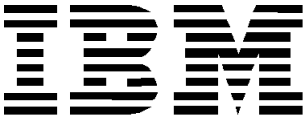
IBM® Storage

Automate and Orchestrate Your IBM FlashSystem Hybrid Cloud with Red Hat Ansible

Version 1 Release 1



Contents

About this document

This document is intended to facilitate the deployment of Red Hat Ansible for the IBM FlashSystem®. The document describes the automation and orchestration of storage provisioning for the IBM FlashSystem by using Red Hat Ansible. To complete the tasks that are described in this document, you must understand the IBM FlashSystem and Red Hat Ansible.

The information in this document is distributed on an “as-is” basis without any warranty that is either expressed or implied. Support assistance for the use of this material is limited to situations where IBM FlashSystem storage devices are supported and entitled, and where the issues are specific to a blueprint implementation.

Executive summary

In today's world with the speed, scale, and complexity of Hybrid Multicloud and even traditional on-premises environments, automation is a top priority. The IBM FlashSystem family for Hybrid Multicloud includes Ansible integration, which allows IT to create an Ansible playbook. The playbook automates the tasks that are repeated across an organization in a consistent manner, which improves outcomes and reduces risk. It also standardizes how IT and application owners interact together.

Automation is becoming an integral part with IT environments that are too complex, and that must scale up and down quickly for system administrators and developers to meet business requirements. Ansible is becoming popular for orchestration automation for following reasons:

- Simple to set up and use with no special skills required to create Ansible playbooks
- You can orchestrate and customize the environment based on your needs, at on-premises or in hybrid multicloud environments, which provides agility and flexibility
- No need to install any other software or agents on the client system that you want to automate

With Ansible and IBM Storage, clients can easily use cutting-edge technology by automating tasks, such as configuration management, provisioning, workflow orchestration, application deployment, and lifecycle management.

Consider the following points:

- By using Ansible and IBM Storage, clients can reduce system inconsistencies with the automation modules.
- Ansible can also be used to configure end-to-end infrastructure in an orchestrated fashion.
- Ansible provides a single pane of glass visibility to multi cluster, multicloud environments, which allows lines of business to use playbooks to accomplish their goals without needing to understand the details of how the work is being done.

IBM is a Red Hat Certified Support Module Vendor that provides simple management for IBM FlashSystems and IBM Spectrum Virtualize.

Scope

This blueprint provides the following information:

- A solutions architecture and related solution configuration workflows, with the following essential software and hardware components:
  - IBM FlashSystem
  - IBM Spectrum Virtualize for Public Cloud on AWS
  - Red Hat Ansible 2.9 or higher
- Detailed technical configuration steps for building the Ansible playbooks

This technical report does not:

- Provide performance analysis from a user perspective
- Replace any official manuals and documents that are produced by IBM

Prerequisites

This technical paper assumes that the reader has basic knowledge of the following topics:

- IBM FlashSystem
- IBM Spectrum Virtualize for Public Cloud on AWS
- Red Hat Ansible

Getting started: Automation using Ansible for IBM FlashSystem

This section describes the essential building material for running an Ansible playbook and automating and orchestrating tasks for an IBM FlashSystem using Ansible.

IBM FlashSystem Family

IBM FlashSystem Family is an excellent platform to simplify your hybrid multicloud storage.

The new IBM FlashSystem family simplifies storage for hybrid multicloud environments with a unified set of software, tools, and APIs. IBM FlashSystems address the entire range of storage needs, all from one data platform that extends enterprise functionality across the storage system.

With IBM Spectrum Virtualize software, the IBM FlashSystem family is an industry-leading storage solution that includes technologies that complement and enhance virtual environments to achieve a simpler, more scalable, and cost-efficient IT infrastructure. To further drive your IT transformation, IBM Spectrum Virtualize for Public Cloud offers various ways to create hybrid cloud solutions between on-premisess private clouds and the public cloud.

