# Contents

Introduction to system-level diagnostics ..................................................... 4  
  Requirements for running system-level diagnostics ..................................... 4  
  How to use online command-line help ........................................................ 5  
Running system installation diagnostics .................................................... 7  
Running system panic diagnostics .............................................................. 11  
Running slow system response diagnostics ............................................... 14  
Running hardware installation diagnostics ............................................... 17  
Running device failure diagnostics ............................................................ 20  
Copyright information ............................................................................... 24  
Trademark information ............................................................................. 25  
How to send comments about documentation and receive update notifications ........................................................................................................ 26  
Index ............................................................................................................. 27  

Introduction to system-level diagnostics

System-level diagnostics provides a command-line interface for tests that search for and determine hardware problems on supported storage systems. You use system-level diagnostics to confirm that a specific component is operating properly or to help identify faulty components.

System-level diagnostics is available for supported storage systems only. Entering system-level diagnostics at the command-line interface of unsupported storage systems generates an error message.

You run system-level diagnostics after one of the following common troubleshooting situations:

- Initial system installation
- Addition or replacement of hardware components
- System panic caused by an unidentified hardware failure
- Access to a specific device becomes intermittent or the device becomes unavailable
- System response time becomes sluggish

To run system-level diagnostics, you must already be running Data ONTAP because you need to reach the Maintenance mode boot option in Data ONTAP. There are several approaches to get to this option, but this is the recommended approach taken in the procedures documented in this guide. Some hardware components in your system may require a specific approach, and this would be documented in the applicable field replaceable unit (FRU) flyer. This guide does not provide detailed definitions of specific commands, subcommands, tests, or conditions.

Once the command is entered, the tests run in the background and the passed or failed outcome of the tests is logged in the internal memory-based log, which has a fixed size. Some tests are utilities and will simply state completed rather than passed or failed. After you run the appropriate tests, the procedures documented in this guide help you generate status report. Once the test results show a successful completion of system-level diagnostics, it is a recommended best practice to clear the log.

In the event of test failures, the status reports will help technical support make appropriate recommendations. The failure could be resolved by reinstalling the FRU, by ensuring cables are connected, or by enabling specific tests recommended by technical support and then re-running those tests. If the failure cannot be resolved, then there is a hardware failure and the affected hardware must be replaced.

There are no error messages that require further definitions or explanations.

Requirements for running system-level diagnostics

Depending on the system-level diagnostic tests you are running, you need to be aware of time and system hardware requirements.

Each documented task has slight differences; use the recommended procedure for the task.

The following requirements must be met when running system-level diagnostics; otherwise, parts of the tests fail and error messages appear in the status report:

General requirements

- Each system being tested must be on a separate network.
  The network interface test assigns unique static IP addresses, beginning with 172.25.150.23, to all available network interfaces on a storage system. This results in network interface ports on different storage controllers being assigned the same IP address. If all the systems being tested are
on the same network, then duplicate ip address warning messages appear on the connected consoles. These warning messages do not affect the test results.

**System memory requirements**
- You need to set aside time when running memory tests; the larger the memory capacity of your storage system, the longer it takes.

**NIC requirements**
- All adjacent network interface ports on the system must be connected for best performance using a standard Ethernet cable.
  Examples of adjacent ports are e0a and e0b or e2c and e2d.
  **Attention:** e0M and e0P ports cannot be connected together due to an internal switch connection. In systems with e0M and e0P ports, the most efficient pairings are e0M with e0a and e0P with e0b.
- If there are a number of network interface ports on the system, you may need to run the NIC system-level diagnostic test several times, limiting each run to no more than two pairs each time.

**SAS requirements**
- When running the SAS system-level diagnostic tests, adjacent SAS ports must be connected for best performance; storage shelves must be disconnected from the ports.
  **Note:** Connections between adjacent SAS ports is no longer a requirement for systems running Data ONTAP 8.2; however, only the internal loopback test will be run for systems with unconnected SAS ports.

