NetApp

Plan and prepare for Ubuntu or Debian installation

StorageGRID

NetApp
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Plan and prepare for Ubuntu or Debian installation

Before you install (Ubuntu or Debian)

Before deploying grid nodes and configuring the StorageGRID grid, you must be familiar with the steps and requirements for completing the procedure.

The StorageGRID deployment and configuration procedures assume that you are familiar with the architecture and operation of the StorageGRID system.

You can deploy a single site or multiple sites at one time; however, all sites must meet the minimum requirement of having at least three Storage Nodes.

Before starting a StorageGRID installation, you must:

- Understand StorageGRID's compute requirements, including the minimum CPU and RAM requirements for each node.
- Understand how StorageGRID supports multiple networks for traffic separation, security, and administrative convenience, and have a plan for which networks you intend to attach to each StorageGRID node.

  See the StorageGRID networking guidelines.

- Understand the storage and performance requirements of each type of grid node.
- Identify a set of servers (physical, virtual, or both) that, in aggregate, provide sufficient resources to support the number and type of StorageGRID nodes you plan to deploy.
- Understand the requirements for node migration, if you want to perform scheduled maintenance on physical hosts without any service interruption.
- Gather all networking information in advance. Unless you are using DHCP, gather the IP addresses to assign to each grid node, and the IP addresses of the domain name system (DNS) and network time protocol (NTP) servers that will be used.
- Install, connect, and configure all required hardware, including any StorageGRID appliances, to specifications.

  (i) Hardware-specific installation and integration instructions are not included in the StorageGRID installation procedure. To learn how to install StorageGRID appliances, see the installation and maintenance instructions for your appliance.

- Decide which of the available deployment and configuration tools you want to use.

Related information

Networking guidelines

SG100 and SG1000 services appliances

SG6000 storage appliances

SG5700 storage appliances

Required materials

Before you install StorageGRID, you must gather and prepare required materials.

Item	Notes
NetApp StorageGRID license	You must have a valid, digitally signed NetApp license. **Note**: A non-production license, which can be used for testing and proof of concept grids, is included in the StorageGRID installation archive.
StorageGRID installation archive	You must download the StorageGRID installation archive and extract the files.
Service laptop	The StorageGRID system is installed through a service laptop. The service laptop must have: • Network port • SSH client (for example, PuTTY) • Supported web browser
StorageGRID documentation	• Release notes • Instructions for administering StorageGRID

Related information

NetApp Interoperability Matrix Tool

Download and extract the StorageGRID installation files

You must download the StorageGRID installation archive and extract the required files.

Steps

1. Go to the NetApp Downloads page for StorageGRID.

2. Select the button for downloading the latest release, or select another version from the drop-down menu and select **Go**.

3. Sign in with the username and password for your NetApp account.

4. If a Caution/MustRead statement appears, read it and select the check box.

> (i) You must apply any required hotfixes after you install the StorageGRID release. For more information, see the hotfix procedure in the recovery and maintenance instructions

5. Read the End User License Agreement, select the check box, and then select **Accept & Continue**.

   The downloads page for the version you selected appears. The page contains three columns:

6. In the **Install StorageGRID** column, select the .tgz or .zip file for Ubuntu or Debian.

   > (i) Select the `.zip` file if you are running Windows on the service laptop.

7. Save and extract the archive file.
8. Choose the files you need from the following list.

   The set of files you need depends on your planned grid topology and how you will deploy your StorageGRID grid.

   > (i) The paths listed in the table are relative to the top-level directory installed by the extracted installation archive.

Path and file name	Description
`./debs/README`	A text file that describes all of the files contained in the StorageGRID download file.
`./debs/NLF000000.txt`	A non-production NetApp License File that you can use for testing and proof of concept deployments.
`./debs/storagegrid-webscale-images-version-SHA.deb`	DEB package for installing the StorageGRID node images on Ubuntu or Debian hosts.
`./debs/storagegrid-webscale-images-version-SHA.deb.md5`	MD5 checksum for the file `/debs/storagegrid-webscale-images-version-SHA.deb`.
`./debs/storagegrid-webscale-service-version-SHA.deb`	DEB package for installing the StorageGRID host service on Ubuntu or Debian hosts.
Deployment scripting tool	**Description**
`./debs/configure-storagegrid.py`	A Python script used to automate the configuration of a StorageGRID system.
`./debs/configure-sga.py`	A Python script used to automate the configuration of StorageGRID appliances.
`./debs/storagegrid-ssoauth.py`	An example Python script that you can use to sign in to the Grid Management API when single sign-on is enabled.

Path and file name	Description
`./debs/configure-storagegrid.sample.json`	An example configuration file for use with the `configure-storagegrid.py` script.
`./debs/configure-storagegrid.blank.json`	A blank configuration file for use with the `configure-storagegrid.py` script.
`./debs/extras/ansible`	Example Ansible role and playbook for configuring Ubuntu or Debian hosts for StorageGRID container deployment. You can customize the role or playbook as necessary.
`./debs/extras/api-schemas`	API schemas for StorageGRID. **Note**: Before you perform an upgrade, you can use these schemas to confirm that any code you have written to use StorageGRID management APIs will be compatible with the new StorageGRID release if you do not have a non-production StorageGRID environment for upgrade compatibility testing.

Related information

Recover and maintain

CPU and RAM requirements

Before installing StorageGRID software, verify and configure the hardware so that it is ready to support the StorageGRID system.

