They provide the script or command with access to Credentials (user name and password) without having to hard-code the Credentials in the script, command, or parameters itself.

In order to enable the use of Resolvable Credentials, the Resolvable Credentials Permitted Universal Controller system property must be set to true (default is false).

If the Resolvable Credentials Permitted property is set to false, the following restrictions on Resolvable Credentials apply:

- You cannot create a Resolvable Credential.
- You cannot convert a Standard Credential to a Resolvable Credential.
- Any attempt to launch a task with an embedded Resolvable Credential will result in a Start Failure status.

Using Resolvable Credentials in a Script

To use Resolvable Credentials with a script, embed the Resolvable Credentials in any of the following:

- Content of a Script specified in the Script field in a Linux/Unix or Windows task.
- Content of a Data Script.
- Universal Template Script (Script, Linux/Unix Script, or Windows Script field).
- Content of a Script specified in the Payload Script field in a Web Service task.

Using Resolvable Credentials in a Task

To use Resolvable Credentials with a task, embed the Resolvable Credentials in any of the following:

Task	Fields
Linux/Unix	• Command • Parameters
Windows	• Command • Parameters
Web Service	• URL Query Parameter Values (Not Name) • Form Data Values (Not Name) • Form Payload • HTTP Headers Values (Not Name)

Embedding Resolvable Credentials

Five Controller Credentials Functions are available for embedding Resolvable Credentials:

Name	Description	Syntax
Return Key Location of a Credential	Used for embedding the Key Location in a script.	**${_credentialKeyLoc**('<credential_name>')}
Return Passphrase of a Credential	Used for embedding the Passphrase in a script.	**${_credentialPassphrase**('<credential_name>')}
Return Token of a Credential	Used for embedding the Token in a script.	**${_credentialToken**('<credential_name>')}

Return User Name of a Credential	Used for embedding the Runtime User in a script.	**${_credentialUser**('<credential_name>')}
Return User Password of a Credential	Used for embedding the Runtime Password in a script.	**${_credentialPwd**('<credential_name>')}

Variables are supported for these Functions.

For example:

- **${_credentialKeyLoc**('${my_credential}')}
- **${_credentialPassphrase**('${my_credential}')}
- **${_credentialToken**('${my_credential}')}
- **${_credentialUser**('${my_credential}')}
- **${_credentialPwd**('${my_credential}')}

In the resolved script, these Functions are resolved to (for example):

- $(ops_unv_cred_key_loc_08236da16c3944899aae5a874da077bb)
- $(ops_unv_cred_passphrase_08236da16c3944899aae5a874da077bb)
- $(ops_unv_cred_token_08236da16c3944899aae5a874da077bb)
- $(ops_unv_cred_user_08236da16c3944899aae5a874da077bb)
- $(ops_unv_cred_pwd_08236da16c3944899aae5a874da077bb)

Additionally, for a Universal Template, you can create a Field of Type = Credential, which lets you select or create Resolvable Credentials. The Controller will create a variable for the Resolvable Credential Field, which you can embed in the Universal Template script using the Credentials Functions. This also lets you change Credentials when you run a Universal Task based on the Universal Template.

Note

When you embed Resolvable Credentials in a script, the password is exposed in the temporary script on the Agent while the task instance is running.

Resolvable Credentials embedded in a command or parameters field of a Linux/Unix or Windows task are not exposed on the Agent system.

By default, occurrences of Resolvable Credential passwords are scrubbed from the output, reducing (but not eliminating) the risk of passwords echoed directly to the task instance output, which can be retrieved and viewed within the Universal Controller. Please note, however, you still could echo the password to a file on the Agent server.

Note

By default, occurrences of Resolvable Credential passwords and passphrases are scrubbed from Web Service task output, reducing (but not eliminating) the risk of passwords and passphrases return to the task instance output or output metadata, which can be retrieved and viewed within Universal Controller. Please note, however, you still could use the functions against some API that stores the password and passphrase somewhere that you have access to.

Restrictions on Embedding Resolvable Credentials

If an embedded Credential is not a Resolvable Credential, the task instance will transition into the Start Failure status with one of the following status descriptions:

- `Execution with credentials "credential-name", contained within the Universal Template Script, prohibited due to credential type constraint; only Resolvable credential type permitted.`
- `Execution with credentials "credential-name", contained within the command field or parameters field prohibited due to credential type constraint; only Resolvable credential type permitted.`
- `Execution with credentials "credential-name", contained within the script "script-name", prohibited due to credential type constraint; only Resolvable credential type permitted.`
- For Web Service tasks:
  `Execution with credentials "credential-name", contained within the "<URL Query Parameter/Form Data/Payload/Payload Script/HTTP Headers>" field, prohibited due to credential type constraint; only Resolvable credential type permitted.`

If the Execution User for a task instance does not have Execute permission for an embedded Resolvable Credential, the task instance will transition to the Start Failure status with one of the following status descriptions:

- `Execution with credentials "credential-name", contained within the Universal Template Script, prohibited due to security constraints.`
- `Execution with credentials "credential-name", contained within the command field or parameters field, prohibited due to security constraints.`
- `Execution with credentials "credential-name", contained within the script "script-name", prohibited due to security constraints.`
- `Execution with credentials "credential-name", contained within a script, prohibited due to security constraints.`
- For Web Service tasks:
  `Execution with credentials "credential-name", contained within the "<URL Query Parameter/Form Data/Payload/Payload Script/HTTP Headers>" field, prohibited due to security constraints.`

If the Resolvable Credentials Permitted Universal Controller system property is set to false, any task instance with an embedded Resolvable Credential will result in a Start Failure status with the following status description:

- `Execution with resolvable credentials not permitted; Universal Controller property "Resolvable Credentials Permitted" is not enabled.`
- For Web Service tasks:
  - `Execution with resolvable credentials not permitted; Universal Controller property "Web Service Task Resolvable Credentials Functions Permitted" is not enabled`
  - `Execution with resolvable credentials not permitted; Universal Controller property "Resolvable Credentials Permitted" and "Web Service Task Resolvable Credentials Functions Permitted" are not enabled`

If an embedded Resolvable Credential cannot be decrypted, the task instance will transition into the Start Failure status with the following status description:

- `Unable to decrypt password for "credential-name" credentials.`

Other Credentials

You can embed source and destination Credentials in a UDM script using File Transfer Task Instance built-in variables.

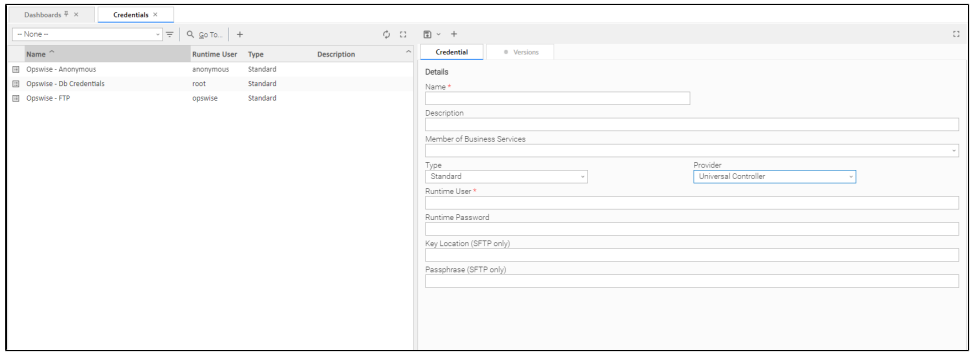
For File Transfer tasks, the Agent may need additional credentials for logging on to the FTP server.

Defining a Credential

Step 1

From the Automation Center navigation pane, select **Other > Credentials**. The Credentials list displays a list of all currently defined Credentials.

Below the list, Credential Details for a new Credential displays.



Step 2	Enter/select Details for a new Credential, using the field descriptions below as a guide. As a best practice, use an alias in the **Name** field, as you may have several identical user names for different s • Required fields display an asterisk (*) after the field name. • Default values for fields, if available, display automatically. To display more of the Details fields on the screen, you can either: • Use the scroll bar. • Temporarily hide the list above the Details. • Click the **New** button above the list to display a pop-up version of the Details.
Step 3	Click a **Save** button. The Credential is added to the database, and all buttons and tabs in the Credential Details are enabled.

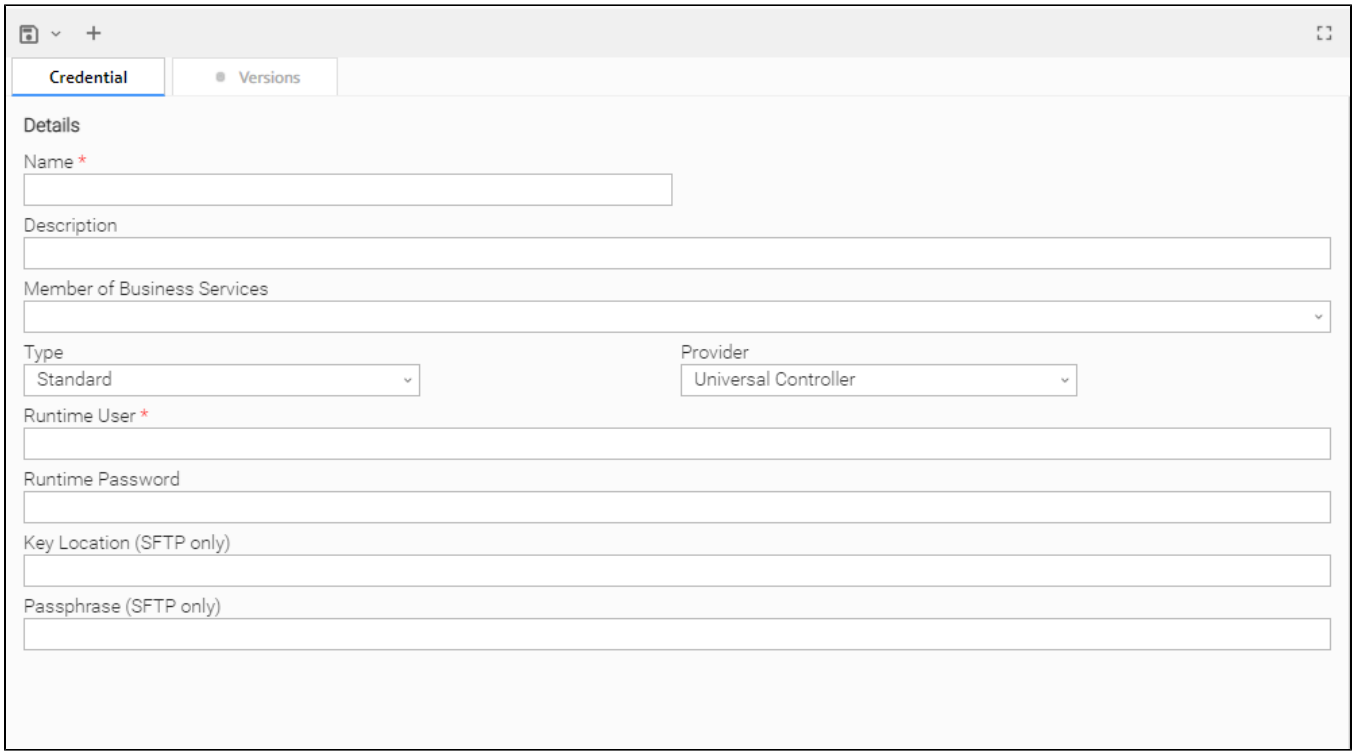
Note

To open an existing record on the list, either:

- Click a record in the list to display its record Details below the list. (To clear record Details below the list, click the **New** button that displays above and below the Details.)
- Clicking the Details icon next to a record name in the list, or right-click a record in the list and then click **Open** in the Action menu that displays, to display a pop-up version of the record Details.
- Right-click a record in the a list, or open a record and right-click in the record Details, and then click **Open In Tab** in the Action menu that displays, to display the record Details under a new tab on the record list page (see Record Details as Tabs).

Credential Details

The following Credential Details is for an existing credential. See the field descriptions, below, for a description of all fields that display in the Credential Details.



For information on how to access additional details - such as Metadata and complete database Details - for Credentials (or any type of record), see Records.

Credential Details Field Descriptions

The following table describes the fields, buttons, and tabs that display in the Credential Details.

Field Name	Description
Details	This section contains detailed information about the credential.
Name	Required. Name for this credential.
Version	System-supplied; version number of the current record, which is incremented by Universal Controller every time a user updates a record. Click on the Versions tab to view previous versions. For details, see Record Versioning.

Description	Description of this record. (Maximum = 255 characters.)
Member of Business Services	User-defined; Allows you to select one or more Business Services that this record belongs to. (You also can Check All or Uncheck All Business Services for this record.) You can select up to 62 Business Services for any record type, and enter a maximum of 2048 characters for each Business Service. If the Business Service Visibility Restricted Universal Controller system property is set to true, depending on your assigned (or inherited) Permissions or Roles, Business Services available for selection may be restricted.
Type	Type of Credential. Options: • Standard (default) • Resolvable • Web Service • Email Note Only Resolvable Credentials can be embedded in a Universal Template script.
Provider	Specifies Provider. Options: • Universal Controller • AWS Secrets Manager • Azure Key Vault • CyberArk Credential Provider • CyberArk Central Credential Provider Default is Universal Controller.
Provider Parameters	When switching the **Provider** option, the default **Provider Parameters** for each provider will be populated. When switching to the Universal Controller provider, the **Provider Parameters** will not be displayed.

Runtime User	Runtime user ID, including an LDAP- or AD-formatted user ID, under which the job will be run.
	
	If the user does not have a login shell, add a - character in front of the ID. The Controller will provide a shell for that user and strip the - character from the username.
	
	When specifying a Windows account, be aware that the user must have the following privileges based upon the Universal Agent's configuration for the UAG logon option:
	• logon = Interactive (default)
	  • Not be in "Deny log on locally."
	  • Be a member of "Allow log on locally."
	• logon = Batch
	  • Not be in "Deny log on as a batch job"
	  • Be a member of "Allow log on as a batch job"
	
	When specifying a **local** Windows account that may be used by an Agent running inside a Windows domain environment, be sure to use "." as a placeholder for the domain name (for example, ".\<localuser>").
	
	This qualifies the account name and ensures that Windows will authenticate it against the local – and not the active directory – account database. If the "." placeholder is missing, the account may be interpreted as a domain account in a domain environment, and a task using that credential may fail.
	
	If none of your Agents execute on a Windows domain member or domain controller, the placeholder is optional.
	
	If a domain account must be used, you may specify the account name using the user principal name (UPN) format (that is, "<domainuser>@<domainname>") or the down-level logon name format (that is, "<domainname>\<domainuser>").

Runtime Password	Runtime user's password. Maximum is 512 characters. Note As of Universal Controller release 6.4.4.0, a credential with a password greater than 40 characters can now be used for an agent-based task instance that uses Universal Agent 6.4.2.0 or greater. If the Universal Agent release is earlier than 6.4.2.0, the agent-based task instance will continue to go Start Failure with the expected Status Description. Credentials with a password greater than 40 characters are supported only on Universal Agent 6.4.2.0 or higher.
Key Location (SFTP only)	Location of the Runtime User's SSH private key in OpenSSH format; only applicable for SFTP.
Passphrase (SFTP only)	Passphrase for the Runtime User's SSH private key file; only applicable for SFTP.
Token	If Type = Resolvable; Token for the Runtime User that can be used with the ${_credentialToken(credential_name)} function.
Metadata	This section contains Metadata information about this record.
UUID	Universally Unique Identifier of this record.
Updated By	Name of the user that last updated this record.

Updated	Date and time that this record was last updated.
Created By	Name of the user that created this record.
Created	Date and time that this record was created.
Buttons	This section identifies the buttons displayed above and below the Credential Details that let you perform various actions.
Save	Saves a new Credential record in the Controller database.
Save & New	Saves a new record in the Controller database and redisplays empty Details so that you can create another new record.
Save & View	Saves a new record in the Controller database and continues to display that record.
New	Displays empty (except for default values) Details for creating a new record.
Update	Saves updates to the record.
Test Provider	For providers other than Universal Controller. **Test Provider** button will be available for validating the configured Provider Parameters.
Convert...	Allows you to convert the current Credential Type to a new type and define a new password for the Credential (see Converting Credential Types).
Delete	Deletes the current record.
Refresh	Refreshes any dynamic data displayed in the Details.
Close	For pop-up view only; closes the pop-up view of this credential.
Tabs	This section identifies the tabs across the top of the Credential Details that provide access to additional information about the credential.
Versions	Stores copies of all previous versions of the current record. See Record Versioning.

Provider Parameters

When switching the **Provider** option, the default **Provider Parameters** for each provider will be populated.

When switching to the Universal Controller provider, the **Provider Parameters** will not be displayed.

If a provider parameter is sensitive, value input will be masked in the client, and encrypted in the database. When viewing existing credentials, sensitive provider parameter values are never sent to the client.

AWS Secrets Manager

Provider Parameter	Required	Description
ACCESS_KEY_ID	true	The AWS access key, used to identify the user interacting with AWS.

SECRET_ACCESS_KEY	true	The AWS secret access key, used to authenticate the user interacting with AWS.
REGION	true	The region name (e.g., us-east-1).
SECRET_ID	true	The ARN or name of the secret to retrieve.
SECRET_PASSWORD_KEY	false	If this secret was created by using the console, then Secrets Manager stores the information as a JSON structure of key/value pairs. Specifies the key for the password in the JSON structure. • If left unspecified, the password will evaluate to the entire secret value.
SECRET_PASSPHRASE_KEY	false	Specifies the key for the passphrase in the JSON structure. • If left unspecified, the passphrase will be undefined.
SECRET_TOKEN_KEY	false	Specifies the key for the token in the JSON structure. • If left unspecified, the token will be undefined.
CACHE_TTL	false	The TTL (Time To Live), in seconds, for the cached secret before a new request to the provider is made. (default 3600 seconds / 1 hour)

Azure Key Vault

Provider Parameter	Required	Description
KEY_VAULT_NAME	true	The name of the Key Vault used to build the vault URL to send HTTP requests to. • https://<your-key-vault-name>.vault.azure.net
SECRET_NAME	true	The name of the secret.
CLIENT_ID	true	The client (application) ID.
TENANT_ID	true	The Azure Active Directory tenant (directory) Id.
CLIENT_SECRET		The client secret used to authenticate. • Only one of CLIENT_SECRET, CLIENT_ASSERTION, PEM_CERTIFICATE, or PFX_CERTIFICATE can be specified.
CLIENT_ASSERTION		The client assertion used to authenticate. • Only one of CLIENT_SECRET, CLIENT_ASSERTION, PEM_CERTIFICATE, or PFX_CERTIFICATE can be specified.
PEM_CERTIFICATE		The path of the PEM certificate used for authenticating. • Only one of CLIENT_SECRET, CLIENT_ASSERTION, PEM_CERTIFICATE, or PFX_CERTIFICATE can be specified.

PFX_CERTIFICATE		The path of the PFX certificate used for authenticating. • Only one of CLIENT_SECRET, CLIENT_ASSERTION, PEM_CERTIFICATE, or PFX_CERTIFICATE can be specified.
PFX_CERTIFICATE_PASSWORD		The password for the PFX certificate. • Required if the PFX_CERTIFICATE is specified.
CACHE_TTL	false	The TTL (Time To Live), in seconds, for the cached secret before a new request to the provider is made. (default 28800 seconds / 8 hours)

CyberArk Credential Provider

Provider Parameter	Required	Description
APPLICATION_ID	true	The unique ID of the application issuing the password request.
SAFE	true	The name of the Safe where the password is stored.
FOLDER	true	The name of the folder where the password is stored.
OBJECT	true	The name of the password object to retrieve.
REASON	false	The reason for retrieving the password.
CACHE_TTL	false	The TTL (Time To Live), in seconds, for the cached secret before a new request to the provider is made. (default 5

CyberArk Central Credential Provider

Provider Parameter	Required	Description
HOST	true	The hostname of the Central Credential Provider.
PORT	true	The port of the Central Credential Provider.
APPLICATION_ID	true	The unique ID of the application issuing the password request.
SAFE	true	The name of the Safe where the password is stored.
FOLDER	true	The name of the folder where the password is stored.
OBJECT	true	The name of the password object to retrieve.
CACHE_TTL	false	The TTL (Time To Live), in seconds, for the cached secret before a new request to the provider is made. (default 5 seconds)

Deleting a Credential

You cannot delete a Credential if any references exist for the Credential.

References will be checked according to the Credential type, as shown in the following table:

Credential Type	Record Type
Resolvable	• Universal Task (Credentials Fields 1-4) • Universal Template Field (Default Value)
Email	• Email Monitor (Credentials)
Web Service	• Web Service Task (Credentials)
Standard	• Windows Agent (Credentials) • Linux/Unix Agent (Credentials) • Application (Credentials) • Database Connection (Credentials) • PeopleSoft Connection (Credentials) • Windows Task (Credentials) • Linux/Unix Task (Credentials) • z/OS Task (Credentials) • Universal Command Task (Utility Credentials, UCMD Credentials) • SAP Task (Utility Credentials, SAP Credentials) • PeopleSoft Task (Utility Credentials, PeopleSoft Credentials) • File Transfer Task (Credentials, FTP Credentials, Source Credentials, Destination Credentials) • SQL Task (Credentials) • Stored Procedure Task (Credentials) • File Monitor Task (Credentials) • FTP File Monitor Task (Credentials, FTP Credentials) • System Monitor (Credentials) • Universal Task (Credentials) • Universal Template (Credentials)

Note

Resolvable, Email, and Web Service Credentials can be used anywhere that a Standard Credential can be specified.

Email Templates

Overview

Email templates allow you to construct commonly-used information that can be copied to create Email tasks.

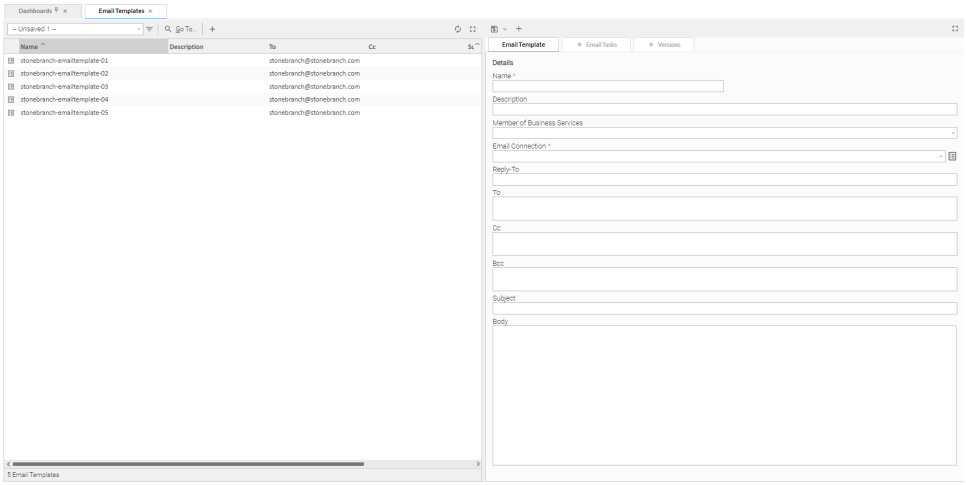
If an Email task specifies a template, Universal Controller uses the information in the template to construct and execute the Email task. Any information specified in the task overrides what is specified in the template.

Creating an Email Template

Step 1

From the Agents & Connections navigation pane, select **Other> Email Templates**. The Email Templates list displays.

To the right of the list, Email Template Details for a new Email Template displays.



Step 2	Enter / select Details for a new Email Template, using the field descriptions below as a guide. • Required fields display an asterisk (*) after the field name. • Default values for fields, if available, display automatically. To display more of the Details fields on the screen, you can either: • Use the scroll bar. • Temporarily hide the list above the Details. • Click the + button above the list to display a pop-up version of the Details.
Step 3	Click a button. The Email Template is added to the database, and all buttons and tabs in the Email Template Details are enabled.

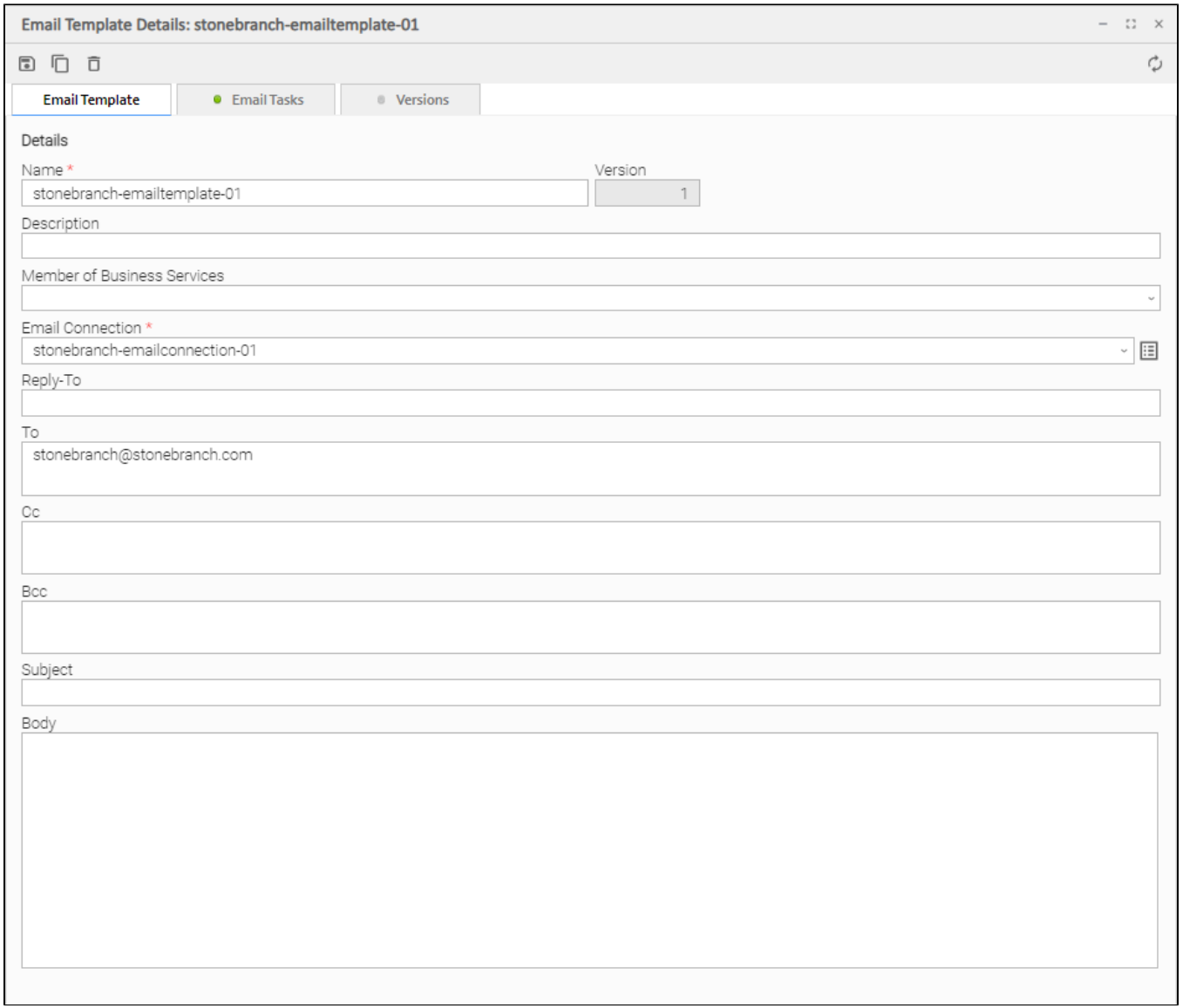
Note

To open an existing record on the list, either:

- Click a record in the list to display its record Details below the list. (To clear record Details below the list, click the **New** button that displays above and below the Details.)
- Clicking the Details icon next to a record name in the list, or right-click a record in the list and then click **Open** in the Action menu that displays, to display a pop-up version of the record Details.
- Right-click a record in the a list, or open a record and right-click in the record Details, and then click **Open In Tab** in the Action menu that displays, to display the record Details under a new tab on the record list page (see Record Details as Tabs).

Email Template Details

The following Email Template Details is for an existing Email Template. See the field descriptions, below, for a description of all fields that display in the Email Template Details.



For information on how to access additional details - such as Metadata and complete database Details - for Email Templates (or any type of record), see Records.