**FC-AL requirements**
- When running the FC-AL system-level diagnostic tests, you must have loopback hoods on FC-AL interfaces on the motherboard or expansion adapters for best performance; all other cables for storage or Fibre Channel networks must be disconnected from the ports.
  **Note:** While the use of loopback hoods on FC-AL interfaces are no longer requirements for systems running Data ONTAP 8.2, the scope of the test coverage on the interface is also reduced.

**CNA requirements**
- The use of loopback hoods is not a requirement for running CNA system-level diagnostics tests.

**Interconnect requirements**
- Both platform controller modules in a dual controller system must be in Maintenance mode for the interconnect system-level diagnostic test to run.
  **Attention:** You will receive a warning message if you attempt to run the interconnect system-level diagnostic test with other system-level diagnostic tests.

**How to use online command-line help**
You can get command-line syntax help from the command line by entering the name of the command followed by `help` or the question mark (`?`).

The fonts or symbols used in syntax help are as follows:
keyword
   Specifies the name of a command or an option that must be entered as shown.

< > (less than, greater than symbols)
   Specify that you must replace the variable identified inside the symbols with a value.

| (pipe)
   Indicates that you must choose one of the elements on either side of the pipe.

[ ] (brackets)
   Indicate that the element inside the brackets is optional.

{ } (braces)
   Indicate that the element inside the braces is required.

You can also type the question mark at the command line for a list of all the commands that are available at the current level of administration (administrative or advanced).

The following example shows the result of entering the `environment help` command at the storage system command line. The command output displays the syntax help for the `environment` commands.

toaster> environment help
Usage: environment status |
[status] [shelf [<adapter>]] |
[status] [shelf_log] |
[status] [shelf_stats] |
[status] [shelf_power_status] |
[status] [chassis [all | list-sensors | Fan | Power | Temp | Power Supply | RTC Battery | NVRAM4-temperature-7 | NVRAM4-battery-7]]
Running system installation diagnostics

You run diagnostics after an initial system installation to identify the version of system-level diagnostics and the supported devices on your storage system, and to verify that the installation is successful and that all hardware is functioning properly.

Before you begin
Your storage system must already be running Data ONTAP.

Steps
1. At the storage system prompt, switch to the LOADER prompt:
   \texttt{halt}

2. Enter the following command at the LOADER prompt:
   \texttt{boot\_diags}
   \textbf{Note:} You must run this command from the LOADER prompt for system-level diagnostics to function properly. The \texttt{boot\_diags} command starts special drivers designed specifically for system-level diagnostics.

3. View the version of system-level diagnostics present on your storage system by entering the following command:
   \texttt{sldiag version show}
   The version is displayed in the format \texttt{System Level DiagnosticsX.nn.nn}. The \texttt{X} is an alpha reference and \texttt{nn.nn} are major and minor numeric references, respectively.

4. Identify the device types in your new system installation so that you know which components to verify by entering the following command:
   \texttt{sldiag device types}
   Your storage system displays some or all of the following devices:
   - \texttt{ata} is an Advanced Technology Attachment device.
   - \texttt{bootmedia} is the system booting device.
   - \texttt{cna} is a Converged Network Adapter not connected to a network or storage device.
   - \texttt{env} is motherboard environmentals.
   - \texttt{fcache} is the Flash Cache adapter, also known as the Performance Acceleration Module 2.
   - \texttt{fcal} is a Fibre Channel-Arbitrated Loop device not connected to a storage device or Fibre Channel network.
   - \texttt{fcvi} is the Fiber Channel Virtual Interface not connected to a Fibre Channel network.
   - \texttt{interconnect} or \texttt{nvram\textsl{-ib}} is the high-availability interface.
   - \texttt{mem} is system memory.
   - \texttt{nic} is a Network Interface Card not connected to a network.
   - \texttt{nvram} is nonvolatile RAM.
- **nvmem** is a hybrid of NVRAM and system memory.
- **sas** is a Serial Attached SCSI device not connected to a disk shelf.
- **serviceproc** is the Service Processor.
- **storage** is an ATA, FC-AL, or SAS interface that has an attached disk shelf.
- **toe** is a TCP Offload Engine, a type of NIC.

