



Deploy appliance node

StorageGRID appliances

NetApp

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Deploy an appliance node

Deploy appliance Storage Node

After installing and configuring the storage appliance, you can deploy it as a Storage Node in a StorageGRID system. When you deploy an appliance as a Storage Node, you use the StorageGRID Appliance Installer included on the appliance.

Before you begin

- If you are cloning an appliance node, continue following the [appliance node cloning](#) process.
- The appliance has been installed in a rack or cabinet, connected to your networks, and powered on.
- Network links, IP addresses, and port remapping (if necessary) have been configured for the appliance using the StorageGRID Appliance Installer.



Support for port remapping is deprecated and will be removed in a future release. To remove remapped ports, refer to [Remove port remaps on StorageGRID appliances](#).

- You know one of the IP addresses assigned to the appliance's compute controller. You can use the IP address for any attached StorageGRID network.
- The primary Admin Node for the StorageGRID system has been deployed.
- All Grid Network subnets listed on the IP Configuration page of the StorageGRID Appliance Installer have been defined in the Grid Network Subnet List on the primary Admin Node.
- You have a service laptop with a supported web browser.

About this task

Each storage appliance functions as a single Storage Node. Any appliance can connect to the Grid Network, the Admin Network, and the Client Network

To deploy an appliance Storage Node in a StorageGRID system, you access the StorageGRID Appliance Installer and perform the following steps:

- You specify or confirm the IP address of the primary Admin Node and the name of the Storage Node.
- You start the deployment and wait as volumes are configured and the software is installed.
- When the installation pauses partway through the appliance installation tasks, you resume the installation by signing into the Grid Manager, approving all grid nodes, and completing the StorageGRID installation and deployment processes.



If you need to deploy multiple appliance nodes at one time, you can automate the installation process by using the `configure-sga.py` [Appliance Installation script](#).

- If you are performing an expansion or recovery operation, follow the appropriate instructions:
 - To add an appliance Storage Node to an existing StorageGRID system, see the instructions for [adding grid nodes](#).
 - To deploy an appliance Storage Node as part of a recovery operation, see instructions [recovering an appliance Storage Node](#).

Steps

1. Open a browser, and enter one of the IP addresses for the appliance's compute controller.

https://Controller_IP:8443

The StorageGRID Appliance Installer Home page appears.

2. Select the **Node type**. For more information, see [Types of Storage Nodes](#).



Metadata-only can only be selected during appliance deployment. If Metadata-only is selected as the Storage Node type, it can't be changed after the appliance is deployed.

3. In the **Node name** field, provide the system name you want to use for this appliance node, and click **Save**.

The name that appears here will be the appliance node's system name. System names are required for internal StorageGRID operations and can't be changed. To change an appliance node's display name, see [How to rename grid, sites, or nodes](#)

4. In the **Primary Admin Node connection** section, determine whether you need to specify the IP address for the primary Admin Node.

If you have previously installed other nodes in this data center, the StorageGRID Appliance Installer can discover this IP address automatically, assuming the primary Admin Node, or at least one other grid node with ADMIN_IP configured, is present on the same subnet.

5. If this IP address is not shown or you need to change it, specify the address:

Option	Description
Manual IP entry	<ol style="list-style-type: none">Clear the Enable Admin Node discovery checkbox.Enter the IP address manually.Click Save.Wait for the connection state for the new IP address to become ready.
Automatic discovery of all connected primary Admin Nodes	<ol style="list-style-type: none">Select the Enable Admin Node discovery checkbox.Wait for the list of discovered IP addresses to be displayed.Select the primary Admin Node for the grid where this appliance Storage Node will be deployed.Click Save.Wait for the connection state for the new IP address to become ready.

6. In the **Installation** section, confirm that the current state is "Ready to start installation of *node name* into grid with primary Admin Node *admin_ip*" and that the **Start Installation** button is enabled.

If the **Start Installation** button is not enabled, you might need to change the network configuration or port settings. For instructions, see the maintenance instructions for your appliance.



If you are deploying the Storage Node appliance as a node cloning target, stop the deployment process here and continue the [node cloning procedure](#).

7. From the StorageGRID Appliance Installer home page, click **Start Installation**.

The Current state changes to “Installation is in progress,” and the [Monitor Installation page](#) is displayed.



If you need to access the Monitor Installation page manually, click **Monitor Installation**.

8. If your grid includes multiple appliance Storage Nodes, repeat these steps for each appliance.



If you need to deploy multiple appliance Storage Nodes at one time, you can automate the installation process by using the `configure-sga.py` [Appliance Installation script](#).

Deploy services appliance node

You can deploy a services appliance as a primary Admin Node, a non-primary Admin Node, or a Gateway Node. All services appliances can operate as Gateway Nodes and Admin Nodes (primary or non-primary) at the same time.

Deploy services appliance as primary Admin Node

When you deploy a services appliance as a primary Admin Node, you use the StorageGRID Appliance Installer included on the appliance to install the StorageGRID software, or you upload the software version you want to install. You must install and configure the primary Admin Node before you install any other appliance node types. A primary Admin Node can connect to the Grid Network, and to the optional Admin Network and Client Network, if one or both are configured.

Before you begin

- The appliance has been installed in a rack or cabinet, connected to your networks, and powered on.
- Network links, IP addresses, and port remapping (if necessary) have been configured for the appliance using the StorageGRID Appliance Installer.



Support for port remapping is deprecated and will be removed in a future release. To remove remapped ports, refer to [Remove port remaps on StorageGRID appliances](#).

- You have a service laptop with a [supported web browser](#).
- You know one of the IP addresses assigned to the appliance. You can use the IP address for any attached StorageGRID network.

About this task

To install StorageGRID on an appliance primary Admin Node:

- You use the StorageGRID Appliance Installer to install the StorageGRID software. If you want to install a different version of the software, you first upload it using the StorageGRID Appliance Installer.
- You wait as the software is installed.
- When the software has been installed, the appliance is rebooted automatically.

Steps

1. Open a browser, and enter the IP address for the appliance.

https://services_appliance_IP:8443

The StorageGRID Appliance Installer Home page appears.

2. In the **This Node** section, select **Primary Admin**.

3. In the **Node name** field, enter the name you want to use for this appliance node, and click **Save**.

The node name is assigned to this appliance node in the StorageGRID system. It is shown on the Grid Nodes page in the Grid Manager.