Email Template Details Field Descriptions

The following table describes the fields, buttons, and tabs that display in the Email Template Details.

Field Name	Description
Details	This section contains detailed information about the Email Template.
Name	Name used within the Controller to identify this resource. Up to 40 alphanumerics. It is the responsibility of the user to develop a workable naming scheme for resources.
Version	System-supplied; version number of the current record, which is incremented by the Controller every time a user updates a record. Click the Versions tab to view previous versions. For details, see Record Versioning.
Description	Description of this record. (Maximum = 255 characters.)
Member of Business Services	User-defined; Allows you to select one or more Business Services that this record belongs to. (You also can Check All or Uncheck All Business Services for this record.) You can select up to 62 Business Services for any record type, and enter a maximum of 2048 characters for each Business Service. If the Business Service Visibility Restricted Universal Controller system property is set to true, depending on your assigned (or inherited) Permissions or Roles, Business Services available for selection may be restricted.
Email Connection	Connection used for the Email Template. Select an Email Connection from the drop-down list, or click the Details icon to create a new Email Connection or view the Details of a selected Email Connection.
Reply-To	Email address of the sender. Use commas to separate multiple recipients. Variables and functions supported.
To	Required unless CC or BCC is specified; Email address of the recipient. Use commas to separate multiple recipients. Variables and functions supported.
CC	Required unless To or BCC is specified; Email address of the party being sent a copy of the email, if any. Use commas to separate multiple recipients. Variables and functions supported.
BCC	Required unless To or CC is specified; Email address of the party being sent a blind (hidden) copy of the email, if any. Use commas to separate multiple recipients. Variables and functions supported.
Subject	Subject line of the email. Variables and functions supported.
Body	Text of the email message. Variables and functions supported. Note If both the Email Template and the Email Task (or Email Notification) contain text in the Body, the text in the Email Template is appended to the text in the Email Task (or Email Notification).

Metadata	This section contains Metadata information about this record.
UUID	Universally Unique Identifier of this record.
Updated By	Name of the user that last updated this record.
Updated	Date and time that this record was last updated.
Created By	Name of the user that created this record.
Created	Date and time that this record was created.
Buttons	This section identifies the buttons displayed above and below the Email Template Details that let you perform various actions.
Save	Saves a new Email Template record in the Controller database.
Save & New	Saves a new record in the Controller database and redisplays empty Details so that you can create another new record.
Save & View	Saves a new record in the Controller database and continues to display that record.
New	Displays empty (except for default values) Details for creating a new record.
Update	Saves updates to the record.
Copy	Creates a copy of this Email Template, which you are prompted to rename.
Delete	Deletes the current record.
Refresh	Refreshes any dynamic data displayed in the Details.
Close	For pop-up view only; closes the pop-up view of this Email Template.
Tabs	This section identifies the tabs across the top of the Email Template Details that provide access to additional information about the Email Template.
Email Tasks	Displays a list of Email Tasks that specify this Email Template, and lets you create a new Email Task with its Email Template field pre-populated with this Email Template.
Versions tab	Stores copies of all previous versions of the current record. See Record Versioning.

Copying Email Templates

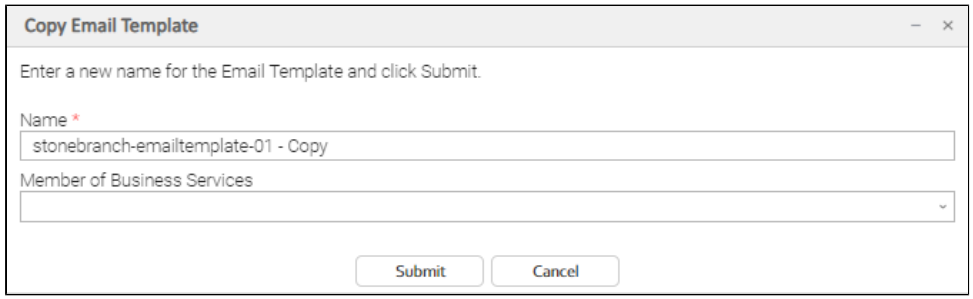
Overview

You can make copies of all Universal Controller records, including Email Templates, using the standard method for Copying a Record: selecting **Insert** on the Action menu.

However, you also can use the Copy action on the Email Templates Action menu or the Copy button in the Email Templates Details.

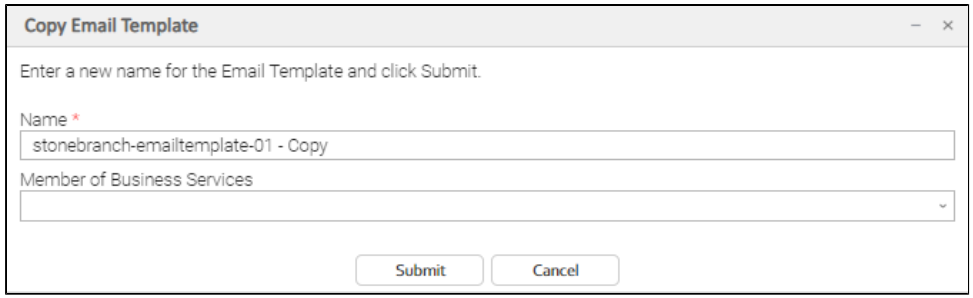
Copying One or More Email Templates from an Email Templates List

Step 1	From the Agents & Connections navigation pane, select **System > Email Templates** to display the Email Templates list.
Step 2	Locate the Email Template(s) you want to copy (see Filtering).

Step 3	Copy the Email Template(s): **Copy One Email Template** 1. Right-click the **Email Template Name**. 2. On the Action menu, select **Copy**. A Copy Email Template pop-up dialog displays.  3. Enter a new name for the Email Template and, optionally, select any Business Services that you want the Email Template assigned to. 4. Click **Submit** to create a copy of the Email Template. **Copy Multiple Email Templates** 1. Ctrl-Click the Email Templates you want to copy. 2. Right-click any of the selected Email Templates. 3. On the Action menu, select **Copy**. 4. On the Confirmation pop-up that displays, click **OK**. The copied Email Templates are added to the list, with **- Copy** added as a suffix to the Email Template Name for each Email Template. If an Email Template with that **- Copy** name already exists, another copy is not created.

Copying an Email Template from the Email Template Details

Step 1	Select an Email Template from the Email Template list. The Email Template Details for that Email Template displays.

Step 2	Either: • Click the **Copy** button. • Right-click the Details to display the Action menu, and then click **Copy**. A Copy Email Template pop-up dialog displays. 
Step 3	Enter a new name for the Email Template and, optionally, select any Business Services that you want the Email Template assigned to.
Step 4	Click **Submit** to create a copy of the Email Template.

Copy Permissions

To copy an Email Template, you must have both Read permission and Copy command permission for the Email Template you are copying, in addition to having Create permission for the copied Email Template.

Scripts

Overview

Scripts allows you to store scripts in the Universal Controller database.

When a task that specifies a stored script is executed, the script is transmitted to the remote machine for execution.

Note

There is a 1MB limit on the content size of scripts, whether the content is defined in the Script Details or a uploaded from a local file system (see Uploading a Script, below).

You can use scripts with the following task types: Windows, Linux/Unix, SAP, and File Transfer (UDM scripts for UDM File Transfer tasks).

You cannot import compiled executables into Scripts. The content of scripts must be text that can be processed by some shell, script host, or command interpreter.

You can embed Universal Controller variables in the script content. Embedded variables are resolved at trigger/run time before the script is sent to an Agent.

Controller variables can be passed as parameters, but the script still has to be written to parse the variables. However, you cannot pass variables as parameters that contain data longer than the parameter field (for example, SQL results).

For example, the following script shows how a Controller variable could be used.

```
#!/bin/bash
echo Task Name: ${ops_task_name}
echo Task Instance: ${ops_task_id}
```

Note

You also can enter a script directly into a Universal Template, but you cannot select a stored script.

Types of Scripts

There are five types of scripts:

Script	For use in Windows or Linux/Unix tasks.
SAP Definition	For use in SAP tasks.
UDM Script	For use in UDM File Transfer tasks.
Web Service Payload	For use in Web Service tasks.
Data	For use in a script or task (see Data Scripts, below).

Data Scripts

Data Scripts (Script Type = Data) are meant to be used with scripts and commands specified in tasks, and resolved when the script or command is executed. Data Scripts provide the script or command with access to a path on the UAG file system where the temporary Data Script content resides.

Note

Deleting a Data script is prohibited if it is referenced by one or more Universal Tasks or Universal Template Fields (Default Value).

Changing the type for a Data script is prohibited if it is referenced by one or more Universal Tasks or Universal Template Fields (Default Value).

The Tasks tab on the Script Details is enabled for Data scripts and lists Universal Tasks that reference the script via a mapped Script field.

Using Data Scripts in a Script

To use a Data Script with a script, embed the Data Script in any of the following:

- Content of a Script specified in the Script field in a Linux/Unix or Windows task.
- Content of a Data Script.
- Universal Template Script (Script, Linux/Unix Script, or Windows Script field).

Using Data Scripts in a Task

To use a Data Script with a task, embed the Data Script in any of the following:

- Command field in a Linux/Unix or Windows task
- Parameters field in a Linux/Unix or Windows task

Note

Although you can embed a Data Script in the Command field or Parameters field of a Linux/Unix or Windows task, only scripts with Script Type = Script can be referenced in a Linux/Unix or Windows task; that is, it is the only type of script that is available for selection in the Linux/Unix or Windows task Script field.

Embedding a Data Script

To embed a Data Script, use the following Script Function:

Name	Description	Syntax
Return Path to Data Script	Used for embedding the path to a Data Script.	**${_scriptPath**('<script_name>')}

Note

_scriptPath requires Agent 6.4.0.0 or later.

Upon task instance execution, the Controller will resolve **${_scriptPath**('<script_name>')} and replace it with a token representing the path to the embedded Data Script in the following format: $(ops_unv_script_path_<script-sys_id>).

For every Data Script embedded in a Data Script, the Controller will resolve **${_scriptPath**('script_name')} (if Resolve UAC Variables is enabled for the Data Script), and look for additional Data Script references (and Resolvable Credentials references). This process will continue until no additional Data Script references are found.

For each Data Script reference, the Controller will send UAG the Data Script Content, file extension, and the corresponding token - $(ops_unv_script_path_<script-sys_id>) - that would represent a reference to that Content, which would ultimately be temporarily written to the UAG file system.

UAG will replace any tokens within the Script Content, Universal Template Script, Command, or Parameters with the appropriate file path associated with the Data Script Content. UAG also will replace any tokens within each Data Script Content.

Additionally, for a Universal Template, you can create a Field of Type = Script, which lets you select or create Data Scripts. The Controller will create a variable for the Data Script Field, which you can embed in the Universal Template script using the Script Functions. This also lets you change Scripts when you run a Universal Task based on the Universal Template.

Restrictions on Embedding Data Scripts

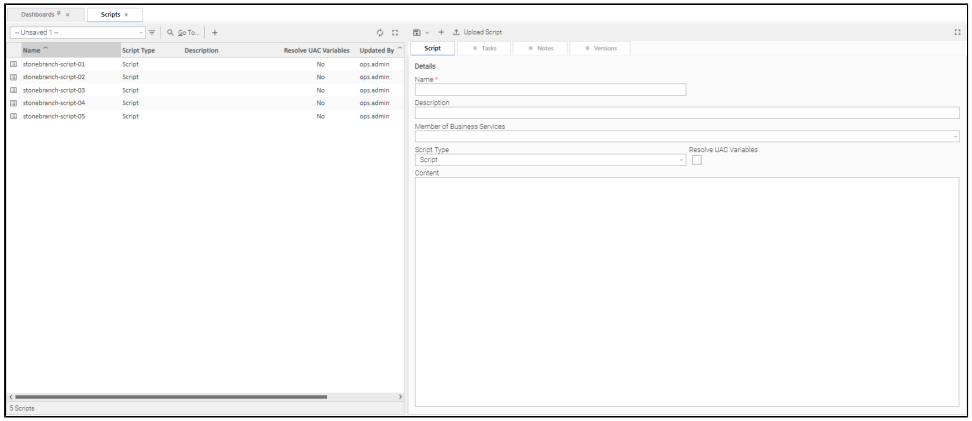
For every embedded Script, the Script Type must be Data; otherwise, the task will transition to the Start Failure status with one of the following status descriptions:

```
Execution for script "script-name", contained within the Universal Template Script, prohibited due to script type constraint; only Data script type permitted.

Execution for script "script-name", contained within the command field or parameters field prohibited due to script type constraint; only Data script type permitted.

Execution for script "script-name", contained within the script "script-name", prohibited due to script type constraint; only Data script type permitted.
```

For every embedded Data Script, the Execution User must have Execute permission for the Data Script; otherwise, the task instance will transition to the Start Failure status with one of the following status descriptions:

```
Execution for script "script-name", contained within a Universal Template Script or script, prohibited due to security constraints.

Execution for script "script-name", contained within a script, command field, or parameters field, prohibited due to security constraints.
```

Creating a Script

Step 1	From the Automation Center navigation pane, select **Other > Scripts**. The Scripts list displays a list of all existing scripts. To the right of the list, Script Details for a new script displays. 
Step 2	Enter / select Details for a new script, using the field descriptions below as a guide. • Required fields display an asterisk (*) after the field name. • Default values for fields, if available, display automatically. To display more of the Details fields on the screen, you can either: • Use the scroll bar. • Temporarily hide the list above the Details. • Click the + button above the list to display a pop-up version of the Details.
Step 3	Click a save button. The script is added to the Controller database, and all buttons and tabs in the Script Details are enabled.

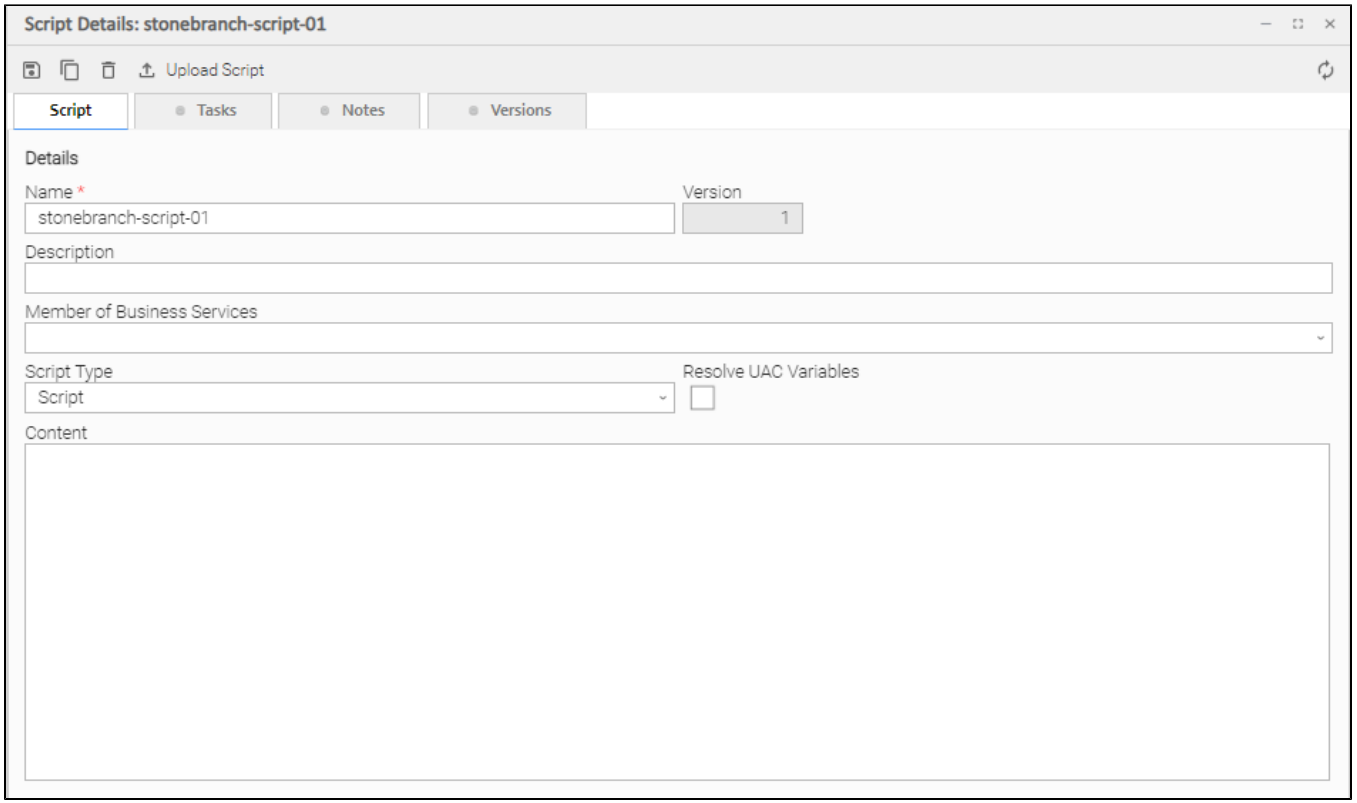
Note

To open an existing record on the list, either:

- Click a record in the list to display its record Details below the list. (To clear record Details below the list, click the **New** button that displays above and below the Details.)
- Clicking the Details icon next to a record name in the list, or right-click a record in the list and then click **Open** in the Action menu that displays, to display a pop-up version of the record Details.
- Right-click a record in the a list, or open a record and right-click in the record Details, and then click **Open In Tab** in the Action menu that displays, to display the record Details under a new tab on the record list page (see Record Details as Tabs).

Script Details

The following Script Details is for an existing script. See the field descriptions, below, for a description of all fields that display in the Script Details.



For information on how to access additional details - such as Metadata and complete database Details - for Scripts (or any type of record), see Records.

Script Details Field Descriptions

The following table describes the fields, buttons, and tabs that display in the Script Details.

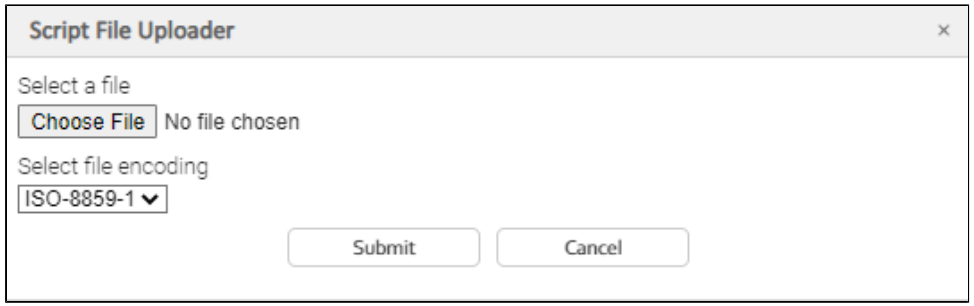
Field Name	Description
Details	This section contains detailed information about the Script.
Name	Name of the script. This name can be the same as the name of the script file. You also can specify a file extension; the default file extension for Windows is **`.bat`**. If the name has the extension **`.ps1`**, Windows will run the script as a powershell script. You may have to create the appropriate file association and security for this to work.

Version	System-supplied; version number of the current record, which is incremented by the Controller every time a user updates a record. Click the Versions tab to view previous versions. For details, see Record Versioning.
Description	Description of this record. (Maximum = 255 characters.)
Member of Business Services	User-defined; Allows you to select one or more Business Services that this record belongs to. (You also can Check All or Uncheck All Business Services for this record.) You can select up to 62 Business Services for any record type, and enter a maximum of 2048 characters for each Business Service. If the Business Service Visibility Restricted Universal Controller system property is set to true, depending on your assigned (or inherited) Permissions or Roles, Business Services available for selection may be restricted.
Script Type	Type of script: Options: • Script • SAP Definition • UDM Script • Web Service Payload • Data
Resolve UAC Variables	Controls whether or not the Script will be parsed in pursuit of Universal Controller variables. It allows the Controller to avoid the overhead of parsing a Script that does not contain variables. Note Variables *could* be embedded with this field disabled; likewise, you could have a Script with no variables but have this field enabled. However, enabling this field for a Script that does not contain Controller variables will impose an unnecessary burden (however small) on the Controller.
Content	Content of the script or SAP definition file. You can enter content manually or upload content from the local file system by using the #Upload Script button. For UDM Scripts, Source and Destination credentials are available for use. The credentials can be coded into the UDM script using the following File Transfer variables: • ops_src_cred_user • ops_src_cred_pwd • ops_dst_cred_user • ops_dst_cred_pwd The variables will be resolved by UDM internally. The following example illustrates the correct way to code them: `open src=srcserver user=$(ops_src_cred_user) pwd=$(ops_src_cred_pwd) dst=dstserver user=$(ops_dst_cred_user) pwd=$(ops_dst_cred_pwd)` The values for these variables are sent to UDM via stdin. This provides a secure channel where the credentials never show up in the script or on the command line.

Metadata	This section contains Metadata information about this record.
UUID	Universally Unique Identifier of this record.
Updated By	Name of the user that last updated this record.
Updated	Date and time that this record was last updated.
Created By	Name of the user that created this record.
Created	Date and time that this record was created.
Buttons	This section identifies the buttons displayed above and below the Script Details that let you perform various actions.
Save	Saves a new script record in the Controller database.
Save & New	Saves a new record in the Controller database and redisplays empty Details so that you can create another new record.
Save & View	Saves a new record in the Controller database and continues to display that record.
New	Displays empty (except for default values) Details for creating a new record.
Update	Saves updates to the record.
Upload Script	Allows you to upload a script from the local file system and place it in the Content field (see Uploading a Script, below).
Copy	Creates a copy of this script, which you are prompted to rename.
Delete	Deletes the current record.
Refresh	Refreshes any dynamic data displayed in the Details.
Close	For pop-up view only; closes the pop-up view of this task.
Tabs	This section identifies the tabs across the top of the Script Details that provide access to additional information about the script.
Tasks	Lists of all tasks using this script.
Notes	Lists all notes associated with this record.
Versions	Stores copies of all previous versions of the current record. See Record Versioning.

Uploading a Script

To upload a script into the Content field in the Script Details:

Step 1	Click the Upload Script button. The Script File Uploader pop-up displays. 
Step 2	Click the **Choose File** button and select a script from the local file system.
Step 3	From the **Select file encoding** drop-down list, select the character set of the script: ISO-8859-1, US-ASCII, UTF-8, UTF-16, UTF-16BE, or UTF-16LE.
Step 4	Click the **Submit** button to add the script to the Content field.

Copying Scripts

Overview

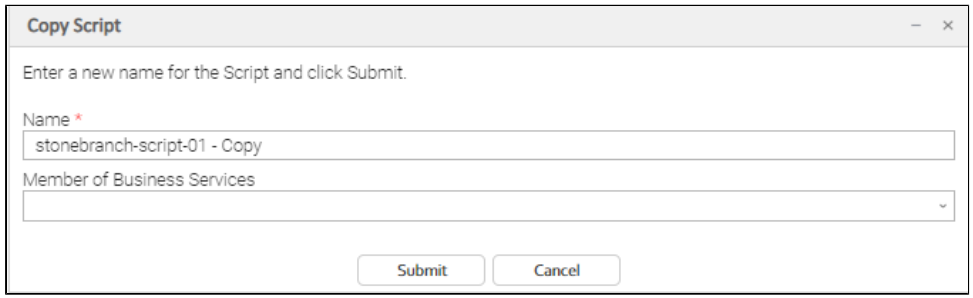
You can make copies of all Universal Controller records, including scripts, using the standard method for Copying a Record: selecting **Insert** on the Action menu.

However, this method does not make copies of any records that are associated with the copied record. For scripts, **Insert** does not make copies of any Notes that are associated with the script.

The Copy option allows you to make a complete copy of a script, including all of its Notes.

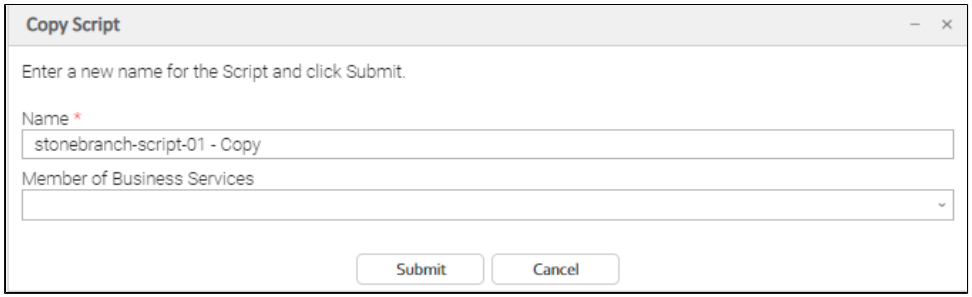
Copying One or More Scripts from a Scripts List

Step 1	From the Automation Center navigation pane, select **Other > Scripts** to display the Scripts list.
Step 2	Locate the script(s) you want to copy (see Filtering).

Step 3	Copy the script(s): **Copy One Script** 1. Right-click the **Script Name**. 2. On the Action menu, select **Copy**. A Copy Script pop-up dialog displays.  3. Enter a new name for the script and, optionally, select any Business Services that you want the script assigned to. 4. Click **Submit** to create a copy of the script. **Copy Multiple Scripts** 1. Ctrl-Click the scripts you want to copy. 2. Right-click any of the selected scripts. 3. On the Action menu, select **Copy**. 4. On the Confirmation pop-up that displays, click **OK**. The copied scripts are added to the list, with **- Copy** added as a suffix to the Script Name for each script. If a script with that **- Copy** name already exists, another copy is not created.

Copying a Script from the Script Details

Step 1	Select a script from the Script list. The Script Details for that script displays.

Step 2	Either: • Click the **Copy** button. • Right-click the Details to display the Action menu, and then click **Copy**. A Copy Script pop-up dialog displays. 
Step 3	Enter a new name for the script and, optionally, select any Business Services that you want the script assigned to.
Step 4	Click **Submit** to create a copy of the script.

Copy Permissions

To copy a Script, you must have both Read permission and Copy command permission for the Script you are copying, in addition to having Create permission for the copied Script.

Variables and Functions

Variables

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Using Variables

Setting Variables under Special Circumstances

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SAP Task Instance Variables

SQL and Stored Procedure Task Instance Variables

SQL Task Instance Variables

Stored Procedure Task Instance Variables

System Monitor Task Instance Variables

Task Instance Variables (all task types)

Task Monitor Task Instance/Trigger Variables

Trigger Variables (all trigger types)

Variable Monitor Task Instance/Trigger Variables

Web Service Task Instance Variables

z/OS Task Instance Variables

The information on these pages also is located in the Universal Controller 7.2.x Variables and Functions.pdf.

Variables and Functions Overview

Variables and Functions

Variables and functions can be used in free-text fields within tasks and workflows. When a variable or function is specified in a free-text field, the Controller inserts its value into the field when the task or workflow is run.

Triggers can pass variables and functions into the tasks and workflows that they launch.

Additionally, email notifications for Controller resources (agents, OMS servers, and cluster nodes) can use Built-In Variables that are specific to that type of resource.

Types of Variables

Universal Controller supports the following types of variables, all of which can be used in free text fields within tasks:

User-Defined Variables	These variables are created by the user for use within: • A single trigger, task, or workflow (that is a trigger-, task-, or workflow-specific variable). • All trigger, tasks, and workflows (that is, a Global variable).
Built-In Variables	These variables, maintained by the Controller, allow you to access information about task instances and other related data, such as task name, task status, and trigger name.
Functions	These variables calculate some value, such as current date and time, or perform some function, such as _replaceAll.

Setting Variables under Special Circumstances

The Controller also supports several features that allow you to set variables under special circumstances:

- Manually launch tasks and temporarily set user-defined variables.
- Manually launch all of the tasks associated with a trigger while supplying variable values used by the task(s) (see Triggering with Variables).
- Use the Set Variable action to set variables within a task or workflow.
- Use the ops-variable-set CLI function to set variables.

User-Defined Variables

Overview

User-defined Universal Controller variables are available for use in triggers, tasks, and Workflows.

You can define variables to be either:

- Available to a single trigger, task, or workflow; that is, **Local**.
- Available to all triggers, tasks, and workflows; that is, Global.

You define **Local** variables (variables specific to a single trigger, task, or workflow) on the **Variables** tab in the Details of that trigger, task, or workflow. These variables are stored in the ***ops_local_variable*** table.

You define Global variables either by:

- Selecting **Other > Variables** from the Automation Center navigation pane.
- Using the Set Variable action for a task or workflow.

Global variables are stored in the ***ops_variable*** table.

