IBM® Guardium Data Encryption

Installation & Configuration Guide

Release 4.0.0.0

IBM Guardium Data Encryption 4.0.0.0 is the same product as Vormetric Data Security (VDS) Release 6.2.0. VDS Release 6 consists of Data Security Manager and Vormetric Agents.

Vormetric Data Security Platform

Guardium Data Encryption

Release 6

Version 6.2.0

Installation and Configuration Guide

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Vormetric Data Security Platform
Installation and Configuration Guide
v6.2.0

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Preface

The *Install and Configuration Guide* describes how to install and configure the appliance. This document is intended for system administrators who install the GDE appliance and connect it to a network.

DOCUMENTATION VERSION HISTORY

The following table describes the documentation changes made for each document version.

Documentation Changes

Document Version	Date	Changes
GDE v3.0 v1	09/22/2017	The GDE 3.0a release is the same as DSM release v6.0.1. This release introduces the following new features: Bonded NICs, a new concise initialization method that reduces the load on the appliance and the network when the agents are re-initialized, and re-signing of host settings. Enhancements have been made to High Availability.
GDE 3.0b v1	12/14/2017	GDE 3.0b release is the same as DSM release v6.0.2-patch. This release addresses several security issues.
GDE 3.0.0.1 v1	07/06/2018	GA release of GDE 3.0.0.1. The GDE 3.0.0.1 release is the same as DSM release v6.0.3. This release introduces support for nShield Connect Integration, Automatic registration of LDT/Docker hosts and, Bring Your Own Encryption Keys (BYOK).
GDE 3.0.0.2 v1	09/07/2018	GA release of GDE 3.0.0.2. The GDE 3.0.0.2 release is the same as DSM release v6.1.0. Virtual appliances can now be HMS-enabled by connecting them to an nShield Connect appliance.
GDE 4.0.0.0	4/11/2019	GA release; HA is now active/active, new CLI commands, new API calls . This guide contains new troubleshooting information. Added rules for hostnames.

ASSUMPTIONS

This documentation assumes that you have knowledge of your computer network as well as network configuration concepts.

For more information about what’s new in this release, refer to the *4.0.0.0 Release Notes*. Refer to the *GDE Administrators Guide* for how to administer your GDE Appliance and to the various agent guides for information about Vormetric Data Security Agents.

SALES AND SUPPORT

For support and troubleshooting issues:

- http://help.thalesesecurity.com
- http://support.vormetric.com
- support@thalesesecurity.com
- (877) 267-3247

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- http://enterprise-encryption.vormetric.com/contact-sales.html
- sales@thalesesecurity.com
- (408) 433-6000

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Installing & Configuring GDE

This chapter describes how to install the IBM Guardium Data Encryption (GDE) virtual appliance as a standalone, primary, or failover server. It contains the following sections:

Overview

The the IBM GDE virtual appliance helps you protect structured and unstructured data and meet compliance requirements. It provides centralized encryption key and policy management to simplify data security management.

In conjunction with the GDE appliance, VTE/VAE/VTS/VPTD agents enable data-at-rest encryption and the collection of security intelligence logs without re-engineering applications or infrastructure.

Installation Process

The installation process includes the following steps:

1. Download the CI9V9EN.tar file from the IBM Passport website and extract the files. The tarball contains the following files:
   - GDE_PreReq_Download_Credential.bin
   - GDE_4_0_0_0.bin
   - GDE_README.txt
2. Run the GDE_PreReq_Download_Credential.bin file to generate the credentials required to log on to the Thales eSecurity website and download the GDE Appliance OVA file.

NOTE: The GDE_PreReq_Download_Credential.bin must be run in a Linux GUI. Console (CLI) mode is not supported.

3. Run the enabler: GDE_4_0_0_0.bin, to extract a license for the GDE appliance. You will need to upload this license once the GDE appliance is deployed and configured.
4. Deploy the OVA file on your ESXi server.
5. Configure the appliance.

Extract the GDE appliance license

1. Run the enabler file (GDE_4_0_0_0.bin) downloaded from the IBM Passport website. The file must be run on a RedHat or CentOS 6/7 system. To run the file type the following at the prompt:

   ```
   ./GDE_4_0_0_0.bin
   ```
2. Select a language to display the instructions and the EULA, by entering a number that corresponds to that language.
3. Accept the default location to install the license, or follow the on-screen instructions to save it to another location. Press ENTER to continue.
4. Accept the license agreement.
5. The license will be saved on your system in the default location or to the one you specified.

Make sure you can access the system on which you have saved the license from the GDE appliance. You will need to upload this license file to start using the appliance.

Installing the GDE Appliance

This section describes the steps to build a GDE appliance.

System Requirements

- VMware ESXi v5.5 or later with v9 hardware or later
- VMware vSphere Client
- GDE virtual appliance OVA file

These instructions assume the IP address, routing configuration, and DNS addresses for the GDE, appliance allow connectivity to all hosts where the Vormetric Agents are installed.

Hardware Requirements

The hardware hosting the virtual machine must meet the following requirements:

Table 1: Virtual machine hardware requirements

	Number of Agents			
	1 to 10	**11 to 50**	**51 to 250**	**Over 250**
Number of CPUs	2	4	4	6
RAM (in GB)	4	8	12	16
HD (in GB)[a]	250	250	250	above 250

a. The disk size change was introduced in v5.3.1, however you can still use "thin" provision to minimize storage utilization.

Installation Plan

1. Assemble configuration information using the checklist, see "GDE Appliance Installation Checklist".
2. Complete the pre-configuration tasks described here "Installation and Pre-Configuration tasks", if applicable.
3. Deploy the GDE appliance as described here, "Deploying the GDE Appliance".
4. Setup initial and basic configurations as described here, "Configure the appliance".
5. Verify Web access as described here, "Verify web access".

GDE Appliance Installation Checklist

Table 2: Installation Checklist

REQUIREMENT	VALUE
Software requirements	
Virtual Machine file from Support.	
Hardware requirements for Virtual Machine	
1 virtual socket, 4 cores per socket	
4GB memory	
2 virtual NIC cards	
250GB virtual disk	
Network Information	
eth0—dhcp by default.	IP address netmask default gateway (optional)
eth1—this comes configured with a default IP address 192.168.10.1. We recommend that you retain this configuration in the event that you need a recovery option to access the appliance.	IP address netmask default gateway (optional)
bond0—this interface is used when the eth0 and eth1 interfaces are aggregated into a single logical interface for load balancing./fault tolerance. If configured, the bond0interface supersedes the eth0 and eth1 interfaces, and must be used to access the GDE appliance.	IP address netmask default gateway (optional)
GDE appliance Initial HA node Hostname: FQDN (lowercase only)	
GDE appliance HA node Hostname: FQDN (lowercase only)	
Domain Name Server (DNS) addresses - up to 3 plus optional DNS search domains.	
NTP server FQDN or IP address (if applicable)	
Certificate Information	
GDE appliance Hostname: FQDN (must be an exact match to the hostname)	
Name of your organizational unit	

Name of your organization	
Name of your city or locality. Must be fully spelled out, no abbreviations.	
Name of your state or province. Must be fully spelled out, no abbreviations, e.g., California *not* CA	
Two-letter country code	

Installation and Pre-Configuration tasks

Specify host name resolution method

You can map a host name to an IP address using a Domain Name Server (DNS). DNS is the preferred method of host name resolution. DNS names are case sensitive, make sure host names are correctly entered while configuring DNS and registering hosts. A valid hostname must:

- Be an FQDN
- Be in all lowercase
- Match exactly with:
  - Name set in the CLI (system$ **`set hostname`**)
  - Hostname used when running (`system$ security genca)`
  - Hostname used when running (`system$ security gencert)`

You can also modify the `/etc/hosts` file on the GDE Appliance or identify a host using only the IP address.

- If you use DNS to resolve host names, use the FQDN for the host names.
  - Both forward and reverse address resolution is required for nodes in a cluster.
  - FQDN name must be lowercase
- If you do NOT use a DNS server to resolve host names, do the following on all of the GDE Appliances and the protected hosts:
  - Modify the *host* file on the GDE Appliance: To use names like serverx.domain.com, enter the host names and matching IP addresses in the `/etc/hosts` file on the GDE Appliance using the `host` command under the `network` menu. For example:

```
0011:network$ host add <hostname> 192.168.1.1
SUCCESS: add host
0012:network$ host show
name=localhost1.localdomain1 ip=::1
name=<host name>.<domain name>.com ip=192.168.10.8
name=<host name> ip=192.168.1.1
```

```
SUCCESS: show host
```

You must do one of the following on *each* GDE Appliance, since entries in the host file are not replicated across GDE Appliances.

