EMC Data Domain Virtual Edition

Version 3.0.1

Installation and Administration Guide

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EMC²

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Preface

As part of an effort to improve its product lines, EMC periodically releases 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 EMC developers of products that include a DD VE component, for EMC employees who provide technical support for the vSphere Data Protection product and its embedded DD VE, and for other internal EMC users.

Related documentation
The following EMC publications and websites provide additional information:

- *Data Domain Operating System Release Notes*
- *EMC Data Domain Operating System Initial Configuration Guide*
  This manual explains configuration steps that are common to hardware and virtual Data Domain systems.
- *EMC Data Domain Operating System OS Command Reference Guide*
  This manual explains how to administer Data Domain systems from the command line.
- *EMC Data Domain Operating System OS Administration Guide*
  This manual explains how to administer Data Domain systems with the System Manager graphical user interface.
- *EMC 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.
- *Avamar, Data Domain and NetWorker Compatibility Guide*: http://compatibilityguide.emc.com:8080/CompGuideApp/
  This website lists Avamar and NetWorker software support for DD VE.

Special notice conventions used in this document
EMC uses the following conventions for special notices:

⚠ DANGER

Indicates a hazardous situation, which if not avoided, will result in serious injury or death.

⚠ WARNING

Indicates a hazardous situation, which if not avoided, could result in serious injury or death.

⚠ CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Calls attention to a potential business or data loss.

Note

Contains information that is incidental, but not essential, to the topic.

Typographical conventions

EMC uses the following type style conventions in this document:

Bold	Use for names of interface elements, such as names of windows, dialog boxes, buttons, fields, tab names, key names, and menu paths (what the user specifically selects or clicks)
Italic	Use for full titles of publications referenced in text
`Monospace`	Use for: • System code • System output, such as an error message or script • Pathnames, filenames, prompts, and syntax • Commands and options
Monospace italic	Use for variables
`Monospace bold`	Use for user input
[ ]	Square brackets enclose optional values
|	Vertical bar indicates alternate selections - the bar means “or”
{ }	Braces enclose content that the user must specify, such as x or y or z
...	Ellipses indicate nonessential information omitted from the example

Where to get help

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

Product information

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

Technical support

For technical support of this release of DD VE, go to EMC 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:

Revision history

Table 1 Data Domain Virtual Edition Installation and Administration Guide revision history for DD OS 6.0.1

Revision	Date	Description
01 (DD OS 6.0.1)	February 2017	Initial publication.

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.

Data Domain Virtual Edition 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. For more information about the features and capabilities of Data Domain systems (both physical and virtual), see the *EMC Data Domain Operating System Administration Guide*.

Note

For DD VE, the 6.0.1 release of DD VE adds support for VMWare vSphere ESX 6.0 Patch 3.

DD VE capabilities and licensing

DD VE provides the capabilities of a physical Data Domain system in a virtual machine template for VMware ESXi or Microsoft Hyper-V. DD VE is available in the following resource configurations:

- Up to 500 GB (evaluation version only)
- Up to 4 TB
- Up to 8 TB
- Up to 16 TB
- Up to 32 TB
- Up to 48 TB
- Up to 64 TB

- Up to 96 TB

Actual DD VE capacity is available in 1 TB increments starting at 1 TB, and up to 96 TB.

The following sections list supported and unsupported Data Domain protocols and features in DD VE.

Supported Data Domain protocols

- CIFS
- NFS
- Data Domain Boost (DD Boost) over IP
- Data Domain Boost (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
- Data Domain Cloud Tier (supported in 16 TB, 64 TB and 96 TB configurations)
- DD Boost for Big Data
- VMware
- Hyper-V (Hyper-V HA)

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

Unsupported Data Domain features

- DD Boost over FC
- Extended retention
- DD High Availability (HA)--however, VMware and Hyper-V HA are supported
- NDMP
- VTL
- Collection replication
- Directory replication
- Instant access
- Retention lock

DD OS commands related to these unsupported features, and commands for hardware features that are not applicable to a virtual machine, are not supported on the DD VE platform.

DD VE licensing

Refer to the applicable *EMC Data Domain Operating System Release Notes* for the most up-to-date information on product features, software updates, software compatibility guides, and information about EMC products, licensing, and service.

DD VE management

Use the VMware vSphere client software, the VMware vSphere Web client, or Hyper-V Manager to install the DD VE and define its virtual hardware: CPUs, memory, network interfaces, and virtual disks.

The DDSM GUI provides a configuration wizard to guide you through the steps required to configure DD OS after the virtual appliance is installed.

Once the DD VE is configured and running, you can access the system console to run DD OS commands by using the VMware vSphere Web client, or Hyper-V Manager. You can also administer the DD VE by using a terminal emulator or `ssh` command line to use the command-line interface.

The default login credentials for the DD VE instance are:

- Username: sysadmin
- Password: changeme

Note

The system may panic if an RSA DPM client certificate is within 15 days of expiring.

CHAPTER 2

Configuring the virtual environment for DD VE

This chapter explains how to configure the virtual environment prior to installing the DD VE software. This chapter covers the following topics:

Supported virtual environments

DD VE is supported in the following virtual environments:

- VMware ESXi servers, either standalone or managed by VMware vCenter, versions 5.5 or 6.0, with the corresponding versions of the VMware vSphere client application.

  Note

  The OpenVMTools are pre-installed on the DD VE image. When you update the DD OS software on the DD VE from within the DD OS environment, any necessary updates to the OpenVMTools get installed automatically. It is not possible to update OpenVMTools on the virtual machine from outside DD OS.

- Microsoft Windows Server 2012 R2 with Hyper-V.

The hypervisor user should have only read-only privileges on the data center object where the server or cluster hosting the DD VE instance resides.

For information about compatibility with more recent versions of VMware or Microsoft products, visit the support portal at https://support.emc.com.

Provision physical storage

DD VE supports the use of VMware NFS datastores and virtual machine file system (VMFS) datastores, or Microsoft virtual hard drives. Provision the appropriate type of datastore for the individual environment. All physical storage provisioned for the DD VE should be dedicated to the DD VE and not used for any other purpose.

Before you begin

For VMware NFS datastores, always present NFS storage to the ESXi hosts with a consistent identifier, so that each NFS folder gets treated as the same unique datastore by all ESXi hosts. If you refer to the same storage host with different names on different ESXi hosts, the hosts will see the NFS volumes as different datastores. This problem can occur if you use a partial server name on one host (for example, nfssrv1) and the full server name on another host (for example, nfssrv1.mycompany.com). In this scenario, the same folder on the NFS server may be presented as two different datastores in the vSphere client, and it will be difficult to ensure that the DD VE system is using a dedicated datastore.

Procedure

1. Run the DAT to make sure the underlying physical storage meets the requirements for DD VE.

   Table 2 on page 14 lists the required physical storage specifications for DD.

2. Create a volume with the recommended RAID level that is dedicated to the DD VE system.

   Note

   These disks should not be used for any other purpose.

3. Export one or more LUNs from this volume
4. Create exactly one datastore or virtual hard drive for each LUN.

Like the volume, these data stores and virtual hard drives should be dedicated to the DD VE system and should not be used for any other purpose.

After you finish

Also see Disk (Spindle) Group Configuration on page 46.

Raw physical capacity needed

The table below shows the raw capacity needed to get the desired usable capacity. For raw capacities not shown in the table, use the same raw capacity in TiB as the usable capacity.

For example:

1. To get 40 TB usable capacity, you need to provision 40 TiB.
2. For 5 TB capacity with 4 TB configuration, provision 5 TiB.

Important: The capacity in vCenter or Hyper-V manager is in TiB. When you create a virtual disk in vCenter of 1 TB, a storage capacity of 1 TiB is allocated.

Note

This table does not apply to configurations with DD Cloud Tier.

Usable Capacity (TB)	Raw Capacity (GiB) at each configuration						
	4	8	16	32	48	64	96
0.5	620	622	620	632	694	752	846
1	1114	1116	1114	1126	1188	1245	1340
2	2100	2101	2100	2112	2174	2232	2326
3	3072	3072	3072	3098	3161	3218	3312
4	4096	4096	4096	4096	4148	4205	4299
5		5120	5120	5120	5120	5191	5286
6		6144	6144	6144	6144	6144	6272
7		7168	7168	7168	7168	7168	7259
8			8192	8192	8192	8192	8245
9			9216	9216	9216	9216	9216

Conversions	GiB	TB
	1	0.001074
	TB	TiB
	1	0.909495

Performance Monitoring

Data Domain recommends that you enable the performance monitoring features of the DD VE instance. If you ever need to troubleshoot a DD VE performance problem, you should begin by using the performance monitoring software to detect and resolve any performance problems on the physical storage layer.

Data Domain provides a deployment assessment tool (DAT) to scan the available physical storage to determine if the storage meets the DD VE requirements. Table 2 on page 14 lists the required physical storage specifications for DD VE.

Configuration of other resources

This section discusses resources other than storage.

CPU resources

For VMware environment, Initial virtual machine configuration on page 25 lists the CPU requirements. For Windows environment, the CPU reservation is configured as percentage, “Virtual Machine Reserve” should be set to 100%.

Note

Do not reduce system memory after you have created the file system in DD OS. This makes the file system unusable.

Network adapters

DD VE can support up to eight virtual network adapters.

For VMware environments, the ova package creates two VMXNET3 virtual network adapters by default. DHCP will be configured automatically on these two interfaces inside the DD VE. DHCP can be configured manually on any additional interfaces.

For Windows environments, DHCP will be configured automatically for up to two network interfaces. DHCP can be configured manually on any additional interfaces.

Disk controllers

For VMware environments, DD VE supports up to four VMware Paravirtual SCSI Controllers. Other types of SCSI controllers are not supported.

For Windows environments, DD VE supports up to four Microsoft SCSI controllers.

One SCSI Controller is configured by default. The maximum number of disks for each controller is 15 for vSphere and 64 for Hyper-V. If the environment requires more than the maximum number of disks, you may add extra SCSI HBA controllers to the DD VE system, but do not change the HBA controller type from the type of the first HBA controller. If you make changes accidentally, power off the virtual machine and restore the original settings.

Using resource pools and vApp containers (VMware only)

If you put DD VE systems into resource pools or vApp containers, do not override the default memory and CPU resource allocation settings. The DD VE virtual machine will fail to boot up and report an `insufficient resource` message if it cannot satisfy the minimum resource requirements shown in the next table.