It also enables real-time storage-based data replication and disaster recovery and data migration between local storage and AWS. This ability allows storage administration at a cloud service provider's site in the same way as on-premises, regardless of the type of storage. For more information, see the System's Hardware Data Sheet *IBM FlashSystem Family: Efficient all-flash and hybrid solutions with enterprise-class performance and functionality*.

IBM as a Red Hat Certified Support Module Vendor provides simple management for the storage provisioning commands that are used in the IBM Spectrum Virtualize Ansible Collection:

- Collect facts: Gather array information, such as hosts, host groups, snapshots, consistency groups, and volumes
- Manage hosts: Create, delete, or modify hosts
- Manage volumes: Create, delete, or extend the capacity of volumes
- Manage MDisk: Create or delete a managed disk
- Manage Pool: Create or delete a pool (managed disk group)
- Manage Volume Map: Create or delete a volume map

The same Ansible modules can be used for automating and orchestrating storage provisioning tasks for IBM Spectrum Virtualize for Public Cloud in AWS.

IBM Spectrum Virtualize for Public Cloud in AWS

IBM Spectrum Virtualize for Public Cloud is a version of IBM Spectrum Virtualize that is implemented in a cloud environment. Designed for public cloud IaaS, IBM Spectrum Virtualize for Public Cloud represents a solution for public cloud implementations and includes technologies that complement and enhance public cloud IaaS offering capabilities.

IBM Spectrum Virtualize for Public Cloud provides for the deployment of IBM Spectrum Virtualize-based software in public clouds, starting with IBM Cloud™ and is now available in Amazon AWS. This new offering with IBM Spectrum Virtualize for Public Cloud on AWS is a Bring your Own License (BYOL) offering that can be purchased as a perpetual license or a monthly license.

IBM Spectrum Virtualize for Public Cloud can be deployed on AWS IaaS by way of the AWS Marketplace to enable hybrid cloud solutions. This feature offers the ability to transfer data between on-premisess data centers by using any IBM Spectrum Virtualize-based appliance and AWS (see Table 1).

Table 1 IBM Spectrum Virtualize for Public Cloud at a glance

Storage supported	AWS EBS block storage
Licensing approach	Simple, flat cost per managed Terabyte with monthly licensing, or perpetual licensing
Platform	IBM Spectrum Virtualize for Public Cloud on AWS installed on supported EC2 instance

Ansible playbook architecture diagram for lab demonstration

The architecture that was used in the lab is shown in Figure 1. The architecture shows the orchestration and automation of storage tasks using Red Hat Ansible Spectrum Virtualize modules.

