HP Cloud Service Automation 4.10



Custom Resource Provider and Pool Selection

Table of contents

Introduction	2
Prerequisites	2
Concept	2
Build Resource Provider and Pool List	2
Select Resource Provider and Pool	2
Example	3
Use Case	3
Steps to Configure Provider Selection	3
REST APIs	13
Get the list of candidate providers and pools	13
Update the list of valid providers	13
Appendix A – HP 00 Flow	15
Get Candidate Provider Pool	17
Get Valid Provider Pool XML	17
For more information	19

Introduction

This document describes how to implement custom provider and pool selection. HP CSA comes with out-of-the-box resource provider selection actions. These actions select a list of resource providers and pools that are capable of providing a resource offering and select a provider and pool from this list. This selection functionality can be further refined by filtering the list of providers based on a desired condition, before the final resource provider and pool is selected.

In this white paper, any reference to the term provider implies reference to a resource provider.

Prerequisites

This document is targeted at individuals who are familiar with the basic concepts of HP CSA. Experience with HP Operations Orchestration (HP OO) flow authoring is also required. You should have run the Process Definition tool for the out-of-the-box content. For more information refer the *HP CSA Configuration Guide*.

Note

The *HP CSA Concepts Guide* includes information on basic HP CSA concepts, including a master glossary of HP CSA-related terminology.

Concept

HP CSA provides capability to configure demand and utilization of resource capacity across categories of providers. Resource Pool is the model to capture the demand and express the utilization consumed on HP CSA per provider. Each pool can be configured with multiple capacities like CPU, Memory etc., which will be consumed by HP CSA during subscription fulfillment. Capacity is consumed during the Reservation phase and released during Un-Reservation phase of the Lifecycle process.

Resource pools can be configured on HP CSA for the following two cases:

- 1. To manage (increase or decrease) resource capacity and select the provider and pool which satisfy the demand.
- 2. To manage only the utilization of resource capacity, but externalize the selection of provider and pool.

This document will explain the latter case.

The following internal actions help with provider and pool selection:

- Build Resource Provider and Pool List.
- Select Resource Provider and Pool.

These actions are explained in the following sections.

Build Resource Provider and Pool List

This action does the following:

- Builds a list of resource providers and pools.
- Filters the list belonging to at least one of the resource environments that are associated with the corresponding service catalog. By corresponding service catalog, we mean that catalog through which we publish the service offering related to the service design having this action.

The criteria to build a candidate list of resource providers and pools are as follows:

- They must have the provider availability option set to Enabled.
- They must have the pool availability option set to Enabled.

This action also sets the valid list of resource providers to the list resulting from this action

Select Resource Provider and Pool

This action selects a resource provider and a pool from the valid list of pools built by the previous action. The resource provider is selected randomly from the list of valid providers. The selected provider is then written to a property on the associated service component. Users specify the name of this property through a well-known property of this action.

Example

Use Case

Data store is an essential resource capacity that is consumed by various applications in a data center. Consider a VMware vCenter provider having three data stores in a data center. Subscription request fulfillment requires selecting a data store having enough disk space to provision the server instance. Each data store can be configured as a provider pool on the VCenter resource provider. During provider selection, appropriate data stores can be selected by comparing the disk size request from the customer subscription against the provider's data store disk space.

Since HP CSA contains out-of-the-box sample content for VMware vCenter, you will import it into the Designs area of the Cloud Service Management console and use it to illustrate the steps. Import the VCENTER_COMPUTE_CUSTOM_POOL_SELECTION content now. The content can be found at the location:

%CSA_HOME%/CSAKit-<version>/Content Archives/sequenced/vmware vcenter.

Steps to Configure Provider Selection

1. Add a VCenter resource provider.

Figure 1. VCenter Resource Provider

(pp	Cloud Service Automa	tion			admin 💄	• 😮
<	Providers			Ву Туре		~-
6	HP Helion OpenStack 🔒	🔄 VMware vCenter				
(p)	HP Helion Public Cloud 🔒	Providers Components				
(p)	HP Matrix Operating E 🔒		Search		Q	
(p)	HP Network Automation 🔒 🛛	VCenter https://192.168.254.254:443				
SA	HP Server Automation 🔒					
I SIS	HP SiteScope 🔒					
(p)	HP UCMDB 🔒					
	OpenStack 🔒					
ß	VMware vCenter 🔒					
Ref	resh 🔅	Create			1 Tota	il Items

 Associate resource offerings to resource providers capable of offering the resource. For this example, we will associate the VMware vCenter provider with the resource offering named VCENTER_FLEX_COMPUTE_SERVER_RESOURCES.