Table 2 DD VE resource reservations

Resources		Up to 4 TB	4 TB to 8 TB	8 TB to 16 TB	16 TB to 32 TB	32 TB to 48 TB	48 TB to 64 TB	64 TB to 96 TB
Computing resources	CPU	2 x 1.5 GHz vCPU		4 x 1.5 GHz vCPU			8 x 1.5 GHz vCPU	
	Memory	6 GB	8 GB	16 GB	24 GB	36 GB	48 GB	64 GB
	Shares	Normal						
	Limit	Unlimited						

Table 2 DD VE resource reservations (continued)

Resources		Up to 4 TB	4 TB to 8 TB	8 TB to 16 TB	16 TB to 32 TB	32 TB to 48 TB	48 TB to 64 TB	64 TB to 96 TB
Underlying storage requirements	Random IOPS	160	320	650	1280	1920	2560	3200
	Random I/O latency	14 ms						
	Sequential throughput	40 MB/s	80 MB/s	160 MB/s	320 MB/s	480 MB/s	640 MB/s	960 MB/s
	RAID	RAID 5 or 6						
	SCSI controllers	Up to 4 SCSI controllers						
	NVRAM simulation file size	512 MB	512 MB	512 MB	1 GB	1 GB	1 GB	2GB
		Configurations with DD Cloud Tier support has the same NVRAM size as the corresponding ones without DD Cloud Tier.						
	System disks	• 250 GB root disk • 10 GB NVRAM disk **Note** The root disk and NVRAM disk are required to deploy DD VE.						
	Data disks	• The minimum first data disk size: 500GiB for 64TB, Cloud 64TB, 96TB, and Cloud 96TB; 200GiB for all other configurations • All subsequent data disks: at least 100 GB Whenever possible, use disks that are larger than the minimum required disk sizes. The maximum capacity of DD VE is defined by the DD VE license, and the maximum virtual disk size supported by the hypervisor. **Note** The usable capacity available on a data disk is less than the capacity specified when the disk was created because of overhead requirements. DD VE storage guidelines on page 34 provides additional details about DD VE storage overhead requirements.						
Network adapters		Up to 8 network adapters						

The system displays an error message if you attempt to configure a higher capacity with fewer memory and CPU resources than the amounts listed in the table above. To check these settings, use the Resources tab of the Virtual Machine Properties dialog box in the vSphere client, or the `system vresource show requirements` command.

Collecting performance counters

DD VE collects performance counters from the hypervisor to assist with troubleshooting. Use the following commands to enable the collection of performance counters. DD VE collects performance counters in five minute intervals. Disable performance counter collection after troubleshooting is complete.

The hypervisor user should have only read-only privileges on the data center object where the server or cluster hosting the DD VE instance resides.

1. Run the **vserver config set host *<vserver-host>* [port <port-number>]** command to set the hypervisor credentials on DD VE.
2. Run the `vserver perf-stats start` command to begin performance counter collection.
3. Run the `vserver perf-stats stop` command to end performance counter collection.

Configuration requirements for DD Cloud Tier support

To configure DD Cloud Tier for each DD VE, refer to The DD OS Administration Guide. This section discusses resources for DD Cloud Tier support for each DD VE.

Table 3 DD VE resource reservations

Configuration	CPU	Memory (GiB)	Minimum Metadata Tier Size(GiB)	Metadata Tier Throughput(MB/S)	Metadata Tier IOPS	Metadata Tier Latency (ms)
16 TB	4	32	500	160	640	14
64 TB	8	60	500	640	2560	14
96 TB	8	80	500	960	3200	14

The minimum metadata size is a hard limit. We recommend users start with 1 TB metadata tier and use 1 TB as incremental size.

Table 4 DD Cloud Tier Meta Data Size for DD VE

CU Size(TiB)	1~16	16~32	32~48	48~64	64~80	80~96	96~112	112~128	128~144	144~160	160~176	176~192
MD Size(TiB)	1	2	3	4	5	6	7	8	9	10	11	12

*The CU (TiB) size includes both cloud units.

The table above is a breakdown of recommended metadata tier size for the corresponding cloud unit (CU) size range. Refer to the *EMC Data Domain Operating System 6.0 Administration Guide* for additional information.

Figure 1 DD Cloud Tier Configuration Wizard for DD VE

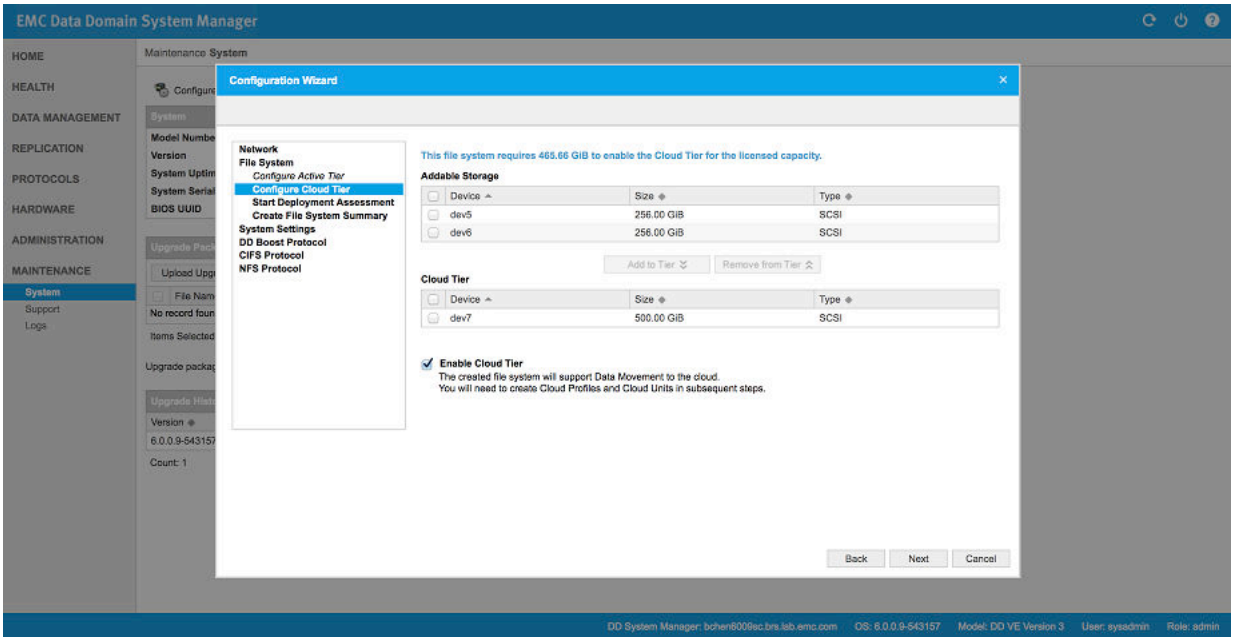
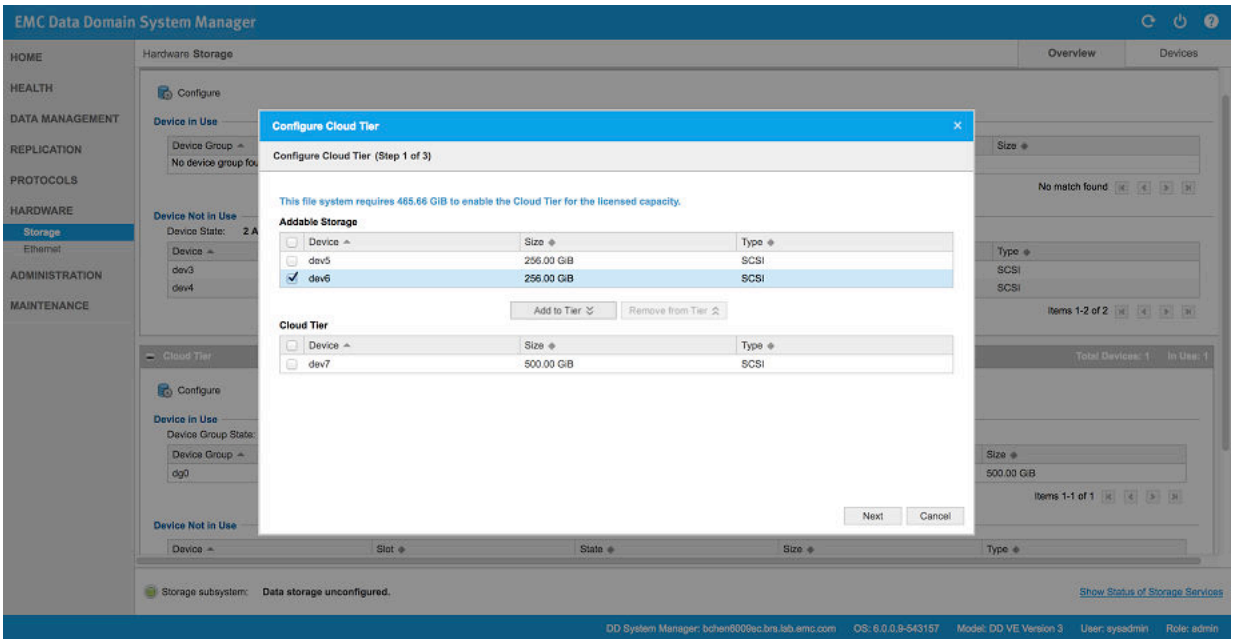


Figure 2 Configure DD Cloud Tier for DD VE



The images above contain DD Cloud Tier screenshots for DD VE. Refer to the *EMC Data Domain Operating System 6.0 Administration Guide* for additional DD Cloud Tier information.

CHAPTER 3

Downloading and Installing DD VE

This chapter describes the procedures to download the DD VE template, install the template, and add storage. This chapter covers the following topics:

Performing the DD VE Download

DD VE is packaged as a zip file that contains a virtual machine template (.ova for VMware, or .vhd for Microsoft) file. The zip file is available from EMC Online Support at https://support.emc.com. There are separate zip packages for VMware and Microsoft Hyper-V available for download. Customer should choose the package that best suits the customer's environment.

Note

The 500 GiB evaluation version is also available from the EMC Trial Download page.

All capacity configurations are available from the same zip file.