For information about supported servers, see the Interoperability Matrix.

Each StorageGRID node requires the following minimum resources:

- CPU cores: 8 per node
- RAM: At least 24 GB per node, and 2 to 16 GB less than the total system RAM, depending on the total RAM available and the amount of non-StorageGRID software running on the system

Ensure that the number of StorageGRID nodes you plan to run on each physical or virtual host does not exceed the number of CPU cores or the physical RAM available. If the hosts are not dedicated to running StorageGRID (not recommended), be sure to consider the resource requirements of the other applications.

> (i) Monitor your CPU and memory usage regularly to ensure that these resources continue to accommodate your workload. For example, doubling the RAM and CPU allocation for virtual Storage Nodes would provide similar resources to those provided for StorageGRID appliance nodes. Additionally, if the amount of metadata per node exceeds 500 GB, consider increasing the RAM per node to 48 GB or more. For information about managing object metadata storage, increasing the Metadata Reserved Space setting, and monitoring CPU and memory usage, see the instructions for administering, monitoring, and upgrading StorageGRID.

If hyperthreading is enabled on the underlying physical hosts, you can provide 8 virtual cores (4 physical cores) per node. If hyperthreading is not enabled on the underlying physical hosts, you must provide 8 physical cores per node.

If you are using virtual machines as hosts and have control over the size and number of VMs, you should use a single VM for each StorageGRID node and size the VM accordingly.

For production deployments, you should not run multiple Storage Nodes on the same physical storage hardware or virtual host. Each Storage Node in a single StorageGRID deployment should be in its own isolated failure domain. You can maximize the durability and availability of object data if you ensure that a single hardware failure can only impact a single Storage Node.

See also the information about storage requirements.

Related information

NetApp Interoperability Matrix Tool

Storage and performance requirements

Administer StorageGRID

Monitor and troubleshoot

Upgrade software

Storage and performance requirements

You must understand the storage requirements for StorageGRID nodes, so you can provide enough space to support the initial configuration and future storage expansion.

StorageGRID nodes require three logical categories of storage:

- **Container pool** — Performance-tier (10K SAS or SSD) storage for the node containers, which will be assigned to the Docker storage driver when you install and configure Docker on the hosts that will support your StorageGRID nodes.
- **System data** — Performance-tier (10K SAS or SSD) storage for per-node persistent storage of system data and transaction logs, which the StorageGRID host services will consume and map into individual nodes.
- **Object data** — Performance-tier (10K SAS or SSD) storage and capacity-tier (NL-SAS/SATA) bulk storage for the persistent storage of object data and object metadata.

You must use RAID-backed block devices for all storage categories. Non-redundant disks, SSDs, or JBODs are not supported. You can use shared or local RAID storage for any of the storage categories; however, if you want to use StorageGRID's node migration capability, you must store both system data and object data on shared storage.

Performance requirements

The performance of the volumes used for the container pool, system data, and object metadata significantly impacts the overall performance of the system. You should use performance-tier (10K SAS or SSD) storage for these volumes to ensure adequate disk performance in terms of latency, input/output operations per second (IOPS), and throughput. You can use capacity-tier (NL-SAS/SATA) storage for the persistent storage of object data.

The volumes used for the container pool, system data, and object data must have write-back caching enabled. The cache must be on a protected or persistent media.

Requirements for hosts that use NetApp AFF storage

If the StorageGRID node uses storage assigned from a NetApp AFF system, confirm that the volume does not have a FabricPool tiering policy enabled. Disabling FabricPool tiering for volumes used with StorageGRID nodes simplifies troubleshooting and storage operations.

> ⓘ Never use FabricPool to tier any data related to StorageGRID back to StorageGRID itself. Tiering StorageGRID data back to StorageGRID increases troubleshooting and operational complexity.

Number of hosts required

Each StorageGRID site requires a minimum of three Storage Nodes.

> ⓘ In a production deployment, do not run more than one Storage Node on a single physical or virtual host. Using a dedicated host for each Storage Node provides an isolated failure domain.

Other types of nodes, such as Admin Nodes or Gateway Nodes, can be deployed on the same hosts, or they can be deployed on their own dedicated hosts as required.

Number of storage volumes for each host

The following table shows the number of storage volumes (LUNs) required for each host and the minimum size required for each LUN, based on which nodes will be deployed on that host.

The maximum tested LUN size is 39 TB.

> ⓘ These numbers are for each host, not for the entire grid.

LUN purpose	Storage category	Number of LUNs	Minimum size/LUN
Container engine storage pool	Container pool	1	Total number of nodes × 100 GB
`/var/local` volume	System data	1 for each node on this host	90 GB
Storage Node	Object data	3 for each Storage Node on this host **Note:** A software-based Storage Node can have 1 to 16 storage volumes; at least 3 storage volumes are recommended.	12 TB (4 TB/LUN) See storage requirements for Storage Nodes for more information.

LUN purpose	Storage category	Number of LUNs	Minimum size/LUN
Admin Node audit logs	System data	1 for each Admin Node on this host	200 GB
Admin Node tables	System data	1 for each Admin Node on this host	200 GB

> ⓘ Depending on the audit level configured, the size of user inputs such as S3 object key name, and how much audit log data you need to preserve, you might need to increase the size of the audit log LUN on each Admin Node. As a general rule, a grid generates approximately 1 KB of audit data per S3 operation, which would mean that a 200 GB LUN would support 70 million operations per day or 800 operations per second for two to three days.