- Modify the *host* file on the protected hosts: Enter the GDE Appliance host names and matching IP addresses in the `/etc/hosts` file on the protected host.

NOTE: You must do this on EACH protected host making sure to add an entry for all GDE Appliance nodes (if using HA).

- Use IP addresses: You may use IP addresses or the FQDN to identify the host simultaneously. In other words, they don't all have to use an IP address or FQDN.

Port configuration

If a GDE appliance must communicate with a device behind a firewall, you must open various ports in the firewall.

The following table lists the communication direction and purpose of each port you must open.

Table 3: Ports to configure

Port	Protocol	Communication Direction	Purpose
	ICMP	All ICMP	Used to run Ping
22	TCP	Management Console → GDE GDE → SSHD Server	CLI SSH Access Auto-backup via SCP
443	TCP	Browser →GDE Appliance GDE Appliance ↔ GDE Appliance Agent → GDE Appliance	Redirects to either port 8445 or 8448 depending on the security mode. (8445 is used in compatible & RSA modes; 8448 is used in Suite B mode, for secure communication between GDE Appliances in an HA cluster and for LDT registration.)
5432	TCP	GDE HA node 1 ↔ GDE HA node 2	Uses SNMP to get HA node response time.
7025	TCP/UDP	SNMP Manager → GDE GDE ↔ GDE	SNMP queries from an external manager and to get HA node response times.

Table 3: Ports to configure

8080	TCP	Agent → GDE	Port 8080 is no longer used for registration, but you can manually close/open this legacy port for new deployment, for backward compatibility if you use previous versions of the agent and need to register to 8080. Default is on, (open). **Syntax** `# security legacyregistration [ on | off | show ]`
8443	TCP	Agent → GDE	Fallback RSA TCP/IP port through which the agent communicates with the GDE, in case 8446 is blocked. The agent establishes a secure connection to the GDE appliance, via certificate exchange, using this port.
8444	TCP	Agent → GDE	Fallback RSA port via which the Agent log messages are uploaded to GDE, in case 8447 is blocked.
8445	TCP	Browser → GDE GDE ↔ GDE (fallback)	Management Console, VMSSC, and fallback for RSA HA communication in case port 8448 is blocked.
8446	TCP	Agent → GDE	Configuration Exchange using Elliptic Curve Cryptography (Suite B).
8447	TCP	Agent → GDE	Agent uploads log messages to GDE using Elliptic Curve Cryptography (Suite B).
8448	TCP	Browser → GDE GDE ↔ GDE	GUI management during enhanced security using Elliptic Curve Cryptography (Suite B). Also for secure communication between GDE appliances in HA clusters.
9004	TCP	GDE Appliance ↔ network HSM	GDE Appliance communication with nShield Connect and its associated RFS
9005	TCP	GDE Appliance ↔ remote admin	Used by Remote Administration Service process to accept connections from the Remote Administration Client.

Access the Command Line Interface (CLI)

The CLI commands are used to configure the appliance. The commands are grouped into the following categories or *submenus*. Entering ? on the CLI command line lists those categories:

```
0000:dsm$ ?
network      Networking configuration
system       System configuration
hsm          HSM configuration
maintenance  System maintenance utilities
```

```
ha            HA configuration
ipmi          IPMI configuration
user          User configuration
exit          Exit
```

To enter a submenu, enter a name or just the first few letters of the name. To display the commands for that submenu, enter a ?. For example, the submenu `maintenance` is used to provide maintenance utilities:

```
0001:dsm$ main
0038:maintenance$ ?
showver       Show the installed VTS version
ntpdate       Set ntp services
date          Set system date
time          Set system time
gmttimezone   Set system time zone
diag          OS diagnostics
up            Return to previous menu
exit          Exit
```

Every command has usage and example input. Type the command without a value:

```
0039:maintenance$ ntpdate

usage: ntpdate {sync | add SERVER_ADDRESS | delete SERVER_ADDRESS | on |
off | show }
0040:maintenance$ date

month=Mar day=17 year=2015

Show system date SUCCESS

  0041:maintenance$ time

hour=11 min=11 sec=36 zone=PDT

Show system time SUCCESS

  0042:maintenance$ gmttimezone

usage: gmttimezone {list|show|set ZONE_NAME}

  0043:maintenance$ diag

usage: diag [log [ list | view LOG_FILE_NAME] | vmstat | diskusage |
hardware | osversion | uptime ]

  0044:maintenance$
```

You must enter the submenu to execute the submenu commands. For example, the reboot command is in the system submenu, so you would enter system, then enter reboot. To return to the main level when finished, enter up.

A complete description of the CLI commands can be found in the *Administrators Guide*.

Deploying the GDE Appliance

This section describes how to deploy the OVA file to create the appliance. The GDE appliance uses static IP addresses and cannot be assigned an address by DHCP.

1. Open the VMware vSphere Client.
2. Click **File > Deploy OVF template**.
3. Click **Browse** and locate the OVA file. Select the file and click **Next**. The *OVF Template Details* page appears.

   The file name format for the OVA file is *Vormetric DSM - Virtual Appliance<version>.OVA*
4. Click **Next**. The *Name and Location* page opens.
5. Type in a name for the Virtual Appliance and then click **Next**. The *Storage* page opens.
6. Select a destination for the Virtual Appliance and then click **Next**. The *Disk Format* page opens.

   Select the type of provisioning based on the storage characteristics for your system. The options are:

   - **Thick Provisioned Lazy Zeroed**: creates the VM and allocates all the blocks for the VM but doesn’t zero them.
   - **Thick Provisioned Eager Zeroed**: creates the VM, allocates and zeros all the blocks.
   - **Thin Provision**: creates the VM with just the header information, but it does not allocate or zero blocks.

   In the following example, we use **Thick Provisioned Lazy Zeroed**.
7. Select **Thick Provisioned Lazy Zeroed** and click **Next**. The *Ready to Complete* window opens.
8. Click **Finish** to deploy the Virtual Appliance. This takes a few minutes.
9. At the message **Completed Successfully**, click **Close**. The main screen of the vSphere Client appears.
10. In the left pane, select the Virtual Appliance you just created and then click the power on icon in the tool bar. It takes about a half hour to provision the VM and build the appliance.
11. To watch the output as the installation progresses, click the Console tab and click inside the console window. When the installation is finished, continue to the next section.

Configure the appliance

This section describes how to configure network settings, NTP, Time Zone and Date/Time, and the hostname. It describes how to configure a bonded NIC device type should you choose to use this feature. It also describes how to generate a certificate authority (CA), add console administrators, and verify Web access.

If you are setting up the GDE appliance in a high availability (HA) deployment, configure each node as a standalone appliance, which is the same procedure as described here. Then add each node to the initial node and join the HA network.

Configure network settings

1. Access the GDE appliance CLI and log in with the default login and password:

```
Login: cliadmin
Password: cliadmin123
```

2. The Thales EULA is displayed, type ‘y’ to accept and press **Enter**.
3. When prompted, type in a new password and press **Enter**. Reconfirm your password.

Warning! Do not lose this password.

4. Navigate to the *network commands* menu. Type:

```
0000:dsm$ network
```

5. Add an IP address for the GDE appliance. Type:

NOTE: We recommend that you retain the default eth1 IP address configuration in the event that you need a recovery option to access the GDE appliance.

```
0001:network$ ip address init <GDE IP address>/<subnet mask (e.g. 16 or
24)> dev eth0/eth1
```

Example: `ip address init 192.168.10.2/16 dev eth1`

IPv6 Example: `ip address init fa01::3:15:130/64 dev eth1`

NOTE: If you are connected via eth0 and you choose to configure eth0 with a new IP address, you will be disconnected at this step. Reconnect on the new IP address.

6. (Optional) You may choose to configure the eth0 interface instead of retaining the default IP address 192.168.10.1, if for example, you want the GDE appliance to communicate with agents on a different subnet, or access the Management Console from a different subnet. To configure an IP address for eth0, type:

   ```
   0001:network$ ip address init <eth0 IP address>/<subnet mask (e.g., 16
   or 24)> dev eth0
   ```

   Example: `ip address init 192.168.10.3/16 dev eth0`

   IPv 6 Example: `ip address init fa01::3:15:130/64 dev eth0`

   The following warning is displayed:

   ```
   WARNING: Changing the network ip address requires server software to be
   restarted.
   Continue? (yes|no) [no]:
   ```

   Type ‘yes’ to continue with the IP address configuration.