5. Run all the default selected diagnostic tests on your storage system by entering the following command:
```
sldiag device run
```

6. View the status of the test by entering the following command:
```
sldiag device status
```
Your storage system provides the following output while the tests are still running:

```
There are still test(s) being processed.
```

After all the tests are complete, the following response appears by default:

```
*> <SLDIAG:_ALL_TESTS_COMPLETED>
```

7. Verify that there are no hardware problems on your new storage system by entering the following command:
```
sldiag device status -long -state failed
```

**Example**
The following example shows how the full status of the failures is displayed in a test run without the appropriate hardware:

```
*> sldiag device status -long -state failed
TEST START --------------------------------------------------
DEVTYPE: nvram_ib
NAME: external loopback test
START DATE: Sat Jan 3 23:10:55 GMT 2009

STATUS: Completed
ib3a: could not set loopback mode, test failed
END DATE: Sat Jan 3 23:11:04 GMT 2009

LOOP: 1/1
TEST END --------------------------------------------------

TEST START --------------------------------------------------
DEVTYPE: fcal
NAME: Fcal Loopback Test
START DATE: Sat Jan 3 23:10:56 GMT 2009

STATUS: Completed
Starting test on Fcal Adapter: 0b
Started gathering adapter info.
Adapter get adapter info OK
Adapter fc_data_link_rate: 1Gib
Adapter name: QLogic 2532
Adapter firmware rev: 4.5.2
Adapter hardware rev: 2
```
Started adapter get WWN string test.
    Adapter get WWN string OK wwn_str: 5:00a:098300:035309

Started adapter interrupt test
    Adapter interrupt test OK

Started adapter reset test.
    Adapter reset OK

Started Adapter Get Connection State Test.
    Connection State: 5
    Loop on FC Adapter 0b is OPEN

Started adapter Retry LIP test
    Adapter Retry LIP OK

ERROR: failed to init adaptor port for IOCTL call
    ioctl_status.class_type = 0x1
    ioctl_statussubclass = 0x3
    ioctl_status.info = 0x0

    Started INTERNAL LOOPBACK:
    INTERNAL LOOPBACK OK
    Error Count: 2  Run Time: 70 secs

>>>>> ERROR, please ensure the port has a shelf or plug.

END DATE: Sat Jan 3 23:12:07 GMT 2009

LOOP: 1/1
TEST END --------------------------------------------

If the system-level
diagnostics tests...

<table>
<thead>
<tr>
<th>Were completed without any failures</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are no hardware problems and your storage system returns to the prompt.</td>
<td></td>
</tr>
</tbody>
</table>

a. Clear the status logs by entering the following command:

    sldiag device clearstatus

b. Verify that the log is cleared by entering the following command:

    sldiag device status

The following default response is displayed:

    SLDIAG: No log messages are present.

c. Exit Maintenance mode by entering the following command:

    halt

d. Enter the following command at the Loader prompt to boot the storage system:

    boot_ontap

You have completed system-level diagnostics.
<table>
<thead>
<tr>
<th>If the system-level diagnostics tests...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resulted in some test failures</td>
<td>Determine the cause of the problem.</td>
</tr>
<tr>
<td></td>
<td>a. Exit Maintenance mode by entering the following command:</td>
</tr>
<tr>
<td></td>
<td><code>halt</code></td>
</tr>
<tr>
<td></td>
<td>b. Perform a clean shutdown and disconnect the power supplies.</td>
</tr>
<tr>
<td></td>
<td>c. Verify that you have observed all the considerations identified for running system-level diagnostics, that cables are securely connected, and that hardware components are properly installed in the storage system.</td>
</tr>
<tr>
<td></td>
<td>d. Reconnect the power supplies and power on the storage system.</td>
</tr>
<tr>
<td></td>
<td>e. Repeat Steps 1 through 7 of <em>Running system installation diagnostics.</em></td>
</tr>
</tbody>
</table>
Running system panic diagnostics

Running diagnostics after your storage system suffers a system panic can help you to identify the possible cause of the panic.