Minimum storage space for a host

The following table shows the minimum storage space required for each type of node. You can use this table to determine the minimum amount of storage you must provide to the host in each storage category, based on which nodes will be deployed on that host.

> ⓘ Disk snapshots cannot be used to restore grid nodes. Instead, refer to the recovery and maintenance procedures for each type of node.

Type of node	Container pool	System data	Object data
Storage Node	100 GB	90 GB	4,000 GB
Admin Node	100 GB	490 GB (3 LUNs)	*not applicable*
Gateway Node	100 GB	90 GB	*not applicable*
Archive Node	100 GB	90 GB	*not applicable*

Example: Calculating the storage requirements for a host

Suppose you plan to deploy three nodes on the same host: one Storage Node, one Admin Node, and one Gateway Node. You should provide a minimum of nine storage volumes to the host. You will need a minimum of 300 GB of performance-tier storage for the node containers, 670 GB of performance-tier storage for system data and transaction logs, and 12 TB of capacity-tier storage for object data.

Type of node	LUN purpose	Number of LUNs	LUN size
Storage Node	Docker storage pool	1	300 GB (100 GB/node)
Storage Node	`/var/local` volume	1	90 GB
Storage Node	Object data	3	12 TB (4 TB/LUN)

Type of node	LUN purpose	Number of LUNs	LUN size
Admin Node	`/var/local` volume	1	90 GB
Admin Node	Admin Node audit logs	1	200 GB
Admin Node	Admin Node tables	1	200 GB
Gateway Node	`/var/local` volume	1	90 GB
Total		**9**	**Container pool:** 300 GB **System data:** 670 GB **Object data:** 12,000 GB

Storage requirements for Storage Nodes

A software-based Storage Node can have 1 to 16 storage volumes—3 or more storage volumes are recommended. Each storage volume should be 4 TB or larger.

> ℹ️ An appliance Storage Node can have up to 48 storage volumes.

As shown in the figure, StorageGRID reserves space for object metadata on storage volume 0 of each Storage Node. Any remaining space on storage volume 0 and any other storage volumes in the Storage Node are used exclusively for object data.
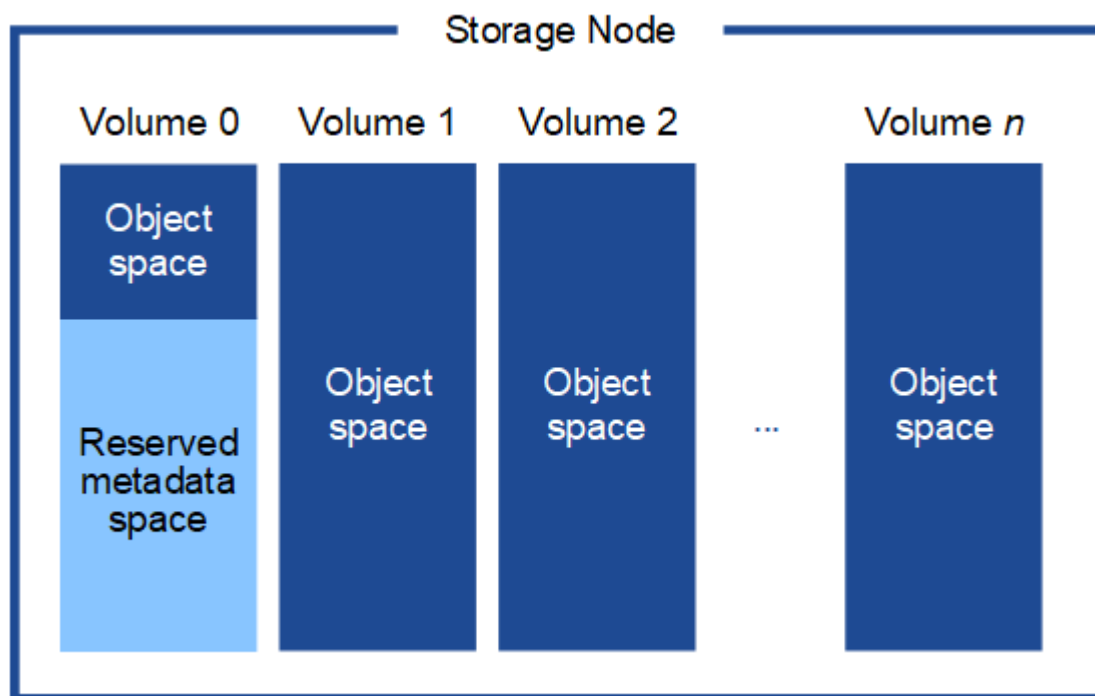
To provide redundancy and to protect object metadata from loss, StorageGRID stores three copies of the metadata for all objects in the system at each site. The three copies of object metadata are evenly distributed across all Storage Nodes at each site.

When you assign space to volume 0 of a new Storage Node, you must ensure there is adequate space for that node's portion of all object metadata.

- At a minimum, you must assign at least 4 TB to volume 0.

> (i) If you use only one storage volume for a Storage Node and you assign 4 TB or less to the volume, the Storage Node might enter the Storage Read-Only state on startup and store object metadata only.

- If you are installing a new StorageGRID 11.6 system and each Storage Node has 128 GB or more of RAM, you should assign 8 TB or more to volume 0. Using a larger value for volume 0 can increase the space allowed for metadata on each Storage Node.
- When configuring different Storage Nodes for a site, use the same setting for volume 0 if possible. If a site contains Storage Nodes of different sizes, the Storage Node with the smallest volume 0 will determine the metadata capacity of that site.