7. Add the IP address for the default gateway. Type:

   ```
   0001:network$ ip route add default table main.table dev [eth0 or eth1]
   via <IP address for the default gateway>
   ```

   Example: `ip route add default table main.table dev eth0 via 192.168.1.5`

   IPv 6 Example: `ip route add default table main.table dev eth0 via fa01::3:15:120`

8. Verify interface settings. Type:

   ```
   ip address show
   ```

9. Verify route settings. Type:

   ```
   ip route show
   ```

10. If you are using DNS, set the primary DNS server for the GDE appliance. Type:

    ```
    dns dns1 <ip address for dns server 1>
    ```

11. If you have a second or third DNS server, set them for the GDE appliance. Type:

    ```
    dns dns2 <ip address for dns server 2>
    ```

12. If you want to set the search domain, type:

```
dns search <search_domain>
```

13. Show the DNS settings. Type:

```
dns show
```

14. Return to the main menu. Type:

```
up
```

Configure a bonded NIC device

This section describes how to aggregate the two NICs on the GDE appliance into a single logical interface to provide load balancing and/or fault tolerance. The bonded NIC device is called `bond0`.

On the virtual appliance, you must configure at least two NICs and define them as `eth0` and `eth1` in order to enable the bond0 device type. Any additional physical/virtual NICs are ignored. For virtual appliances where only one network connector is configured for a virtual machine, the `bond0` interface cannot be enabled—the network interface itself can be up but, no IP address can be assigned to it.

The NIC bonding setting is system specific. If it is to be used for all nodes in a cluster, it must be enabled on all nodes individually.

1. Access the GDE appliance CLI and login with your login credentials. If this is the first time you are logging in, then you will be required to accept the license agreement and change the default password, see "Configure network settings".
2. Navigate to the network commands menu;

```
0000:dsm$ network

0001:network$
```

3. Enable the bonded NIC;

```
0001:network$ ip address init <ip_address>/<subnet_mask> dev bond0
```

Example: `ip address init 1.2.3.4/16 dev bond0`

In the event that a bonded NIC is being configured after the initial configuration, or after the GDE appliance has been upgraded, if you want to reuse an IP address that was originally assigned to `eth0` or `eth1`, then you must delete that address from `eth0` or `eth1` first, and then reassign it to the `bond0` interface.

4. Add a default gateway for the `bond0` device;

```
0001: ip route add default table main.table dev bond0 via
<gateway_ip_address>
```

Example: `ip route add default table main.table dev bond0 via 1.2.7.8`

If a bond0 interface is configured after setting up the eth0 and/or eth1 interfaces, and it is configured with an IP address that is on the same subnet as a default gateway, that gateway configuration continues to apply. However, if you configure bond0 with an IP address on a different subnet, you will have to reconfigure the default gateway.

5. You can change the bonding driver mode based on your requirements. There are seven modes available from 0-6. See "Bonding driver modes" for more information. Note however, that only the default options are available with each of the modes and these options cannot be changed.

   When the mode option is specified the speed option cannot be specified (i.e. the options mode and speed are mutually exclusive). In other words, bond0 does not take the speed option and both eth0 and eth1 don't take the mode option. However, the MTU and up/down options can still be used for the bond0 device.

   To set or change the mode type:

   ```
   0002:network$ ip link set bond0 mode <mode>
   ```

   Example: `ip link set bond0 mode 2`

   To see what mode is currently in use type:

   ```
   0002: network$ ip link show bond0
   ```

6. To disable or break up a bonded NIC type, you can use either the delete or flush command. Delete will only delete a specific IP address (multiple can be assigned) and flush will clear all assigned IP addresses.

   ```
   0003:network$ ip address delete <ip_address>/<subnet_mask> dev bond0

   0003:network$ ip address flush bond0
   ```

   Routes that are associated with this bonded NIC device will also be deleted.

Bonding driver modes

The modes specify the bonding policies. The following modes are supported (see Table 4 below), but none of the options for the modes are configurable and take the default values for those modes, except for the miimon setting. The miimon setting specifies the MII link monitoring frequency in milliseconds, which determines how often the link state of each slave is inspected for link failures. The miimon setting has a value of 100 instead of the default value of 0.

Table 4: Bonding driver modes

Mode	Name	Description	Load-balancing	Fault tolerance
0	balance-rr	Round-robin policy. Transmit packets in sequential order from the first available through the last. This is the default mode for the bonded NICs.	Yes	Yes

Mode	Name	Description	Load-balancing	Fault tolerance
1	active-backup	Active-backup policy: Only one slave in the bond is active. A different slave becomes active if, and only if, the active slave fails. The bond's MAC address is externally visible on only one port (network adapter) to avoid confusing the switch.	No	Yes
2	balance-xor	XOR policy: Transmit based on the selected transmit hash policy. The default policy is a simple [(source MAC address XOR'd with destination MAC address) modulo slave count].	Yes	Yes
3	broadcast	Broadcast policy: transmits everything on all slave interfaces.	No	Yes
4	802.3ad	IEEE 802.3ad Dynamic link aggregation. Creates aggregation groups that share the same speed and duplex settings. Utilizes all slaves in the active aggregator according to the 802.3ad specification.	Yes	Yes
5	balance-tlb	Adaptive transmit load balancing: channel bonding that does not require any special switch support. The outgoing traffic is distributed according to the current load (computed relative to the speed) on each slave. Incoming traffic is received by the current slave. If the receiving slave fails, another slave takes over the MAC address of the failed receiving slave.	Yes	Yes
6	balance-alb	Adaptive load balancing: includes balance-tlb plus receive load balancing (rlb) for IPV4 traffic, and does not require any special switch support. The receive load balancing is achieved by ARP negotiation. The bonding driver intercepts the ARP Replies sent by the local system on their way out and overwrites the source hardware address with the unique hardware address of one of the slaves in the bond such that different peers use different hardware addresses for the server.	Yes	Yes

Configure NTP, time zone, date, time

You must have the correct time set on your GDE appliance(s) as this will affect system functions such as agent registration, log timestamps, high availability cluster synchronization, and certificate exchange. Although configuring an NTP server is not mandatory, it is strongly recommended.

1. Navigate to the *maintenance commands* menu. Type:

   ```
   0000:dsm$ maintenance
   ```

2. Show the current ntpdate settings. Type:

   ```
   0001:maintenance$ ntpdate show
   ```

3. Add a new ntpdate server. Type:

```
0002:maintenance$ ntpdate add <IP address/Hostname for the ntpdate server>
```

Repeat this step for each ntpdate server.

4. Activate the ntpdate server connection. Type:

   ```
   0003:maintenance$ ntpdate on
   ```

5. Show the current timezone settings. Type:

   ```
   0004:maintenance$ gmttimezone show
   ```

6. Set the country and city where the GDE appliance resides. Type:

   ```
   0005:maintenance$ gmttimezone set <country/city>
   ```

7. Set the date. (If you used `ntpdate synch`, this step is not necessary.) Type:

   ```
   0006:maintenance$ date <mm/dd/yyyy>
   ```

8. Set the time. (If you used `ntpdate synch`, this step is not necessary.) Type:

   ```
   0007:maintenance$ time <hh:mm:ss>
   ```

   Where *hh* is 00 to 23.

9. Verify your settings. Type:

   ```
   0008:maintenance$ time
   0009:maintenance$ date
   ```

10. Return to the main menu. Type:

    ```
    0010:maintenance$ up
    ```

Configure the hostname

1. Navigate to the *system* menu. Type:

   ```
   0001:dsm$ system
   ```

2. Show the current setting. Type:

   ```
   0002:system$ setinfo show
   ```

   The default host name in the output is *your. name.here*.

3. Set the hostname. You must enter the fully qualified domain name for the GDE appliance. Type:

   ```
   0003:system$ setinfo hostname <FQHN>
   ```

   Example:

   ```
   0003:system$ setinfo hostname securityserver.company.com
   ```

Generate the Certificate Authority

1. Generate a new certificate authority for the GDE appliance. Type:

```
0004:system$ security genca
```

2. A warning is displayed, informing you that all agents and peer node certificates will need to be re-signed after the CA and server certificate have been regenerated, and the GDE appliance server software will be restarted. Type ‘yes’ to continue, the default is ‘no’.
3. Enter the FQDN of this appliance, the name displayed in ‘This Security Server host name [FQDN of the GDE appliance]’, should be correct if you entered the host name information in the previous sections correctly. Press **Enter** to accept the name.
4. Next, enter the information required to generate the certificate. Answer the prompts:

   a. What is the name of your organizational unit? []:

   b. What is the name of your organization? []:

   c. What is the name of your City or Locality? []:

   d. What is the name of your State or Province? []:

   e. What is your two-letter country code? [US]:
5. Once the certificate is signed, return to the main menu. Type:

```
up
```

Add CLI administrators (optional)

With separation of duties for good security practices, CLI administrators can only log into the CLI and administer the GDE appliance. Management Console administrators can only log on to the Management Console to administer the GDE appliance.