DD VE requires a minimum of 760 GiB for configurations of 64TB, Cloud 64TB, 96TB, and cloud 96TB. The minimum size of the first data disk is 500 GiB. DD VE requires a minimum of 460 GiB of available storage to deploy. The 460 GiB breaks down as follows:

- System disk: 250 GiB
- NVRAM disk: 10 GiB
- First data disk: 200 GiB

Performing the DD VE Installation

Before you begin

Be sure you have downloaded the DD VE template, or know its URL, as described in Performing the DD VE Download on page 20.

Installation procedures with the vSphere client are included for:

- Installing on a VMware ESXi Server on page 20
- Installing through a VMware vCenter Server on page 21
- Installing on a Microsoft Windows 2012 R2 with Hyper-V Server on page 22
- You can also use `ovftool` to install the software from the command line. For help, see the VMware documentation.

Installing on a VMware ESXi Server

Table 5 on page 20 lists the information required to deploy the DD VE instance on a VMware ESXi server.

Table 5 Installing DD VE on a VMware ESXi server

Installation step	Description
Username and password for the ESXi server.	Specify the credentials in the vSphere Client to log into the ESXi server.
Launch virtual machine deployment wizard.	Use the VMware deployment wizard to deploy the DD VE instance.
Choose the deployment method.	Deploy from a local file, or deploy from a network location.

Table 5 Installing DD VE on a VMware ESXi server (continued)

Installation step	Description
Review the VM details.	Review the details to this point, and proceed if they look correct.
Review the End User License Agreement (EULA).	Accept the EULA.
Specify a name for the DD VE virtual machine.	This name identifies the virtual machine on the VMware server; it does not become a host name on your LAN.
Choose a datastore to host the DD VE instance.	Select the datastore where the DD VE instance will reside. For best performance, Data Domain recommends that you use a dedicated datastore, one that is not shared by other virtual machines.
Review and complete the deployment.	Review the deployment summary and finish the wizard.
Configure the virtual machine	See Initial Virtual Machine Configuration with the vSphere Client.

The hypervisor documentation provides additional details.

Installing through a VMware vCenter Server

Table 6 on page 21 lists the information required to deploy the DD VE instance on a VMware vCenter server.

Note

When using version 5.5 of the vSphere web client to install DD VE, the system displays the following warning: `The OVF package contains extra configuration options, which possess a potential security risk. Review the extra configuration options below and accept to continue the deployment.` Select **Accept extra configuration options** to continue.

Table 6 Installing DD VE on a VMware vCenter server

Installation step	Description
Username and password for the vCenter server.	Specify the credentials in the vSphere Client to log into the vCenter server.
Launch virtual machine deployment wizard.	Use the VMware deployment wizard to deploy the DD VE instance.
Choose the deployment method.	Deploy from a local file, or deploy from a network location.
Review the VM details.	Review the details to this point, and proceed if they look correct.

Table 6 Installing DD VE on a VMware vCenter server (continued)

Installation step	Description
Review the End User License Agreement (EULA).	Accept the EULA.
Specify a name for the DD VE virtual machine.	This name identifies the virtual machine on the VMware server; it does not become a host name on your LAN.
Select an Inventory Location.	Select the inventory location, or data center to assign the DD VE instance to a host or cluster.
Select a host or cluster.	Choose a host or cluster in the specified inventory location or data center where the DD VE instance will reside.
Choose a datastore to host the DD VE instance.	Select the datastore where the DD VE instance will reside. For best performance, Data Domain recommends that you use a dedicated datastore, one that is not shared by other virtual machines.
Choose the format for the virtual disks.	Data Domain recommends Thick Provision Lazy Zeroed to provide the best balance of performance and deployment time. Thick Provision Eager Zeroed provides the best performance, but takes a long time to deploy.
Review and complete the deployment.	Review the deployment summary and finish the wizard.
Configure the virtual machine	See Initial Virtual Machine Configuration with the vSphere Client.

The hypervisor documentation provides additional details.

Installing on a Microsoft Windows 2012 R2 with Hyper-V Server

Table 6 on page 21 lists the information required to deploy the DD VE instance on a Windows server.

Note

There are three ways to perform this installation: creating a VM, running the powershell script to install DD VE on Hyper-V manager machine, or running the powershell for MS System Center.

Installing on a Microsoft Windows 2012 R2 with Hyper-V Server by creating a VM

Installation step	Description
Username and password for the Windows server.	Specify the credentials to log into the Windows server.
Launch virtual machine deployment wizard.	Use the Hyper-V deployment wizard to deploy the DD VE instance.

Installation step	Description
Specify a name for the DD VE virtual machine.	This name identifies the virtual machine on the Windows server; it does not become a host name on your LAN.
Specify the amount of memory.	Assign memory to the virtual machine.
Configure networking.	Connect the DD VE virtual machine to the Hyper-V networking switch.
Select the virtual disk.	Select the `.vhd` file that contains the DD VE instance.
Configure the virtual machine	See Initial Virtual Machine Configuration.

The hypervisor documentation provides additional details.

Installing on a Microsoft Windows 2012 R2 with Hyper-V Server via powershell script for Hyper-V Manager

This installation script deploys DD VE on Hyper-V.

Syntax: **`C:\ddve-hyperv-0.6000.11.0-524942\ddve-installer.ps1 [-VMName] <String> [-Configuration] <String> [[-VirtualMachinePath] <String>] [[-VirtualHardDiskPath] <String>] [-Force] [<CommonParameters>]`**

Example: **`C:\PS>ddve-installer.ps1 -VMName DDVE -Configuration 4TB -VirtualMachinePath C:\DDVE -VirtualHardDiskPath C:\DDVE`**

Parameter	Description
-VMName `<String>`	Specify the name of DD VE virtual machine
-Configuration `<String>`	Specify the configuration of the DD VE. This parameter accepts one of these values 4TB, 8TB, 16TB, 32TB, 48TB, 64TB, 96TB.
-VirtualMachinePath `<String>`	Specify the directory to store files for the DD VE virtual machine. This parameter is optional and wildcard characters are supported for this parameter value. If this parameter were not specified in command line, Hyper-V setting would be used for this parameter value.
-VirtualHardDiskPath `<String>`	Specify the directory to store virtual hard disks for the DD VE. This parameter is optional and wildcard characters are supported for this parameter value. If this parameter were not specified in command line, Hyper-V setting would be used for this parameter value.
-Force [`<SwitchParameter>`]	
`<CommonParameters>`	This cmdlet supports the common parameters: `Verbose`, `Debug`, `ErrorAction`, `ErrorVariable`, `WarningAction`, `WarningVariable`, `OutBuffer`, `PipelineVariable`, and `OutVariable`. For more information, see

Parameter	Description
	about_CommonParameters, available from the Microsoft website.

Please see ddve-installer-help.txt for additional information.

Installing on a Microsoft Windows 2012 R2 with Hyper-V Server via powershell script for MS System Center

This installation script deploys DD VE on System Center Virtual Machine Manager (SCVMM).

Syntax: `C:\ddve-hyperv-0.6000.11.0-524942\ddve-installer-sc.ps1 [-VMName] <String> [-Configuration] <String> [-SCVMMServer] <String> [-SCVMHost] <String> [-SCVMNetwork] <String> [[-VirtualMachinePath] <String>] [[-VirtualHardDiskPath] <String>] [[-NetworkAdapterCount] <Int32>] [[-IPAddress] <String>] [[-Gateway] <String>] [[-Netmask] <String>] [[-DnsServer1] <String>] [[-DnsServer2] <String>] [<CommonParameters>]`

Example: `C:\PS>.\ddve-installer-sc.ps1 -VMName DDVE -Configuration 4TB -SCVMMServer localhost -SCVMHost osdev-ucs30d -SCVMNetwork mktest-vmnet -NetworkAdapterCount 3`

Parameter	Description
-VMName <String>	Specify the name of DD VE virtual machine.
-Configuration <String>	Specify the configuration of the DD VE. This parameter accepts one of these values 4TB, 8TB, 16TB, 32TB, 48TB, 64TB, 96TB, Cloud16TB, Cloud64TB, Cloud96TB.
-SCVMMServer <String>	Specify the system center VMM server name.
-SCVMHost <String>	Specify the Hyper-V host where DD VE will be deployed.
-SCVMNetwork <String>	Specify a VM Network.
-VirtualMachineHostname <String>	Specify the hostname of the DD VE virtual machine. This parameter is optional and wildcard characters are supported for this parameter value. If this parameter is not specified in command line, localhost would be used for this parameter value.
-VirtualMachinePath <String>	Specify the directory to store files for the DD VE virtual machine. The VirtualMachinePath folder must exist on host SCVMHost. If this parameter is not specified in command line, Hyper-V setting would be used for this parameter value.
-VirtualHardDiskPath <String>	Specify the directory to store virtual hard disks for the DD VE. The VirtualHardDiskPath folder must exist on host SCVMHost. If this parameter is not specified in command line,

Parameter	Description
	Hyper-V setting would be used for this parameter value.
-NetworkAdapterCount <Int32>	Specify the number of network adapters to be added to DD VE. If this parameter is not specified, 2 networks adapters are added. This parameter accepts value in range 1 to 8.
-IPAddress <String>	Specify IP address.
-Gateway <String>	Specify gateway IP address.
-Netmask <String>	Specify netmask.
-DnsServer1 <String>	Specify first DNS server IP address.
-DnsServer2 <String>	Specify second DNS server IP address.
<CommonParameters>	This cmdlet supports the common parameters: `Verbose`, `Debug`, `ErrorAction`, `ErrorVariable`, `WarningAction`, `WarningVariable`, `OutBuffer`, `PipelineVariable`, and `OutVariable`. For more information, see about_CommonParameters, available from the Microsoft website.

Please see ddve-installer-sc-help.text for additional information.

Initial virtual machine configuration

The DD VE template does not include any storage, so you need to add data disks to the system. The procedure in this section explains how to add the disks before you start the virtual machine.

Note

You can add the first or additional virtual data disks while the virtual machine is running, provided that you do not also need to add more virtual memory to support the additional disks. DD VE supports virtual disk hot-plugging, but not CPU, memory, HBA card or NIC card hot-plugging.

Depending on the amount of disk space, you may also need to add memory to the virtual machine. The next table shows the supported storage configurations and their virtual CPU and memory requirements.