Variable Naming Conventions

- Variable names must begin with a letter.
- Allowable characters are alphanumerics (upper or lower case), and underscore (_).
- White spaces are not permitted
- Variable names are not case-sensitive.

Warning

Do not define Controller variables with the prefix **ops**_. That prefix is reserved for built-in variables.

Resolving User-Defined Variables

When the Controller creates a task instance from a task, it also resolves all variables specified in its free text fields. Because you can define variables at four different levels (trigger, task, workflow, and global), the Controller follows a prescribed formula to determine which variable takes precedence if duplicate variables have been defined. The general order of precedence, each of which may or may not exist in any given situation, is as follows:

1. Task trigger (highest precedence)
2. Task
3. Workflow trigger
4. Workflow
5. Global (lowest precedence)

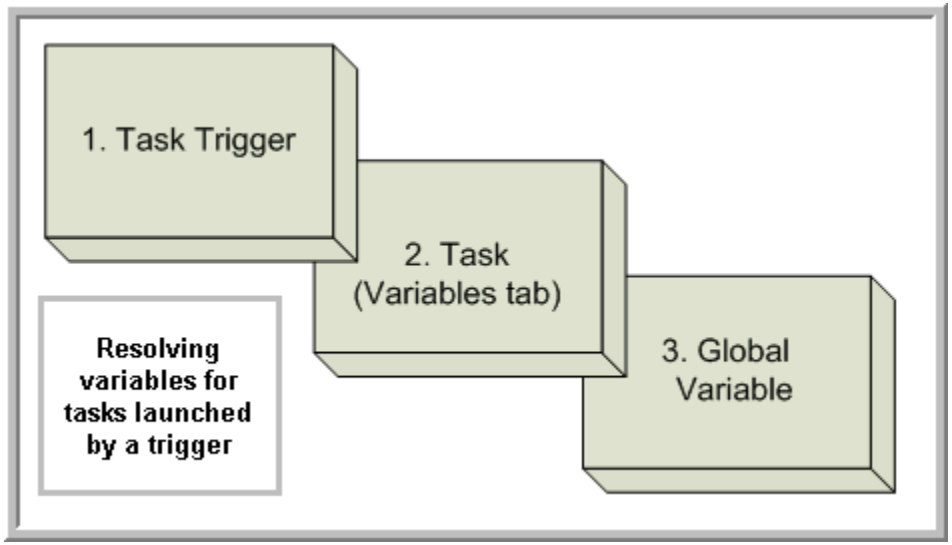
Note

You also can use the Set Variable Action of any task or workflow to define a variable. The Set Variable action explicitly states what scope you are setting the variable at, and under what circumstances.

The following scenarios provide more detailed information about how Controller variables are resolved.

For Tasks Launched by a Trigger

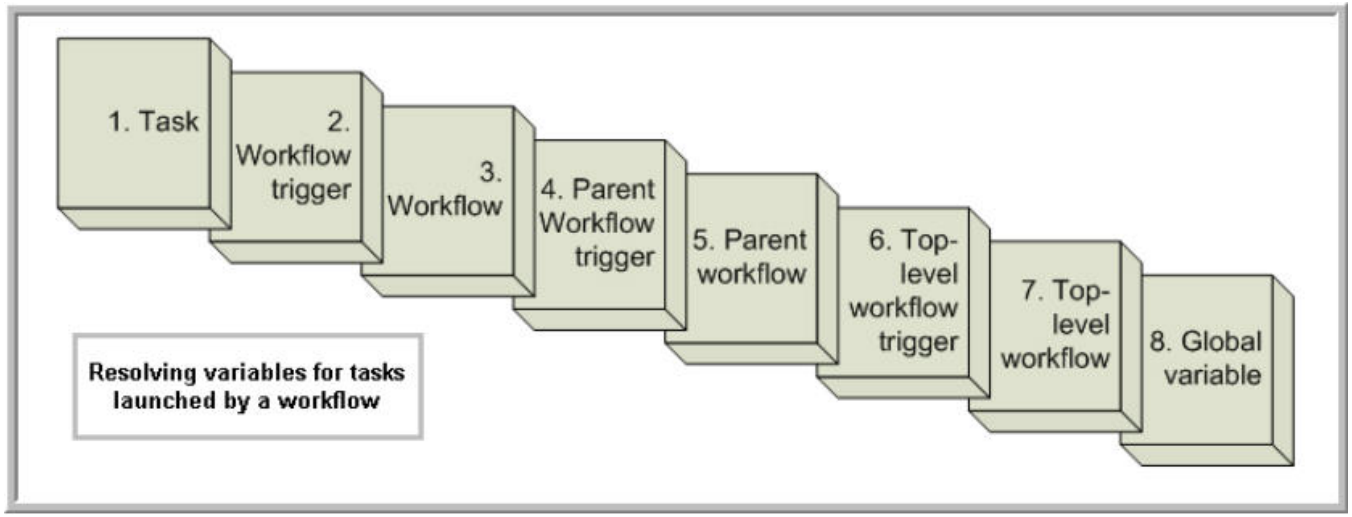
1. If the trigger defines the variable in the variables tab, that value is used to resolve the variable.
2. If the trigger does not define the variable, the value from the variable tab in the task Details is used.
3. If neither the trigger nor the task define the variable, the variable definition in the global variables table is used.
4. If the global variables table does not define the variable, the variable remains unresolved.



For Tasks Launched by a Workflow

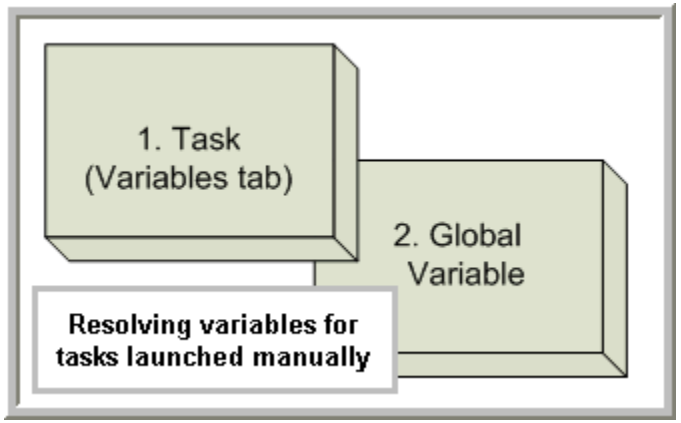
1. If the task defines the variable in the variables tab, that value is used to resolve the variable.
2. If the task does not define the variable, and the workflow was launched by a trigger, the value defined in the trigger is used.
3. If the workflow's trigger does not define the variable or the workflow was not launched by a trigger, the value defined in the workflow is used.
4. If the workflow does not define the variable, and there is a parent workflow, the value defined in the parent workflow's trigger is used.
5. If the parent workflow's trigger does not define the variable or if there is no trigger, the value defined in the parent workflow is used.
6. If the parent workflow does not define the variable, the Controller checks up a level for the trigger on the next parent workflow.

7. If that trigger does not define the variable, it checks for variables associated with the workflow. (This continues until the top level workflow is reached.)
8. If the top-level workflow does not define the variable, the variable definition in the global variables table is used.
9. If the global variables table does not define the variable, the variable remains unresolved.



For Tasks Launched Manually

1. If the task defines the variable in the variables tab, that value is used to resolve the variable.
2. If the task does not define the variable, the variable definition in the global variables table is used.
3. If the global variables table does not define the variable, the variable remains unresolved.



Format for Using Variables

When you enter a variable into a text field, precede the variable with the dollar sign ($) and enclose the variable in curly braces ({ }). You can enter a series of variables or nested variables.

Examples:

```
${variable_name}
${v1}${v2}
${${inner_variable}}
```

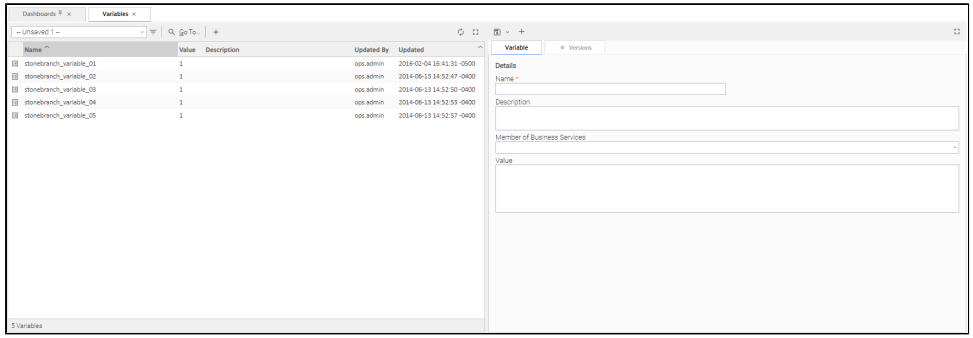
Creating a Variable

You can create variables that are:

1. Available on a Global level; that is, available for all triggers, tasks, and Workflows.
2. Available only for a specific trigger, task, or Workflow.

Creating a Global Variable

To create a Global variable that is available for all triggers, tasks, and Workflows:

Step 1	From the Automation Center navigation pane, select **Other > Variables**. The Variables list displays a list of all Global variables. (You also can define a Global variable by using the Set Variable actio To the right of the list, Variable Details for a new Global variable displays. 
Step 2	Enter / select Details for a new Variable, using the field descriptions below as a guide. • Required fields display an asterisk (*) after the field name. • Default values for fields, if available, display automatically. To display more of the Details fields on the screen, you can either: • Use the scroll bar. • Temporarily hide the list above the Details. • Click the + button above the list to display a pop-up version of the Details.

Step 3	Click a button to save the record in the Controller database.

Note

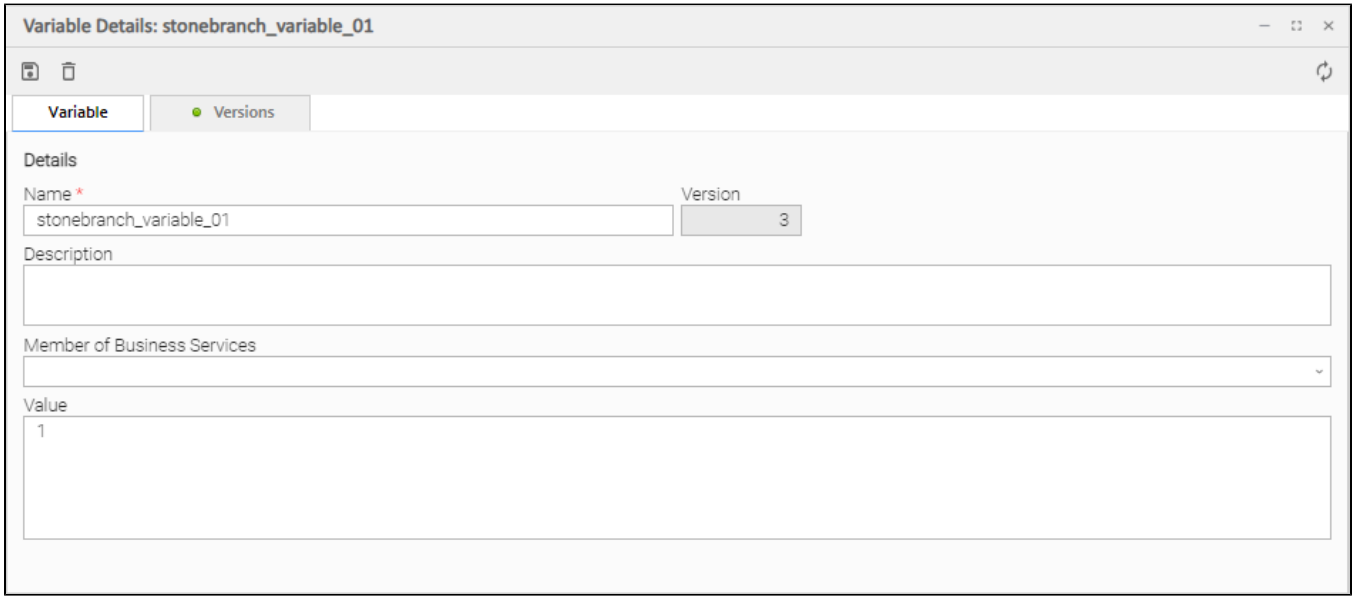
To open an existing record on the list, either:

- Click a record in the list to display its record Details below the list. (To clear record Details below the list, click the **New** button that displays above and below the Details.)
- Clicking the Details icon next to a record name in the list, or right-click a record in the list and then click **Open** in the Action menu that displays, to display a pop-up version of the record Details.
- Right-click a record in the a list, or open a record and right-click in the record Details, and then click **Open In Tab** in the Action menu that displays, to display the record Details under a new tab on the record list page (see Record Details as Tabs).

Global Variable Details

The following Variable Details is for an existing Global Variable.

See the field descriptions below for a description of all fields that display in the Global Variable Details.



For information on how to access additional details - such as Metadata and complete database Details - for Variables (or any type of record), see Records.

Global Variable Details Field Descriptions

The following table describes the fields and buttons in the Variables Details.

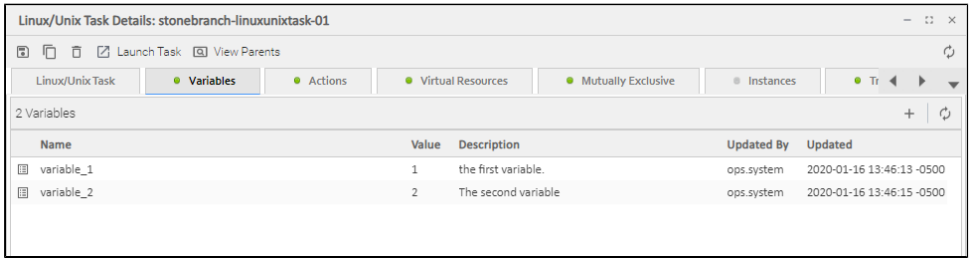
Field Name	Description
Details	This section contains assorted detailed information about the variable.

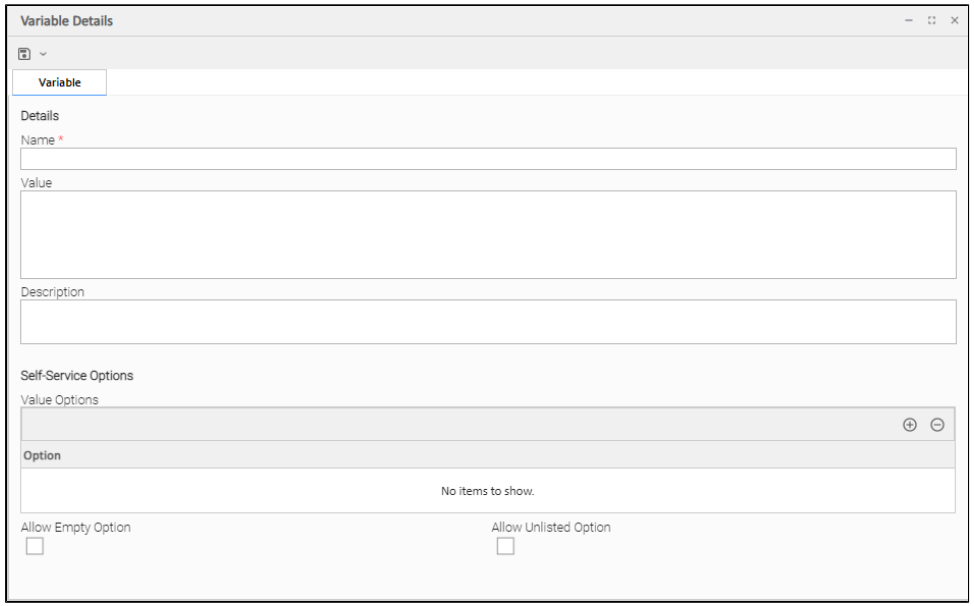
Name	Name of the variable. Up to 128 alphanumerics. The name must begin with an alphabetic character and can consist of: alphas (a-z, A-Z), numerics 0-9, _ (underscore). White spaces are not permitted; names are not case-sensitive. Important Do not define variables with the prefix **ops**_. The **ops**_ prefix is reserved for built-in variables.
Version	System-supplied. The version number of the current record, which is incremented by the Controller every time a user updates a record. Click the Versions tab to view previous versions. For details, see Record Versioning.
Description	Optional. Description of this variable.
Member of Business Services	User-defined; allows you to select one or more Business Services that this record belongs to. If the Business Service Visibility Restricted Universal Controller system property is set to true, depending on your assigned (or inherited) Permissions or Roles, Business Services available for selection may be restricted.
Value	Value of the variable up to a maximum of 25000 characters.
Self-Service Options	This section contains assorted information about the variable for tasks, workflows, and triggers only - ***not for Global Variables***.
Value Options	Value options that will presented when editing values from the Trigger Now... and Launch Task with Variables... command dialogs. Only non-empty values are allowed; duplicate values are not allowed. (Maximum = 25000 characters.)
Allow Empty Option	Indication of whether or not an empty value is a valid value option. If true, an empty option will be added to the drop-down when editing values from the Trigger Now… and Launch Task with Variables… command dialogs.
Allow Unlisted Option	Indication of whether or not an unlisted value is a valid value option. If true, the drop-down input box should allow users to enter a value that is not present in the set of value options when editing values from the Trigger Now… and Launch Task with Variables… command dialogs.
Metadata	This section contains Metadata information about this record.
UUID	Universally Unique Identifier of this record.
Updated By	Name of the user that last updated this record.
Updated	Date and time that this record was last updated.
Created By	Name of the user that created this record.
Created	Date and time that this record was created.
Buttons	This section identifies the buttons displayed above and below the Global Variable Details that let you perform various actions.
Save	Saves a new variable record in the Controller database.

Save & New	Saves a new record in the Controller database and redisplays empty Details so that you can create another new record.
Save & View	Saves a new record in the Controller database and continues to display that record.
New	Displays empty (except for default values) Details for creating a new record.
Update button	Saves updates to the record.
Delete button	Deletes the current record.
Refresh	Refreshes any dynamic data displayed in the Details.
Close	For pop-up view only; closes the pop-up view of this task.

Creating a Variable Specific to a Trigger, Task, or Workflow

To create a variable that is specific to a single trigger, task, or Workflow:

Step 1	From the Automation Center navigation pane, select **Trigger ><trigger type>** or **Tasks ><task type>**. The records list for that trigger or task type displays.
Step 2	Open a task on the list and click the **Variables** tab to display a list of any currently defined variables specific to that record. 

Step 3	Click the + button to display Variables Details for a new variable. 
Step 4	Using the field descriptions provided for Global Variable Details as a guide, complete the fields as needed.
Step 5	Click the button, or right-click in the Details and click **Save**, to save the record.
Step 6	If appropriate, repeat these steps for any additional variables you want to add.

Automatically Incrementing a Variable

For example: To increment **`${counter}`**, use a Set Variable action to set **`${counter}`** with a value of **`${_trim(${__add("${counter}", "1")})}`**.

Built-In Variables

- Remote File Monitor Task Instance Variables
  - Base Trigger File Name
  - Files Matching Wildcard
  - Remote Trigger File Name
  - Remote Trigger File Name (No Path)
  - Trigger File Directory
  - Trigger File Directory (with Final Directory Separator)
  - Trigger File Directory (without Final Directory Separator)
  - Trigger File Extension
  - Trigger Wildcard
  - Trigger Wildcard Path Only
  - Trigger Wildcard Path Only (without Final Slash)
- SAP Task Instance Variables
  - SAP InfoPackage Request ID
  - SAP Job ID
  - SAP Job Name
  - SAP Process Chain ID
  - SAP Process Chain Log ID
- SQL and Stored Procedure Task Instance Variables
  - Error Message
  - Processed Rows
  - Return Code for SQL Statement Outcome
- SQL Task Instance Variables
  - SQL Command Field
- Stored Procedure Task Instance Variables
  - Stored Procedure Name
- System Monitor Task Instance Variables
  - Actual Size
  - Actual Size (Rounded)
  - Actual Size (Scale)
  - Scale
  - Size
  - Size (Rounded)

- Task Instance Variables
  - Cluster Node Hostname
  - Cluster Node ID
  - Cluster Node IP Address
  - Cluster Node Mode
  - Cluster Node Name
  - Cluster Node Running Time
  - Cluster Node Start Time
  - Command
  - Command Parameters
  - Custom Field 1
  - Custom Field 2
  - Description
  - Duration
  - Duration In Seconds
  - End Time
  - End Time: Average Estimated
  - End Time: Highest Estimated
  - End Time: Lowest Estimated
  - End Time: User Estimated
  - Execution User ID
  - Instance Number
  - Launch Time
  - Maximum Retry Count
  - Parent Workflow Instance sys_id
  - Parent Workflow Name
  - Projected End Time of Workflow
  - Queued Time
  - Reference Id
  - Retry Count
  - Retry Interval
  - Script ID
  - Script Name
  - Script Parameters
  - Starting Time
  - Task Instance Attempts
  - Task Instance Definition ID
  - Task Instance Exit Code
  - Task Instance Name
  - Task Instance Status
  - Task Instance Status Description
  - Task Instance sys_id
  - Task Name at Instance Creation Time
  - Task Type
  - Time Zone (Task time zone)
  - Time Zone (Trigger time zone)
  - Top-Level Workflow Name
  - Top-Level Workflow Task Instance ID
  - Virtual Resource Priority
- Task Monitor Task Instance/Trigger Variables
  - Trigger Task Name
  - Trigger Task Status
  - Trigger Task sys_id
  - Trigger Task Type
  - Trigger Workflow

Overview

Built-in variables are maintained by Universal Controller and provide information about task instances, agents, Universal Message Service (OMS), and cluster nodes. They can be used in free text fields in triggers, tasks, task actions, and email notifications for agents, OMS servers, and cluster nodes.

Supported built-in variables and their descriptions are provided below. All built-in variables are prefixed with `ops_`.

Built-In Variable Categories

Built-in variables are listed alphabetically within the following categories on this page:

Agent Variables

The following agent variables can be used to pass information into an Agent notification.

Agent Hostname

Description	Resolves to the agent hostname.
Syntax	${ops_agent_hostname}
Example	

Agent IP Address

Description	Resolves to the agent IP address (see `${ops_agent_ip}`, below.
Syntax	${ops_agent_ipaddr}
Example	

Agent IP Address

Description	Resolves to the agent IP address.
Syntax	${ops_agent_ip}
Example	

Agent Mode

Description	Resolves to the agent operational mode (Active, Offline).
Syntax	${ops_agent_mode}
Example	

Agent Name

Description	Resolves to the agent name.
Syntax	${ops_agent_name}
Example	

Agent Queue Name

Description	Resolves to the agent queue name. Note In the user interface, the queue name is labelled **Agent Id**.
Syntax	${ops_agent_id}
Example	

Note

Although they have the same syntax, ${ops_agent_id}, this Agent Queue Name Agent variable resolves to a different value than the Agent sys_id Agent-based task instance variable.

Agent-Based Task Instance Variables

The following variables can be used to pass agent information into agent-based task (Windows, Linux/Unix, z/OS, and SAP) notifications; see Creating Email Notifications and Creating SNMP Notifications.

Agent Hostname

Description	Resolves to the agent hostname.
Syntax	${ops_agent_hostname}
Example	

Agent IP Address

Description	Resolves to the agent IP address (see `${ops_agent_ip}`, below.
Syntax	${ops_agent_ipaddr}
Example	

Agent IP Address

Description	Resolves to the agent IP address.
Syntax	${ops_agent_ip}
Example	

Agent Name

Description	Resolves to the agent name.
Syntax	${ops_agent_name}
Example	

Agent sys_id

Description	Resolves to the sys_id of the agent.
Syntax	${ops_agent_id}
Example	

Note

Although they have the same syntax, ${ops_agent_id}, this Agent sys_id Agent-based task instance variable resolves to a different value than the Agent Queue Name Agent variable.

Agent Queue Name

Description	Resolves to the agent queue name. Note In the user interface, the queue name is labelled **Agent Id**.
Syntax	${ops_agent_queue_name}

Example	

Agent Cluster Variables

The following agent cluster variables can be used to pass information into an Agent Cluster notification.

Agent Cluster Name

Description	Resolves to the agent cluster name.
Syntax	${ops_agent_cluster_name}
Example	

Agent Cluster Distribution

Description	Resolves to the Distribution type for the agent cluster.
Syntax	${ops_agent_cluster_distribution}
Example	

Agent Cluster Task Execution Limit

Description	Resolves to the type of Task Execution Limit for the agent cluster.
Syntax	${ops_agent_cluster_limit_type}
Example	

Agent Cluster Suspended

Description	Resolves to the current suspension status of the agent cluster.
Syntax	${ops_agent_cluster_suspended}
Example	

Agent Cluster Task Execution Limit Amount

Description	Resolves to the maximum number of tasks that can be running at the same time by Agents in this agent cluster.
Syntax	${ops_agent_cluster_limit_max}
Example	

Agent Cluster Task Execution Current Limit

Description	Resolves to the current number of tasks currently being run by the Agents in this agent cluster.
Syntax	${ops_agent_cluster_limit_current}
Example	

Agent Cluster Network Alias

Description	Resolves to the Network Alias of this agent cluster.
Syntax	${ops_agent_cluster_network_alias}
Example	

Agent Cluster Network Alias Port

Description	Resolves to the Agent Port of this agent cluster.
Syntax	${ops_agent_cluster_network_alias_port}
Example	

Agent Cluster Notification State

Description	Resolves to the Notification State for which the notification matched.
Syntax	${ops_agent_cluster_notification_state}
Example	

Agent File Monitor Task Instance / Trigger Variables

When one or more tasks are launched by a Agent File Monitor trigger after the conditions in its associated Agent File Monitor task are met, the built-in variables described below are passed into the tasks being launched by the trigger.

For example, the Agent File Monitor trigger may specify the launch of a Windows task each time the associated Agent File Monitor task detects the creation of a specific file. The Windows task might use one of these built-in variables as a command argument. Or, if the Agent File Monitor task is not associated with a trigger but is running within a workflow, on completion you can propagate one or more of these built-in variable values to the parent workflow level using the Set Variable action. This allows you to pass information from the Agent File Monitor task to a successor task within the same workflow hierarchy.

Base File Name

Description	Resolves to the base file name.
Syntax	${ops_trigger_file_name_simple}

File Directory

Description	Resolves to the directory where the new file was created, but not the file itself. If the existence or non-existence of the final directory separator is a requirement, we recommend the use of `${ops_trigger_file_fullpath}` and `${ops_trigger_file_fullpath_no_separator}`, respectively.
Syntax	${ops_trigger_file_path}
Example	

File Directory (with Final Directory Separator)

Description	Resolves to the directory where the new file was created, but not the file itself; includes the final directory separator.
Syntax	${ops_trigger_file_fullpath}
Example	

File Directory (without Final Directory Separator)

Description	Resolves to the directory where the new file was created, but not the file itself; does not include the final directory separator.
Syntax	${ops_trigger_file_fullpath_no_separator}
Example	

File Extension

Description	Resolves to the file extension of a file.
Syntax	${ops_trigger_file_name_extension}

Example	

Separator

Description	Resolves to the separator appropriate to the platform where the agent is running. For Windows, resolves to a backslash (\ ); for Linux/Unix, resolves to forward slash (/). This variable may be useful if you want to piece together a pathname using a combination of text and variables.
Syntax	${ops_trigger_file_separator}
Example	`${ops_trigger_file_fullpath}sub_folder_name` `${ops_trigger_file_separator}filename.txt`

Trigger File Date

Description	Resolves to the file date of the file that fired the trigger.
Syntax	${ops_trigger_file_date}
Example	

Trigger File Group

Description	Resolves to the file group of the file that fired the trigger.
Syntax	${ops_trigger_file_group}
Example	

Trigger File Name

Description	Resolves to the name of the file that fired the trigger.
Syntax	${ops_trigger_file_name}
Example	

Trigger File Name (No Path)

Description	Resolves to the name of the file that fired the trigger, but without any path information.