Steps

1. At the storage system prompt, switch to the LOADER prompt:
   ```
   halt
   ```

2. Enter the following command at the LOADER prompt:
   ```
   boot_diags
   ```
   **Note:** You must run this command from the LOADER prompt for system-level diagnostics to function properly. The `boot_diags` command starts special drivers designed specifically for system-level diagnostics.

3. Run diagnostics on all the devices by entering the following command:
   ```
   sldiag device run
   ```

4. View the status of the test by entering the following command:
   ```
   sldiag device status
   ```
   Your storage system provides the following output while the tests are still running:

   ```
   There are still test(s) being processed.
   ```

   After all the tests are complete, you receive the following default response:

   ```
   > <SLDIAG:_ALL_TESTS_COMPLETED>
   ```

5. Identify the cause of the system panic by entering the following command:
   ```
   sldiag device status -long -state failed
   ```

Example

The following example shows how the full status of the failures is displayed in a test run without the appropriate hardware:

```
> sldiag device status -long -state failed

TEST START ------------------------------------------
DEVTYPE: nvram_ib
NAME: external loopback test
START DATE: Sat Jan 3 23:10:55 GMT 2009

STATUS: Completed
ib3a: could not set loopback mode, test failed
END DATE: Sat Jan 3 23:11:04 GMT 2009

LOOP: 1/1
TEST END --------------------------------------------

TEST START ------------------------------------------
DEVTYPE: fcal
NAME: Fcal Loopback Test
```
START DATE: Sat Jan 3 23:10:56 GMT 2009

STATUS: Completed
Starting test on Fcal Adapter: 0b
Started gathering adapter info.
Adapter get adapter info OK
Adapter fc_data_link_rate: 1Gib
Adapter name: QLogic 2532
Adapter firmware rev: 4.5.2
Adapter hardware rev: 2

Started adapter get WWN string test.
Adapter get WWN string OK wwn_str: 5:00a:098300:035309

Started adapter interrupt test
Adapter interrupt test OK

Started adapter reset test.
Adapter reset OK

Started Adapter Get Connection State Test.
Connection State: 5
Loop on FC Adapter 0b is OPEN

Started adapter Retry LIP test
Adapter Retry LIP OK

ERROR: failed to init adaptor port for IOCTL call
ioctl_status.class_type = 0x1
ioctl_statussubclass = 0x3
ioctl_status.info = 0x0

    Started INTERNAL LOOPBACK:
    INTERNAL LOOPBACK OK
    Error Count: 2  Run Time: 70 secs

>>> ERROR, please ensure the port has a shelf or plug.
END DATE: Sat Jan 3 23:12:07 GMT 2009

