Data Domain Virtual Edition (DD VE) in Google Cloud Platform (GCP)
Version DD VE 4.0 with DD OS 6.2.0.10

Installation and Administration Guide
302-005-341 REV 03
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## Revision history

*Table 1* DD VE 4.0 in Google Cloud Platform Installation and Administration Guide revision history

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
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<tr>
<td>03</td>
<td>March 2019</td>
<td>Editorial updates</td>
</tr>
<tr>
<td>02</td>
<td>February 2019</td>
<td>DD OS 6.2.0.10 Release</td>
</tr>
<tr>
<td>01</td>
<td>December 2018</td>
<td>Initial Publication (with DD OS 6.2.0.5).</td>
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</tbody>
</table>
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 Data Domain Virtual Edition (DD VE) systems.

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

Related documentation
The following publications and websites provide additional information:

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

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.

Technical support
For technical support of this release of DD VE, go to Online Support at 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.
CHAPTER 1

Introduction to DD VE

This chapter includes the following topics:

- What is DD VE? ................................................................. 10
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What is DD VE?

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

DD VE runs the Data Domain Operating System (DD OS), and provides the DD OS command line interface (CLI) and the Data Domain System Manager graphical user interface (GUI) for performing all system operations.

DD VE maintains the core Data Domain features that differentiate it as the industry-leading protection storage. This includes high-speed, variable length deduplication for a 10 - 30x reduction in storage requirements, unparalleled data integrity to ensure reliable recovery, and seamless integration with leading backup and archiving applications.

DD VE also comes with DD Boost, which speeds backups by 50%, DD Encryption for enhanced security of data, and DD Replicator, which enables network efficient replication for faster time-to-DR readiness.

DD VE runs on two types of platforms, on premises or in the cloud. On premises, DD VE supports VMware, Hyper-V, KVM, and VxRail. In the cloud, DD VE also runs in the Amazon Web Services (AWS) (cloud and gov cloud), Azure (cloud and gov cloud), VMware Cloud on AWS cloud platforms, and Google Cloud Platform (GCP). For more information about the features and capabilities of Data Domain systems (both physical and virtual), see the Data Domain Operating System Administration Guide.

DD VE cloud capabilities

<table>
<thead>
<tr>
<th>Type</th>
<th>Resource Configuration Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD VE on Block Storage</td>
<td>up to 16 TB</td>
</tr>
<tr>
<td>DD VE 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 and unsupported Data Domain protocols and features in DD VE.

**Supported Data Domain protocols**
- DD Boost over IP
- DD Boost FS

**Supported Data Domain features**
- DD Boost managed file replication (MFR)
- Encryption
- MTree replication
- Data Domain System Manager GUI for DD VE management
- Secure multitenancy (SMT) with Network Isolation Support in 6.0
- DD Boost for Big Data
- Key Management Interoperability Protocol (KMIP)
- More restricted IPtables settings

**Note**

DD VE 4.0 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
- On-prem to cloud and converse replication

Please see the DD OS Administration Guide, DD Boost OST Guide, DD Boost for Partner Integration Administration Guide for additional information about the supported protocols and features above.
CHAPTER 2

Deploy the DD VE

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Deploying DD VE on the Google Cloud Platform

The following provides general guidelines to deploy, configure, and run DD VE on GCP (Google Cloud Platform) with Active Tier on Google Cloud Object Storage.

Prerequisites to Deploy DD VE in GCP

The following are prerequisite steps to complete before the DD VE can be deployed in GCP:

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 DD VE image

Set up the environment

Procedure

1. Install and configure Google Cloud SDK on your PC before deployment.
   - To install Google Cloud SDK on Linux, see Quickstart for Linux.
   - To install Google Cloud SDK on Windows, see Quickstart for Windows.
   - 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 the intended ones.

   **Example 1 Verify values using** `gcloud config list`

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

   **Note**

   These steps are applicable for deployment using Linux shell script or Windows Powershell script only.

Provisioning information

The following information should be available before beginning deployment:
Table 3 Provisioning Information

<table>
<thead>
<tr>
<th>Provisioning</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Subnet ID</td>
<td></td>
</tr>
<tr>
<td>Firewall rules</td>
<td></td>
</tr>
<tr>
<td>Key-value pair or Username/Password</td>
<td></td>
</tr>
</tbody>
</table>

Enabling Private Google Access

The DD VE object store solution needs network connectivity to 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. Please see Configuring Private Google Access for more information.

Note

We strongly recommend that you enable Private Google Access for security and efficiency. Do not, under any circumstance, enable or attach a public IP address to DD VE in the cloud.

This is an excerpt of steps to enable Private Google Access.

Create bucket in Google Cloud storage

These steps enable you to create a bucket in GCP.

The bucket should be created in the same region as the DD VE instance.

Procedure

1. Navigate to Storage > Browser.
2. Click **Create Bucket**.

3. Enter bucket name and other required parameters and click **Create**.

DD VE supports these storage classes.

- Regional (Recommended)
- Multi-regional

**Note**

- We recommend you select the storage class as **Regional** and choose the same region used for the DD VE instance.
- **Multi-regional** should only be used if the user is in a location where no data centers are available as regional locations.

These storage classes are not supported:

- Nearline
- Coldline
Alternatively, you can also create a bucket using `gsutil`. Please follow the steps at this link: Creating Storage Buckets. Make sure you are providing 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**

These steps enable you to get secret/access keys from the GCP web console.

**Procedure**

1. Login to the GCP web console.

2. On GCP web console, go to Storage > Settings.

3. Click on **Interoperability** tab.

4. Copy the secret and access key from this page. If the keys do not exist, create keys by clicking button **Create a new key**.
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 of storage.legacyBucketWriter can be granted on the bucket that is created in Create Bucket in GCP. The permissions that are included in that role are:

- storage.objects.list
- storage.objects.create
- storage.objects.delete
- storage.buckets.get

Note

The following access and secret keys are for illustration purposes only. Use access and secret keys belonging to your own account.

For more information:

- Access Control Lists (ACLs): https://cloud.google.com/storage/docs/access-control/lists
- 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

Create DD VE image

Choose one of these options to create a DD VE 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 DD VE instances.


Complete the following before you create a DD VE image:
Procedure

1. Download the DD VE image package from the Online Support site.
   `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 DD VE 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 DD VE using CLI.

Create a DD VE image using the GCP web console

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 GCP web console
2. Navigate to Compute Engine>Images
Deploy the DD VE

3. Click on [+Create Image]

4. Enter values for all the required fields. Select Source as “Cloud Storage file” and click on Browse. Then search for the bucket you created, for example “bucket-1” and select the DD VE image packet, for example, `ddve-gcp-6.2.0.10-xyz.tar.gz`. 
5. Click Create.

Create a DD VE image using gcloud command (Alternative Approach):

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

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

**Procedure**

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

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

**Deploy DD VE in GCP**

DD VE can be deployed in GCP using one of the following ways:

- Linux shell script
- Windows PowerShell
- GCP web console

We strongly recommend deployment using Linux shell script because it will automatically create and attach metadata disks as per Storage Best Practices in the correct order for the DD VE.
Deploy the DD VE using Linux shell script

Note
You can skip this section if you choose to deploy a DD VE using Windows Powershell Script or GCP Web Console.

The user deploying the DD VE using the script should be granted the following roles:
- Compute Instance Admin
- Storage Admin*

Alternatively, for more granular access of services, the following set of permissions can be granted.

Note
If a user has been granted the roles above, there is no need to add these permissions.

- 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/permission is only required when using the `-f` and `-b` options for deployment. After creating DD VE image, deploy a DD VE using the Linux script with the following parameters
Deploy the DD VE using Linux shell script

Note

Replace the example values with values appropriate to your own environment.

```bash
./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 meta data 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 DD VE ...
  Succeed.

Summary:
=====================================================================
  DD VE name: myddve
  cpu: 16 cores
  memory: 64GB
  capacity: 96TB
  image name: myimage
  project: myproject
  zone: myzone
  vpc name: myvpc
  subnets name: mysubnet
  private IP: myIP
  Object store configured:
    number of metadisks: 10
    size of metadisks: 1TB
=====================================================================
```

Note: Use the following options, as needed:

- `-n` to provide DD VE name
- `-i` to provide DD VE 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 DD VE with Object Store. With Linux script, you don't need to provide any value for this option.

The project and zone options are optional. If the zone or project is not specified, the system uses the default values from the gcloud config list.

The script automatically creates the recommended metadata disks, per selected configuration (-c option). No need to add disks manually. The -m option can override this number.
- For 16 TB: 2 metadata disks
- For 32 TB: 4 metadata disks
- For 96 TB: 10 metadata disks

Deploy DD VE using Windows PowerShell script (Alternate Approach)

You can skip this section if you choose to Deploy the DD VE using Linux shell script or Deploy DD VE from the GCP Web Console. The permissions required to deploy a DD VE using the PowerShell script can be found here.

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

Note

Refer to Microsoft Running Scripts for more information.

