Revision history

Table 1 DDVE 5.0 in Google Cloud Platform Installation and Administration Guide revision history

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>May 2020</td>
<td>Initial Publication (with DD OS 7.2).</td>
</tr>
</tbody>
</table>
Revision history
Preface

As part of an effort to improve its product lines, we periodically release revisions of its software and hardware. Therefore, some functions described in this document might not be supported by all versions of the software or hardware currently in use. The product release notes provide the most up-to-date information on product features.

Purpose

This manual describes how to install, configure, and administer DD Virtual Edition (DDVE) systems.

Audience

This manual is intended for use by both system administrators and general users of DD Virtual Edition.

Related documentation

The following publications and websites provide additional information:

- **DD Operating System Release Notes**
- **DD Operating System Initial Configuration Guide**
  This manual explains configuration steps that are common to hardware and virtual DD systems.
- **DD Operating System OS Command Reference Guide**
  This manual explains how to administer DD systems from the command line.
- **DD Operating System OS Administration Guide**
  This manual explains how to administer DD systems with the System Manager graphical user interface.
- **DD Boost for OpenStorage Administration Guide**
  This manual explains how to use the DD Boost protocol for data transfer between backup software and DD systems.
  This website lists Avamar and NetWorker software support for DDVE.

Where to get help

We support, product, and licensing information can be obtained as follows:

Product information

For documentation, release notes, software updates, or information about products, go to Online Support at [https://support.emc.com](https://support.emc.com).

Technical support

For technical support of this release of DDVE, go to Online Support at [https://support.emc.com](https://support.emc.com).

Your comments

Your suggestions will help us continue to improve the accuracy, organization, and overall quality of the user publications. Send your opinions of this document to [DPAD.Doc.Feedback@emc.com](mailto:DPAD.Doc.Feedback@emc.com).
CHAPTER 1
Getting Started

This chapter includes the following topics:

- Purpose of this guide ............................................................................................................. 10
- Audience................................................................................................................................ 10
- Architecture overview............................................................................................................10
Purpose of this guide

This installation guide is intended as a supplement to the *DD Operating System Administration Guide*, which includes content for all DD systems. The content describes upgrading the DDVE software and using the DD System Manager to monitor DD systems for errors, disk space, and service events.

This guide contains content specific to deploying DD Virtual Edition (DDVE) on Google Cloud Platform. Use this guide with the *DD Operating System Administration Guide* and applicable Google Cloud Platform documentation.

See [Google Cloud documentation](https://cloud.google.com) for more information.

Audience

This document is intended for data protection and storage administrators who want to use Google Cloud Platform to back up DD Virtual Edition (DDVE) content. Users should know about the following technology:

- GCP Compute Engine
- GCP Storage
- GCP VPC network

Architecture overview

DDVE is a virtual deduplication appliance that provides data protection for entry, enterprise, and service provider environments.

The following diagram represents the architecture of the DDVE on Google Cloud Platform solution.

Legend:

1. To keep data traffic between DDVE and the bucket within the GCP infrastructure, Dell EMC recommends that you create Private Google Access. This configuration keeps DDVE from depending on a NAT Gateway or Public IP address to access the bucket.

2. To keep data transfers secure, Dell EMC recommends a VPN connection to replicate data from an on-premises host to DDVE in the cloud or the opposite way.

3. DDVE is categorized as a backend server. It must be kept in a private subnet with a private address. Never set a public IP address for DDVE.

4. Dell EMC recommends that you create the bucket in the region where the DDVE instance is running. Multiregional bucket is also supported and should be used if the user is in a location where no data center is available as a regional location. A separate bucket for each DDVE is required.

5. All DDVE instances must be secured with the appropriate security group entries. Typically SSH (Port 22) or HTTPS (Port 443) is used for DDVE inbound access. HTTPS (443) must be allowed for outbound bucket access for DDVE. TCP ports 2049 and 2051 are used for DD Boost and replication purposes. See the DDVE documentation for more information and for a complete list of ports.
CHAPTER 2

Introducing DDVE

This chapter includes the following topics:

- Introducing DDVE .......................................................... 14
- DDVE cloud features ....................................................... 14
Introducing DDVE

DD Virtual Edition (DDVE) is a software-only protection storage appliance: a virtual deduplication appliance that provides data protection for entry, enterprise and service provider environments. Like any DD system, DDVE is always paired with backup software.

DDVE runs the DD Operating System (DD OS), and includes the DD System Manager graphical user interface (GUI) and the DD OS command line interface (CLI) for performing system operations.

DDVE includes the following features:

- High-speed, variable length deduplication for a 10 to 30 times reduction in storage requirements
- Unparalleled data integrity to ensure reliable recovery, and seamless integration with leading backup and archiving applications
- DD Boost to speed backups by 50 percent
- DD Encryption for enhanced security of data
- DD Replicator for network efficient replication that enables faster time-to-DR readiness

DDVE runs on two types of platforms:

- On premises, DDVE supports VMware, Hyper-V, KVM, and VxRail.
- In the cloud, DDVE also runs in the Amazon Web Services (AWS) (cloud and gov cloud), Azure (cloud and gov cloud), VMware Cloud (VMC) on AWS cloud platforms, and Google Cloud Platform (GCP).

For more information about the features and capabilities of DD systems (both physical and virtual), see the *DD Operating System Administration Guide*.

DDVE cloud features

**Table 2 DDVE on GCP resource configuration size**

<table>
<thead>
<tr>
<th>Type</th>
<th>Resource configuration size</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDVE on Block storage</td>
<td>up to 16 TB</td>
</tr>
<tr>
<td>DDVE on Object storage</td>
<td>up to 96 TB</td>
</tr>
</tbody>
</table>

*Note: Object storage is recommended for new deployments.*

The following sections list supported DD protocols and features in DDVE.

**Supported DD protocols**

- DD Boost over IP
- DD Boost FS

**Supported DD features**

- DD Boost managed file replication (MFR)
- Encryption
- MTree replication
- DD System Manager GUI for DDVE management
• Secure multitenancy (SMT) with Network Isolation Support
• DD Boost/BoostFS for Big Data
• Key Management Interoperability Protocol (KMIP)
• More restricted IPtables settings

**Note:** DDVE supports these replication capabilities:

• Managed file replication and MTree replication
• Replication across availability zones and regions
• Replication within the GCP cloud and replication to and from other clouds

The *DD OS Administration Guide, DD Boost OST Guide, DD Boost for Partner Integration Administration Guide* provide additional information about supported protocols and features.
Introducing DDVE
CHAPTER 3

Deploying DDVE

This chapter includes the following topics:

- Deploying DDVE on the Google Cloud Platform ....................................................... 18
- Prerequisites to Deploy DDVE in GCP ................................................................. 18
- Deploy DDVE in GCP .............................................................................................. 24
Deploying DDVE on the Google Cloud Platform

The following sections provide prerequisites and general guidelines to deploy, configure, and run DDVE on Google Cloud Platform (GCP) with Active Tier on Google Cloud Object Storage.

Prerequisites to Deploy DDVE in GCP

Complete the prerequisites in the following sections before attempting to deploy DDVE on the GCP.

The high-level prerequisites steps are as follows:
1. Set up the environment
2. Enable Private Google Access
3. Create the bucket in Google Cloud Storage
4. Get access and secret keys from the GCP web console
5. Create the DDVE image

Set up the environment

Procedure
1. Use one of the following methods to install and configure Google Cloud SDK on your PC:
   - Install Google Cloud SDK on Linux. Quickstart for Linux provides instructions.
   - Install Google Cloud SDK on Windows. Quickstart for Windows provides instructions.
   - Configure Google Cloud SDK with your setup project, zone, and so on.

2. Run the `gcloud config list` command and verify that the values are correct.
   
   Note: This command is applicable for deployment using Linux shell script or Windows Powershell script only.
   
   For example:

   ```
   # gcloud config list
   [compute]
   region = myregion
   zone = myzone
   [core]
   account = myaccount@gmail.com
   disable_usage_reporting = True
   project = myproject
   ```

3. Make note of the following provisioning information, which you will need for deployment:
   - Subnet ID
   - Firewall rules
- Key-value pair or Username/Password

Enable Private Google Access

The DDVE object store solution needs network connectivity to the object store bucket. Enable Private Google Access to internally route the network traffic towards the bucket within the Google network.

By default, Private Google Access is not enabled. You can enable it when you create a subnet, and you can enable or disable it by editing a subnet. Configuring Private Google Access provides more information.

Note: We strongly recommend that you enable Private Google Access for security and efficiency. Never enable or attach a public IP address to DDVE in the cloud.

The following figure shows an excerpt of the steps required to enable Private Google Access.

Create bucket in Google Cloud storage

About this task

Create the bucket in the same region as the DDVE instance.

Procedure

1. Navigate to Storage > Browser.

2. Click Create Bucket.
3. Enter the bucket name and other required parameters, and then click Create, as shown in the following figure.

DDVE supports only Regional (recommended) or Multi-regional storage classes. Nearline and Coldline options are not supported.

**Note:**

- We recommend that you select the Regional storage class and select the same region used for the DDVE instance.
- Use Multi-regional only if the user is in a location where no data centers are available as regional locations.

**Note:** Alternatively, you can create a bucket using gsutil. Creating Storage Buckets provides instructions. Ensure that you provide the storage class as Regional. For Example:

```
gsutil mb -c regional -l us-east1 gs://my-bucket/
```

Get access and secret keys from GCP web console

**Procedure**

1. Login to the GCP web console.
2. Select Storage > Settings.
3. Click **Interoperability**.

4. Copy the secret and access keys from this page. If the keys do not exist, click **Create a new key** to create the keys, as shown in the following example.

   ![Interoperability storage access keys](image)

   **Note:** The user with these access and secret keys should be granted the **Storage Admin** role. Alternatively, for more granular access of services, the bucket-level Cloud IAM role, **storage.legacyBucketWriter** can be granted on the bucket that is created in Create Bucket in GCP. The permissions that are included in this role are:
   - storage.objects.list
   - storage.objects.create
   - storage.objects.delete
   - storage.buckets.get

   For more information, see:
   - Access Control Lists (ACLs): [https://cloud.google.com/storage/docs/access-control/lists](https://cloud.google.com/storage/docs/access-control/lists)
   - Best practices: [https://cloud.google.com/storage/docs/access-control/iam#best_practices](https://cloud.google.com/storage/docs/access-control/iam#best_practices)
   - View and manage permissions: [https://console.cloud.google.com/iam-admin/iam](https://console.cloud.google.com/iam-admin/iam)

---

**Create DDVE image**

**About this task**

Use one of the following options to create a DDVE image on GCP:

- Use the GCP web console
- Use the `gcloud` command
Note: Creation of an image is a one-time task. The same image can be used later to deploy multiple DDVE instances.


Complete the following before you create a DDVE image:

Procedure

1. Download the DDVE image package from the Online Support site.
   For example: ddve-gcp-6.2.0.10-xyz.zip
2. Unzip the file to access the root disk zip file and the Linux script (gcp-deploy-linux.sh).
3. Create a bucket, for example: bucket-1. See Create a bucket.
4. Upload the DDVE image package to the newly created bucket with values appropriate to your own environment using the following gsutil command.
   
   $  gsutil cp ddve-gcp-6.2.0.10-xyz.tar.gz gs://bucket-1/

   The permissions required to run this command include:

   - storage.buckets.list: This permission is required when uploading the image package from the GCP web console.
   - storage.objects.create
   - storage.objects.delete: This permission is only required when the inserted object has the same name as an object that already exists in the bucket.
   - storage.objects.list

   Note: Use separate buckets for uploading the image package and creating object store profile in the section Configure DDVE using CLI.

Create a DDVE image using the GCP web console

Before you begin

The permissions required to create an image using the GCP web console include:

- compute.images.create
- compute.images.list
- compute.projects.get
- storage.buckets.list

Procedure

1. Log in to the GCP web console.
2. Select Compute Engine > Images
3. Click `[+]Create Image`.

4. Enter values for all the required fields, as shown in the following figure.
Under **Source**, select **Cloud Storage file** and click **Browse**. Search for the bucket you created and select the DDVE image packet, for example, `ddve-gcp-6.2.0.10-xyz.tar.gz`.

5. Click **Create**.

### Create a DDVE image using the `gcloud` command

**Before you begin**

The permissions required to create an image using the `gcloud` command line include:

- `compute.images.create`
- `compute.images.get`
- `storage.objects.get`

**Procedure**

- Create your own DDVE image from `ddve-gcp-6.2.0.10-xyz.tar.gz` with values appropriate to your own environment.

  **For example:**
  ```
  $ gcloud compute images create myimage --source-uri gs://bucket-1/ddve-gcp-6.2.0.10-xyz.tar.gz
  ```

### Deploy DDVE in GCP

Choose a method to deploy DDVE in GCP.

DDVE can be deployed in GCP using any of the following:

- **Linux shell script**—Strongly recommended because it automatically creates and attaches metadata disks in the correct order for DDVE according to Storage Best Practices.
- **Windows PowerShell**
- **GCP web console**
Procedures for all three methods follow.

**Deploy DDVE using Linux shell script**

Deploy DDVE using Linux shell script and the DDVE image you created previously.

**Before you begin**

The user deploying the DDVE using the script should be granted one of the following roles:

- Compute Instance Admin
- Storage Admin*

Alternatively, the following set of permissions provides a more granular access of services. These permissions are already part of the Compute Instance Admin and the Storage Admin roles.