LOOP: 1/1
TEST END --------------------------------------------
<table>
<thead>
<tr>
<th>If the system-level diagnostics tests...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were completed without any failures</td>
<td>There are no hardware problems and your storage system returns to the prompt.</td>
</tr>
<tr>
<td></td>
<td>a. Clear the status logs by entering the following command:</td>
</tr>
<tr>
<td></td>
<td>\texttt{sldiag device clearstatus}</td>
</tr>
<tr>
<td></td>
<td>b. Verify that the log is cleared by entering the following command:</td>
</tr>
<tr>
<td></td>
<td>\texttt{sldiag device status}</td>
</tr>
<tr>
<td></td>
<td>The following default response is displayed:</td>
</tr>
<tr>
<td></td>
<td>\texttt{SLDIAG: No log messages are present.}</td>
</tr>
<tr>
<td></td>
<td>c. Exit Maintenance mode by entering the following command:</td>
</tr>
<tr>
<td></td>
<td>\texttt{halt}</td>
</tr>
<tr>
<td></td>
<td>d. Enter the following command at the Loader prompt to boot the storage system:</td>
</tr>
<tr>
<td></td>
<td>\texttt{boot_ontap}</td>
</tr>
<tr>
<td></td>
<td>You have completed system-level diagnostics.</td>
</tr>
<tr>
<td>Resulted in some test failures</td>
<td>Determine the cause of the problem.</td>
</tr>
<tr>
<td></td>
<td>a. Exit Maintenance mode by entering the following command:</td>
</tr>
<tr>
<td></td>
<td>\texttt{halt}</td>
</tr>
<tr>
<td></td>
<td>b. Perform a clean shutdown and disconnect the power supplies.</td>
</tr>
<tr>
<td></td>
<td>c. Verify that you have observed all the considerations identified for running system-level diagnostics, that cables are securely connected, and that hardware components are properly installed in the storage system.</td>
</tr>
<tr>
<td></td>
<td>d. Reconnect the power supplies and power on the storage system.</td>
</tr>
<tr>
<td></td>
<td>e. Repeat Steps 1 through 5 of \textit{Running system panic diagnostics}.</td>
</tr>
</tbody>
</table>

**After you finish**

If the failures persist after repeating the steps, you need to replace the hardware.
Running slow system response diagnostics

Running diagnostics can help you identify the causes of slow system response times.

Steps
1. At the storage system prompt, switch to the LOADER prompt:
   
   halt
2. Enter the following command at the LOADER prompt:
   
   boot_diags
   
   Note: You must run this command from the LOADER prompt for system-level diagnostics to function properly. The `boot_diags` command starts special drivers designed specifically for system-level diagnostics.
3. Run diagnostics on all the devices by entering the following command:
   
   sldiag device run
4. View the status of the test by entering the following command:
   
   sldiag device status
   
   Your storage system provides the following output while the tests are still running:

   There are still test(s) being processed.

   After all the tests are complete, the following response appears by default:

   * > <SLDIAG:_ALL_TESTS_COMPLETED>
5. Identify the cause of the system sluggishness by entering the following command:
   
   sldiag device status -long -state failed

Example
The following example shows how the full status of the failures is displayed in a test run without the appropriate hardware:

```bash
* > sldiag device status -long -state failed
TEST START ----------------------------------------------
DEVTYPE: nvrail
NAME: external loopback test
START DATE: Sat Jan 3 23:10:55 GMT 2009

STATUS: Completed
ib3a: could not set loopback mode, test failed
END DATE: Sat Jan 3 23:11:04 GMT 2009
LOOP: 1/1
TEST END ----------------------------------------------

TEST START ----------------------------------------------
DEVTYPE: fc
NAME: Fcal Loopback Test
START DATE: Sat Jan 3 23:10:56 GMT 2009
```
STATUS: Completed
Starting test on Fcal Adapter: 0b
Started gathering adapter info.
Adapter get adapter info OK
Adapter fc_data_link_rate: 1Gib
Adapter name: QLogic 2532
Adapter firmware rev: 4.5.2
Adapter hardware rev: 2

Started adapter get WWN string test.
Adapter get WWN string OK wwn_str: 5:00a:098300:035309

Started adapter interrupt test
Adapter interrupt test OK

Started adapter reset test.
Adapter reset OK

Started Adapter Get Connection State Test.
Connection State: 5
Loop on FC Adapter 0b is OPEN

Started adapter Retry LIP test
Adapter Retry LIP OK

ERROR: failed to init adaptor port for IOCTL call
ioctl_status.class_type = 0x1
ioctl_status.subclass = 0x3
ioctl_status.info = 0x0

Started INTERNAL LOOPBACK:
INTERNAL LOOPBACK OK
Error Count: 2  Run Time: 70 secs

>>> ERROR, please ensure the port has a shelf or plug.
END DATE: Sat Jan  3 23:12:07 GMT 2009