Figure 2. vCenter Flex Resource Offering

Ø Cloud Service Automation	admin 💄 🗸 😮
Providers	
🛐 VCenter	VMware vCenter
Overview Properties Environments Offerings Resource Pools Components	
	Search Q
VCENTER_COMPUTE_FLEX_SERVER_RESOURCES_3.20 Adds/Removes CPU or Memory from all servers in the server group.	
Refresh Select	1 Total Items

3. Create resource pools.

Create data store pools on HP CSA so that they have display names that are the same as the name on the VMware vCenter provider. Figure 3 shows that there are three data store pools for the provider, and that they have been given the same display names in HP CSA.

Figure 3. Datastore Pools

Create Basever Bask		2.44	File Edit	View Inventor	y Admin	nistration	Plug-ins	Help		
Create Resource Pool		1.16		💧 🔥 Home	▶ की	Inventor	ry 🕨 🗧	Datastore	es and Datastore Cl	usters
Display Name *	Default Settings									
EVA_SWIFT_DS_1	Enabled	• 0	🗆 🔁 V0	ENTER5.CSADEV	.COM					
Description				CSADEV	(1)			Getting S	itarted Summary	Virtual Machines
				EVA_SWIFT	_DS_1					` <u> </u>
				EVA_SWIFT	_DS_2 _DS_3			What	is a datastore	?
				Ĩ.				A data	store is a logic	al container that
								operat	tions. Datastor	es can exist on d
Known By Provider As *								physic	al storage, inc	luding local stora
CSADEV								NFS-b	ased	5. A datastore ca
Resource Synchronization Action *										
None 💽 🕄										
	Create C	Cancel								
< Providers										
										VMwara uCapter
VCenter VCenter										where veener
Overview Properties Environments	Offerings Resource Pools	Co	mponents							
									Sourch	0
										54
CSAResourcePool										
EVA_SWIFT_DS_1										
EVA_SWIFT_DS_1										
EVA SWIFT DS 2										
EVA_SWIFT_DS_2										
EVA SWIFT DS 3										
EVA_SWIFT_DS_3										

Add the resource capacity and availability for each resource pool.
 Add storage capacity for the data store resource pool. Select "Unlimited" resource availability option.

Figure 4. Resource Capacity of a Pool

Cloud Service Automation	Add Resource ? 🔀
< Providers	Resource Type *
EVA_SWIFT_DS_1 (on VCenter)	Storage 💽 💿
Associate resources such as storage, memory, or network addresses with this pool and se	Resource Availability Unlimited
	Add Cancel

5. Add the providers to the resource environment.

Note

This is an optional step during provider configuration.

Providers can be grouped together by *resource environment*. One or more resource environments can be linked to a service catalog to restrict provider selection at subscription time. The steps to do this are indicated in the following example:

A. Add two regions, East and West, by first selecting **By Environment** in the upper-right drop-down field and clicking on the gear icon to add the regions.

< Providers		By Environment
💱 EAST	🎼 WEST	Search Q
🎲 west	No Resource Providers Found	
	Select Resource Providers	
Refresh	Select	

Figure 5. East and West Regions Added

B. Associate the necessary providers into each resource environment.

Figure 6. vCenter Provider Associated with the East Region

<	Providers			By Environment	~-
8	EAST	💱 EAST	Search	Q	$\blacksquare\equiv$
	WEST	VCenter			
Ref	resh 🔅	Select		1	Total Items

C. Add the resource environments onto the desired catalogs in the Catalog area of the CSA interface. In this example, we will add the "East" resource environment into the "Global" catalog, so subscriptions requested from the "Global" catalog will always choose providers from the "East" resource environment during the provider selection stage of subscription fulfillment.