- `compute.disks.create`
- `compute.disks.delete`
- `compute.disks.get`
- `compute.disks.use`
- `compute.images.list`
- `compute.images.create*`
- `compute.images.get*`
- `compute.images.useReadOnly`
- `compute.instances.attachDisk`
- `compute.instances.create`
- `compute.instances.get`
- `compute.instances.list`
- `compute.instances.setMetadata`
- `compute.instances.setServiceAccount`
- `compute.machineTypes.get`
- `compute.projects.get`
- `compute.subnetworks.use`
- `compute.zones.list`
- `storage.buckets.create*`
- `storage.buckets.delete*`
- `storage.buckets.get*`
- `storage.objects.create*`
- `storage.objects.delete*`

* This role and permission is only required when using the `-f` and `-b` options for deployment.

**About this task**

Use the following options, as needed:

- `-n` to provide DDVE name
- `-i` to provide DDVE image name
- `-z` to provide zone
-v to provide VPC name
-s to provide subnet
-p to provide GCP project name
-c to provide wanted configuration (16 TB, 32 TB, or 96 TB)
-o to deploy a DDVE with Object Store. With Linux script, you are not required to provide any value for this option.

The script automatically creates the recommended metadata disks, per selected configuration (-c option). There is no requirement to add disks manually. The -m option can override this number.
  - For 16 TB: Two metadata disks
  - For 32 TB: Four metadata disks
  - For 96 TB: Ten metadata disks

Procedure

Deploy a DDVE instance using the Linux script with the following parameters. Replace the sample values with the values for your environment: $./gcp-deploy-linux.sh -n myddve -i myimage -z myzone -v myvpc -s mysubnet -p myproject -c 96TB -o

Google Cloud SDK 225.0.0
alpha 2018.11.09
beta 2018.11.09
bq 2.0.37
core 2018.11.09
gsutil 4.34
kubectl 2018.11.09
Object store configured with 10 metadata disks.

Starting deployment ...
Creating myddve-nvram disk with 10GB. It may take some time ...
Succeed.
Creating myddve-metadata1 with 1TB. It may take some time ...
Succeed.
Creating myddve-metadata2 with 1TB. It may take some time ...
Succeed.
Creating myddve-metadata3 with 1TB. It may take some time ...
Succeed.
Creating myddve-metadata4 with 1TB. It may take some time ...
Succeed.
Creating myddve-metadata5 with 1TB. It may take some time ...
Succeed.
Creating myddve-metadata6 with 1TB. It may take some time ...
Succeed.
Creating myddve-metadata7 with 1TB. It may take some time ...
Succeed.
Creating myddve-metadata8 with 1TB. It may take some time ...
Succeed.
Creating myddve-metadata9 with 1TB. It may take some time ...
Succeed.
Creating myddve-metadata10 with 1TB. It may take some time ...
Succeed.
Creating DDVE ...
Succeed.

Summary:
================================================================================
  DDVE name: myddve
  cpu: 16 cores
  memory: 64GB
Deploying DDVE

Deploy DDVE using Windows PowerShell script

Deploy DDVE using Windows PowerShell script and the DDVE image you created previously.

**Before you begin**

The permissions required to deploy a DDVE using the PowerShell script are the same as for **Deploy DDVE using Linux shell script** on page 25.

**Procedure**

1. Start Windows PowerShell with the *Run as Administrator* option.
   
   Only members of the Administrators group on the computer can change the execution policy.

2. Enable running unsigned scripts by entering `set-executionpolicy remotesigned`.
   
   Microsoft Running Scripts provides more information.

3. Run the following command from Windows PowerShell, replacing the sample values with the values for your environment.

   ```bat
   # .\gcp-deploy-windows.ps1 -n myddve0 -i myimage -z myzone -v myvpc -s mysubnet -p myproject -c 96TB -o 1
   ```

   Use the following options, as needed:

   - `-n` to provide DDVE name
   - `-i` to provide DDVE image name
   - `-z` to provide zone
   - `-v` to provide VPC name
   - `-s` to provide subnet
   - `-p` to provide GCP project name
   - `-c` to provide desired configuration (16 TB, 32 TB, or 96 TB)
   - `-o` to deploy a DDVE with Object Store. For Windows Powershell script, the value of this option is always 1.

For example,

```
# .\gcp-deploy-windows.ps1 -n myddve0 -i my-image -z myzone -v myvpc -s mysubnet -p my-project -c 96TB -o 1
```

Google Cloud SDK 232.0.0
bq 2.0.40
core 2019.01.27
gsutil 4.35
Starting deployment ...
Creating nvram disk. It may take some time ...
Created [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/disks/myddve0-nvram].

New disks are unformatted. You must format and mount a disk before it can be used. You can find instructions on how to do this at:
https://cloud.google.com/compute/docs/disks/add-persistent-disk#formatting

Succeed.
Creating myddve0-metadata1. It may take some time ...
Created [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/disks/myddve0-metadata1].

New disks are unformatted. You must format and mount a disk before it can be used. You can find instructions on how to do this at:
https://cloud.google.com/compute/docs/disks/add-persistent-disk#formatting

Succeed.
Creating myddve0-metadata2. It may take some time ...
Created [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/disks/myddve0-metadata2].

New disks are unformatted. You must format and mount a disk before it can be used. You can find instructions on how to do this at:
https://cloud.google.com/compute/docs/disks/add-persistent-disk#formatting

Succeed.
Creating myddve0-metadata3. It may take some time ...
Created [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/disks/myddve0-metadata3].

New disks are unformatted. You must format and mount a disk before it can be used. You can find instructions on how to do this at:
https://cloud.google.com/compute/docs/disks/add-persistent-disk#formatting

Succeed.
Creating myddve0-metadata4. It may take some time ...
Created [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/disks/myddve0-metadata4].

New disks are unformatted. You must format and mount a disk before it can be used. You can find instructions on how to do this at:
https://cloud.google.com/compute/docs/disks/add-persistent-disk#formatting

Succeed.
Creating myddve0-metadata5. It may take some time ...
Created [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/disks/myddve0-metadata5].

New disks are unformatted. You must format and mount a disk before it can be used. You can find instructions on how to do this at:
https://cloud.google.com/compute/docs/disks/add-persistent-disk#formatting

Succeed.
Creating myddve0-metadata6. It may take some time ...
Created [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/disks/myddve0-metadata6].

New disks are unformatted. You must format and mount a disk before it can be used. You can find instructions on how to do this at:

https://cloud.google.com/compute/docs/disks/add-persistent-disk#formatting

Succeed.

Creating myddve0-metadata7. It may take some time ...
Created [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/disks/myddve0-metadata7].

New disks are unformatted. You must format and mount a disk before it can be used. You can find instructions on how to do this at:

https://cloud.google.com/compute/docs/disks/add-persistent-disk#formatting

Succeed.

Creating myddve0-metadata8. It may take some time ...
Created [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/disks/myddve0-metadata8].

New disks are unformatted. You must format and mount a disk before it can be used. You can find instructions on how to do this at:

https://cloud.google.com/compute/docs/disks/add-persistent-disk#formatting

Succeed.

Creating myddve0-metadata9. It may take some time ...
Created [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/disks/myddve0-metadata9].

New disks are unformatted. You must format and mount a disk before it can be used. You can find instructions on how to do this at:

https://cloud.google.com/compute/docs/disks/add-persistent-disk#formatting

Succeed.

Creating myddve0-metadata10. It may take some time ...
Created [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/disks/myddve0-metadata10].

New disks are unformatted. You must format and mount a disk before it can be used. You can find instructions on how to do this at:

https://cloud.google.com/compute/docs/disks/add-persistent-disk#formatting

Succeed.

Creating DDVE ...
Created [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/instances/myddve0].
Succeed.

Attaching myddve0-metadata1. It may take some time ...
Updated [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/instances/myddve0].
Succeed.

Attaching myddve0-metadata2. It may take some time ...
Updated [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/instances/myddve0].
Succeed.

Attaching myddve0-metadata3. It may take some time ...
Updated [https://www.googleapis.com/compute/v1/projects/my-project/ zones/myzone/instances/myddve0].
Succeed.
Attaching myddve0-metadata4. It may take some time ...
Updated [https://www.googleapis.com/compute/v1/projects/my-project/
zones/myzone/instances/myddve0].
Succeed.
Attaching myddve0-metadata5. It may take some time ...
Updated [https://www.googleapis.com/compute/v1/projects/my-project/
zones/myzone/instances/myddve0].
Succeed.
Attaching myddve0-metadata6. It may take some time ...
Updated [https://www.googleapis.com/compute/v1/projects/my-project/
zones/myzone/instances/myddve0].
Succeed.
Attaching myddve0-metadata7. It may take some time ...
Updated [https://www.googleapis.com/compute/v1/projects/my-project/
zones/myzone/instances/myddve0].
Succeed.
Attaching myddve0-metadata8. It may take some time ...
Updated [https://www.googleapis.com/compute/v1/projects/my-project/
zones/myzone/instances/myddve0].
Succeed.
Attaching myddve0-metadata9. It may take some time ...
Updated [https://www.googleapis.com/compute/v1/projects/my-project/
zones/myzone/instances/myddve0].
Succeed.
Attaching myddve0-metadata10. It may take some time ...
Updated [https://www.googleapis.com/compute/v1/projects/my-project/
zones/myzone/instances/myddve0].
Succeed.
Summary:
========================================
DDVE name: myddve0
  cpu: 16 cores
  memory: 64GB
  capacity: 96TB
  image name: my-image
  project: my-project
  zone: myzone
  vpc name: myvpc
  subnets name: mysubnet
  private IP: 10.10.11.52
Object store configured:
  number of metadisks: 10
  size of metadisks: 1TB
========================================

Deploy DDVE from the GCP Web Console

Deploy DDVE from the GCP Web console using the DDVE image that you created previously.

Before you begin
The user that deploys DDVE from the GCP Web Console should be granted the role Compute Instance Admin.

Alternatively, for more granular access of services, the Compute Viewer role and the following set of additional permissions can be granted:

- compute.disks.create
- compute.disks.use
- compute.images.useReadOnly
- compute.instances.create
- compute.subnetworks.use

Google Cloud Understanding Engine Roles provides more information.
Procedure

2. Create the DDVE instance from the image.
   a. Click CREATE INSTANCE to launch virtual machine creation.

   ![Google Cloud Platform VM instances page](image)

   b. Specify the virtual machine name, and select the zone where the VPC and subnet are created. Customize the CPU and memory to the required values based on the configuration type you want to deploy.

   **Storage Best Practices** provides more information about supported configurations. For example: Customize CPU to 16 cores and memory to 64 GB for a 96 TB DDVE instance.

   ![Google Cloud Platform Create instance page](image)

   c. Under Boot Disk, click Change > Custom Images and select the DDVE image as the boot disk.
Verify that the disk type is Standard Persistent Disk and the size is 250 GB.

d. To create the NVRAM disk, on the bottom of the screen, click Management, security, disks, networking, sole tenancy > Disks > Add new disk.
e. Specify the NVRAM disk name, select SSD persistent disk for the disk type, select Blank disk for the source type, and set the disk size to 10 GB.
f. Add metadata disks to the DDVE instance.

   The recommended number of metadata disks by capacity is:
   
   - For 16 TB: 2
   - For 32 TB: 4
   - For 96 TB: 10

   **Note:** The number of metadata disks to add depends on the assumption of 20x overall deduplication ratio (10x deduplication and 2x compression). For workloads with a higher deduplication ratio, more metadata storage is needed.

   g. From the **Networking** tab, for **Network**, select your VPC and for **Subnetwork**, select your subnet. If you already a configured jump box in this subnet and want to access the DDVE only through the jump box, set **External IP** to **None**.
h. (Optional) When you deploy from the Google Cloud Console, DDVE supports assigning an SSH key for the sysadmin user.

Note:
- Click Add item to add more SSH keys to DDVE.
- The SSH key is only for the sysadmin user.

i. Start the DDVE deployment process by clicking the Create button.

The DDVE instance appears when the deployment completes.
Expand metadata storage

Expand metadata storage by adding new metadata disks.

**Before you begin**

It is recommended that you expand metadata storage by adding new metadata disks. When the total number of metadata disks reaches its limit, you can expand metadata storage by increasing the size of existing metadata disks. Shrinking disks size is not supported.

- Before expanding metadata storage, disable the file system.
- You cannot expand the first metadata disk.
- Observe the recommended increment size of 1 TiB.

**Procedure**

1. Log in to the GCP web console, select **Compute Engine > VM Instances**, find your DDVE, and stop it.

2. On **VM Instance details** page, go to **Additional disks**, and select the metadata disk that you plan to expand.
   
   ![VM Instance details](image)

   **Note:** You cannot expand the first metadata disk.

3. To increase the size of the selected metadata disk, click the **EDIT** button.

4. To increase the size of other metadata disks, repeat step 2 on page 36 and step 3 on page 36.

5. Start the DDVE.

6. To confirm the disk size change, use the **Disk show hardware** or **Storage show all** command.

7. Disable the file system with the **filesystem disable** command.

8. Expand metadata storage with the **filesystem expand** command.

9. Enable file system with the **filesystem enable** command, and check file system status with **filesystem status** command.

10. To confirm the metadata storage expansion, use the **filesystem show space tier active local-metadata** command.
CHAPTER 4

Completing Initial DDVE Configuration

This chapter includes the following topics:

- **Configure DDVE in GCP** ................................................................. 38
- **Recovering DDVE using system headswap** ............................... 46
- **Recovering the DDVE instance** .................................................. 48
Configure DDVE in GCP

About this task

There are two ways to configure a DDVE after deployment:

- Using DDSM Interface
- Using the CLI

Before you begin:

- Consider metadata storage size and count requirements. Refer to Storage Best Practices for additional information.
- Create the GCP storage bucket. Make note of the bucket name, as you will need it when you create the cloud profile.
- If the storage class is selected as regional, we recommend that you create the bucket in the same region as the DDVE instance.