1. Navigate to the *user commands* menu. Type:

```
0001:dsm$ user
```

2. Add an administrator. Type:

```
0002:user$ add <administrator name>
```

3. When prompted, enter a password. The password criteria are:
   - Does not have repeating characters
   - Uses at least 1 upper and 1 lower case character
   - Uses at least 1 special character
4. Return to the main menu. Type:

```
0003:user$ up
```

Verify web access

The Management Console is a Web-based GUI used for day-to-day security and administration tasks. Open a browser and confirm access over HTTPS to either the GDE appliance hostname (if configured in DNS) or the IP address defined in "Configure network settings" on page 16.

Example URL:

```
https://securityserver.vormetric.com
```

If the URL doesn't work because, for example, port 443 is blocked by a firewall, specify port 8448.

Example:

```
https://securityserver.vormetric.com:8448
```

or specify port 8445. Example

```
https://securityserver.vormetric.com:8445
```

If the link still does not work, make sure all the necessary ports are open, see Table 3, "Ports to configure," on page 12.

The first time you connect to the appliance via a web browser, a self-signed certificate is used by default. Your browser will display a warning about the SSL certificate, follow the instructions on your browser to continue with the default self-signed certificate. You can configure the GDE appliance to use third party signed certificates after you have logged in for the first time. Refer to the *GDE Administrators Guide*, chapter 6 for procedures to do this.

The default user name and password to log on to the GDE appliance the for first time are; `admin` and `admin123`. You will be prompted to reset the password. The password criteria are:

- Does not have repeating characters
- Uses at least 1 upper and 1 lower case character
- Uses at least 1 special character

Upload a license file

The first time you log on to the GDE appliance, the dashboard displays "License file not found," and all you will see are the *Dashboard* and *System* tabs. You need to click **System**, select **License**, and then **Upload the license file**.

Upload the license file that you extracted from the enabler package.

After uploading your license file, all the other tabs for which you have licenses are displayed.

Upgrading GDE Appliance Software

2

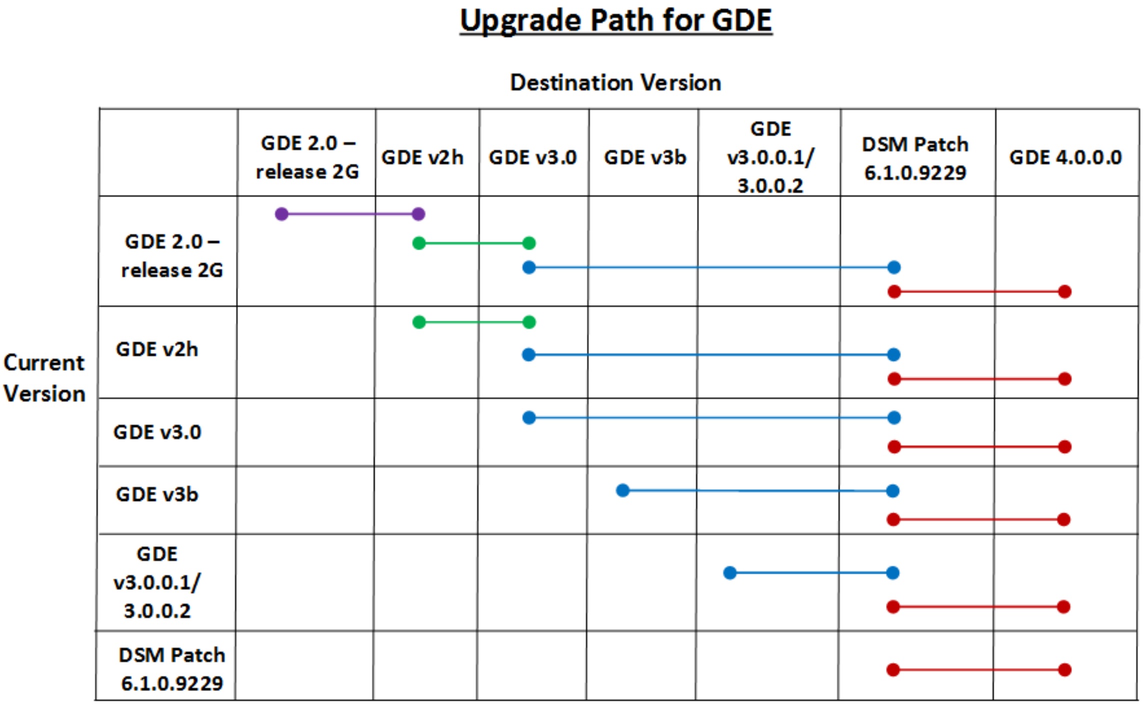
This chapter contains instructions for migrating data from GDE 2.0 release 2h to GDE 4.0.0.0.

It contains the following sections:

Upgrade Paths

The following table describes the GDE upgrade path based on your current version:

Figure 1: Upgrade Path for GDE



- If you are on a GDE version prior to GDE 2.0 release 2h, you must upgrade to release 2h.
- The change from GDE r2h to GDE r3.0 involves an operating system change. Therefore, you must back up your current system, build a v3.0 system, and then restore to your r3.0 system.
- The change from DSM patch 6.1.0.9229 to GDE 4.0.0.0 involves a database migration. That migration is built into 6.1.0.9229 which is why all users must upgrade to 6.1.0.9229 first, and then upgrade from 6.1.0.9229 to GDE 4.0.0.0.

Migrating to a GDE 3.0 Appliance

As illustrated in Figure 1, you must first upgrade your GDE appliance to GDE 3.0. To complete this task, you must:

1. "Backup the current configuration"
2. "Install and configure a GDE appliance"
3. "Restore backup to new GDE appliance"

NOTE: If you are upgrading from a version higher than GDE 3.0, you can upgrade directly to the DSM patch 6.1.0.9229. Prior to upgrading, follow the steps below to backup your current configuration, in case the upgrade fails to upgrade your system properly.

Backup the current configuration

A backup is a snapshot of a GDE appliance configuration. When a backup is restored, the GDE appliance Management Console will contain and display the same information captured at the time the backup was originally made.

Create or import a wrapper key

GDE appliance backup files are encrypted with a wrapper key to keep them secure. This wrapper key must be created, or imported from a previous create operation, before creating a backup. The same wrapper key used to encrypt a backup is also required to restore that backup. For additional security, wrapper keys can be broken up into key shares—pieces of a wrapper key. These key shares can then be divided amongst two or more custodians, such that each custodian must contribute their key share in order to assemble a complete wrapper key. This is also referred to as split key knowledge or M of N configuration.

For example, you can break up the wrapper key amongst a total of five custodians and set the minimum number of required custodians at two. When the wrapper key is required, at least two of the custodians must contribute their key share in order to assemble a complete wrapper key. The wrapper key must be created by a System administrator or an AllAdmin.

1. Log on to the Management Console as a System administrator or an AllAdmin.
2. Select **System > Wrapper Keys** from the menu bar.
3. In the *Wrapper Keys* window, select **Operation > Create**, then click **Apply** to create the wrapper key.
4. Select **System > Backup and Restore > Manual Backup and Restore** from the menu bar.

   A confirmation message also displays on this tab, stating that the wrapper key exists. You can now proceed with creating a backup.
5. Click **Backup** tab and select **Ok**.

NOTE: Some Browsers will automatically save and download the file. Some will display a Save as dialog.

6. Click **Save** in the File Download dialog box, if your browser displays one.
7. Save the file to a secure location that you are sure will still be accessible if the server fails.

   By default, the file name will be in the format: backup_config_<gde *server name*>_yyyy_mm_dd_hhmm.tar. Where <*gde_server name*> is the FQDN of the GDE appliance that is being backed up.
8. Return to the **System > Wrapper Keys** menu option and select **Operation > Export** to export key shares.
9. Set a number for both the **Minimum Custodians Needed** and the **Total Number of Custodians**.

   This setting splits the wrapper key value among multiple custodians. If only a single administrator is to control the wrapper key, enter a value of 1 in both fields.
10. Select the GDE appliance administrators who will serve as custodians for the wrapper key shares.

    Administrators of type *System Administrator* and *All* are listed. You can select any of these administrators, with the exception of the default initial log-on administrator *admin*, as a custodian.
11. Click **Apply** on the bottom right hand corner.