Syntax	${ops_trigger_file_name_nopath}
Example	

Trigger File Owner

Description	Resolves to the file owner of the file that fired the trigger.
Syntax	${ops_trigger_file_owner}
Example	

Trigger File Scan Result

Description	Resolves to the result of the file scan: FOUND or NOT_FOUND.
Syntax	${ops_trigger_file_scan}
Example	

Trigger File Size

Description	Resolves to the file size of the file that fired the trigger.
Syntax	${ops_trigger_file_size}
Example	

Application Monitor Trigger Variables

When a task is launched by an Application Monitor trigger, the following built-in variables are passed into the task being launched by the trigger:

Trigger Application Name

Description	Resolves to the name of the Application being monitored by the trigger.
Syntax	${ops_trigger_appl_name}
Example	

Trigger Application Status

Description	Resolves to the status of the Application being monitored by the trigger.
Syntax	${ops_trigger_appl_status}
Example	

Trigger Application sys_id

Description	Resolves to the sys_id of the application.
Syntax	${ops_trigger_appl_id}
Example	

Trigger Application Type

Description	Resolves to the type of Application being monitored by the trigger, as defined by the Application Type field.
Syntax	${ops_trigger_appl_type}
Example	

Cluster Node Variables

The following cluster node variables allow you to pass information into a cluster node (Controller server) notification:

Cluster Node Hostname

Description	Resolves to the hostname of this cluster node.
Syntax	${ops_cluster_hostname}
Example	`ops_cluster_hostname = MACHINEC19A`

Cluster Node ID

Description	Resolves to the cluster node's internally-generated build ID.
Syntax	${ops_cluster_id}

Example	`ops_cluster_id = MACHINEC19A:8080-uc`

Cluster Node IP Address

Description	Resolves to the IP address of this cluster node.
Syntax	${ops_cluster_ipaddr}
Example	`ops_cluster_ipaddr = 10.N.N.NN`

Cluster Node Mode

Description	Resolves to the current mode of this cluster node: Offline, Active, Passive. For more information, see Viewing Node Status.
Syntax	${ops_cluster_mode}
Example	`ops_cluster_mode = Active`

Cluster Node Name

Description	${ops_cluster_name} is an alias for the ${ops_cluster_id} variable.
Syntax	${ops_cluster_name}
Example	`ops_cluster_name = MACHINEC19A:8080-uc`

Cluster Node Running Time

Description	Resolves to the numbers of days, hours, and minutes that this cluster node has been running since it was last started.

Syntax	${ops_cluster_uptime}
Example	`ops_cluster_uptime = 7 Seconds`

Cluster Node Start Time

Description	Resolves to the date and time the cluster node (server) was started.

Syntax	${ops_cluster_start_time}
Example	`ops_cluster_start_time = 2011-09-26 17:35:01 -0400`

Common Variables

The following variable is available for Task Instances, Agents, OMS Servers, and Cluster Nodes.

System Identifier

Description	Resolves to the value of the System Identifier Universal Controller system property.
Syntax	${ops_system_identifier}
Example	

Composite Trigger Variables

The following built-in variable is associated with the Composite Trigger type. This variable is only available for Composite Trigger components that have a Built-in Variable Prefix specified.

Trigger Component Event Time

Description	Resolves to the time when a Composite Trigger component fired.
Syntax	${<prefix>_trigger_component_event_time}
Example	

Email Monitor Task Instance/Trigger Variables

When one or more tasks are launched by an Email Monitor trigger after the conditions in its associated Email Monitor task are met, the built-in variables described below are passed into the tasks being launched by the trigger.

For example, the Email Monitor trigger may specify the launch of an Email task each time the associated Email Monitor task detects the status in a Mailbox folder. The Windows task might use one of these built-in variables as a command argument. Or, if the Agent File Monitor task is not associated with a trigger but is running within a workflow, on completion you can propagate one or more of these built-in variable values to the parent workflow level using the Set Variable action. This allows you to pass information from the Email Monitor task to a successor task within the same workflow hierarchy.

Body Field

Description	Resolves to the Body field of the Email.
Syntax	${ops_trigger_email_body}
Example	

Cc Field

Description	Resolves to the Cc field of the Email.
Syntax	${ops_trigger_email_cc}
Example	

From Field

Description	Resolves to the From field of the Email.
Syntax	${ops_trigger_email_from}
Example	

HTML Body Field

Description	Resolves to the HTML Body field of the Email.
Syntax	${ops_trigger_email_body_html}
Example	

Received Date Field

Description	Resolves to the Received Date field of the Email.
Syntax	${ops_trigger_email_received_date}
Example	

Reply To Field

Description	Resolves to the Reply-To field of the Email.
Syntax	${ops_trigger_email_reply_to}
Example	

Sent Date Field

Description	Resolves to the Sent Date field of the Email.
Syntax	${ops_trigger_email_sent_date}
Example	

Subject Field

Description	Resolves to the Subject field of the Email.
Syntax	${ops_trigger_email_subject}
Example	

To Field

Description	Resolves to the To field of the Email.
Syntax	${ops_trigger_email_to}
Example	

File Transfer Task Instance Variables

For UDM Scripts

These File Transfer variables are available for use in UDM scripts.

The Source and Destination variables are the legacy variables. The Primary and Secondary variables are new for Universal Controller 7.0.0.0.

A UDM Script using the legacy variables will continue to work; those variables will be replaced with the new ones before the script is sent to the Agent.

Note

These variables differ from all other built-in variables in that they are resolved by Universal Data Mover (UDM) on a UDM agent, not by the Universal Controller. File Transfer variables are sent to an agent unresolved and UDM performs all resolution for them. The resolved value is never available to the Controller.

Unlike the syntax of built-in variables resolved by Universal Controller - **`${<variable-name>}`** - the syntax of File Transfer variables is the same as all UDM variables - **`$(<variable-name>)`**.

The following example illustrates the correct way to code them:

Source and Destination Variables

```
open src=srcserver user=$(ops_src_cred_user) pwd=$(ops_src_cred_pwd) dst=dstserver user=$(ops_dst_cred_user) pwd=$(ops_dst_cred_pwd)
```

Primary and Secondary Variables

```
open src=srcserver user=$(ops_primary_cred_user) pwd=$(ops_primary_cred_pwd) secondary=secserver user=$(ops_secondary_cred_user)
pwd=$(ops_secondary_cred_pwd)
```

Source Password

Description	Resolves to the source password.
Syntax	$(ops_src_cred_pwd)
Example	

Source User ID

Description	Resolves to the source user ID.
Syntax	$(ops_src_cred_user)
Example	

Destination Password

Description	Resolves to the destination password.

Syntax	$(ops_dst_cred_pwd)
Example	

Destination User ID

Description	Resolves to the destination user ID.
Syntax	$(ops_dst_cred_user)
Example	

Primary Password

Description	Resolves to the Primary password.
Syntax	$(ops_primary_cred_pwd)
Example	

Primary User ID

Description	Resolves to the Primary user ID.
Syntax	$(ops_primary_cred_user)
Example	

Secondary Password

Description	Resolves to the Secondary password.
Syntax	$(ops_secondary_cred_pwd)
Example	

Secondary User ID

Description	Resolves to the Secondary user ID.
Syntax	$(ops_secondary_cred_user)

Example	

For Transfer Protocol = UDM

Primary File Name

Description	Resolves to the Primary File(s) field values. If the Primary File(s) field is empty, it resolves to empty string/blank.
Syntax	$(ops_primary_filename) $(ops_primary_filename) is an alias for $(ops_local_filename).
Example	

Secondary File Name

Description	Resolves to the Secondary File(s) field values. If the Secondary File(s) field is empty, it resolves to empty string/blank.
Syntax	$(ops_secondary_filename) $(ops_secondary_filename) is an alias for $(ops_remote_filename).
Example	

Primary Agent Hostname

Description	If UDM Agent Option = UDM Agent Hostname; Resolves to the specified hostname. If UDM Agent Option = UDM Agent or UDM Agent Cluster; Resolves to the IP address of the referenced Agent definition. If UDM Agent Option = --None–; Resolves to empty string/blank. If UDM Agent Option = Utility Agent; Resolves to *.
Syntax	$(ops_primary_agent_hostname)
Example	

Secondary Agent Hostname

Description	If UDM Agent Option = UDM Agent Hostname; Resolves to the specified hostname. If UDM Agent Option = UDM Agent or UDM Agent Cluster; Resolves to the IP address of the referenced Agent definition. If UDM Agent Option = --None–; Resolves to empty string/blank.
Syntax	$(ops_secondary_agent_hostname)
Example	

For Transfer Protocol = FTP/SFTP/FTPS

Local File Name

Description	Resolves to the Local Filename field values. If the Local Filename field is empty, it resolves to empty string/blank.
Syntax	$(ops_local_filename) $(ops_local_filename) is an alias for $(ops_primary_filename).
Example	

Remote File Name

Description	Resolves to the Remote Filename field values. If the Remote Filename field is empty, it resolves to empty string/blank.
Syntax	$(ops_remote_filename) $(ops_remote_filename) is an alias for $(ops_secondary_filename).
Example	

OMS Server Variables

The following OMS Server variables allow you to pass information into an OMS Server notification.

Last OMS Server Connected

Description	Resolves to the last OMS Server connected to the Controller in an OMS HA cluster.

Syntax	${ops_oms_last_connected}
Example	

Last OMS Server Connected Time

Description	Resolves to the last time that the OMS Server connected to the Controller in an OMS HA cluster.
Syntax	${ops_oms_last_connected_time}
Example	

OMS Server IP Address

Description	Resolves to the OMS Server IP address.
Syntax	${ops_oms_server_address}
Example	

OMS Server Status

Description	Resolves to the current status of the OMS Server.
Syntax	${ops_oms_status}
Example	

OMS Server sys_id

Description	Resolves to the sys_id of the OMS server.
Syntax	${ops_oms_id}
Example	

OMS Server Messaging Sessions Status

Description	Resolves to the current status of the OMS Server messaging sessions (heartbeat, input, output): Operational, Impaired, None.
Syntax	${ops_oms_session_status}

Example	

PeopleSoft Task and Task Instance Variables

The following built-in variables are available for PeopleSoft tasks and task instances:

Distribution Status

(For task instances only.)

Description	Resolves to the PeopleSoft task instance Distribution Status.
Syntax	${ops_distribution_status}
Example	

Main Job Name

Description	Resolves to the PeopleSoft Main Job Name.
Syntax	${ops_main_job_name}
Example	

Main Schedule Name

Description	Resolves to the PeopleSoft task/task instance Main Schedule Name.
Syntax	${ops_main_schedule_name}
Example	

Process Instance

(For task instances only.)

Description	Resolves to the PeopleSoft task instance Process Instance.
Syntax	${ops_process_instance}
Example	

Process Name

Description	Resolves to the PeopleSoft task/task instance Process/Job Name.
Syntax	${ops_process_name}
Example	

Process Type

Description	Resolves to the PeopleSoft task/task instance Process Type.
Syntax	${ops_process_type}
Example	

Run Status

(For task instances only.)

Description	Resolves to the PeopleSoft task instance Run Status.
Syntax	${ops_run_status}
Example	

Recurring Task Instance Variables

The following built-in variables are available for Recurrent tasks and task instances:

Next Recurrence Time

Description	Resolves to the time when the Recurrence task next runs.
Syntax	${ops_next_recurrence_time}
Example	

Recurrence Count

Description	Resolves to the current count of task recurrences.

Syntax	${ops_recurrence_count}
Example	

Source Instance ID

Description	Resolves to the ID of the Recurrence task instance.
Syntax	${ops_source_instance_id}
Example	

Source Instance Name

Description	Resolves to the name of the Recurrence task instance.
Syntax	${ops_source_instance_name}
Example	

Target Task ID

Description	Resolves to the ID of the target task.
Syntax	${ops_target_task_id}
Example	

Target Task Name

Description	Resolves to the name of the target task.
Syntax	${ops_target_task_name}
Example	

Remote File Monitor Task Instance Variables

The following built-in variables are available for Remote File Monitor task instances and provide information about the file or file(s) that matched the monitor's criteria.

You can use these variables in a Remote File Monitor action or in a successor task instance by propagating one or more of these built-in variable values to a parent workflow using the Set Variable action.

Base Trigger File Name

Description	Resolves to the base file name.
Syntax	${ops_trigger_file_name_simple}
Example	

Files Matching Wildcard

Description	Resolves to a comma-separated list of files that matched the wildcard, if one was specified in the Remote Filename field in the Remote File Monitor task.
Syntax	${ops_trigger_files}
Example	`ops_trigger_files = COMPANY-2011-11-22.xls, COMPANY-2011-11-23.xls,COMPANY-2011-11-24.xls`

Remote Trigger File Name

Description	Resolves to the remote file name.
Syntax	${ops_trigger_file_name}
Example	

Remote Trigger File Name (No Path)

Description	Resolves to the remote file name without any path information.
Syntax	${ops_trigger_file_name_nopath}
Example	

Trigger File Directory

Description	Resolves to the directory where the remote file is located, but not the file itself. ${ops_trigger_file_path} is an alias for ${ops_trigger_file_fullpath_no_separator}.
Syntax	${ops_trigger_file_path}
Example	

Trigger File Directory (with Final Directory Separator)

Description	Resolves to the directory where the remote file is located, but not the file itself; includes the final directory separator.
Syntax	${ops_trigger_file_fullpath}
Example	

Trigger File Directory (without Final Directory Separator)

Description	Resolves to the directory where the remote file is located, but not the file itself; does not include the final directory separator.
Syntax	${ops_trigger_file_fullpath_no_separator}
Example	

Trigger File Extension

Description	Resolves to the file extension of the file.
Syntax	${ops_trigger_file_name_extension}
Example	

Trigger Wildcard

Description	Resolves to the contents of the Remote Filename field in the Remote File Monitor task.
Syntax	${ops_trigger_wildcard}
Example	`ops_trigger_wildcard = /home/prod/stonebranch/COMPANY*.xls`

Trigger Wildcard Path Only

Description	Resolves to the path only, with the final slash but without the file name, from the Remote Filename field in the Remote File Monitor task.
Syntax	${ops_trigger_wildcard_path}

Example	`ops_trigger_wildcard_path = /home/prod/stonebranch/`

Trigger Wildcard Path Only (without Final Slash)

Description	Resolves to the path only, without the final slash and without the file name, from the Remote Filename field in the Remote File Monitor task.
Syntax	${ops_trigger_wildcard_path_no_separator}
Example	`ops_trigger_wildcard_path_no_separator = /home/prod/stonebranch`

SAP Task Instance Variables

For an SAP task instance, where applicable, the following built-in variables resolve to the SAP jobname and SAP jobid of the job running in the SAP system. If you need to use the SAP jobname and/or the SAP jobid from one SAP task instance in a successor SAP task instance, you can use the Set Variable action to propagate these built-in variable values to the parent workflow.

SAP InfoPackage Request ID

Description	Resolves to the SAP InfoPackage Request ID.
Syntax	${ops_sap_requestid}
Example	

SAP Job ID

Description	Resolves to the SAP job ID.
Syntax	${ops_sap_jobid}
Example	

SAP Job Name

Description	Resolves to the SAP job name.
Syntax	${ops_sap_jobname}

Example	

SAP Process Chain ID

Description	Resolves to the SAP Process Chain ID.
Syntax	${ops_sap_chainid}
Example	

SAP Process Chain Log ID

Description	Resolves to the SAP Process Chain Log ID.
Syntax	${ops_sap_logid}
Example	

SQL and Stored Procedure Task Instance Variables

The following built-in variables are used in SQL tasks and Stored Procedure tasks to collect SQLException data, if any:

Error Message

Description	Resolves to any error message generated by the database.
Syntax	${ops_sql_error_msg}
Example	

Processed Rows

Description	Resolves to the number of rows processed.
Syntax	${ops_sql_rows}
Example	

Return Code for SQL Statement Outcome

Description	Resolves to a return code that indicates the outcome of the most recently executed SQL statement.
Syntax	${ops_sql_state}
Example	

SQL Task Instance Variables

The following built-in variable is available for SQL task instances.

SQL Command Field

Description	Resolves to the value of the SQL Command field.
Syntax	${ops_sql_command}
Example	

Stored Procedure Task Instance Variables

The following built-in variable is available for Stored Procedure task instances and provides information about the stored procedure itself.

Stored Procedure Name

Description	Resolves to the value from the Stored Procedure Name field.
Syntax	${ops_stored_proc_name}
Example	

System Monitor Task Instance Variables

The following System Monitor variables show the results for **Resource Available** and **Actual Available** that can be utilized in System Monitor tasks.

Actual Size

Description	Actual size determined by the agent.
Syntax	${ops_sm_actual_size}
Example	

Actual Size (Rounded)

Description	Same as ops_sm_actual_size, except rounded to the nearest integer.
Syntax	${ops_sm_actual_int_size}
Example	

Actual Size (Scale)

Description	Scale of the actual size determined by the agent.
Syntax	${ops_sm_actual_scale}
Example	

Scale

Description	Scale specified in the **By Scale** field for **Resource Available** of the System Monitor task definition.
Syntax	${ops_sm_scale}
Example	

Size

Description	Size specified in the **Resource Available** field of the System Monitor task definition.
Syntax	${ops_sm_size}
Example	

Size (Rounded)

Description	Same as ops_sm_size, except that ops_sm_int_size is rounded to the nearest integer.
Syntax	${ops_sm_int_size}
Example	

Task Instance Variables

The following built-in variables are associated with task instances for all task types.

Cluster Node Hostname

Description	Resolves to the hostname of the Active cluster node.
Syntax	${ops_cluster_hostname}
Example	`ops_cluster_hostname = MACHINEC19A`

Cluster Node ID

Description	Resolves to the Active cluster node's internally-generated build ID.
Syntax	${ops_cluster_id}
Example	`ops_cluster_id = MACHINEC19A:8080-uc`

Cluster Node IP Address

Description	Resolves to the IP address of the Active cluster node.
Syntax	${ops_cluster_ipaddr}
Example	`ops_cluster_ipaddr = 10.N.N.NN`

Cluster Node Mode

Description	Resolves to the current mode of the cluster node: Offline, Active, Passive. For more information, see Viewing Node Status.
Syntax	${ops_cluster_mode}

Example	`ops_cluster_mode = Active`

Cluster Node Name

Description	${ops_cluster_name} is an alias for the ${ops_cluster_id} variable.
Syntax	${ops_cluster_name}
Example	`ops_cluster_name = MACHINEC19A:8080-uc`

Cluster Node Running Time

Description	Resolves to the numbers of days, hours, and minutes that the Active cluster node has been running since it was last started.
Syntax	${ops_cluster_uptime}
Example	`ops_cluster_uptime = 7 Seconds`

Cluster Node Start Time

Description	Resolves to the date and time the Active cluster node (server) was started.
Syntax	${ops_cluster_start_time}
Example	`ops_cluster_start_time = 2011-09-26 17:35:01 -0400`

Command

Description	For tasks that launch a command on a Windows or Linux/Unix machine; resolves to the task command.
Syntax	${ops_cmd}

Example	

Command Parameters

Description	For tasks that launch a command on a Windows or Linux/Unix machine; resolves to the task command parameters.
Syntax	${ops_cmd_parms}
Example	

Custom Field 1

Description	Resolves to the value of user-defined field #1.
Syntax	${ops_custom_field1}
Example	

Custom Field 2

Description	Resolves to the value of user-defined field #2.
Syntax	${ops_custom_field2}
Example	

Description

Description	Resolves to the value of the Task Description field.
Syntax	${ops_description}
Example	

Duration

Description	Resolves to the task instance Duration.
Syntax	${ops_duration_text}
Example	ops_duration_text = 2 Minutes 10 Seconds

Duration In Seconds

Description	Resolves to the task instance Duration In Seconds.
Syntax	${ops_duration}
Example	ops_duration = 130000

End Time

Description	Resolves to the task ending time.
Syntax	${ops_end_time}
Example	

End Time: Average Estimated

Description	Resolves to the Average Estimated End Time in the server's time zone.
Syntax	${ops_avg_estimated_end_time}
Example	${ops_avg_estimated_end_time} > 2018-10-16 15:01:45 -0400

End Time: Highest Estimated

Description	Resolves to the Highest Estimated End Time in the server's time zone.
Syntax	${ops_highest_estimated_end_time}
Example	${ops_highest_estimated_end_time} > 2018-10-16 15:01:45 -0400

End Time: Lowest Estimated

Description	Resolves to the Lowest Estimated End Time in the server's time zone.
Syntax	${ops_lowest_estimated_end_time}
Example	${ops_lowest_estimated_end_time} > 2018-10-16 15:01:44 -0400

End Time: User Estimated

Description	Resolves to the User Estimated End Time in the server's time zone.
Syntax	${ops_user_estimated_end_time}
Example	${ops_user_estimated_end_time} > 2018-10-16 15:01:54 -0400

Execution User ID

Description	Resolves to the ID of the user who launched the task or to the ID of the user who enabled the trigger that launched the task.
Syntax	${ops_execution_user}
Example	

Instance Number

Description	Resolves to the sequentially assigned number, maintained per task, representing the creation order of the instance. For example, if you launch a task twice, the first task instance will have instance number 1, and the second task instance will have instance number 2.
Syntax	${ops_instance_number}
Example	

Launch Time

Description	Resolves to the task launch time. For workflows, all descendants will have the same launch time as the top-level workflow.
Syntax	${ops_launch_time}
Example	

Maximum Retry Count

Description	Resolves to the maximum retry count.
Syntax	${ops_retry_maximum}
Example	

Parent Workflow Instance sys_id

Description	Resolves to the sys_id of the parent workflow task instance.

Syntax	${ops_workflow_id}
Example	

Parent Workflow Name

Description	Resolves to the name of the parent workflow.
Syntax	${ops_workflow_name}
Example	

Projected End Time of Workflow

Description	Resolves to the projected end time of workflow, based on its critical path calculations.
Syntax	${projected_end_time}
Example	

Queued Time

Description	Resolves to the date and time that the task was queued for processing.
Syntax	${ops_queued_time}
Example	

Reference Id

Description	Resolves to the sequentially assigned number, maintained per task, representing the creation order of the instance. For example, if you launch a task twice, the first task instance will have instance number 1, and the second task instance will have instance number 2. Note Although it still is supported, the Reference Id built-in variable has been superseded by the Instance Number built-in variable.
Syntax	${ops_task_ref_count}
Example	

Retry Count

Description	Resolves to the current retry count.
Syntax	${ops_retry_count}
Example	

Retry Interval

Description	Resolves to the retry interval (seconds).
Syntax	${ops_retry_interval}
Example	

Script ID

Description	For Windows, Linux/Unix, and SAP tasks where a Script or SAP Definition from Scripts is specified; resolves to the Controller system ID of the script.
Syntax	${ops_script_id}
Example	

Script Name

Description	For Windows, Linux/Unix, and SAP tasks where a Script or SAP Definition from Scripts is specified; resolves to the Controller name of the script.
Syntax	${ops_script_name}
Example	

Script Parameters

Description	For tasks that run a script on a Windows or Linux/Unix machine; resolves to the task script parameters.
Syntax	${ops_script_parms}
Example	

Starting Time

Description	Resolves to the task starting time.

Syntax	${ops_start_time}
Example	

Task Instance Attempts

Description	Resolves to the current task instance attempt count. Each Re-run operation increments the attempt. Initial attempt is 1.
Syntax	${ops_attempt}
Example	

Task Instance Definition ID

Description	Resolves to the task instance definition ID.
Syntax	${ops_task_definition_id}
Example	

Task Instance Exit Code

Description	Resolves to the task instance exit code, if any.
Syntax	${ops_exit_code}
Example	

Task Instance Name

Description	Resolves to the task instance name.
Syntax	${ops_task_name}
Example	

Task Instance Status

Description	Resolves to the current task instance status.
Syntax	${ops_status}

Example	

Task Instance Status Description

Description	Resolves to the task instance status description.
Syntax	${ops_status_description}
Example	

Task Instance sys_id

Description	Resolves to the sys_id of the task instance.
Syntax	${ops_task_id}
Example	

Task Name at Instance Creation Time

Description	Resolves to the name of the task at the time the task instance was created. Note If the name of the task contains variables, those variables contained in the task will be fully resolved when using this built-in variable, ${ops_task_security_name}.
Syntax	${ops_task_security_name}
Example	

Task Type

Description	Resolves to the task type.
Syntax	${ops_task_type}
Example	

Time Zone (Task time zone)

Description	Resolves to the time zone of the task instance, as specified by the Time Zone Preference field.
Syntax	${ops_task_time_zone}

Example	

Time Zone (Trigger time zone)

Description	Resolves to the time zone of the trigger that launched the task. If the task was launched by the Trigger Now/Launch Task command, the built-in variable will resolve to the command's time zone option, or if no time zone option was specified, the server time zone.
Syntax	${ops_time_zone}
Example	

Top-Level Workflow Name

Description	Resolves to the name of the top-level workflow task instance.
Syntax	${ops_top_level_workflow_name}
Example	

Top-Level Workflow Task Instance ID

Description	Resolves to the sys_id of the top-level workflow task instance.
Syntax	${ops_top_level_workflow_id}
Example	

Virtual Resource Priority

Description	Resolves to the value of the task instance field Virtual Resource Priority.
Syntax	${ops_resource_priority}
Example	

Task Monitor Task Instance/Trigger Variables

When the conditions of a Task Monitor task are met and its associated Task Monitor trigger launches one or more tasks, the following built-in variables are passed into the task instances being launched by the trigger.

For example, the Task Monitor trigger may specify an Email task that will launch each time the conditions in the associated Task Monitor task are met. You might want to specify one or more of these variables in the body of the email.

If the Task Monitor task is not associated with a trigger but is running within a workflow, on completion you can propagate one or more of these built-in variable values to the parent workflow level by using the Set Variable action. This allows you to pass information from the Task Monitor task to a successor task within the same workflow hierarchy.

Trigger Task Name

Description	Resolves to the name of the task instance that fired the trigger.
Syntax	${ops_trigger_task_name}
Example	

Trigger Task Status

Description	Resolves to the status of the task instance that fired the trigger.
Syntax	${ops_trigger_task_status}
Example	

Trigger Task sys_id

Description	Resolves to the sys_id of the task instance that fired the trigger.
Syntax	${ops_trigger_task_id}
Example	

Trigger Task Type

Description	Resolves to the type of the task instance that fired the trigger.
Syntax	${ops_trigger_task_type}
Example	

Trigger Workflow

Description	Resolves to the name of the workflow instance that fired the trigger. This variable is available only for a Task Monitor task that has a Workflow Condition specified. If a workflow condition is specified, **`${ops_trigger_workflow_name}`** will resolve to the name of the workflow instance that the workflow condition matched.
Syntax	${ops_trigger_workflow_name}
Example	

Trigger Variables

The following built-in variables are associated with all trigger types.

When a task is launched by a trigger, the values of the following built-in variables, if they are specified in the task, are passed into the task instance.

Custom Field 1

Description	Resolves to the value of user-defined field #1.
Syntax	${ops_trigger_custom_field1}
Example	

Custom Field 2

Description	Resolves to the value of user-defined field #2.
Syntax	${ops_trigger_custom_field2}
Example	

Trigger Name

Description	Resolves to the name of the trigger that launched the task instance.
Syntax	${ops_trigger_name}
Example	

Trigger Time

Description	Resolves to the scheduled time of the trigger or, if the trigger is not scheduled, the actual trigger time. If the task is triggered by date/time, it resolves to that specified date/time.

Syntax	${ops_trigger_time}
Example	

Trigger Time (Trigger time zone)

Description	Resolves to the trigger time in the time zone of the trigger.
Syntax	${ops_trigger_time_tz}
Example	

Universal Event Task Instance/Trigger Variables

Universal Event Attributes

Description	Name of a Universal Event Attribute. Facilitates the passing of matched Universal Event attributes to downstream instances within a workflow or to instances launched by a Universal Monitor Trigger.
Syntax	${ops_trigger_eventName_attributeName}
Example	

Universal Event Name

Description	Name of the Universal Event.
Syntax	${ops_trigger_universal_event_name}
Example	

Universal Event Publisher ID

Description	UUID of the Universal Task Instance that published the Universal Event, if applicable.
Syntax	${ops_trigger_universal_event_publisher_id}
Example	

Universal Event Time To Live

Description	Time To Live (in minutes) for the Universal Event.
Syntax	${ops_trigger_universal_event_ttl}
Example	

Universal Template ID

Description	UUID of the Universal Template, if applicable.
Syntax	${ops_trigger_universal_template_id}
Example	

Universal Template Event Template ID

Description	UUID of the Universal Template Event Template, if applicable.
Syntax	${ops_trigger_universal_template_event_template_id}
Example	

Universal Event Template ID

Description	UUID of the Universal Event Template, if applicable.
Syntax	${ops_trigger_universal_event_template_id}
Example	

Variable Monitor Task Instance/Trigger Variables

When the conditions of a Variable Monitor task are met and its associated Variable Monitor trigger launches one or more tasks, the following built-in variables are passed into the task instances being launched by the trigger.