For details, go to Manage object metadata storage.

Related information

Node container migration requirements

Recover and maintain

Node container migration requirements

The node migration feature allows you to manually move a node from one host to another. Typically, both hosts are in the same physical data center.

Node migration allows you to perform physical host maintenance without disrupting grid operations. You simply move all StorageGRID nodes, one at a time, to another host before taking the physical host offline. Migrating nodes requires only a short downtime for each node and should not affect operation or availability of grid services.

If you want to use the StorageGRID node migration feature, your deployment must meet additional requirements:

- Consistent network interface names across hosts in a single physical data center
- Shared storage for StorageGRID metadata and object repository volumes that is accessible by all hosts in a single physical data center. For example, you might use NetApp E-Series storage arrays.

If you are using virtual hosts and the underlying hypervisor layer supports VM migration, you might want to use this capability instead of StorageGRID's node migration feature. In this case, you can ignore these additional requirements.

Before performing migration or hypervisor maintenance, shut down the nodes gracefully. See the instructions for shutting down a grid node.

VMware Live Migration not supported

OpenStack Live Migration and VMware live vMotion cause the virtual machine clock time to jump and are not supported for grid nodes of any type. Though rare, incorrect clock times can result in loss of data or configuration updates.

Cold migration is supported. In cold migration, you shut down the StorageGRID nodes before migrating them between hosts. See the instructions for shutting down a grid node.

Consistent network interface names

In order to move a node from one host to another, the StorageGRID host service needs to have some confidence that the external network connectivity the node has at its current location can be duplicated at the new location. It gets this confidence through the use of consistent network interface names in the hosts.

Suppose, for example, that StorageGRID NodeA running on Host1 has been configured with the following interface mappings:

eth0 ⟶ bond0.1001

eth1 ⟶ bond0.1002

eth2 ⟶ bond0.1003

The lefthand side of the arrows corresponds to the traditional interfaces as viewed from within a StorageGRID container (that is, the Grid, Admin, and Client Network interfaces, respectively). The righthand side of the arrows corresponds to the actual host interfaces providing these networks, which are three VLAN interfaces subordinate to the same physical interface bond.

Now, suppose you want to migrate NodeA to Host2. If Host2 also has interfaces named bond0.1001, bond0.1002, and bond0.1003, the system will allow the move, assuming that the like-named interfaces will provide the same connectivity on Host2 as they do on Host1. If Host2 does not have interfaces with the same names, the move will not be allowed.

There are many ways to achieve consistent network interface naming across multiple hosts; see Configure the host network for some examples.

Shared storage

In order to achieve rapid, low-overhead node migrations, the StorageGRID node migration feature does not physically move node data. Instead, node migration is performed as a pair of export and import operations, as follows:

Steps

1. During the "node export" operation, a small amount of persistent state data is extracted from the node container running on HostA and cached on that node's system data volume. Then, the node container on HostA is deinstantiated.

2. During the "node import" operation, the node container on HostB that uses the same network interface and block storage mappings that were in effect on HostA is instantiated. Then, the cached persistent state data is inserted into the new instance.

Given this mode of operation, all of the node's system data and object storage volumes must be accessible from both HostA and HostB for the migration to be allowed, and to work. In addition, they must have been mapped into the node using names that are guaranteed to refer to the same LUNs on HostA and HostB.

The following example shows one solution for block device mapping for a StorageGRID Storage Node, where

DM multipathing is in use on the hosts, and the alias field has been used in `/etc/multipath.conf` to provide consistent, friendly block device names available on all hosts.

/var/local ⟶ /dev/mapper/sgws-sn1-var-local

rangedb0 ⟶ /dev/mapper/sgws-sn1-rangedb0

rangedb1 ⟶ /dev/mapper/sgws-sn1-rangedb1

rangedb2 ⟶ /dev/mapper/sgws-sn1-rangedb2

rangedb3 ⟶ /dev/mapper/sgws-sn1-rangedb3

Deployment tools

You might benefit from automating all or part of the StorageGRID installation.

Automating the deployment might be useful in any of the following cases:

- You already use a standard orchestration framework, such as Ansible, Puppet, or Chef, to deploy and configure physical or virtual hosts.
- You intend to deploy multiple StorageGRID instances.
- You are deploying a large, complex StorageGRID instance.

The StorageGRID host service is installed by a package and driven by configuration files that can be created interactively during a manual installation, or prepared ahead of time (or programmatically) to enable automated installation using standard orchestration frameworks. StorageGRID provides optional Python scripts for automating the configuration of StorageGRID appliances, and the whole StorageGRID system (the "grid"). You can use these scripts directly, or you can inspect them to learn how to use the StorageGRID Installation REST API in grid deployment and configuration tools you develop yourself.

If you are interested in automating all or part of your StorageGRID deployment, review Automate the installation before beginning the installation process.

Prepare the hosts (Ubuntu or Debian)

Install Linux

You must install Linux on all grid hosts. Use the NetApp Interoperability Matrix Tool to get a list of supported versions.

Steps

1. Install Linux on all physical or virtual grid hosts according to the distributor's instructions or your standard procedure.

(i) Do not install any graphical desktop environments. When installing Ubuntu, you must select **standard system utilities**. Selecting **OpenSSH server** is recommended to enable ssh access to your Ubuntu hosts. All other options can remain unselected.