Figure 7. Adding a Resource Environment to a Catalog

Icloud Service Automation	Select Resource Environments for Global Shared Catalog					
< Catalogs	Search C		Search	Q		
Global Sharod Catalog	Available Resource Environments		Selected Resource Environments			
Overview Categories Offerings Environ Image: Subscriptions from this catalog will use resource proceed and the second secon	:@: WEST	Add > < Remove	₩ EAST			
			Save	Cancel		

6. Create a sequenced service design.

For this example, create a sequenced service design having the following components, with the hierarchy as indicated in the following list and shown in Figure 8:

- Service Composite
- Infrastructure Service
- Server Group
- Server

Figure 8. Service Design

🅢 Cloud Service A	utomation
Sequenced Designs	
📦 VCENTER_COMI	PUTE_CUSTOM_POOL_SELECTION_3.20
Overview Designer	Subscriber Options
	v Center Simple Compute ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓

7. Add the resource offerings to the components.

Resource offerings are associated with components using resource bindings. In this example, add the VCENTER_FLEX_SERVER_RESOURCES binding to the Server Group component, and the VCENTER_COMPUTE binding to the Server component.

Figure 9. Resource Offering on Components

	Server Group Server Group Resource Bindings
□ — ⊙ — □ ⊘ ¥3	Simple Compute Server Server Resource Bindings C *] × VCENTER_COMPUTE_3.20 VMware vCenter

- Create Provider Selection actions for the resource bindings on the Server Group component.
 Add the following actions to the Server Group component's binding (VCENTER_FLEX_SERVER_RESOURCES) in the following order:
 - Build Resource Provider and Pool List (Internal Process Engine)
 - vCenter Provider Pool Selection for Datastore (HP 00 Flow)
 - Select Resource Provider and Pool (Internal Process Engine)

Figure 10. Provider and Pool Actions on the Resource Binding for the Server Group

VCENTER_COM	MPUTE_FLEX_SER	VER_RESOURCES_3.20 Resource	Binding Properties			? >
Summary Pr	rovider Selection	Resource Accounting Measure	urable Properties	Offering Lifecycle	Offering Properties	
onfigure the acti	ions to use for reso	ource provider selection below. T	hese actions will exe	cute during Pre-Rese	erving.	
o to ×					Q Search	
Execution Orde	r Display Nan	ne	Process Engine	Pro	ocess Definition	
1	Build Resour	rce Provider and Pool List	🔤 Internal Proce	ss Engine Bui	ild Resource Provider and Pool List	
	vCenter Prov	vider Pool Selection for Datastore	🛚 🌆 00-MACHINE-	NAME VCe	enter Provider Pool Selection for Datastore	
2						

9. Specify the property of the Select Resource Provider and Pool internal action.

The Select Resource Provider and Pool action has a property called Pool Property Name. With this property the user can specify the name of the property in which the selected resource provider ID will be set as a property of the service component. For example, if the user specifies VCENTER_POOL as the value for this property, then the selected provider pool Id will be set as a property on the service component as follows: Provider=ID of Selected Provider Pool. Figure 11. Provider Property Name

Select Resou	rce Provider and Pool Properties		? ×
Summary	Properties		
Action Inputs Specify the value	ies to pass to the process definition.		
VCENTER_P	DOL		0
Resource Bin	ding ID		
[TOKEN:RSC	_BINDING_ID]		0
Service Com	oonent ID		
[TOKEN:SVC	_COMPONENT_ID]		0
	Save	Reset	Close

 Create Provider Selection actions for the resource bindings on the Server component. Add the Select Resource Provider and Pool from Parent internal action on the Server component's binding (VCENTER_COMPUTE).

Figure 12. Provider Selection Action on Resource Binding

VCENTER_	COMPUTE_3.20 Resou	urce Binding Properties				? ×
Summary	Provider Selection	Resource Accounting	Measurable Properties	Offering Lifecycle	Offering Properties	
Configure the	actions to use for res	ource provider selection be	low. These actions will ex	ecute during Pre-Res	serving.	
0 1	×IB				Q Search	
C 1	× I 🗎 rder 🛛 Display Nan	ne	Process Engi	ine	C Search Process Definition	

11. Specify the property of the internal action.

The Select Resource Provider and Pool from Parent action has a property called Pool Property Name. Set the value of this property as VCENTER_POOL. The action will retrieve the Provider Pool Id populated on the property VCENTER_POOL from the parent Server Group component and store it on the Server component.