    If you have selected more than one custodian, each of them is given a share of the wrapper key. The wrapper key share is displayed on their **Dashboard** page, beneath the fingerprint for the CA, when they log into the Management Console. The generated wrapper key, or key shares, are exported and are visible on the **Dashboard**, beneath the fingerprint for the CA. The **Wrapper Key Share** displayed on the *Dashboard* is a toggle. Click **Show** to display the wrapper key share value. Each administrator must see a unique wrapper key share displayed on the dashboard beneath the fingerprint for the CA.
12. On the Dashboard, click **Wrapper Key Share** string to hide the value and display ‘Show’.

13. Ensure the administrator(s) or wrapper key custodian(s) securely store a copy of this key or key share. This is required, as part of their role in a GDE appliance restore operation.

NOTE: Do NOT lose the wrapper key used to create the backup. You cannot restore the backup without the wrapper key that was used to create it.

14. Create a backup of the GDE appliance configuration after the wrapper key has been created.

Create a backup

1. Log on to the Management Console as an administrator of type *System Administrator* or *All*.
2. Select the **System > Backup and Restore** menu option. The *Manual Backup and Restore* page opens.
3. Click the **Backup** tab and then click **Ok**.
4. Click **Save** in the **File Download** dialog box. Save the file to a secure location that you are sure will still be accessible if the server fails. By default, the file name will be in the format:

   `backup_config_<gde server name>_yyyy_mm_dd_hhmm.tar`

   Where <*gde server name*> is the FQDN of the GDE appliance that is being backed up.
5. Save the backup to a secure location. Access to the backup should be limited to only a few employees and should be audited.

Install and configure a GDE appliance

In order to ensure the continuity of your GDE deployment, you must configure the GDE 3.0 appliance with the same hostname as the GDE appliance that is being migrated. You can assign a new IP address to the appliance, however you must ensure that the hostname resolution method in use is correspondingly updated.

NOTE: If you are using a third party SSL certificate, then a change in the GDE appliance hostname will cause a cause a conflict when you restore the backup.

You will have to upload a new third party certificate with the new GDE appliance hostname.

After you configure the new GDE 3.0 appliance with the same hostname and IP address, you must take the old appliance off of the network, otherwise any registered agents will try and communicate with both the old and the new GDE appliance and cause conflicts in your system.

If you configure a GDE 3.0 appliance and give it a new hostname, then when you reach your destination version of the GDE software, VTE agents that were registered with the earlier GDE appliance backup will have to re-register with the new GDE appliance. Refer to the *VTE Agent Installation and Configuration Guide* for detailed procedures to re-register agents.

For procedures to install and configure a GDE appliance, see “Installing the GDE Appliance”.

Restore backup to new GDE appliance

The GDE appliance backup is restored via the Management Console.

1. Locate the backup that is to be restored.
2. Log on to the Management Console as an administrator of type *System Administrator* or *All*.

NOTE: If you already have the Wrapper Key imported, skip to Step 7.

3. Import wrapper keys. Select **System > Wrapper Keys** from the menu bar.
4. Select **Import** from the **Operation** dropdown menu. Click **Add**.
5. If key shares have created from the wrapper key, paste a Key Share value from one previously stored with a custodian into the **Key Share** text field and click **Ok**.

   Repeat steps 5 and 6 for each administrator selected as a key custodian if you have chosen to have more than one custodian for the wrapper key. A key share must be imported for at least as many as were specified by the Minimum Number of Custodians value when the wrapper key was exported.
6. Click **Apply** to finish importing the wrapper key.
7. Restore the backup file. Select **System > Backup and Restore** from the menu bar.
8. Select the **Restore** tab.
9. Click **Browse**. Locate and select the backup file to restore.
10. Click **Ok**. The restored file uploads and the GDE appliance disconnects from the Management Console. The restore operation takes up to 30 minutes to complete.

    If the browser has not refreshed automatically after the restore operation, you must manually refresh the browser to log back on to the Management Console.

    If you were using a third party SSL certificate, this certificate will now also be restored as part of this operation. See “Verify web access” on page 23 for more details.
11. Log back on to the Management Console as an administrator of type *System* or *All*. Verify that the configuration is restored correctly

Your GDE appliance is now migrated to version 3.0.

Upload a license

As part of the process of configuring a new GDE 3.0 appliance, you will have already uploaded the GDE 3.0 license. However, once you restore a backup of the earlier GDE version, you will need to upload the license once again. Follow the steps to upload the license as described here, "Upload a license file".

Upgrade to the DSM patch 6.1.0.9229

After upgrading to GDE 3.0 or higher, you must upgrade to the DSM patch 6.1.0.9229:

1. Click **System > Software upgrade**.
2. Delete the idle version if it exists.
3. Select the 6.1.0.9229 upgrade tar file.
4. Click **Upgrade.**

Upgrade to GDE 4.0.0.0

After upgrading to 6.1.0.9229, you can migrate to GDE 4.0.0.0.

1. Click **System > Software upgrade**.
2. Delete the idle version if it exists.
3. Select the GDE 4.0.0.0 upgrade tar file.
4. Click **Upgrade.**

Configuring and Migrating to a High Availability Configuration

As of GDE v4.0.0.0, HA is now configured as Active-Active. This means that there is no longer a primary or a failover node. All nodes are peers. When one node fails, the other nodes continue operating normally. When the failed node is working properly again, it synchronizes with the other HA nodes.

Optimize the Upgrading of Nodes in the HA Cluster

The initial node is the only node that needs to be upgraded. This ensures that all of the content of the node: policies, admins, domains, keys, reports, logs, etc. will be saved. However, an upgrade is unnecessary for the other nodes in the cluster, because all of the content of the initial node will be copied over from the initial node when all of the nodes in the HA cluster synchronize. Therefore, to optimize upgrading the virtual GDE Appliances for the additional nodes in the HA cluster:

1. Log on to the primary and backup the GDE configuration, see "Backup the current configuration"
2. Upgrade the initial node to GDE v4.0.0.0.
3. On each additional node, perform a fresh installation of GDE v4.0.0.0. In other words, use the OVA file for the installation, not the upgrade tar file.
4. Once the software upgrade/installation on each of the nodes is complete, add the nodes to the cluster and join the HA cluster. See "Adding GDE Nodes to an HA Cluster" on page 31 and "Join a Node to an HA Cluster" on page 32 for more information.
5. Restore the backup, taken in step 1, to the initial GDE 4.0.0.0 HA node as described here, "Restore backup to new GDE appliance".

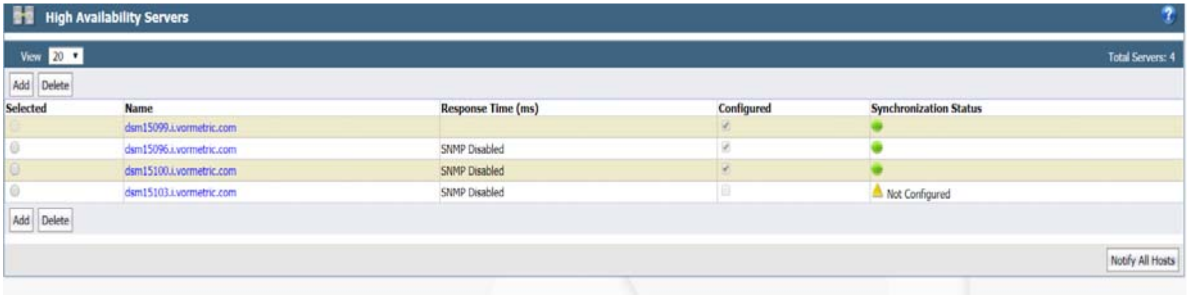
Adding GDE Nodes to an HA Cluster

1. Install and configure your GDE Appliances as described in previous chapters of this guide.

NOTE: The license must be installed on the GDE Appliance designated as HA node 1 before you can configure the other HA nodes.

2. On HA node 1 (the Initial Server), log on to the Management Console as an administrator of type System, or All.
3. Click **High Availability** in the menu bar. The *High Availability Servers* window opens.
4. Click **Add**. The **Add High Availability Server** window opens.
5. In the **Server Name** field, enter the host name or FQDN of a GDE Appliance node.
6. Click **Ok**. The GDE Appliance node is listed in the **High Availability Servers** window. It is designated as 'Not Configured'.

Figure 2: Node added but not configured/joined to the cluster



High Availability Servers

View 20 ▾ Total Servers: 4

Add Delete

Selected	Name	Response Time (ms)	Configured	Synchronization Status
○	dsm15099.i.vormetric.com		☑	●
○	dsm15096.i.vormetric.com	SNMP Disabled	☑	●
○	dsm15100.i.vormetric.com	SNMP Disabled	☑	●
○	dsm15103.i.vormetric.com	SNMP Disabled	□	⚠ Not Configured

Add Delete

Notify All Hosts

NOTE: You can also add nodes in the CLI. See the High Availability Category section in the CLI chapter in the GDE Appliance Admin guide.