2. Ensure that all hosts have access to Ubuntu or Debian package repositories.

3. If swap is enabled:

    a. Run the following command: `$ sudo swapoff --all`

    b. Remove all swap entries from `/etc/fstab` to persist the settings.

    (i) Failing to disable swap entirely can severely lower performance.

Understand AppArmor profile installation

If you are operating in a self-deployed Ubuntu environment and using the AppArmor mandatory access control system, the AppArmor profiles associated with packages you install on the base system might be blocked by the corresponding packages installed with StorageGRID.

By default, AppArmor profiles are installed for packages that you install on the base operating system. When you run these packages from the StorageGRID system container, the AppArmor profiles are blocked. The DHCP, MySQL, NTP, and tcdump base packages conflict with AppArmor, and other base packages might also conflict.

You have two choices for handling AppArmor profiles:

- Disable individual profiles for the packages installed on the base system that overlap with the packages in the StorageGRID system container. When you disable individual profiles, an entry appears in the StorageGRID log files indicating that AppArmor is enabled.

  Use the following commands:

  ```
  sudo ln -s /etc/apparmor.d/<profile.name> /etc/apparmor.d/disable/
  sudo apparmor_parser -R /etc/apparmor.d/<profile.name>
  ```

  Example:

  ```
  sudo ln -s /etc/apparmor.d/bin.ping /etc/apparmor.d/disable/
  sudo apparmor_parser -R /etc/apparmor.d/bin.ping
  ```

- Disable AppArmor altogether. For Ubuntu 9.10 or later, follow the instructions in the Ubuntu online community: Disable AppArmor.

  Once you disable AppArmor, no entries indicating that AppArmor is enabled will appear in the StorageGRID log files.

Configure the host network (Ubuntu or Debian)

After completing the Linux installation on your hosts, you might need to perform some additional configuration to prepare a set of network interfaces on each host that are suitable for mapping into the StorageGRID nodes you will deploy later.

What you'll need

- You have reviewed the StorageGRID networking guidelines.

- You have reviewed the information about node container migration requirements.

- If you are using virtual hosts, you have read the considerations and recommendations for MAC address cloning before configuring the host network.

> ⓘ If you are using VMs as hosts, you should select VMXNET 3 as the virtual network adapter. The VMware E1000 network adapter has caused connectivity issues with StorageGRID containers deployed on certain distributions of Linux.

About this task

Grid nodes must be able to access the Grid Network and, optionally, the Admin and Client Networks. You provide this access by creating mappings that associate the host's physical interface to the virtual interfaces for each grid node. When creating host interfaces, use friendly names to facilitate deployment across all hosts, and to enable migration.

The same interface can be shared between the host and one or more nodes. For example, you might use the same interface for host access and node Admin Network access, to facilitate host and node maintenance. Although the same interface can be shared between the host and individual nodes, all must have different IP addresses. IP addresses cannot be shared between nodes or between the host and any node.

You can use the same host network interface to provide the Grid Network interface for all StorageGRID nodes on the host; you can use a different host network interface for each node; or you can do something in between. However, you would not typically provide the same host network interface as both the Grid and Admin Network interfaces for a single node, or as the Grid Network interface for one node and the Client Network interface for another.

You can complete this task in many ways. For example, if your hosts are virtual machines and you are deploying one or two StorageGRID nodes for each host, you can simply create the correct number of network interfaces in the hypervisor, and use a 1-to-1 mapping. If you are deploying multiple nodes on bare metal hosts for production use, you can leverage the Linux networking stack's support for VLAN and LACP for fault tolerance and bandwidth sharing. The following sections provide detailed approaches for both of these examples. You do not need to use either of these examples; you can use any approach that meets your needs.

> ⓘ Do not use bond or bridge devices directly as the container network interface. Doing so could prevent node start-up caused by a kernel issue with the use of MACVLAN with bond and bridge devices in the container namespace. Instead, use a non-bond device, such as a VLAN or virtual Ethernet (veth) pair. Specify this device as the network interface in the node configuration file.

Considerations and recommendations for MAC address cloning

MAC address cloning causes the container to use the MAC address of the host, and the host to use the MAC address of either an address you specify or a randomly generated one. You should use MAC address cloning to avoid the use of promiscuous mode network configurations.

Enabling MAC cloning

In certain environments, security can be enhanced through MAC address cloning because it enables you to use a dedicated virtual NIC for the Admin Network, Grid Network, and Client Network. Having the container use the MAC address of the dedicated NIC on the host allows you to avoid using promiscuous mode network configurations.

> ⓘ MAC address cloning is intended to be used with virtual server installations and might not function properly with all physical appliance configurations.

> ⓘ If a node fails to start due to a MAC cloning targeted interface being busy, you might need to set the link to "down" before starting node. Additionally, it is possible that the virtual environment might prevent MAC cloning on a network interface while the link is up. If a node fails to set the MAC address and start due to an interface being busy, setting the link to "down" before starting the node might fix the issue.

MAC address cloning is disabled by default and must be set by node configuration keys. You should enable it when you install StorageGRID.

There is one key for each network:

- `ADMIN_NETWORK_TARGET_TYPE_INTERFACE_CLONE_MAC`
- `GRID_NETWORK_TARGET_TYPE_INTERFACE_CLONE_MAC`
- `CLIENT_NETWORK_TARGET_TYPE_INTERFACE_CLONE_MAC`

Setting the key to "true" causes the container to use the MAC address of the host's NIC. Additionally, the host will then use the MAC address of the specified container network. By default, the container address is a randomly generated address, but if you have set one using the `_NETWORK_MAC` node configuration key, that address is used instead. The host and container will always have different MAC addresses.