LOOP: 1/1
TEST END ____________________________

<table>
<thead>
<tr>
<th>If the system-level diagnostics tests...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were completed without any failures</td>
<td>There are no hardware problems and your storage system returns to the prompt.</td>
</tr>
<tr>
<td></td>
<td>a. Clear the status logs by entering the following command:</td>
</tr>
<tr>
<td></td>
<td><strong>sldiag device clearstatus</strong></td>
</tr>
<tr>
<td></td>
<td>b. Verify that the log is cleared by entering the following command:</td>
</tr>
<tr>
<td></td>
<td><strong>sldiag device status</strong></td>
</tr>
<tr>
<td></td>
<td>The following default response is displayed:</td>
</tr>
<tr>
<td></td>
<td><strong>SLDIAG: No log messages are present.</strong></td>
</tr>
<tr>
<td></td>
<td>c. Exit Maintenance mode by entering the following command:</td>
</tr>
<tr>
<td></td>
<td><strong>halt</strong></td>
</tr>
<tr>
<td></td>
<td>d. Enter the following command at the Loader prompt to boot the storage system:</td>
</tr>
<tr>
<td></td>
<td><strong>boot_ontap</strong></td>
</tr>
<tr>
<td></td>
<td>You have completed system-level diagnostics.</td>
</tr>
<tr>
<td>If the system-level diagnostics tests...</td>
<td>Then...</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Resulted in some test failures</td>
<td>Determine the cause of the problem.</td>
</tr>
<tr>
<td></td>
<td>a. Exit Maintenance mode by entering the following command:</td>
</tr>
<tr>
<td></td>
<td>halt</td>
</tr>
<tr>
<td></td>
<td>b. Perform a clean shutdown and disconnect the power supplies.</td>
</tr>
<tr>
<td></td>
<td>c. Verify that you observed all the requirements for running system-level diagnostics, that cables are securely connected, and that hardware components are properly installed in the storage system.</td>
</tr>
<tr>
<td></td>
<td>d. Reconnect the power supplies and power on the storage system.</td>
</tr>
<tr>
<td></td>
<td>e. Repeat Steps 1 through 5 of <em>Running slow system response diagnostics</em>.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resulted in the same test failures</th>
<th>Technical support might recommend modifying the default settings on some of the tests to help identify the problem.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a. Modify the selection state of a specific device or type of device on your storage system by entering the following command:</td>
</tr>
<tr>
<td></td>
<td>sldiag device modify [-dev devtype</td>
</tr>
<tr>
<td></td>
<td>-selection enable</td>
</tr>
<tr>
<td></td>
<td>b. Verify that the tests were modified by entering the following command:</td>
</tr>
<tr>
<td></td>
<td>sldiag option show</td>
</tr>
<tr>
<td></td>
<td>c. Repeat Steps 3 through 5 of <em>Running slow system response diagnostics</em>.</td>
</tr>
<tr>
<td></td>
<td>d. After you identify and resolve the problem, reset the tests to their default states by repeating substeps 1 and 2.</td>
</tr>
<tr>
<td></td>
<td>e. Repeat Steps 1 through 5 of <em>Running slow system response diagnostics</em>.</td>
</tr>
</tbody>
</table>

**After you finish**

If the failures persist after repeating the steps, you need to replace the hardware.
Running hardware installation diagnostics

You run diagnostics after adding or replacing hardware components in your storage system to verify that the component has no problems and that the installation is successful.

Steps

1. At the storage system prompt, switch to the LOADER prompt:
   
   halt

2. Enter the following command at the LOADER prompt:
   
   boot_diags
   
   **Note:** You must run this command from the LOADER prompt for system-level diagnostics to function properly. The `boot_diags` command starts special drivers designed specifically for system-level diagnostics.