3. Run the following command from Windows PowerShell

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

Note

Replace the example values with values appropriate to your own environment.

```
# .\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 DD VE ...
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:
========================================

<table>
<thead>
<tr>
<th>DD VE name: myddve0</th>
</tr>
</thead>
<tbody>
<tr>
<td>cpu: 16 cores</td>
</tr>
<tr>
<td>memory: 64GB</td>
</tr>
<tr>
<td>capacity: 96TB</td>
</tr>
<tr>
<td>image name: my-image</td>
</tr>
<tr>
<td>project: my-project</td>
</tr>
<tr>
<td>zone: myzone</td>
</tr>
<tr>
<td>vpc name: myvpc</td>
</tr>
<tr>
<td>subnets name: mysubnet</td>
</tr>
<tr>
<td>private IP: 10.10.11.52</td>
</tr>
<tr>
<td>Object store configured:</td>
</tr>
<tr>
<td>number of metadisks: 10</td>
</tr>
<tr>
<td>size of metadisks: 1TB</td>
</tr>
</tbody>
</table>

Note: Use the following options, as needed:

- `-n` to provide DD VE name
- `-i` to provide DD VE 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 DD VE with Object Store. For Windows Powershell script, the value of this option is always 1.

Deploy DD VE from the GCP Web Console (Alternate Approach)

You can skip this section if you choose to Deploy the DD VE using Linux shell script or Deploy the DD VE using Windows PowerShell script.
DD VE can also be deployed from the GCP Web console using the DD VE image created in previous sections.

The user deploying from the GCP Web Console should be granted the role Compute Instance Admin

Alternatively, for more granular access of services, the following set of roles and additional permissions can be granted (Note: if a user has been granted the roles above, there is no need to add these roles/permissions):

**Role**
- Compute Viewer

**Permissions:**
- compute.disks.create
- compute.disks.use
- compute.images.useReadOnly
- compute.instances.create
- compute.subnetworks.use

Refer to Google Cloud Understanding Engine Roles for more information.

**Procedure**

2. Create the DD VE 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 and memory to the desired values based on the configuration type you want to deploy. Please refer to section **Storage Best Practices** for more information on supported configurations.

   For example: Customize CPU to 16 cores and memory to 64GB for a 96TB DD VE.
c. Click **Change**, under **Boot Disk** section. then click on **Custom Images** and select the DD VE image as the boot disk. Verify the disk type is **Standard Persistent Disk** and the size is 250 GB.
d. On bottom of the screen, click the link **Management, security, disks, networking, sole tenancy**. Click Disks and then click **Add new disk** to create the NVRAM disk.

![Image of disk addition process]

- 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.

---

**Deploy the DD VE**
f. After adding the NVRAM disk, add metadata disks to the DD VE. The recommended number of metadata disks by capacity:

- For 16 TB: 2
- For 32 TB: 4
- For 96 TB: 10

Note

The number of metadata disks you need to add depends on the assumption of 20x overall dedup ratio (10x dedup and 2x compression). For workloads with higher dedup ratio, more metadata storage is needed.

g. From the Networking tab, select your VPC for Network and pick your subnet for Subnetwork. If you have already setup your own jump box in this
subnet and want to access the DD VE only through the jump box, set 
External IP to None.

h. DD VE supports assigning SSH key when deploying from Google Cloud 
Console for the sysadmin user. This step is optional.

i. Deploy the DD VE. You will see the DD VE instance when the deployment 
completes.
Deploy the DD VE from the GCP Web Console (Alternate Approach)
Deploy the DD VE
CHAPTER 3

DD VE Initial Configuration

- Configure DD VE in GCP ................................................................. 36
- System Headswap for DD VE in GCP ........................................... 45
- System Recovery Procedure .......................................................... 47
Configure DD VE in GCP

There are two ways to configure a DD VE after deployment:

- Using DD SM 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, it will be used during the cloud profile creation.
- If the storage class is selected as regional when you create the bucket, we recommend you create the bucket in the same region as the DD VE instance.

Configure DD VE in cloud using DD SM interface (https)

The DD VE in GCP may be configured using the DD SM interface (https).

Procedure

1. Login to Data Domain System Manager using the IP address of your DD VE. The default login credentials for the DD VE instance are:
   - Username: sysadmin
   - GCP default password: changeme

2. Add Licenses: select from the list of options of licenses to apply:
   a. Pre-Installed Evaluation License
   b. License File
c. License Server (Alternative choice, if license server is available)

3. After applying a license, accept the End User License Agreement.

4. The configuration wizard will be launched automatically. Leave the Network settings as default. Proceed to File System Settings by selecting No.

5. Click Yes for File System configuration.
6. Select the Storage Type as Object Store, enter the passphrase (these fields won't be displayed when passphrase once set), the profile details (bucket name, access key, and secret key.)

Note

- Refer to Create bucket in Google Cloud Storage for steps to create a bucket
- Refer to Getting Access and Secret Keys from GCP Web Console for steps to get access key and secret key

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

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

9. The file system will be created and enabled.
10. Click OK to proceed to the System Settings tab

11. Change the DD VE password

12. Configure the email server as needed.
13. Click Submit to save the system settings. Then quit the wizard.

Note

It is very important that DD VE running in GCP has its clock synchronized with NTP for object store communication. DD VE automatically synchronizes its clock using the time server information in DHCP response provided by the GCP infrastructure. If there are any changes in the GCP setup that prevent the NTP server announcement, configure and check the NTP status explicitly by navigating to Administration -> Settings -> More Tasks -> Configure Time Settings. Refer to Google Set up network time protocol (NTP) for instances.

The DD VE configuration using DD SM is now complete.

Re-launch the configuration wizard

You will need to re-launch the configuration wizard after completing the initial DD VE 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 DD VE in GCP using CLI (Alternate approach)

The DD VE can be configured by logging in through SSH to use the command line interface. Authentication using key-value pair and username/password are supported.

Procedure

1. Log in to the DD VE instance to configure the system. The default login credentials for the DD VE instance are:
   - **Username:** sysadmin
   - **GCP default password:** changeme

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

2. During the first login, users will be prompted to accept the EULA and change the password.

3. The configuration wizard will then be launched.

4. Follow the steps in the wizard to add elicense and Configure Object Store

   **Note**

   If an elicense file cannot be found in /ddr/var the license can be pasted directly in the wizard.

   ```
   Welcome to Data Domain 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>Capacity licenses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature</td>
</tr>
<tr>
<td>Exp. Date</td>
</tr>
</tbody>
</table>
-----------------------------------------------
1 | CAPACITY | 87.31 TiB | permanent (int) | active |

---

** System is using internal licenses.

New Licenses:

<table>
<thead>
<tr>
<th>Capacity licenses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature</td>
</tr>
<tr>
<td>Exp. Date</td>
</tr>
</tbody>
</table>
-----------------------------------------------
1 | CAPACITY | 87.31 TiB | permanent (int) | active |

---

** 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]:

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.
Do you want to import that certificate with below fingerprint?

Pending Object Store Settings
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.

5. Run the command below to view the disks attached to the DD VE

```bash
# disk show hardware
```

Example:

```
# disk show hardware
Disk   Slot        Manufacturer/Model         Firmware   Serial
No.   Capacity    Type                       (pci/idx)
----   ---------   ------------------------   --------
---    ---------   -------                    -------
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.
```

6. Add the disks to the active tier. This would be the metadata storage disk added to the instance

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

7. Create and enable file system

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

**Note**

It is very important that DD VE running in GCP has its clock synchronized with NTP for successful object store communication. The DD VE automatically synchronizes its clock using the time server information in DHCP response provided by the GCP infrastructure. If there are any changes in GCP setup that prevents NTP server announcement, please 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`.

Refer to [Google set up network time protocol (NTP) for instances](https://cloud.google.com/compute/docs/using-ntp) for more information on GCP time synchronization.
The DD VE configuration using CLI is now complete.

Configure the DD VE manually

This section describes how to manually configure the DD VE, e.g., updating elicense, setting the system passphrase, enabling the object-store feature and setting the object-store profile. These steps can be executed if the configuration wizard was skipped or at any point after the initial configuration.

Procedure

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

   **Note**
   
   if the license file cannot be found in `/ddr/var` its content can be pasted directly on the console.

```
# elicense update license.lic

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

Feature licenses:
## Feature  Count  Type                  State
Expiration Date  Note             ---------  -------
---------------  -------  --------------------  -----
1  REPLICATION  1  permanent (int)  active   n/a
2  DDBOOST  1  permanent (int)  active   n/a
```
3 ENCRIPTION 1 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.

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

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

3. Enable 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 key obtained from previous step.
```

6. Enter the bucket name created in step Create bucket in Google Cloud Storage. For GCP, the GlobalSign certificate is needed to communicate with object store and should be imported for the profile creation to succeed. The following command will auto-import that certificate

```
# 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.