> ⓘ Enabling MAC cloning on a virtual host without also enabling promiscuous mode on the hypervisor might cause Linux host networking using the host's interface to stop working.

MAC cloning use cases

There are two use cases to consider with MAC cloning:

- MAC cloning not enabled: When the `_CLONE_MAC` key in the node configuration file is not set, or set to "false," the host will use the host NIC MAC and the container will have a StorageGRID-generated MAC unless a MAC is specified in the `_NETWORK_MAC` key. If an address is set in the `_NETWORK_MAC` key, the container will have the address specified in the `_NETWORK_MAC` key. This configuration of keys requires the use of promiscuous mode.

- MAC cloning enabled: When the `_CLONE_MAC` key in the node configuration file is set to "true," the container uses the host NIC MAC, and the host uses a StorageGRID-generated MAC unless a MAC is specified in the `_NETWORK_MAC` key. If an address is set in the `_NETWORK_MAC` key, the host uses the specified address instead of a generated one. In this configuration of keys, you should not use promiscuous mode.

> ⓘ If you do not want to use MAC address cloning and would rather allow all interfaces to receive and transmit data for MAC addresses other than the ones assigned by the hypervisor, ensure that the security properties at the virtual switch and port group levels are set to **Accept** for Promiscuous Mode, MAC Address Changes, and Forged Transmits. The values set on the virtual switch can be overridden by the values at the port group level, so ensure that settings are the same in both places.

To enable MAC cloning, see the instructions for creating node configuration files.

MAC cloning example

Example of MAC cloning enabled with a host having MAC address of 11:22:33:44:55:66 for the interface ens256 and the following keys in the node configuration file:

- `ADMIN_NETWORK_TARGET = ens256`

- `ADMIN_NETWORK_MAC = b2:9c:02:c2:27:10`

- `ADMIN_NETWORK_TARGET_TYPE_INTERFACE_CLONE_MAC = true`

Result: the host MAC for ens256 is b2:9c:02:c2:27:10 and the Admin Network MAC is 11:22:33:44:55:66

Example 1: 1-to-1 mapping to physical or virtual NICs

Example 1 describes a simple physical interface mapping that requires little or no host-side configuration.
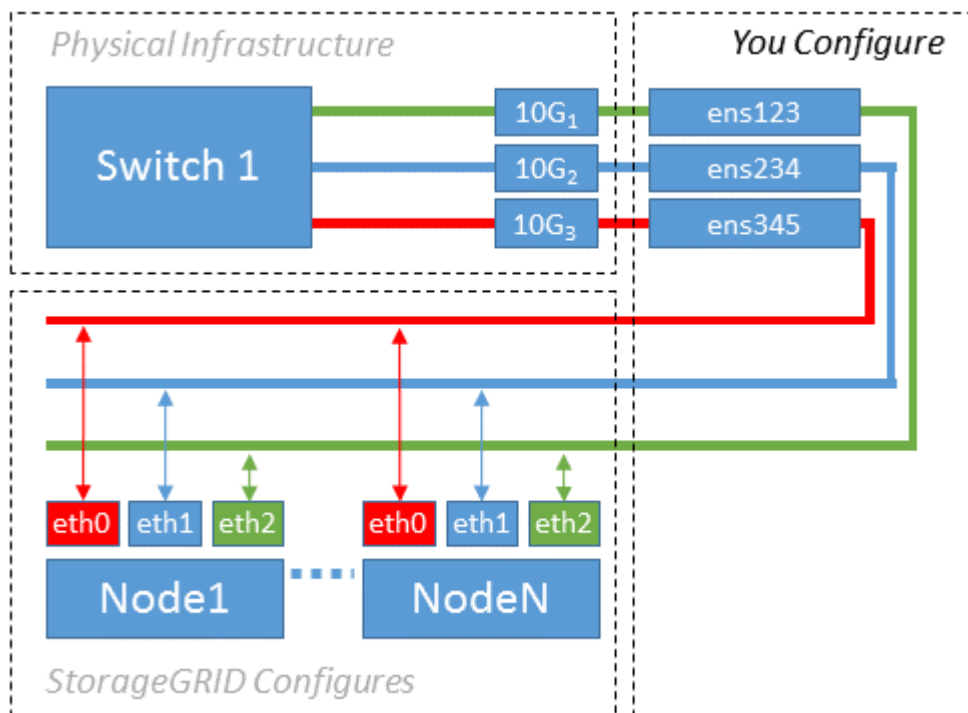
The Linux operating system creates the ensXYZ interfaces automatically during installation or boot, or when the interfaces are hot-added. No configuration is required other than ensuring that the interfaces are set to come up automatically after boot. You do have to determine which ensXYZ corresponds to which StorageGRID network (Grid, Admin, or Client) so you can provide the correct mappings later in the configuration process.

Note that the figure show multiple StorageGRID nodes; however, you would normally use this configuration for single-node VMs.

If Switch 1 is a physical switch, you should configure the ports connected to interfaces 10G$_1$ through 10G$_3$ for access mode, and place them on the appropriate VLANs.

## Example 2: LACP bond carrying VLANs

Example 2 assumes you are familiar with bonding network interfaces and with creating VLAN interfaces on the Linux distribution you are using.