Join a Node to an HA Cluster

To join an HA node to the HA cluster:

1. Log on to HA Node 2 on the Cluster.
2. Switch to the HA menu, type:

```
0000:dsm$ ha
```

3. Join the node to the cluster. Type:

```
0000:dsm$ join
```

System Response:

```
WARNING: This server node is about to join an HA cluster.

Please make sure the HA cluster is running and has this server node in
its HA node list.

This may take several minutes.
```

NOTE: Sometimes, when nodes are spread far apart geographically, or are in a cloud environment, the Join function takes so long that the ssh session times out and terminates automatically before the Join can finish. If the Join function fails, type: **`join longwait`** to make the join command proceed in a 'longwait mode' (as opposed to the 'normalwait' mode). The difference between the two modes is the duration that it waits for the node replication status state to be set to 'ready.' Longwait waits for approximately twice as long as the normalwait mode.

4. Follow the prompts:

a. Type `yes` to continue.

b. For **HA Initial Server host name**, type the hostname of HA Node 1.

c. For **Initial Security Server system administrator name**, type the UI admin name for the **Current** node.

d. For **Initial Security Server system administrator password**, type the UI admin password for the **Current** node.

System Response:

```
This node may have multiple IP addresses. All the agents will
have to connect to the Security Server using the same IP.

Enter the host name of this node. This will be used by Agents
to talk to this Security Server.

This Security Server host name[HaNode1.i.vormetric.com]:

Please enter the following information for key and certificate
generation.
```

5. The HA cluster will issue the certificate using the information you provide in the following steps:

a. What is the name of your organizational unit? []:

b. What is the name of your organization? []:

c. What is the name of your City or Locality? []:

d. What is the name of your State or Province? []:

e. What is your two-letter country code? [US]:

System Response:

```
WARNING: The following information you entered will be used to
join this server to the HA cluster, please make sure the
information is correct

Initial Security Server host name:HaNode1.i.vormetric.com

Initial Security Server system administrator name:voradmin

Initial Security Server system administrator password:xxxxxxxx

This Security Server host name[HaNode2.i.vormetric.com]:
HaNode2.i.vormetric.com

The name of your organizational unit: TP

The name of your organization: IBM

The name of your City or Locality: SJ

The name of your State or Province: CA

Your two-letter country code[US]: US

Continue? (yes|no)[no]:
```

6. Type **yes** to continue.

7. The installation utility creates certificates, completes the installation process, and then starts the HA node. This may take a few minutes.

   The CA certificate fingerprint is displayed.

8. On HA node 1 on the Management Console, click the **Dashboard** tab.

9. Match the fingerprint from the output on HA node 2 with the **RSA CA fingerprint** on the HA node 1 **Dashboard**.

   Sample output:

   ```
   Initial_Server=HaNode1.i.vormetric.com
   CAs_Fingerprint=8F:104:BE:78:0E:BB:28:4F:64:4D:54:5A:B1

   Ensure the fingerprint listed above matches the one on the
   primary

   Security Server web console dashboard.

   Self test in progress: passed

   Starting data store

   Starting Security Server

   Security Server started in compatible mode

   SUCCESS: joined to the HA cluster. The server is started.
   Please verify the fingerprint.

   0009:ha$
   ```

10. Click the **High Availability** tab. In the row for the HA node 2, the **Synchronization status** should contain a green circle and the Configured column should contain a check.

Troubleshooting

3

This section describes some troubleshooting procedures for your appliance.

Loss of Connection

If you have created GuardPoints and for some reason the appliance cannot be reached, the GuardPoints will continue to function with no issues. However, if the system is rebooted, the agent cannot access its configuration from the appliance and the GuardPoints cannot use the encryption key to encrypt or decrypt data, unless you are using a cached-on-host key. Challenge and response and manual passwords are good way to provide business continuity in these situations.

Is the Management Console accessible?

1. Try to open a web browser with the correct address to the appliance (example: https://192.168.10.11:8445 or 8448 for Suite B mode).
2. Check if the appliance is a trusted site in your web browser's Security Options.
3. Netcat or Telnet to the appliance and see if it's listening on port 8445. (8448 for Suite B mode.)

Check whether Agent communication ports are open from the UI

1. Use the Network Diagnostic checkport tool in the Management Console (or CLI) to check those ports.
2. Refer to the GDE Installation and Configuration guide for information about ports that need to be configured.

GLOSSARY

G

access control
The ability of Vormetric Transparent Encryption (VTE) to control access to data on protected hosts. Access can be limited by user, process (executable), action (for example read, write, rename, and so on), and time period. Access limitations can be applied to files, directories, or entire disks.

admin administrator
The default DSM administrator created when you install the DSM. Admin has DSM System Administrator privileges and cannot be deleted.

Administrative Domain
(domains). A protected host or group of protected hosts on which an DSM administrator can perform security tasks such as setting policies. Only DSM administrators assigned to a domain can perform security tasks on the protected hosts in that domain. The type of VTE tasks that can be performed depends on the type of administrator. See also "**local domain**".

administrator
See "**DSM Administrator and types**".

Agent utilities
A set of utilities installed with the VTE agents and run on protected hosts. These utilities provide a variety of useful functions such as gathering protected host and agent configuration data, registering agents on the DSM, and encrypting data on the protected host.

All Administrator, **Administrator of type All**
The DSM Administrator with the privileges of all three administrator types: *System*, *Domain* and *Security*.

appliance
The DSM server. Often referred to as a *DSM virtual appliance*, which is the software version of the DSM to be deployed by the customers as a virtual machine.

asymmetric key cryptography
See *public key cryptographic algorithm.*

asymmetric key pair
A public key and its corresponding private key used with a public key algorithm. Also called a key pair.

authentication
A process that establishes the origin of information, or determines the legitimacy of an entity's identity.

authorization
Access privileges granted to an entity that convey an "official" sanction to perform a security function or activity.

block devices
Devices that move data in and out by buffering in the form of blocks for each input/output operation.

catch-all rule
The last policy rule that applies to any GuardPoint access attempt that did not fit any of the other rules in the policy.

certification authority or CA
A trusted third party that issues digital certificates that allow a person, computer, or organization to exchange information over the Internet using the public key infrastructure. A digital certificate provides identifying information, cannot be forged, and can be verified because it was issued by an official trusted agency. The certificate contains the name of the certificate holder, a serial number, expiration dates, a copy of the certificate holder's public key (used for encrypting messages and digital signatures) and the digital signature of the certificate-issuing authority (CA) so that a recipient can verify that the certificate is real. This allows others to rely upon signatures or assertions made by the private key that corresponds to the public key that is certified. The CA must be trusted by both the owner of the certificate and the party relying upon the certificate.

challenge-response
When a protected host is disconnected from the DSM, the GuardPoint data is not accessible to users. Challenge-response is a password-based procedure that allows users to gain access to their GuardPoint data during disconnection. Users run a utility, `vmsec challenge`, a seemingly random string (the challenge) is displayed. The user calls this in to their DSM Security administrator. The administrator returns a counter-string (the response) that the host user must enter to decrypt guarded data.

Character device
See *"**raw device.**"*

ciphertext
Data in its encrypted form. Ciphertext is the result of encryption performed on plaintext using an algorithm, called a cipher.

cleartext or plaintext
Data in its unencrypted form.

cryptographic algorithm
A computational procedure that takes variable inputs, including a cryptographic key, and produces ciphertext output. Also called a cipher. Examples of cryptographic algorithms include AES, ARIA, and DES.

cryptographic key
See "**encryption key**."

cryptographic signature
See “**signing files**.”

Database Encryption Key (DEK)
A key generated by Microsoft SQL when TDE is enabled.

Data Security Manager (DSM)
Sometimes called the *Security Server* or *appliance*. A Vormetric server that acts as the central repository and manager of encryption keys and security policies. Receives instructions and configuration from administrators through a GUI-based interface called the *Management Console*. Passes and receives information to and from VTE Agents.

dataxform
A utility to encrypt data in a directory. Short for “data transform.”

DB2
A relational model database server developed by IBM.

Decryption
The process of changing ciphertext into plaintext using a cryptographic algorithm and key.

Digital signature
A cryptographic transformation of data that provides the services of origin authentication, data integrity, and signer non-repudiation.

domains
See *administrative domains*.

Domain Administrator
The second-level DSM administrator created by a DSM *System Administrator*. The DSM *Domain Administrator* creates and assigns DSM *Security Administrators* to domains and assigns them their security “**roles**”. See “**DSM Administrator and types**”.

Domain and Security Administrator
A hybrid DSM administrator who is has the privileges of a DSM Domain Administrator and Security Administrator.