For example, the Variable Monitor trigger may specify an Email task that will launch each time the conditions in the associated Variable Monitor task are met. You might want to specify one or more of these variables in the body of the email.

If the Variable Monitor task is not associated with a trigger but is running within a workflow, on completion you can propagate one or more of these built-in variable values to the parent workflow level by using the Set Variable action. This allows you to pass information from the Variable Monitor task to a successor task within the same workflow hierarchy.

Trigger Variable Name

Description	Resolves to the name of the variable being monitored.
Syntax	${ops_trigger_variable_name}
Example	

Trigger Variable Value

Description	Resolves to the current value of the variable being monitored.
Syntax	${ops_trigger_variable_value}
Example	

Trigger Variable Previous Value

Description	Resolves to previous value of the variable being monitored.
Syntax	${ops_trigger_variable_prev_value}
Example	

Web Service Task Instance Variables

The following built-in variables are available for Web Service task instances:

URL

Description	Resolves to the entire encoded URL containing the host, port, path and query.
Syntax	${ops_url}
Example	

Raw Value of URL

Description	Resolves to the raw value of the URL field.
Syntax	${ops_url_raw}
Example	

URL Host

Description	Resolves to the URL host.
Syntax	${ops_url_host}
Example	

URL Port

Description	Resolves to the URL port.
Syntax	${ops_url_port}
Example	

URL Path

Description	Resolves to the encoded URL path.
Syntax	${ops_url_path}
Example	

Unencoded URL Path

Description	Resolves to the unencoded URL path.
Syntax	${ops_url_path_unencoded}
Example	

URL Query

Description	Resolves to the URL query.
Syntax	${ops_url_query}
Example	

Unencoded URL Query

Description	Resolves to the unencoded URL query.
Syntax	${ops_url_query_unencoded}
Example	

z/OS Task Instance Variables

The following built-in variables are available for z/OS task instances:

JCL Location

Description	Resolves to the file and member name containing the JCL script.
Syntax	${ops_jcl_location}
Example	

Job Number

Description	Resolves to the job number assigned to the job by JES.
Syntax	${ops_job_id}
Example	

Override JCL Location

Description	Resolves to the file and member name of the JCL location containing a potential override JCL script.
Syntax	${ops_override_jcl_location}
Example	

Submitted JCL Location

Description	Resolves to the file and member name of the JCL location that was actually used for job submission.
Syntax	${ops_submitted_jcl_location}
Example	

Launching With Variables

For information on how to launch a task with variables, see Launch a Task Manually with Temporary Variable Values on the Manually Running and Controlling Tasks page.

Trigger With Variables

For information on how to use variables when manually launching tasks associated with a trigger, see Triggering with Variables (in the Triggers section of this documentation).

Creating a Set Variable Action within a Task or Workflow

Overview

The Set Variable action allows you to set a variable to a specific value for a task or workflow, and to select a scope (level of usage) for that variable (see Variables and Variable Scope, below). Unless you set the scope of the variable to **GLOBAL**, which specifies that the variable can be accessed at any time by any task, workflow, or trigger, the value exists in memory only for the time that the task or workflow is running, or until another Set Variable action sets the variable to another value.

Note

Variables with a Variable Scope set to **GLOBAL** are added to the list of global variables on the Variables list (**Automation Center > Other > Variables**) after the task or workflow is run.

You can use the Set Variable action to create a new variable or modify an existing variable.

When creating a Set Variable action, you can trigger the Set Variable action based on one or more of the following:

- Status
- Exit codes
- Late start
- Late or early finish

Variables and Variable Scope

A variable defined for a task under the **Variables** tab for that task is used only by that task.

A variable defined for a workflow under the **Variables** tab for that workflow is available for any task in that workflow; a task will use the variable value defined for the workflow unless the variable is defined for that task.

A variable defined for a task or workflow in the Set Variable Action Details lets you specify, in the Variable Scope field, the scope of that variable. You can specify that a variable be available for:

- Only the task where it is set.
- All tasks within the task's parent (immediate) workflow.
- All tasks within the task's top-level parent workflow.
- All tasks and workflow instances.

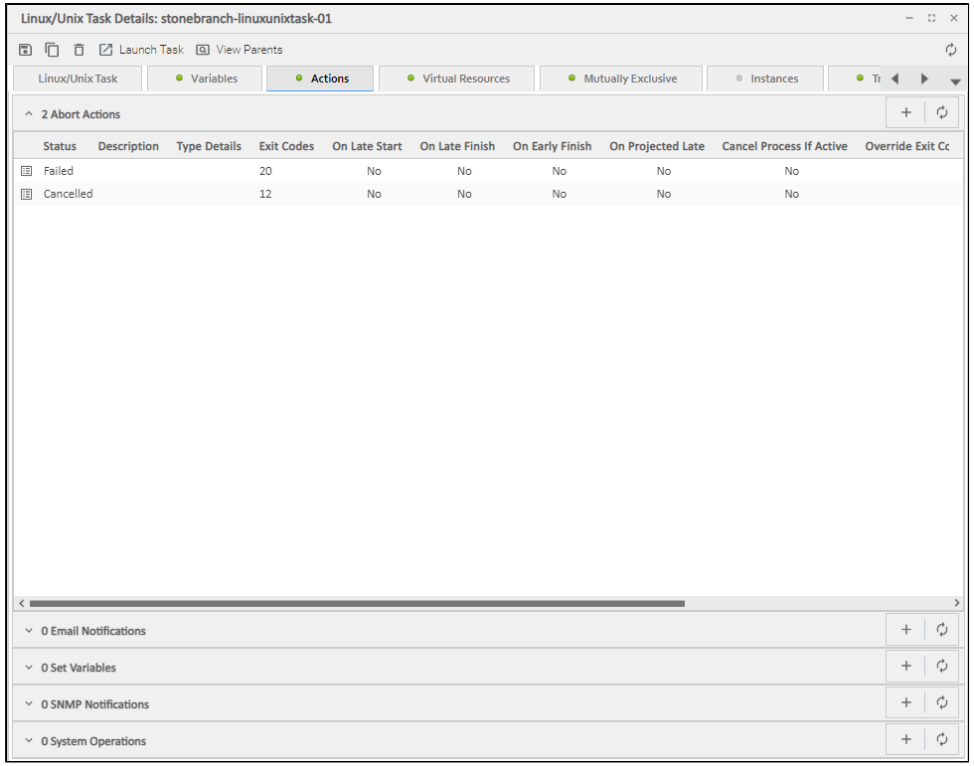
For example, if you set a variable for a task to be available within the scope of its parent workflow, the value of that variable is propagated up to the parent workflow level. As each task in the workflow is run, that value is available for that task.

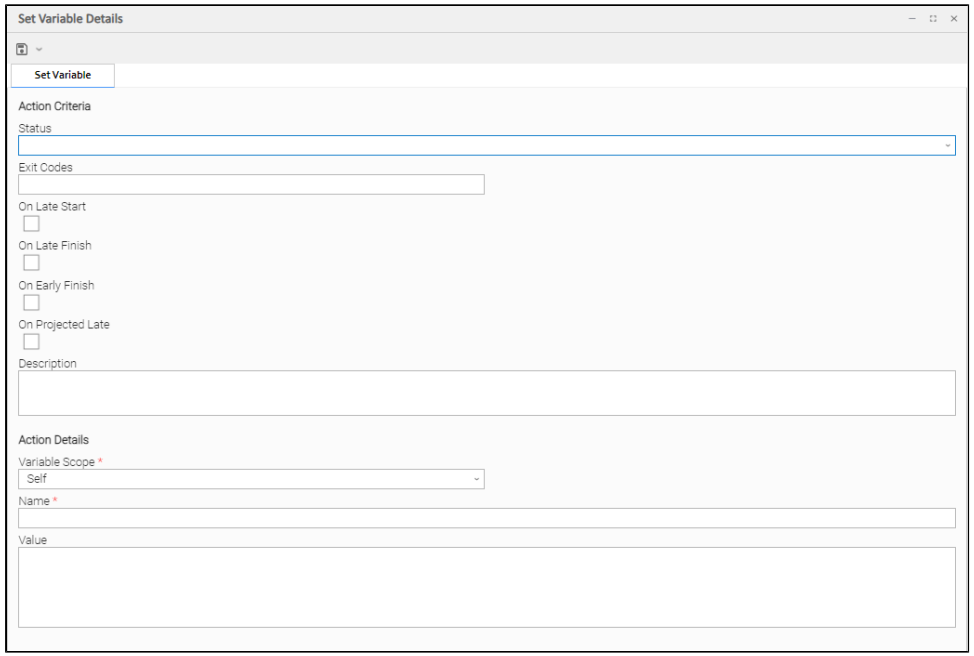
Creating a Set Variable Action

Step 1	Display the Task Details of the task for which you are creating the Set Variable action.

Step 2

Click the **Actions** tab. A list of any defined Actions for that task displays.



Step 3	Click the + button that displays on the Set Variables row. The Set Variable Details pop-up displays. 
Step 4	Using the field descriptions below as a guide, complete the fields as needed.
Step 5	Click a button to save the record in the Controller database.
Step 6	If appropriate, repeat these steps for any additional Set Variable actions you want to create.

Set Variable Details Field Descriptions

The table below describes the fields and buttons in the Set Variable Details.

Field Name	Description
Action Criteria	This section contains criteria for performing the action.
Type Details	Displays - on the Set Variables actions list - the Variable Scope, Name, and Value for this action.

Action Inheritance	For Workflow tasks only; the records that this action applies to. Options: • Self The action applies only to the workflow; it is not inherited by its children tasks. For example, if the action is defined for the Defined status, when the workflow where the action is specified transitions into the Defined status, the action will run for the workflow. When children tasks within this workflow transition into the Defined status, the action will not run. • Self/Children The action applies to the workflow and any children under the workflow (it is as if each child under the workflow had the action specified on itself). For example, if the workflow or any of its children transition into the Defined status, the action will run. • Children This action applies only to the children under the workflow and not the workflow itself. For example, if any child of this workflow transitions into the Defined status, the action will run. However, when the workflow where this action is specified transitions into the Defined status, this action will not run.
Status	The status of the task, by itself or together with an exit code, that will trigger this Set Variable action. You can specify as many statuses as needed.
Exit Codes	Specifies one or more exit codes that will trigger the event. If you specify an exit code, you must also specify at least one status. Use commas to separate multiple exit codes; use a hyphen to specify a range. Example: 1, 5, 22-30.
On Late Start	Generates the action or notification if the task started late, based on the Late Start Time specified in the task.
On Late Finish	Generates the action or notification if the task finishes late, based on the Late Finish time specified in the task.
On Early Finish	Generates the action or notification if the task finishes early, based on the Early Finish Time specified in the task.
On Projected Late	Execute the Action when the task instance is projected to be late based on critical path projected end times. Only applicable when a Late Start Time, Late Start Duration, or Late Finish Time is specified for the task instance. Note ⚠ This field displays in the Details only if the Controller is configured for critical path calculations with an enabled Critical Path Calculations Permitted Universal Controller system property.
Description	Description of this action.
Action Details	This section contains additional details about the action.

<table>
<tr><td>Variable Scope</td><td>Applies to variables associated with a task in a workflow.

Options:
<table><tr><th>Scope</th><th>Scope Value</th><th>Description</th></tr><tr><td>Self</td><td>1</td><td>The variable is updated or created in the scope of the task instance running the action. If the task instance is a workflow, then any child of that workflow will be able to read that variable.</td></tr><tr><td>Parent</td><td>2</td><td>The variable is updated or created in the immediate parent workflow scope, allowing a child within a workflow to make a variable available to any other child in the same workflow (at the same level).</td></tr><tr><td>Top Level Parent</td><td>3</td><td>The variable is updated or created at the top-level workflow variable scope, allowing a child anywhere in the workflow hierarchy to make a variable available to any other child in the workflow hierarchy, regardless of which level in the workflow the task instances are running.</td></tr><tr><td>Global</td><td>4</td><td>A global variable will be updated and or created. Allows for variables to be shared across independent workflows.</td></tr></table></td></tr>
<tr><td>System Notification</td><td>If Variable Scope = Global; Status of the Set Variable action that will trigger a system notification.

Options:
None
Operation Failure (default)
Operation Success/Failure
Operation Success
Note
The Controller must be configured for system notifications in order for system notifications to be triggered.</td></tr>
<tr><td>Name</td><td>Name of the variable. Up to 128 alphanumerics. The name must begin with an alphabetic character and can consist of: alphas (a-z, A-Z), numerics 0-9, _ (underscore). White spaces are not permitted; names are not case-sensitive. Do not define variables with the prefix ops_. The ops_ prefix is reserved for built-in variables.
If the specified variable name contains an embedded variable or function, the above restrictions will not be validated until runtime.</td></tr>
<tr><td>Value</td><td>Value of the variable.

Note
While a global variable value can never exceed 25000 characters, a task instance variable value assigned dynamically at run time (for example, using a function to assign a variable value to Self, Parent, or Top Level Parent, using the Set Variable Action, can exceed the 25000 character limit. Keep in mind, however, that the Maximum Nested Variable Expansion Universal Controller system property prevents unlimited variable value expansion.</td></tr>
<tr><td>Metadata</td><td>This section contains Metadata information about this record.</td></tr>
<tr><td>UUID</td><td>Universally Unique Identifier of this record.</td></tr>
<tr><td>Updated By</td><td>Name of the user that last updated this record.</td></tr>
<tr><td>Updated</td><td>Date and time that this record was last updated.</td></tr>
<tr><td>Created By</td><td>Name of the user that created this record.</td></tr>
</table>

Created	Date and time that this record was created.
Buttons	This section identifies the buttons displayed above and below the Action Details that let you perform various actions.
Save	Saves a new Action record in the Controller database.
Save & New	Saves a new record in the Controller database and redisplays empty Details so that you can create another new record.
Save & View	Saves a new record in the Controller database and continues to display that record.
New	Displays empty (except for default values) Details for creating a new record.
Update	Saves updates to the record.
Delete	Deletes the current record.
Refresh	Refreshes any dynamic data displayed in the Details.
Close	Closes the Details pop-up of this action.

Listing and Setting Variables from the Command Line

To list and set variables from the command line, use the List Variables (ops-variable-list) and Set Variables (ops-variable-set) commands of the Universal Controller Command Line Interface (CLI).

Functions

- SAP Connection Functions
  - Returns Property of an SAP Connection
- Script Functions
  - Returns Path to Data Script
- SQL/Stored Procedure Functions
  - Return Column Names for SQL Results from Current Task
  - Return Column Names for SQL Results from Sibling Task
  - Return SQL Results from Current Task
  - Return SQL Results from Sibling Task
  - Return SQL Warnings from Current Task
  - Return SQL Warnings from Sibling Task
  - Return String Value of Row/Column by Column Name
  - Return String Value of Row/Column by Column Number
  - Return String Values of Columns
- String Functions
  - Convert Characters in Value to Lower Case
  - Convert Characters in Variable to Lower Case
  - Convert Characters in Value to Upper Case
  - Convert Characters in Variable to Upper Case
  - Escape Characters in Variable Using XML Entities
  - Escape Characters in Variable Using JSON String Rules
  - Escape Characters in Variable Using JavaScript String Rules
  - Escape Characters in Variable Using HTML Entities
  - Escape Characters in Variable as a Literal Pattern
  - Randomly Generate a String
  - Replace Substring of Value with Regular Expression
  - Replace Substring of Variable with Regular Expression
  - Return Base64 Encoded String
  - Return Copy of Value with Whitespace Omitted
  - Return Copy of Variable with Whitespace Omitted
  - Return Index of Substring in String Value
  - Return Index of Substring in String Variable
  - Return Index of Substring Plus Offset in String Value
  - Return Index of Substring Plus Offset in String Variable
  - Return Index of Rightmost Occurrence of Substring in String Value
  - Return Index of Rightmost Occurrence of Substring in String Variable
  - Return Index of Rightmost Occurrence of Substring Plus Offset in String Value
  - Return Index of Rightmost Occurrence of Substring Plus Offset in String Variable
  - Return Length of Value
  - Return Length of Variable
  - Return New String that is Substring of Value
  - Return New String that is Substring of Variable
  - Return URL-Encoded String
  - Variable By XPath
  - Variable By JsonPath
  - Variable By JsonPath As Array
  - Variable Number of Lines
  - Variable By Specific Line(s)
  - Variable By Line(s) Matching Regular Expression
  - Variable Path

Overview

Variables and functions can be used in free-text fields within tasks and workflows. When a variable or function is specified in a free-text field, the Controller inserts its value into the field when the task or workflow is run.

Also, triggers can pass variables and functions into the tasks and workflows they launch.

Universal Controller supports a number of functions that can be specified in free-text fields. They are resolved when a task instance runs or when a Set Variable action containing a function is executed.

Functions are entered using the following formats:

```
${_function}
${_function(arg1, ..., argN)}
```

Formatting Rules

- Functions *must* be written either:
  - In all lower-case characters.
  - Exactly as shown in the tables on this page.
- Functions have zero, one, or multiple parameters.
- Each function parameter is one of three specific types:
  - String
  - Integer
  - Boolean
- String parameters *must* be enclosed in **single or double** quotation marks.

- Integer and Boolean parameters *can* be enclosed in **single or double** quotation marks.
- Optional parameters are identified on this page by being enclosed in [square brackets]. When copying a function from the documentation, be sure to remove the square brackets; otherwise, the function will not resolve.
- If a function has more than one optional parameter, any optional parameters preceding a specified optional parameter must be included in the function's parameter list. For example:
  - For function `${_responseJsonPath('pathExpression'[,'defaultValue','delimiter',prettyPrint])}`, usage `${_responseJsonPath('.outputData','','',true)}` would be valid, whereas `${_responseJsonPath('.outputData',,,true)}` would not be valid.
  - For function `${_formatDate(['date_time', 'format', day_offset, use_business_days, hour_offset, minute_offset, timezone])}`, usage `${_formatDate('2018-09-01','',0,true)}` would be valid, whereas `${_formatDate('2018-09-01','',,true)}` would not be valid.
- All functions allow nesting to two levels. That is, a function can be an argument to another function, which itself can be an argument to another function.
  - You must use a double underscore preceding the name of a first-level nested function.
  - You must use a triple underscore preceding the name of a second-level nested function.

  For example, for 2nd day of next month less one Business Day:

```
${_formatDate('${__dayOfMonth(2,'${___dateadv('yyyy-MM-dd',0,1)}')}','',-1,true)}
```

Function Categories

Functions are listed alphabetically within the following categories on this page:

Conditional Functions

Return Conditional Value Depending on Equality of String Parameters

Description	Returns a conditional value depending on the equality of two string parameters. (Returns `if_value` if string `value1` is equal to string `value2`; otherwise, `else_value` is returned.)
Syntax	**`${_ifEqual`**`('value1', 'value2', 'if_value', 'else_value'[, ignore_case])}`

Parameters	• `value1` Required; First string. • `value2` Required; Second string. • `if_value` Required; Return value if `value1` equals `value2`. • `else_value` Required; Return value if `value1` does not equal `value2`. • `ignore_case` Optional; Specification (**true** or **false**) whether or not to ignore case when comparing `value1` and `value2`. Default is false.

Examples	`${_ifEqual('abc','def','YES','NO')}`
	`${_ifEqual('abc','ABC','YES','NO',true)}`
	`${_ifEqual('2015-08-15','${__date()}','17:00','18:00')}`

Return Conditional Value Depending on Value of Boolean Parameter

Description	Returns a conditional value depending on the value of a boolean parameter. Returns `if_value` if `value` is **true**; otherwise, `else_value` is returned.
Syntax	**`${_ifTrue`**`(value, 'if_value', 'else_value')}`
Parameters	• `value` Required; Boolean value (**true** or **false**). • `if_value` Required; Return value if `value` is **true**. • `else_value` Required; Return value if `value` is **false**.
Example	`${_ifTrue(${__isToday('Mon', 'E')},'20:00','22:00')}`

Credential Functions

Return Key Location of a Credential

Description	Returns a token representing the Resolvable Credential Key Location that you want to embed.

Syntax	**${_credentialKeyLoc**('<credential_name>')}
Parameters	• credential_name Required; Name of the Credential.
Example	${_credentialKeyLoc('RCredentialXYZ')} $(ops_unv_cred_key_loc_c89e7b2caf4247909bc46041df8a2643)

Return Passphrase of a Credential

Description	Returns a token representing the Resolvable Credential Passphrase that you want to embed.
Syntax	**${_credentialPassphrase**('<credential_name>')}
Parameters	• credential_name Required; Name of the Credential.
Example	${_credentialPassphrase('RCredentialXYZ')} $(ops_unv_cred_passphrase_c89e7b2caf4247909bc46041df8a2643)

Return Token of a Credential

Description	Returns a token representing the Resolvable Credential Token that you want to embed.
Syntax	**${_credentialToken**('<credential_name>')}
Parameters	• credential_name Required; Name of the Credential.
Example	${_credentialToken('RCredentialXYZ')} $(ops_unv_cred_token_c89e7b2caf4247909bc46041df8a264

Return User Name of a Credential

Description	Returns a token representing the Resolvable Credential Runtime User that you want to embed.
Syntax	**${_credentialUser**('<credential_name>')}

Parameters	• `credential_name` Required; Name of the Credential.
Example	`${_credentialUser('RCredentialXYZ')}  $(ops_unv_cred_user_c89e7b2caf4247909bc46041df8a2643)`

Return User Password of a Credential

Description	Returns a token representing the Resolvable Credential Runtime Password that you want to embed.
Syntax	**`${_credentialPwd`**`('<credential_name>')}`
Parameters	• `credential_name` Required; Name of the Credential.
Example	`${_credentialPwd('RCredentialXYZ')}  $(ops_unv_cred_pwd_c89e7b2caf4247909bc46041df8a2643)`

Date Functions

Checks if Date Argument Equals Today's Date

Description	Checks if a date argument is equal to today's date in the specified format. Returns **true** if `date` is equal to today's date in the specified format; otherwise, **false** is returned.
Syntax	**`${_isToday`**`('date'[, 'format', is_relative])}`
Parameters	• `date` Required; Date to compare to today's date. • `format` Optional; Format of today's date. Default is yyyy-MM-dd. • `is_relative` Optional; Specification (**true** or **false**) for whether today's date is relative to the trigger/launch time of the task instance. Default is false.
Examples	`${_isToday('Wed', 'E')}` `${_isToday('${__dayOfMonth(1,'','',true)}')}`

Resolve to Current Date and Time

Description	Resolves to the current date and time.
Syntax	**`${_date`**`(['format', day_offset, hour_offset, minute_offset])}`
Parameters	• `format` Optional; Date format. Default format is yyyy-MM-dd HH:mm:ss Z. For details on the `format` parameter, see https://docs.oracle.com/javase/8/docs/api/java/time/format/DateTimeFormatter.html • `day_offset` Optional; +/- number of days to offset. • `hour_offset` Optional; +/- number of hours to offset. • `minute_offset` Optional; +/- number of minutes to offset.

Examples	`${_date} --> 2012-07-14 12:43:06 -0400`
	`${_date()} --> 2012-07-14 12:43:06 -0400`
	`${_date('yyyy-MM-dd', 5)} --> 2012-07-19`
	`${_date('yyyy-MM-dd HH:mm:ss', -2, -1)} --> 2012-07-12 11:43:06`
	`${_date('', 0, 0, 10)} --> 2012-07-14 12:53:06 -0400`

Resolve to Current Date and Time (Advanced)

Description	Resolves to the current date and time.
Syntax	**`${_dateadv`**`(['format', year_offset, month_offset, day_offset, hour_offset, minute_offset])}`
Parameters	• `format` Date format. Default format is yyyy-MM-dd HH:mm:ss Z. For details on the `format` parameter, see https://docs.oracle.com/javase/8/docs/api/java/time/format/DateTimeFormatter.html • `year_offset` Optional; +/- number of years to offset. • `month_offset` Optional; +/- number of months to offset. • `day_offset` Optional; +/- number of days to offset. • `hour_offset` Optional; +/- number of hours to offset. • `minute_offset` Optional; +/- number of minutes to offset.

Examples	``` ${_dateadv} --> 2012-07-29 09:31:42 -0700 ${_dateadv('yyyy-MMM', -1)} --> 2011-Jul ${_dateadv('yyyy-MMM', 0, -1)} --> 2012-Jun ```

Resolve to Current Unix Epoch Time

Description	Resolves to the current time in milliseconds since Wed Dec 31 1969 19:00:00 GMT-0500 (EST) – the start of Unix epoch time.
Syntax	**`${_currentTimeMillis}`**
Parameters	n/a

Return Date with Offsets

Description	Returns the date after applying offsets. Optionally, can specify the output format. Whether a holiday is treated as a business day or a non-business day is specified by the Exclude Holidays for Business Days Universal Controller system property.
Syntax	**`${_formatDate`**`(['date_time', 'format', day_offset, use_business_days, hour_offset, minute_offset, timezone])}`

Parameters	• `date_time`
	Date and time in any of the following formats:
	  • yyyy-MM-dd
	  • yyyy-MM-dd HH:mm
	  • yyyy-MM-dd HH:mm:ss
	  • yyyy-MM-dd HH:mm Z
	  • yyyy-MM-dd HH:mm:ss Z.
	  • yyyy-MM-dd HH:mm:ss.SSS
	  • yyyy-MM-dd HH:mm:ss.SSS Z.
	Default is the current date and time.
	• `format`
	Format of returned date. If date_time specifies a time, the default format is yyyy-MM-dd HH:mm; otherwise, the default format is yyyy-MM-dd. For details on the `format` parameter, see https://docs.oracle.com/javase/8/docs/api/java/time/format/DateTimeFormatter.html
	• `day_offset`
	+/- number of days to offset.
	• `use_business_days`
	Specification (`true` or `false`) for whether `day_offset` is for business days. Default is false.
	• `hour_offset`
	+/- number of hours to offset.
	• `minute_offset`
	+/- number of minutes to offset.
	• `timezone`
	Time Zone that the date is formatted in.

Example	``` ${_formatDate} --> 2018-08-24 15:37 ${_formatDate()} --> 2018-08-24 15:37 ${_formatDate('','MMddyyyy',5)} --> 08292018 ${_formatDate('2018-09-01','',5)} --> 2018-09-06 ${_formatDate('2018-09-01','',-5)} --> 2018-08-27 ${_formatDate('2018-10-13 12:13:14 -0400','',5,true,0,0,'Australia/Sydney')} --> 2018-10-14 03:13:14 +1100 ```

Return Date with Offsets (Advanced)

Description	Returns the date after applying offsets. Optionally, can specify the output format. Whether a holiday is treated as a business day or a non-business day is specified by the Exclude Holidays for Business Days Universal Controller system property.
Syntax	**`${_formatDateAdv`**`(['date_time', 'format', year_offset, month_offset, day_offset, use_business_days, hour_offset, minute_offset, timezone])}`

Parameters	• `date_time`
	Date and time in any of the following formats:
	  • yyyy-MM-dd
	  • yyyy-MM-dd HH:mm
	  • yyyy-MM-dd HH:mm:ss
	  • yyyy-MM-dd HH:mm Z
	  • yyyy-MM-dd HH:mm:ss Z.
	  • yyyy-MM-dd HH:mm:ss.SSS
	  • yyyy-MM-dd HH:mm:ss.SSS Z.
	Default is the current date and time.
	• `format`
	Format of returned date. If date_time specifies a time, the default format is yyyy-MM-dd HH:mm; otherwise, the default format is yyyy-MM-dd. For details on the `format` parameter, see https://docs.oracle.com/javase/8/docs/api/java/time/format/DateTimeFormatter.html
	• `year_offset`
	Optional; +/- number of years to offset.
	• `month_offset`
	Optional; +/- number of months to offset.
	• `day_offset`
	Optional; +/- number of days to offset.
	• `use_business_days`
	Optional; Specification (**true** or **false**) for whether `day_offset` is for business days. Default is false.
	• `hour_offset`
	+/- number of hours to offset.
	• `minute_offset`
	+/- number of minutes to offset.
	• `timezone`
	Time Zone that the date is formatted in.