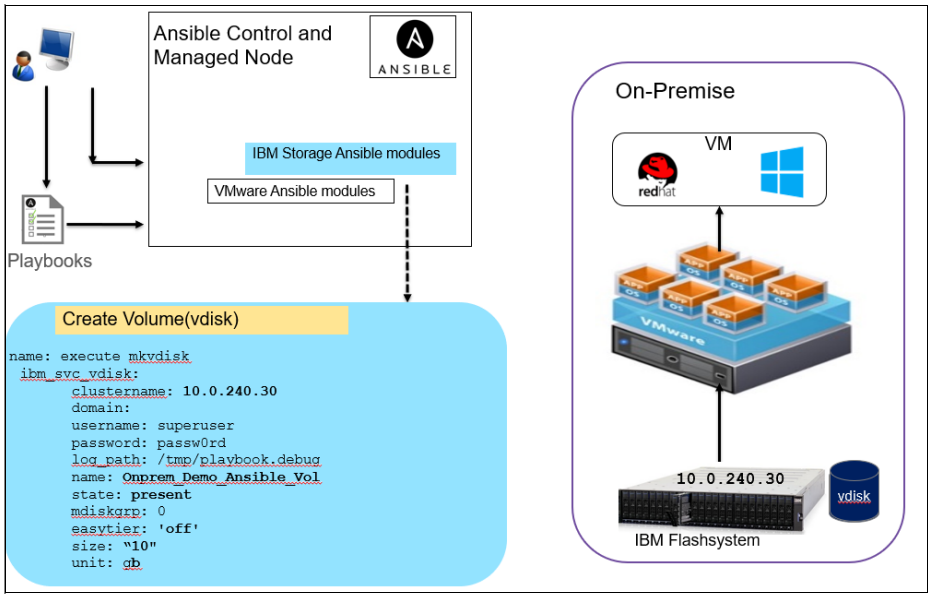


Figure 1 Architecture diagram for lab demonstration

In this test environment, an IBM FlashSystem® is deployed that is connected to a VMware ESXi host. The Ansible modules for IBM® Spectrum Virtualize and VMware modules are used to showcase end-to-end storage provisioning and VM deployment using an Ansible playbook.

This test environment performs the automation steps by using IBM Spectrum® Virtualize Ansible modules and VMware Ansible modules.

Steps using IBM Spectrum Virtualize Ansible modules:

1. Create a VDisk on the IBM FlashSystem.
2. Map the newly created VDisk to the ESXi host.

Steps using VMware Ansible Modules:

1. Scan the HBA for the newly allocated VDisk on vCenter.
2. Create a vmfs datastore.
3. Create a virtual machine (VM).

Installing and configuring Ansible and IBM Spectrum Virtualize modules

This section describes the configuration and deployment of Ansible.

Ansible is an agentless automation management tool that uses the SSH protocol. Currently, Ansible can be run from any machine with Python 2 (version 2.7) or Python 3 (versions 3.5 and higher) installed. This includes Red Hat, Debian, CentOS, macOS, any of the BSDs. Windows is *not* supported for the control node.

For more information about installing on each operating system, see this web page.

For IBM Spectrum Virtualize modules, Ansible version 2.9 or higher is required. For more information about installing IBM Spectrum Virtualize, see this web page.

After the IBM Spectrum Virtualize modules are installed, the tree structure of the collection is created (see Figure 2 on page 6).

```
[root@vm09-ansible collections]# cd ibm
[root@vm09-ansible ibm]# tree
.
└── spectrum_virtualize
    ├── galaxy.yml
    ├── playbooks
    │   ├── 1
    │   ├── createpool-FQCN.yaml
    │   ├── createpool.yaml
    │   ├── create_vdisk.yaml
    │   ├── deletepool-FQCN.yaml
    │   ├── deletepool.yaml
    │   ├── gather_info_collections-FQCN.yaml
    │   └── gather_info_collections.yaml
    ├── plugins
    │   ├── modules
    │   │   ├── ibm_svc_host.py
    │   │   ├── ibm_svc_info.py
    │   │   ├── ibm_svc_mdiskgrp.py
    │   │   ├── ibm_svc_mdisk.py
    │   │   ├── ibm_svc_vdisk.py
    │   │   ├── ibm_svc_vol_map.py
    │   │   └── __init__.py
    │   ├── module_utils
    │   │   └── ibm_svc_utils.py
    │   └── README.md
    └── README.md
```

Figure 2 Tree structure

The following Ansible modules are available for IBM Spectrum Virtualize:

- ibm_svc_info: Collects information about an IBM Spectrum Virtualize system
- ibm_svc_host: Host management for IBM Spectrum Virtualize
- ibm_svc_mdisk: MDisk managment for IBM Spectrum Virtualize
- ibm_svc_mdiskgrp: Pool management for IBM Spectrum Virtualize
- ibm_svc_vdisk: Volume management for IBM Spectrum Virtualize
- ibm_svc_vol_map: Volume mapping management for IBM Spectrum Virtualize

Install the VMware modules as described at this web page.

Creating the Ansible playbook for storage provisioning

This section describes creating the Ansible playbook for an IBM Spectrum Virtualize system.

An Ansible playbook is an organized unit of scripts that defines work and tasks for the management of an infrastructure (in this case, IBM Spectrum Virtualize by the automation tool). Ansible plays are written in YAML.