Hardware configuration		Storage capacity range (TB)							
		Up to 500 GB	Up to 4 TB	Up to 8 TB	Up to 16 TB	Up to 32 TB	Up to 48 TB	Up to 64 TB	Up to 96 TB
CPU	Topology	1 socket with 2 cores			1 socket with 4 cores			1 socket with 8 cores	
	Reservation	2 x 1.5 GHz			4 x 1.5 GHz			8 x 1.5 GHz	

Hardware configuration		Storage capacity range (TB)						
Memory	Topology	6 GB	8 GB	16 GB	24 GB	36 GB	48 GB	64 GB
	Reservation							

The system displays an error message if you attempt to configure a higher capacity with fewer memory and CPU resources than the amounts listed in the table above. The `system vresource show requirements` command lists the virtual resources available on the host.

Adding NICs

When initially deployed, DD VE is provisioned with two VMXNET3 NICs which can be configured as required. Additional NIC cards can be added up to a maximum of:

- DD VE 3.0: 8 NICs total

Note

The following applies specifically to VMware:

- Additional NICs can only be of type VMXNET3. NICs of type VMXNET2 and E1000(E) can be added to the DD VE virtual machine, but will not be visible or usable within DD OS on the appliance.
- DD VE does not support hot add of NICs. A VMXNET3 NIC can be added while DD VE is powered on, the NIC will not be visible or useable within the DD OS on the appliance until the DD VE appliance is restarted.
- DD VE does not support hot remove of NICs. Any attempt to remove a NIC while the DD VE appliance is powered on will cause ESXi/vSphere to report the following error: `The guest operating system did not respond to a hot-remove request for device ethernet3 in a timely manner.The DD VE appliance must be powered off before NICs can be removed.`

Adding disks and memory

Before you begin

Make sure you have enough licensed capacity available to add new capacity to DD VE.

When adding additional capacity, make sure the DD VE instance has enough memory to support the new capacity. Initial virtual machine configuration on page 25 describes the amount of memory required to support DD VE capacity.

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

- The minimum size of the first data disk is 477 GiB (512 GB).
- The minimum size of any subsequent data disks is 94 GiB (100 GB).
- For VMware environments, KB article 1003565 *Block size limitations of a VMFS datastore* onhttp://kb.vmware.com describes how block size constrains the maximum size of the disk.
- If applicable, select Thick Provision Lazy Zeroed as the disk provisioning option.

After you finish

To add additional storage or memory in the future, follow the requirements above. It is not necessary to shut down the virtual machine before adding storage.

Note

The virtual disk cannot be expanded. Create a new virtual disk to add additional storage to the virtual machine.

Setting Up NTP Time Synchronization

By default, NTP is disabled on the DD VE system by default, and the DD VE instance system time is synchronized with the host.

If you need to enable NTP on the DD VE, follow these steps:

Note

Skip this task if you are going to join the DD VE to an Active Directory domain. Because the Windows domain controller obtains the time from an external source, NTP must be configured. See the Microsoft documentation on how to configure NTP for the Windows operating system version or service pack that is running on your domain controller. After joining the domain, the system time is periodically synchronized with the domain controller time. When the host joins the Active Directory, the DD VE displays a warning if multiple time sources are in use.

Later, while performing initial configuration of the DD VE system, enable NTP by selecting the appropriate options from the configuration wizards. If you do not use the wizards to perform initial configuration, you can use the `ntp enable` command on the DD OS command line. Enabling NTP with the `ntp enable` command automatically disables synchronizing the time on the guest to the host time.

To reenable synchronizing the guest time to the host time, run the `ntp disable` command.

Note

NTP is disabled by default. The `ntp reset` command also deactivates NTP on the guest.

The Hyper-V and VMware documentation provides additional details.

Upgrading DD VE

Upgrading DD VE 2.0 to DD VE 3.0

DD VE 3.0 uses DD OS 6.0. To upgrade DD VE 2.0 to DD VE 3.0, RPM upgrade of DD OS to DD OS 6.0 level. Refer to the *EMC Data Domain Operating System 6.0 Administration Guide* and the *EMC Data Domain Virtual Edition Installation and Administration Guide* for additional information.

Upgrading DD VE to a higher capacity

If the higher capacity does NOT need additional resources (refer to Table 2 on page 14), follow these steps.

1. Add the needed hard disks for the new capacity
2. Configure the newly added data disks using the CLI command `storage add dev tier active<device ID>`(Or, use DD SM GUI)

3. Expand the file system using the CLI command `filesys expand`

If the higher capacity will require DD VE to have higher resources, follow these steps to upgrade DD VE to a higher capacity.

1. Shutdown DD VE
2. Increase the memory to support the higher capacity configuration (refer to Table 2 on page 14)
3. Increase the number of CPUs for the higher capacity configuration (refer to Table 2 on page 14)
4. Increase the CPU reservations (refer to Table 2 on page 14)
5. Add the needed hard disks for the new capacity
6. Power on the DD VE
7. Add the license for the new capacity
8. Configure the newly added data disks using the CLI command `storage add dev tier active<device ID>`
9. Expand the file system using the CLI command `filesys expand`

Powering on the virtual machine

If the installation is successful, you should be able to power on the DD VE virtual machine and log into the system.

Procedure

1. From the Hyper-V or VMware, power on the DD VE virtual machine.

   Note

   There may be a delay of several minutes until the DD OS prompt appears, depending on your hardware and configuration.

2. Optionally, open the virtual machine console to view the boot and initialization process. You should see the CLI prompt to log in for a successful boot.
3. Note the IP Address assigned to the system by DHCP and shown in the previous figure.

   You can use this address to configure or administer the system outside the hypervisor.

After you finish

The next step is the initial system configuration in DD OS. See Initial Setup and Configuration in DD OS on page 31 for an overview, and see the *EMC Data Domain Operating System Initial Configuration Guide* for detailed instructions.

Note

To shut down the DD VE virtual machine, shut down the guest operating system from the DDSH with the command `system poweroff` or `system reboot` for reboot. Do not reset or power off the DD VE virtual machine, which will perform a hard reset of the system rather than an orderly shutdown. Currently, the Guest OS shutdown and Guest OS reboot features in the hypervisor also cannot guarantee an orderly shutdown and reboot.

The hypervisor documentation provides additional details.

CHAPTER 4

Initial Setup and Configuration in DD OS

This chapter explains how to perform initial setup and configuration of the system in DD OS in the following sections:

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 listed below.

Note

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

Table 7 System Setup Worksheet for DD VE

Information	Your Values
A fully qualified host name for the system:	
The DNS domain name:	
A default gateway IP address (if you are not using DHCP):	
DNS server IP addresses (if you are not using DHCP): • Primary • Secondary • Tertiary	
If you will enable CIFS access, enter the information for your CIFS authentication method: For Workgroup authentication: • Workgroup name: • Backup user name: • Password: For Active Directory authentication: • Realm name: • Domain admin name: • Password	
Host name from which to administer the system:	
Administrator's email address (or admin group alias):	
Mail server (SMTP) host name:	
Hypervisor server name:	
(Optional) Physical location of the hypervisor server:	
Time zone name (default is US/Pacific):	

Table 7 System Setup Worksheet for DD VE (continued)

Information	Your Values
Serial number (SN) provided to you by Data Domain:	
Virtual machine unique ID (after initial configuration, use the system show serialno command to display this ID):	

Use this table to enter Ethernet connectivity information. By default, DHCP is enabled on both ports.

Table 8 Ethernet Connectivity Worksheet

Ethernet Connectivity	Enable	Use DHCP	IP Address (if no DHCP)	Netmask (if no DHCP)
ethV0				
ethV1				
ethV2				
ethV3				
ethV4				
ethV5				
ethV6				
ethV7				

Initial System Configuration

You can connect to the system to perform the initial system configuration with the command-line configuration wizard, or the DDSM Configuration Wizard.

DHCP is enabled on the DD VE system by default. If the DHCP service is available, the DD VE system will receive IP addresses from the DHCP server. You can see the DHCP-assigned IP addresses in the Summary tab of the vSphere Client window. You can change these IP addresses to static IP addresses during initial configuration. For Hyper-V, you can find the IP address on the Networking tab of the Hyper-V Manager.

Note

DHCP is only activated automatically for the first two network interface cards (NICs) which are built into the virtual machine template. Any extra NICs must be configured manually.

Using the GUI

Access DDSM by entering the IP address of the DD VE into a web browser, and logging in.

The GUI Configuration Wizard contains six sections: Networking, File System, System Settings, DD Boost, CIFS, and NFS.

Configuring DD VE in Data Domain System Manager on page 35 describes how to configure the DD VE from the GUI.

Using the CLI

There are two ways to access the CLI:

- By using the VMware or Hyper-V to access the DD OS console
- By using `ssh` or a terminal emulator to access the DD OS command line

The CLI configuration utility contains four sections: Network, eLicenses, System, and DD Boost.

Provisioning the storage with the CLI on page 40 describes how to configure the DD VE manually with the CLI instead of using the configuration utility.

DD VE storage guidelines

Be aware of the following virtual storage guidelines for DD VE before deploying a DD VE instance.

DD VE licenses are sold in Terabytes (TB), but VMware disk sizes are actually measured in Tebibytes (TiB). 1 TB is equal to 0.97 TiB or 1.02 TB is equal to 1 TiB. Because of this, DD VE allows a 10% buffer to reach the licensed capacity measured in TB. Additionally, Hyper-V manager also uses GiB for "GB" in its GUI.

Table 9 TB to TiB equivalents

Licensed capacity in TB	Licensed capacity in TiB	Maximum capacity with buffer in TB
4 TB	3.6 TiB	4.4 TB
8 TB	7.3 TiB	8.8 TB
16 TB	14.6 TiB	17.6 TB
32 TB	29.2 TiB	35.2 TB
48 TB	43.8 TiB	52.8 TB
64 TB	58. 4 TiB	70.4 TB
96 TB	87.6 TiB	105.6 TB

Individual virtual disks are subject to overhead that reduce their amount of usable capacity to amounts lower than their specified capacity.