4. Optionally, to install a different version of the StorageGRID software, follow these steps:

- a. Download the installation archive:

[NetApp Downloads: StorageGRID](#)

- b. Extract the archive.

- c. From the StorageGRID Appliance Installer, select **Advanced > Upload StorageGRID Software**.

- d. Click **Remove** to remove the current software package.

- e. Click **Browse** for the software package you downloaded and extracted. Select the `storagegrid-webscale-images-version.deb` package.

- f. Select **Home** to return to the Home page.

5. Confirm that the current state is “Ready to start installation of primary Admin Node name with software version x.y” and that the **Start Installation** button is enabled.



If you are deploying the Admin Node appliance as a node cloning target, stop the deployment process here and continue the [node cloning procedure](#).

6. From the StorageGRID Appliance Installer home page, click **Start Installation**.

The Current state changes to “Installation is in progress,” and the Monitor Installation page is displayed.



If you need to access the Monitor Installation page manually, click **Monitor Installation** from the menu bar.

Deploy services appliance as Gateway or non-primary Admin Node

When you deploy a services appliance as a Gateway Node or non-primary Admin Node, you use the StorageGRID Appliance Installer included on the appliance.

Before you begin

- The appliance has been installed in a rack or cabinet, connected to your networks, and powered on.
- Network links, IP addresses, and port remapping (if necessary) have been configured for the appliance using the StorageGRID Appliance Installer.



Support for port remapping is deprecated and will be removed in a future release. To remove remapped ports, refer to [Remove port remaps on StorageGRID appliances](#).

- The primary Admin Node for the StorageGRID system has been deployed.
- All Grid Network subnets listed on the IP Configuration page of the StorageGRID Appliance Installer have been defined in the Grid Network Subnet List on the primary Admin Node.
- You have a service laptop with a [supported web browser](#).
- You know the IP address assigned to the appliance. You can use the IP address for any attached StorageGRID network.

About this task

To install StorageGRID on a services appliance node:

- You specify or confirm the IP address of the primary Admin Node and the name of the appliance node.
- You start the installation and wait as the software is installed.

Partway through the appliance Gateway Node installation tasks, the installation pauses. To resume the installation, you sign into the Grid Manager, approve all grid nodes, and complete the StorageGRID installation process.

-  Mixing services appliances with different levels of performance in the same site, such as an SG100 or SG110 with an SG1000 or SG1100, can cause unpredictable and inconsistent results when using multiple nodes in a high-availability group or when balancing client load across multiple services appliances.
-  If you need to deploy multiple appliance nodes at one time, you can automate the installation process. See [Automate appliance installation and configuration](#).

Steps

1. Open a browser, and enter the IP address for the appliance.

`https://Controller_IP:8443`

The StorageGRID Appliance Installer Home page appears.

2. In the Primary Admin Node connection section, determine whether you need to specify the IP address for the primary Admin Node.

If you have previously installed other nodes in this data center, the StorageGRID Appliance Installer can discover this IP address automatically, assuming the primary Admin Node, or at least one other grid node with `ADMIN_IP` configured, is present on the same subnet.

3. If this IP address is not shown or you need to change it, specify the address:

Option	Description
Manual IP entry	<ol style="list-style-type: none"> Clear the Enable Admin Node discovery checkbox. Enter the IP address manually. Click Save. Wait for the connection state for the new IP address to become ready.

Option	Description
Automatic discovery of all connected primary Admin Nodes	<ol style="list-style-type: none"> a. Select the Enable Admin Node discovery checkbox. b. Wait for the list of discovered IP addresses to be displayed. c. Select the primary Admin Node for the grid where this appliance Gateway or non-primary Admin Node will be deployed. d. Click Save. e. Wait for the connection state for the new IP address to become ready.

4. In the **Node name** field, provide the system name you want to use for this appliance node, and click **Save**.

The name that appears here will be the appliance node's system name. System names are required for internal StorageGRID operations and can't be changed. To change an appliance node's display name, see [How to rename grid, sites, or nodes](#)

5. Optionally, to install a different version of the StorageGRID software, follow these steps:

a. Download the installation archive:

[NetApp Downloads: StorageGRID](#)

b. Extract the archive.

c. From the StorageGRID Appliance Installer, select **Advanced > Upload StorageGRID Software**.

d. Click **Remove** to remove the current software package.

e. Click **Browse** for the software package you downloaded and extracted. Select the `storagegrid-webscale-images-version.deb` package.

f. Select **Home** to return to the Home page.

6. In the Installation section, confirm that the current state is "Ready to start installation of `node_name` into grid with primary Admin Node `admin_ip`" and that the **Start Installation** button is enabled.

If the **Start Installation** button is not enabled, you might need to change the network configuration or port settings. For instructions, see the maintenance instructions for your appliance.

7. From the StorageGRID Appliance Installer home page, click **Start Installation**.

The Current state changes to "Installation is in progress," and the [Monitor Installation page](#) is displayed.



If you need to access the Monitor Installation page manually, click **Monitor Installation** from the menu bar.

8. If your grid includes multiple appliance nodes, repeat the previous steps for each appliance.

Monitor appliance installation

The StorageGRID Appliance Installer provides status until installation is complete. When the software installation is complete, the appliance is rebooted.

Example 1. Steps

Storage appliance

1. To monitor the installation progress, click **Monitor Installation**.

The Monitor Installation page shows the installation progress.

The blue status bar indicates which task is currently in progress. Green status bars indicate tasks that have completed successfully.



The installer ensures that tasks completed in a previous install aren't re-run. If you are re-running an installation, any tasks that don't need to be re-run are shown with a green status bar and a status of "Skipped."

2. Review the progress of the first two installation stages.

1. Configure storage

During this stage, the installer connects to the storage controller, clears any existing configuration, creates RAIDs according to the configured RAID Mode, allocates volumes for StorageGRID software and object data storage, and configures host settings.

2. Install OS

During this stage, the installer copies the base operating system image for StorageGRID to the appliance.

3. Continue monitoring the installation progress until the **Install StorageGRID** stage pauses and a message appears on the embedded console, prompting you to approve this node on the Admin Node using the Grid Manager; then, go to the next step.
4. [Go to the Grid Manager](#) of the Primary Admin node, approve the pending storage node, and complete the StorageGRID installation process.