Figure 13. Provider Property Name

Select Resou	rce Provider and Pool from I	Parent Properties	? ×
Summary	Properties		
Action Inputs Specify the val	ues to pass to the process definitio	on.	
Parent Comp	onent ID		-
[TOKEN:PRN	_COMPONENT_ID]		8
Pool Proper	y Name		
VCENTER_P	DOL		C
Resource Bir	ding ID		
[TOKEN:RSC	_BINDING_ID]		8
		Save	et Close

- 12. Create the following component properties on the Server Group component:
 - An Integer property named "diskSize"
 - A String property named "templateReference"
- 13. Source bind the Server component properties to the Server Group component, as follows:
 - Source bind the disk property on the Server component to the diskSize property on the Server Group component (Figure 14).
 - Source bind the templateReference property on the Server component to templateReference property on the Server Group component (Figure 15)

Figure 14. Source Binding the "disk" Property

🗹 disk Properties		× Property Browser	×	Simple Compute Server
Name		Select the service component an	d property that you wish this property to obtain its value from.	And the second s
lates	0	Service Components	Properties	Manager Dr. Brennings
Display Name *		✓ ♥ vCenter Simple Compu✓ ♥ Infra Service	diskSize o (GB)	Litegale
Disk Size		🔫 🎁 Server Group	178 mayServerCount	Properties
Description		Simple Compt	0	o n x
Disk Size			iminServerCount	Controlline Prostovelpart
Marketplace Portal Options			0	- Carlos and a frame - data contactor
🕑 Visible				100
Resource Type and Unit for a Measurable Property				All Tarres Lenge
Storage (GB)	- 0			CB demanifiante
Value Entry Method Manual Entry Source Binding				CB Institutio
Value Binding A No Service Component Selected	5 0	-	Select Cancel	C status
Save	Reset Close	<u>.</u>		

Figure 15. Source Binding the "templateReference" Property

Z templateReference Properties	>	Property Browser		×	Simple Compute Server
Name *		Select the service component and	property that you wish this property to obtain its value from.		Andrew Mandanas
tamalata Pafavanza	0	Service Components	Properties		Automatic Boundary
tempatekererence		🔻 🏶 vCenter Simple Compu	templateReference		Lifecycle
Display Name *		🔻 📦 Infra Service	<templatereference></templatereference>		Name and American
Template Reference		Simple Comp			Constitute.
Description		a simple compt			O D X
Template Reference					Conceptor Statistical parts
Marketplace Portal Options					Constanting Name And American Vision
VISIBLE					G
Value Entry Method					ALL Server Group
 Manual Entry Source Binding 					C dampholipme
Value Binding A No Service Component Selected	6 0				D beatherse
🔲 Confidential Data					
	Save Reset Close		Select Can	cel	i Die Address

- 14. Ceate the necessary subscriber options, as follows:
 - A. Create an option set having options for various disk sizes (Small and Medium, for example, in Figure 16).
 - B. Create a DiskSize property of Integer type on each option having values corresponding to the storage sizes.
 - C. Create a templateReference property of String type on each option, the value being a clone template name residing on the VCenter provider. The clone template should provision the instance for the requested disk size.

Figure	16.	Subscriber	Options
--------	-----	------------	---------

	VCENT	FER_COM	PUTE_CUSTOM_POOL_SELECTION_3	3.20
Ov	verview	Designer	Subscriber Options	
∰ s	ubscriber Opt Configure the su	ions Ibscriber configu	rable options for this service design.	
Yil	Choose the D)isk Size for Poo	Selection	
۲	Small <size> GB</size>			
	Disk Size		× S	
	Template	Reference emplate_50GB	9	
0	Medium <size> GB</size>			
	Disk Size		× S	
	Template	Reference emplate_100GB	9	

- D. Create a target binding between the DiskSize property on each Option to the diskSize property on the Server Group.
- E. Create target binding between the templateReference property on each Option to the templateReference property on the Server Group.

Figure 17. Target Binding the Option Properties to Server Group Properties

☑ diskSize Properties	× 🛛 🗹 templa	eReference Propertie	s ×
Properties # Bindings	Propertie	s # Bindings	
The list of properties that this property is bound to are s the toolbar options to add or remove additional propert	shown below Use The list of the toolba	oroperties that this pro options to add or rem	operty is bound to are shown below Use ove additional properties.
Service Component	Service C	omponent 4	Property Name
Server Group diskSize	Serve	r Group	templateReference
Save	Reset Close		Save Reset Close

15. Publish the Design.

After you have completed the above steps in this procedure, the service is ready to be associated with a service offering and published to a catalog. After a user subscribes to the published service, HP CSA creates a service instance that moves through the HP CSA lifecycle phases. When the provider selection actions are executed during the Reserving – Pre-Transition lifecycle phase, the following sequence of operations occurs:

• "Build Resource Provider and Pool List," an internal action, gets the list of resource providers associated with the resource offering corresponding to the resource binding, and HP CSA stores the VCenter Provider and the list of pools associated with the provider. The list stored in HP CSA for the binding is called the Candidate Provider and Pool list.