Profile is set.
```

System Headswap for DD VE in GCP

A system headswap recovers a DD VE instance from a head unit failure. The head unit refers to DD VE root disk. This section describes how the system headswap command recovers the DD VE with head unit failure in GCP Object Store.

**Note**

Perform this procedure **ONLY** when you want to recover DD VE with head unit failure in GCP.

To perform system headswap, vNVRAM disk and metadata disks from system A (original system) should be available, and they will be attached to the new instance B.
If either vNVRAM disk or any metadata disk is not available, the command “system recovery from object-store” should be used instead.

**Procedure**

1. Create instance B with Head Unit (root disk only) with the same instance type as the original one.

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

2. Detach the vNVRAM and metadata disks from the failed head unit (instance A).

3. Attach the vNNRAM and metadata disks that were detached from instance A to instance B.

4. Set the system passphrase.

   **Note**
   Set the passphrase to match with system A, otherwise, headswap will fail to proceed.

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

5. Ensure 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.

   ```bash
   # 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.

   # filesys status
   The filesystem is enabled and running.

**Note**

- You may need to re-activate license on the new instance if unserved-mode license is used.
- The CLIs elicense checkout and elicense check in are used to obtain licenses from the DD VE
  - If you experience an "invalid key magic" issue after a headswap, set the passphrase on the new DD VE, then perform the headswap `ddboost user revoke token-access sysadmin`.
  - If DD VE was attached to an AV-server and you experienced a certificate authentication issue after a headswap, detach and re-attach the DD from the AV-server. The AV-server will then regenerate the certificate and import it to DD.

---

**System Recovery Procedure**

**Note**

Perform this procedure **ONLY** when you lose the original DD VE and need to recover data to a new DD VE

This section describes system recovery for DD VE on GCP Object Store. The system recovery command recovers the DD VE with head unit, NVRAM disk, metadata disk failure or any combination of the three.

However if both NVRAM disk and Metadata disks are available, then the command `system headswap` should be used instead.

Create instance B with the same configuration as instance A, including instance type, Metadata disk capacity. Follow these instructions to perform recovery on instance B.

**Procedure**

1. Enable object-store.

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

2. Set object-store profile.

    Make sure the passphrase on system B matches that on system A. Otherwise, the recovery will fail to proceed. Also, make sure that the bucket name for both systems is the same

3. Run the command to verify the disks attached to the DD VE: 

   ```
   # disk show hardware
   ```

4. Add disks to the active tier.
Note

Add disks (with same capacity or more) that matches system A to the active tier.

# storage add tier active dev<n>

5. Run system recovery precheck.

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

6. Execute the recovery.

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

7. Check the recovery status.

The system will reboot during the recovery process.

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

8. Check the filesys status after the recovery process is complete.

# filesys status
The filesystem is enabled and running.
This chapter covers the following topics:

- DD VE Licensing ........................................................................................................50
- Expanding Metadata Storage ..................................................................................51
- Enable or update SSH keys after deployment .......................................................51
- Add NICs for DD VE ...............................................................................................53
- Optional Additional System Configuration .........................................................53
- Extensions to DD OS for DD VE ...........................................................................54
- DD VE-only commands .........................................................................................55
- System Recovery CLI .............................................................................................57
- Modified DD OS commands ................................................................................59
- Performance Troubleshooting for GCP .................................................................61
- Unsupported DD OS Commands .........................................................................61
- Upgrade DD OS .....................................................................................................66
- Define the Data Domain system information for your site ..................................67
- Configuration of optional software and internal licenses ...............................68
DD VE Licensing

DD VE licensing may be via

- Served Licensing
- File based license

Licensing for DD VE is based on capacity, with the minimum purchased capacity being 1 TB and going up in 1 TB increments. There are no differences in the available features and functionality between any of the available resource configurations.

**DD VE Served Licensing**

DD VE 4.0 features the Served Licensing Model for DD VE which provides the solution for managing licensing for the deployment of DD VE(s). This licensing model is useful if you have multiple DD VE instances in your environment. This solution is only available for virtual systems, not physical systems at this time. The sales ordering process will remain the same. Licenses are retrieved, by the customer, from the Software Licensing Central (SLC) portal. This allows you to deploy the license server software (the hardware server is not provided) by downloading this license, loading it into the license server, and configuring the DD VE to talk to the license server. Refer to the applicable *Data Domain Operating System Release Notes* for the most up-to-date information on product features, software updates, software compatibility guides, and information about products, licensing, and service.

**Note**

When you obtain the original license file name the server, do not enter the comma in the license file name. DD OS will not accept the name if the comma is used. Please save the filename with a hyphen or underscore instead of a comma.

*Figure 1* on page 51 shows a sample email generated by the Software Licensing Central portal system.

[https://support.emc.com/servicecenter/license/](https://support.emc.com/servicecenter/license/) provides additional information about software licensing. If you cannot find your License Authorization e-mail, contact your account representative or support.

**File based license**

DD VE is licensed through the Software Licensing Central portal. When you purchase DD VE, you receive an email which email contains a license authorization code (LAC) to redeem for the DD VE software license. Follow the instructions in the email to create the license for the DD VE instance.
Expanding Metadata Storage

Metadata disks should first be added using the GCP console. Refer to Add disks for the DD VE from the GCP Console.

Note

It is not possible to extend a virtual disk if it has already been used by the file system. Instead, expand the storage by adding a new virtual disk.

Additional metadata storage can be configured in the DD VE using the GUI or the CLI.

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

Using the CLI
When you add a new virtual data disk to an existing DD OS file system, use the filesys expand command instead of the filesys create command.

Disk (Spindle Group) Configuration
Do not explicitly configure any spindle groups. It is done automatically.

Enable or update SSH keys after deployment

DD VE supports assigning SSH keys when deploying from Google Cloud console, but does not support updating SSH keys from Google Cloud console after deployment. DD VE adds both project-wide and instance-level SSH keys, but only during the first boot. It will not work if you add it after first boot.

If you did not enable SSH key access during deployment or you have assigned SSH keys and need to update them, complete the following steps:

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:QcPMwxTVRmpD3zmn2Km4LpmdhmSHAt4hpjTf6FD4  yourusername@yourlinuxclient
The key’s randomart image is:
```
+---[RSA 2048]----+
| .     *=oo=* .  |
|  o .  .*+ +.. . |
| oo+ .  ..+   .  |
|oo.=o .  . . .   |
|. + o. +S   .    |
| . E  =    . .   |
|  o .. .  . =    |
|   .  +. o B     |
|    .=. o.=      |
+----[SHA256]-----+
```
With default options, you get 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 the DD VE:
```
adminaccess add ssh-keys user sysadmin
```
```
sysadmin@<DDVE-name>:# adminaccess add ssh-keys user sysadmin
Enter the key and then press Control-D, or press Control-C to cancel.

```
ssh-rsa
AAAAB3NzaClYe2EAAAAADAQABAAAAABQ4CyYWyP1Q3pmWbDjbTqkg7qi3wc97K5jpygX9EeLNEY3VQqzAjhsHwvk
PnyQgK1YXOv3jhwQKz2ct/Z1OUpd8MwMcaDh1zyf70r77Di5P811dh/Cxe60Wcr1WcG6UE
+1dH2zbPrrphmZdZCJ3jhn/gLGoPqQASHTCZJRzXUHcqu/yvFdmEzy22bsNYeCdbJ6MjwaQ2FknUHGAyeD175dsXEB+k1izcKL6J55dJHKDhIY21NfF5jc1pkoM694wvSupe
+z44tX7E1dLiDi286rW851RwTtISXyGlyz2Wx3AWzXPQGksLqBEK0AcWba4hEliAa31NI5mt
```
SSH key accepted.

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

```
sysadmin@<DDVE-name>:# adminaccess show ssh-keys user sysadmin
User "sysadmin" :
  1 edcsa-sha-2-nistp256
  AAAAE2vijZ3HNaLVNoY1TTbmlzdHAyNTYAAAABBBGQpC6UL9B4Nd5yGj4GsdKbdPnBTc1D7hsY
  1GX2/3e2zdD2DDRUpjK4kVY8LJLJ/S9f0pxA3FrloQXha77cy8= google-ssh {"userName":"cloudboost
  .btlr@gmail.com","expireOn":"2018-08-28T09:07:10+0000"}
  2 edcsa-sha-2-nistp256 AAAAE2vijZ3HNaLVNoY1TTbmlzdHAyNTYAAAABBBFPfRza
  +rt93vmT9iqMRHwjjpInAxs3GhxX0g4pGy575svuVXMSXxxatjK99Jk+6edmV120l1Fv5k= google-ssh
  {"userName":"cloudboost
  .btlr@gmail.com","expireOn":"2018-08-28T09:06:51+0000"}
  3 ssh-rsa AAAAB3NzaClYe2EAAAAADAQABAAAAABAC179b11R70bo/
  Yj9RD8o1Lbhh7TvUJF6621bZk6GUPCLLbVzYggfGm+Y0AqNlI1Npx
  +fc26zkwKNRhH16o1Hx3Hj6t6VAG6Y8EVM9x8xviki4n6beMkkBmohkoiF07Y2ECcfqysVdjcQf4CE18ivs4bOTo
  0e qAG11cYzGx8vDcwykGK12ZA+FP4k8QofbDkrBruUN51QshWy510k501cMVPo1AwJEfSd1X6kx3CqeBR
  +ck69gPunUMjXJfAU2qdfQDcwIrEirz1dK75nChrJ
  +705EFkX3IhbaStosTS9WmrhK2UBMoqejXyxy9Sdqy+y7knuV2P9eDRwGl= google-ssh {"userName":"cloudboost
  .btlr@gmail.com","expireOn":"2018-08-28T09:06:50+0000"}
```

Data Domain Virtual Edition (DD VE) in Google Cloud Platform (GCP) DD VE 4.0 with DD OS 6.2.0.10 Installation and Administration Guide

Page 52
You can SSH into the DD VE with a private key.

