



Technical Report

Configuring vRealize Automation with VMware Storage Policy-Based Management and SolidFire Virtual Volumes

Automating Performance Profiles for vRealize Automation Blueprints

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Abstract

This document explains how to integrate the vSphere Storage Policy-Based Management framework into the vRealize Automation service catalog and describes the benefits of the integration.

TABLE OF CONTENTS

1	Solution Overview	3
1.1	Key Benefits.....	3
1.2	Requirements.....	4
2	Plugin Installation and SPBM Configuration	4
2.1	Modify Plugin Installation Steps	4
2.2	SolidFire Virtual Volumes.....	5
2.3	SPBM Policies	5
3	vRA Blueprints with a Single Policy	7
4	vRA Blueprints with Multiple Disks and Policies	9
	Where to Find Additional Information	12
	Version History	12

LIST OF TABLES

Table 1)	Solution software components.	4
Table 2)	SPBM example policies.....	5

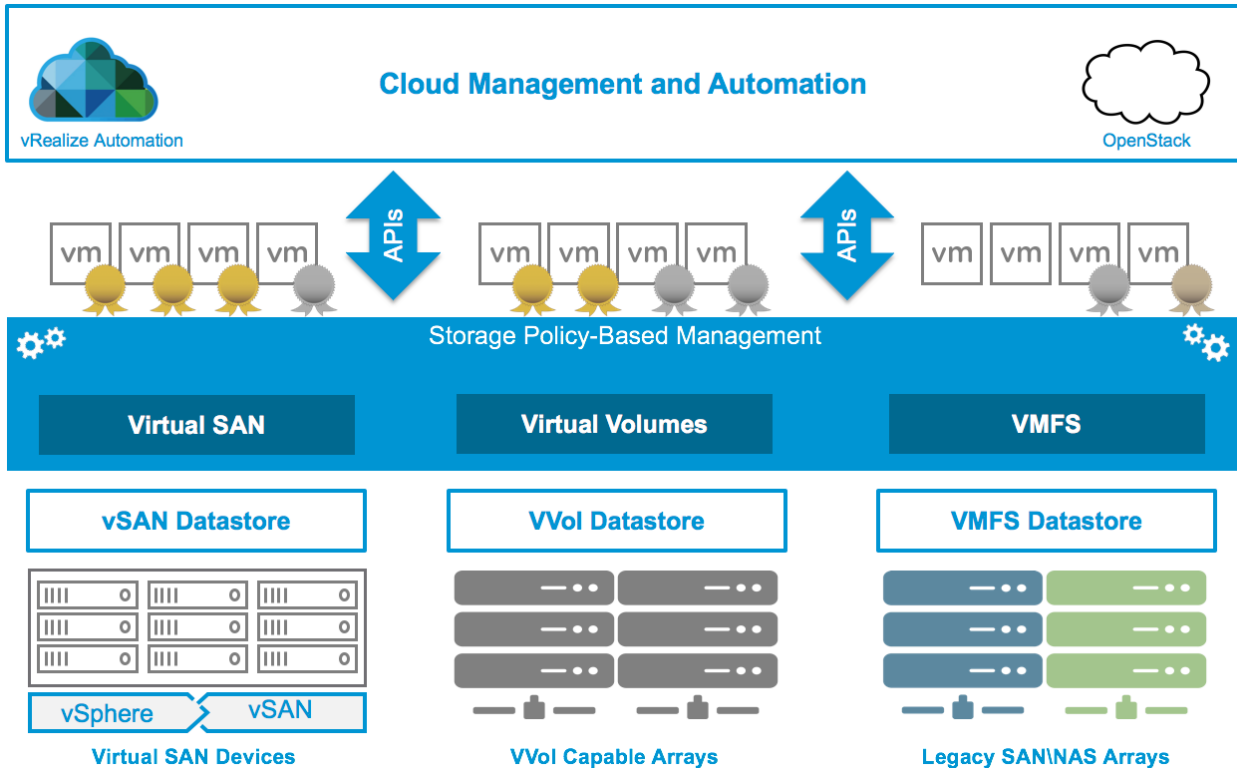
LIST OF FIGURES

Figure 1)	SPBM and vRA framework integration.....	3
Figure 2)	SolidFire VVols overview.	5
Figure 3)	SPBM policy.....	6
Figure 4)	Single policy.....	6
Figure 5)	Multiple policies.....	7

1 Solution Overview

Software-defined storage (SDS) technologies are among the key pillars of the software-defined data center (SDDC). Storage policies are an enabling feature that provides agility, responsiveness, and efficiency with enterprise storage offerings that are provisioned from vRealize Automation (vRA). This document describes how to integrate the vSphere Storage Policy-Based Management (SPBM) framework into the vRealize Automation service catalog. This integration enables on-demand, policy-driven provisioning and consumption of virtual machine storage provided by NetApp® SolidFire® Virtual Volumes (VVols).