The playbook is the core component of any Ansible configuration. An Ansible playbook contains one or multiple plays, and each play defines the task to be done for a configuration on a managed storage system.

In the solution lab test environment, the following playbook is described and shown:

1. Create a VDisk and map the newly created VDisk to the host. Ansible playbooks are written in YAML. The Ansible playbook that creates and maps the VDisk is shown in Figure 3.

```
---
- name: Using IBM Spectrum Virtualize collection to create mdisk
group and mdisk
  hosts: localhost
  collections:
    - ibm.spectrum_virtualize
  gather_facts: no
  connection: local
  tasks:
    - name: make vdisk
      ibm_svc_vdisk:
        clustername: <IBM Flashsystem Cluster IP>
        domain:
        username: superuser
        password: xxxxxxxx
        log_path: /tmp/playbook.debug
        name: Onprem_Demo_Ansible_Vol
        state: present
        mdiskgrp: SVPC Pool
        easytier: 'off'
        size: "10"
        unit: gb
    - name: map volume to host
      ibm_svc_vol_map:
        clustername: <IBM Flashsystem Cluster IP>
        domain:
        username: superuser
        password: xxxxxxxxxx
        log_path: /tmp/playbook.debug
        volname: Onprem_Demo_Ansible_Vol
        host: HG-ESX6
        state: present
~
```

Figure 3 Playbook for IBM Spectrum Virtualize for creating and mapping VDisks

As shown in Figure 3, be sure to include the IBM FlashSystem Cluster IP address, and the credentials for the username and password. Also, make a note the VDisk name and host name of the newly created VDisk that must be mapped.

2. After the YAML file is created, run the Ansible playbook, as shown in Figure 4.

```
[root@vm09-ansible .ansible]# vi on-prem-storage-provisioning.yaml
[root@vm09-ansible .ansible]# ansible-playbook on-prem-storage-provisioning.yaml
[WARNING]: provided hosts list is empty, only localhost is available. Note that the implicit localhost does not match 'all'


PLAY [Using IBM Spectrum Virtualize collection to create mdisk group and mdisk] ************************************************

TASK [make vdisk] ********************************************************************************************************
changed: [localhost]

TASK [map volume to host] ************************************************************************************************
changed: [localhost]

PLAY RECAP ***************************************************************************************************************
localhost                  : ok=2    changed=2    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

Figure 4 Execution output of playbook

The Ansible playbook runs the tasks in sequence:

a. It uses the `ibm_svc_vdisk` module to create a 10 GB volume with the VDisk name `Onprem_Demo_Ansible_Vol`.

b. After the VDisk is created, it runs the second task by using module `ibm_svc_vol_map` to map the volume Onprem_Demo_Ansible_Vol to Host HG-ESX6 (see Figure 5).

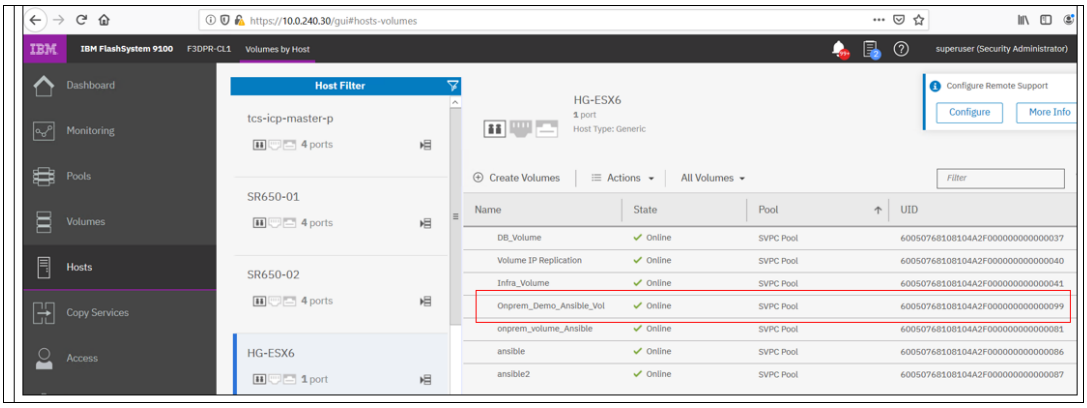


Figure 5 IBM FlashSystem output that shows creating the volume by using the Ansible playbook

Creating VMware playbooks

VMware-related tasks can be done by using playbooks and by using the same YAML files. The sample playbook to scan the HBA for the newly assigned VDisk is shown in Figure 6.