When you click **Install** from the Grid Manager, Stage 3 completes and stage 4, **Finalize Installation**, begins. When stage 4 completes, the controller is rebooted.

Close the window after all installation stages are complete.

Services appliance

1. To monitor the installation progress, click **Monitor Installation**.

The Monitor Installation page shows the installation progress.

The blue status bar indicates which task is currently in progress. Green status bars indicate tasks that have completed successfully.



The installer ensures that tasks completed in a previous install aren't re-run. If you are re-running an installation, any tasks that don't need to be re-run are shown with a green status bar and a status of "Skipped."

2. Review the progress of the first two installation stages.

1. Configure storage

During this stage, the installer clears any existing configuration from the drives in the appliance, and configures host settings.

2. Install OS

During this stage, the installer copies the base operating system image for StorageGRID to the appliance.

3. Continue monitoring the installation progress until one of the following processes occurs:

- For all appliance nodes except the primary Admin Node, the Install StorageGRID stage pauses and a message appears on the embedded console, prompting you to approve this node on the Admin Node using the [Grid Manager](#); then, go to the next step.
- For appliance primary Admin Node installation, you don't need to approve the node. The appliance is rebooted. You can skip the next step.



During installation of an appliance primary Admin Node, a fifth phase appears to load the StorageGRID Installer (the example screen shot shows only the first four phases). If loading the StorageGRID Installer (fifth phase) is in progress for more than 10 minutes, refresh the web page manually.

4. [Go to the Grid Manager](#) of the Primary Admin node, approve the pending grid node, and complete the StorageGRID installation process.

When you click **Install** from the Grid Manager, Stage 3 completes and stage 4, **Finalize Installation**, begins. When stage 4 completes, the appliance is rebooted.

Close the window after all installation stages are complete.

Reboot appliance while StorageGRID Appliance Installer is running

You might need to reboot the appliance while the StorageGRID Appliance Installer is running. For example, you might need to reboot the appliance if the installation fails.

About this task

This procedure only applies when the appliance is running the StorageGRID Appliance Installer. Once the installation is completed, this step no longer works because the StorageGRID Appliance Installer is no longer available.

Steps

1. From the StorageGRID Appliance Installer, click **Advanced > Reboot Controller**, and then select one of these options:
 - Select **Reboot into StorageGRID** to reboot the controller with the node rejoining the grid. Select this option if you are done working in maintenance mode and are ready to return the node to normal operation.
 - Select **Reboot into Maintenance Mode** to reboot the controller with the node remaining in maintenance mode. (This option is available only when the controller is in maintenance mode.) Select this option if there are additional maintenance operations you need to perform on the node before rejoicing the grid.

Troubleshoot hardware installation (SG100 and SG1000)

If you encounter issues during the installation, you might find it helpful to review troubleshooting information related to hardware setup and connectivity issues.

View boot-up codes

When you apply power to the appliance, the BMC logs a series of boot-up codes. You can view these codes on a graphical console that is connected to the BMC management port.

Before you begin

- You know how to [access the BMC dashboard](#).
- If you want to use serial-over-LAN (SOL), you have experience using IPMI SOL console applications.

Steps

1. Select one of the following methods for viewing the boot-up codes for the appliance controller, and gather the required equipment.

Method	Required equipment
VGA console	<ul style="list-style-type: none">• VGA-capable monitor• VGA cable
KVM	<ul style="list-style-type: none">• RJ-45 cable
Serial port	<ul style="list-style-type: none">• DB-9 serial cable• Virtual serial terminal
SOL	<ul style="list-style-type: none">• Virtual serial terminal

2. If you are using a VGA console, perform these steps:
 - a. Connect a VGA-capable monitor to the VGA port on the back of the appliance.
 - b. View the codes displayed on the monitor.
3. If you are using BMC KVM, perform these steps:
 - a. Connect to the BMC management port and log in to the BMC web interface.
 - b. Select **Remote Control**.
 - c. Launch the KVM.
 - d. View the codes on the virtual monitor.
4. If you are using a serial port and terminal, perform these steps:
 - a. Connect to the DB-9 serial port on the back of the appliance.
 - b. Use settings 115200 8-N-1.
 - c. View the codes printed over the serial terminal.
5. If you are using SOL, perform these steps:

- a. Connect to the IPMI SOL using the BMC IP address and login credentials.

```
ipmitool -I lanplus -H BMC_Port_IP -U admin -P Password sol activate
```



In some cases the default username might be `root` instead of `admin`.

- b. View the codes on the virtual serial terminal.

6. Use the table to look up the codes for your appliance.

Code	Indicates
HT	The master boot script is waiting for OS boot to complete.
HI	The master boot script has started.
PP	The system is checking to see if the FPGA needs to be updated.
HP	The system is checking to see if the network interface card (NIC) firmware needs to be updated.
HB	The system is checking to see if the 10/25-GbE controller firmware needs to be updated.
RB	The system is rebooting after applying firmware updates.
FP	The hardware subsystem firmware update checks have been completed. Inter-controller communication services are starting.
HC	The system is checking for existing StorageGRID installation data.
HO	The StorageGRID appliance is running.
HA	StorageGRID is running.

View error codes

If a hardware error occurs when the appliance is booting up, the BMC logs an error code. As required, you can view these error codes using the BMC interface or the appliance serial port, and then work with technical support to resolve the issue.

Before you begin



If your BMC does not have a BIOS POST Code menu item, access the error codes using the appliance serial port.

- If you are using the BMC, you know how to [access the BMC dashboard](#).
- If you are using a serial port and terminal, gather the required equipment:

- DB-9 serial cable
- Virtual serial terminal

Steps

1. Access the error codes using one of the following methods.

BMC

If you are using the BMC, perform these steps:

- a. [Access the BMC dashboard](#).
- b. From the BMC dashboard, select **BIOS POST Code**.
- c. Review the information displayed for Current Code and the Previous Code.

Serial port

If you are using a serial port and terminal, perform these steps to view the error codes. BIOS POST codes display on the serial console when the appliance reboots.

- a. Connect to the DB-9 serial port on the back of the appliance.
- b. Use settings 115200 8-N-1.
- c. View the codes printed over the serial terminal.