- The first data disk is subject to 120 GB of base overhead, with 5.6% of the remaining capacity reserved for RAID-on-LUN
- All subsequent data disks are subject to 5.6% overhead reserved for RAID-on-LUN

Table 10 Virtual disk overhead calculations

Disk	Overhead calculation	Usable capacity examples
First data disk (200 GB or more)	(Total capacity - 120 GB) * 0.944	• 200 GB disk: 75.5 GB • 300 GB disk: 169.9 GB • 400 GB disk: 264.3 GB • 500 GB disk: 358.7 GB

Table 10 Virtual disk overhead calculations (continued)

Disk	Overhead calculation	Usable capacity examples
All subsequent data disks (100 GB or more)	Total capacity * 0.944	• 100 GB disk: 94.4 GB • 200 GB disk: 188.8 GB • 300 GB disk: 283.2 GB • 400 GB disk: 377.6 GB • 500 GB disk: 472 GB

Configuring DD VE in Data Domain System Manager

DD VE licensing and configuration can be accomplished through the Configuration Wizard in Data Domain System Manager. After the initial installation of a DD VE instance, the Configuration Wizard automatically appears after the licensing screen on the first launch of DDSM.

Enter the DD VE virtual machine IP address into a web browser to launch Data Domain System Manager. Log in with the following credentials:

- Username: sysadmin
- Password: changeme

DD VE licensing

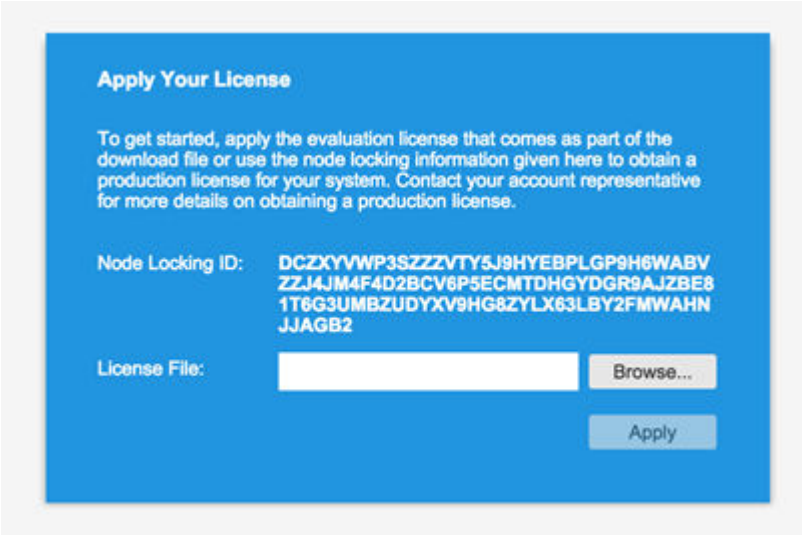
The **Apply Your License** window is the first screen that appears when DDSM is launched for the first time. The DD VE instance is locked until a license file is applied.

Click **Browse**, locate the license file for a purchased capacity license or the evaluation license included with the DD VE download, then click **Apply**.

Note

If you begin the configuration with the evaluation license, but wish to purchase a license later, you will need the Node Locking ID for the DD VE instance. Click **Administration** > **Licenses** to view the Node Locking ID.

Figure 3 DD VE Node Locking ID

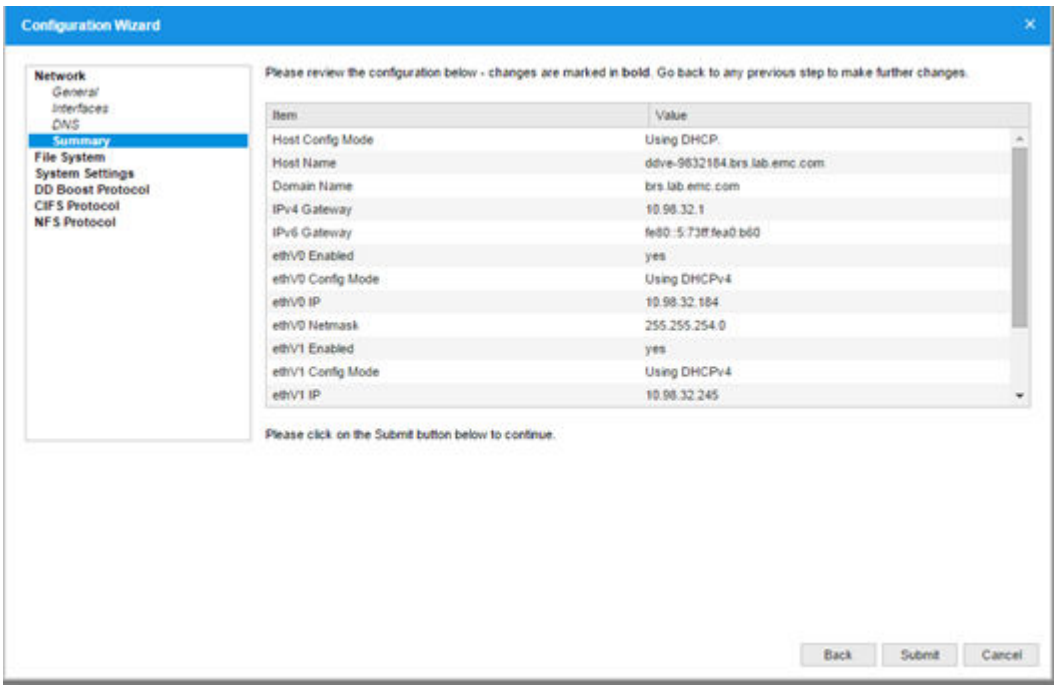


DD VE configuration

After applying the DD VE license, the Configuration Wizard begins automatically. The wizard assists in configuring the following aspects of the DD VE:

- Networking
  - DHCP or manual settings
  - Virtual interface ethV0 and ethV1 configuration
  - DHCP or manual DNS configuration

  Figure 4 Configuration Wizard - Network



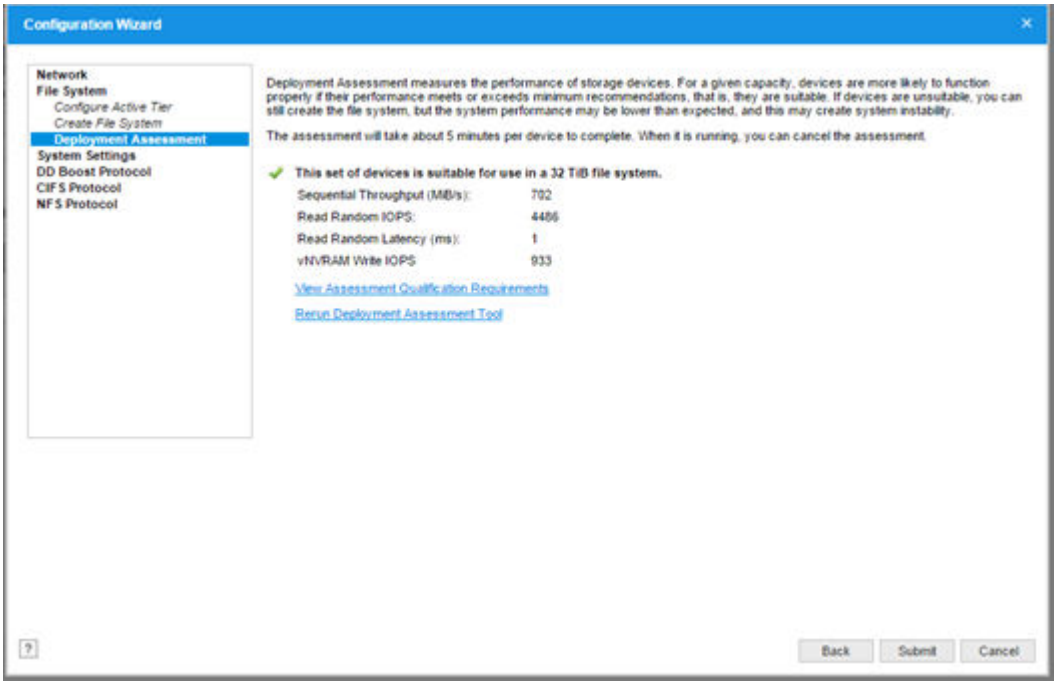
- File system

Note

DD VE supports a maximum of six MTrees active at a given time, however up to 100 MTrees can be created on DD VE.

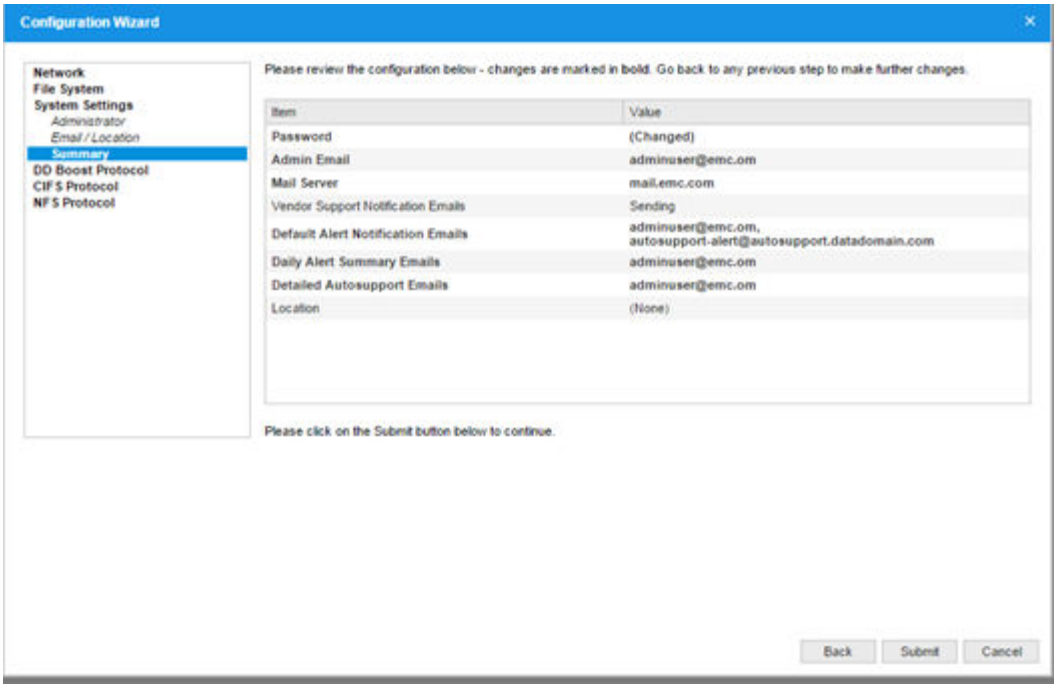
- Create virtual storage devices
- Optionally enable the DDFS automatically after creating it
- Run the DAT to determine if the underlying storage hardware meets DD VE requirements