```
---
- name: Rescan HBA's for a given ESXi host and refresh storage system objects
  hosts: localhost
  gather_facts: no

  vars:
      vcenter_server: "10.0.240.101"
      vcenter_user: "administrator@vsphere.local"
      vcenter_pass: "Passw0rd!"
      datacenter_name: "On-Premise"
      inventory_hostname: "10.0.240.21"

  tasks:
     - name : Rescan HBA's for given ESXi host
       vmware_host_scanhba:
          hostname: '{{ vcenter_server }}'
          username: '{{ vcenter_user }}'
          password: '{{ vcenter_pass }}'
          validate_certs: no
          esxi_hostname: '{{ inventory_hostname }}'
          refresh_storage: true
```

Figure 6 VMware HBA scan playbook

After the HBA rescan is completed, create a playbook to create a VMFS datastore by using the newly allocated VDisk and create a VM on the new datastore (see Figure 7 on page 9).

```
---
- name: Rescan Create VMFS datastore
  hosts: localhost
  gather_facts: no

  vars:
      vcenter_server: "10.0.240.101"
      vcenter_user: "administrator@vsphere.local"
      vcenter_pass: "Passw0rd!"
      datacenter_name: "On-Premise"
      inventory_hostname: "10.0.240.21"
      item_name: "Onprem_Demo_Ansible_Vol"
      item_type: "vmfs"

  tasks:
     - name: Create a VMFS datastore
       vmware_host_datastore:
          hostname: "{{ vcenter_server }}"
          username: "{{ vcenter_user }}"
          password: "{{ vcenter_pass }}"
          validate_certs: no
          datastore_name: "Onprem_Demo_Ansible_Vol"
          datastore_type: "{{ item_type }}"
          vmfs_device_name: "naa.60050768108104a2f000000000000099"
          vmfs_version: 6
          esxi_hostname: "{{ inventory_hostname }}"
          state: present