2. If any of the following error codes are shown, work with technical support to resolve the issue.

Code	Indicates
0x0E	Microcode not found
0x0F	Microcode not loaded
0x50	Memory initialization error. Invalid memory type or incompatible memory speed.
0x51	Memory initialization error. SPD reading has failed.
0x52	Memory initialization error. Invalid memory size or memory modules don't match.
0x53	Memory initialization error. No usable memory detected.
0x54	Unspecified memory initialization error
0x55	Memory not installed
0x56	Invalid CPU type or speed

Code	Indicates
0x57	CPU mismatch
0x58	CPU self-test failed, or possible CPU cache error
0x59	CPU micro-code is not found, or micro-code update failed
0x5A	Internal CPU error
0x5B	Reset PPI is not available
0x5C	PEI phase BMC self-test failure
0xD0	CPU initialization error
0xD1	North bridge initialization error
0xD2	South bridge initialization error
0xD3	Some architectural protocols aren't available
0xD4	PCI resource allocation error. Out of resources.
0xD5	No space for legacy option ROM
0xD6	No console output devices are found
0xD7	No console input devices are found
0xD8	Invalid password
0xD9	Error loading boot option (LoadImage returned error)
0xDA	Boot option failed (StartImage returned error)
0xDB	Flash update failed
0xDC	Reset protocol is not available
0xDD	DXE phase BMC self-test failure
0xE8	MRC: ERR_NO_MEMORY
0xE9	MRC: ERR_LT_LOCK

Code	Indicates
0xEA	MRC: ERR_DDR_INIT
0xEB	MRC: ERR_MEM_TEST
0xEC	MRC: ERR_VENDOR_SPECIFIC
0xED	MRC: ERR_DIMM_COMPAT
0xEE	MRC: ERR_MRC_COMPATIBILITY
0xEF	MRC: ERR_MRC_STRUCT
0xF0	MRC: ERR_SET_VDD
0xF1	MRC: ERR_IOT_MEM_BUFFER
0xF2	MRC: ERR_RC_INTERNAL
0xF3	MRC: ERR_INVALID_REG_ACCESS
0xF4	MRC: ERR_SET_MC_FREQ
0xF5	MRC: ERR_READ_MC_FREQ
0x70	MRC: ERR_DIMM_CHANNEL
0x74	MRC: ERR_BIST_CHECK
0xF6	MRC: ERR_SMBUS
0xF7	MRC: ERR_PCU
0xF8	MRC: ERR_NGN
0xF9	MRC: ERR_INTERLEAVE_FAILURE

Hardware setup appears to hang

The StorageGRID Appliance Installer might not be available if hardware faults or cabling errors prevent the appliance from completing its boot-up processing.

Steps

1. Review the LEDs on the appliance and the boot-up and error codes displayed in the BMC.

2. If you need help resolving an issue, contact technical support.

Connection issues

If you can't connect to the services appliance, there might be a network issue, or the hardware installation might not have been completed successfully.

Steps

1. Try to ping the appliance using the IP address for the appliance :

`ping services_appliance_IP`

2. If you receive no response from the ping, confirm you are using the correct IP address.

You can use the IP address of the appliance on the Grid Network, the Admin Network, or the Client Network.

3. If the IP address is correct, check appliance cabling, QSFP or SFP transceivers, and the network setup.
4. If physical access to the appliance is available, you can use a direct connection to the permanent link-local IP 169.254.0.1 to check controller networking configuration and update if necessary. For detailed instructions, see step 2 in [Access StorageGRID Appliance Installer](#).

If that does not resolve the issue, contact technical support.

5. If the ping was successful, open a web browser.
6. Enter the URL for the StorageGRID Appliance Installer:

`https://appliances_controller_IP:8443`

The Home page appears.

Troubleshoot hardware installation (SG110 and SG1100)

If you encounter issues during the installation, you might find it helpful to review troubleshooting information related to hardware setup and connectivity issues.

View boot-up codes

When you apply power to the appliance, the BMC logs a series of boot-up codes. You can view these codes on a graphical console that is connected to the BMC management port.

Before you begin

- You know how to [access the BMC dashboard](#).
- If you want to use serial-over-LAN (SOL), you have experience using IPMI SOL console applications.

Steps

1. Select one of the following methods for viewing the boot-up codes for the appliance controller, and gather the required equipment.

Method	Required equipment
VGA console	<ul style="list-style-type: none"> • VGA-capable monitor • VGA cable
KVM	<ul style="list-style-type: none"> • RJ-45 cable
Serial port	<ul style="list-style-type: none"> • USB cable • Virtual serial terminal
SOL	<ul style="list-style-type: none"> • Virtual serial terminal

2. If you are using a VGA console, perform these steps:
 - a. Connect a VGA-capable monitor to the VGA port on the back of the appliance.
 - b. View the codes displayed on the monitor.
3. If you are using BMC KVM, perform these steps:
 - a. Connect to the BMC management port and log in to the BMC web interface.
 - b. Select **Remote Control**.
 - c. Launch the KVM.
 - d. View the codes on the virtual monitor.
4. If you are using a serial port and terminal, perform these steps:
 - a. Connect to the serial USB port on the back of the appliance.
 - b. Use settings 115200 8-N-1.
 - c. View the codes printed over the serial terminal.
5. If you are using SOL, perform these steps:
 - a. Connect to the IPMI SOL using the BMC IP address and login credentials.

```
ipmitool -I lanplus -H BMC_Port_IP -U admin -P Password sol activate
```

 - b. View the codes on the virtual serial terminal.
6. Use the table to look up the codes for your appliance.

Code	Indicates
HT	The master boot script is waiting for OS boot to complete.
HI	The master boot script has started.
PP	The system is checking to see if the FPGA needs to be updated.
HP	The system is checking to see if the network interface card (NIC) firmware needs to be updated.

Code	Indicates
RB	The system is rebooting after applying firmware updates.
FP	The hardware subsystem firmware update checks have been completed. Inter-controller communication services are starting.
HC	The system is checking for existing StorageGRID installation data.
HO	The StorageGRID appliance is running.
HA	StorageGRID is running.

View error codes

If a hardware error occurs when the appliance is booting up, the BMC logs an error code. As required, you can view these error codes using the appliance serial port, and then work with technical support to resolve the issue.