Figure 5 Configuration Wizard - File System



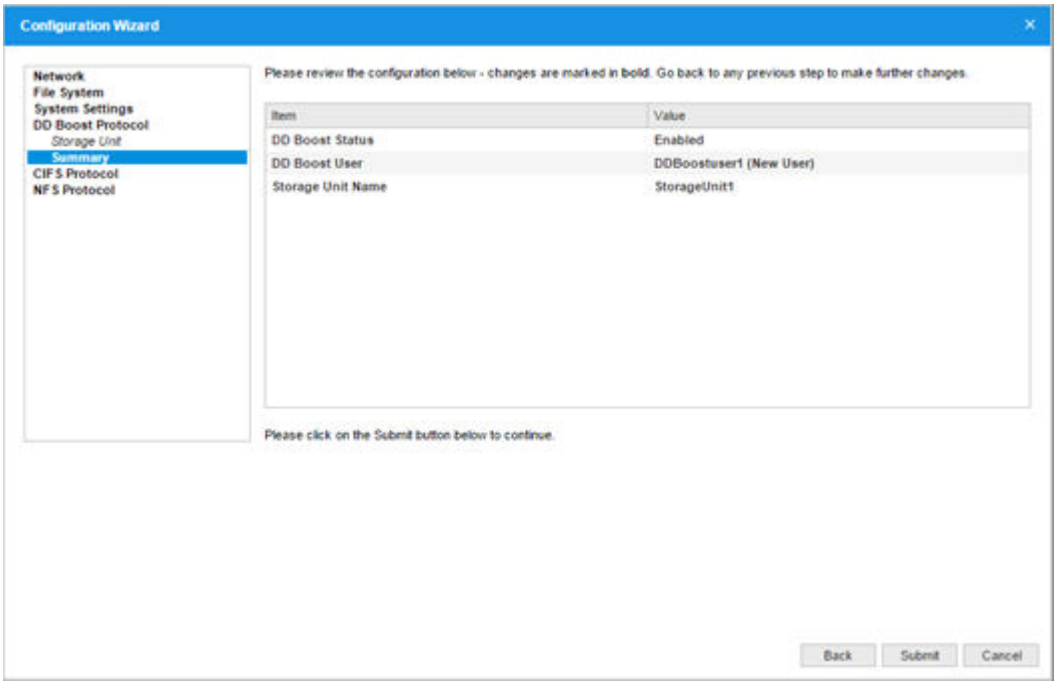
- System settings
  - Update the sysadmin password
  - Optionally configure alert and autosupport email settings

Figure 6 Configuration Wizard - System Settings



- DD Boost
  - Create a Boost storage-unit, and assign a user ID to own it

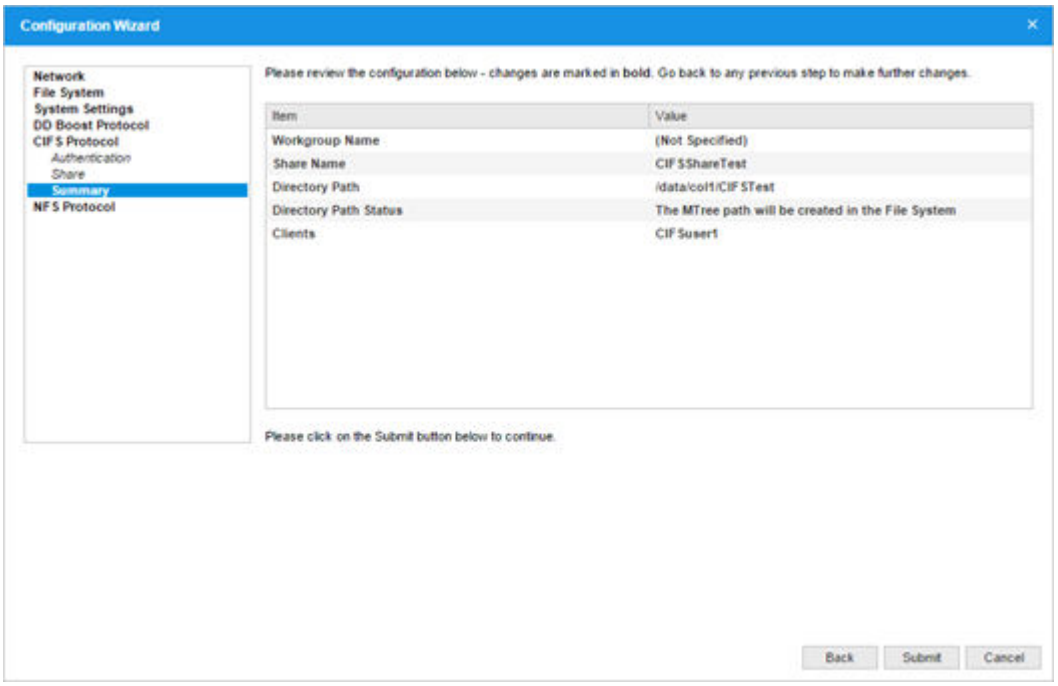
Figure 7 Configuration Wizard - DD Boost Protocol



- CIFS
  - Select workgroup or Active Directory mode

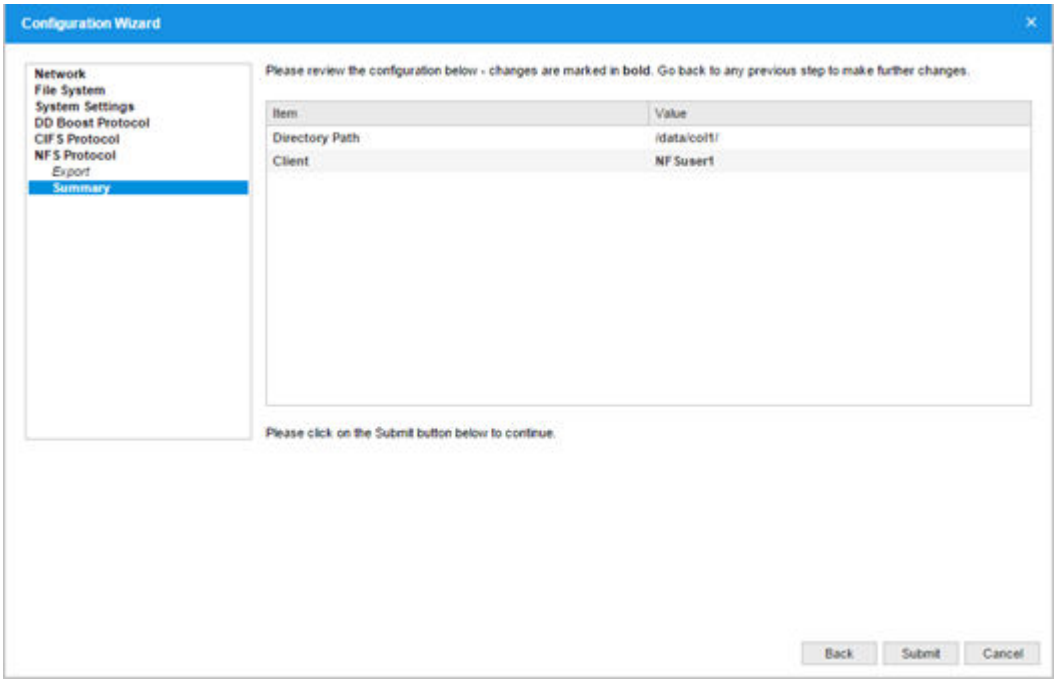
- Create CIFS shares and add clients

Figure 8 Configuration Wizard - CIFS Protocol



- NFS
  - Create NFS exports and add clients

Figure 9 Configuration Wizard - NFS Protocol



Provisioning the storage with the CLI

Before you begin

See Disk (Spindle) Group Configuration on page 46.

Procedure

1. Log into the system with the user name of **sysadmin**.

   The default password is **changeme**.

   At the first login, use the `elicense` command to add a DD VE license.
2. Type control-C to exit the configuration utility.
3. Confirm that virtual disk dev3 exists and has the expected size:

   `# disk show hardware`
   The output should include a line similar to the following example:

   `dev3 VMware Virtual disk 1.0 (unknown) 256.00 GiB SAS n/a`
   The first two virtual disks (dev1 and dev2) are used for the system software and cannot be used for storage. The `disk show state` command shows `System Dev` for these system disks.
4. Choose to run DAT tool test (optional):

   `#disk benchmark start dev3`
   This command starts the DAT tool test.

   `#disk benchmark watch`
   You can monitor the test's progress by entering this command.

   `#disk benchmark show`
   Once the test is complete, you can use this command to see the test's result.
5. Add the storage disk to the active storage tier:

   `# storage add dev3`

   If you are adding more than one virtual disk, repeat the storage add command for each disk. For guidelines on specifying the optional spindle-group argument, see Configuring Disk (Spindle) Groups on page 46.
6. Create the file system:

   `# filesys create`

   The "filesys create" may take longer to complete if the hypervisor's storage is slow and does not meet the criteria.
7. Enable the file system:

   `# filesys enable`

After you finish

You can now complete the initial system configuration. See Completing Initial Configuration with the Command-Line.

Completing Initial Configuration with the Command-Line

Procedure

1. Enter the `config setup` command to start the configuration utility.

2. When prompted, enter the Name, and Domain Name of the system.
3. When prompted, configure the initial IP port.

   You can:

   - Choose DHCP.
   - Enter a static IP address and Net Mask.
4. When prompted, either exit the configuration utility and continue configuring the system using the Graphical User Interface, or continue using the CLI configuration utility.

   The list entries in the utility can be comma-separated, space-separated, or both.

   - At each prompt, enter a value, OR
   - Enter a question mark (?) for more details, OR
   - Press Enter to accept the value displayed in braces.

   Follow the configuration utility instructions for entering appropriate values. At the end of each configuration section, you can choose to: `Save`, `Cancel`, or `Retry` (restart the input entry as the beginning of the current section).

   Note

   If you need to enable NTP, you can do so with the configuration utility.

Configure the System for Data Access

The DD VE system provides multiple protocols for data access: NFS, CIFS, and DD Boost. You need to configure one or more protocols for data access, depending on your environment. You also need to configure the clients for accessing the DD VE with the protocol of your choice.

If you did not configure data access with the configuration wizard, use the instructions in this section.