- "vCenter Provider Pool Selection for Datastore," an HP 00 flow, performs the following steps:
 - Retrieves the storage requested by the consumer using the HP CSA Rest API. Refer to the REST APIs section. The
 value is stored in the "diskSize" property on the Server Group component.
 - Retrieves the list of data store names and corresponding storage space from the VMWARE VCenter provider.
 - Retrieves the Candidate Provider and Pool list stored in the previous action using the HP CSA Rest API. Refer to the REST APIs section.
 - Retrieves the disk size property value defined on the Server Group component.
 - Verifies the pool names for each of the above lists against the candidate pool list.
 - Filters the candidate pool list which satisfies the storage space against the disk size.
 - Updates the filtered candidate list as a valid pool list onto HP CSA using the HP CSA Rest API. Refer to the REST APIs section.
- "Select Resource Provider and Pool," an internal action, performs following steps:
 - Retrieves the list of valid provider and pools built by the previous action.
 - Selects a random pool Id and saves it on the VCENTER_POOL property on the Server Group component.

Note

The discussion of how to create HP 00 flows is beyond the scope of this document.

REST APIs

Get the list of candidate providers and pools

To get the list of candidate providers and pools use the GET artifact API.

URI:

```
https://localhost:8444/csa/rest/artifact/<RESOURCE_BINDING_ID>?userIdentifier=<USE
R_ID>&scope=view&view=candidatepools
```

Method: GET

Response:

```
<ResourceBinding>
      <id>90e72d893cd0fb1d013cd108d496004f</id>
       <objectId>90e72d893cd0fb1d013cd108d496004f</objectId>
       <isCriticalSystemObject>false</isCriticalSystemObject>
       <description>binding_February 12, 2013 6:14:59 PM UTC</description>
       <name>binding_February 12, 2013 6:14:59 PM UTC</name>
       <displayName>binding_February 12, 2013 6:14:59 PM UTC</displayName>
      <artifactType>
       . . . . . . . . . .
      </artifactType>
      <disabled>false</disabled>
       <candidateProvider>
              <id>90e72d893ccf9a39013ccf9cf167001a</id>
              <resourceProvider>
                    <id>90e72d893ccf9a39013ccf9cf167001a</id>
                    <objectId>90e72d893ccf9a39013ccf9cf167001a</objectId>
                    <isCriticalSystemObject>false</isCriticalSystemObject>
                    <name>Provider2_February 12, 2013 6:13:54 PM UTC</name>
                    <displayName>Provider2</displayName>
                    <disabled>false</disabled>
              </resourceProvider>
              <candidatePool>
                    <id>90e72d893ccf9a39013ccf9d5d630022</id>
                    <objectId>90e72d893ccf9a39013ccf9d5d630022</objectId>
                    <isCriticalSystemObject>false</isCriticalSystemObject>
                    <name>P2-Pool1_February 12, 2013 6:14:22 PM UTC</name>
                    <displayName>P2-Pool1</displayName>
                    <disabled>false</disabled>
                    <useProviderEnv>false</useProviderEnv>
              </candidatePool>
             <candidatePool>
              . . . . . . . . .
              </candidatePool>
       </candidateProvider>
</ResourceBinding>
```

Update the list of valid providers

To update the list of valid providers use the PUT artifact API.

URI:

```
https://localhost:8444/csa/rest/artifact/<RESOURCE_BINDING_ID>?userIdentifier=<USE R_ID>&scope=view&view=validproviderspools
```

Method: PUT

Body: Include the refined list of valid providers. In this example, we have refined the list to remove Provider3.

```
<ResourceBinding>
<id>90e72d893ccf9a39013ccfa0076a0099</id>
<validProvider>
```

```
<resourceBinding>
                    <id>90e72d893ccf9a39013ccfa0076a0099</id>
             </resourceBinding>
             <resourceProvider>
                    <id>90e72d893ccf9a39013ccf9cf167001a</id>
             </resourceProvider>
             <validPool>
                    <id>90e72d893ccf9a39013ccf9c6be60014</id>
             </validPool>
             <validPool>
                    <id>90e72d893ccf9a39013ccf9c6be60016</id>
             </validPool>
      </validProvider>
      <validProvider>
      . . . . . .
      </validProvider>
</ResourceBinding>
```

Appendix A – HP OO Flow

This appendix provides a brief overview of how custom pool selection is implemented in the vCenter Provider Pool Selection for Datastore HP 00 flow. This flow is provided as out-of-the-box content with HP CSA. Refer to the *HP CSA Configuration Guide* to configure HP 00 to obtain the flows from HP CSA.