Before you begin

- Gather the required equipment:
 - USB cable
 - Virtual serial terminal

Steps

1. Connect to the serial USB port on the back of the appliance.
2. Use settings 115200 8-N-1.
3. Review the information printed over the serial terminal for Current Code and the Previous Code.

If any of the following error codes are shown, work with technical support to resolve the issue.

Code	Indicates
0x0E	Microcode not found
0x0F	Microcode not loaded
0x50	Memory initialization error. Invalid memory type or incompatible memory speed.
0x51	Memory initialization error. SPD reading has failed.
0x52	Memory initialization error. Invalid memory size or memory modules don't match.
0x53	Memory initialization error. No usable memory detected.

Code	Indicates
0x54	Unspecified memory initialization error
0x55	Memory not installed
0x56	Invalid CPU type or speed
0x57	CPU mismatch
0x58	CPU self-test failed, or possible CPU cache error
0x59	CPU micro-code is not found, or micro-code update failed
0x5A	Internal CPU error
0x5B	Reset PPI is not available
0x5C	PEI phase BMC self-test failure
0xD0	CPU initialization error
0xD1	North bridge initialization error
0xD2	South bridge initialization error
0xD3	Some architectural protocols aren't available
0xD4	PCI resource allocation error. Out of resources.
0xD5	No space for legacy option ROM
0xD6	No console output devices are found
0xD7	No console input devices are found
0xD8	Invalid password
0xD9	Error loading boot option (LoadImage returned error)
0xDA	Boot option failed (StartImage returned error)
0xDB	Flash update failed
0xDC	Reset protocol is not available

Code	Indicates
0xDD	DXE phase BMC self-test failure
0xE8	MRC: ERR_NO_MEMORY
0xE9	MRC: ERR_LT_LOCK
0xEA	MRC: ERR_DDR_INIT
0xEB	MRC: ERR_MEM_TEST
0xEC	MRC: ERR_VENDOR_SPECIFIC
0xED	MRC: ERR_DIMM_COMPAT
0xEE	MRC: ERR_MRC_COMPATIBILITY
0xEF	MRC: ERR_MRC_STRUCT
0xF0	MRC: ERR_SET_VDD
0xF1	MRC: ERR_IOT_MEM_BUFFER
0xF2	MRC: ERR_RC_INTERNAL
0xF3	MRC: ERR_INVALID_REG_ACCESS
0xF4	MRC: ERR_SET_MC_FREQ
0xF5	MRC: ERR_READ_MC_FREQ
0x70	MRC: ERR_DIMM_CHANNEL
0x74	MRC: ERR_BIST_CHECK
0xF6	MRC: ERR_SMBUS
0xF7	MRC: ERR_PCU
0xF8	MRC: ERR_NGN
0xF9	MRC: ERR_INTERLEAVE_FAILURE

Hardware setup appears to hang

The StorageGRID Appliance Installer might not be available if hardware faults or cabling errors prevent the appliance from completing its boot-up processing.

Steps

1. Review the LEDs on the appliance and the boot-up and error codes displayed in the BMC.
2. If you need help resolving an issue, contact technical support.

Connection issues

If you can't connect to the services appliance, there might be a network issue, or the hardware installation might not have been completed successfully.

Steps

1. Try to ping the appliance using the IP address for the appliance :

`ping appliance_IP`

2. If you receive no response from the ping, confirm you are using the correct IP address.

You can use the IP address of the appliance on the Grid Network, the Admin Network, or the Client Network.

3. If the IP address is correct, check appliance cabling, QSFP or SFP transceivers, and the network setup.
4. If physical access to the appliance is available, you can use a direct connection to the permanent link-local IP `169.254.0.1` to check controller networking configuration and update if necessary. For detailed instructions, see step 2 in [Access StorageGRID Appliance Installer](#).

If that does not resolve the issue, contact technical support.

5. If the ping was successful, open a web browser.
6. Enter the URL for the StorageGRID Appliance Installer:

`https://appliances_controller_IP:8443`

The Home page appears.

Troubleshoot hardware installation (SG5700 or SG6000)

If you encounter issues during the installation, you might find it helpful to review troubleshooting information related to hardware setup and connectivity issues.

View boot-up codes (SG6000-CN controller)

When you apply power to the appliance, the BMC logs a series of boot-up codes for the SG6000-CN controller. You can view these codes in several ways.

Before you begin

- You know how to [access the BMC dashboard](#).
- If you want to use serial-over-LAN (SOL), you have experience using IPMI SOL console applications.

Steps

1. Select one of the following methods for viewing the boot-up codes for the appliance controller, and gather the required equipment.

Method	Required equipment
VGA console	<ul style="list-style-type: none">• VGA-capable monitor• VGA cable
KVM	<ul style="list-style-type: none">• RJ-45 cable
Serial port	<ul style="list-style-type: none">• DB-9 serial cable• Virtual serial terminal
SOL	<ul style="list-style-type: none">• Virtual serial terminal

2. If you are using a VGA console, perform these steps:
 - a. Connect a VGA-capable monitor to the VGA port on the back of the appliance.
 - b. View the codes displayed on the monitor.
3. If you are using BMC KVM, perform these steps:
 - a. Connect to the BMC management port and log in to the BMC web interface.
 - b. Select **Remote Control**.
 - c. Launch the KVM.
 - d. View the codes on the virtual monitor.
4. If you are using a serial port and terminal, perform these steps:
 - a. Connect to the DB-9 serial port on the back of the appliance.
 - b. Use settings 115200 8-N-1.
 - c. View the codes printed over the serial terminal.
5. If you are using SOL, perform these steps:
 - a. Connect to the IPMI SOL using the BMC IP address and login credentials.

```
ipmitool -I lanplus -H BMC_Port_IP -U admin -P Password sol activate
```

 In some cases the default username for an SG6000 appliance might be `root` instead of `admin`.
 - b. View the codes on the virtual serial terminal.
6. Use the table to look up the codes for your appliance.

Code	Indicates
HT	The master boot script is waiting for OS boot to complete.