Configure DDVE in GCP using DDSM

You can configure DDVE in GCP using the DDSM UI.

Procedure

1. Log in to DD System Manager using the IP address of your DDVE. The default login credentials for the DDVE instance are: sysadmin/<Instance_Id>.
   
   Note: You can find the Instance Id from the VM instance details on the GCP portal.

2. From the Use list, select one of the following licenses:
   - Pre-Installed Evaluation License
   - License File
   - License Server (Alternative choice, if license server is available)

3. Accept the End User License Agreement.
   
   The configuration wizard is launched automatically.

4. Leave the default Network settings. Click No to go to the File System Settings.

5. Click Yes for File System configuration.

6. For Storage Type, select Object Store, enter the passphrase, bucket name, access key, and secret key.
These fields are not displayed after the passphrase is set.

1. **Note:**
   - Create bucket in Google Cloud Storage provides steps to create a bucket.
   - Getting Access and Secret Keys from GCP Web Console provides steps to get the access key and secret key.

7. Configure Storage. Select the disks under **Available Storage** and move them to the **Metadata Storage** section by clicking **Add to Metadata**. Add the disks to the active tier (this action adds the metadata storage disk to the instance).

8. **File System Summary Page:** Click the Summary tab to review all the fields. Check the box **Enable file system after creation** and click **Submit**.

---

The image shows a configuration page with options for network, file system, active tier, and summary. The storage section includes options for available storage and metadata storage. The file system summary page displays general and active tier capacity with an option to enable file system after creation.
The file system is created and enabled.

9. Click OK to go to the System Settings tab.
10. Change the DDVE password.

11. Configure the email server as needed.

12. Click Submit to save the system settings, and then exit the wizard.
Note: DDVE running in GCP must have its clock synchronized with NTP for object store communication. DDVE automatically synchronizes its clock using the time server information in the DHCP response that the GCP infrastructure provides. If there are any changes in the GCP setup that prevent the NTP server announcement, configure and check the NTP status by going to Administration > Settings > More Tasks > Configure Time Settings. See Google Set up network time protocol (NTP) for instances.

Results
The DDVE configuration using DDSM is complete.

Re-launch the configuration wizard

About this task
You will need to re-launch the configuration wizard after completing the initial DDVE configuration, if you choose to modify the object-store profile or make other changes after this initial configuration.

Procedure
1. Navigate to Maintenance >System.
2. Click on the Configuration System option.
3. Object store local metadata storage can be checked by navigating to Data Management>File System.
Configure DDVE in GCP using CLI

You can log in using SSH to configure DDVE using the command line interface. Authentication using key-value pair and username and password are supported.

Procedure

1. Log in to the DDVE instance to configure the system. The default login credentials for the DDVE instance are: sysadmin/<Instance_Id>.

```
# ssh sysadmin@<IP address of DDVE>
EMC DD Virtual Edition
Password:
Welcome to DD OS 6.2.0.10-xyz
------------------------------------------
sysadmin@myddve0#
```

2. During the first login, you are prompted to accept the EULA and change the password. The configuration wizard launches.

3. Follow the steps in the wizard to add the elicense and configure the Object Store.

   **Note:** If an elicense file cannot be found in `/ddr/var` you can paste the license directly in the wizard.

```
Welcome to DD OS 6.2.0.10-614837
------------------------------------------
Do you want to configure system using GUI wizard (yes|no) [no]:
Network Configuration
  Configure Network at this time (yes|no) [no]:
.elicenses Configuration
  Configure elicenses at this time (yes|no) [no]: yes

Available elicense Files
  #   File Name
  -   ---------
  1   elicense.lic
  -   ---------

  Do you want to use an existing elicense file (yes|no) [yes]:
Enter the index of elicense file [1|cancel] : 1
```
Pending eLicense Settings
Existing Licenses:
<table>
<thead>
<tr>
<th>Feature</th>
<th>Capacity</th>
<th>Type</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPACITY</td>
<td>87.31 TiB</td>
<td>permanent (int)</td>
<td>active</td>
</tr>
</tbody>
</table>

** System is using internal licenses.

New Licenses:
<table>
<thead>
<tr>
<th>Feature</th>
<th>Capacity</th>
<th>Type</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPACITY</td>
<td>87.31 TiB</td>
<td>permanent (int)</td>
<td>active</td>
</tr>
</tbody>
</table>

** New license(s) will overwrite existing license(s).
Do you want to save these settings (Save|Cancel|Retry): Save

Successfully updated elicenses.

Filesystem Configuration
Configure Filesystem at this time (yes|no) [no]:

System Configuration
Configure System at this time (yes|no) [no]:

CIFS Configuration
Configure CIFS at this time (yes|no) [no]:

NFS Configuration
Configure NFS at this time (yes|no) [no]:

SMT Configuration
Configure SMT at this time (yes|no) [no]:

Storage object-store profile Configuration
Configure Storage object-store profile at this time (yes|no) [no]: yes

Do you want to enable object store (yes|no) [yes]:
A passphrase needs to be set on the system.
Enter new passphrase:
Re-enter new passphrase:
Passphrases matched.

Config object store
Enter the access key:
Enter the secret key:
Enter the bucket name: simp-test-bucket

Object-store endpoint needs the GlobalSign certificate to be imported.
Completing Initial DDVE Configuration

Bucket name: simp-test-bucket

Do you want to save these settings (Save|Cancel|Retry): Save

The passphrase is set

Successfully set object store profile.

Configuration complete.

4. Run the following command to view the disks that are attached to the DDVE:

```bash
# disk show hardware
```

Example:

```
# disk show hardware
Disk   Slot        Manufacturer/Model         Firmware   Serial No. (pci/idx)
Capacity    Type
----   ---------   ------------------------   --------   ----------
---------   -------
dev1   0:0         Google  PersistentDisk     n/a        (unknown)
250.0 GiB   SAS
dev2   0:1         Google  PersistentDisk     n/a        (unknown)
10.0 GiB  SAS-SSD
dev3   0:2         Google  PersistentDisk     n/a        (unknown)
1.0 TiB    SAS-SSD
dev4   0:3         Google  PersistentDisk     n/a        (unknown)
1.0 TiB    SAS-SSD
```

4 drives present.

5. Add the disks to the active tier (this action adds the metadata storage disk to the instance).

```bash
# storage add tier active dev<n>
```

6. Create and enable file system.

```bash
# filesys create
# filesys enable
```

Note: DDVE running in GCP must have its clock synchronized with NTP for successful object store communication. The DDVE automatically synchronizes its clock by using the time server information in the DHCP response that the GCP infrastructure provides. If there are any changes in the GCP setup that prevent NTP server announcement, configure NTP explicitly by using `ntp add timeserver <server>` and `ntp sync` commands. You can check the NTP status for your instance by running the command `ntp status`.

See [Google set up network time protocol (NTP) for instances](https://cloud.google.com/compute/docs/using-ntp) for more information about GCP time synchronization.

Results

The DDVE configuration using CLI is complete.
## Configure DDVE manually

You can manually configure the DDVE if the configuration wizard was skipped or at any point after the initial configuration.

### About this task

This procedure enables you to configure or update the elicense, set the system passphrase, enable the object-store feature, and set the object-store profile.

### Procedure

1. To add the elicense, save the license file to `/ddr/var/license`. Run the command `elicense update license.lic`.

   **Note:** if the license file cannot be found in `/ddr/var`, you can paste its content directly to the console.

```
# elicense update license.lic

Existing licenses:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Capacity</th>
<th>Type</th>
<th>State</th>
<th>Expiration Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPACITY</td>
<td>0.45 TiB</td>
<td>unexpired evaluation</td>
<td>active</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Feature licenses:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Count</th>
<th>Type</th>
<th>State</th>
<th>Expiration Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>REPLICATION</td>
<td>1</td>
<td>unexpired evaluation</td>
<td>active</td>
<td>n/a</td>
</tr>
<tr>
<td>DDBOOST</td>
<td>1</td>
<td>unexpired evaluation</td>
<td>active</td>
<td>n/a</td>
</tr>
<tr>
<td>RETENTION-LOCK-GOVERNANCE</td>
<td>1</td>
<td>unexpired evaluation</td>
<td>active</td>
<td>n/a</td>
</tr>
<tr>
<td>ENCRYPTION</td>
<td>1</td>
<td>unexpired evaluation</td>
<td>active</td>
<td>n/a</td>
</tr>
</tbody>
</table>

New licenses:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Capacity</th>
<th>Type</th>
<th>State</th>
<th>Expiration Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPACITY</td>
<td>87.31 TiB</td>
<td>permanent (int)</td>
<td>active</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Feature licenses:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Count</th>
<th>Type</th>
<th>State</th>
<th>Expiration Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>REPLICATION</td>
<td>1</td>
<td>permanent (int)</td>
<td>active</td>
<td>n/a</td>
</tr>
<tr>
<td>DDBOOST</td>
<td>1</td>
<td>permanent (int)</td>
<td>active</td>
<td>n/a</td>
</tr>
<tr>
<td>ENCRYPTION</td>
<td>1</td>
<td>permanent (int)</td>
<td>active</td>
<td>n/a</td>
</tr>
</tbody>
</table>
** New license(s) will overwrite all existing license(s).
Do you want to proceed? (yes|no) [yes]: yes
eLicense(s) updated.

2. Set the system passphrase by running the command `system passphrase set`.

```
# system passphrase set
Enter new passphrase:
Re-enter new passphrase:
Passphrases matched.
The passphrase is set.
```

3. Enable the object store using the command `storage object-store enable`.

```
# storage object-store enable
Object-store is enabled.
```

4. Get the access and secret keys by following the steps in Getting Access and Secret Keys from GCP Web Console.

5. Run the following command to create/modify the cloud profile:

```
# storage object-store profile set
```
Enter the access and secret keys obtained from the previous step.

6. Enter the bucket name created in step Create bucket in Google Cloud Storage.

7. GCP needs the GlobalSign certificate to communicate with the object store. Import the certificate using the following command:

```
# storage object-store profile set
Enter the access key: <enter your GCP access key>
Enter the secret key: <enter your GCP secret key>
Enter the bucket name: my-bkt
Object-store endpoint needs the GlobalSign certificate to be imported.
Do you want to import that certificate with below fingerprint?
Profile is set.
```

Recovering DDVE using system headswap

A system headswap recovers a DDVE instance from a head unit failure. The head unit refers to the DDVE root disk.

**Before you begin**

Ensure that the vNVRAM disk and metadata disks from system A (original system) are available, as they will be attached to the new instance B. If either the vNVRAM disk or any metadata disk is not available, use the `system recovery from object-store` command instead.
About this task

Use this procedure only to run the system headswap command to recover DDVE with a head unit failure in GCP Object Store.

⚠️ Note: The failed instance is referred to as instance A. The new instance is instance B.

Procedure

1. Create instance B with Head Unit (root disk only) with the same instance type as the original one.
2. Detach the vNVRAM and metadata disks from the failed head unit (instance A).
3. Attach the vNVRAM and metadata disks that were detached from instance A to instance B.
4. Set the system passphrase.
   ☑️ Note: Set the passphrase to match system A, otherwise, headswap fails.

   ```
   # system passphrase set
   Enter new passphrase:
   Re-enter new passphrase:
   Passphrases matched.
   The passphrase is set.
   ```

5. Ensure that system A is powered off.

   This step is required to detach the bucket from system A and make it available to be attached with system B.

6. Run the system headswap command on instance B.
   ☑️ Note: The system will reboot during the headswap process.

   ```
   # system headswap
   This command returns the system back to its prior operational conditions. The system will be rebooted before resuming normal operations.

   ** If system passphrase was set on the old head, you will need to do one of the following after headswap completes:
   - unlock the filesystem if you have encrypted data, or
   - set the system passphrase if you don't have encrypted data
   Are you sure? (yes|no) [no]: yes
   ok, proceeding.

   Please enter sysadmin password to confirm 'system headswap':
   Restoring the system configuration, do not power off / interrupt process ...#

   Broadcast message from root (Fri May 25 07:12:35 2018):
   The system is going down for reboot NOW!
   ```

7. Verify the file system status after the headswap process completes.

   ```
   # filesystem status
   The filesystem is enabled and running.
   ```
You might need to re-activate the license on the new instance if an unserved-mode license is used.

Use the CLI `elicense checkout` and `elicense checkin` to obtain licenses from DDVE

- If an invalid key magic error occurs after a headswap, set the passphrase on the new DDVE, and then perform the headswap using `ddboost user revoke token-access sysadmin`.
- If DDVE was attached to an AV-server and a certificate authentication error occurs after a headswap, detach and re-attach the DD from the AV-server. The AV-server regenerates the certificate and imports it to DD.

Recovering the DDVE instance

Use this procedure only when you lose the original DDVE instance and must recover data to a new DDVE instance.

About this task

This procedure recovers the DDVE system on the GCP Object Store. The system recovery command recovers the DDVE with failure of the head unit, NVRAM disk, metadata disk, or any combination of the three.

If both NVRAM and metadata disks are available, use the `system headswap` command instead.

Procedure

1. Create instance B with the same configuration as instance A, including instance type, and metadata disk capacity.

2. Use the following command to enable the object-store:

   ```
   # storage object-store enable
   Object-store is enabled.
   ```

3. Set the object-store profile.

   Ensure that the passphrase on system B matches that on system A. Otherwise, the recovery fails. Also, ensure that the bucket name for both systems is the same.

4. Run the command to verify the disks that are attached to the DDVE:

   ```
   # disk show hardware.
   ```

5. Add disks to the active tier:

   ```
   # storage add tier active dev<n>
   ```

   **Note:** Add disks with at least the same capacity as system A.

6. Run system recovery precheck:

   ```
   # system recovery precheck from object-store
   Recovery precheck passed. Use start command to start the recovery.
   ```
7. Run the recovery:

**Note:** Ensure that instance A is shut down before running the recovery.