NFS

The NFS configuration section in the configuration utility sets up the NFS clients to allow access to `/backup` on the DD VE. You also need to set up the NFS clients to allow access to `/backup`, and any user-created MTrees on the DD VE. This can be done using the following steps:

- Create a mount point (directory) such as `/dd/rstr01/MTree1` and create an administrative mount point such as `/dd/rstr01/ddvar`.
- NFS mount the directories on the new mount points. For example:

  `mount -F nfs -o hard,intr,vers=3,proto=tcp rstr01:/ MTree1 /dd/rstr01/backup`

  `mount -F nfs -o hard,intr,vers=3,proto=tcp rstr01:/ ddvar /dd/rstr01/ddvar`
- Add the following lines to the file `/etc/vfstab` (the file name may be different depending on your UNIX-based system). The lines mount the directories at every reboot. For example:

  `system:/backup - /dd/rstr01/MTree1 nfs - yes hard,intr,vers=3,proto=tcp`

  `system:/ddvar - /dd/rstr01/ddvar nfs - yes hard,intr,vers=3,proto=tcp`

- To cause backup software to abort when the system is not mounted, create a backup directory within the mounted file system, such as `/dd/rstr01/MTree/disk1`.

For more configuration information, see the specific Data Domain Integration Documentation at https://support.emc.com.

Note

Do not mix NFS/CIFS exports of the same directory structures.

CIFS
The CIFS configuration section in the configuration utility sets up the CIFS clients to allow access to `/backup` on the DD VE. You also need to set up the CIFS clients to allow access to `/backup`, and any user-created MTrees on the DD VE. For additional configuration information, see the specific Data Domain Integration Documentation at https://support.emc.com.

DD Boost (License required)
For setting up the Data Domain DD Boost feature, see the *EMC Data Domain Boost for OpenStorage Administration Guide* or *EMC Data Domain Boost for Partner Integration Administration Guide* available at https://support.emc.com.

Application Integration
For information about how to integrate the Data Domain system with backup software, see the documentation for the applicable application at the Data Domain Integration Documentation section on the Data Domain Support web site https://support.emc.com.

Configuration of optional software and internal licenses

If you need to configure more than 500 GB of storage for your DD VE, or license optional software features, you need to install and activate those licenses before you configure those features. See DD VE capabilities and licensing on page 8 for information about features and licenses that are available to for DD VE. A separate license is required for DD Cloud Tier.

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

Optional Additional System Configuration

See the *EMC 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.

Note

Any system command that accepts a list, such as a list of IP addresses, accepts entries separated by either commas or spaces. See the *EMC Data Domain Operating System Command Reference Guide* for command details.

Give access to additional backup servers:

```
# nfs add /backup {*|client-list} [options]
```

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 *EMC Data Domain Operating System Administration Guide* for details.

To Shut Down The System:

```
# system poweroff
```

CHAPTER 5

DD VE Administration

This chapter covers the following topics:

Adding virtual storage

Additional virtual storage can be added using the GUI or the CLI.

Note

DD VE does not support the use of VMware RDM volumes.

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.

Using the GUI

In DDSM, click **Hardware** > **Storage** > **Configure Storage** to add additional devices to the DD VE active tier.

Note

If no addable devices exist, create new virtual disks as described in Adding disks and memory on page 26.

After adding the storage, click **Data Management** > **File System** > **Expand Capacity** > **Next** to launch the DAT to verify the hardware supporting the virtual storage meets the requirements for DD VE.

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. For instructions and restrictions, see Initial Virtual Machine Configuration with the vSphere Client.

Disk (Spindle) Group Configuration

DD VE 3.0 supports 16 spindle-groups. We recommend that virtual disks from the same storage be configured with same spindle-group number. For virtual disks with different storage should be configured with a different spindle-group number.

Note

DD VE 3.0 supports up to 58 virtual disks on VMware and supports up to 120 virtual disks on Hyper-V.

Load and capacity balancing in DD OS depends on correct assignment of virtual disks to disk (spindle) groups. You do this by specifying the optional `spindle-group` argument to the `storage add` command. The command syntax is:

```
# storage add devdisk-id spindle-group 1
```

For example, if three disks are configured on DD VE, dev3 and dev4 are from the same storage, and dev5 is from a different storage.

```
# storage add dev3 spindle-group 1
# storage add dev4 spindle-group 1
# storage add dev5 spindle-group 2
```

Extensions to DD OS for DD VE

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

Storage performance evaluation

Manage virtual disk performance benchmark tests.

Storage performance can be evaluated in two ways:

- With the DAT in DDSM
- With the `disk benchmark` command in the DD OS CLI

DAT
In addition to being part of the DDSM Configuration Wizard, DAT can be run as part of the process of adding new devices to expand the file system on the DD VE instance.

Note

Running DAT before expanding the file system requires the presence of at least one device to add to the active storage tier. Also, benchmark should not be run when virtual disks are absent.

In DDSM, click **Data Management** > **File System** > **Expand Capacity**.

Click **Configure** to add devices to the active tier, or click **Next** if you have already added the devices to the active tier.

Run the DAT to analyze the underlying storage performance.

disk benchmark
`disk benchmark requirements`
Displays the currently configured recommended performance characteristics by disk capacity.

`disk benchmark start <dev-list>`
Start a performance benchmark test on one or more data disks in series or in parallel.

- Specify `dev[3-5]+dev7+dev[10-12]` to test the specified devices in sequence, one after the other.
- Specify `dev(3-5) dev7 dev(10-12)` to test the specified devices in parallel.

Example 1

Test **dev3**. When that test finishes, test **dev4**.

```
# disk benchmark start dev[3-4]
```

Test **dev3** and **dev4** in parallel.

```
disk benchmark start dev(3-4)
```

Start two series of tests in parallel. The two series of tests are **dev3** followed by **dev4**, and **dev5** followed by **dev6**.

```
# disk benchmark start dev(3-4) dev(5-6)
```

```
disk benchmark show {[[detailed] test-id] | all | requirements}
```

Print disk performance benchmark test results and report a recommended capacity for the tested configuration. With no arguments, the command prints information about the most recent test for every disk. Specify a *test-id* to see information about a single test. Specify `all` to see a table of previous and currently running tests. Specify `requirements` to see a table of performance goals.

Note

The `disk benchmark show` command shows the results of the test of storage performance on the host system to determine which DD VE capacity configurations can be supported on the host.

`disk benchmark start`
Conducts a test of storage performance.

`disk benchmark stop`
Stop all running tests.

`disk benchmark watch`
Display the ongoing results of all tests in progress.

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 host.

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

DD VE-only commands

The following commands only work on DD VE, and are not supported on physical Data Domain systems.

Table 11 DD VE-only commands

Command	Description
`disk benchmark [[detailed] <test-id>]`	Create a disk benchmark test, and specify a unique ID for the test. Use the `detailed` option to collect more advanced information.
`disk benchmark show all`	List all the disk benchmark tests stored on the system.
`disk benchmark show requirements`	Displays the physical storage requirements for running DD VE.
`disk benchmark start <dev-list>`	Start disk benchmarking tests on the specified device or group of devices. For the `<dev-list>` parameter: • Specify `dev[3-5]+dev7+dev[10-12]` to test the specified devices in sequence, one after the other. • Specify `dev(3-5) dev7 dev(10-12)` to test the specified devices in parallel.
`disk benchmark stop`	Stop all disk benchmarking.
`disk benchmark watch`	Displays information about an in-progress disk benchmarking test, including the test being run, the device being tested, and the percent complete. This command blocks the system until the test completes, or the user types **`Ctrl + C`**.
`system vresource show [requirements]`	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.
`vserver config set`	DD VE supports the hypervisor's functionality to collect performance statistics from the hypervisor. These performance statistics can be used to troubleshoot the DD VE performance problems. To do that, users need to specify the vServer information (hostname or IP address) and the credential information(username and password). The vServer can be a vCenter server, an ESXi host for vSphere, a Hyper-V server, or an SVCMM server for Hyper-V. Once this information is

Table 11 DD VE-only commands (continued)

Command	Description
	configured, DD VE will collect performance statistics from the vServer every 5 minutes.
`vserver config reset`	Reset the vServer credentials for DD VE to their default values.
`vserver config show`	Display the vServer credentials for DD VE.

Modified DD OS Commands

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

Table 12 Modified DD OS Commands

Command	Changes
`alert`	The `tenant-unit` parameter is not supported.
`compression`	The `tenant-unit` parameter is not supported.
`config setup show`	Arguments for configuring features not available in DD VE have been removed.
`ddboost clients show active`	The `tenant-unit` parameter is not supported.
`ddboost file-replication show active`	The `tenant-unit` parameter is not supported.
`ddboost file-replication show detailed-file-history`	The `tenant-unit` parameter is not supported.
`ddboost file-replication show file-history`	The `tenant-unit` parameter is not supported.
`ddboost option reset`	The `fc` parameter is not supported.
`ddboost option show`	The `fc` parameter is not supported.
`ddboost storage-unit create`	The `tenant-unit` parameter is not supported.
`ddboost storage-unit modify`	The `tenant-unit` parameter is not supported.
`ddboost storage-unit show`	The `tenant-unit` parameter is not supported.
`ddboost streams show active`	The `tenant-unit` parameter is not supported.
`ddboost streams show history`	The `tenant-unit` parameter is not supported.

Table 12 Modified DD OS Commands (continued)

Command	Changes
`disk rescan`	The *<enlcosure-ID>.<disk-ID>* parameter is not supported.
`disk show state`	DD VE system disks show the `System Dev` state.
`disk show stats`	The DD VE format for this command is `disk show stats [dev <n>]`
`disk status`	The `Spare` row has been removed from the output. The `System` row has been added.
`enclosure show all`	The `[<enclosure>]` parameter is not supported.
`enclosure show controllers`	The `[<enclosure>]` parameter is not supported.
`enclosure show cpus`	The `[<enclosure>]` parameter is not supported.
`enclosure show io-cards`	The `[<enclosure>]` parameter is not supported.
`enclosure show memory`	The `[<enclosure>]` parameter is not supported.
`filesys encryption keyes delete`	The `[tier {active | archive} | archive-unit <unit-name>]` parameter is not supported.
`filesys encryption keys show`	The `[tier {active | archive} | archive-unit <unit-name>]` parameter is not supported.
`filesys fastcopy`	The `[retention-lock]` parameter is not supported.
`filesys show compression`	The `[tier {active | archive} | archive-unit <unit-name>]` parameter is not supported.
`filesys show space`	The `[tier {active | archive} | archive-unit <unit-name> | arcjove-unit {all | <unit-name>]` parameter is not supported.
`mtree create`	The `tenant-unit` parameter is not supported.
`mtree list`	The `tenant-unit` parameter is not supported.
`mtree show compression`	The `tenant-unit` and `tenant-unit` parameters are not supported.