About this task

Example 2 describes a generic, flexible, VLAN-based scheme that facilitates the sharing of all available network bandwidth across all nodes on a single host. This example is particularly applicable to bare metal hosts.

To understand this example, suppose you have three separate subnets for the Grid, Admin, and Client Networks at each data center. The subnets are on separate VLANs (1001, 1002, and 1003) and are presented to the host on a LACP-bonded trunk port (bond0). You would configure three VLAN interfaces on the bond: bond0.1001, bond0.1002, and bond0.1003.

If you require separate VLANs and subnets for node networks on the same host, you can add VLAN interfaces on the bond and map them into the host (shown as bond0.1004 in the illustration).
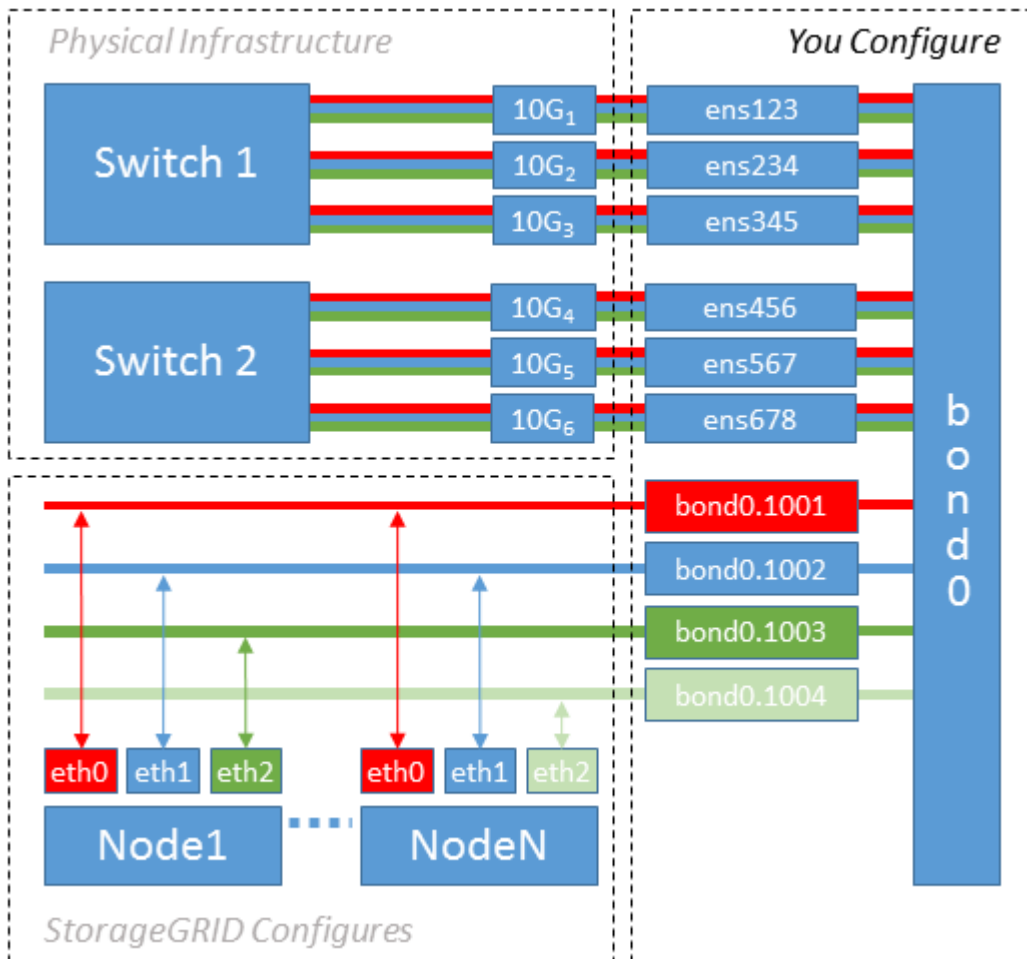
Steps

1. Aggregate all physical network interfaces that will be used for StorageGRID network connectivity into a single LACP bond.

Use the same name for the bond on every host, for example, bond0.

2. Create VLAN interfaces that use this bond as their associated "physical device," using the standard VLAN interface naming convention `physdev-name.VLAN ID`.

   Note that steps 1 and 2 require appropriate configuration on the edge switches terminating the other ends of the network links. The edge switch ports must also be aggregated into a LACP port channel, configured as a trunk, and allowed to pass all required VLANs.

   Sample interface configuration files for this per-host networking configuration scheme are provided.

Related information

Example /etc/network/interfaces

Configure host storage

You must allocate block storage volumes to each host.

What you'll need

You have reviewed the following topics, which provide information you need to accomplish this task:

Storage and performance requirements

Node container migration requirements

About this task

When allocating block storage volumes (LUNs) to hosts, use the tables in "Storage requirements" to determine the following:

- Number of volumes required for each host (based on the number and types of nodes that will be deployed on that host)
- Storage category for each volume (that is, System Data or Object Data)
- Size of each volume

You will use this information as well as the persistent name assigned by Linux to each physical volume when you deploy StorageGRID nodes on the host.

> ⓘ You do not need to partition, format, or mount any of these volumes; you just need to ensure they are visible to the hosts.

Avoid using "raw" special device files (`/dev/sdb`, for example) as you compose your list of volume names. These files can change across reboots of the host, which will impact proper operation of the system. If you are using iSCSI LUNs and device mapper multipathing, consider using multipath aliases in the `/dev/mapper` directory, especially if your SAN topology includes redundant network paths to the shared storage. Alternatively, you can use the system-created softlinks under `/dev/disk/by-path/` for your persistent device names.