```
# system recovery start from object-store
System recovery has started. Use status command to check the status.
```

8. Check the recovery status.

The system reboots during the recovery process.

```
# system recovery status
System recovery is running: stage 2 of 6 (attaching object-store).
```

9. After the recovery process is complete, check the file system status.

```
# filesys status
The filesystem is enabled and running.
```
CHAPTER 5

Administering DDVE

This chapter includes the following topics:

- Adding virtual storage ................................................................. 52
- Extensions to DDOS for DDVE ...................................................... 52
- DDVE-only commands ............................................................... 53
- Modified DD OS commands ....................................................... 54
- Unsupported DD OS commands ............................................... 56
- Troubleshooting performance issues ........................................ 61
Adding virtual storage

More virtual storage can be added to the DDVE using the GUI or the CLI.

Using the GUI

In DD SM, click Hardware > Storage > Configure Storage to add the additional devices to the DDVE active tier.

Using the CLI

Extensions to DDOS for DDVE

Several DDOS commands are supported on the DDVE platform only. This section describes these commands.

**perf**

Collect and show DDVE performance statistics.

- `perf disable trace event-regexp [module {default | ddfs}]`  
  Disable tracing of specified events.
- `perf enable trace event-regexp [module {default | ddfs}]`  
  Enable tracing of the specified events.
- `perf start histogram [module {default | ddfs}]`  
  Start collecting performance histograms. This command may reduce performance marginally.
- `perf start stats`  
  Start printing statistics. This command may reduce performance marginally.
- `perf start trace [allow-wrap] [module {default | ddfs}]`  
  Start tracing events. This command may reduce performance marginally.
- `perf status trace event-regexp [module {default | ddfs}]`  
  Shows whether tracing is enabled or disabled for the specified events.
- `perf stop histogram histogram-filename [module {default | ddfs}]`  
  Stop collecting histograms and write the collected histograms to the specified file.
- `perf stop stats`  
  Stop printing statistics.
- `perf stop trace trace-filename [module {default | ddfs}]`  
  Stop tracing events and write the collected traces to the specified file.

**system vresource**

Display details about the virtual CPU and memory resources on the DDVE.