Code	Indicates
HI	The master boot script has started.
PP	The system is checking to see if the FPGA needs to be updated.
HP	The system is checking to see if the network interface card (NIC) firmware needs to be updated.
RB	The system is rebooting after applying firmware updates.
FP	The hardware subsystem firmware update checks have been completed. Inter-controller communication services are starting.
HE	<p>For an appliance Storage Node only:</p> <p>The system is awaiting connectivity with the storage controllers and synchronizing with the SANtricity operating system.</p> <p>Note: If the boot-up procedure does not progress past this stage, perform these steps:</p> <ol style="list-style-type: none"> <li data-bbox="528 899 1393 963">Confirm that the four interconnect cables between the SG6000-CN controller and the two storage controllers are securely connected. <li data-bbox="528 973 1328 1015">As required, replace one or more of the cables, and try again. <li data-bbox="528 1026 1295 1068">If this does not resolve the issue, contact technical support.
HC	The system is checking for existing StorageGRID installation data.
HO	The StorageGRID Appliance Installer is running.
HA	StorageGRID is running.

View error codes (SG6000-CN controller)

If a hardware error occurs when the SG6000-CN controller is booting up, the BMC logs an error code. As required, you can view these error codes using the BMC interface or the appliance serial port, and then work with technical support to resolve the issue.

Before you begin

 If your BMC does not have a BIOS POST Code menu item, access the error codes using the appliance serial port.

- If you are using the BMC, you know how to [access the BMC dashboard](#).
- If you are using a serial port and terminal, gather the required equipment:
 - DB-9 serial cable

- Virtual serial terminal

Steps

1. Access the error codes using one of the following methods.

BMC

If you are using the BMC, perform these steps:

- a. [Access the BMC dashboard](#).
- b. From the BMC dashboard, select **BIOS POST Code**.
- c. Review the information displayed for Current Code and the Previous Code.

Serial port

If you are using a serial port and terminal, perform these steps to view the error codes. BIOS POST codes display on the serial console when the appliance reboots.

- a. Connect to the DB-9 serial port on the back of the appliance.
- b. Use settings 115200 8-N-1.
- c. View the codes printed over the serial terminal.

2. If any of the following error codes are shown, work with technical support to resolve the issue.

Code	Indicates
0x0E	Microcode not found
0x0F	Microcode not loaded
0x50	Memory initialization error. Invalid memory type or incompatible memory speed.
0x51	Memory initialization error. SPD reading has failed.
0x52	Memory initialization error. Invalid memory size or memory modules don't match.
0x53	Memory initialization error. No usable memory detected.
0x54	Unspecified memory initialization error
0x55	Memory not installed
0x56	Invalid CPU type or speed
0x57	CPU mismatch

Code	Indicates
0x58	CPU self-test failed, or possible CPU cache error
0x59	CPU micro-code is not found, or micro-code update failed
0x5A	Internal CPU error
0x5B	Reset PPI is not available
0x5C	PEI phase BMC self-test failure
0xD0	CPU initialization error
0xD1	North bridge initialization error
0xD2	South bridge initialization error
0xD3	Some architectural protocols aren't available
0xD4	PCI resource allocation error. Out of resources.
0xD5	No space for legacy option ROM
0xD6	No console output devices are found
0xD7	No console input devices are found
0xD8	Invalid password
0xD9	Error loading boot option (LoadImage returned error)
0xDA	Boot option failed (StartImage returned error)
0xDB	Flash update failed
0xDC	Reset protocol is not available
0xDD	DXE phase BMC self-test failure
0xE8	MRC: ERR_NO_MEMORY
0xE9	MRC: ERR_LT_LOCK
0xEA	MRC: ERR_DDR_INIT

Code	Indicates
0xEB	MRC: ERR_MEM_TEST
0xEC	MRC: ERR_VENDOR_SPECIFIC
0xED	MRC: ERR_DIMM_COMPAT
0xEE	MRC: ERR_MRC_COMPATIBILITY
0xEF	MRC: ERR_MRC_STRUCT
0xF0	MRC: ERR_SET_VDD
0xF1	MRC: ERR_IOT_MEM_BUFFER
0xF2	MRC: ERR_RC_INTERNAL
0xF3	MRC: ERR_INVALID_REG_ACCESS
0xF4	MRC: ERR_SET_MC_FREQ
0xF5	MRC: ERR_READ_MC_FREQ
0x70	MRC: ERR_DIMM_CHANNEL
0x74	MRC: ERR_BIST_CHECK
0xF6	MRC: ERR_SMBUS
0xF7	MRC: ERR_PCU
0xF8	MRC: ERR_NGN
0xF9	MRC: ERR_INTERLEAVE_FAILURE

Hardware setup appears to hang (SG6000 or SG5700)

The StorageGRID Appliance Installer might not be available if hardware faults or cabling errors prevent the storage controllers or the appliance controller from completing their boot-up processing.

Example 2. Steps

SG5700

1. [Watch the codes on the SG5700 seven-segment displays.](#)

While the hardware is initializing during power up, the two seven-segment displays show a sequence of codes. When the hardware boots successfully, the seven-segment displays show different codes for each controller.

2. Review the codes on the seven-segment display for the E5700SG controller.



The installation and provisioning take time. Some installation phases don't report updates to the StorageGRID Appliance Installer for several minutes.

If an error occurs, the seven-segment display flashes a sequence, such as HE.

3. To understand what these codes mean, see the following resources:

Controller	Reference
E5700SG controller	<ul style="list-style-type: none">• “Status indicators on the E5700SG controller”• “HE error: Error synchronizing with SANtricity OS Software”
E2800 controller	<p>E5700 and E2800 System Monitoring Guide</p> <p>Note: The codes described for the E-Series E5700 controller don't apply to the E5700SG controller in the appliance.</p>

4. If this does not resolve the issue, contact technical support.

SG6000

1. For the storage controllers, watch the codes on the seven-segment displays.

While the hardware is initializing during power up, the two seven-segment displays show a sequence of codes. When the hardware boots successfully, both seven-segment displays show 99.

2. Review the LEDs on the SG6000-CN controller and the boot-up and error codes displayed in the BMC.
3. If you need help resolving an issue, contact technical support.

Connection issues (SG5700 or SG6000)

If you encounter connection issues during the StorageGRID appliance installation, you should perform the corrective action steps listed.

Unable to connect to SG6000 appliance

If you can't connect to the appliance, there might be a network issue, or the hardware installation might not have been completed successfully.