DSM
See ***“Data Security Manager (DSM).”***

DSM Administrator and types
Specialized system security administrators who can access the Vormetric DSM Management Console. There are five types of DSM administrators:

> *DSM System Administrator* - Creates/removes other DSM administrators of any type, changes their passwords, creates/removes, domains, assigns a Domain Administrator to each domain. Cannot do any security procedures in any domain.

Domain Administrator - Adds/removes DSM Security Administrators to domains, and assign roles to each one. Cannot remove domains and cannot do any of the domain security roles.

Security Administrator - Performs the data protection work specified by their roles. Different roles enable them to create policies, configure hosts, audit data usage patterns, apply GuardPoints, and so on.

Domain and Security Administrator - Can do the tasks of DSM Domain and Security Administrators.

All - Can do the tasks of all three of the DSM administrative types

DSM Automation Utilities
Also called VMSSC. A set of command line utilities that is downloaded and installed separately on the protected host or any networked machine. These utilities can be used by advanced users to automate DSM processes that would normally be done with the Management Console. See the *DSM Automation Reference* for complete details.

DSM CLI
A command line interface executed on the DSM to configure the DSM network and perform other system-level tasks. See the *DSM Command Line Interface* documentation

DSM CLI Administrator
A user who can access the DSM CLI. DSM CLI Administrators are actual system users with real UNIX login accounts. They perform tasks to setup and operate the DSM installation. They do not have access to the Management Console.

DSM database
A database associated with the DMS containing the names of protected hosts, policies, GuardPoints, settings, and so on.

DSM System Administrator
The highest level of DSM administrator. This administrator creates/removes other DSM administrators of any type, creates/removes domains, and assigns a Domain Administrator to each domain. The DSM System Administrator cannot perform any security procedures in any domain or system. This administrator is not related to computer or network system administrators.

EKM
See “**Extensible Key Management (EKM)**.”

Encryption
The process of changing plaintext into ciphertext using a cryptographic algorithm and key.

encryption agent
See *Vormetric Transparent Encryption agent*.

encryption key
A piece of information used in conjunction with a cryptographic algorithm that transforms plaintext into ciphertext, or vice versa during decryption. Can also be used to encrypt digital signatures or encryption keys themselves. An entity with knowledge of the key can reproduce or reverse the operation, while an entity

without knowledge of the key cannot. Any VDS policy that encrypts GuardPoint data requires an encryption key.

Extensible Key Management (EKM)
An API library specification provided by Microsoft that defines a software framework that allows hardware security module (HSM) providers to integrate their product with the Microsoft SQL Server.

failover DSM
A secondary DSM that assumes the policy and key management load when a protected host cannot connect to the primary DSM or when a protected host is specifically assigned to the failover DSM. A failover DSM is almost identical to the primary DSM, having the same keys, policies, protected hosts, and so on.

FF1
See “Format Preserving Encryption (FPE)”.

FF3
See “Format Preserving Encryption (FPE)”.

file signing
See *signing files*.

File Key Encryption Key (FKEK)
The key used to encrypt the file encryption key that is used to encrypt on-disk data, also known as a wrapper key.

FKEK
See “File Key Encryption Key (FKEK)”

File System Agent
A Vormetric software agent that resides on a host machine and allows administrators to control encryption of, and access to, the files, directories and executables on that host system. For example, administrators can restrict access to specific files and directories to specific users at specific times using specific executables. Files and directories can be fully encrypted, while the file metadata (for example, the file names) remain in cleartext. Also called the “**VTE Agent**”.

Format Preserving Encryption (FPE)
An encryption algorithm that preserves both the formatting and length of the data being encrypted. Examples of such algorithms used by Vormetric include FF1 and FF3, both of which are approved by NIST. Vormetric’s **FPE tokenization format** uses the FF3 algorithm.

FQDN
Fully qualified domain name. A domain name that specifies its exact location in the tree hierarchy of the Domain Name Server (DNS). For example: `example.vormetric.com`.

GPFS
General Parallel File System is a high-performance shared-disk clustered file system developed by IBM.

GuardPoint

A location in the file system hierarchy, usually a directory, where everything underneath has a Vormetric data protection policy applied to it. The File System Agent intercepts any attempt to access anything in the GuardPoint and uses policies obtained from the DSM to grant or deny the access attempt. Usually, depending on the policies, data copied into a GuardPoint is encrypted, and only authorized users can decrypt and use that GuardPoint data.

Hardware Security Module or HSM

A tamper-resistant hardware device that stores keys and provides stringent access control. It also provides a random number generator to generate keys. The DSM Appliance can come with an embedded Hardware Security Module.

host locks

Two Management Console options, **FS Agent Locked** and **System Locked,** that are used to protect the File System Agent and certain system files. File System Agent protection includes preventing some changes to the File System Agent installation directory and preventing the unauthorized termination of File System Agent processes.

host password

This is not a regular login or user password. This is the password entered by a host system user to unlock a GuardPoint when there is no DSM connection. This password decrypts cached keys when the DSM is not accessible. The host must also be configured with **Cached on Host** keys. See "**challenge-response**".

initial test policy

A first data security policy applied to a GuardPoint that is used to gather directory access information so DSM Security Administrators can create a permanent operational policy. The initial test policy encrypts all data written into the GuardPoint; decrypts GuardPoint data for any user who access it; audits and creates log messages for every GuardPoint access; reduces log message "noise" so you can analyze the messages that are important to you for tuning this policy; is run in the "**Learn Mode**" which does not actually deny user access, but allows you to record GuardPoint accesses.

After enough data is collected, the DSM Security Administrator can modify the initial test policy into an operational policy.

Key Agent

A Vormetric agent that provides an API library supporting a subset of the PKCS#11 standard for key management and cryptographic operations. It is required for the following products: Vormetric Key Management (VKM), Vormetric Tokenization, Vormetric Application Encryption (VAE), Vormetric Cloud Encryption Gateway (VCEG). Sometimes called the *VAE Agent*.

key group

A key group is a collection of asymmetric keys that are applied as a single unit to a policy.

key management

The management of cryptographic keys and other related security objects (for example, passwords) during their entire life cycle, including their generation, storage, establishment, entry and output, and destruction.

key template
A template that lets you quickly add agent keys by specifying a template with predefined attributes. You can define specific attributes in a template, then you can call up the template to add a key with those attributes.

key shares
When data is backed up or exported from VTE (for example, symmetric keys or DSM database backups), they can be encrypted in a wrapper key needed to restore the exported data on the new machine. Wrapper keys can be split and distributed to multiple individuals. Each split piece of the wrapper key is called a *key share*. Decrypting the data requires that some specified number of the individuals that received key shares contribute their key share to decrypt the data.

key wrapping
A class of symmetric encryption algorithms designed to encapsulate (encrypt) cryptographic key material. The key wrap algorithms are intended for applications such as protecting keys while in untrusted storage or transmitting keys over untrusted communications networks. Wrapper keys can be broken up into *key shares*, which are pieces of a wrapper key. Key shares are divided amongst two or more *custodians* such that each custodian must contribute their key share in order to assemble a complete wrapper key.

Learn Mode
A DSM operational mode in which all actions that would have been denied are instead permitted. This permits a policy to be tested without actually denying access to resources. In the Learn Mode, all GuardPoint access attempts that would have been denied are instead permitted. These GuardPoint accesses are logged to assist in tuning and troubleshooting policies.

Live Data Transformation (LDT)
A separately licensed feature of Vormetric Transparent Encryption (VTE) that allows you to transform (encrypt or decrypt) or rekey GuardPoint data without blocking use or application access to that data.

local domain
A DSM domain in which DSM administration is restricted to Domain Administrators or Security Administrators assigned to that domain. To access a local domain in the Management Console, a DSM administrator must specify their local domain upon login.

Management Console
The graphical user interface (GUI) to the DSM.

Master encryption key (MEK)
The encryption key for Oracle Database used to encrypt secondary data encryption keys used for column encryption and tablespace encryption. Master encryption keys are part of the Oracle Advanced Security Transparent Data Encryption (TDE) two-tier key architecture.

MEK
See *Master encryption key.*

Microsoft SQL Server
A relational database server, developed by Microsoft.