Examples	`${_formatDateAdv} --> 2012-08-24 15:55`
	`${_formatDateAdv()} --> 2012-08-24 15:55`
	`${_formatDateAdv('','MMddyyyy',1)} --> 08242013`
	`${_formatDateAdv('2012-09-01','',0,1)} --> 2012-10-01`
	`${_formatDateAdv('2012-09-01','',0,-1)} --> 2012-08-01`
	`${_formatDateAdv('2012-09-01','',0,0,5,false)} --> 2012-09-06`

Return Date with Time Zone

Description	Returns the Date and Time in another time zone.
Syntax	**`${_formatDateTz`**`('date_time', 'target_time_zone'[, 'output_format'])}`

Parameters	• `date_time`
	Date and time in any of the following formats:
	  • yyyy-MM-dd HH:mm
	  • yyyy-MM-dd HH:mm:ss
	  • yyyy-MM-dd HH:mm Z
	  • yyyy-MM-dd HH:mm:ss Z.
	  • yyyy-MM-dd HH:mm:ss.SSS
	  • yyyy-MM-dd HH:mm:ss.SSS Z.
	• `target_time_zone`
	Time zone in which to format the date and time.
	• `output_format`
	Optional; Format of the date and time in the other time zone.

Examples	`${_formatDateTz('2018-10-13 01:02:03 -0400', 'Australia/Sydney')} --> 2018-10-13 16:02:03 +1100`
	`${_formatDateTz('2018-10-13 01:02:03 -0400', 'Australia/Sydney','yyyy-MM-dd HH:mm Z')} --> 2018-10-13 16:02 +1100`
	`${_formatDateTz('${ops_launch_time}', '${ops_time_zone}')} = ${_formatDateTz('2018-06-13 15:35:00 -0400', 'Europe/Berlin')} = 2018-06-13 21:35:00 +0200`

Return Day of Week

Description	Returns the day of week for the specified date as a number.
Syntax	**`${_dayOfWeek`**`(['date', 'first_dow', first_dow_value])}`

Parameters	• `date`
	Date in any of the following formats:
	  • yyyy-MM-dd
	  • yyyy-MM-dd HH:mm
	  • yyyy-MM-dd HH:mm:ss
	  • yyyy-MM-dd HH:mm Z
	  • yyyy-MM-dd HH:mm:ss Z.
	  • yyyy-MM-dd HH:mm:ss.SSS
	  • yyyy-MM-dd HH:mm:ss.SSS Z.
	Default is the current date.
	• `first_dow`
	Optional; Specification for whether the week starts on Sunday or Monday. Values are **sun** and **mon** (not case-sensitive). Default is sun.
	• `first_dow_value`
	Optional; Starting value for the first day of week. Value must be a non-negative number. Default is 1.

Example	`${_dayOfWeek} --> 6`
	`${_dayOfWeek()} --> 6`
	`${_dayOfWeek('2012-07-04')} --> 4`
	`${_dayOfWeek('2012-07-04', 'mon')} --> 3`

Return Days between Dates

Description	Returns the number of days between date1 and date2. • If return value is > 0, date2 is after date1. • If return value is < 0, date2 is before date1. • If return value is 0, date1 is equal to date2. The start date is inclusive, but the end date is not.
Syntax	**`${_daysBetween`**`('date1', 'date2')}`

Parameters	• `date1` Required. • `date2` Required. date1 and date2 are specified in any of the following formats: • yyyy-MM-dd • yyyy-MM-dd HH:mm • yyyy-MM-dd HH:mm:ss • yyyy-MM-dd HH:mm Z • yyyy-MM-dd HH:mm:ss Z. • yyyy-MM-dd HH:mm:ss.SSS • yyyy-MM-dd HH:mm:ss.SSS Z.
Example	`${_daysBetween('2012-08-01','2012-09-01')} --> 31`

Return Non-Business Day of Month

Description	Returns the Nth non-business day of month for the month of the date specified. Optionally, can start from the end of the month. Whether a holiday is treated as a business day or a non-business day is specified by the Exclude Holidays for Business Days Universal Controller system property.
Syntax	**`${_nonBusinessDayOfMonth`**`(index, ['date', 'format', reverse])}`
Parameters	• `index` Required; Nth non-business day of month. • `date` Date (and time) is specified in any of the following formats: • yyyy-MM-dd • yyyy-MM-dd HH:mm • yyyy-MM-dd HH:mm:ss • yyyy-MM-dd HH:mm Z • yyyy-MM-dd HH:mm:ss Z. • yyyy-MM-dd HH:mm:ss.SSS • yyyy-MM-dd HH:mm:ss.SSS Z. Default is the current date. • `format` Optional; Format of returned date. Default is yyyy-MM-dd. For details on the `format` parameter, see https://docs.oracle.com/javase/8/docs/api/java/time/format/DateTimeFormatter.html • `reverse` Optional; Specification (**true** or **false**) for starting from the end of the month. Default is false.

Examples	`${_nonBusinessDayOfMonth(1)} --> 2012-08-04`
	`${_nonBusinessDayOfMonth(1,'2012-09-01')} --> 2012-09-01`
	`${_nonBusinessDayOfMonth(1,'2012-09-01','',true)} --> 2012-09-30`

Return Nth Business Day of Month

Description	Returns the Nth business day of month for the month of the date specified. Optionally, can start from the end of the month. Whether a holiday is treated as a business day or a non-business day is specified by the Exclude Holidays for Business Days Universal Controller system property.
Syntax	**`${_businessDayOfMonth`**`(index, ['date', 'format', reverse])}`
Parameters	• `index` Required; Nth business day of month. • `date` Date (and time) is specified in any of the following formats: ◦ yyyy-MM-dd ◦ yyyy-MM-dd HH:mm ◦ yyyy-MM-dd HH:mm:ss ◦ yyyy-MM-dd HH:mm Z ◦ yyyy-MM-dd HH:mm:ss Z. ◦ yyyy-MM-dd HH:mm:ss.SSS ◦ yyyy-MM-dd HH:mm:ss.SSS Z. Default is the current date. • `format` Optional; Format of returned date. Default is yyyy-MM-dd. For details on the `format parameter`, see https://docs.oracle.com/javase/8/docs/api/java/time/format/DateTimeFormatter.html • `reverse` Optional; Specification (`true` or `false`) for starting from the end of the month. Default is false.

Examples	`${_businessDayOfMonth(1)} --> 2012-08-01`
	`${_businessDayOfMonth(1,'2012-09-01')} --> 2012-09-04`
	`${_businessDayOfMonth(1,'2012-09-01','',true)} --> 2012-09-28`

Return Nth Day of Month

Description	Returns the Nth day of month for the month of the date specified. Optionally, can start from the end of the month.
Syntax	**`${_dayOfMonth`**`(index, ['date', 'format', reverse])}`

Parameters	• `index`
	Required; Nth day of month.
	• `date`
	Date (and time) is specified in any of the following formats:
	  • yyyy-MM-dd
	  • yyyy-MM-dd HH:mm
	  • yyyy-MM-dd HH:mm:ss
	  • yyyy-MM-dd HH:mm Z
	  • yyyy-MM-dd HH:mm:ss Z.
	  • yyyy-MM-dd HH:mm:ss.SSS
	  • yyyy-MM-dd HH:mm:ss.SSS Z.
	Default is the current date.
	• `format`
	Optional; Format of returned date. Default is yyyy-MM-dd.
	• `reverse`
	Optional; Specification (**true** or **false**) for starting from the end of the month. Default is false.

Examples	`${_dayOfMonth(5)} --> 2012-08-05`
	`${_dayOfMonth(15,'2012-09-01','MM/dd/yyyy')} --> 09/15/2012`
	`${_dayOfMonth(1,'2012-09-01','',true)} --> 2012-09-30`

Return Number of Business Days between Dates

Description	Returns the number of business days between date1 and date2. • If return value is > 0, `date2` is after `date1`. • If return value is < 0, `date2` is before `date1`. • If return value is 0, `date1` is equal to `date2`. The start date is inclusive, but the end date is not. Whether a holiday is treated as a business day or a non-business day is specified by the Exclude Holidays for Business Days Universal Controller system property.
Syntax	**`${_businessDaysBetween`**`('date1', 'date2')}`

Parameters	• `date1` Required. • `date2` Required. date1 and date2 are specified in any of the following formats: • yyyy-MM-dd • yyyy-MM-dd HH:mm • yyyy-MM-dd HH:mm:ss • yyyy-MM-dd HH:mm Z • yyyy-MM-dd HH:mm:ss Z. • yyyy-MM-dd HH:mm:ss.SSS • yyyy-MM-dd HH:mm:ss.SSS Z.
Example	`${_businessDaysBetween('2012-08-01','2012-09-01')} --> 23`

Mathematical Functions

Add

Description	Return the sum of the augend added with the addend.
Syntax	**`${_add`**`(augend, addend)}`
Parameters	• `augend` Integer to which the `addend` is being added. • `addend` Integer being added to the `augend`.

Example	`${_add('77', '33')} --> 110`
	
	Using Variables for augend and addend (${augend} = 17, ${addend} = 5):
	
	`${_add('${augend}','${addend}')} --> 22`

Divide

Description	Return the quotient of the dividend divided by divisor.
Syntax	**`${_divide`**`(dividend, divisor)}`
Parameters	• `dividend` Integer being divided by the `divisor`. • `divisor` Integer being used to divide the `dividend`.

Example	`${_divide('7','20')} --> 0`
	`${_divide('20','7')} --> 2`
	`${_divide('20','5')} --> 4`
	
	Using Variables for dividend and divisor (${dividend} = 100, ${divisor} = 5)
	
	`${_divide('${dividend}','${divisor}')} --> 20`

Multiply

Description	Return the product of the multiplicand multiplied with the multiplier.

Syntax	**${_multiply**(multiplicand, multiplier)}
Parameters	• multiplicand Integer being multiplied by the multiplier. • multiplier Integer being used to multiply the multiplicand.
Example	${_multiply('7','20')} --> 140 Using Variables for multiplicand and multiplier (${multiplicand} = 100, ${multiplier} = 5): ${_multiply('${multiplicand}','${multiplier}')} --> 500

Return Absolute Value

Description	Return the absolute value of the parameter.
Syntax	**{_abs**(parameter)}
Parameters	• parameter Integer (positive or negative value).
Example	${_abs('-1200')} --> 1200 ${_abs('1200')} --> 1200 Using Variables for parameter (${parameter} = -100): ${_abs('${parameter}')} --> 100

Return Modulo

Description	Return the modulo (remainder) of the dividend divided by divisor.
Syntax	**`${_mod`**`(dividend, divisor)}`
Parameters	• `dividend` Integer being divided by the `divisor`. • `divisor` Integer being used to divide the `dividend`.

Example	`${_mod('10', '2')} --> 0`
	`${_mod('10', '3')} --> 1`
	`${_mod('70', '65')} --> 5`
	
	Using Variables for dividend and divisor (${dividend} = 23, ${divisor} = 5):
	
	`${_mod('${dividend}','${divisor}')} --> 3`

Subtract

Description	Return the difference of the subtrahend subtracted from the minuend.
Syntax	**`${_subtract`**`(minuend, subtrahend)}`
Parameters	• `minuend` Integer from which the `subtrahend` is being subtracted. • `subtrahend` Integer being subtracted from the `minuend`.

Example	``` ${_subtract('77','33')} --> 44 ${_subtract('33','77')} --> -44 ``` Using Variables for minuend and subtrahend (${minuend} = 100, ${subtrahend} = 5): ``` ${_subtract('${minuend}','${ subtrahend }')} --> 95 ```

Other Task Functions

Business Services Membership

Description	Resolves to a delimited list of business service names the task instance is a member of.
Syntax	**`${_businessServices`**`(['resultDelimiter'])}`
Parameters	• `resultDelimiter` Optional; Delimiter to use when concatenating business service names. If not specified, ", " will be used.
Example	If a task instance is a member of business services A, B, and C. ``` ${_businessServices()} A, B, C ``` ``` ${_businessServices('\n')} A B C ``` If a task instance is not a member of any business service, the function will evaluate to empty.

Output Functions

(For Web Service output, see Web Service Functions.)

Note

A prerequisite for the use of these functions is that Automatic Output Retrieval and Wait For Output are selected at task level, with the exception of the EXTENSION output type.

Task Instance Output

Description	Resolves to the output data, of the specified `outputType`, of the task instance that is resolving the function. • If the output record of the specified `ouptutType` cannot be found, the function will remain unresolved.
Syntax	**`${_output`**`('outputType'[, 'defaultValue'])}`
Parameters	• `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG. • `defaultValue` Optional; Default value to return if the output data is not found. Default is empty (').

Sibling Task Instance Output

Description	Resolves to the output data, of the specified `outputType`, of the task instance specified by the `siblingName` parameter. The sibling task instance must be within the same workflow, and the Execution User of the task instance that is resolving the function must have Read permission for the sibling task instance. • If the output record of the specified `outputType` cannot be found, the function will remain unresolved.
Syntax	**`${_outputFromTask`**`('siblingName', 'outputType'[, 'defaultValue'])}`
Parameters	• `siblingName` Required; Name of a sibling task instance. • `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG. • `defaultValue` Optional; Default value to return if the output data is not found. Default is empty (').

Task Instance Output Number of Lines

Description	Resolves to the number of lines of output data, of the specified `outputType`, of the task instance that is resolving the function. • If the output record of the specified ouptutType cannot be found, the function will remain unresolved.
Syntax	**`${_outputNumberOfLines(`**`'outputType'`**`)}`**

Parameters	• `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG.
Example	**`${_outputNumberOfLines`**`('STDOUT')}` `> 6`

Sibling Task Instance Output Number of Lines

Description	Resolves to the number of lines of output data, of the specified outputType, of the task instance specified by the siblingName parameter. • The sibling task instance must be within the same workflow, and the Execution User of the task instance that is resolving the function must have Read permission for the sibling task instance. • If the output record of the specified outputType cannot be found, the function will remain unresolved.
Syntax	**`${_outputNumberOfLinesFromTask('`**`siblingName', 'outputType`**`')}`**
Parameters	• `siblingName` Required; Name of a sibling task instance. • `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG.
Example	${_**`outputNumberOfLinesFromTask`**('test', 'STDOUT')} `> 8`

Task Instance Output by Specific Line(s)

Description	Resolves to the specified line(s) of output data, of the specified `outputType`, of the task instance that is resolving the function. • If the output record of the specified `ouptutType` cannot be found, the function will remain unresolved.
Syntax	**`${_outputLines`**`('outputType', startLine, numberOfLines[, 'defaultValue', 'resultDelimiter'])}`
Parameters	• `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG. • `startLine` Required; Start line, where 1 is the first line and -1 is the last line. • `numberOfLines` Required; Number of lines to return starting from the `startLine`. • `defaultValue` Optional; Default value to return if no lines qualify. Default is empty (') • `resultDelimiter` Optional; Delimiter to use when concatenating matching lines. If not specified, "\n" or "\r\n" depending on original output line endings.

Sibling Task Instance Output by Specific Line(s)

Description	Resolves to the specified line(s) of output data, of the specified `outputType`, of the task instance specified by the `siblingName` parameter. The sibling task instance must be within the same workflow, and the Execution User of the task instance that is resolving the function must have Read permission for the sibling task instance. • If the output record of the specified `outputType` cannot be found, the function will remain unresolved.
Syntax	**`${_outputLinesFromTask`**`('siblingName', 'outputType', startLine, numberOfLines[, 'defaultValue', 'resultDelimiter'])}`
Parameters	• `siblingName` Required; Name of a sibling task instance. • `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG. • `startLine` Required; Start line, where 1 is the first line and -1 is the last line. • `numberOfLines` Required; Number of lines to return starting from the `startLine`. • `defaultValue` Optional; Default value to return if no lines qualify. Default is empty (''). • `resultDelimiter` Optional; Delimiter to use when concatenating matching lines. If not specified, "\n" or "\r\n" depending on original output line endings.

Task Instance Output by Line(s) Matching Regular Expression

Description	Resolves to the line(s) of output data that match the specified regular expression, of the specified `outputType`, of the task instance that is resolving the function by specifying a regular expression. • The complete output line is returned. • If the output record of the specified `ouptutType` cannot be found, the function will remain unresolved.
Syntax	**`${_outputLinesByRegex`**`('outputType', 'regexPattern'[, maxCount, numberOfLinesBefore, numberOfLinesAfter, 'defaultValue', 'resultDelimiter'])}`
Parameters	• `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG. • `regexPattern` Required; Regular expression used for determining if a line matches. Regular expression must match the whole line (see Example, below). • `maxCount` Optional; Maximum number of matching lines to return. Default is 1. • `numberOfLinesBefore` Optional; Number of lines before each matching line to return along with the matching line. Default is 0. • `numberOfLinesAfter` Optional; Number of lines after each matching line to return along with the matching line. Default is 0. • `defaultValue` Optional; Default value to return if no lines match the regular expression. Default is empty (''). • `resultDelimiter` Optional; Delimiter to use when concatenating matching lines. If not specified, "\n" or "\r\n" depending on original output line endings.

Example	STDOUT contains: *Some_Text* *ABC=Some_String* *More_Text* ${_outputLinesByRegex('STDOUT', '^ABC=')} Returns empty (the whole Line was not matched) ${_outputLinesByRegex('STDOUT', '^ABC=.*')} Returns ABC=Some_String

Sibling Task Instance Output by Line(s) Matching Regular Expression

Description	Resolves to the line(s) of output data that match the specified regular expression, of the specified `outputType`, of the task instance specified by the `siblingName` parameter. The sibling task instance must be within the same workflow, and the Execution User of the task instance that is resolving the function must have Read permission for the sibling task instance. • If the output record of the specified `outputType` cannot be found, the function will remain unresolved.
Syntax	**`${_outputLinesByRegexFromTask`**`('siblingName', 'outputType', 'regexPattern'[, maxCount, numberOfLinesBefore, numberOfLinesAfter, 'defaultValue', 'resultDelimiter'])}`
Parameters	• `siblingName` Required; Name of a sibling task instance. • `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG. • `regexPattern` Required; Regular expression used for determining if a line matches. • `maxCount` Optional; Maximum number of matching lines to return. Default is 1. • `numberOfLinesBefore` Optional; Number of lines before each matching line to return along with the matching line. Default is 0. • `numberOfLinesAfter` Optional; Number of lines after each matching line to return along with the matching line. Default is 0. • `defaultValue` Optional; Default value to return if no lines match the regular expression. Default is empty (''). • `resultDelimiter` Optional; Delimiter to use when concatenating matching lines. If not specified, "\n" or "\r\n" depending on original output line endings.

Task Instance Output By XPath

Description	Resolves to the XML output data of the task instance that is resolving the function, corresponding to the evaluated XPath expression. • If the output record cannot be found, the function will remain unresolved. • If the output record is found, but the path expression does not yield a result, the function will resolve to the default value.
Syntax	${**`_outputXPath`**`('outputType', 'xPathExpression'[, 'defaultValue', 'delimiter', prettyPrint])}`

Parameters	• `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG. • `xPathExpression` Required; XPath expression. https://www.w3schools.com/xml/xpath_intro.asp • `defaultValue` Optional; Default value to return if the result is not found. Default is empty (''). • `delimiter` Optional; If `xPathExpression` evaluates to multiple results, the delimiter to be used to separate those results. Default is new line character (\n). • `prettyPrint` Optional; Specification (**true** or **false**) for whether or not XML output will be pretty printed (indented). Default is false.

Example	**XML**
	
	`<message>`
	`  <code>10</code>`
	`</message>`
	
	Function
	
	`${_outputXPath('STDOUT', '//code/text()')}`
	
	Result
	
	`10`

Sibling Task Instance Output By XPath

Description	Resolves to the XML output data of the task instance specified by the `siblingName`, corresponding to the evaluated XPath expression. The sibling task instance must be within the same workflow and the Execution User of the task instance that is resolving the function must have Read permission for the sibling task instance. • If the output record cannot be found, the function will remain unresolved. • If the output record is found but the path expression does not yield a result, the function will resolve to the default value.
Syntax	`${_outputXPathFromTask('siblingName', 'outputType', 'xPathExpression'[, 'defaultValue', 'delimiter', prettyPrint])}`
Parameters	• `siblingName` Required; Name of a sibling task instance. • `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG. • `xPathExpression` Required; XPath expression. https://www.w3schools.com/xml/xpath_intro.asp • `defaultValue` Optional; Default value to return if the result is not found. Default is empty (''). • `delimiter` Optional; If `xPathExpression` evaluates to multiple results, the delimiter to be used to separate those results. Default is new line character (\n). • `prettyPrint` Optional; Specification (**true** or **false**) for whether or not XML output will be pretty printed (indented). Default is false.

Example	**XML**
	
	`<message><code>10</code></message>`
	
	Function
	
	`${_outputXPathFromTask('Sibling_With_XML_Output','STDOUT','//code/text()')}`
	
	Result
	
	`10`

Task Instance Output By JsonPath

Description	Resolves to the JSON output data of the task instance that is resolving the function, corresponding to the evaluated JsonPath expression. • If the output record cannot be found, the function will remain unresolved. • If the output record is found but the path expression does not yield a result, the function will resolve to the default value.
Syntax	`${_outputJsonPath('outputType', 'pathExpression'[, 'defaultValue', 'delimiter', prettyPrint])}`
Parameters	• `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG. • `PathExpression` Required; JsonPath expression. https://github.com/json-path/Jsonpath • `defaultValue` Optional; Default value to return if the result is not found. Default is empty (''). • `delimiter` Optional; If `pathExpression` evaluates to multiple results, the delimiter to be used to separate those results. Default is new line character (\n). • `prettyPrint` Optional; Specification (**true** or **false**) for whether or not JSON output will be pretty printed (indented). Default is false.

Example	**JSON**
	
	`{`
	`  "code": 10`
	`}`
	
	Function
	
	`${_outputJsonPath('STDOUT', '$.code')}`
	
	Result
	
	`10`

Sibling Task Instance Output By JsonPath

Description	Resolves to the JSON output data of the task instance specified by the `siblingName`, corresponding to the evaluated JsonPath expression. The sibling task instance must be within the same workflow and the Execution User of the task instance that is resolving the function must have Read permission for the sibling task instance. • If the output record cannot be found, the function will remain unresolved. • If the output record is found but the path expression does not yield a result, the function will resolve to the default value
Syntax	`${_outputJsonPathFromTask('siblingName', 'outputType', 'pathExpression'[, 'defaultValue', 'delimiter', prettyPrint])}`
Parameters	• `siblingName` Required; Name of a sibling task instance. • `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG. • `PathExpression` Required; JsonPath expression. https://github.com/json-path/Jsonpath • `defaultValue` Optional; Default value to return if the result is not found. Default is empty (''). • `delimiter` Optional; If `pathExpression` evaluates to multiple results, the delimiter to be used to separate those results. Default is new line character (\n). • `prettyPrint` Optional; Specification (**true** or **false**) for whether or not JSON output will be pretty printed (indented). Default is false.

Example	**JSON**
	
	`{`
	`  "code": 10`
	`}`
	
	Function
	
	`${_outputJsonPathFromTask('Sibling_With_JSON_Output', 'STDOUT', '$.code')}`
	
	Result
	
	`10`

Task Instance Output By JsonPath As Array

Description	Resolves to the JSON output data of the task instance that is resolving the function, corresponding to the evaluated JsonPath expression. • If the output record cannot be found, the function will remain unresolved. • If the output record is found but the path expression does not yield a result, the function will resolve to the default value.
Syntax	`${_outputJsonPathAsArray('outputType', 'pathExpression'[, 'defaultValue', prettyPrint])}`

Parameters	• `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG. • `PathExpression` Required; JsonPath expression. https://github.com/json-path/Jsonpath • `defaultValue` Optional; Default value to return if the result is not found. Default is empty (''). • `prettyPrint` Optional; Specification (**true** or **false**) for whether or not JSON output will be pretty printed (indented). Default is false.

Example	**JSON**
	
	`[`
	`  {`
	`  "message" : "Hello",`
	`  "code" : 10`
	`  },`
	`  {`
	`  "message" : "World!",`
	`  "code" : 20`
	`  }`
	`]`
	
	Function
	
	`${_outputJsonPathAsArray('STDOUT', '$[*].message', '', true)}`
	
	Result
	
	`[`
	`  "Hello",`
	`  "World!"`
	`]`

Sibling Task Instance Output By JsonPath As Array

Description	Resolves to the JSON output data of the task instance specified by the `siblingName`, corresponding to the evaluated JsonPath expression. The sibling task instance must be within the same workflow and the Execution User of the task instance that is resolving the function must have Read permission for the sibling task instance. • If the output record cannot be found, the function will remain unresolved. • If the output record is found but the path expression does not yield a result, the function will resolve to the default value.
Syntax	`${_outputJsonPathFromTask('siblingName', 'outputType', 'pathExpression'[, 'defaultValue', prettyPrint])}`

Parameters	• `siblingName` Required; Name of a sibling task instance. • `outputType` Required; Type of output to resolve: STDOUT, STDERR, FILE, EXTENSION, or JOBLOG. • `PathExpression` Required; JsonPath expression. https://github.com/json-path/Jsonpath • `defaultValue` Optional; Default value to return if the result is not found. Default is empty ('). • `prettyPrint` Optional; Specification (**true** or **false**) for whether or not JSON output will be pretty printed (indented). Default is false.

Example	**JSON**
	`[ { "message" : "Hello", "code" : 10 }, { "message" : "World!", "code" : 20 } ]`
	Function
	`${_outputJsonPathAsArrayFromTask('Sibling_With_JSON_Output', 'STDOUT', '$[*].message')}`
	Result
	`["Hello","World!"]`

Task Instance Output Path

Description	Returns a token representing the path to a temporary file containing the specified task instance output data. • $(ops_output_path_<instanceId>_<outputType>_<fileExtension>) The resolved token is supported within the Command, Parameters, and Script of a Windows and Linux/Unix Task.
Syntax	**`${_outputPath`**`('outputType'[, 'fileExtension'])`**`}`**

Parameters	• `outputType`
	Required; Type of output to create a temporary file for: STDOUT, STDERR, FILE, EXTENSION, JOBLOG, WEBSERVICE, SQL, STOREDPROC.
	• `fileExtension`
	Optional; The extension to use for the temporary file. Can be a maximum of 10 characters.
	  • For SQL and STOREDPROC `outputType`, the result set is translated to comma-separated values (csv), or tab-separated values (tsv), and, therefore, only csv (default) and tsv are supported file extensions.
	  • For any other `outputType`, the default file extension is txt.

Example	`application.exe -file ${_outputPath('STDOUT')}`
	`> application.exe -file $(ops_output_path_16383022124425286 29FTPBE4AJQV2FT_stdout_txt)`
	
	`application.exe -file ${_outputPath('SQL')}`
	`> application.exe -file $(ops_output_path_16395032122940786 71DNPMULGSEVMHT_sql_csv)`
	
	`application.exe -file ${_outputPath('SQL', 'tsv')}`
	`> application.exe -file $(ops_output_path_16395032122940786 71DNPMULGSEVMHT_sql_tsv)`
	
	`application.exe -file ${_outputPath('EXTENSION', 'json')}`
	`> application.exe -file $(ops_output_path_16395032122941876 71OAI9SM79CNC2V_extension_json)`

Sibling Task Instance Output Path

Description	Returns a token representing the path to a temporary file containing the specified sibling task instance output data. • $(ops_output_path_<instanceId>_<outputType>_<fileExtension>) The resolved token is supported within the Command, Parameters, and Script of a Windows and Linux/Unix Task.
Syntax	**${_outputPathFromTask**`('siblingName', 'outputType'[, 'fileExtension'])`**}**

Parameters	• `siblingName`
	Required; Name of a sibling task instance.
	• `outputType`
	Required; Type of output to create a temporary file for: STDOUT, STDERR, FILE, EXTENSION, JOBLOG, WEBSERVICE, SQL, STOREDPROC.
	• `fileExtension`
	Optional; The extension to use for the temporary file. Can be a maximum of 10 characters.
	  • For SQL and STOREDPROC `outputType`, the result set is translated to comma-separated values (csv), or tab-separated values (tsv), and, therefore, only csv (default) and tsv are supported file extensions.
	  • For any other `outputType`, the default file extension is txt.