Steps

1. If you are unable to connect to SANtricity System Manager:
 - a. Try to ping the appliance using the IP address for either storage controller on the management network for SANtricity System Manager:
ping *Storage_Controller_IP*
 - b. If you receive no response from the ping, confirm you are using the correct IP address.
Use the IP address for management port 1 on either storage controller.
 - c. If the IP address is correct, check appliance cabling and the network setup.
If that does not resolve the issue, contact technical support.
 - d. If the ping was successful, open a web browser.
 - e. Enter the URL for SANtricity System Manager:
https://*Storage_Controller_IP*
- The log in page for SANtricity System Manager appears.
2. If you are unable to connect to the SG6000-CN controller:
 - a. Try to ping the appliance using the IP address for the SG6000-CN controller:
ping *SG6000-CN_Controller_IP*
 - b. If you receive no response from the ping, confirm you are using the correct IP address.
You can use the IP address of the appliance on the Grid Network, the Admin Network, or the Client Network.
 - c. If the IP address is correct, check appliance cabling, SFP transceivers, and the network setup.
 - d. If physical access to the SG6000-CN is available, you can use a direct connection to the permanent link-local IP 169.254.0.1 to check controller networking configuration and update if necessary. For detailed instructions, see step 2 in [Accessing StorageGRID Appliance Installer](#).
 - If that does not resolve the issue, contact technical support.
 - e. If the ping was successful, open a web browser.
 - f. Enter the URL for the StorageGRID Appliance Installer:
https://*SG6000-CN_Controller_IP*:8443
- The Home page appears.

SG6060 expansion shelves don't appear in Appliance Installer

If you have installed expansion shelves for the SG6060 and they don't appear in the StorageGRID Appliance Installer, you should verify that the shelves have been completely installed and powered on.

About this task

You can verify that the expansion shelves are connected to the appliance by viewing the following information in the StorageGRID Appliance Installer:

- The **Home** page contains a message about expansion shelves.

 The storage system contains 2 expansion shelves.

- The **Advanced > RAID Mode** page indicates by number of drives whether or not the appliance includes expansion shelves. For example, in the following screen shot, two SSDs and 178 HDDs are shown. An SG6060 with two expansion shelves contains 180 total drives.

Configure RAID Mode

This appliance contains the following drives.

Type	Size	Number of drives
SSD	800 GB	2
HDD	11.8 TB	178

If the StorageGRID Appliance Installer pages don't indicate that expansion shelves are present, follow this procedure.

Steps

1. Verify that all required cables have been firmly connected. See [Cable appliance](#).
2. Verify that you have powered on the expansion shelves. See [Connect power cords and apply power \(SG6000\)](#).
3. If you need help resolving an issue, contact technical support.

Unable to connect to SG5700 appliance

If you can't connect to the appliance, there might be a network issue, or the hardware installation might not have been completed successfully.

Steps

1. If you are unable to connect to SANtricity System Manager:
 - a. Try to ping the appliance using the IP address for the E2800 controller on the management network for SANtricity System Manager:
ping E2800_Controller_IP
 - b. If you receive no response from the ping, confirm you are using the correct IP address.

Use the IP address for management port 1 on the E2800 controller.
 - c. If the IP address is correct, check appliance cabling and the network setup.

If that does not resolve the issue, contact technical support.
 - d. If the ping was successful, open a web browser.
 - e. Enter the URL for SANtricity System Manager:
https://E2800_Controller_IP

The log in page for SANtricity System Manager appears.
2. If you are unable to connect to the E5700SG controller:

- a. Try to ping the appliance using the IP address for the E5700SG controller:
`ping E5700SG_Controller_IP`
- b. If you receive no response from the ping, confirm you are using the correct IP address.

You can use the IP address of the appliance on the Grid Network, the Admin Network, or the Client Network.

- c. If the IP address is correct, check appliance cabling, SFP transceivers, and the network setup.

If that does not resolve the issue, contact technical support.

- d. If the ping was successful, open a web browser.
- e. Enter the URL for the StorageGRID Appliance Installer:

`https://E5700SG_Controller_IP:8443`

The Home page appears.

HE error: Error synchronizing with SANtricity OS Software (SG5700)

The seven-segment display on the compute controller shows an HE error code if the StorageGRID Appliance Installer can't synchronize with SANtricity OS Software.

About this task

If an HE error code is displayed, perform this corrective action.

Steps

1. Check the integrity of the two SAS interconnect cables, and confirm they are securely connected.
2. As required, replace one or both of the cables, and try again.
3. If this does not resolve the issue, contact technical support.

Troubleshoot hardware installation (SG5800 or SG6100)

If you encounter issues during the installation, you might find it helpful to review troubleshooting information related to hardware setup and connectivity issues.

View boot-up codes (SGF6112 and SG6160 only)

When you apply power to the appliance, the BMC logs a series of boot-up codes. You can view these codes on a graphical console that is connected to the BMC management port.

Before you begin

- You know how to [access the BMC dashboard](#).
- If you want to use serial-over-LAN (SOL), you have experience using IPMI SOL console applications.

Steps

1. Select one of the following methods for viewing the boot-up codes for the appliance controller, and gather the required equipment.

Method	Required equipment
VGA console	<ul style="list-style-type: none"> • VGA-capable monitor • VGA cable
KVM	<ul style="list-style-type: none"> • RJ-45 cable
Serial port	<ul style="list-style-type: none"> • USB cable • Virtual serial terminal
SOL	<ul style="list-style-type: none"> • Virtual serial terminal

2. If you are using a VGA console, perform these steps:
 - a. Connect a VGA-capable monitor to the VGA port on the back of the appliance.
 - b. View the codes displayed on the monitor.
3. If you are using BMC KVM, perform these steps:
 - a. Connect to the BMC management port and log in to the BMC web interface.
 - b. Select **Remote Control**.
 - c. Launch the KVM.
 - d. View the codes on the virtual monitor.
4. If you are using a serial port and terminal, perform these steps:
 - a. Connect to the serial USB port on the back of the appliance.
 - b. Use settings 115200 8-N-1.
 - c. View the codes printed over the serial terminal.
5. If you are using SOL, perform these steps:
 - a. Connect to the IPMI SOL using the BMC IP address and login credentials.

```
ipmitool -I lanplus -H BMC_Port_IP -U admin -P Password sol activate
```



In some cases the default username might be 'root' instead of 'admin'.

- b. View the codes on the virtual serial terminal.
6. Use the table to look up the codes for your appliance.