     - name: Create a VM task
       vmware_guest:
          hostname: "{{ vcenter_server }}"
          username: "{{ vcenter_user }}"
          password: "{{ vcenter_pass }}"
          validate_certs: no
          datacenter: On-Premise
          folder: /On-Premise/vm/
          name: Demo_Ansible_VM
          state: poweredoff
          guest_id: centos64Guest
          esxi_hostname: "10.0.240.21"
          disk:
          - size_gb: 10
            type: thin
            datastore: "Onprem_Demo_Ansible_Vol"
          hardware:
            memory_mb: 512
            num_cpus: 4
            scsi: paravirtual
                 networks:
          - name: VM Network
            ip: 10.0.240.114
            netmask: 255.255.254.0
            device_type: vmxnet3
```

Figure 7 VMware VMFS and VM Creation playbook

As shown in Figure 7, the playbook details the Storage UID on which the VMFS datastore must be created and then creates a VM with the parameters that are described in the playbook.

Summary

The deployment of multicloud environments is gaining attraction for organizations. With it brings the complexity of managing the on-premises and different cloud environments.

The IBM FlashSystem family is designed to meet the full range of enterprise storage needs from entry to high-end systems that extend to your hybrid multicloud storage deployments without increasing cost and complexity. All based on a common storage software platform, IBM Spectrum Virtualize works seamlessly across all deployment types and supports your storage estate, whether the storage is from IBM or other vendors, to efficiently meet the challenges of rapid data growth and constrained IT budgets.

By using orchestration and automation tools, such as Red Hat Ansible, storage platforms can address managing complex IT infrastructure challenges with simplicity. With Red Hat Ansible support for IBM FlashSystems, clients can seamlessly orchestrate and automate their storage infrastructure management on-premises or in a Cloud environment by using a common a toolset.

Notices

This information was developed for products and services offered in the US. This material might be available from IBM in other languages. However, you may be required to own a copy of the product or product version in that language in order to access it.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:
IBM Director of Licensing, IBM Corporation, North Castle Drive, MD-NC119, Armonk, NY 10504-1785, US

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you provide in any way it believes appropriate without incurring any obligation to you.

The performance data and client examples cited are presented for illustrative purposes only. Actual performance results may vary depending on specific configurations and operating conditions.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

Statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to actual people or business enterprises is entirely coincidental.

COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. The sample programs are provided "AS IS", without warranty of any kind. IBM shall not be liable for any damages arising out of your use of the sample programs.

Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corporation, registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at “Copyright and trademark information” at http://www.ibm.com/legal/copytrade.shtml

The following terms are trademarks or registered trademarks of International Business Machines Corporation, and might also be trademarks or registered trademarks in other countries.

Redbooks (logo)  ®	IBM Cloud™	IBM Spectrum®
IBM®	IBM FlashSystem®	

The following terms are trademarks of other companies:

Windows, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Ansible, Red Hat, are trademarks or registered trademarks of Red Hat, Inc. or its subsidiaries in the United States and other countries.

VMware, and the VMware logo are registered trademarks or trademarks of VMware, Inc. or its subsidiaries in the United States and/or other jurisdictions.

Other company, product, or service names may be trademarks or service marks of others.

Terms and conditions for product documentation

Permissions for the use of these publications are granted subject to the following terms and conditions.

Applicability

These terms and conditions are in addition to any terms of use for the IBM website.

Commercial use

You may reproduce, distribute and display these publications solely within your enterprise provided that all proprietary notices are preserved. You may not make derivative works of these publications, or reproduce, distribute or display these publications or any portion thereof outside your enterprise, without the express consent of IBM.

Rights

Except as expressly granted in this permission, no other permissions, licenses or rights are granted, either express or implied, to the publications or any information, data, software or other intellectual property contained therein.

IBM reserves the right to withdraw the permissions granted herein whenever, in its discretion, the use of the publications is detrimental to its interest or, as determined by IBM, the above instructions are not being properly followed.

You may not download, export or re-export this information except in full compliance with all applicable laws and regulations, including all United States export laws and regulations.

IBM MAKES NO GUARANTEE ABOUT THE CONTENT OF THESE PUBLICATIONS. THE PUBLICATIONS ARE PROVIDED "AS-IS" AND WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE.

Privacy policy considerations

IBM Software products, including software as a service solutions, ("Software Offerings") may use cookies or other technologies to collect product usage information, to help improve the end user experience, to tailor interactions with the end user, or for other purposes. In many cases no personally identifiable information is collected by the Software Offerings. Some of our Software Offerings can help enable you to collect personally identifiable information. If this Software Offering uses cookies to collect personally identifiable information, specific information about this offering's use of cookies is set forth below.

This Software Offering does not use cookies or other technologies to collect personally identifiable information.

If the configurations deployed for this Software Offering provide you as customer the ability to collect personally identifiable information from end users via cookies and other technologies, you should seek your own legal advice about any laws applicable to such data collection, including any requirements for notice and consent.

For more information about the use of various technologies, including cookies, for these purposes, see IBM's Privacy Policy at http://www.ibm.com/privacy and IBM's Online Privacy Statement at http://www.ibm.com/privacy/details in the section entitled "Cookies, Web Beacons and Other Technologies," and the "IBM Software Products and Software-as-a-Service Privacy Statement" at http://www.ibm.com/software/info/product-privacy.

April 2020

Please recycle

ISBN 0738458813

REDP-5598-00