Figure 1) SPBM and vRA framework integration.



The vRA and SPBM framework integration enables VM-granular control of storage provisioning based on the SPBM framework. The SPBM plugin exposes SPBM policies from vCenter to the vRA service catalog, so that they can be incorporated into blueprints and provisioning workflows.

The SolidFire VVols feature in Element® OS version 9.0 and later enables the configuration and enforcement of per-VM quality of service (QoS) performance guarantees. The result is a self-service cloud offering that delivers guaranteed performance for all workloads.

1.1 Key Benefits

Key benefits to leveraging vRealize Automation with the SPBM plugin and SolidFire VVols include:

- Storage consumption for virtual machine blueprints is policy driven.
- All storage resources are defined and consumed automatically via policy.
- vRA blueprints can be configured with selectable performance tiers that are applied when the service offering is created.

- Virtual machines deployed on SolidFire virtual volumes have guaranteed performance profiles (QoS) applied to their associated disks.
- Storage resources are scaled seamlessly with no data migration or forklift upgrades.

1.2 Requirements

Table 1 describes the components used to build the solution.

Table 1) Solution software components.

Component	Description
vRealize Automation	Version 7.1 or later fully functional environment (IaaS, vRO, and existing blueprints)
vRA SPBM Integration Plugin	Version 2.1.0 or later
vSphere	Version 6.0 or later
SolidFire	Any SolidFire model with Element OS 9.0 or later

2 Plugin Installation and SPBM Configuration

2.1 Modify Plugin Installation Steps

To install the SPBM plugin, follow the steps in the installation and configuration guide found on the VMware Solution Exchange for vRealize Automation and Storage Policy-Based Management Framework Integration. When installing the plugin, you may need to modify the following steps.

- Page 14, step 2
Property definitions are required for every disk that is to receive an SPBM policy. For example, a blueprint with four disks requires a property definition for each disk as well as the home directory, as shown in the following screenshot.

Property Definitions

Create and manage property definitions.

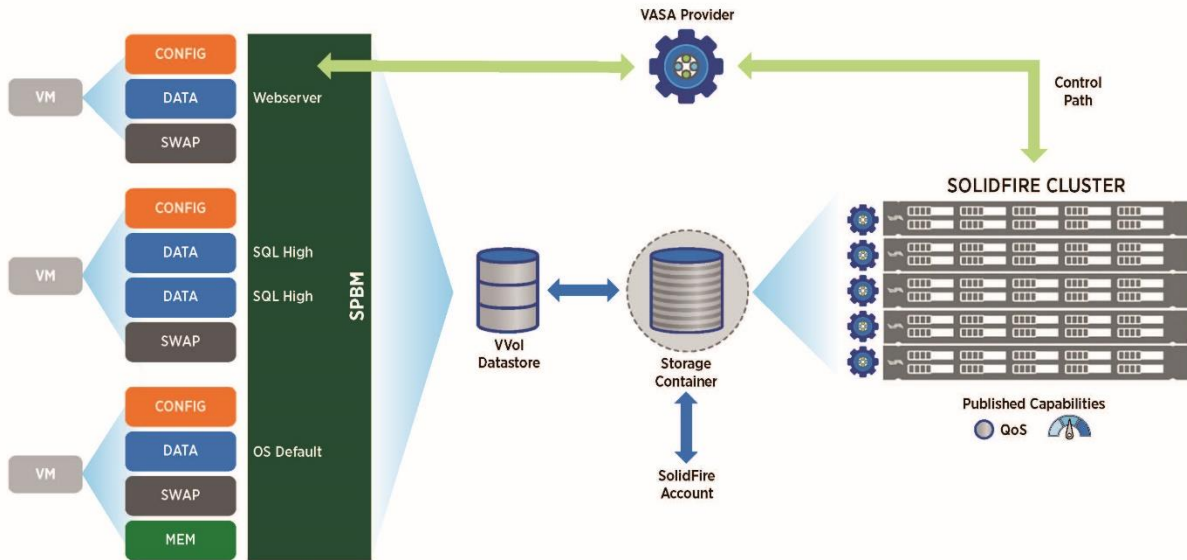
 New  Edit  Delete		
Name	Label ▲	Description
VirtualMachine.Disk0.DiskStor...	Virtual Machine Disk0 Storage Policy	SPBM Policy for root VM disk
VirtualMachine.Disk1.DiskStor...	Virtual Machine Disk1 Storage Policy	SPBM Policy for Disk 1
VirtualMachine.Disk2.DiskStor...	Virtual Machine Disk2 Storage Policy	SPBM Policy for Disk 2
VirtualMachine.Disk3.DiskStor...	Virtual Machine Disk3 Storage Policy	SPBM Policy for Disk 3
VMHomeStoragePolicy	VM Home Storage Policy	SPBM policy for VM Home