Example	`application.exe -file ${_outputPathFromTask('Sibling_Instance_Name', 'STDERR')}`
	`> application.exe -file $(ops_output_path_163950321229412867 1YL1B04U3OT55P_stderr_txt)`
	
	`application.exe -file ${_outputPathFromTask('Sibling_Instance_Name', 'STOREDPROC')}`
	`> application.exe -file $(ops_output_path_163950321229419767 1Q13UV8MSH6355_storedproc_csv)`
	
	`application.exe -file ${_outputPathFromTask('Sibling_Instance_Name', 'STOREDPROC', 'tsv')}`
	`> application.exe -file $(ops_output_path_163950321229419767 1Q13UV8MSH6355_storedproc_tsv)`
	
	`application.exe -file ${_outputPathFromTask('Sibling_Instance_Name', 'WEBSERVICE', 'json')}`
	`> application.exe -file $(ops_output_path_163950321229408867 1CAWMP3VNQ468B_webservice_json)`

SAP Connection Functions

Returns Property of an SAP Connection

Description	Returns a token representing the property associated with an SAP connection
Syntax	`${_sapConnection('<sapConnection_name>', '<property-name>')}`
Parameters	• `sapConnection_name` Required; Name of the SAP Connection. • `property_name` Required; Name of the SAP Connection property.
Example	`${_sapConnection('sap1', 'sap_connection_type')}` `$(ops_unv_sap_connection_sap_connection_type_3ac17d7f3ecb4df0b81aec9c7a24a38c)`

Script Functions

Returns Path to Data Script

Description	Returns a token representing the path to a Data Script that you want to embed.

Syntax	**${_scriptPath**('script_name')**}**
Parameters	• `script_name` Required; Name of the Data Script.
Example	**Script Name:** MyDataScript **Script UUID:** 507ffdbd0eba4b62b0e31e0fd22f6bec `${_scriptPath('MyDataScript')} --> $(ops_unv_script_path_507ffdbd0eba4b62b0e31e0fd22f6bec)` Note The Agent will replace the resolved token with a path to a temporary file containing the content of the Data Script. For additional details, refer to Embedding a Data Script.

Note

_scriptPath requires Agent 6.4.0.0 or later.

SQL/Stored Procedure Functions

Return Column Names for SQL Results from Current Task

Description	Returns the column names for the SQL results from the current SQL or Stored Procedure task. Column names are separated by the specified `separator`.
Syntax	**${_resultsColumnNames**(['separator'])}
Parameters	• `separator` Optional; Column name separator. Default is comma (,).

Return Column Names for SQL Results from Sibling Task

Description	Returns the column names for the SQL results from a sibling SQL or Stored Procedure task, within the same workflow. Column names are separated by the specified `separator`.
Syntax	**${_resultsColumnNamesFromTask**('name'[, 'separator'])}
Parameters	• `name` Required; Name of the sibling task that the results should come from. The task must be within the same workflow. • `separator` Optional; Column name separator. Default is comma (,).

Return SQL Results from Current Task

Description	Returns all SQL results from the current SQL or Stored Procedure task. Columns are separated by the specified `separator` and rows are separated by a new line.
Syntax	**`${_resultsAll`**`(['separator', 'rowSeparator'])}`
Parameters	• `separator` Optional; Column separator. Default is comma (,). • `rowSeparator` Optional; Overrides default New Line character.

Return SQL Results from Sibling Task

Description	Returns all SQL results from a sibling SQL or Stored Procedure task, within the same workflow. Columns are separated by the specified `separator` and rows are separated by a new line.
Syntax	**`${_resultsAllFromTask`**`('name'[, 'separator', 'rowSeparator'])}`
Parameters	• `name` Required; Name of the task that the results should come from. The task must be within the same workflow. • `separator` Optional; Column separator. Default is comma (,). • `rowSeparator` Optional; Overrides default New Line character.

Return SQL Warnings from Current Task

Description	Returns all SQL warnings from the current SQL or Stored Procedure task. Columns are separated by the specified `separator` and rows are separated by a new line.
Syntax	**`${_SQLWarnings`**`(['separator'])}`
Parameters	• `separator` Optional; Column separator. Default is comma (,).

Return SQL Warnings from Sibling Task

Description	Returns all SQL warnings from a sibling SQL or Stored Procedure task, within the same workflow. Columns are separated by the specified `separator` and rows are separated by a new line.
Syntax	**`${_SQLWarningsFromTask`**`('name'[, 'separator'])}`

Parameters	• `name` Required; Name of the sibling task that the warnings should come from. The task must be within the same workflow. • `separator` Optional; Column separator. Default is comma (,).

Return String Value of Row/Column by Column Name

Description	Returns the string value of a row/column from a previously executed SQL task within the same workflow, or from the current SQL task.
Syntax	**`${_resultsColumn`**`('name', 'colname'[, rownum, 'default_value'])}`
Parameters	• `name` Required; Name of a sibling SQL task within the same workflow from which you want the function to fetch results. If you want to execute the function against the current task, use an empty string for the name parameter. • `colname` Required; Name of column to retrieve. • `rownum` Optional; Numeric row number in result set to retrieve. Default is 1. • `default_value` Optional; Default value to return if result not found.

Return String Value of Row/Column by Column Number

Description	Returns the string value of a row/column from a previously executed SQL task within the same workflow, or from the current SQL task.
Syntax	**`${_resultsColumnByNo`**`('name', colnum[, rownum, 'default_value'])}`
Parameters	• `name` Required; Name of a sibling SQL task within the same workflow from which you want the function to fetch results. If you want to execute the function against the current task, use an empty string for the name parameter. • `colnum` Required; Number of column to retrieve. First column in result is 1, second is 2, and so on. • `rownum` Optional; Numeric row number in result set to retrieve. Default is 1. • `default_value` Optional; Default value to return if result not found.

Return String Values of Columns

Description	Returns the string values of columns in a specific row in CSV (comma-separated values) format, from a previously executed SQL task within the same workflow, or from the current SQL task.
Syntax	**`${_resultsColumnsCSV`**`('name'[, rownum])}`

Parameters	
	• `name` Required; Name of a sibling SQL task within the same workflow from which you want the function to fetch results. If you want to execute the function against the current task, use an empty string for the `name` parameter. • `rownum` Optional; Numeric row number in result set to retrieve. Default is 1.

String Functions

String Functions can accept:

- String content in a String parameter.
- Variable name in a String parameter (prefixed with _var) from which string content can be obtained.
- Integer and Boolean parameters.

For String functions that accept a String value parameter directly, the value parameter can be specified using hard-coded text, variables, functions, or any combination of the three.

Note

When using String functions that accept a String value parameter directly, you should be aware of expectations with respect to escape characters and escape sequences (see Escape Sequences, below).

For String functions that accept a variable name parameter, the fully resolved value of the variable by the specified name will be used as the String value argument. The variable must be fully resolvable and must not contain an unresolved function.

Note

Indexing functions use zero-based numbering; that is, the initial element is assigned the index 0.

Escape Sequences

An escape character preceded by a backslash (\) is an escape sequence (see the following table for a list of escape sequences).

If you are using a String function to manipulate a String value that potentially may contain an escape sequence, you should use the String function that accepts a variable name parameter to allow for passing the value to the function without the escape sequence being interpreted.

Escape Sequences	Escape Sequence Description
\t	Insert a tab in the text at this point.
\b	Insert a backspace in the text at this point.
\n	Insert a newline in the text at this point.
\r	Insert a carriage return in the text at this point.
\f	Insert a formfeed in the text at this point.
\'	Insert a single quote character in the text at this point.

\"	Insert a double quote character in the text at this point.
\\	Insert a backslash character in the text at this point.

Convert Characters in Value to Lower Case

Description	Converts all of the characters in the `value` to lower case using the rules of the default locale.
Syntax	**`${_toLowerCase`**`('value')}`
Parameters	• `value` Required; String to convert to lower case.

Convert Characters in Variable to Lower Case

Description	Converts all of the characters in the variable to lower case using the rules of the default locale.
Syntax	**`${_varToLowerCase`**`('variableName')}`
Parameters	• `variableName` Required; Name of the variable being passed into the function.

Convert Characters in Value to Upper Case

Description	Converts all of the characters in the `value` to upper case using the rules of the default locale.
Syntax	**`${_toUpperCase`**`('value')}`
Parameters	• `value` Required; String to convert to upper case.

Convert Characters in Variable to Upper Case

Description	Converts all of the characters in the variable to upper case using the rules of the default locale.
Syntax	**`${_varToUpperCase`**`('variableName')}`
Parameters	• `variableName` Required; Name of the variable being passed into the function.

Escape Characters in Variable Using XML Entities

Description	Escapes the characters in a variable value using XML entities.
Syntax	**`${_varEscapeXml`**`('variableName')}`
Parameters	• `variableName` Required; Name of the variable being passed into the function. The variable value will be escaped for insertion into XML.
Example	Variable Name: escape_me Variable Value: `1234567890\E-=[]\;',./ ~!@#$%^&*()_+{}\|:"<>?  `${_varEscapeXml('escape_me')} --> `1234567890\E-=[]\;',./ ~!@#$%^&*()_+{}|:"<>?`

Escape Characters in Variable Using JSON String Rules

Description	Escapes the characters in a variable value using JSON string values.
Syntax	**`${_varEscapeJson`**`('variableName')}`
Parameters	• `variableName` Required; Name of the variable being passed into the function. The variable value will be escaped for insertion into JSON.
Example	Variable Name: escape_me Variable Value: `1234567890\E-=[]\;',./ ~!@#$%^&*()_+{}\|:"<>?  `${_varEscapeJson('escape_me')} --> `1234567890\\E-=[]\\;',.\/ ~!@#$%^&*()_+{}|:\"<>?`

Escape Characters in Variable Using JavaScript String Rules

Description	Escapes the characters in a variable value using JavaScript String rules.
Syntax	**`${_varEscapeJavaScript`**`('variableName')}`
Parameters	• `variableName` Required; Name of the variable being passed into the function. The variable value will be escaped for insertion into JavaScript.
Example	Variable Name: escape_me Variable Value: `1234567890\E-=[]\;',./ ~!@#$%^&*()_+{}\|:"<>?  `${_varEscapeJavaScript('escape_me')} --> `1234567890\\E-=[]\\;\',.\/ ~!@#$%^&*()_+{}|:\"<>?`

Escape Characters in Variable Using HTML Entities

Description	Escapes the characters in a variable value using HTML entities. (Supports all known HTML 4.0 entities.)
Syntax	**`${_varEscapeHtml`**`('variableName')}`
Parameters	• `variableName` Required; Name of the variable being passed into the function. The variable value will be escaped for insertion into HTML.
Example	Variable Name: escape_me Variable Value: `1234567890\E-=[]\;',./ ~!@#$%^&*()_+{}\|:"<>?  `${_varEscapeHtml('escape_me')} --> `1234567890\E-=[]\;',./ ~!@#$%^&*()_+{}|:"<>?`

Escape Characters in Variable as a Literal Pattern

Description	Returns a literal regular expression pattern String for the value of the specified variable. This method produces a String that can be used to create a Pattern that would match the String as if it were a literal pattern.

Syntax	**`${_varLiteralPattern`**`('variableName')}`
Parameters	• `variableName` Required; Name of the variable being passed into the function. The variable value will be escaped for insertion into a regular expression as a literal pattern.
Example	Variable Name: escape_me Variable Value: `1234567890\E-=[]\;',./ ~!@#$%^&*()_+{}\|:"<>?  `${_varLiteralPattern('escape_me')} --> \Q`1234567890\E\\E\Q-=[]\;',./ ~!@#$%^&*()_+{}|:"<>?\E`

Randomly Generate a String

Description	Randomly generates a String with a specified length.
Syntax	**`${_randomString`**`(length[, 'excludeCharacters', 'defaultCharacters'])}`
Parameters	• `length` Required; String length. • `excludeCharacters` Optional; String containing characters to exclude from the default character set. • `defaultCharacters` Optional; String for overriding default character set. Note The following characters are included in the default character set, in addition to the space character. ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz1234567890`-=~!@#$%^&*()_+[]\{}|;':",./<>?
Example	`${_randomString(24, '', 'ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890@#$%*')} --> 5*L8T1RN#$AQWEKPA@BQ19JD`

Replace Substring of Value with Regular Expression

Description	Replaces each substring of value that matches the specified regular expression, regex, with the specified replacement.
Syntax	**`${_replaceAll`**`('value', 'regex', 'replacement')}`

Parameters	• `value` Required; Input string. • `regex` Required; Regular expression. • `replacement` Required; Replacement string.

Replace Substring of Variable with Regular Expression

Description	Replaces each substring of `variableName` that matches the specified regular expression, regex, with the specified replacement.
Syntax	**`${_varReplaceAll`**`('variableName', 'regex', 'replacement')}`
Parameters	• `variableName` Required; Name of the variable being passed into the function. • `regex` Required; Regular expression. • `replacement` Required; Replacement string.

Return Base64 Encoded String

Description	Returns the value of the specified variable encoded using the Base64 encoding scheme.
Syntax	**`${_varEncodeBase64`**`('variableName'[, 'charset'])}`
Parameters	• `variableName` Required; Name of the variable whose value will be encoded using the Base64 encoding scheme. • `charset` Optional; Name of the charset; default UTF-8.
Example	Where Variable rawstring contains a value of "Test String": `${_varEncodeBase64('rawstring')} --> VGVzdCBTdHJpbmc=`

Return Copy of Value with Whitespace Omitted

Description	Returns a copy of `value`, with leading and trailing whitespace omitted.
Syntax	**`${_trim`**`('value')}`

Parameters	• `value` Required; String to trim.

Return Copy of Variable with Whitespace Omitted

Description	Returns a copy of `variableName`, with leading and trailing whitespace omitted.
Syntax	**`${_varTrim`**`('variableName')}`
Parameters	• `variableName` Required; Name of the variable being passed into the function.

Return Index of Substring in String Value

Description	Returns the index within the string value of the first occurrence of the specified substring, `str`.
Syntax	**`${_indexOf`**`('value', 'str')}`
Parameters	• `value` Any string. • `str` Substring to search for. If the `str` argument occurs as a substring within the value, then the index of the first character of the first such substring is returned; if it does not occur as a substring, -1 is returned.

Return Index of Substring in String Variable

Description	Returns the index within the string variable of the first occurrence of the specified substring, `str`.
Syntax	**`${_varIndexOf`**`('variableName', 'str')}`
Parameters	• `variableName` Required; Name of the variable being passed into the function. • `str` Required; Substring to search for. If the `str` argument occurs as a substring within the variable, the index of the first character of the first such substring is returned; if it does not occur as a substring, -1 is returned.

Return Index of Substring Plus Offset in String Value

Description	Returns the index within this string of the first occurrence of the specified substring plus the specified offset. The integer returned is the smallest value.

Syntax	**${_indexOfWithOffset**('value', 'str', offset)}
Parameters	• value Required; Any string. • str Required; Substring to search for. If the str argument occurs as a substring within the value, then the index of the first character of the first such substring is returned; if it does not occur as a substring, -1 is returned. • offset Required; Number (positive or negative) to offset the found index.

Return Index of Substring Plus Offset in String Variable

Description	Returns the index within this string of the first occurrence of the specified substring plus the specified offset. The integer returned is the smallest variable.
Syntax	**${_varIndexOfWithOffset**('variableName', 'str', offset)}
Parameters	• variableName Required; Name of the variable being passed into the function. • str Required; Substring to search for. If the str argument occurs as a substring within the variable, then the index of the first character of the first such substring is returned; if it does not occur as a substring, -1 is returned. • offset Required; Number (positive or negative) to offset the found index.

Return Index of Rightmost Occurrence of Substring in String Value

Description	Returns the index within the string value of the rightmost occurrence of the specified substring, str.
Syntax	**${_lastIndexOf**('value', 'str')}
Parameters	• value Required; Any string. • str Required; Substring to search for. If the str argument occurs one or more times as a substring within the value, then the index of the first character of the last such substring is returned. If it does not occur as a substring, -1 is returned.

Return Index of Rightmost Occurrence of Substring in String Variable

Description	Returns the index within the string variable of the rightmost occurrence of the specified substring, str.
Syntax	**${_varLastIndexOf**('variableName', 'str')}

Parameters	• `variableName` Required; Name of the variable being passed into the function. • `str` Required; Substring to search for. If the `str` argument occurs one or more times as a substring within the variable, then the index of the first character of the last such substring is returned. If it does not occur as a substring, -1 is returned.

Return Index of Rightmost Occurrence of Substring Plus Offset in String Value

Description	Returns the index within this string of the rightmost occurrence of the specified substring, plus the specified offset. The returned index is the largest value.
Syntax	**`${_lastIndexOfWithOffset`**`('value', 'str', offset)}`
Parameters	• `value` Required; Any string. • `str` Required; Substring to search for. If the `str` argument occurs as a substring within the value, then the index of the first character of the first such substring is returned; if it does not occur as a substring, -1 is returned. • `offset` Required; Number (positive or negative) to offset the found index.

Return Index of Rightmost Occurrence of Substring Plus Offset in String Variable

Description	Returns the index within this string of the rightmost occurrence of the specified substring, plus the specified offset. The returned index is the largest variable.
Syntax	**`${_varLastIndexOfWithOffset`**`('variableName', 'str', offset)}`
Parameters	• `variableName` Required; Name of the variable being passed into the function. • `str` Required; Substring to search for. If the `str` argument occurs as a substring within the variable, then the index of the first character of the first such substring is returned; if it does not occur as a substring, -1 is returned. • `offset` Required; Number (positive or negative) to offset the found index.

Return Length of Value

Description	Returns the length of `value`.
Syntax	**`${_length`**`('value')}`

Parameters	• `value` Required; Any string.

Return Length of Variable

Description	Returns the length of `variableName`.
Syntax	**`${_varLength`**`('variableName'[, useEmptyForUndefined])}`

Parameters	• `variableName`
	Required; Name of the variable being passed into the function.
	• `useEmptyForUndefined`
	Optional; Specification (**true** or **false**) for the handling of a missing variable name. Default is false.
	  • If `useEmptyForUndefined` = **true**, the function will return 0.
	  • If `useEmptyForUndefined` = **false**, the function will remain unresolved if the variable name does not exist.

Return New String that is Substring of Value

Description	Returns a new string that is a substring of `value`. The substring begins at `beginIndex` and extends to the character at `endIndex` -1.
Syntax	**`${_substring`**`('value', beginIndex[, endIndex])}`
Parameters	• `value` Required; String to make a substring from. • `beginIndex` Required; Beginning index, inclusive. • `endIndex` Optional; Ending index, exclusive.
Example	`${_substring('hamburger', 4, 8)} --> urge` `${_substring('smiles', 1, 5)} --> mile`

Return New String that is Substring of Variable

Description	Returns a new string that is a substring of `variableName`. The substring begins at `beginIndex` and extends to the character at `endIndex` -1.
Syntax	**`${_varSubstring`**`('variableName', beginIndex[, endIndex])}`

Parameters	• `variableName` Required; Name of the variable being passed into the function. • `beginIndex` Required; Beginning index, inclusive. • `endIndex` Optional; Ending index, exclusive.

Examples	If the value of the `food` variable is **hamburger**, and the value of the `face` variable is **smiles**:
	
	`${_varSubstring('food', 4, 8)} --> urge`
	`${_varSubstring('face', 1, 5)} --> mile`

Return URL-Encoded String

Description	Returns a URL-encoded string according to the ASCII Encoding Reference for UTF-8; all non-alphanumeric characters are replaced with their equivalent hexadecimal escape sequences.
Syntax	**`${_varEncodeUrl`**`('variableName')}`
Parameters	• `variableName` Required; Name of the variable whose value will be converted to a URL encoded string.
Example	Where Variable rawstring contains a value of "`ABC$%^----DEF`": `${_varEncodeUrl('rawstring')} --> ABC%24%25%5E----DEF`

Variable By XPath

Description	Resolves to the evaluated XPath expression applied to the value of the specified variable. • If the variable is unresolved, the function will remain unresolved. • If the variable is undefined, blank, or the path expression does not yield a result, the function will resolve to the default value.
Syntax	${_**varXPath**('variableName', 'xPathExpression'[, 'defaultValue', 'delimiter', prettyPrint])}

Parameters	`variableName`
	Required; The name of the variable to apply the XPath expression to.
	
	`xPathExpression`
	Required; XPath expression. https://www.w3schools.com/xml/xpath_intro.asp
	
	`defaultValue`
	Optional; Default value to return if the result is not found. Default is empty (').
	
	`delimiter`
	Optional; If xPathExpression evaluates to multiple results, the delimiter to be used to separate those results. Default is new line character (\n).
	
	`prettyPrint`
	Optional; Specification (**true** or **false**) for whether or not XML will be pretty printed (indented). Default is false.

Example	`my_variable=`
	`<message><code>10</code></message>`
	
	`${_varXPath('my_variable', '//code/text()')}`
	`> 10`

Variable By JsonPath

Description	Resolves to the evaluated JsonPath expression applied to the value of the specified variable. • If the variable is unresolved, the function will remain unresolved. • If the variable is undefined, blank, or the path expression does not yield a result, the function will resolve to the default value.
Syntax	${**_varJsonPath**('variableName', 'pathExpression'[, 'defaultValue', 'delimiter', prettyPrint])}

Parameters	`variableName`
	Required; The name of the variable to apply the JsonPath expression to.
	
	`pathExpression`
	Required; JsonPath expression. https://github.com/json-path/JsonPath
	
	`defaultValue`
	Optional; Default value to return if the result is not found. Default is empty (').
	
	`delimiter`
	Optional; If `pathExpression` evaluates to multiple results, the delimiter to be used to separate those results. Default is new line character (\n).
	
	`prettyPrint`
	Optional; Specification (**true** or **false**) for whether or not JSON will be pretty printed (indented). Default is false.

Example	`my_variable=`
	`{`
	`  "code": 10`
	`}`
	
	`${_varJsonPath('my_variable', '$.code')}`
	`> 10`

Variable By JsonPath As Array

Description	Resolves to the evaluated JsonPath expression applied to the value of the specified variable. • If the variable is unresolved, the function will remain unresolved. • If the variable is undefined, blank, or the path expression does not yield a result, the function will resolve to the default value.
Syntax	${_**varJsonPathAsArray**('variableName', 'pathExpression'[, 'defaultValue', prettyPrint])}

Parameters	`variableName`
	Required; The name of the variable to apply the JsonPath expression to.
	
	`pathExpression`
	Required; JsonPath expression. https://github.com/json-path/JsonPath
	
	`defaultValue`
	Optional; Default value to return if the result is not found. Default is empty ('').
	
	`prettyPrint`
	Optional; Specification (**true** or **false**) for whether or not JSON will be pretty printed (indented). Default is false.

Example	`my_variable=`
	`[`
	`  {`
	`  "message" : "Hello",`
	`  "code" : 10`
	`  },`
	`  {`
	`  "message" : "World!",`
	`  "code" : 20`
	`  }`
	`]`
	
	`${_varJsonPathAsArray('my_variable', '$[*].message', '', true)}`
	`>`
	`[`
	`  "Hello",`
	`  "World!"`
	`]`

Variable Number of Lines

Description	Resolves to the number of lines the value of the specified variable has. • If the variable is unresolved, the function will remain unresolved. • If the variable is undefined, or blank, the function will resolve to 0.
Syntax	${_**varNumberOfLines**('variableName')}
Parameters	`variableName` Required; The name of the variable to return the number of lines for.

Example	`my_variable=`
	`Line 1`
	`Line 2`
	`Line 3`
	
	`${_varNumberOfLines('my_variable')}`
	`> 3`

Variable By Specific Line(s)

Description	Resolves to the specified line(s) of variable data for the specified variable. • If the variable is unresolved, the function will remain unresolved. • If the variable is undefined, blank, or no lines qualify, the function will resolve to the default value.
Syntax	${_**varLines**('variableName', startLine, numberOfLines[, 'defaultValue', 'resultDelimiter'])}

Parameters	`variableName`
	Required; The name of the variable to apply the function to.
	
	`startLine`
	
	Required; Start line, where 1 is the first line and -1 is the last line.
	
	`numberOfLines`
	Required; Number of lines to return starting from the `startLine`.
	
	`defaultValue`
	Optional; Default value to return if no lines qualify. Default is empty ('').
	
	`resultDelimiter`
	Optional; Delimiter to use when concatenating matching lines. If not specified, "\n" or "\r\n" depending on original output line endings.

Example	`my_variable=`
	`Line 1`
	`Line 2`
	`Line 3`
	`Line 4`
	
	`${_varLines('my_variable', 2, 2)}`
	`>`
	`Line 2`
	`Line 3`

Variable By Line(s) Matching Regular Expression

Description	Resolves to the line(s) of variable data that match the specified regular expression, of the specified variable. • If the variable is unresolved, the function will remain unresolved. • If the variable is undefined, blank, or no lines qualify, the function will resolve to the default value.

Syntax	${_**varLinesByRegex**('variableName', 'regexPattern'[, maxCount, numberOfLinesBefore, numberOfLinesAfter, 'defaultValue', 'resultDelimiter'])}

Parameters	`variableName`
	Required; The name of the variable to apply the function to.
	
	`regexPattern`
	Required; Regular expression used for determining if a line matches. Regular expression must match the whole line (see Example, below).
	
	`maxCount`
	Optional; Maximum number of matching lines to return. Default is 1.
	
	`numberOfLinesBefore`
	Optional; Number of lines before each matching line to return along with the matching line. Default is 0.
	
	`numberOfLinesAfter`
	Optional; Number of lines after each matching line to return along with the matching line. Default is 0.
	
	`defaultValue`
	Optional; Default value to return if the result is not found. Default is empty (').
	
	`resultDelimiter`
	Optional; Delimiter to use when concatenating matching lines. If not specified, "\n" or "\r\n" depending on original output line endings.

Example	`my_variable=`
	`Some_Text`
	`ABC=Some_String`
	`More_Text`
	
	`${_varLinesByRegex('my_variable', '^ABC=')} /* Returns empty (the whole Line was not matched) */`
	`>`
	
	`${_varLinesByRegex('my_variable', '^ABC=.*')}`
	`> ABC=Some_String`

Variable Path

Description	Returns a token representing the path to a temporary file containing the value of the specified variable. • $(ops_variable_path_<variableName><fileExtension>) The resolved token is supported within the Command, Parameters, and Script of a Windows and Linux/Unix Task.
Syntax	${_**varPath**('variableName'[, 'fileExtension'])}

Parameters	`variableName`
	Required; The variable to create a temporary file for.
	
	`fileExtension`
	Optional; The extension to use for the temporary file. Can be a maximum of 10 characters. Default is txt.

Example	`application.exe -file ${_varPath('my_variable')}`
	`> application.exe -file $(ops_variable_path_my_variable_txt)`
	
	`application.exe -file ${_varPath('my_variable', 'csv')}`
	`> application.exe -file $(ops_variable_path_my_variable_csv)`

System Functions

Display Variables

Description	Displays all the defined and built-in variables associated with the task instance.
Syntax	**`${_scope}`**
Parameters	(none)
Example	`${_scope} --> {ops_workflow_id=, ops_task_type=Unix, ops_status=DEFINED, ops_retry_interval=60, ops_exit_code=0, ops_retry_maximum=0, ops_cmd_parms=, ops_cmd=ls -la; exit ${_random('9')};, ops_retry_count=0, ops_agent_id=67e4994143d2617201cdf4ba9df9ab0a, ops_task_id=84880af243d26172019aa1d25988a8f9, ops_task_name=uc - Linux Ls}`

Generate Random Number

Description	Generates a random number between `max` (inclusive) and `min` (inclusive)
Syntax	**`${_random`**`([max, min])}`
Parameters	• `max` Optional; Upper bound (inclusive) on the random number. Default is 9. • `min` Optional; Lower bound (inclusive) on the random number. Default is 0.

Resolve to GUID (Globally Unique ID)

Description	Resolves to a 32-byte GUID (Globally Unique ID).
Syntax	**`${_guid}`**

Parameters	(none)

Resolve to Host Name

Description	Resolves to the hostname of the machine running the Controller, if available.
Syntax	**`${_hostname}`**
Parameters	(none)

Resolve to IP Address

Description	Resolves to the IP address of the machine running the Controller.
Syntax	**`${_ipaddress}`**
Parameters	(none)

Resolve to SYS_ID

Description	Resolves to the sys_id of the first task instance found within the same workflow specified by the sibling name.
Syntax	**`${_siblingid`**`('sibling_name')}`
Parameters	• `sibling_name` Required; Sibling name.
Example	`${_siblingid('Timer 60')} --> 5dbaaab943d26172015e10ab3e894e10`

Resolve to Variable Value

Description	Locates the specified variable in the specified sibling task instance within the same workflow and resolves to the variable value.
Syntax	**`${_varLookup`**`('sibling_name', 'variable_name'[,'def'])}`

Parameters	• `sibling_name` Required; Name of the sibling task instance from which the function is collecting the variable value. • `variable_name` Required; Name of the variable being collected by the function. • `def` Optional; Default value to return if the variable is not defined in the sibling task instance.