```bash
$ ssh -i ./id_rsa
sysadmin@yourddvename
```

EMC Data Domain Virtual Edition

Last login: Fri May 25 03:39:27 PDT 2018 from 10.10.9.2 on pts/0

Welcome to Data Domain OS 6.2.0 10-xyz

```
sysadmin@<DDVE-name>#
```

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

```bash
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 system.

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

** Import CA certificate for "login-auth" application to enable GUI/Web-services access.

Adminaccess option "password-auth" set to "disabled".
```

Add NICs for DD VE

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

Configure each NIC with a different VPC. Refer to Creating Instances with Multiple Network Interfaces for additional information. Add additional NIC cards up to a maximum of:

- For a customized instance type, one NIC per vCPU, up to a maximum of 8 NIC cards.

Optional Additional System Configuration

See the Data Domain Operating System Initial Configuration Guide for help performing typical but optional initial system configuration tasks. Below is a summary of the DD OS CLI commands for some common tasks.
Any system command that accepts a list, such as a list of IP addresses, accepts entries separated by either commas or spaces. See the *Data Domain Operating System Command Reference Guide* for command details.

Add users to the email list that reports system problems:

```
# alerts notify-list add group-name
```

Add users to the system report email list:

```
# autosupport add {alert-summary|asup-detailed} emails email-list
```

Enable FTP or TELNET:

```
# adminaccess enable {ftp|telnet}
```

Add remote hosts to use FTP:

```
# adminaccess ftp add <host list>
```

Add a user:

```
# user add name [role {admin|user}]
```

Change a user’s password:

```
# user change password username
```

To enable remote management, refer to the *Data Domain Operating System Administration Guide* for details.

To Shut Down The System:

```
# system poweroff
```

## Extensions to DD OS for DD VE

Several DD OS commands are supported on the DD VE platform only. This section describes these commands.

### perf

Collect and show DD VE 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 DD VE on GCP. Display the virtual hardware requirements.

system vresource show [current | requirements]
Display details about the virtual CPU and memory resources on the DD VE.

Display the hardware requirements:

`# system vresource show requirements`

Sample output:

```
# system vresource show requirements

<table>
<thead>
<tr>
<th>Active Tier</th>
<th>Cloud Capacity (TB)</th>
<th>Capacity (TB)</th>
<th>Instance Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>n/a</td>
<td>custom-4-16384 (Only block storage is supported)</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>n/a</td>
<td>custom-4-16384</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>n/a</td>
<td>custom-8-32768</td>
</tr>
<tr>
<td></td>
<td>96</td>
<td>n/a</td>
<td>custom-16-65536</td>
</tr>
</tbody>
</table>