- Page 16, step 9c
If you want to have SPBM policies applied to all blueprints, remove the conditional [Data > Blueprint name].

2.2 SolidFire Virtual Volumes

VMware Virtual Volumes (VVol) are a new storage consumption paradigm that enables VM-centric storage services. SPBM policies are used to configure storage systems for these VM services. SPBM policies allow vCenter to consume published capabilities from a storage system, such as deduplication or compression capabilities. The storage system vStorage APIs for Storage Awareness (VASA) provider is responsible for translating the SPBM policies into storage management operations.

Figure 2) SolidFire VVols overview.



When an SPBM policy is created, it configures the storage according to the capabilities profile of the VASA provider on the storage system. For SolidFire systems, only QoS is configured through the policy. Other features such as data protection, deduplication, compression, and data placement are handled automatically by SolidFire and do not require any configuration.

2.3 SPBM Policies

Creating SPBM policies in vCenter allows the simple and programmatic configuration of QoS values for virtual machines on VVols. Defining a policy requires setting the minimum, maximum, and burst IOPS values for the "Data VVol." Table 2 shows how typical QoS policies might be configured.

Table 2) SPBM example policies.

SPBM Policy Name	Minimum IOPS	Maximum IOPS	Burst IOPS
ServerOS-Base	1,000	2,500	10,000
ServerOS-SQL	2,000	4,000	8,000
SQL-Backup	2,500	5,000	10,000
SQL-DB	2,500	5,000	10,000
SQL-Logs	1,000	4,000	8,000

Figure 3 shows an example SPBM policy.

Figure 3) SPBM policy.

ServerOS-Base: Edit VM Storage Policy

Name and description

Common rules

Rule-set 1

Storage compatibility

Rule-set 1
Select a storage type to place the VM and add rules for data services provided by datastores. The rule-set will be applied when the VM is placed on datastores from the selected storage type. Adding tags to the rule-set will filter only datastores matching those tags.

☒ Use rule-sets in the storage policy ⓘ

▼ Placement

Storage Type: com.solidfire.vasa.capabilities ▼

Data VVol Minimum IOPS * ⓘ

Data VVol Maximum IOPS * ⓘ

Data VVol Burst IOPS * ⓘ

Config VVol Minimum IOPS * ⓘ

Config VVol Maximum IOPS * ⓘ

Config VVol Burst IOPS * ⓘ




OK **Cancel**





A policy can be defined for an entire virtual machine or for a disk attached to a virtual machine.

A basic virtual machine such as a web server with a single disk can only have the ServerOS-Base policy applied to it. The VM shown in Figure 4 was created from a vRA blueprint with a single SPBM policy defined.

Figure 4) Single policy.

Storage


  

Name	VM Storage Policy	Compliance Status
 VM home	 ServerOS-Base	✓ Compliant
 Hard disk 1	 ServerOS-Base	✓ Compliant

However, a SQL server can have distinct policies applied for the base OS, log, database, and backup disks. The VM shown in Figure 5 was created from a vRA blueprint with distinct policies for each disk. This configuration allows guaranteed performance for all components of the virtual machine and the application it serves.

Figure 5) Multiple policies.

Storage



Name	VM Storage Policy	Compliance Status
VM home	ServerOS-SQL	✓ Compliant
Hard disk 1	ServerOS-SQL	✓ Compliant
Hard disk 2	SQL-Logs	✓ Compliant
Hard disk 3	SQL-DB	✓ Compliant
Hard disk 4	SQL-Backup	✓ Compliant

3 vRA Blueprints with a Single Policy

These steps explain how to add a single SPBM policy to an existing blueprint. This procedure configures the blueprint to share a single SPBM policy for the VM Home object as well as the root virtual machine disk.

1. Log into vRA as a user who has rights to create and modify blueprints.
2. Navigate to Design > Blueprints and edit an existing blueprint.