For example:

```
ls -l
$ ls -l /dev/disk/by-path/
total 0
lrwxrwxrwx 1 root root  9 Sep 19 18:53 pci-0000:00:07.1-ata-2 -> ../../sr0
lrwxrwxrwx 1 root root  9 Sep 19 18:53 pci-0000:03:00.0-scsi-0:0:0:0 ->
../../sda
lrwxrwxrwx 1 root root 10 Sep 19 18:53 pci-0000:03:00.0-scsi-0:0:0:0-part1
-> ../../sda1
lrwxrwxrwx 1 root root 10 Sep 19 18:53 pci-0000:03:00.0-scsi-0:0:0:0-part2
-> ../../sda2
lrwxrwxrwx 1 root root  9 Sep 19 18:53 pci-0000:03:00.0-scsi-0:0:1:0 ->
../../sdb
lrwxrwxrwx 1 root root  9 Sep 19 18:53 pci-0000:03:00.0-scsi-0:0:2:0 ->
../../sdc
lrwxrwxrwx 1 root root  9 Sep 19 18:53 pci-0000:03:00.0-scsi-0:0:3:0 ->
../../sdd
```

Results will differ for each installation.

Assign friendly names to each of these block storage volumes to simplify the initial StorageGRID installation and future maintenance procedures. If you are using the device mapper multipath driver for redundant access to shared storage volumes, you can use the `alias` field in your `/etc/multipath.conf` file.

For example:

```
multipaths {
     multipath {
          wwid 3600a09800059d6df00005df2573c2c30
          alias docker-storage-volume-hostA
     }
     multipath {
          wwid 3600a09800059d6df00005df3573c2c30
          alias sgws-adm1-var-local
     }
     multipath {
          wwid 3600a09800059d6df00005df4573c2c30
          alias sgws-adm1-audit-logs
     }
     multipath {
          wwid 3600a09800059d6df00005df5573c2c30
          alias sgws-adm1-tables
     }
     multipath {
          wwid 3600a09800059d6df00005df6573c2c30
          alias sgws-gw1-var-local
     }
     multipath {
          wwid 3600a09800059d6df00005df7573c2c30
          alias sgws-sn1-var-local
     }
     multipath {
          wwid 3600a09800059d6df00005df7573c2c30
          alias sgws-sn1-rangedb-0
     }
     …
```

This will cause the aliases to appear as block devices in the `/dev/mapper` directory on the host, allowing you to specify a friendly, easily-validated name whenever a configuration or maintenance operation requires specifying a block storage volume.

> ⓘ If you are setting up shared storage to support StorageGRID node migration and using device mapper multipathing, you can create and install a common `/etc/multipath.conf` on all co-located hosts. Just make sure to use a different Docker storage volume on each host. Using aliases and including the target hostname in the alias for each Docker storage volume LUN will make this easy to remember and is recommended.

Related information

Storage and performance requirements

Node container migration requirements

Configure the Docker storage volume

Before installing Docker, you might need to format the Docker storage volume and mount it on `/var/lib/docker`.

About this task

You can skip these steps if you plan to use local storage for the Docker storage volume and have sufficient space available on the host partition containing `/var/lib`.

Steps

1. Create a file system on the Docker storage volume:

   ```
   sudo mkfs.ext4 docker-storage-volume-device
   ```

2. Mount the Docker storage volume:

   ```
   sudo mkdir -p /var/lib/docker
   sudo mount docker-storage-volume-device /var/lib/docker
   ```

3. Add an entry for docker-storage-volume-device to /etc/fstab.

   This step ensures that the storage volume will remount automatically after host reboots.

Install Docker

The StorageGRID system runs on Linux as a collection of Docker containers. Before you can install StorageGRID, you must install Docker.

Steps

1. Install Docker by following the instructions for your Linux distribution.

   > ℹ️ If Docker is not included with your Linux distribution, you can download it from the Docker website.

2. Ensure Docker has been enabled and started by running the following two commands:

   ```
   sudo systemctl enable docker
   ```

   ```
   sudo systemctl start docker
   ```

3. Confirm you have installed the expected version of Docker by entering the following:

```
sudo docker version
```

The Client and Server versions must be 1.11.0 or later.

Related information

[Configure host storage](#)

Install StorageGRID host services

You use the StorageGRID DEB package to install the StorageGRID host services.

About this task

These instructions describe how to install the host services from the DEB packages. As an alternative, you can use the APT repository metadata included in the installation archive to install the DEB packages remotely. See the APT repository instructions for your Linux operating system.

Steps

1. Copy the StorageGRID DEB packages to each of your hosts, or make them available on shared storage.

   For example, place them in the `/tmp` directory, so you can use the example command in the next step.

2. Log in to each host as root or using an account with sudo permission, and run the following commands.

   You must install the `images` package first, and the `service` package second. If you placed the packages in a directory other than `/tmp`, modify the command to reflect the path you used.

   ```
   sudo dpkg --install /tmp/storagegrid-webscale-images-version-SHA.deb
   ```

   ```
   sudo dpkg --install /tmp/storagegrid-webscale-service-version-SHA.deb
   ```

   > ⓘ Python 2.7 must already be installed before the StorageGRID packages can be installed. The `sudo dpkg --install /tmp/storagegrid-webscale-images-version-SHA.deb` command will fail until you have done so.