3. Run the default tests on the particular device you added or replaced by entering the following command:
   
   sldiag device run [-dev devtype|mb|slotslotnum] [-name device]
   
   - **-dev devtype** specifies the type of device to be tested.
     - ata is an Advanced Technology Attachment device.
     - bootmedia is the system booting device.
     - cna is a Converged Network Adapter not connected to a network or storage device.
     - env is motherboard environmental.
     - fcache is the Flash Cache adapter, also known as the Performance Acceleration Module 2.
     - fcal is a Fibre Channel-Arbitrated Loop device not connected to a storage device or Fibre Channel network.
     - fcvi is the Fiber Channel Virtual Interface not connected to a Fibre Channel network.
     - interconnect or nvram-ib is the high-availability interface.
     - mem is system memory.
     - nic is a Network Interface Card not connected to a network.
     - nvram is nonvolatile RAM.
     - nvmem is a hybrid of NVRAM and system memory.
     - sas is a Serial Attached SCSI device not connected to a disk shelf.
     - serviceproc is the Service Processor.
     - storage is an ATA, FC-AL, or SAS interface that has an attached disk shelf.
     - toe is a TCP Offload Engine, a type of NIC.
    
   - **-mb** specifies that all the motherboard devices are to be tested.
• `slot slotnum` specifies that a device in a specific slot number is to be tested.
• `name device` specifies a given device class and type.

4. View the status of the test by entering the following command:

```
sldiag device status
```

Your storage system provides the following output while the tests are still running:

```
There are still test(s) being processed.
```

After all the tests are complete, the following response appears by default:

```
*> <SLDIAG:_ALL_TESTS_COMPLETED>
```

5. Verify that no hardware problems resulted from the addition or replacement of hardware components on your storage system by entering the following command:

```
sldiag device status [-dev devtype|mb|slot|slotnum] [-name device] -long -state failed
```

Example

The following example pulls up the full status of failures resulting from testing a newly installed FC-AL adapter:

```
*> sldiag device status -dev fcal -long -state failed
```

```
TEST START ------------------------------------------
DEVTYPE: fcal
NAME: Fcal Loopback Test
START DATE: Sat Jan  3 23:10:56 GMT 2009

STATUS: Completed
Starting test on Fcal Adapter: 0b
Started gathering adapter info.
Adapter get adapter info OK
Adapter fc_data_link_rate: 1Gib
Adapter name: QLogic 2532
Adapter firmware rev: 4.5.2
Adapter hardware rev: 2
Started adapter get WWN string test.
Adapter get WWN string OK wwn_str: 5:00a:098300:035309

Started adapter interrupt test
Adapter interrupt test OK

Started adapter reset test.
Adapter reset OK

Started Adapter Get Connection State Test.
Connection State: 5
Loop on FC Adapter 0b is OPEN

Started adapter Retry LIP test
Adapter Retry LIP OK

ERROR: failed to init adaptor port for IOCTL call
ioctl_status.class_type = 0x1
ioctl_statussubclass = 0x3
ioctl_status.info = 0x0
```
Started INTERNAL LOOPBACK:
INTERNAL LOOPBACK OK
Error Count: 2  Run Time: 70 secs
>>>>> ERROR, please ensure the port has a shelf or plug.
END DATE: Sat Jan  3 23:12:07 GMT 2009

LOOP: 1/1
TEST END --------------------------------------------

If the system-level diagnostics tests... Then...

Were completed without any failures
There are no hardware problems and your storage system returns to the prompt.

a. Clear the status logs by entering the following command:
   `sldiag device clearstatus [-dev devtype|mb|slot|slotnum]`

b. Verify that the log is cleared by entering the following command:
   `sldiag device status [-dev devtype|mb|slot|slotnum]`
   The following default response is displayed:
   `SLDIAG: No log messages are present.`

c. Exit Maintenance mode by entering the following command:
   `halt`

You have completed system-level diagnostics.

d. Enter the following command at the Loader prompt to boot the storage system:
   `boot_ontap`

If the system-level diagnostics resulted in some test failures
Determine the cause of the problem.

a. Exit Maintenance mode by entering the following command:
   `halt`

b. Perform a clean shutdown and disconnect the power supplies.

c. Verify that you have observed all the considerations identified for running system-level diagnostics, that cables are securely connected, and that hardware components are properly installed in the storage system.

d. Reconnect the power supplies and power on the storage system.

e. Repeat Steps 1 through 6 of Running hardware installation diagnostics.