```
# system vresource show [current | requirements]
```

<table>
<thead>
<tr>
<th>Active Tier</th>
<th>Cloud Tier</th>
<th>Instance</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (TB)</td>
<td>Capacity (TB)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
<td>----------</td>
<td>---------------</td>
</tr>
<tr>
<td>16</td>
<td>n/a</td>
<td></td>
<td>custom-4-16384</td>
</tr>
<tr>
<td>32</td>
<td>n/a</td>
<td></td>
<td>custom-8-32768</td>
</tr>
<tr>
<td>96</td>
<td>n/a</td>
<td></td>
<td>custom-16-65536</td>
</tr>
</tbody>
</table>
** The maximum allowed system capacity for active tier on block storage is 16 TB

## DDVE-only commands

The following commands only work on DDVE and are not supported on physical DD systems.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>elic license checkout feature-license &lt;feature-name-list&gt;</td>
<td>Allows user to check out the features of licenses for License Server installation</td>
</tr>
<tr>
<td>elic license checkout capacity-license &lt;feature-name&gt; value &lt;n&gt; {TB</td>
<td>GB}</td>
</tr>
<tr>
<td>elic license checkin [&lt;feature-name-list&gt;</td>
<td>all]</td>
</tr>
<tr>
<td>elic license-server set server {&lt;ipaddr&gt;</td>
<td>&lt;hostname&gt;} port &lt;port-number&gt;</td>
</tr>
<tr>
<td>elic license-server reset</td>
<td>Returns DDVE to factory license settings.</td>
</tr>
<tr>
<td>elic license-server show</td>
<td></td>
</tr>
<tr>
<td>filesystem show space tier active local-metadata</td>
<td>Displays the usage for the metadata storage. Note: Some portion of the disk space is reserved for internal metadata, such as index. The amount of space is based on the maximum capacity of the platform and not on licensed capacity.</td>
</tr>
<tr>
<td>net hosts add</td>
<td>Two DDVEs in different regions cannot resolve each other's hostname. Run this command to add a host list entry.</td>
</tr>
</tbody>
</table>
Table 3 DDVE-only commands (continued)

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>storage object-store enable</td>
<td>Enables the object-store feature for DDVE.</td>
</tr>
<tr>
<td>storage object-store disable</td>
<td>Disables the object-store feature for DDVE.</td>
</tr>
<tr>
<td>storage object-store profile set</td>
<td>Configures the object-store access profile.</td>
</tr>
<tr>
<td>storage object-store profile show status</td>
<td>This CLI lists the object-store profile information set on the DDVE.</td>
</tr>
<tr>
<td>system vresource show [requirements]</td>
<td>Displays the file system capacity, the number of virtual CPUs, and the amount of memory assigned to the virtual machine running the DDVE instance. The requirements option displays the physical storage requirements for DDVE.</td>
</tr>
</tbody>
</table>

Modified DD OS commands

The behavior of the following commands is modified on the DDVE platform:

Table 4 Modified DD OS commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>alert</td>
<td>The tenant-unit parameter is not supported.</td>
</tr>
<tr>
<td>compression</td>
<td>The tenant-unit parameter is not supported.</td>
</tr>
<tr>
<td>config setup show</td>
<td>Arguments for configuring features not available in DDVE have been removed.</td>
</tr>
<tr>
<td>ddboost clients show active</td>
<td>The tenant-unit parameter is not supported.</td>
</tr>
<tr>
<td>ddboost file-replication show active</td>
<td>The tenant-unit parameter is not supported.</td>
</tr>
<tr>
<td>ddboost file-replication show detailed-file-history</td>
<td>The tenant-unit parameter is not supported.</td>
</tr>
<tr>
<td>ddboost file-replication show file-history</td>
<td>The tenant-unit parameter is not supported.</td>
</tr>
<tr>
<td>ddboost option reset</td>
<td>The fc parameter is not supported.</td>
</tr>
<tr>
<td>ddboost option show</td>
<td>The fc parameter is not supported.</td>
</tr>
<tr>
<td>Command</td>
<td>Changes</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>ddboost storage-unit create</td>
<td>The <code>tenant-unit</code> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost storage-unit modify</td>
<td>The <code>tenant-unit</code> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost storage-unit show</td>
<td>The <code>tenant-unit</code> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost streams show active</td>
<td>The <code>tenant-unit</code> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost streams show history</td>
<td>The <code>tenant-unit</code> parameter is not supported.</td>
</tr>
<tr>
<td>disk rescan</td>
<td>The <code>&lt;enclosure-ID&gt;.&lt;disk-ID&gt;</code> parameter is not supported.</td>
</tr>
<tr>
<td>disk show state</td>
<td>DDVE system disks show the <code>System Dev state</code>.</td>
</tr>
<tr>
<td>disk show stats</td>
<td>The DDVE format for this command is <code>disk show stats [dev &lt;n&gt;]</code></td>
</tr>
<tr>
<td>disk status</td>
<td>The <code>Spare</code> row has been removed from the output. The <code>System</code> row has been added.</td>
</tr>
<tr>
<td>enclosure show all</td>
<td>The <code>[&lt;enclosure&gt;]</code> parameter is not supported.</td>
</tr>
<tr>
<td>enclosure show controllers</td>
<td>The <code>[&lt;enclosure&gt;]</code> parameter is not supported.</td>
</tr>
<tr>
<td>enclosure show cpus</td>
<td>The <code>[&lt;enclosure&gt;]</code> parameter is not supported.</td>
</tr>
<tr>
<td>enclosure show io-cards</td>
<td>The <code>[&lt;enclosure&gt;]</code> parameter is not supported.</td>
</tr>
<tr>
<td>enclosure show memory</td>
<td>The <code>[&lt;enclosure&gt;]</code> parameter is not supported.</td>
</tr>
<tr>
<td>filesystem encryption keys delete</td>
<td>The `[tier {active</td>
</tr>
<tr>
<td>filesystem encryption keys show</td>
<td>The `[tier {active</td>
</tr>
<tr>
<td>filesystem fastcopy</td>
<td>The <code>[retention-lock]</code> parameter is supported with DDVE 5.0. Retention lock governance mode is supported for DDVE on premises. Retention lock compliance mode is not supported for any DDVE.</td>
</tr>
</tbody>
</table>
Table 4 Modified DD OS commands (continued)

<table>
<thead>
<tr>
<th>Command</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>filesystem show compression</td>
<td>The [tier {active</td>
</tr>
<tr>
<td>filesystem show space</td>
<td>The [tier {active</td>
</tr>
<tr>
<td>mtree create</td>
<td>The tenant-unit parameter is not supported.</td>
</tr>
<tr>
<td>mtree list</td>
<td>The tenant-unit parameter is not supported.</td>
</tr>
<tr>
<td>mtree show compression</td>
<td>The tenant-unit and tenant-unit parameters are not supported.</td>
</tr>
<tr>
<td>mtree show performance</td>
<td>The tenant-unit parameter is not supported.</td>
</tr>
<tr>
<td>net create interface</td>
<td>The &lt;virtual-ifname&gt; parameter is not supported.</td>
</tr>
<tr>
<td>net destroy</td>
<td>The &lt;virtual-ifname&gt; parameter is not supported.</td>
</tr>
<tr>
<td>perf</td>
<td>The vtl option is not supported on any perf command.</td>
</tr>
<tr>
<td>storage add</td>
<td>The enclosure and disk parameters are not supported.</td>
</tr>
<tr>
<td>storage remove</td>
<td>The enclosure and disk parameters are not supported.</td>
</tr>
<tr>
<td>storage show</td>
<td>The archive option is not supported.</td>
</tr>
<tr>
<td>system show stats</td>
<td>NVRAM statistics are not reported, because DDVE systems do not have physical NVRAM.</td>
</tr>
<tr>
<td>quota</td>
<td>The tenant-unit parameter is not supported.</td>
</tr>
<tr>
<td>replication</td>
<td>MTTree replication is the only type of replication supported.</td>
</tr>
<tr>
<td>snapshot</td>
<td>The tenant-unit parameter is not supported.</td>
</tr>
</tbody>
</table>

Unsupported DD OS commands

The following DD OS commands and command options are not supported on the DDVE platform.
<table>
<thead>
<tr>
<th>Unsupported command or command option</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>adminaccess https generate certificate</td>
<td>Deprecated. Use adminaccess certificate generate instead.</td>
</tr>
<tr>
<td>alerts add</td>
<td>Deprecated. Use alerts notify-list add instead.</td>
</tr>
<tr>
<td>alerts del</td>
<td>Deprecated. Use alerts notify-list del instead.</td>
</tr>
<tr>
<td>alerts notify-list option set group-name tenant-alert-summary {enabled</td>
<td>disabled}</td>
</tr>
<tr>
<td>alerts notify-list option reset group-name tenant-alert-summary</td>
<td></td>
</tr>
<tr>
<td>alerts reset</td>
<td>Deprecated. Use alerts notify-list reset instead.</td>
</tr>
<tr>
<td>alerts show alerts-list</td>
<td>Deprecated. Use alerts notify-list show instead.</td>
</tr>
<tr>
<td>alerts test</td>
<td>Deprecated. Use alerts notify-list test instead.</td>
</tr>
<tr>
<td>archive</td>
<td></td>
</tr>
<tr>
<td>authorization</td>
<td></td>
</tr>
<tr>
<td>autosupport display</td>
<td>Deprecated. Use autosupport show report instead.</td>
</tr>
<tr>
<td>autosupport reset support-list</td>
<td>Deprecated. Use autosupport reset { all</td>
</tr>
<tr>
<td>autosupport show support-list</td>
<td>Deprecated. Use autosupport show { all</td>
</tr>
<tr>
<td>cifs set authentication nt4</td>
<td>Deprecated. Use cifs set authentication active-directory instead.</td>
</tr>
<tr>
<td>cluster</td>
<td></td>
</tr>
<tr>
<td>ddboost fc</td>
<td></td>
</tr>
<tr>
<td>ddboost option reset fc</td>
<td></td>
</tr>
<tr>
<td>ddboost option set distributed-segment-processing disabled</td>
<td>Turning off distributed segment processing (DSP) with this DDBoom command is not supported for DDVE on DD OS 6.1.2.x.</td>
</tr>
<tr>
<td>ddboost option show</td>
<td>Turning off DSP with this DDBoom command is not supported for DDVE on DD OS 6.1.2.x.</td>
</tr>
<tr>
<td>ddboost option show fc</td>
<td></td>
</tr>
<tr>
<td>ddboost show image-duplication</td>
<td>Deprecated. Use ddboost file-replication show instead.</td>
</tr>
<tr>
<td>ddboost user option set user default-tenant-unit tenant-unit</td>
<td></td>
</tr>
<tr>
<td>ddboost user option reset user [default-tenant-unit]</td>
<td></td>
</tr>
<tr>
<td>Unsupported command or command option</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>disk add dev disk-id [spindle-group 1-16]</td>
<td>Deprecated. Use storage add instead.</td>
</tr>
<tr>
<td>disk add enclosure enclosure-id</td>
<td>Deprecated. Use storage add instead.</td>
</tr>
<tr>
<td>disk benchmark start</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>disk benchmark show</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>disk benchmark stop</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>disk benchmark watch</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>disk expand</td>
<td>Deprecated. Use storage add instead.</td>
</tr>
<tr>
<td>disk fail enclosure-id disk-id</td>
<td></td>
</tr>
<tr>
<td>disk multipath</td>
<td></td>
</tr>
<tr>
<td>disk port</td>
<td></td>
</tr>
<tr>
<td>disk rescan [enclosure-id disk-id]</td>
<td></td>
</tr>
<tr>
<td>disk show detailed-raid-info</td>
<td>Deprecated. Use disk show state and storage show instead.</td>
</tr>
<tr>
<td>disk show failure-history</td>
<td></td>
</tr>
<tr>
<td>disk show performance</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>disk show raid-info</td>
<td>Deprecated. Use disk show state and storage show instead.</td>
</tr>
<tr>
<td>disk show reliability-data</td>
<td></td>
</tr>
<tr>
<td>disk disk show stats</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>disk unfail</td>
<td></td>
</tr>
<tr>
<td>enclosure beacon</td>
<td></td>
</tr>
<tr>
<td>enclosure show all [enclosure]</td>
<td>This command is supported, but not with the enclosure argument.</td>
</tr>
<tr>
<td>enclosure show chassis</td>
<td></td>
</tr>
<tr>
<td>enclosure show controllers enclosure</td>
<td>This command is supported, but not with the enclosure argument.</td>
</tr>
<tr>
<td>enclosure show cpus [enclosure]</td>
<td>This command is supported, but not with the enclosure argument.</td>
</tr>
<tr>
<td>enclosure show fans</td>
<td></td>
</tr>
<tr>
<td>enclosure show io-cards [enclosure]</td>
<td>This command is supported, but not with the enclosure argument.</td>
</tr>
<tr>
<td>enclosure show memory [enclosure]</td>
<td>This command is supported, but not with the enclosure argument.</td>
</tr>
<tr>
<td>enclosure show nvram</td>
<td></td>
</tr>
<tr>
<td>enclosure show powersupply</td>
<td></td>
</tr>
<tr>
<td>Unsupported command or command option</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>enclosure show summary</td>
<td></td>
</tr>
<tr>
<td>enclosure show temperature-sensors</td>
<td></td>
</tr>
<tr>
<td>enclosure show topology</td>
<td></td>
</tr>
<tr>
<td>enclosure test topology</td>
<td></td>
</tr>
<tr>
<td>filesys archive</td>
<td></td>
</tr>
<tr>
<td>filesys clean update-stats</td>
<td>Deprecated. Use filesys show space instead.</td>
</tr>
<tr>
<td>filesys encryption</td>
<td></td>
</tr>
<tr>
<td>filesys encryption passphrase change</td>
<td>Deprecated. Use system passphrase change instead.</td>
</tr>
<tr>
<td>filesys retention-lock</td>
<td>Deprecated. Use mtree retention-lock instead.</td>
</tr>
<tr>
<td>filesys show compression tier</td>
<td>The tier option is not supported.</td>
</tr>
<tr>
<td>filesys show history</td>
<td>Deprecated. Use filesys show compression daily instead.</td>
</tr>
<tr>
<td>ha create</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>ha destroy</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>ha status</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>ha failover</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>ha online</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>ha offline</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>license</td>
<td>The license commands are not supported because DDVE uses new elicense commands.</td>
</tr>
<tr>
<td>mtree show compression mtree_path tier</td>
<td></td>
</tr>
<tr>
<td>net aggregate</td>
<td></td>
</tr>
<tr>
<td>net config ifname type cluster</td>
<td></td>
</tr>
<tr>
<td>net create interface virtual-ifname</td>
<td></td>
</tr>
<tr>
<td>net create interface physical-ifname vlan vlan-id</td>
<td></td>
</tr>
<tr>
<td>net create virtual vethid</td>
<td></td>
</tr>
<tr>
<td>net destroy virtual-ifname</td>
<td></td>
</tr>
<tr>
<td>net destroy vlan-ifname</td>
<td></td>
</tr>
<tr>
<td>net failover</td>
<td></td>
</tr>
<tr>
<td>net modify virtual-ifname bonding</td>
<td></td>
</tr>
<tr>
<td>net modify virtual-ifname bonding aggregate</td>
<td>failover</td>
</tr>
<tr>
<td>net set portnaming</td>
<td></td>
</tr>
<tr>
<td>ndmp</td>
<td></td>
</tr>
<tr>
<td>Unsupported command or command option</td>
<td>Notes</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ndmpd</td>
<td></td>
</tr>
<tr>
<td>perf * module vtl</td>
<td></td>
</tr>
<tr>
<td>san</td>
<td></td>
</tr>
<tr>
<td>shelf migration start</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>shelf migration status</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>shelf migration suspend</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>shelf migration resume</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>shelf migration precheck</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>shelf migration option</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>shelf migration finalize</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>shelf migration show history</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>snapshot add schedule name [days days] time time [,time...] [retention period]</td>
<td>Deprecated. Use snapshot schedule create instead.</td>
</tr>
<tr>
<td>snapshot add schedule name [days days] time every mins [retention period]</td>
<td>Deprecated. Use snapshot schedule create instead.</td>
</tr>
<tr>
<td>snapshot add schedule name [days days] time time-time [every hrs</td>
<td>mins] [retention period]</td>
</tr>
<tr>
<td>snapshot del schedule {name</td>
<td>all}</td>
</tr>
<tr>
<td>snapshot modify schedule name {[(days days)</td>
<td>time time [,time...]</td>
</tr>
<tr>
<td>snapshot modify schedule name {[(days days)</td>
<td>time time every {mins</td>
</tr>
<tr>
<td>snapshot modify schedule name {[(days days)</td>
<td>time time-time [every {hrs</td>
</tr>
<tr>
<td>snapshot reset schedule</td>
<td>Deprecated. Use snapshot schedule reset instead.</td>
</tr>
</tbody>
</table>
Table 5 Unsupported commands and command options (continued)

<table>
<thead>
<tr>
<th>Unsupported command or command option</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>snapshot show schedule</td>
<td>Deprecated. Use snapshot schedule show instead.</td>
</tr>
<tr>
<td>storage add enclosure enclosure-id</td>
<td></td>
</tr>
<tr>
<td>storage add disk enclosure-id.disk-id</td>
<td></td>
</tr>
<tr>
<td>storage remove enclosure enclosure-id</td>
<td></td>
</tr>
<tr>
<td>storage remove disk enclosure_id.disk-id</td>
<td></td>
</tr>
<tr>
<td>system firmware</td>
<td></td>
</tr>
<tr>
<td>system option set console</td>
<td></td>
</tr>
<tr>
<td>system retention-lock</td>
<td></td>
</tr>
<tr>
<td>system sanitize</td>
<td></td>
</tr>
<tr>
<td>system show anaconda</td>
<td></td>
</tr>
<tr>
<td>system show controller-inventory</td>
<td></td>
</tr>
<tr>
<td>system show nvram</td>
<td></td>
</tr>
<tr>
<td>system show nvram-detailed</td>
<td></td>
</tr>
<tr>
<td>system show oemid</td>
<td></td>
</tr>
<tr>
<td>system upgrade continue</td>
<td></td>
</tr>
<tr>
<td>user</td>
<td></td>
</tr>
<tr>
<td>user change priv</td>
<td>Deprecated, with no replacement.</td>
</tr>
<tr>
<td>vserver config set host</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>vserver config reset</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>vserver config show</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>vserver config perf-stats start</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>vserver config perf-stats stop</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>vserver config perf-stats status</td>
<td>Not supported by DDVE in cloud</td>
</tr>
<tr>
<td>vtl lunmask</td>
<td>Deprecated. Use vtl group instead.</td>
</tr>
<tr>
<td>vtl lunmask add</td>
<td>Deprecated. Use vtl group add instead.</td>
</tr>
<tr>
<td>vtl lunmask del</td>
<td>Deprecated.</td>
</tr>
<tr>
<td>vtl lunmask show</td>
<td>Deprecated. Use vtl group show instead.</td>
</tr>
</tbody>
</table>

Troubleshooting performance issues

You can check DDVE performance statistics as follows:

You can also use the following to monitor benchmark performance:

Extensions to DDOS for DDVE on page 52 provides more information about commands.
CPU Performance

The two key statistics for CPU performance are:

- CPU usage—CPU usage as a percentage during the interval
- CPU ready—The percentage of time that the virtual machine was ready, but could not get scheduled to run on the physical CPU. This counter might not be displayed by default.

If these counters are high, there may be a performance problem on the hypervisor host.

Memory Performance

- Memory swapping—The key statistic for memory performance, which is the current amount of guest physical memory swapped out to the virtual machine’s swap file.

Virtual Disk Performance

The key statistics for virtual disk performance are:

- I/O throughput—A decrease in these values indicates a performance issue.
- I/O latency—An increase in read and write latency values indicates a performance problem.
- Failed commands—An increase in the average number of outstanding read and write requests indicates a performance problem.
APPENDIX A

Best Practices for Working with DDVE in the Cloud

This chapter includes the following topics:

- Supportability ................................................................. 64
- ASUP Configuration .................................................. 64
- Increase GCP resource quota ..................................... 64
- GCP Licensing ............................................................. 65
- Storage best practices .................................................. 65
- Security best practices ................................................ 67
**Supportability**

Use this procedure to connect to the serial console.

**About this task**

The interactive serial console is useful to debug boot and networking issues, troubleshoot malfunctioning instances, interact with the GRand Unified Bootloader (GRUB), and perform other troubleshooting tasks. GCP supports enabling interactive serial console access for an individual instance or an entire project. We recommend enabling the serial console for the DDVE.

**Procedure**

1. Navigate to Compute Engine>VM Instances on the GCP web console.
2. Select your DDVE instance.
3. Click Connect to serial console.
4. In the console dialog box, log in using the DDVE credentials.

__(Note: GCP Serial Console provides more information.)__

**ASUP Configuration**

Enable AutoSupport (ASUP) in DDVE to ensure that ASUPs and alert emails from your system are sent to the DD system.

Set up the following:

- **Administrator:** Enter a password and email address for the Administrator.
- **Email/Location:** Enter the mail server used to send outgoing alert and ASUPs to recipients. Recipients are subscribers to groups. A group that is named default is created with the email address of two subscribers: the administrator and autosupportalert@autosupport.datadomain.com. The location field is for your information, only.
- **Summary:** Review the summary carefully. The default address for alerts and autosupport emails is autosupportalert@autosupport.datadomain.com. A detailed autosupport and an alert summary are scheduled to run daily at 06:00.

**Increase GCP resource quota**

GCP might have a default quota setup for each region/zone for your project. To support DDVE 16 TB, 32 TB, and 96 TB requirements, increase the quota before deploying DDVE. Because only an SSD persistent disk is supported as a data disk, ensure that the SSD persistent disk meets the quota requirement. If you plan to deploy multiple DDVE instances, you might also need to increase other resource quotas, such as CPU number, IP address number, and instance number. __Storage Best Practices__ provides more requirement details.

You can determine each resource requirement by multiplying the number of requirements by the planned instance number. __GCP Resource Quotas__ provides more information about sending a quota increase request.
GCP Licensing

The DDVE license is node locked, which means the same license cannot be used on multiple DDVE instances. To facilitate DDVE license management, we recommend using a served-mode license for multiple DDVE instances.

**Note:**
- The DDVE license might become invalid after removing the first NIC ethV0.
- In the case of a head swap, a served-mode license continues to work on new DDVE instance. Other license types require that you re-activate the license.
- You can create a new DDVE instance from GCP snapshot. A served-mode license is automatically checked out from the license server on the new instance, as long as the license server has sufficient licenses. Other license types require that you re-activate the license.

Storage best practices

**Storage type**

Ensure that you use the appropriate storage type. DDVE on GCP uses the standard persistent disk (HDD) for the root disk. The NVRAM disk and all metadata disks use the SSD persistent disk.

**Note:** For GCP the hard limit of total throughput per instance is 120 MB/s. The HDD disk cannot meet this requirement.

**Storage Specifications for Object Storage for DDVE on GCP**

The following table shows the instance types and storage types required for the Object Store. The compression ratio in your environment might require more metadata disks.

<table>
<thead>
<tr>
<th>DDVE Configuration</th>
<th>Instance Type</th>
<th>Root Disk/ Size</th>
<th>NVRAM Disk</th>
<th>Metadata Disk</th>
<th>Number of Metadata Disks</th>
<th>Data Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 TB</td>
<td>custom-4-163</td>
<td>Standard persistent disk/250 GB</td>
<td>SSD persistent disk/10 GB</td>
<td>SSD persistent disk/1024 GB</td>
<td>1-2</td>
<td>Google Cloud Storage (Regional is recommended )</td>
</tr>
<tr>
<td></td>
<td>84</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 TB</td>
<td>custom-8-327</td>
<td>Standard persistent disk/250 GB</td>
<td>SSD persistent disk/10 GB</td>
<td>SSD persistent disk/1024 GB</td>
<td>1-4</td>
<td>Google Cloud Storage (Regional is recommended )</td>
</tr>
<tr>
<td></td>
<td>68</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>96 TB</td>
<td>custom-16-65</td>
<td>Standard persistent disk/250 GB</td>
<td>SSD persistent disk/10 GB</td>
<td>SSD persistent disk/1024 GB</td>
<td>1-10</td>
<td>Google Cloud Storage (Regional is recommended )</td>
</tr>
<tr>
<td></td>
<td>536</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GCP Machine Types provides more details about GCP instance types.
Note: If DDVE in GCP uses the incorrect instance type, an incorrect virtual hardware configuration alert appears.

Storage Specifications for Block Storage for DDVE on GCP

The following table shows the instance types and storage types required for Block Storage. For DDVE with Block Storage solution, the maximum supported capacity is 16 TB.

Table 7 Storage Configuration Types for DDVE on GCP

<table>
<thead>
<tr>
<th>DDVE Configuration</th>
<th>Instance Type</th>
<th>Root Disk/Size</th>
<th>NVRAM Disk</th>
<th>Data Disk</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 TB</td>
<td>custom-4-16384</td>
<td>Standard persistent disk/250 GB</td>
<td>SSD persistent disk/10 GB</td>
<td>SSD persistent disk/2048 GB</td>
</tr>
</tbody>
</table>

GCP Machine Types provides more details about GCP instance types.

Note: If DDVE in GCP uses the incorrect instance type, an incorrect virtual hardware configuration alert appears.

Storage Size Specifications

The compression ratio in your environment might require more metadata disks.

Table 8 Storage size specifications

<table>
<thead>
<tr>
<th>Capacity Configuration</th>
<th>Instance Type</th>
<th>Storage Configuration Type</th>
<th>Root Disk</th>
<th>NVRAM Disk</th>
<th>Metadata Disk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 16 TB</td>
<td>custom-4-16384</td>
<td>Root Disk</td>
<td>250 GB</td>
<td>10 GB</td>
<td>2 x 1024 GB</td>
</tr>
<tr>
<td>16 TB to 32 TB</td>
<td>custom-8-32768</td>
<td>Root Disk</td>
<td>250 GB</td>
<td>10 GB</td>
<td>4 x 1024 GB</td>
</tr>
<tr>
<td>32 TB to 96 TB</td>
<td>custom-16-65536</td>
<td>Root Disk</td>
<td>250 GB</td>
<td>10 GB</td>
<td>10 x 1024 GB</td>
</tr>
</tbody>
</table>

Note: The metadata requirements that are listed for supported virtualization platforms are based on 10X dedup ratio and 2X compression. Your system configuration may require a higher storage ratio. Expand the storage if required.

Supported Stream Count

Table 9 Supported stream count (Object Storage)

<table>
<thead>
<tr>
<th>Capacity Configuration (TiB)</th>
<th>Instance Type</th>
<th>vCPUs</th>
<th>Memory</th>
<th>Stream Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>vCPUs</td>
<td>Memory</td>
<td>Read</td>
</tr>
<tr>
<td>16</td>
<td>custom-4-16384</td>
<td>4</td>
<td>16</td>
<td>30</td>
</tr>
<tr>
<td>32</td>
<td>custom-8-32768</td>
<td>8</td>
<td>32</td>
<td>50</td>
</tr>
<tr>
<td>96</td>
<td>custom-16-65536</td>
<td>16</td>
<td>64</td>
<td>50</td>
</tr>
</tbody>
</table>
Table 10 Supported stream count (Block Storage)

<table>
<thead>
<tr>
<th>Capacity Configuration (TiB)</th>
<th>Instance Type</th>
<th>vCPUs</th>
<th>Memory</th>
<th>Stream Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Read</td>
</tr>
<tr>
<td>16</td>
<td>custom-4-16384</td>
<td>4</td>
<td>16</td>
<td>30</td>
</tr>
</tbody>
</table>

**Metadata Disk Storage Expansion Notes**

You can deploy metadata disks incrementally. The minimum incremental size is 1 TiB. Add metadata disks as required up to the supported system capacity. The following table lists the recommended number of metadata disks by instance, based on the assumption of 2X overall deduplication ratio (10X deduplication and 2X compression). For workloads with a higher deduplication ratio, additional metadata storage is required.

Table 11 Recommended metadata disks by instance

<table>
<thead>
<tr>
<th>Instance</th>
<th>Recommended metadata disks</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 TB</td>
<td>2</td>
</tr>
<tr>
<td>32 TB</td>
<td>4</td>
</tr>
<tr>
<td>96 TB</td>
<td>10</td>
</tr>
</tbody>
</table>

When adding the volume, there is no need to specify a spindle group. The spindle group assignment is balanced automatically when storage is added. We recommend that you do not manually set or change the spindle group setting. Run `storage show all` to verify that each data volume has been assigned to a different spindle group.

**Data Storage Configuration Notes for Object Storage Solution**

- The bucket that is provided during file system creation must be empty, otherwise file system creation fails.
- When the file system is destroyed, the associated bucket and the objects it contains are not automatically deleted or removed. The bucket be must intentionally deleted to avoid incurred costs with the content stored in the object store.

**Security best practices**

**Avoid public IP address**

To prevent brute force attacks on the DDVE, do not configure DDVE with a public IP address.

**Secure access**

DDVE supports the authentication methods listed in the following table:

Table 12 Access types and authentication

<table>
<thead>
<tr>
<th>Access Type</th>
<th>Authentication Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUI</td>
<td>username/password X509 certificates</td>
</tr>
<tr>
<td>SSH</td>
<td>username/password</td>
</tr>
<tr>
<td></td>
<td>SSH key pair</td>
</tr>
</tbody>
</table>
Table 12 Access types and authentication (continued)

<table>
<thead>
<tr>
<th>Access Type</th>
<th>Authentication Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>REST API</td>
<td>username/password X509 certificates</td>
</tr>
</tbody>
</table>

For better security, we recommend that you disable the username/password-based user authentication. If the username/password based authentication is required, configure it with a strong password.

Note: Do not disable password-based login if you want to configure Avamar Virtual Edition, NetWorker, or other backup software to connect to DDVE in GCP, because these products use password authentication for communication between them.

Security best practices

Because GCP is a public cloud, pay attention to the security in your deployment. We suggest these best practices:

- Use public key based authentication for SSH access.
- Use certificate based authentication for DDSM access.
- Do not configure public IP for DDVE in GCP.
- Enable encryption for DDFS and replication.
- Use an external KMIP server to store encryption keys.

When deploying DDVE from the Google cloud console, you cannot assign a password for the DDVE default user sysadmin, but you can assign a public key for the sysadmin.

Note the important differences between the DDVE and the standard Linux flavor in GCP:

- After deployment, the DDVE SSH user/password login is enabled. The sysadmin default password is changeme. On first login, you must change the password.
- If you assign a public key when deploying DDVE from the Google cloud console, you can access DDVE over SSH key pair.
- For DDVE, the public key is applied only to the sysadmin user. In standard Linux, if you provide a public key with the format ssh-rsa [KEY_VALUE] [USERNAME], and then create a USERNAME, this public key is applied only to this user.

IP Tables feature

After protecting the DDVE using secure setup, in DDVE you can filter the network traffic that enters by using the iptables feature. The Net Filter section of the DD OS Command Reference Guide provides more configuration information.

Firewall rule settings

Because the DDVE instance on GCP is always running in a VPC, configure the VPC so that only required and trusted clients have access to the DD system. The following tables show the TCP and UDP ports that are used by the DD system for inbound and outbound traffic the services that use them. Consider the following information when configuring VPC firewall rules. GCP firewall rules provides more information.

Inbound control

The following table lists the inbound ports used by DDVE.
Table 13 Inbound ports used by DDVE

<table>
<thead>
<tr>
<th>Port</th>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP 22</td>
<td>SSH</td>
<td>Used for SSH (CLI) access and for configuring DDVE.</td>
</tr>
<tr>
<td>TCP 443</td>
<td>HTTPS</td>
<td>Used for DDSM (GUI) access and for configuring DDVE.</td>
</tr>
<tr>
<td>TCP 2049</td>
<td>DD Boost/NFS</td>
<td>Main port used by NFS. You can modify using the nfs set server-port command which requires SE mode.</td>
</tr>
<tr>
<td>TCP 2051</td>
<td>Replication/DD Boost/ Optimized Duplication</td>
<td>Used only if replication is configured (run replication show config on DD system to determine). You can modify this port using replication modify.</td>
</tr>
<tr>
<td>TCP 3009</td>
<td>SMS (system management)</td>
<td>Used for managing a system remotely with DD System Manager. This port cannot be modified. This port must be open if you plan to configure replication from within the DD System Manager, as the replication partner needs to be added to the DD System Manager.</td>
</tr>
</tbody>
</table>

Depending on the protocol that is used to backup data to DDVE, additional ports are enabled with inbound firewall rules. Ports for inbound traffic provides a complete list of all ports enabled for inbound traffic for DD systems.

Outbound control

The following table lists the outbound ports that are used by DDVE.

Table 14 Outboard ports used by DDVE

<table>
<thead>
<tr>
<th>Port</th>
<th>Service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UDP 123</td>
<td>NTP</td>
<td>Used by the DD system to synchronize to a time server.</td>
</tr>
<tr>
<td>TCP 443</td>
<td>HTTPS</td>
<td>Used for DDVE to communicate with outside services.</td>
</tr>
<tr>
<td>TCP 2049</td>
<td>DD Boost/NFS</td>
<td>Main port used by NFS - can be modified using the nfs set server-port command which requires SE mode.</td>
</tr>
<tr>
<td>TCP 2051</td>
<td>Replication/DD Boost/ Optimized Duplication</td>
<td>Used only if replication is configured (run replication show config on DD system to determine). This port can be modified using replication modify.</td>
</tr>
<tr>
<td>TCP 2051</td>
<td>SMS (system management)</td>
<td>Used for managing a system remotely using DD System Manager. This port cannot be modified. This port will also need to be opened if you plan to configure replication from within the DataDomain System Manager, as the replication partner needs to be added to the DD System Manager.</td>
</tr>
</tbody>
</table>

Depending on the other applications/services that are being used, additional ports are enabled for outbound firewall rules. For a complete list of all ports enabled for outbound traffic for DD systems, see Ports for outbound traffic table.
This chapter includes the following topics:

- **VPC architecture**: ..................................................................................................................72
- **Multiple NICs for DDVE in GCP**: .......................................................................................... 72
- **Default DHCP configuration**: .................................................................................................. 72
- **Ports for inbound traffic**: ........................................................................................................ 72
- **Ports for outbound traffic**: ...................................................................................................... 74
VPC architecture

It is recommend that you use public or private subnet architecture to deploy the DDVE in a private subnet. It will secure the DDVEs (VMs) with the appropriate VPC components such as route tables, access control lists, and firewall rules.

Multiple NICs for DDVE in GCP

Follow this guidance when deploying a DDVE with multiple NICs.

- Assign multiple NICs when deploying the DDVE. GCP does not support adding additional NICs after the VM has been deployed.
- Ensure the first NIC eth0 is not disabled
- Ensure that each NIC is in a different VPC. This is a GCP requirement.

Default DHCP configuration

Dynamic Host Configuration Protocol (DHCP) is enabled by default for up to two interfaces in the DDVE. If there are additional interfaces, DHCP can be manually enabled or those interfaces can be configured manually. All the interfaces in DDVE can be configured manually using static IP addresses. However, ensure that the IP addresses are known to the corresponding network interfaces in GCP.

Ports for inbound traffic

The following are the ports that are used by the DD system for inbound traffic.

Table 15 Ports Used by DD System for Inbound Traffic

<table>
<thead>
<tr>
<th>Port</th>
<th>Service</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP 21</td>
<td>FTP</td>
<td>Port is used for control only if FTP is enabled (run 'adminaccess show' on the DD system to determine if this is the case).</td>
</tr>
<tr>
<td>TCP 22</td>
<td>SSH</td>
<td>Port is used only if SSH is enabled (run 'adminaccess show' on the DD system to determine if this is the case).</td>
</tr>
<tr>
<td>TCP 23</td>
<td>Telnet</td>
<td>Port is used only if Telnet is enabled (run 'adminaccess show' on the DD system to determine if this is the case).</td>
</tr>
<tr>
<td>TCP 80</td>
<td>HTTP</td>
<td>Port is used only if HTTP is enabled (run 'adminaccess show' on the DD system to determine if this is the case).</td>
</tr>
<tr>
<td>TCP 111</td>
<td>DDBOOST/ NFS (portmapper)</td>
<td>Used to assign a random port for the mountd service used by NFS and DDBOOST. Mountd service port can be statically assigned.</td>
</tr>
<tr>
<td>Port</td>
<td>Service</td>
<td>Note</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>UDP111</td>
<td>DDBOOST/ NFS (portmapper)</td>
<td>Used to assign a random port for the mountd service used by NFS and DDBOOST. Mountd service port can be statically assigned.</td>
</tr>
<tr>
<td>UDP 123</td>
<td>NTP</td>
<td>Port is used only if NTP is enabled on the DD system. Run ntp status to determine if this is the case.</td>
</tr>
<tr>
<td>UDP 137</td>
<td>CIFS (NetBIOS Name Service)</td>
<td>Port used by CIFS for NetBIOS name resolution.</td>
</tr>
<tr>
<td>UDP 138</td>
<td>CIFS (NetBIOS Datagram Service)</td>
<td>Port used by CIFS for NetBIOS Datagram Service.</td>
</tr>
<tr>
<td>TCP 139</td>
<td>CIFS (NetBIOS Session Service)</td>
<td>Port used by CIFS for session information.</td>
</tr>
<tr>
<td>UDP 161</td>
<td>SNMP (Query)</td>
<td>Port is used only if SNMP is enabled. Run 'snmp status' to determine if this is the case.</td>
</tr>
<tr>
<td>TCP 389</td>
<td>LDAP</td>
<td>LDAP server listens on this port for any LDAP client request. By Default it uses TCP.</td>
</tr>
<tr>
<td>TCP 443</td>
<td>HTTPS</td>
<td>Port is used only if HTTPS is enabled (run adminaccess show on the DD system to determine if this is the case).</td>
</tr>
<tr>
<td>TCP 445</td>
<td>CIFS (Microsoft-DS)</td>
<td>Main port used by CIFS for data transfer.</td>
</tr>
<tr>
<td>TCP 2049</td>
<td>DD Boost / NFS</td>
<td>Main port used by NFS. Can be modified via the 'nfs set server-port' command. Command requires SE mode.</td>
</tr>
<tr>
<td>TCP 2051</td>
<td>Replication / DD Boost / Optimized Duplication</td>
<td>Port is used only if replication is configured on the DD system. Run replication show config to determine if this is the case. This port can be modified via the replication modify command.</td>
</tr>
<tr>
<td>TCP 2052</td>
<td>NFS Mountd / DD BOOST / Optimized Duplication</td>
<td>Main port used by NFS MOUNTD</td>
</tr>
<tr>
<td>TCP 3009</td>
<td>SMS (System Management)</td>
<td>Port is used for managing a system remotely using Web Based GUI DD EM (DD Enterprise Manager). This port cannot be modified. This port is only used on DD systems running DD OS 4.7.x or later. This port will also need to be opened if you plan to configure replication from within the DD GUI interface, as the replication partner needs to be added to the DD Enterprise Manager.</td>
</tr>
<tr>
<td>TCP 5001</td>
<td>iPerf</td>
<td>Port is default used by iperf. To change the port, it requires -p option from se iperf or port option from the net iperf command. The remote side must listen on the new port.</td>
</tr>
</tbody>
</table>
Table 15  Ports Used by DD System for Inbound Traffic  (continued)

<table>
<thead>
<tr>
<th>Port</th>
<th>Service</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP 5002</td>
<td>Congestion-checker</td>
<td>Port is default used by <code>congestion-checker</code>, when it runs <code>iperf</code>. To change the port the new port needs to be specified in the port option of the <code>net congestion-check</code> command. The remote side must also be listen on the new port. It is available only for DD OS 5.2 and above.</td>
</tr>
</tbody>
</table>

Ports for outbound traffic

The following are the ports that are used by the DD system for outbound traffic.

Table 16  Ports Used by DD System for Outbound Traffic

<table>
<thead>
<tr>
<th>Port</th>
<th>Service</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP 20</td>
<td>FTP</td>
<td>Port is used for data only if FTP is enabled (run <code>adminaccess show</code> on the DD system to determine if this is the case).</td>
</tr>
<tr>
<td>TCP 25</td>
<td>SMTP</td>
<td>Used by the DD system to send email autosupports and alerts.</td>
</tr>
<tr>
<td>UDP/TCP 53</td>
<td>DNS</td>
<td>Port is used by DD system to perform DNS lookups when DNS is configured. Run <code>net show dns</code> to review DNS configuration.</td>
</tr>
<tr>
<td>TCP 80</td>
<td>HTTP</td>
<td>Used by DD system for uploading log files to DD Support via the <code>support upload</code> command.</td>
</tr>
<tr>
<td>UDP 123</td>
<td>NTP</td>
<td>Used by the DD system to synchronize to a time server.</td>
</tr>
<tr>
<td>UDP 162</td>
<td>SNMP (Trap)</td>
<td>Used by the DD system to send SNMP traps to SNMP host. Use <code>snmp show trap-hosts</code> to see destination hosts and <code>snmp status</code> to display service status.</td>
</tr>
<tr>
<td>TCP 443</td>
<td>HTTPS</td>
<td>Port is used for communicating with Object store (S3).</td>
</tr>
<tr>
<td>UDP 514</td>
<td>Syslog</td>
<td>Used by the DD system to send syslog messages, if enabled. Use 'log host show' to display destination hosts and service status.</td>
</tr>
<tr>
<td>TCP 2051</td>
<td>Replication / OST / Optimized Duplication</td>
<td>Used by DD system only if replication is configured. Use <code>replication show config</code> to determine if this is the case.</td>
</tr>
<tr>
<td>TCP 3009</td>
<td>SMS (System Management)</td>
<td>Port is used for managing a system remotely using Web Based GUI DD EM (DD Enterprise Manager). This port cannot be modified. This port is only used on DD systems running DD OS 4.7.x or later. This port will also need to be opened if you plan to configure replication from within the DD GUI.</td>
</tr>
</tbody>
</table>

Networking Best Practices for DDVE in the Cloud

PowerProtect DD Virtual Edition on Google Cloud Platform Installation and Administration Guide
### Table 16 Ports Used by DD System for Outbound Traffic (continued)

<table>
<thead>
<tr>
<th>Port</th>
<th>Service</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP 5001</td>
<td>iPerf</td>
<td>Port is default used by iPerf. To change the port, it requires <code>-p</code> option from <code>iperf</code> or <code>port</code> option from the <code>net</code> command. And the remote side must listen on the new port.</td>
</tr>
<tr>
<td>TCP 5002</td>
<td>Congestion-checker</td>
<td>Port is default used by congestion-checker, when it runs <code>iperf</code>. To change the port the new port needs to be specified in the port option of the <code>net congestion-check</code> command. The remote side must also be able to listen on the new port. It is available only for DD OS 5.2 and above.</td>
</tr>
<tr>
<td>TCP 27000</td>
<td>Avamar client communications with Avamar server</td>
<td>Avamar client network hosts.</td>
</tr>
<tr>
<td>TCP 27000</td>
<td>Avamar server communications with Replicator target server (Avamar proprietary communication)</td>
<td>Required if server is used as replicator source.</td>
</tr>
<tr>
<td>TCP 28001</td>
<td>Avamar client communications with administrator server</td>
<td>Avamar clients required.</td>
</tr>
<tr>
<td>TCP 28002</td>
<td>Administrator server communications with Avamar client</td>
<td>Optional for browsing clients and cancelling backups from Avamar administrator management console.</td>
</tr>
<tr>
<td>TCP 29000</td>
<td>Avamar client Secure Sockets Layer (SSL) communications with Avamar server</td>
<td>Avamar clients required.</td>
</tr>
<tr>
<td>TCP 29000</td>
<td>Avamar server SSL communications with Replicator target server</td>
<td>Required if server is replicator source.</td>
</tr>
</tbody>
</table>
APPENDIX C

Installing and Configuring DDVE on Block Storage in the Cloud

This chapter includes the following topics:

- Deploying DDVE on Google Cloud Platform Block storage .......................................................... 78
- Configuring DDVE block storage on the Google Cloud Platform ..................................................... 87
Deploying DDVE on Google Cloud Platform Block storage

You can deploy DDVE on GCP block storage using the GCP console or by using a shell script. Ensure that your system meets the requirements in the following table:

Table 17 GCP System Requirements

<table>
<thead>
<tr>
<th>Instance type</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>4 cores</td>
</tr>
<tr>
<td>Memory</td>
<td>16 GiB</td>
</tr>
<tr>
<td>System Disk</td>
<td>Boot disk: 250 GB Standard persistent disk</td>
</tr>
<tr>
<td></td>
<td>NVRAM disk: 10 GB SSD persistent disk</td>
</tr>
<tr>
<td>Storage Capacity</td>
<td>16 TB</td>
</tr>
</tbody>
</table>

Creating a DDVE instance using a deployment script

The DDVE for Google Cloud Platform (GCP) package contains the DDVE root disk zip file and deployment scripts for Linux and Windows.

Before you begin

Install and configure Google Cloud SDK on your PC before deployment.

- Before running the deployment script, create your own project, virtual network (VPC), and subnet. Verify that the VPC and subnet are available in your zone.
- To install Google Cloud SDK on Linux, refer to Quickstart for Linux.
- To install Google Cloud SDK on Windows, refer to Quickstart for Windows.
- Configure Google Cloud SDK with your setup for project, zone, and so forth.

About this task

The following steps describe how to create DDVE from a Linux shell script. The Windows Powershell script uses the same options. Replace the sample values with values appropriate to your environment.

Note:
- The \(-C\) 16TB parameter is optional. 16 TB is the only supported configuration.
- In the second deployment command, <dir> is the path to the zip file ddve-gcp.tar.gz that was unzipped from the DDVE for GCP image package. You can use either the absolute path or the relative path.
- In the second deployment command, mybucket is the GCP bucket where the ddve-gcp.tar.gz file will be uploaded. If you do not specify the bucket, all the xx.tar.gz files will upload to the ddve-gcp-bucket by default.
- You can manually create a DDVE image from a local ddve-gcp.tar.gz using the following commands:

  ```
  $ gsutil cp ddve-gcp.tar.gz gs://mybucket/
  $ gcloud compute images create myimage --source-uri gs://mybucket/ddve-gcp.tar.gz
  ```
Procedure

1. Download the DDVE image package from the Online Support site and extract the contents.
   The package contains the DDVE root disk file and the following deployment scripts: `gcp-deploy-linux.sh` for Linux shell and `gcp-deploy-windows.ps1` for Windows Powershell.

2. Do one of the following:
   - If you have already created a DDVE image in your project in GCP, create a DDVE instance with the following parameters:

     ```bash
     $ ./gcp-deploy-linux.sh -n myddve0 -i myimage -z myzone -v myvpc -s mysubnet -p myproject <-c 16TB>
     Google Cloud SDK 195.0.0
     bq 2.0.30
     core 2018.03.23
     gsutil 4.29
     Starting deployment ...
     Creating disk. It may take some time ...
     Succeed.
     Creating DDVE ...
     Succeed.
     Summary:
     ==========================================================================
     DDVE name: myddve0
       cpu: 4 cores
       memory: 16 GB
       capacity: 16TB
     image name: myimage
       project: myproject
       vpc name: myvpc
       subnet name: mysubnet
       private IP: 10.10.9.14
     ==========================================================================
     ```

   - If the image does not exist in GCP, run the appropriate script with the following parameters to automatically create an image and the DDVE instance.

     ```bash
     $ ./gcp-deploy-linux.sh -n myddve0 -f <dir>/ddve-gcp.tar.gz -b mybucket -z myzone -v myvpc -s mysubnet -p myproject <-c 16TB>
     ```

Creating a DDVE instance from the GCP console

If you have already created a DDVE image, you can deploy DDVE from the Google Cloud Console (GCP).

Procedure

1. Login to GCP console at [https://console.cloud.google.com](https://console.cloud.google.com) and verify the values for the project, VPC, subnet, and DDVE image.
2. Create the DDVE instance from the image:
   a. Click **CREATE INSTANCE** to launch virtual machine creation.
   b. Specify the virtual machine name, select the zone where the VPC and subnet are created, and customize the CPU to 4 cores and memory to 16 GB.
   c. Click **Change** and select the DDVE image as the boot disk. Verify that the disk type is **Standard Persistent Disk** and the size is 250 GB.
## Installing and Configuring DDVE on Block Storage in the Cloud

### Create an Instance

| Name | myddve1 |
| Zone | us-central1-a |
| Machine type | Customize to select cores, memory and GPUs. |
| 4 vCPUs | 16 GB memory |

**Boot disk**

- New 10 GB standard persistent disk
- Image: Debian GNU/Linux 9 (stretch)
- Change

**Identity and API access**

- Service account: Compute Engine default service account
- Access scopes
  - Allow default access
  - Allow full access to all Cloud APIs
  - Set access for each API

### Boot Disk

Select an image or snapshot to create a boot disk, or attach an existing disk.

<table>
<thead>
<tr>
<th>OS images</th>
<th>Application images</th>
<th>Custom images</th>
<th>Snapshots</th>
<th>Existing disks</th>
</tr>
</thead>
</table>

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### Boot Disk Type

- Boot disk type: Standard persistent disk
- Size (MB): 250
d. Select **Management, disks, networking, SSH keys** > Disks > Add item to create the NVRAM disk. From the disk name list, select **Create disk**. Specify the NVRAM disk name, and set the following parameters:

- Disk type—SSD persistent disk
- Source type—None (blank disk)
- Disk size—10 GB
e. From the Networking tab, set the following parameters:

- **Network**—Select your VPC
- **Subnetwork**—Your subnet
- **External IP**—If you have already setup your own jump box in this subnet and want to access the DDVE only through the jump box, select **None**.
f. (Optional) Assign an SSH key for the sysadmin user.

To add more SSH keys to DDVE, click **Add item**. The SSH key is only for the sysadmin user.

g. Deploy DDVE.
Results
The DDVE instance appears.

Enabling or updating SSH keys after deployment

DDVE supports assigning SSH keys during deployment from the Google Cloud console, but you cannot use the Google Cloud console to update SSH keys after deployment. DDVE adds both project-wide and instance-level SSH keys only during the first boot. Use this procedure to enable or update SSH keys.

Procedure

1. Generate SSH key pairs in any Linux client if you do not have SSH keys ready.