Microsoft SQL Transparent Data Encryption (MS-SQL TDE)
Microsoft SQL Server native encryption for columns and tables.

multi-factor authentication
An authentication algorithm that requires at least two of the three following authentication factors: 1) something the user knows (for example, password); 2) something the user has (example: RSA SecurID); and 3) something the user is (example: fingerprint). VTE implements an optional form of multi-factor authentication for Management Console users by requiring DSM administrators to enter the token code displayed on an RSA SecurID, along with the administrator name each time the administrator logs on to the Management Console.

multitenancy
A VTE feature that enables the creation of multiple local domains within a single DSM. A local domain is a DSM domain in which DSM administration is restricted to Domain Administrators or Security Administrators assigned to that domain. This allows Cloud Service Providers to provide their customers with VTE administrative domains over which the customer has total control of data security. No other administrators, including CSP administrators, have access to VTE security in a local domain.

offline policy
Policies for Database Backup Agents. *Online policies* are for the File System Agent.

one-way communication
A VTE feature for an environment where the DSM cannot establish a connection to the agent, but the agent can establish a connection to the DSM. For example, the protected host is behind a NAT so protected host ports are not directly visible from the DSM, or the protected host is behind a firewall that prohibits incoming connections, or the protected host does not have a fixed IP address as in the cloud. When an agent is registered with one-way communication, changes made for that protected host on the DSM are not pushed to the protected host, rather as the protected host polls the DSM it will retrieve the change.

online policies
Policies for the File System Agent. *Offline policies* are for Database Backup Agents.

policy
A set of security access and encryption rules that specify who can access which files with what executable during what times, and whether or not those files are encrypted. Policies are created by DSM Security Administrators, stored in the DSM, and implemented on protected hosts by a File system Agent. See “**rule (for policies)**”.

policy tuning
The process of creating a simple Learn Mode policy that allows any protected host user to access a GuardPoint; to examine who accesses the GuardPoint, what executables they use, and what actions they require; and to modify the policy such that it allows the right people, using the right executable, performing the right action to do their job, and prevent anyone else from inappropriate access.

process set
A list of processes that can be used by the users in a user set associated with a policy rule.

protected host
A host on which a VTE Agent is installed to protect that host’s data.

public key cryptographic algorithm, public key infrastructure
A cryptographic system requiring two keys, one to lock or encrypt the plaintext, and one to unlock or decrypt the ciphertext. Neither key can do both functions. One key is published (*public key*) and the other is kept private (*private key*). If the lock/encryption key is the one published, the system enables private communication from the public to the unlocking key's owner. If the unlock/decryption key is the one published, then the system serves as a signature verifier of documents locked by the owner of the private key. Also called asymmetric key cryptography.

raw device
A type of block device that performs input/output operations without caching or buffering. This results in more direct access.

register host
The process of enabling communication between a protected host and the DSM. Registration happens during agent installation. Before registration can happen, the host must be added to the DSM database.

rekeying
The process of changing the encryption keys used to encrypt data. Changing keys enhances data security and is a requirement to maintain compliance with some data security guidelines and regulations. Also called *key rotation*.

roles
A set of Management Console permissions assigned to DSM Security Administrators by DSM Domain Administrators. There are five roles: *Audit* (can generate and view logging data for file accesses), *key* (can create, edit, and delete keys), *Policy* (can create, edit, and delete policies), *Host* (can configure, modify, and delete protected hosts and protected host groups), and *Challenge & Response* (can generate a temporary password to give to a protected host user to decrypt cached encryption keys when connection to the DSM is broken).

RSA SecurID
A hardware authentication token that is assigned to a computer user and that generates an authentication code at fixed intervals (usually 60 seconds). In addition to entering a static password, Management Console administrators can be required to input an 8-digit number that is provided by an external electronic device or software.

rule (for policies)
Every time a user or application tries to access a GuardPoint file, the access attempt passes through each rule of the policy until it finds a rule where all the criteria are met. When a rule matches, the *effect* associated with that rule is enforced. A rule consists of five access criteria and an effect. The criteria are Resource (the file/directories accessed), User (the user or groups attempting access), Process (the executable used to access the data), When (the time range when access is attempted) and Action (the type of action attempted on the data, for example read. write, rename and so on). *Effect* can be permit or deny access, decrypt data access, and audit access attempt. See *policy*.

secfs
1) The File System Agent initialization script. 2) An acronym for Vormetric Secure File System agent. It generally refers to the kernel module that handles policies (locks, protected host settings, logging preferences) and keys, and enforces data security protection.

secvm
A proprietary device driver that supports GuardPoint protection to raw devices. `secvm` is inserted in between the device driver and the device itself.

Security Administrator
The third-level DSM administrator who does most of data protection work like creating policies, configuring protected hosts, auditing data usage patterns, applying GuardPoints and other duties. The privileges of each Security Administrator is specified by the roles assigned to them by the Domain Administrator. See *roles*. See "**DSM Administrator and types**".

Security Server
See "**DSM**".

separation of duties
A method of increasing data security by creating customized DSM administrator roles for individual DSM administrators such that no one administrator has complete access to all encryption keys in all domains of all files.

signing files
File signing is a method that VTE uses to check the integrity of executables and applications before they are allowed to access GuardPoint data. If file signing is initiated in the Management Console, the File System Agent calculates the cryptographic signatures of the executables that are eligible to access GuardPoint data. A tampered executable, such as a Trojan application, malicious code, or rogue process, with a missing or mismatched signature, is denied access. Also called *cryptographic signatures*.

Suite B mode
A set of publicly available cryptographic algorithms approved by the United States National Security Agency (NSA). These algorithms enhance security by adding up to 384-bit encryption to the communication between the Web browser and the DSM, the DSM and Agent, and between DSMs in HA environments.

Symmetric-key algorithm
Cryptographic algorithms that use the same cryptographic keys for both encryption of plaintext and decryption of ciphertext. The keys, in practice, represent a shared secret between two or more parties that can be used to maintain a private information link. This requirement that both parties have access to the secret key is one of the main drawbacks of symmetric key encryption, in comparison to public-key encryption.

System Administrator (DSM)
See "**DSM Administrator and types**".

Transparent Data Encryption (TDE)

A technology used by both Microsoft and Oracle to encrypt database content. TDE offers encryption at a column, table, and tablespace level. TDE solves the problem of protecting data at rest, encrypting databases both on the hard drive and consequently on backup media.

user set

A named list of users on which a policy rule applies.

VAE Agent

See “**Key Agent**”.

vmd

Acronym for Vormetric Daemon, vmd is a process that supports communication between the DSM and kernel module.

VMSSC or Vormetric Security Server Command Line Interface

See *DSM Automation Utilities*.

Vormetric Application Encryption (VAE)

A product that enables data encryption at the application level as opposed to the file level as is done with VTE. Where VTE encrypts a file or directory, VAE can encrypt a column in a database or a field in an application. VAE is essentially an API library for key management and cryptographic operations based on PKCS#11. See the *Vormetric Application Encryption Installation and API Reference Guide*.

Vormetric Cloud Encryption Gateway (VCEG)

Vormetric product that safeguards files in cloud storage environments, including Amazon Simple Storage Service (Amazon S3) and Box. The cloud security gateway solution encrypts sensitive data before it is saved to the cloud storage environment, then decrypts data for approved users when it is removed from the cloud.

Vormetric Data Security Platform or VDS Platform

The technology platform upon which all other Vormetric products—Vormetric Transparent Encryption (VTE), Vormetric Application Encryption (VAE), Vormetric Key Management (VKM), Vormetric Cloud Encryption Gateway (VCEG), Vormetric Tokenization Server (VTS), Vormetric Key Management (VKM), and Vormetric Protection for Teradata Database—are based.

Vormetric Encryption Expert or VEE

Earlier name of the Vormetric Transparent Encryption (VTE) product. It may sometimes appear in the product GUI or installation scripts.

Vormetric Key Management (VKM)

Vormetric product that provides a standards-based platform for storing and managing encryption keys and certificates from disparate sources across the enterprise. This includes Vormetric encryption keys, 3rd-party software keys and so on.

Vormetric Protection for Teradata Database

Vormetric product that secures sensitive data in the Teradata environment.

Vormetric Security Intelligence
Vormetric product that provides support for Security Information and Event Management (SIEM) products such as ArcSight, Splunk and QRadar. Provides solutions that monitor real-time events and analyze long-term data to find anomalous usage patterns, qualify possible threats to reduce false positives, and alert organizations when needed. Documented in the VDS Platform Security Intelligence User Guide.

Vormetric Tokenization Server (VTS)
Vormetric product that replaces sensitive data in your database (up to 512 bytes) with unique identification symbols called tokens. Tokens retain the format of the original data while protecting it from theft or compromise.

Vormetric Transparent Encryption or VTE
Vormetric product that protects data-at-rest. Secures any database, file, or volume without changing the applications, infrastructure or user experience.

VTE Agent
Vormetric agents that are installed on protected hosts to implement data protection. See “**File System Agent**”.

wrapper keys
See “**key wrapping**”.

WSDL
Web Services Description Language.