**The maximum allowed system capacity for active tier on block storage is 16 TB**
```

**DD VE-only commands**

The following commands only work on DD VE, cloud provider systems.

**Table 4 DD VE-only commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>elicense 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>elicense checkout capacity-license &lt;feature-name&gt; value &lt;n&gt; {TB</td>
<td>GB}</td>
</tr>
</tbody>
</table>
Table 4 DD VE-only commands (continued)

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>feature licenses. An addition 10 TB CAPACITY license will be checked out. 10 TB additional CAPACITY license has been checked out. License(s) have been checked out for REPLICATION, DDBOOST, ENCRYPTION. Total 10 TB CAPACITY license is now available on this system.</td>
<td>elicense checkin {&lt;feature-name-list&gt;</td>
</tr>
<tr>
<td>elicense license-server set server {&lt;ipaddr&gt;</td>
<td>&lt;hostname&gt;} port &lt;port-number&gt;</td>
</tr>
<tr>
<td>elicense license-server reset</td>
<td></td>
</tr>
<tr>
<td>elicense license-server show</td>
<td></td>
</tr>
<tr>
<td>filesys</td>
<td>Shows space tier active local-metadata: Displays the usage for the metadata storage.</td>
</tr>
<tr>
<td>net hosts add</td>
<td>Two DD VEs in different regions cannot resolve each other's hostname. Run this command to add a host list entry.</td>
</tr>
<tr>
<td>Note</td>
<td>For VPC to VPC connection between different regions in GCP, please see VPC Networking Peering for GCP.</td>
</tr>
<tr>
<td>storage object-store enable</td>
<td>Enables the object-store feature for DD VE.</td>
</tr>
<tr>
<td>storage object-store disable</td>
<td>Disables the object-store feature for DD VE.</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</td>
<td>Displays the object-store access profile.</td>
</tr>
<tr>
<td>storage object-store profile status</td>
<td>Displays the file system capacity, the number of virtual CPUs, and the amount of memory assigned to the virtual machine running the DD VE instance. The requirements option displays the physical storage requirements for DD VE.</td>
</tr>
<tr>
<td>system vresource show [requirements]</td>
<td></td>
</tr>
<tr>
<td>storage object-store disable</td>
<td>Disables the object-store feature for DD VE.</td>
</tr>
</tbody>
</table>
System Recovery CLI

The following system recovery commands are only applicable for the DD VE platform running on object store. These CLIs include:

1. system recovery precheck from object-store
2. system recovery start from object-store
3. system recovery status

Table 5 Object Store Command Descriptions

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>system recovery precheck from object-store</td>
<td>This command checks if system configuration satisfies the requirement of system recovery. The same check will also be run for command system recovery start from object-store</td>
</tr>
<tr>
<td></td>
<td>• system recovery precheck from object-store <strong>Role required: admin</strong> # system recovery precheck from object-store Recovery precheck passed. Use start command to start the recovery.</td>
</tr>
<tr>
<td></td>
<td>• Failure Cases</td>
</tr>
<tr>
<td></td>
<td>▪ Object-store is not enabled. # system recovery precheck from object-store **** Cannot run precheck: object-store is not enabled.</td>
</tr>
<tr>
<td></td>
<td>▪ Profile is not configured # system recovery precheck from object-store **** Cannot run precheck: object-store profile is not configured.</td>
</tr>
<tr>
<td></td>
<td>▪ Object store is not configured # system recovery precheck from object-store **** Cannot run precheck: object-store is not configured.</td>
</tr>
<tr>
<td></td>
<td>▪ Platform configuration doesn't match the original. # system recovery precheck from object-store Precheck found the following issues:</td>
</tr>
<tr>
<td></td>
<td>1. DD VE version version does not match the original version version</td>
</tr>
<tr>
<td></td>
<td>2. Instance type instance does not match the original instance type instance</td>
</tr>
<tr>
<td></td>
<td>3. Passphrase does not match the original passphrase</td>
</tr>
<tr>
<td></td>
<td>4. Active tier capacity n GiB is smaller than the original capacity mGiB</td>
</tr>
<tr>
<td></td>
<td>5. The object-store name does not have valid filesystem data</td>
</tr>
<tr>
<td></td>
<td>6. The filesystem already exists</td>
</tr>
<tr>
<td></td>
<td>7. The system recovery is already in progress</td>
</tr>
</tbody>
</table>

| system recovery start from object-store      | This command starts system recovery from object-store. Since precheck is run again before recovery is actually started, all failure |


### Table 5 Object Store Command Descriptions (continued)

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>cases for system recovery start from object-store also apply for this command.</td>
</tr>
<tr>
<td></td>
<td>- system recovery start from object-store <strong>Role required: admin</strong> system recovery start from object-store System recovery has started. Use status command to check the status.</td>
</tr>
<tr>
<td></td>
<td>- Failure cases <strong>system recovery start from object-store</strong> Precheck found the following issues:</td>
</tr>
<tr>
<td></td>
<td>1. DD VE version does not match the original version</td>
</tr>
<tr>
<td></td>
<td>2. Instance type instance does not match the original instance type instance</td>
</tr>
<tr>
<td></td>
<td>3. Passphrase does not match the original passphrase</td>
</tr>
<tr>
<td></td>
<td>4. Active tier capacity n GiB is smaller than the original capacity mGiB</td>
</tr>
<tr>
<td></td>
<td>5. The object-store name does not have valid filesystem data</td>
</tr>
<tr>
<td></td>
<td>6. The filesystem already exists</td>
</tr>
<tr>
<td></td>
<td>7. The system recovery is already in progress *** Failed to start system recovery.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>system recovery status</th>
<th>This command shows the current system recovery status.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- system recovery status <strong>Role required: anyone</strong> system recovery status System recovery is running: stage x of 6 (stage name) where stage name := [ starting attaching object-store</td>
</tr>
<tr>
<td></td>
<td>- Cases</td>
</tr>
<tr>
<td></td>
<td>■ Recovery has never run <strong>system recovery status</strong> System recovery has never run.</td>
</tr>
<tr>
<td></td>
<td>■ Recovery has completed <strong>system recovery status</strong> System recovery completed on &lt;date time&gt; where &lt;date time&gt; format is, for example, “Tue Feb 1 15:37:32 2018”.</td>
</tr>
<tr>
<td></td>
<td>■ Fail to create volume <strong>system recovery status</strong> *** System recovery did not complete: failed to format active tier.</td>
</tr>
<tr>
<td></td>
<td>■ Fail to restore configurations <strong>system recovery status</strong> *** System recovery did not complete: failed to restore system configurations from object-store.</td>
</tr>
</tbody>
</table>
Table 5 Object Store Command Descriptions (continued)

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>▪ Fail to restore filesystem # system recovery status</td>
</tr>
<tr>
<td></td>
<td>**** System recovery did not complete: failed to restore the filesystem.</td>
</tr>
</tbody>
</table>

Modified DD OS commands

The behavior of the following commands has been modified on the DD VE platform:

Table 6 Modified DD OS commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>alert</td>
<td>The <strong>tenant-unit</strong> parameter is not supported.</td>
</tr>
<tr>
<td>compression</td>
<td>The <strong>tenant-unit</strong> parameter is not supported.</td>
</tr>
<tr>
<td>config setup show</td>
<td>Arguments for configuring features not available in DD VE have been removed.</td>
</tr>
<tr>
<td>ddboost clients show active</td>
<td>The <strong>tenant-unit</strong> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost file-replication show active</td>
<td>The <strong>tenant-unit</strong> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost file-replication show detailed-file-history</td>
<td>The <strong>tenant-unit</strong> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost file-replication show file-history</td>
<td>The <strong>tenant-unit</strong> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost option reset</td>
<td>The <strong>fc</strong> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost option show</td>
<td>The <strong>fc</strong> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost storage-unit create</td>
<td>The <strong>tenant-unit</strong> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost storage-unit modify</td>
<td>The <strong>tenant-unit</strong> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost storage-unit show</td>
<td>The <strong>tenant-unit</strong> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost streams show active</td>
<td>The <strong>tenant-unit</strong> parameter is not supported.</td>
</tr>
<tr>
<td>ddboost streams show history</td>
<td>The <strong>tenant-unit</strong> parameter is not supported.</td>
</tr>
<tr>
<td>disk rescan</td>
<td>The <code>&lt;enlcosure-ID&gt;.&lt;disk-ID&gt;</code> parameter is not supported.</td>
</tr>
<tr>
<td>Command</td>
<td>Changes</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>disk show state</td>
<td>DD VE system disks show the System Dev state.</td>
</tr>
<tr>
<td>disk show stats</td>
<td>The DD VE format for this command is disk show stats [dev &lt;n&gt;]</td>
</tr>
<tr>
<td>disk status</td>
<td>The Spare row has been removed from the output. The System row has been added.</td>
</tr>
<tr>
<td>enclosure show all</td>
<td>The [&lt;enclosure&gt;] parameter is not supported.</td>
</tr>
<tr>
<td>enclosure show controllers</td>
<td>The [&lt;enclosure&gt;] parameter is not supported.</td>
</tr>
<tr>
<td>enclosure show cpus</td>
<td>The [&lt;enclosure&gt;] parameter is not supported.</td>
</tr>
<tr>
<td>enclosure show io-cards</td>
<td>The [&lt;enclosure&gt;] parameter is not supported.</td>
</tr>
<tr>
<td>enclosure show memory</td>
<td>The [&lt;enclosure&gt;] parameter is not supported.</td>
</tr>
<tr>
<td>fileys encryption keys delete</td>
<td>The [tier {active</td>
</tr>
<tr>
<td>fileys encryption keys show</td>
<td>The [tier {active</td>
</tr>
<tr>
<td>fileys fastcopy</td>
<td>The [retention-lock] parameter is supported with DD VE 4.0. Retention lock governance mode is supported for DD VE on premise. Retention lock compliance mode is not supported for any DD VE.</td>
</tr>
<tr>
<td>fileys show compression</td>
<td>The [tier {active</td>
</tr>
<tr>
<td>fileys 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>
</tbody>
</table>
Table 6 Modified DD OS commands (continued)

<table>
<thead>
<tr>
<th>Command</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<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 DD VE 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>

Performance Troubleshooting for GCP

Troubleshoot your DD VE on GCP by checking performance statistics.

- You can check DD VE performance statistics with native tools in GCP
- You can also use the following to monitor and benchmark performance: `perf tool`

---

Note

Refer to Perf section under Extensions to DD OS for DD VE on page 54 for information about commands.

Unsupported DD OS Commands

The following DD OS commands and command options are not supported on the DD VE platform.
### Table 7 Unsupported Commands and Command Options

<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 <code>adminaccess certificate generate</code> instead.</td>
</tr>
<tr>
<td>alerts add</td>
<td>Deprecated. Use <code>alerts notify-list add</code> instead.</td>
</tr>
<tr>
<td>alerts del</td>
<td>Deprecated. Use <code>alerts notify-list del</code> instead.</td>
</tr>
<tr>
<td>alerts notify-list option set group-name tenant-alert-summary {enabled</td>
<td>Deprecated. Use <code>alerts notify-list reset</code> instead.</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 <code>alerts notify-list reset</code> instead.</td>
</tr>
<tr>
<td>alerts show alerts-list</td>
<td>Deprecated. Use <code>alerts notify-list show</code> instead.</td>
</tr>
<tr>
<td>alerts test</td>
<td>Deprecated. Use <code>alerts notify-list test</code> 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 <code>autosupport show report</code> 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 <code>cifs set authentication active-directory</code> 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 show fc</td>
<td></td>
</tr>
<tr>
<td>ddboost show image-duplication</td>