Code	Indicates
HT	The master boot script is waiting for OS boot to complete.
HI	The master boot script has started.
PP	The system is checking to see if the FPGA needs to be updated.

Code	Indicates
HP	The system is checking to see if the network interface card (NIC) firmware needs to be updated.
RB	The system is rebooting after applying firmware updates.
FP	The hardware subsystem firmware update checks have been completed. Inter-controller communication services are starting.
HE	<p>For the SG6160 only:</p> <p>The system is awaiting connectivity with the storage controllers and synchronizing with the SANtricity operating system.</p> <p>Note: If the boot-up procedure does not progress past this stage, perform these steps:</p> <ol style="list-style-type: none"> <li data-bbox="523 741 1383 804">a. Confirm that the four interconnect cables between the SG6100-CN controller and the two storage controllers are securely connected. <li data-bbox="523 819 1323 857">b. As required, replace one or more of the cables, and try again. <li data-bbox="523 872 1295 910">c. If this does not resolve the issue, contact technical support.
HC	The system is checking for existing StorageGRID installation data.
HO	The StorageGRID appliance is running.
HA	StorageGRID is running.

View error codes (SGF6112 and SG6160 only)

If a hardware error occurs when the appliance is booting up, the BMC logs an error code. As required, you can view these error codes using the appliance serial port, and then work with technical support to resolve the issue.

Before you begin

- Gather the required equipment:
 - USB cable
 - Virtual serial terminal

Steps

1. Connect to the serial USB port on the back of the appliance.
2. Use settings 115200 8-N-1.
3. Review the information printed over the serial terminal for Current Code and the Previous Code.

If any of the following error codes are shown, work with technical support to resolve the issue.

Code	Indicates
0x0E	Microcode not found
0x0F	Microcode not loaded
0x50	Memory initialization error. Invalid memory type or incompatible memory speed.
0x51	Memory initialization error. SPD reading has failed.
0x52	Memory initialization error. Invalid memory size or memory modules don't match.
0x53	Memory initialization error. No usable memory detected.
0x54	Unspecified memory initialization error
0x55	Memory not installed
0x56	Invalid CPU type or speed
0x57	CPU mismatch
0x58	CPU self-test failed, or possible CPU cache error
0x59	CPU micro-code is not found, or micro-code update failed
0x5A	Internal CPU error
0x5B	Reset PPI is not available
0x5C	PEI phase BMC self-test failure
0xD0	CPU initialization error
0xD1	North bridge initialization error
0xD2	South bridge initialization error
0xD3	Some architectural protocols aren't available
0xD4	PCI resource allocation error. Out of resources.
0xD5	No space for legacy option ROM

Code	Indicates
0xD6	No console output devices are found
0xD7	No console input devices are found
0xD8	Invalid password
0xD9	Error loading boot option (LoadImage returned error)
0xDA	Boot option failed (StartImage returned error)
0xDB	Flash update failed
0xDC	Reset protocol is not available
0xDD	DXE phase BMC self-test failure
0xE8	MRC: ERR_NO_MEMORY
0xE9	MRC: ERR_LT_LOCK
0xEA	MRC: ERR_DDR_INIT
0xEB	MRC: ERR_MEM_TEST
0xEC	MRC: ERR_VENDOR_SPECIFIC
0xED	MRC: ERR_DIMM_COMPAT
0xEE	MRC: ERR_MRC_COMPATIBILITY
0xEF	MRC: ERR_MRC_STRUCT
0xF0	MRC: ERR_SET_VDD
0xF1	MRC: ERR_IOT_MEM_BUFFER
0xF2	MRC: ERR_RC_INTERNAL
0xF3	MRC: ERR_INVALID_REG_ACCESS
0xF4	MRC: ERR_SET_MC_FREQ
0xF5	MRC: ERR_READ_MC_FREQ

Code	Indicates
0x70	MRC: ERR_DIMM_CHANNEL
0x74	MRC: ERR_BIST_CHECK
0xF6	MRC: ERR_SMBUS
0xF7	MRC: ERR_PCU
0xF8	MRC: ERR_NGN
0xF9	MRC: ERR_INTERLEAVE_FAILURE

Hardware setup appears to hang

The StorageGRID Appliance Installer might not be available if hardware faults or cabling errors prevent the appliance from completing its boot-up processing.

Steps

1. Review the LEDs on the appliance and/or the boot-up and error codes displayed in the BMC (if equipped).
2. If you need help resolving an issue, contact technical support.

Connection issues

Expansion shelves don't appear in Appliance Installer (SG6160)

If you have installed expansion shelves and they don't appear in the StorageGRID Appliance Installer, you should verify that the shelves have been completely installed and powered on.

About this task

You can verify that the expansion shelves are connected to the appliance by viewing the following information in the StorageGRID Appliance Installer:

- The **Home** page contains a message about expansion shelves.

 The storage system contains 2 expansion shelves.

- The **Advanced > RAID Mode** page indicates by number of drives whether or not the appliance includes expansion shelves.

If the StorageGRID Appliance Installer pages don't indicate that expansion shelves are present, follow this procedure.

Steps

1. Verify that all required cables have been firmly connected. See [Cable appliance](#).
2. Verify that you have powered on the expansion shelves. See [Connect power cords and apply power](#)

(SG6100).

3. If you need help resolving an issue, contact technical support.

Unable to connect to appliance

If you can't connect to the storage appliance, there might be a network issue, or the hardware installation might not have been completed successfully.

Steps

1. Try to ping the appliance using the IP address for the appliance : +

`ping appliance/controller_IP`

2. If you receive no response from the ping, confirm you are using the correct IP address.

You can use the IP address of the appliance on the Grid Network, the Admin Network, or the Client Network.

3. If the IP address is correct, check appliance cabling, QSFP or SFP transceivers, and the network setup.
4. If physical access to the appliance is available, you can use a direct connection to the permanent link-local IP 169.254.0.1 to check controller networking configuration and update if necessary. For detailed instructions, see step 2 in [Access StorageGRID Appliance Installer](#).

If that does not resolve the issue, contact technical support.

5. If the ping was successful, open a web browser.
6. Enter the URL for the StorageGRID Appliance Installer or SANtricity System Manager:

`https://appliances_controller_IP:8443`

The Home page appears.

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