```
$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/yourusername/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/yourusername/.ssh/id_rsa.
Your public key has been saved in /home/yourusername/.ssh/id_rsa.pub.
The key fingerprint is:
SHA256:QcPMwxTVRMpDZ3SrnmZKm4mLpmdhmSHAt4hpjTf6FD4
yourusername@yourlinuxclient
The key's randomart image is:
+---[RSA 2048]----+
| .     *=oo=* .  |
|  o .  .*+ +.. . |
| oo+ .  ..+   .  |
|oo.=o .  . . .   |
|. + o. +S   .    |
| . E  =    . .   |
|  o .. .  . =    |
|   .  +. o B     |
|    .=. o.=      |
+----[SHA256]-----+
```

Default options create a pair of SSH keys in the $HOME/.ssh/ directory. The private key file is id_rsa, and the public key file is id_rsa.pub.

2. Run the following command to add the public key content to DDVE: adminaccess add ssh-keys user sysadmin

```
sysadmin@myddve1# adminaccess add ssh-keys user sysadmin
Enter the key and then press Control-D, or press Control-C to cancel.
```

```
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQCyYNyPI1QjpmWbdjBqTqke7q13wc97k5JpygX9EeLNEY3VQozAJsflhwrpkPnyQqKisYX0V3johwQkiK2ct2/1MUEp8MvMCaDhIzKf70rJ7DNg15P81ILh/dhCxe6W0cr1WcG6UE+1dHzbRrphhMzdC2CNJ3nh/GLmpQGASHtCJZMrXzUHCqu/vivedm6y2bsNyeCdbJ6MJwaQ2FnKUhGAYeD17SdsXb+kizOJ6J5dJHkDhIY21NFF5jclpkoM694wvfsupe
```
SSH key accepted.

Note:
- You can disable some key pair access by deleting the corresponding key from DDVE with the following command: `adminaccess del ssh-keys <lineno> user sysadmin`.
- You can list keys and get the `<lineno>` by running the following command: `adminaccess show ssh-keys user sysadmin`.