Table 12 Modified DD OS Commands (continued)

Command	Changes
`mtree show performance`	The `tenant-unit` parameter is not supported.
`net create interface`	The *<virtual-ifname>* parameter is not supported.
`net destroy`	The *<virtual-ifname>* parameter is not supported.
`perf`	The `vtl` option is not supported on any `perf` command.
`storage add`	The `tier`, `enclosure`, and `disk` parameters are not supported.
`storage remove`	The `tier`, `enclosure`, and `disk` parameters are not supported.
`storage show`	The `archive` option is not supported.
`system show stats`	NVRAM statistics are not reported, because DD VE systems do not have physical NVRAM.
`quota`	The `tenant-unit` parameter is not supported.
`replication`	MTree replication is the only type of replication supported.
`snapshot`	The `tenant-unit` parameter is not supported.

Unsupported DD OS Commands

The following DD OS commands and command options are not supported on the DD VE platform.

Table 13 Unsupported Commands and Command Options

Unsupported Command or Command Option	Notes
`adminaccess https generate certificate`	Deprecated. Use `adminaccess certificate generate` instead.
`alerts add`	Deprecated. Use `alerts notify-list add` instead.
`alerts del`	Deprecated. Use `alerts notify-list del` instead.
`alerts notify-list option set` *group-name* `tenant-alert-summary {enabled | disabled}`	
`alerts notify-list option reset` *group-name* `tenant-alert-summary`	
`alerts reset`	Deprecated. Use `alerts notify-list reset` instead.

Table 13 Unsupported Commands and Command Options (continued)

Unsupported Command or Command Option	Notes
`alerts show alerts-list`	Deprecated. Use `alerts notify-list show` instead.
`alerts test`	Deprecated. Use `alerts notify-list test` instead.
`archive`	
`authorization`	
`autosupport display`	Deprecated. Use `autosupport show report` instead.
`autosupport reset support-list`	Deprecated. Use `autosupport reset { all | alert-summary | asup-detailed | support-notify }` instead.
`autosupport show support-list`	Deprecated. Use `autosupport show { all | asup-detailed | alert-summary | support-notify }` instead.
`cifs set authentication nt4`	Deprecated. Use `cifs set authentication active-directory` instead.
`cluster`	
`ddboost fc`	
`ddboost option reset fc`	
`ddboost option show fc`	
`ddboost show image-duplication`	Deprecated. Use `ddboost file-replication show` instead.
`ddboost user option set` *`user`* `default-tenant-unit` *`tenant-unit`*	
`ddboost user option reset` *`user`* `[default-tenant-unit]`	
`disk add dev`*`disk-id`* `[spindle-group` *`1-16`*`]`	Deprecated. Use `storage add` instead.
`disk add enclosure` *`enclosure-id`*	Deprecated. Use `storage add` instead.
`disk beacon` *`enclosure-id.disk-id`*	
`disk expand`	Deprecated. Use `storage add` instead.
`disk fail`*`enclosure-id.disk-id`*	
`disk multipath`	
`disk port`	
`disk rescan [`*`enclosure-id.disk-id`*`]`	
`disk show detailed-raid-info`	Deprecated. Use `disk show state` and `storage show` instead.
`disk show failure-history`	
`disk show raid-info`	Deprecated. Use `disk show state` and `storage show` instead.

Table 13 Unsupported Commands and Command Options (continued)

Unsupported Command or Command Option	Notes
`disk show reliability-data`	
`disk unfail`	
`enclosure beacon`	
`enclosure show all [`*`enclosure`*`]`	This command is supported, but not with the *enclosure* argument.
`enclosure show chassis`	
`enclosure show controllers` *`enclosure`*	This command is supported, but not with the *enclosure* argument.
`enclosure show cpus [`*`enclosure`*`]`	This command is supported, but not with the *enclosure* argument.
`enclosure show fans`	
`enclosure show io-cards [`*`enclosure`*`]`	This command is supported, but not with the *enclosure* argument.
`enclosure show memory [`*`enclosure`*`]`	This command is supported, but not with the *enclosure* argument.
`enclosure show nvram`	
`enclosure show powersupply`	
`enclosure show summary`	
`enclosure show temperature-sensors`	
`enclosure show topology`	
`enclosure test topology`	
`filesys archive`	
`filesys clean update-stats`	Deprecated. Use `filesys show space` instead.
`filesys encryption`	
`filesys encryption passphrase change`	Deprecated. Use `system passphrase change` instead.
`filesys retention-lock`	Deprecated. Use `mtree retention-lock` instead.
`filesys show compression tier`	The `tier` option is not supported.
`filesys show history`	Deprecated. Use `filesys show compression daily` instead.
`filesys show space`	
`ipmi`	The `archive-unit` and `tier` options are not supported in DD VE.
`license`	The `license` commands are not supported because DD VE uses new `elicense` commands.
`mtree retention-lock`	
`mtree show compression` *`mtree_path`* `tier`	

Table 13 Unsupported Commands and Command Options (continued)

Unsupported Command or Command Option	Notes
net aggregate	
net config *ifname* type cluster	
net create interface *virtual-ifname*	
net create interface *physical-ifname* vlan *vlan-id*	
net create virtual veth*id*	
net destroy *virtual-ifname*	
net destroy *vlan-ifname*	
net failover	
net modify *virtual-ifname* bonding {aggregate | failover	
net set portnaming	
ndmp	
ndmpd	
nfs option disable report-replica-as-writable	Deprecated. Use `filesys option disable report-replica-as-writable` instead.
nfs option enable report-replica-as-writable	Deprecated. Use `filesys option enable report-replica-as-writable` instead.
nfs option reset report-replica-as-writable	Deprecated. Use `filesys option reset report-replica-as-writable` instead.
nfs option show report-replica-as-writable	Deprecated. Use `filesys option show report-replica-as-writable` instead.
perf * module vtl	
san	
snapshot add schedule *name* [days *days*] time *time* [,*time*...] [retention *period*]	Deprecated. Use `snapshot schedule create` instead.
snapshot add schedule *name* [days *days*] time *time* every *mins* [retention *period*]	Deprecated. Use `snapshot schedule create` instead.
snapshot add schedule *name* [days *days*] time *time-time* [every *hrs* | *mins*] [retention *period*]	Deprecated. Use `snapshot schedule create` instead.
snapshot del schedule {*name* | all}	Deprecated. Use `snapshot schedule destroy` instead.
snapshot modify schedule *name* {[days *days*] | time *time* [,*time*...] | [retention *period*]}	Deprecated. Use `snapshot schedule modify` instead.
snapshot modify schedule *name* {[days *days*] | time *time* every {*mins* | none} | [retention *period*]}	Deprecated. Use `snapshot schedule modify` instead.

Table 13 Unsupported Commands and Command Options (continued)

Unsupported Command or Command Option	Notes
`snapshot modify schedule` *name* {[`days` *days*] | `time` *time-time* [`every` {*hrs* | *mins* | `none`}] | [`retention` *period*]}	Deprecated. Use `snapshot schedule modify` instead.
`snapshot reset schedule`	Deprecated. Use `snapshot schedule reset` instead.
`snapshot show schedule`	Deprecated. Use `snapshot schedule show` instead.
`storage add enclosure` *enclosure-id*	
`storage add disk` *enclosure-id.disk-id*	
`storage remove enclosure` *enclosure-id*	
`storage remove disk` *enclosure_id.disk-id*	
`system firmware`	
`system option set console`	
`system retention-lock`	
`system sanitize`	
`system show anaconda`	
`system show controller-inventory`	
`system show nvram`	
`system show nvram-detailed`	
`system show oemid`	
`system upgrade continue`	
`user`	
`user change priv`	Deprecated, with no replacement.
`vtl lunmask`	Deprecated. Use `vtl group` instead.
`vtl lunmask add`	Deprecated. Use `vtl group add` instead.
`vtl lunmask del`	Deprecated.
`vtl lunmask show`	Deprecated. Use `vtl group show` instead.

Performance Troubleshooting

You can check DD VE performance statistics with the native tools available in VMware vCenter or ESXi, or Microsoft Hyper-V.

You can also use the `perf show` and `disk benchmark` commands in DD OS to monitor and benchmark performance. See Extensions to DD OS for DD VE on page 47 for information about these commands.

CPU Performance

The two key statistics for CPU performance are:

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

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

Memory Performance
The key statistic for memory performance is memory swapping,: the current amount of guest physical memory swapped out to the virtual machine's swap file. This value should always be zero. If it is not, there is a memory resource contention on the hypervisor host, which is likely to have a severe impact on DD VE performance.

Virtual Disk Performance
The key statistics for virtual disk performance are:

- I/O throughput: a decrease in these values indicates a performance issue.
- I/O latency: an increase in read and write latency values indicates a performance problem.

Failed commands: an increase in the average number of outstanding read and write requests indicates a performance problem.

Note

The controls and names for these statistics and counters are quite different in some versions of the vSphere client, and between VMware and Microsoft hypervisors. See your hypervisor documentation for help displaying these statistics in your environment.

Migrating DD VE

The virtual machine running DD VE supports live migration and cold migration in VMware vCenter environments. The virtual machine running DD VE supports live migration in Hyper-V environments. DD VE supports live migration and cold migration.

Note

After changing the virtual host, verify the network adapters are connected with the correct network label, otherwise the virtual machine will not be able to acquire an IP address. The system generates a warning when a virtual machine host does not have the network label available.

Note

DD VE uses dynamic mac address on Hyper-V platform. When you perform DD VE migration on Hyper-V, the mac address may change. Use DHCP so that IP address will change. However, if you want to keep the MAC address, you can configure DD VE with static mode before migration. For additional information, see *Hyper-V and Dynamic MAC Address Regeneration* at https://blogs.msdn.microsoft.com and *Understanding MAC Address Behavior During Hyper-V Live Migration* at http://www.virtualizationadmin.com

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