Figure 18. Provider Pool Selection HP 00 Flow for vCenter



Figure 18 shows the HP CSA action used in the vCenter design for performing custom provider and pool selection. The Process Definition field (see Figure 19) shows the details of the corresponding HP 00 flow.

Figure 19. HP CSA Action for Custom Provider and Pool Selection

vCenter Prov	vider Pool Selection for Datastore Properties ? ×	
Summary	Properties	
Action Prope	rties	
Configure the p	properties for this action below	
Process Eng	ine	
CO-MAC	HINE-NAME	
Process Defi	nition	
vCenter Prov	ider Pool Selection for Datastore	
/Library/CSA	/3.2/Providers/vCenter/vCenter Custom Provider Pool Selec	
Display Nam	ie *	
vCenter Pro	vider Pool Selection for Datastore	
Description		
Execution O	rder	
2	× (2)	
Execution P	roperties	
Fail on Er	ror 🔽 Error on Timeout	
	Save Reset Close	

Figure 20 shows the HP 00 flow invoked from HP CSA corresponding to the action shown in Figure 20. The steps which implement the refinement logic are shown in the red box below. For this flow, the refinement condition is based on the requesting disk size. A pool will be included in the list of valid pools only if required disk size criteria are satisfied.

Figure 20. vCenter Provider Pool Selection for Datastore



Get Candidate Provider Pool

This step will retrieve all the candidate provider and pools from the HP CSA using the REST API call shown in the red box in Figure 21.

Figure 21. Candidate Pool REST Call

Htment Fror: failure Resolved : success
inspector _ +3
Rep Name: ittp Client Get
Inputs] Results Display Description Advanced Scriptlet
to the second sec
Name: url Input Type: Single Value 💌
Input Data Flow Otherwise: Use Constant' Configuration
Assign from Variable: <not assigned=""></not>
Constant 🖸 Constant
Assign to Variable: <not assigned=""></not>

Get Valid Provider Pool XML

This step will browse through the candidate providers and pools retrieved in last step and filter the pool IDs based on storage. The subflow corresponding to this step is as show in Figure 22 and has following major steps:

• *Get Datastore Info* – Retrieves the list of data store names and free space available from VCENTER Provider.

- *Get Resource Pool* Retrieves the Pool details like pool Name, available etc.
- *Valid Pool List Appender* Appends/Creates the valid pool ids if the disk size requested in less than the free space available for a data store.
- *Valid Provider Pool List Appender* Appends the Provider Id to the valid pool id list created in the previous step, *Valid Pool List Appender*.



Figure 22. Create Valid Provider and Pool list

For more information

HP software product manuals and documentation for HP CSA can be found at <u>http://h20230.www2.hp.com/selfsolve/manuals</u>. You will need an HP Passport to sign in and gain access.

Note

General-access documentation requires that you register for an HP Passport and sign in. In some cases, access to the documentation is restricted and requires that you have an active HP support agreement ID (SAID) and an HP Passport signin.

Table 1. Document Revision History

Date or Version	Changes
June 2013	Initial release of document.
February 2014	Updated for HP CSA 4.00.
July 2014	Updated for HP CSA 4.10.

To help us improve our documents, please send feedback to CSAdocs@hp.com.

Learn more at hp.com/go/csa

Sign up for updates hp.com/go/getupdated

© Copyright 2013-2014 Hewlett-Packard Development Company, L.P. The information contained herein is subject to change without notice. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

Microsoft® and Windows® are U.S. registered trademarks of Microsoft Corporation. Oracle and Java are registered trademarks of Oracle and/or its affiliates. RED HAT READY™ Logo and RED HAT CERTIFIED PARTNER™ Logo are trademarks of Red Hat, Inc. The OpenStack word mark and the Square O Design, together or apart, are trademarks or registered trademarks of OpenStack Foundation in the United States and other countries, and are used with the OpenStack Foundation's permission.