```
sysadmin@<DDVE-name># adminaccess show ssh-keys user sysadmin
User "sysadmin" :
  1 ecdsa-sha2-nistp256
    AAAAE2VjZHNhLXNoYTItbmlzdHAyNTYAAAIblmldHAvNyNTYAAAABBBGKQpC6UL9Nd5yGj4G
    srdKbbFtnCtd7hs1yXZI/xrZdD3DDB0piKAKV8dLJrLjgSf0pxA3flrOQxha77cy8=
    google-ssh {"userName":"cloudboost.blr@gmail.com","expireOn":"2018-08-28T09:07:10+0000"}
  2 ecdsa-sha2-nistp256
    AAAAE2VjZHNhLXNoYTItbmlzdHAyNTYAAAImfr0lmdHAvNyNTYAAAABBBPfRza
    +rT93vmT9xqRHHwvjInAxG3Hx8q4pGzY5jv1uVmlKNvYedmESCxxuSjKOD8hJko
    +e6mnV120lzF1y5k= google-ssh {"userName":"cloudboost.blr@gmail.com","expireOn":"2018-08-28T09:06:51+0000"}
  3 ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAGt7Gb11IR70bo/Yj98Dr10LbhTuvtTJvPe21bZK6CUPZLbVzvg7TqM+Y0ANr7lpnpx
    +fc26zwkNKNHRl6oiH3cjI6oViq6y686VM8pX0vk14n0bemkk8MhohkoIF07Y26Ec6fqsVdj
    cq4rC18ivs4boOCtc6
qAG11ycZy2xG8w8DcWgak112+TPzkBoGpFboDkrrEbbUN51QthW5iok500cMvPoiAwejeften
    1X6k9x3CgeBSr+c69gUmyj1XjfxAU2qdfQDcWcRezIzLjK37nChrJ
    +7o5ekFX3hbaStosTS9WmrxhZU65QejeKJXK9SQyj7jkn5uZVF99eDrwGle= google-ssh
    {"userName":"cloudboost.blr@gmail.com","expireOn":"2018-08-28T09:06:50+0000"}
  4 ecdsa-sha2-nistp256
    AAAAE2VjZHNhLXNoYTItbmlzdHAyNTYAAAImfr0lmdHAvNyNTYAAAABBBQ1HwWgDlph7Z1ZYEYf
    qzNV2YFBjXeCoFMVjeWhhLSK6XG1jmySpqsyZMme/NcXwc2mzeN6Rkxj50bQ3nB0o=
    google-ssh {"userName":"cloudboost.blr@gmail.com","expireOn":"2018-08-28T09:06:46+0000"}
  5 ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQCBkkwQaZpErCrAuuaDI1MysqnC
    +x8B3MVJ0rSFrIEmvucwoX68/86r+y6t1QW/3
    JKWVJilcA15+MVdD9udGqPAlve3cD0MvIIY3CH0Y6Y
    +EZyq2iLYXkOfE1Ch3XVAGE6Nh88Buhm/6mFm/6sGC3Jhrl4pKc
    wUCdx3TywGt2SCMBumXts/QC0X50rhoq6/i7iyyyQ2SAWT1C3xO51m5S/
    TcphAma53Z8j9dP210KgFyuhzh299D9zdPqJr8VkJF1BrAz4pp6y1ZoNy3xgjzms5RJPYIYTur
    OK9hPylhWmj01Zyrbviqu4a57KYSFWcbAd1eIGyqdWooop/OYPLNDR google-ssh
    {"userName":"cloudboost.blr@gmail.com","expireOn":"2018-08-28T09:06:45+0000"}
```

3. Run the following command to disable password login for additional security: `adminaccess option set password-auth disabled`.

```
sysadmin@myddve1# adminaccess option set password-auth disabled
** Disabling password based authentication will disallow users to login using password. **
Ensure users have other login option(s) configured to access the
```
Adding NICs for DDVE

By default, DDVE is provisioned with one NIC for Google Cloud Platform. You cannot add more NICs to existing virtual machines, but you can create a DDVE with multiple NICs when you deploy the DDVE instance.

Procedure
1. Configure each NIC with a different VPC. Creating Instances with Multiple Network Interfaces provides additional information.
2. Add additional NIC cards.
   For a customized instance type, you can add one NIC per vCPU, up to a maximum of 8 NIC cards.

Adding disks for DDVE from the GCP Console

Before you begin
- Verify that sufficient licensed capacity is available to add capacity to the DDVE instance.
- Ensure that the DDVE instance can support the new capacity. DDVE in GCP supports up to 16 TB.

About this task
Although GCP provides four types of disk storage, DDVE supports only the following:
- Standard persistent disk—for the root disk
- SSD persistent disk—for NVRAM disk and data disks

Note: An NVRAM disk is not required when deploying from the DDVE script, but you must create an NVRAM disk when deploying DDVE from the Google Cloud console.

New storage for the DDVE must meet the following requirements:
- The minimum size of the first data disk is 477 GiB (512 GB). We recommend 2 TB.
- The recommended size for any subsequent data disks is 2 TB.

Procedure
- Create the NVRAM disk provides instructions to add a data disk to DDVE.

Configuring DDVE block storage on the Google Cloud Platform

You can configure block storage using the DDSM interface or the CLI interface.

Configuring DDVE block storage in GCP using the DDSM interface

Procedure
1. Login to DD System Manager using the DDVE IP address. The default login credentials for the DDVE instance are sysadmin/changeme.
2. Add licenses. Select from the following licenses to apply:
   - Pre-installed Evaluation License
   - License file
   - License Server (if license server is available)

3. Accept the End User License Agreement.

4. Complete the configuration wizard, as follows:
   a. For Network Settings accept the default settings, and click No to move to the File System settings.
   b. Click Yes to configure the File System settings.
   c. For Storage type, select Block Storage.
   d. Click Add to Tier, verify the disk is shown in the Active Tier, and click Next.
   e. Review the summary and click Submit to create and enable the file system.

The DDVE configuration is complete. To view space usage and availability details for the Active Tier, select Data Management > File System.

**Configuring DDVE block storage in GCP using CLI**

You can configure DDVE block storage in GCP using the Command Line Interface (CLI) on Google Cloud Platform.

**About this task**

If you assigned an SSH key for the default user sysadmin when you deployed DDVE from the Google Cloud console, login to DDVE using either a key pair or a password.

**Procedure**

1. Log in to the DDVE instance to configure the system. The default login credentials for the DDVE instance are sysadmin/changeme.

```
# ssh sysadmin@<IP address of DDVE>
EMC DD Virtual Edition
```
Password: 
Welcome to DD OS 6.2.0.10-xyz 
------------------------------------------ 
sysadmin@myddve0#

2. During the first login, you are prompted to accept the EULA and change the password. The configuration wizard is launched.

3. Follow the steps in the wizard to add the elicense.

Do you want to configure system using GUI wizard (yes|no) [no]:
Network Configuration
Configure Network at this time (yes|no) [no]:
eLicenses Configuration
Configure elicenses at this time (yes|no) [no]: yes
Available elicense Files
#  File Name
-  ------------
  1  elicense.lic
-  

Do you want to use an existing elicense file (yes|no) [yes]: yes
Enter the index of elicense file [1|cancel] : 1
Pending elicense Settings
Existing Licenses: Capacity licenses:
##  Feature    Capacity    Type              State
Expiration Date   Note
--  --------   -----------   ---------------------   ----
---------------   ----
1  CAPACITY   0.45 TiB   unexpired evaluation   active   n/a
--  --------   -----------   ---------------------   ----
---------------   ----
Feature licenses:
##  Feature                     Count   Type
State    Expiration Date   Note
--  -------------------------   -----   ----------------------
------  ---------------   ----
1  REPLICATION                     1   unexpired evaluation
active   n/a
2  DDBOOST                         1   unexpired evaluation
active   n/a
3  RETENTION-LOCK-GOVERNANCE       1   unexpired evaluation
active   n/a
4  ENCRYPTION                      1   unexpired evaluation
active   n/a
--  -------------------------   -----   ----------------------
------  ---------------   ----
New Licenses: Capacity licenses:
##  Feature    Capacity    Type              State
Expiration Date   Note
--  --------   -----------   ---------------------   ----
---------------   ----
1  CAPACITY   87.31 TiB   permanent (int)   active   n/a
--  --------   -----------   ---------------------   ----
---------------   ----
** New license(s) will overwrite existing license(s).
   Do you want to save these settings (Save|Cancel|Retry): Save

Successfully updated eLicenses.

Filesystem Configuration
   Configure Filesystem at this time (yes|no) [no]:

System Configuration
   Configure System at this time (yes|no) [no]:

CIFS Configuration
   Configure CIFS at this time (yes|no) [no]:

NFS Configuration
   Configure NFS at this time (yes|no) [no]:

SMT Configuration
   Configure SMT at this time (yes|no) [no]:

Storage object-store profile Configuration
   Configure Storage object-store profile at this time (yes|no) [no]:

Configuration complete.

4. Run the following command to add storage:
   # storage add tier active dev3

   sysadmin@myddve1# disk show state
   Dev  1  2  3
   ---  -----
   1-3  Y  Y  U
   ---  -----

   Legend   State            Count
   ------   --------------   -----
   U        Unknown Device   1
   Y        System Device    2
   ------   --------------   -----
   Total 0 disks and 3 devs

   sysadmin@myddve1# storage add tier active dev3

   Object-store is not enabled. Filesystem will use block storage for user data.
   Do you want to continue? (yes|no) [no]: yes

   Checking storage requirements...done
   Adding dev3 to the active tier...done
   Updating system information...done
   dev3 successfully added to the active tier.

5. Run the following command to add multiple storage devices at the same time.

   # storage add tier active dev4-6

   Checking storage requirements...done
   Adding dev4 to the active tier...done
   Updating system information...done
dev4 successfully added to the active tier.

Checking storage requirements... done
Adding dev5 to the active tier... done
Updating system information... done
dev5 successfully added to the active tier.

Checking storage requirements... done
Adding dev6 to the active tier... done
Updating system information... done
dev6 successfully added to the active tier.

6. Run the following command to view the attached disks. 
   `# storage show all`

   ```
   sysadmin@myddvel1# storage show all
   Active tier details:
   Device Group Device Size
   ----------- ------- ------ -------
   (available) 3 1.0 TiB
   ----------- ------- ------ -------
   Spindle Group Devices Count Total Size
   ------- ------ ----- ------- -------
   1 3 1 1.0 TiB
   ------- ------ ----- ------- -------
   Current active tier size: 1.0 TiB
   Active tier maximum capacity: 16.0 TiB
   ```

   Capacity License:
   License Total Used Remaining
   -------- --------- ------- --------
   CAPACITY 14.55 TiB 0.90 TiB 13.65 TiB

7. Run the following command to create the file system. 
   `# filesys create`

   ```
   sysadmin@myddvel1# filesys create
   A filesystem of approximate size 846.65 GiB will be created.
   Do you want to continue? (yes|no) [yes]: yes
   ok, continuing.
   This will take 5 - 10 minutes.
   Provisioning storage...
   ######################################################### [100%]
   Initializing filesystem...
   ######################################################### [100%]
   snapshot schedules deleted
   ```
You now have a freshly initialized filesystem. Enable the filesystem using 'filesys enable'.

8. Run the following command to enable the file system

```bash
# filesys enable
```

```
sysadmin@myddve1# filesys enable
Please wait..............................
The filesystem is now enabled.
```

**Note:** If the license file cannot be found in /ddr/var its content can be pasted in the console.

```bash
# elicense update license.lic
Existing licenses:
No licenses found.
New licenses:
Capacity licenses:
++ Feature    Capacity    Type              State    Expiration Date   Note
  1    CAPACITY   87.31 TiB   permanent (int)   active   n/a

** New license(s) will overwrite all existing license(s).

Do you want to proceed? (yes|no) [yes]: yes

`elicense(s) updated.`

Results
The DDVE configuration is complete.
To manually add an elicense or to update an elicense after the initial configuration, place the license file in the folder, /ddr/var/license.lic, and then run the command `elicense update license.lic`.

System Headswap for DDVE block storage in GCP

A system headswap recovers a DDVE instance from a head unit failure. The head unit refers to the DDVE root disk.

About this task

**Note:** The failed instance is referred to as instance A. The new instance is instance B.

Procedure

1. Create instance B with the same instance type and DD OS build. Do not create an NVRAM disk for the new instance.
2. Detach the NVRAM and data disks from the failed head unit (instance A).
3. If instance B was deployed with an NVRAM disk, detach the NVRAM disk, then attach the NVRAM and data disks from instance A to instance B with the same order. Save the configuration of instance B.

4. Run the system headswap command on instance B.

| Note: | The system restarts during the headswap process. |

```
# system headswap
```

This command returns the system back to its prior operational conditions. The system will be rebooted before resuming normal operations.

```
** If system passphrase was set on the old head, you will need to do one of the following after headswap completes:
  - unlock the filesystem if you have encrypted data, or
  - set the system passphrase if you don't have encrypted data

Are you sure? (yes|no) [no]: yes

ok, proceeding.

Please enter sysadmin password to confirm 'system headswap':
```
Restoring the system configuration, do not power off / interrupt process ...
```

```
Broadcast message from root (Fri May 25 07:12:35 2018):
The system is going down for reboot NOW!
```
5. Verify the file system status after the headswap process completes.

```
# filesys status
The filesystem is enabled and running.
```