Resolve Variable

Description	Resolves the variable specified by the `variable_name` parameter and substitutes the `default_value` if the variable cannot be resolved.
Syntax	`${_resolve('variable_name', 'default_value')}`
Parameters	• `variable_name` Required; Variable name. • `default_value` Required; Default value to use if the variable cannot be resolved.

Resolve Variable (Advanced)

Description	Resolves the variable specified by the `variable_name` parameter and substitutes the default value if the variable cannot be resolved.
Syntax	`${_resolveadv('variable_name', 'default_value', [use_default_if_blank])}`
Parameters	• `variable_name` Required; Variable name. • `default_value` Required; Default value to use if the variable cannot be resolved. • `use_default_if_blank` Optional; Specification (**true** or **false**) for whether or not to use the default value if the variable is empty or blank. (If `use_default_if_blank` is false, `_resolveadv` behaves like _resolve.)

Universal Task Functions

Convert Array Field Variable

Description	Given the variable name representing the Array field, generate a String of delimited Array field entry data. The function will remain unresolved if the Array field contains unresolved variables or functions.
Syntax	`${_convertArrayFieldVariable('arrayFieldVariableName'[,'delimiter', 'separator', 'keyQuote', 'valueQuote'])}`

Parameters

- `arrayFieldVariableName`
  Required; Name of the variable for the Array Field; for example, ***ops_af_p2***.
- delimeter
  Optional; Value to be used to delimit the Name from the Value. Default is **=**.
- separator
  Optional; Value to be used to separate one entry/row from the next. Default is comma (**,**).
- keyQuote
  Optional; Quoting to be used around the Name. Default is "no quoting."
- valueQuote
  Optional; Quoting to be used around the Value. Default is "no quoting."

Example

```
ops_af_p1
----------
P1A=5
P1B=42
----------

ops_af_p2
----------
P2A=Red
P2B=White
P2C=Blue
----------

convertArrayFieldVariable(String arrayFieldVariableName, String delimiter, String separator, String keyQuote, String valueQuote)
================================================================================================================================

${_convertArrayFieldVariable('ops_af_p1')}
P1A=5,P1B=42
---------------

${_convertArrayFieldVariable('ops_af_p1', '=')}
P1A=5,P1B=42
---------------

${_convertArrayFieldVariable('ops_af_p1', ':')}
P1A:5,P1B:42
---------------

${_convertArrayFieldVariable('ops_af_p1', ':', ';')}
P1A:5;P1B:42
---------------

${_convertArrayFieldVariable('ops_af_p1', '::', ',', '\'')}
'P1A'::5,'P1B'::42
---------------

${_convertArrayFieldVariable('ops_af_p1', '=', ',', '\'', '"')}
'P1A'="5",'P1B'="42"
---------------

${_convertArrayFieldVariable('ops_af_p1', "", "", '\'', '\'')}
'P1A'='5','P1B'='42'
---------------
```

```
${_convertArrayFieldVariable('ops_af_p1', ':', '\\n', '\'', '\'')}
'P1A':'5'
'P1B':'42'
---------------

${_convertArrayFieldVariable('ops_af_p2')}
P2A=Red,P2B=White,P2C=Blue
---------------

${_convertArrayFieldVariable('ops_af_p2', '=')}
P2A=Red,P2B=White,P2C=Blue
---------------

${_convertArrayFieldVariable('ops_af_p2', ':')}
P2A:Red,P2B:White,P2C:Blue
---------------

${_convertArrayFieldVariable('ops_af_p2', ':', ';')}
P2A:Red;P2B:White;P2C:Blue
---------------

${_convertArrayFieldVariable('ops_af_p2', '::', ',', '\'')}
'P2A'::Red,'P2B'::White,'P2C'::Blue
---------------

${_convertArrayFieldVariable('ops_af_p2', '=', ',', '\'', '"')}
'P2A'="Red",'P2B'="White",'P2C'="Blue"
---------------

${_convertArrayFieldVariable('ops_af_p2', '', '', '\'', '\'')}
'P2A'='Red','P2B'='White','P2C'='Blue'
---------------

${_convertArrayFieldVariable('ops_af_p2', ':', '\\n', '\'', '\'')}
'P2A':'Red'
'P2B':'White'
'P2C':'Blue'
---------------
```

Get Array Field Variable Value

Description	Given the variable name representing the Array field and the name of an entry in the Array field, return the value for the entry.
Syntax	**`${_getArrayFieldVariableValue`**`('arrayFieldVariableName', 'name')}`
Parameters	• `arrayFieldVariableName` Required; Name of the variable for the Array Field; for example, ***ops_af_p1***. • `name` Required; Name of the entry for which the value is to be returned.

Example

```
ops_af_p1
----------
P1A=5
P1B=42
----------

ops_af_p2
----------
P2A=Red
P2B=White
P2C=Blue
----------

getArrayFieldVariableValue(String arrayFieldVariableName, String name)
==========================================================

P1A = ${_getArrayFieldVariableValue('ops_af_p1', 'P1A')}
----------
P1A=5
----------

P1B = ${_getArrayFieldVariableValue('ops_af_p1', 'P1B')}
----------
P1B=42
----------

P2A = ${_getArrayFieldVariableValue('ops_af_p2', 'P2A')}
----------
P2A=Red
----------

P2B = ${_getArrayFieldVariableValue('ops_af_p2', 'P2B')}
----------
P2B=White
----------

P2C = ${_getArrayFieldVariableValue('ops_af_p2', 'P2C')}
----------
P2C=Blue
----------
```

Web Service Functions

All functions will remain unresolved if no Web Service output record can be found for the task instance, for the current attempt.

All functions will remain unresolved if a required parameter either is not specified or specified incorrectly.

Raw Output from Web Service Task

Description	Resolves to the raw output data of the Web Service task instance that is resolving the function. • If the output record cannot be found, the function will remain unresolved. • If the output record is found, but the path expression does not yield a result, the function will resolve to the default value.
Syntax	**`${_responseRaw`**`(['default_value'])}`
Parameters	• `default_value` Optional; Default value to return if the result is not found. Default is empty ('').

Raw Output from Sibling Web Service Task

Description	Resolves to the raw output data of the Web Service task instance specified by the `siblingName` parameter. The sibling task instance must be within the same workflow, and the Execution User of the task instance that is resolving the function must have Read permission for the sibling task instance. • If the output record cannot be found, the function will remain unresolved. • If the output record is found but the path expression does not yield a result, the function will resolve to the default value.
Syntax	**`${_responseRawFromTask`**`('siblingName'[,'defaultValue'])}`
Parameters	• `siblingName` Required; Name of a sibling task instance. • `default_value` Optional; Default value to return if the result is not found. Default is empty ('').

XML Output Data from Web Service Task

Description	Resolves to the XML output data of the Web Service task instance that is resolving the function, corresponding to the evaluated xPath expression. • If the output record cannot be found, the function will remain unresolved. • If the output record is found, but the path expression does not yield a result, the function will resolve to the default value.
Syntax	**`${_responseXPath`**`('xPathExpression'[,'defaultValue','delimiter',prettyPrint])}`
Parameters	• `xPathExpression` Required; xPath expression, https://www.w3schools.com/xml/xpath_intro.asp • `defaultValue` Optional; Default value to return if the result is not found. Default is empty (''). • `delimiter` Optional; If `xPathExpression` evaluates to multiple results, the delimiter to be used to separate those results. Default is new line character (\n). • `prettyPrint` Optional; Specification (**true** or **false**) for whether or not XML output will be pretty printed (indented). Default is false.

Examples	If you want to obtain the `info` element text from the following Web Service Task XML output, you could use either of two examples for this Function.
	
	`<?xml version="1.0" encoding="UTF-8" standalone="yes"?><command-response><type>set_variable</type><success>true</success><info>No changes detected for variable variableName, ignoring Set Variable command.</info><errors></errors></command-response>`
	
	Example 1
	
	`${_responseXPath('//info')}`
	
	Select the info node in the document no matter where it is.
	
	Example 2
	
	`${_responseXPath('/command-response/info')}`
	
	Select the info node from a specific path in the document, starting from the root node.
	
	Using either of these examples will resolve to the following: No changes detected for variable `variableName`, ignoring Set Variable command.

XML Output Data From Sibling Web Service Task

Description	Resolves to the XML output data of the Web Service task instance specified by the siblingName, corresponding to the evaluated xPath expression. The sibling task instance must be within the same workflow and the Execution User of the task instance that is resolving the function must have Read permission for the sibling task instance. • If the output record cannot be found, the function will remain unresolved. • If the output record is found but the path expression does not yield a result, the function will resolve to the default value.
Syntax	**`${_responseXPathFromTask`**`('siblingName','xPathExpression'[,'defaultValue','delimiter',prettyPrint])}`
Parameters	• `siblingName` Required; Name of a sibling task instance. • `xPathExpression` Required; xPath expression, https://www.w3schools.com/xml/xpath_intro.asp • `defaultValue` Optional; Default value to return if the result is not found. Default is empty (''). • `delimiter` Optional; If `xPathExpression` evaluates to multiple results, the delimiter to be used to separate those results. Default is new line character (\n). • `prettyPrint` Optional; Specification (**true** or **false**) for whether or not XML output will be pretty printed (indented). Default is false.

JSON Output Data From Web Service Task

Description	Resolves to the JSON output data of the Web Service task instance that is resolving the function, corresponding to the evaluated JsonPath expression. • If the output record cannot be found, the function will remain unresolved. • If the output record is found but the path expression does not yield a result, the function will resolve to the default value.
Syntax	**`${_responseJsonPath`**`('pathExpression'[,'defaultValue','delimiter',prettyPrint])}`
Parameters	• `pathExpression` Required; JsonPath expression. • `defaultValue` Optional; Default value to return if the result is not found. Default is empty (''). • `delimiter` Optional; If `pathExpression` evaluates to multiple results, the delimiter to be used to separate those results. Default is new line character (\n). • `prettyPrint` Optional; Specification (**true** or **false**) for whether or not JSON output will be pretty printed (indented). Default is false.

JSON Output Data From Sibling Web Service Task

Description	Resolves to the JSON output data of the Web Service task instance specified by the siblingName, corresponding to the evaluated JsonPath expression. The sibling task instance must be within the same workflow and the Execution User of the task instance that is resolving the function must have Read permission for the sibling task instance. • If the output record cannot be found, the function will remain unresolved. • If the output record is found but the path expression does not yield a result, the function will resolve to the default value.
Syntax	**`${_responseJsonPathFromTask`**`('siblingName','pathExpression'[,'defaultValue','delimiter',prettyPrint])}`
Parameters	• `siblingName` Required; Name of a sibling task instance. • `pathExpression` Required; JsonPath expression. • `defaultValue` Optional; Default value to return if the result is not found. Default is empty (''). • `delimiter` Optional; If `pathExpression` evaluates to multiple results, the delimiter to be used to separate those results. Default is new line character (\n). • `prettyPrint` Optional; Specification (**true** or **false**) for whether or not JSON output will be pretty printed (indented). Default is false.

JSON Output Data As Array From Web Service Task

Description	Resolves to the JSON output data of the Web Service task instance that is resolving the function, corresponding to the evaluated JsonPath expression. • If the output record cannot be found, the function will remain unresolved. • If the output record is found but the path expression does not yield a result, the function will resolve to the default value.
Syntax	**`${_responseJsonPathAsArray`**`('pathExpression'[,'defaultValue',prettyPrint])}`
Parameters	• `pathExpression` Required; JsonPath expression. • `defaultValue` Optional; Default value to return if the result is not found. Default is empty (''). • `prettyPrint` Optional; Specification (**true** or **false**) for whether or not JSON output will be pretty printed (indented). Default is false.

JSON Output Data As Array From Sibling Web Service Task

Description	Resolves to the JSON output data of the Web Service task instance specified by the siblingName, corresponding to the evaluated JsonPath expression. The sibling task instance must be within the same workflow and the Execution User of the task instance that is resolving the function must have Read permission for the sibling task instance. • If the output record cannot be found, the function will remain unresolved. • If the output record is found but the path expression doesn't yield a result, the function will resolve to the default value.
Syntax	**`${_responseJsonPathAsArrayFromTask`**`('siblingName','pathExpression'[,'defaultValue',prettyPrint])}`
Parameters	• `siblingName` Required; Name of a sibling task instance. • `pathExpression` Required; JsonPath expression. • `defaultValue` Optional; Default value to return if the result is not found. Default is empty (''). • `prettyPrint` Optional; Specification (**true** or **false**) for whether or not JSON output will be pretty printed (indented). Default is false.

Virtual Resources

Overview

A virtual resource allows you to set up a throttling scheme that will manage the number of specific tasks that can run at one time.

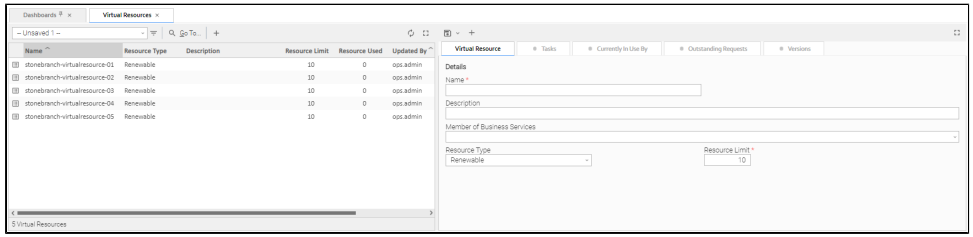
Using a Virtual Resource

Outlined below is the basic procedure and processing flow for using a virtual resource:

Step 1	Create a virtual resource. There are three types of virtual resources: 1. **Renewable** Resources that renew; that is, when a task has finished using them, they can be returned and made available to other tasks sharing the same resources. 2. **Boundary** Resources that are like "windows." Only those tasks defined to fit through that window (or Resource Limit) will run. For example, if you define a Boundary Resource with Resource Limit of 5, and Task A requires a window (amount) of 5, Task B requires a window (amount) of 5, and Task C requires a window (amount) of 10, both A and B will run. However, C will go into a Resource Wait state. If the Boundary Resource is updated to a Resource Limit of 10, C will run. 3. **Depletable** Resources that do not renew. Once consumed by a task, they are gone.
Step 2	Assign a resource limit to the virtual resource as appropriate for the resource type.
Step 3	Assign tasks to the virtual resource.
Step 4	Specify the number of resource units that each task will consume. For example, a task that requires a small amount of processing power might consume one unit; a task that requires a high amount of resources might consume three units. The number of units you specify for each task is relative to the maximum number that you assign to the resource.
Step 5	Save the virtual resource record.

Step 6	When a task with a virtual resource requirement launches, Universal Controller checks the virtual resource record to see if enough units are available to run the task, based on what other tasks assigned to that virtual resource are currently running. • If enough units are available, the task runs and the number of available units is decremented by the amount specified in the task. For example, if the resource has a maximum of ten and the task uses two, the remaining amount available on that virtual resource for use by other tasks is eight. • If there are not enough units available, the task is put into Resource Wait status and is listed in the Outstanding Requests tab in the virtual resource. When the required amount of resource becomes available, the task is launched. • If multiple tasks are in Resource Wait status, the virtual resource priority is used to determine which task will be first to acquire the resource when it becomes available.
Step 7	Tabs on the Virtual Resource record keep track of tasks that are currently "running" on this virtual resource and tasks that are waiting to "run" on this virtual resource.

Creating a Virtual Resource

Step 1	From the Automation Center navigation pane, select **Other > Virtual Resources**. The Virtual Resources list displays: To the right of the list, Virtual Resource Details for a new Virtual Resource record displays. 
Step 2	Enter / select Details for a new Virtual Resource, using the field descriptions below as a guide. • Required fields display an asterisk (*) after the field name. • Default values for fields, if available, display automatically. To display more of the Details fields on the screen, you can either: • Use the scroll bar. • Temporarily hide the list above the Details. • Click the + button above the list to display a pop-up version of the Details.
Step 3	Click a 💾 button. The Virtual Resource record is added to the database, and all buttons and tabs in the Virtual Resource Details are enabled.

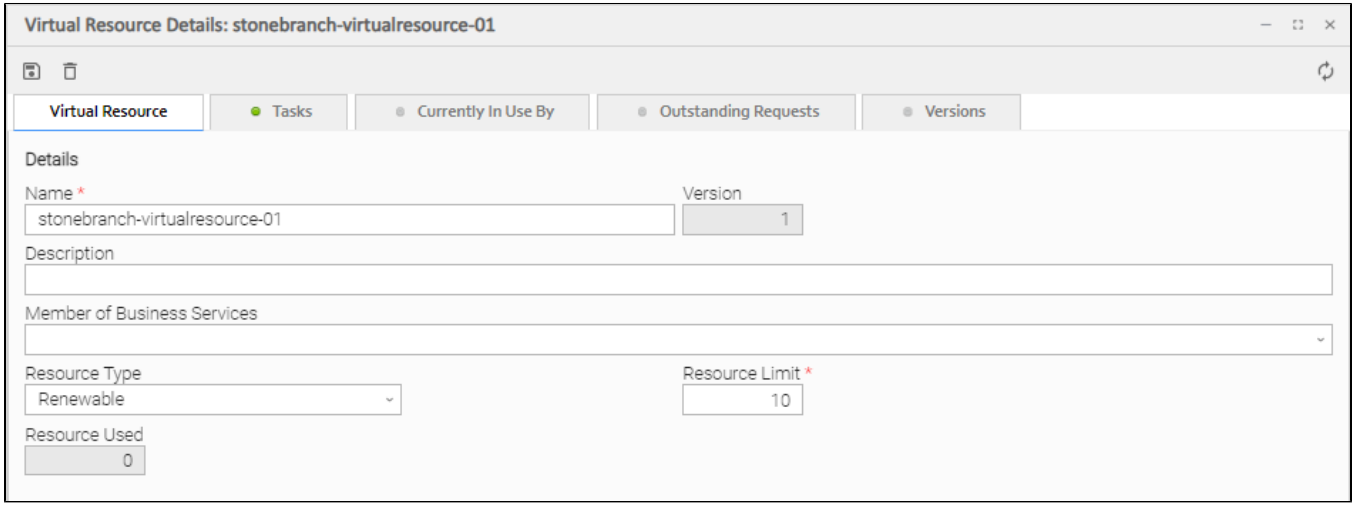
Note

To open an existing record on the list, either:

- Click a record in the list to display its record Details below the list. (To clear record Details below the list, click the + button that displays above and below the Details.)
- Clicking the Details icon next to a record name in the list, or right-click a record in the list and then click **Open** in the Action menu that displays, to display a pop-up version of the record Details.
- Right-click a record in the a list, or open a record and right-click in the record Details, and then click **Open In Tab** in the Action menu that displays, to display the record Details under a new tab on the record list page (see Record Details as Tabs).

Virtual Resource Details

The following Virtual Resource Details is for an existing Virtual Resource. See the field descriptions, below, for a description of all fields that display in the Virtual Resource Details.



Note

This sample Virtual Resource Details shows a Resource Limit of 1. Because each task has a minimum value of 1, this virtual resource would be limited to running only one task at a time.

For information on how to access additional details - such as Metadata and complete database Details - for Virtual Resources (or any type of record), see Records.

Virtual Resource Details Field Descriptions

The following table describes the fields, buttons, and tabs that display in the Virtual Resource Details.

Field Name	Description
Details	This section contains detailed information about the Virtual Resource.
Name	Name used within the Controller to identify this resource. Up to 40 alphanumerics. It is the responsibility of the user to develop a workable naming scheme for resources.
Version	System-supplied; version number of the current record, which is incremented by the Controller every time a user updates a record. Click the Versions tab to view previous versions. For details, see Record Versioning.
Description	Description of this record. (Maximum = 255 characters.)

Member of Business Services	User-defined; Allows you to select one or more Business Services that this record belongs to. (You also can Check All or Uncheck All Business Services for this record.) You can select up to 62 Business Services for any record type, and enter a maximum of 2048 characters for each Business Service. If the Business Service Visibility Restricted Universal Controller system property is set to true, depending on your assigned (or inherited) Permissions or Roles, Business Services available for selection may be restricted.
Resource Type	Type of resource. Options: • Renewable • Boundary • Depletable
Resource Limit	Maximum number of units available for this resource.
Resource Used	If Resource Type = Renewable; system-supplied. Number of units currently in use, as of the time you opened the record.
Metadata	This section contains Metadata information about this record.
UUID	Universally Unique Identifier of this record.
Updated By	Name of the user that last updated this record.
Updated	Date and time that this record was last updated.
Created By	Name of the user that created this record.
Created	Date and time that this record was created.
Buttons	This section identifies the buttons displayed above and below the Virtual Resource Details that let you perform various actions.
Save	Saves a new record in the Controller database.
Save & New	Saves a new record in the Controller database and redisplays empty Details so that you can create another record.
Save & View	Saves a new record in the Controller database and continues to display that record.
New	Displays empty (except for default values) Details for creating a new record.
Update	Saves updates to the record.
Delete	Deletes the current record.
Refresh	Refreshes any dynamic data displayed in the Details.
Close	For pop-up view only; closes the pop-up view of this record.
Tabs	This section identifies the tabs across the top of the Virtual Resource Details that provide access to additional information about the Virtual Resource.

Tasks	Lists tasks that are assigned to this virtual resource.
Currently In Use By	Lists the task instances that have acquired this virtual resource and the number of units acquired, at the time you opened this virtual resource record.
Outstanding Requests	Lists the task instances that are currently waiting to acquire this virtual resource, and the number of units required for each waiting task instance, at the time you opened this record.
Versions	Stores copies of all previous versions of the current record. See Record Versioning.

Assigning Tasks to a Virtual Resource

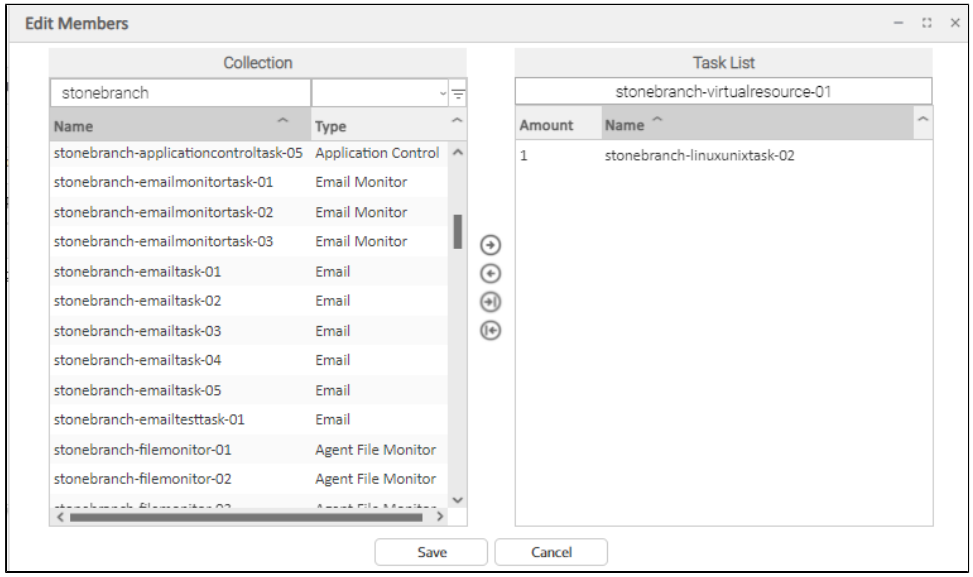
Note

You can also assign a task to a virtual resource from a task Details.

Step 1	Open the Virtual Resource record that you want to assign tasks to.
Step 2	Click the Tasks tab. A list of any tasks assigned to the Virtual Resource displays. 

Step 3

Click the  button. The Edit Members pop-up dialog displays:



- The **Collection** window lists tasks that are not assigned to this virtual resource.
- The **Tasks List** window lists tasks that refer to this virtual resource.

Step 4

To filter the Tasks listed in the Collection window, you can do either or both of the following:

- Enter characters in the text field above the **Task Name** column. Only tasks containing that sequence of characters will display in the list.
- Select a task type from the drop-down list above the **Type** column.

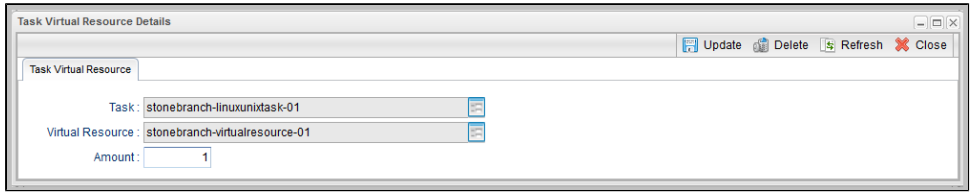
Step 5

To assign a task to the Virtual Resource, move the task from the **Collection** window to the **Tasks List** window:

1. To move a single task, double-click it or click it once and then click the **->** arrow.
2. To move multiple tasks, Ctrl-click them and then click the **>** arrow.
3. To move all tasks, click the **>>** arrow.

To unassign a task to the Virtual Resource, move the task from the **Tasks List** windows to the **Collection** window:

1. To move a single task, double-click it or click it once and then click the **<-** arrow.
2. To move multiple tasks, Ctrl-click them and then click the **<** arrow.
3. To move all tasks, click the **<<** arrow.

Step 6	The default **Amount** for each task assigned to a Virtual Resource is 1. To change the **Amount**, click the icon next to the **Task** name in the Tasks tab list or double-click anywhere in the task row. A T Resource Details pop-up displays  Change the **Amount** as desired and click .
Step 7	Click .

Resetting a Renewable Virtual Resource

You can reset the Resource Used amount of a **Renewable** virtual resource to accurately reflect the actual number of resources currently in use.

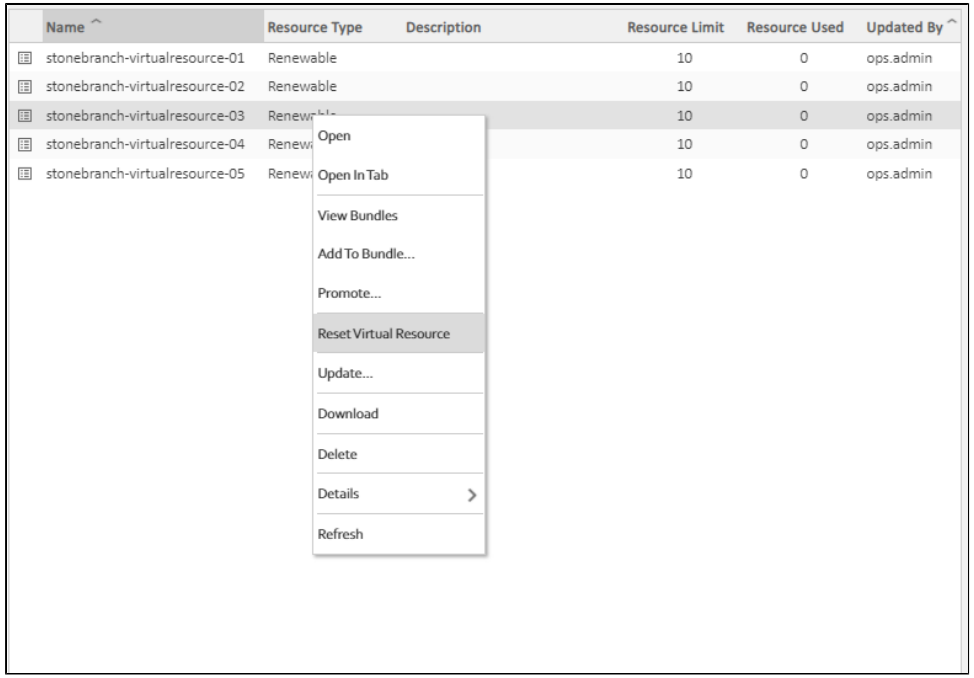
Resetting a **Renewable** virtual resource requires the ops_admin role.

(For **Boundary** and **Depletable** virtual resources, the Resource Used amount is always reset to 0, as it does not apply to these types of virtual resources.)

Step 1	Access the Action menu for the Virtual Resource that you want to reset.

Step 2

Click **Reset Virtual Resource**.



This resets the Resource Used amount to the Currently In Use By value.