Blueprints

Create and manage blueprints. Publish a blueprint to allow architects to reuse your blueprint, and to a

+ New Edit Copy Publish Unpublish Delete

Name	Description	Status
W2016-DataCenter	Windows 2016 Datacenter	Published
W2012R2-DataCenter	Windows Server 2012 R2 Datacenter	Published
W2016-SQL	Windows 2016 Datacenter with SQL 2014 Install	Published

3. In the Properties tab of the blueprint, select the Custom Properties tab. Click the New button and add VMHomeStoragePolicy. Set the value to Datastore Default.

W2016-Srv

General Build Information Machine Resources Storage Network Security **Properties**

Property Groups **Custom Properties**

+ New Edit Delete

Name	Value
VMware.VirtualCenter.OperatingSystem	winLonghorn64Guest
VMHomeStoragePolicy	Datastore Default
Hostname	

4. Select the Storage tab and edit the custom properties for the virtual machine hard disk. Add a new property called VirtualMachine.Disk0.DiskStoragePolicy and set the value to Use VM Home Storage Policy.

Name	Value	Encrypted	Overridable	Show in Request
VirtualMachine.Disk0.DiskStoragePolicy	Use VM Home Storage Policy	No	Yes	No

Note: If more than one disk is attached, add a custom property called VirtualMachine.Disk<N>.DiskStoragePolicy, where N is the number of the disk. Set the value for all disks to Use VM Home Storage Policy.

5. Click OK to finish editing the blueprint.
6. Publish the blueprint.
7. Request the blueprint. Verify that the VM Home Storage Policy option is displayed and select astorage policy for the VM.

vSphere Machine: W2016-Srv

General Storage Properties

Instances: 1

* CPUs: 1 (Select 1-4)

* Memory (MB): 2048 (Select 2048-8192)

Storage (GB): 80

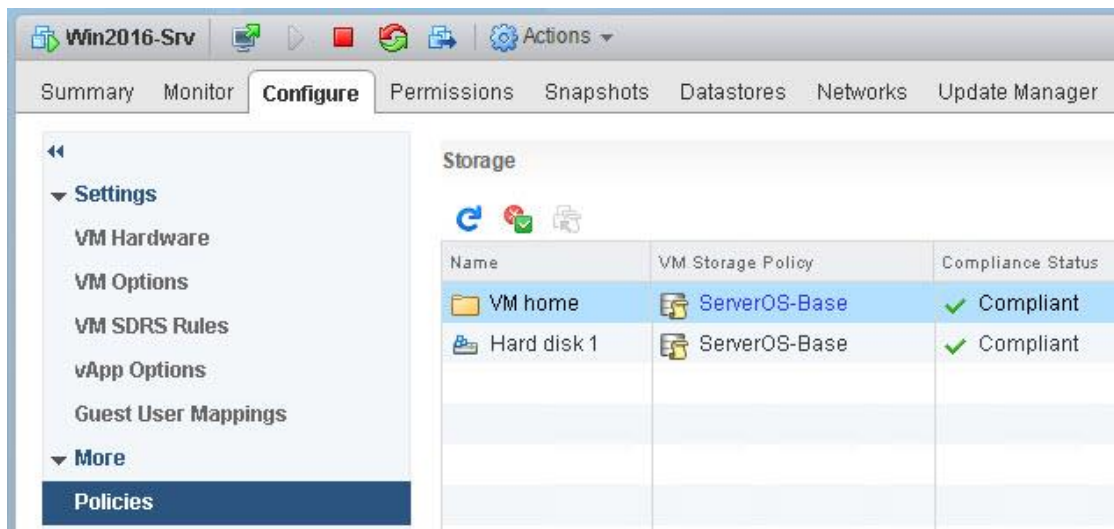
Description: Windows 2016 Datacenter Server

VM Home Storage Policy: ServerOS-Base

* Machine name: Win2016-Srv

8. Submit the request.

The SBPM policy is the last workflow that is processed by vRA as part of the virtual machine deployment once the customization is completed. Therefore it may take a few minutes for the policy to be applied correctly.



4 vRA Blueprints with Multiple Disks and Policies

These steps explain how to add SPBM policies to blueprints with multiple disks that require discrete profiles.

1. Log into vRA as a user who has rights to create and modify blueprints.
2. Navigate to Design > Blueprints and edit an existing blueprint.
3. In the Properties tab of the blueprint, select the Custom Properties tab. Click the New button and add VMHomeStoragePolicy. Set the value to Datastore Default.