<td>Deprecated. Use <code>ddboost file-replication show</code> 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>disk add devdisk-id [spindle-group 1-16]</td>
<td>Deprecated. Use <code>storage add</code> instead.</td>
</tr>
<tr>
<td>disk add enclosure enclosure-id</td>
<td>Deprecated. Use <code>storage add</code> 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>
</tbody>
</table>
Table 7 Unsupported Commands and Command Options (continued)

<table>
<thead>
<tr>
<th>Unsupported Command or Command Option</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<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 failenclosure-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 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 nvramp</td>
<td></td>
</tr>
<tr>
<td>enclosure show powersupply</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>
</tbody>
</table>
### Table 7 Unsupported Commands and Command Options (continued)

<table>
<thead>
<tr>
<th>Unsupported Command or Command Option</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<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 DD VE 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 {aggregate</td>
<td>failover</td>
</tr>
<tr>
<td>net set portnaming</td>
<td></td>
</tr>
<tr>
<td>ndmp</td>
<td></td>
</tr>
<tr>
<td>ndmpd</td>
<td></td>
</tr>
<tr>
<td>Unsupported Command or Command Option</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>perf * module vtl 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 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-time-time every every hrs</td>
<td>[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-time every {hrs</td>
</tr>
<tr>
<td>snapshot reset schedule</td>
<td>Deprecated. Use snapshot schedule reset instead.</td>
</tr>
<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>
</tbody>
</table>
Table 7 Unsupported Commands and Command Options (continued)

<table>
<thead>
<tr>
<th>Unsupported Command or Command Option</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<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>

Upgrade DD OS

The Data Domain Operating System can be upgraded using the rpm package file. For more information, refer to the Data Domain Operating System 6.2 Administration Guide.

DD VE system upgrade for higher capacity

1. Shutdown the DD VE using the command `system poweroff`
2. Upgrade the CPU and memory resources and add additional metadata disks that are required for the new configuration as per the following:
Table 8 Upgrade requirements

<table>
<thead>
<tr>
<th>Instance Type (custom)</th>
<th>#vCPU</th>
<th>Memory</th>
<th>DD Storage Capacity</th>
<th>Metadata disks (num. of disks x size of each disk)</th>
</tr>
</thead>
<tbody>
<tr>
<td>custom-4-16384</td>
<td>4</td>
<td>16 GiB</td>
<td>Up to 16 TB</td>
<td>2 x 1024 GiB</td>
</tr>
<tr>
<td>custom-8-32768</td>
<td>8</td>
<td>32 GiB</td>
<td>Up to 32 TB</td>
<td>4 x 1024 GiB</td>
</tr>
<tr>
<td>custom-16-65536</td>
<td>16</td>
<td>64 GiB</td>
<td>Up to 96 TB</td>
<td>10 x 1024 GiB</td>
</tr>
</tbody>
</table>

3. Power on the DD VE
4. Add the license for the new capacity
5. Configure the newly added metadata disks using the CLI command `storage add dev tier active<device ID>`
6. Expand the file system using the CLI command `filesys expand`

Define the Data Domain system information for your site

An installation requires information unique to your site. Before starting the installation, provide values for the system information that is listed below.

**Note**
Data Domain recommends that you print the tables in this section and record the information.

Table 9 System Setup Worksheet for DD VE on GCP

<table>
<thead>
<tr>
<th>Information</th>
<th>Your Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>A fully qualified host name for the system</td>
<td></td>
</tr>
<tr>
<td>Administrator’s email address (or admin group alias)</td>
<td></td>
</tr>
<tr>
<td>Mail server (SMTP) host name</td>
<td></td>
</tr>
<tr>
<td>Time zone name (default is US/Pacific)</td>
<td></td>
</tr>
<tr>
<td>GCP region</td>
<td></td>
</tr>
<tr>
<td>VPC/Subnet, Availability Zone information</td>
<td></td>
</tr>
<tr>
<td>Firewall Rule</td>
<td></td>
</tr>
<tr>
<td>Instance configuration (CPU and memory)</td>
<td></td>
</tr>
<tr>
<td>Storage capacity</td>
<td></td>
</tr>
<tr>
<td>GCP credentials</td>
<td></td>
</tr>
<tr>
<td>Metadata disks</td>
<td></td>
</tr>
<tr>
<td>Google Cloud Storage bucket name</td>
<td></td>
</tr>
</tbody>
</table>
Configuration of optional software and internal licenses

If you need to configure optional software features, you need to install and activate those licenses before you configure those features. See DD VE capabilities for information about features and licenses that are available to for DD VE.

Information about installing licenses and configuring optional software can be found in the Data Domain Administration Guide. Refer to the applicable Data Domain Operating System Release Notes for the most up-to-date information on product features, software updates, software compatibility guides, and information about our products, licensing, and service. Access the latest documents at https://support.emc.com.
APPENDIX A

DD VE on GCP General Best Practices

This section provides information on the general best practices to be followed to configure DD VE in GCP:

- Supportability
- ASUP Configuration
- Increase GCP resource quota
- GCP Licensing
- Storage best practices
- Security best practices
Supportability

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 DD VE. Follow these steps to connect to the serial console.

Procedure

1. Navigate to Compute Engine>VM Instances on the GCP web console.
2. Click on your DD VE instance.
3. Click on “Connect to serial console”.
4. Once the console dialogue opens up, log in using DD VE credentials.

Note
For more information, refer to GCP Serial Console.

ASUP Configuration

We recommend enabling AutoSupport (ASUP) in DD VE. Although Experience, Secure Remote Services (ESRS) is not yet supported in GCP, you can use the email transfer server to transfer ASUP.

Set up the following to ensure that ASUPs and alert emails from your system are sent to Data Domain.

1. Administrator: Enter a password and email address for the Administrator.
2. 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.
3. 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 0600.

Increase GCP resource quota

GCP may have a default quota setup for each region/zone for your project. To support DD VE 16TB, 32TB, and 96TB requirements, increase the quota before deploying the DD VE. Since we only support SSD persistent disk as data disk, we recommend you get a proper quota for Persistent Disk SSD (GB). If you plan to deploy multiple DD VE instances, you may also need to increase other resource quotas e.g., CPU number, IP address number and instance number. For more requirement details, refer to Storage Best Practices.
You can determine each resource requirement by multiplying number of requirements with planned instance number. Please refer to GCP Resource Quotas for more information on sending a quota increase request.

GCP Licensing

The DD VE license is node locked which means the same license cannot be used on multiple DD VE instances. To facilitate DD VE license management, we recommend using served-mode license if multiple DD VEs are to be deployed.

Note

- The DD VE license may become invalid after removing the first NIC ethV0.
- In the case of a head swap, the license will continue to work on new DD VE instance if served-mode license is used, otherwise you need to re-activate the license.
- You may create a new DD VE instance from GCP snapshot. The license will be automatically checked out from license server on the new instance if served-mode license is used, as long as the license server has sufficient licenses for this new instance to check out. Otherwise you need to re-activate the license.

Storage best practices

Use the right storage type
For DD VE on GCP, the standard persistent disk (HDD) is used for the root disk. The SSD persistent disk is used for NvRAM disk and all metadata disks.

Note

GCP has a hard limit of total throughput per instance - 120 MB/s if HDD is used, which cannot meet the requirement.

Storage Specifications for DD VE on GCP
Object Storage: These tables show the instance types and storage types that need to be configured for Object Store.

Note

Depending upon the compression ratio, you may have to add more metadata disks.

<table>
<thead>
<tr>
<th>DD VE 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-4-16384</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>
</tbody>
</table>
Table 10  Storage Configuration Types for DD VE on GCP (continued)

<table>
<thead>
<tr>
<th>DD VE 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>32 TB</td>
<td>custom-8-32768</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>96 TB</td>
<td>custom-16-65536</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>
</tbody>
</table>

For more details of GCP instance types, see GCP Machine Types.

**Note**

If the incorrect instance type is used for DD VE in GCP, there is an alert for the wrong virtual hardware configuration.

**Block Storage:** These tables show the instance types and storage types that need to be configured for Block Storage.

**Note**

For DD VE with Block Storage solution, the maximum supported capacity is 16TB.

Table 11  Storage Configuration Types for DD VE on GCP

<table>
<thead>
<tr>
<th>DD VE 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>

For more details of GCP instance types, see GCP Machine Types.

**Note**

If the incorrect instance type is used for DD VE in GCP, there is an alert for the wrong virtual hardware configuration.

**Storage Size Specifications**

Depending upon the compression ratio, you might have to add more metadata disks.

Table 12  Storage size specifications

<table>
<thead>
<tr>
<th>Capacity Configuration</th>
<th>Instance Type</th>
<th>Storage Configuration Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Root Disk</td>
</tr>
<tr>
<td>Up to 16 TB</td>
<td>custom-4-16384</td>
<td>250 GB</td>
</tr>
<tr>
<td>16 TB to 32 TB</td>
<td>custom-8-32768</td>
<td>250 GB</td>
</tr>
</tbody>
</table>
Table 12 Storage size specifications (continued)

<table>
<thead>
<tr>
<th>Capacity Configuration</th>
<th>Instance Type</th>
<th>Storage Configuration Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 TB to 96 TB</td>
<td>custom-16-65536</td>
<td>250 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. Please expand the storage if you receive an alert asking you to do so.

Supported Stream Count

Table 13 Supported stream count (Object Storage)

<table>
<thead>
<tr>
<th>Capacity Configuration (TiB)</th>
<th>Instance Type</th>
<th>vCPU</th>
<th>Memory</th>
<th>No. of metadata disks (each 1TB)</th>
<th>Stream Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 TiB</td>
<td>custom-4-16384</td>
<td>4</td>
<td>16</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>32 TiB</td>
<td>custom-8-32768</td>
<td>8</td>
<td>32</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt;=3</td>
<td>40</td>
</tr>
<tr>
<td>96 TiB</td>
<td>custom-16-65536</td>
<td>16</td>
<td>64</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt;=3</td>
<td>40</td>
</tr>
</tbody>
</table>
### Table 14 Supported stream count (Block Storage)

<table>
<thead>
<tr>
<th>Capacity Configuration (TiB)</th>
<th>Instance Type</th>
<th>vCPU</th>
<th>Memory</th>
<th>No. of metadata disks (each 1TB)</th>
<th>Stream Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Read</td>
</tr>
<tr>
<td>16 TiB</td>
<td>custom-4-16384</td>
<td>4</td>
<td>16</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>24</td>
</tr>
</tbody>
</table>

### Metadata Disk Storage Expansion Notes

Metadata disks can be incrementally deployed. The minimum incremental size is 1TiB. Add more metadata disks as required to reach up to the supported system capacity. The recommended number of metadata disks by instance is as follows, based on the assumption of 2x overall dedup ratio (10x dedup and 2x compression). For workloads with higher dedup ration, more metadata storage is needed.

### Table 15 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>

There is no need to specify a spindle group when adding the volume. The spindle group assignment is balanced automatically when storage is added. It is not recommended to 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 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 DD VE, it must not be configured with a public IP address.

**Secure access**

Following table illustrates the different authentication methods that are supported by DD VE.
Table 16 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>
<tr>
<td>REST API</td>
<td>username/password X509 certificates</td>
</tr>
</tbody>
</table>

For better security, it is recommended that you disable the username/password-based user authentication. If the username/password based authentication is wanted, we recommend that a stronger password be configured.

Note

Password-based login should not be disabled if you want to configure Avamar Virtual Edition, NetWorker, or other backup software to connect to DD VE in GCP, because password authentication is used 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 DD VE in GCP, if possible
- Enable encryption for DDFS and replication
- Use external KMIP server to store encryption keys

When deploying DD VE from Google cloud console, you cannot assign a password for the DD VE default user: sysadmin. You can, however, assign a public key for the sysadmin. Note the important differences between the DD VE and the standard Linux flavor in GCP.

- After deployment, the DD VE SSH user/password login is enabled. The sysadmin has a default password "changeme". At the first login, the password must be changed.
- If you assign a public key when deploying DD VE from Google cloud console, the DD VE can be accessed over SSH key pair.
- For DD VE, the public key is only applied to the sysadmin user. While in standard Linux, if you provide a public key with this format: ssh-rsa [KEY_VALUE] [USERNAME] and then a USERNAME is created, and this public key is only applied to this user.

IP Tables feature

After protecting the DD VE using secure setup, within the DD VE we can filter the network traffic that enters by using the `iptables` feature. For more configuration information, see the DD OS 6.2 Command Reference Guide's Net Filter section.

Firewall rule settings

Since the DD VE on GCP is always running in a VPC, the VPC should be configured so that only required and trusted clients have access to the Data Domain system. The following tables show the TCP and UDP ports that are used by the Data Domain system for inbound and outbound traffic, and what service makes use of them.
Consider the following information when configuring VPC firewall rules. For additional information, see GCP firewall rules.

**Inbound control**
The following are the inbound ports used by DD VE.

**Table 17** Inbound ports used by DD VE

<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 DD VE.</td>
</tr>
<tr>
<td>TCP 443</td>
<td>HTTPS</td>
<td>Used for DDSM (GUI) access and for configuring DD VE.</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 Data Domain system to determine). This port can be modified using replication modify.</td>
</tr>
<tr>
<td>TCP 3009</td>
<td>SMS (system management)</td>
<td>Used for managing a system remotely using Data Domain 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.</td>
</tr>
</tbody>
</table>

Depending on the protocol that is used to backup data to DD VE, additional ports are enabled with inbound firewall rules. For a complete list of all ports enabled for inbound traffic for Data Domain systems, see Ports for inbound traffic table.

**Outbound control**
The following are the outbound ports that are used by DD VE.

**Table 18** Outbound ports used by DD VE

<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 Data Domain system to synchronize to a time server.</td>
</tr>
<tr>
<td>TCP 443</td>
<td>HTTPS</td>
<td>Used for DD VE to be able 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 Data Domain 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 Data Domain System Manager. This port cannot be modified. This port will also need</td>
</tr>
</tbody>
</table>
Table 18 Outboard ports used by DD VE (continued)

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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 Data Domain System Manager.</td>
</tr>
</tbody>
</table>

Depending on the other applications/services that are being used, additional ports shall be enabled for outbound firewall rules. For a complete list of all ports enabled for outbound traffic for Data Domain systems, see Ports for outbound traffic table.
APPENDIX B

DD VE Cloud Networking Best Practices

- VPC architecture .................................................................................................................. 80
- Multiple NICs for DD VE in GCP .......................................................................................... 80
- Default DHCP configuration .................................................................................................. 80
- Ports for inbound traffic ......................................................................................................... 80
- Ports for outbound traffic ....................................................................................................... 82
**VPC architecture**

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

**Multiple NICs for DD VE in GCP**

Follow this guidance when deploying a DD VE with multiple NICs.

- Assign multiple NICs when deploying the DD VE. 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 DD VE. If there are additional interfaces, DHCP can be manually enabled or those interfaces can be configured manually. All the interfaces in DD VE 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 Data Domain 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 Data Domain 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 Data Domain 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 Data Domain 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 Data Domain system to determine if this is the case).</td>
</tr>
<tr>
<td>TCP 111</td>
<td>DDBOOST/ NFS</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></td>
<td>(portmapper)</td>
<td></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 Data Domain 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 Data Domain 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 Data Domain 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 (Data Domain Enterprise Manager). This port cannot be modified. This port is only used on Data Domain 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 Data Domain 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</td>
</tr>
</tbody>
</table>
Table 19  Ports Used by Data Domain 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 congestion-checker, when it runs iperf. To change the port the new port needs to be specified in the port option of the net congestion-check command. The remote side must also 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 Data Domain system for outbound traffic.

Table 20  Ports Used by Data Domain 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 adminaccess show on the Data Domain system to determine if this is the case).</td>
</tr>
<tr>
<td>TCP 25</td>
<td>SMTP</td>
<td>Used by the Data Domain system to send email autosupports and alerts.</td>
</tr>
<tr>
<td>UDP/TCP 53</td>
<td>DNS</td>
<td>Port is used by Data Domain system to perform DNS lookups when DNS is configured. Run net show dns to review DNS configuration.</td>
</tr>
<tr>
<td>TCP 80</td>
<td>HTTP</td>
<td>Used by Data Domain system for uploading log files to Data Domain Support via the support upload command.</td>
</tr>
<tr>
<td>UDP 123</td>
<td>NTP</td>
<td>Used by the Data Domain system to synchronize to a time server.</td>
</tr>
<tr>
<td>UDP 162</td>
<td>SNMP (Trap)</td>
<td>Used by the Data Domain system to send SNMP traps to SNMP host. Use snmp show trap-hosts to see destination hosts and snmp status 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 Data Domain 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 Data Domain system only if replication is configured. Use replication show config to determine if this is the case.</td>
</tr>
</tbody>
</table>
### Table 20 Ports Used by Data Domain System for Outbound Traffic (continued)

<table>
<thead>
<tr>
<th>Port</th>
<th>Service</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<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 (Data Domain Enterprise Manager). This port cannot be modified. This port is only used on Data Domain 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 Data Domain 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 <code>-p</code> option from <code>se iperf</code> or <code>port</code> option from the <code>net iperf</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 iPerf. To change the port the new port needs to be specified in the <code>port</code> 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

Overview of DD VE on GCP Block Storage

We recommend the DD VE on GCP Object Storage Solution. You can ignore the following DD VE on GCP Block Storage content, unless you specifically want to use DD VE on GCP on Block Storage solution.

- Deploy DD VE on the Google Cloud Platform - Block version ......................... 86
- Configure DD VE on the Google Cloud Platform - Block version ................... 95
Deploy DD VE on the Google Cloud Platform - Block version

GCP System Configuration requirements

These are the system configuration requirements for configuring the Google Cloud Platform (GCP) DD VE block version.

Table 21 GCP System Requirements

<table>
<thead>
<tr>
<th>Instance type</th>
<th></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>

Create DD VE using the shell script

The DD VE for Google Cloud Platform (GCP) image package contains the DD VE root disk zip file and two deploy scripts gcp-deploy-linux.sh for Linux shell and gcp-deploy-windows.ps1 for Windows Powershell.

Before you begin

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

- 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, etc. (The following steps describe how to create DD VE from a Linux shell script. Replace the example values with values appropriate to your own environment.)

1. Download the DD VE image package from the Online Support site, for example:
   ```
   ddve-gcp-6.1.1.007-598673.zip
   ```

2. Unzip the file to access the root disk zip file: ddve-gcp-6.1.1.007-598673.tar.gz, and two scripts: gcp-deploy-linux.sh and gcp-deploy-windows.ps1.

3. If you already have a DD VE image created in your project in GCP, create a DD VE with the following parameters:
   ```
   $ ./gcp-deploy-linux.sh -n mydve0 -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 ...
   ```
Create DD VE from the GCP Console

You can also deploy DD VE from Google Cloud Console (GCP) if you have already created a DD VE image.

Procedure

1. Login to GCP console at [https://console.cloud.google.com](https://console.cloud.google.com) and verify the values for project, VPC, subnet, and DD VE image.
2. Create the DD VE 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 16GB.

   c. Click “Change” and select the DD VE image as the boot disk. Verify the disk type is “Standard Persistent Disk” and the size is 250 GB.
d. Select Management, disks, networking, SSH keys > Disks > Add item to create the NVRAM disk. Select Create disk from the disk name drop-down list. Specify the NVRAM disk name, select “SSD persistent disk” for the disk type, select “None (blank disk)” for the source type, and set the disk size to 10 GB.
e. From the “Networking” tab, select your VPC for “Network” and pick your subnet for “Subnetwork”. If you have already setup your own jump box in this subnet and want to access the DD VE only through the jump box, set “External IP” to “None”.

Create DD VE from the GCP Console
f. DD VE supports assigning SSH key when deploying from Google Cloud console for the sysadmin user. This step is optional.

Note

- Click “Add item” to add more SSH keys to DD VE.
- The SSH key is only for the sysadmin user.

g. Deploy DD VE. You will see the DD VE instance when the deployment completes.
Enable or update SSH keys after deployment

DD VE supports assigning SSH keys when deploying from Google Cloud console, but does not support updating SSH keys from Google Cloud console after deployment. DD VE adds both project-wide and instance-level ssh keys, but only during the first boot. It won't work if you add it after first boot, therefore complete the following steps if you did not enable SSH key access during deployment and want to enable it during the first boot, or you have assigned SSH keys and need to update them.

**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   .    |
|  o .. .  . =    |
|   .  +. o B     |
|    .=. o.=      |
+----[SHA256]-----+
```