4. Select the Storage tab and edit the custom properties for the virtual machine root disk. Add a new property called VirtualMachine.Disk0.DiskStoragePolicy and set the value to Use VM Home Storage Policy.

Custom Properties [X]

+ New | Edit | Delete

Name	Value	Encrypted	Overridable	Show in Request
VirtualMachine.Disk0.DiskStoragePolicy	Use VM Home Storage Policy	No	Yes	No

OK Cancel

- For each additional disk after ID 0, add the custom property VirtualMachine.DiskN.DiskStoragePolicy, where N is the number of the disk.

W2016-SQL2014

General | Build Information | Machine Resources | **Storage** | Network | Security | Properties

+ New | Edit | Delete

ID	Capacity (GB)	Drive Letter / Mount Path	Label	Storage Reservation Policy	Custom Properties
0	80		Hard disk 1	SPCust1-Storage	Edit
1	5		Hard disk 2	SPCust1-Storage	Edit
2	10		Hard disk 3	SPCust1-Storage	Edit

Custom Properties [X]

+ New | Edit | Delete

Name	Value	Encrypted	Overridable	Show in Request
VirtualMachine.Disk1.DiskStoragePolicy		No	Yes	Yes

OK Cancel

- Click OK to finish editing the blueprint.
- Publish the blueprint.
- Request the blueprint and verify that each disk has a storage policy dropdown.

vSphere Machine: W2016-SQL2014

General | Storage | Properties

Instances: 1

*** CPUs:** 2 (Select 2-8)

*** Memory (MB):** 4096 (Select 4096-16376)

Storage (GB): 115

Description:

VM Home Storage Policy: ServerOS-SQL

Virtual Machine Disk1 St... SQL-Logs

*** Machine name:** W2016-SQLWorks

Virtual Machine Disk2 St... SQL-DB

Virtual Machine Disk3 St... SQL-Backup

9. Verify that the SPBM policies were applied to the new virtual machine following customization.

W2016-SQLWorks | Actions

Summary | Monitor | **Configure** | Permissions | Snapshots | Datastores | Networks | Update Manager

Settings

- VM Hardware
- VM Options
- VM SDRS Rules
- vApp Options
- Guest User Mappings
- More
- Policies**

Storage

Name	VM Storage Policy	Compliance Status
VM home	ServerOS-SQL	✓ Compliant
Hard disk 1	ServerOS-SQL	✓ Compliant
Hard disk 2	SQL-Logs	✓ Compliant
Hard disk 3	SQL-DB	✓ Compliant
Hard disk 4	SQL-Backup	✓ Compliant

10. Verify that QoS values are set in either the SolidFire vCenter plugin or the SolidFire GUI.

Name	Storage Container	Guest OS Type	Virtual Volume Type	Access	Size	Snapshots	Min IOPS	Max IOPS	Burst IOPS
W2016-SQLWorks-420404a8.vswp	SPCust1	windows9Server64Guest	Swap	Read / Write	4.3 GB	0	50	15,000	15,000
W2016-SQLWorks_3.vmdk	SPCust1	windows9Server64Guest	Data	Read / Write	21.5 GB	0	2,500	5,000	10,000
W2016-SQLWorks_2.vmdk	SPCust1	windows9Server64Guest	Data	Read / Write	10.7 GB	0	2,500	5,000	10,000
W2016-SQLWorks_1.vmdk	SPCust1	windows9Server64Guest	Data	Read / Write	5.4 GB	0	1,000	4,000	8,000
W2016-SQLWorks.vmdk	SPCust1	windows9Server64Guest	Data	Read / Write	85.9 GB	0	2,000	4,000	8,000
W2016-SQLWorks	SPCust1	-	Config	Read / Write	4.3 GB	0	50	100	150

Where to Find Additional Information

To learn more about the topics described in this document, refer to the following documents or web sites:

- vRealize Automation and Storage Policy Based Management Framework Integration
<https://solutionexchange.vmware.com/store/products/vrealize-automation-and-storage-policy-based-management-framework-integration>
- Understanding Storage Policy-Based Management
<https://blogs.vmware.com/virtualblocks/2017/01/16/understanding-storage-policy-based-management/>
- SolidFire VMware VVols Configuration Guide
<https://fieldportal.netapp.com/content/476449?assetComponentId=477145>
- VVols on SolidFire – Technical Overview
<https://fieldportal.netapp.com/content/477531?assetComponentId=478230>

Version History

Version	Date	Document Version History
Version 1.0	August 2017	Initial release.

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