With default options you will get 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 the DD VE:

```
adminaccess add ssh-keys user sysadmin
```

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

```
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQCyYNyPI1QjpmWbDjbTqkte7qi3wc97K5Jp
ygkX9ElNEY3VQgAJsfsHwvxxkPnyOqKiYXOV3johwQKih2ct2/1lwEpd8MvMCaDh1z
yf70rJ7Dnq15P811h/dhCxe6W0crylWcG6UE+1dHzbRrphhMzdt2CN3jh/gLGmpQGAShtCJ2rZxUHCqU/
vivfdm62y2bbnNy战斗力6MjMjwaQ2FhKuhGAyedI78dsXb
+kizokL6j5dJHKDhlyJY21NFFjclpkOM694wvSupe
```
SSH key accepted.

Note

- You can disable some key pair access by deleting the corresponding key from DD VE by running the following command: `adminaccess del ssh-keys <lineno> user sysadmin`
- You can list keys and get its <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 AAAAE2VjZHNhLXNoYTItbmlzdHAyNTYAAAAIbmlzdHJveHYAAABBBGKqC6UL9B4Nd5yqj4GsdKbdnPBTc1D7heY1GX2/WeZzdDDZDRUp1aKdWsdJLJ/ S9F0pxA3f1roLQxha77cy8= google-ssh {"userName":"cloudboost.blr@gmail.com","expireOn":"2018-08-28T09:07:10+0000"}
  2 ecdsa-sha2-nistp256 AAAAE2VjZHNhLXNoYTItbmlzdHAyNTYAAAAIbmlzdHJveHYAAABBBBPrFza +r793vmT8xgMRHwpjInAgsxG3HZx04pGyj5yvulVmNKYodmESCXus0Jk8D8hJko +6emdVl2lizPiyvk= google-ssh {"userName":"cloudboost.blr@gmail.com","expireOn":"2018-08-28T09:06:51+0000"}
  3 ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAAG7gb11i1R70b0/Yj9Rd8IolLbhfTuvtXTPf621bk6UFLbYwYa7gffm+YOAgQii!niNpx +fC26zkwKNRHR6i01c3xj6tovl16yK8EVM8POXovI4nuObeMki8MhokoiP0YZEC cfqysVdjcQf4CE18iv4b0Tcc6 qAgiLjcYzG2xgS08dchqAwkI12+Tpmk0080vBuDrkEbn51QsHwY5i0k50eLCMVPOi AwJEfsenDIx6k9xC3qeBrsc+ck6Fmy1XcfjxUA2dfQDcwcIrE1zlKs7nChRj +705Efx3HbaStosTS9MrxxhGZUBMqejXxk9DSsyy7kn5u2VPF9edRwGl= google-ssh {"userName":"cloudboost.blr@gmail.com","expireOn":"2018-08-28T09:06:50+0000"}
  4 ecdsa-sha2-nistp256 AAAAE2VjZHNhLXNoYTItbmlzdHAyNTYAAAAIbmlzdHJveHYAAABBBQCI1HgwGdlj pH27ZvXefqZ2YFB3xjecoFMYjewDhL8Xg6X1jmyPsgy93Nmze/ NcXwncmzN6RxxkJ5bq3nB0o= google-ssh {"userName":"cloudboost.blr@gmail.com","expireOn":"2018-08-28T09:06:46+0000"}
  5 ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAAG7gb11i1R70b0/Yj9Rd8IolLbhfTuvtXTPf621bk6UFLbYwYa7gffm+YOAgQii!niNpx +fC26zkwKNRHR6i01c3xj6tovl16yK8EVM8POXovI4nuObeMki8MhokoiP0YZEC cfqysVdjcQf4CE18iv4b0Tcc6 qAgiLjcYzG2xgS08dchqAwkI12+Tpmk0080vBuDrkEbn51QsHwY5i0k50eLCMVPOi AwJEfsenDIx6k9xC3qeBrsc+ck6Fmy1XcfjxUA2dfQDcwcIrE1zlKs7nChRj +705Efx3HbaStosTS9MrxxhGZUBMqejXxk9DSsyy7kn5u2VPF9edRwGl= 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 system.
  Do you want to continue? (yes|no) [no]: yes
```

Overview of DD VE on GCP Block Storage
Add NICs for DD VE

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

Configure each NIC with a different VPC. Refer to Creating Instances with Multiple Network Interfaces for additional information. Add additional NIC cards up to a maximum of:

- For a customized instance type, one NIC per vCPU, up to a maximum of 8 NIC cards.

Add disks for the DD VE from the GCP Console

Verify that sufficient licensed capacity is available to add capacity to the DD VE. When adding additional capacity, ensure the DD VE instance can support the new capacity. DD VE in GCP supports up to 16 TB.

GCP provides four types of disk storage:

- Standard persistent disk
- SSD persistent disk
- local SSD
- object storage

DD VE only supports standard persistent disk as the root disk, and SSD persistent disk as the NVRAM disk and data disks. Adding an NVRAM disk is not required when deploying from the DD VE script, but you must create an NVRAM disk when deploying DD VE from the Google Cloud console.

New storage for the DD VE must meet the following requirements:

- The minimum size of the first data disk is 477 GiB (512 GB), recommended is 2TB.
- The recommended size for any subsequent data disks is 2 TB.

Note

Refer to step Create the NVRAM disk for instructions to add a data disk to DD VE.

Configure DD VE on the Google Cloud Platform - Block version

Configure DD VE in cloud using DD SM interface - Block version

The DD VE in GCP block version may be configured using the DD SM interface (https) on Google Cloud Platform.

Procedure

1. Login to Data Domain System Manager using the IP address of your DD VE. The default login credentials for the DD VE instance are
Overview of DD VE on GCP Block Storage

- Username: sysadmin
- GCP default password: changeme

2. Add licenses.
   Select from the list of options of licenses to apply:
   - Pre-installed Evaluation License
   - License file
   - License Server (Alternative choice, if license server is available)
3. After applying a license, accept the **End User License Agreement**.

4. The configuration wizard will be launched automatically. Leave the **Network Settings** as default. Proceed to **File System Settings** by selecting **No**.

5. Click **Yes** to configure the **File System** on the configuration wizard screen.
6. **Select Block Storage**

7. **Click Add to Tier**, verify the disk is shown in the Active Tier, and click **Next**.

8. **Review the summary and Click Submit** to create and enable the file system.
The DD VE configuration is now complete.

The **File System** section under the **Data Management** tab provides space usage and availability details for the Active Tier.
To configure or update the elicense on the DD VE, click Replace Licenses

To relaunch the configuration wizard, click Maintenance > System > Configure System
Configure DD VE in cloud using CLI - Block version (Alternate approach)

The DD VE in GCP block version may be configured using the Command Line Interface (CLI) on Google Cloud Platform.

If you have assigned SSH key for the default user sysadmin when deploying DD VE from the Google Cloud console, login to DD VE either by key pair or by password. The default password for sysadmin is changeme.

Procedure

1. Log in to the DD VE instance to configure the system. The default login credentials for the DD VE instance are:
   - Username: sysadmin
   - GCP default password: changeme

   ```
   # ssh sysadmin@<IP address of DD VE>
   EMC Data Domain Virtual Edition
   Password:
   Welcome to Data Domain OS 6.2.0.10-xyz
   -------------------------------
   sysadmin@mydve0#
   ```

2. During the first login, you will be prompted to accept the EULA and change the password.

3. The configuration wizard will then be launched.

4. 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
   ------   ---------------   ----
   ----    CAPACITY   0.45 TiB   unexpired evaluation
   active   n/a
   ----    ---------------   ----

   Feature licenses:
   #   Feature    State   Expiration Date   Count   Note
   Type   --------------------   ------   ---------------   -----   ----
1. REPLICATION 1 unexpired
evaluation 2 DDBOOST 1 unexpired
evaluation 3 RETENTION-LOCK-GOVERNANCE 1 unexpired
evaluation 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.

5. Run the following command to add storage. # storage add tier active dev3
dsksadmin@myddvel1# 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

dsksadmin@myddvel1# 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.

6. 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.
```

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

```
sysadmin@myddve1# storage show all
Active tier details:
Device        Device   Device
Group                  Size
-----------   ------   -------
(available)   3        1.0 TiB
-----------   ------   -------
Spindle   Devices   Count   Total Size
Group
-------   -------   -----   ----------
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
--------   ---------   --------   ---------

8. Run the following command to create the file system. # filesys create

```
sysadmin@myddve1# 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'.

9. Run the following command to enable the file system
   # filesys enable

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

The DD VE configuration is now complete.

To manually add an elicense or to update an elicense after the initial
configuration, place the license file under /ddr/var/license.lic. Then run
the command elicense update license.lic

---

Note

If the license file cannot be found in /ddr/var its content can be pasted
directly on the console.

```
# 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
```

---

System Headswap for DD VE in GCP - Block version

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

Procedure

1. Create instance B with the same instance type and DD OS build. Do not create
   an NVRAM disk for the new instance.
The failed instance is referred to as instance A. The new instance is instance B.

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 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!

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

# fileys status
The filesystem is enabled and running.