After you finish
If the failures persist after repeating the steps, you need to replace the hardware.
Running device failure diagnostics

Running diagnostics can help you determine why access to a specific device becomes intermittent or why the device becomes unavailable in your storage system.

Steps

1. At the storage system prompt, switch to the LOADER prompt:
   `halt`

2. Enter the following command at the LOADER prompt:
   `boot_diags`
   **Note:** You must run this command from the LOADER prompt for system-level diagnostics to function properly. The `boot_diags` command starts special drivers designed specifically for system-level diagnostics.

3. Run diagnostics on the device causing problems by entering the following command: `sldiag device run [-dev devtype|mb|slotslotnum] [-name device]`
   - `–dev devtype` specifies the type of device to be tested.
     - `ata` is an Advanced Technology Attachment device.
     - `bootmedia` is the system booting device.
     - `cna` is a Converged Network Adapter not connected to a network or storage device.
     - `env` is motherboard environmentals.
     - `fcache` is the Flash Cache adapter, also known as the Performance Acceleration Module 2.
     - `fcal` is a Fibre Channel-Arbitrated Loop device not connected to a storage device or Fibre Channel network.
     - `fcvi` is the Fiber Channel Virtual Interface not connected to a Fibre Channel network.
     - `interconnect` or `nvram-ib` is the high-availability interface.
     - `mem` is system memory.
     - `nic` is a Network Interface Card not connected to a network.
     - `nvram` is nonvolatile RAM.
     - `nvmem` is a hybrid of NVRAM and system memory.
     - `sas` is a Serial Attached SCSI device not connected to a disk shelf.
     - `serviceproc` is the Service Processor.
     - `storage` is an ATA, FC-AL, or SAS interface that has an attached disk shelf.
     - `toe` is a TCP Offload Engine, a type of NIC.
   - `mb` specifies that all the motherboard devices are to be tested.
   - `slotslotnum` specifies that a device in a specific slot number is to be tested.
• `-namedevice` specifies a given device class and type.

4. View the status of the test by entering the following command: `sldiag device status`

Your storage system provides the following output while the tests are still running:

```
There are still test(s) being processed.
```

After all the tests are complete, the following response appears by default:

```
*> <SLDIAG:_ALL_TESTS_COMPLETED>
```

5. Identify any hardware problems by entering the following command: `sldiag device status [-dev devtype|mb|slot|slotnum] [-name device] -long -state failed`

**Example**

The following example shows how the full status of failures resulting from testing the FC-AL adapter are displayed:

```
*> sldiag device status fcal -long -state failed

TEST START ------------------------------------------
DEVTYPE: fcal
NAME: Fcal Loopback Test
START DATE: Sat Jan 3 23:10:56 GMT 2009

STATUS: Completed
Starting test on Fcal Adapter: 0b
Started gathering adapter info.
Adapter get adapter info OK
Adapter fc_data_link_rate: lGib
Adapter name: QLogic 2532
Adapter firmware rev: 4.5.2
Adapter hardware rev: 2

Started adapter get WWN string test.
Adapter get WWN string OK wwn_str: 5:00a:098300:035309

Started adapter interrupt test
Adapter interrupt test OK

Started adapter reset test.
Adapter reset OK

Started Adapter Get Connection State Test.
Connection State: 5
Loop on FC Adapter 0b is OPEN

Started adapter Retry LIP test
Adapter Retry LIP OK

ERROR: failed to init adaptor port for IOCTL call
ioctl_status.class_type = 0x1
ioctl_statussubclass = 0x3
ioctl_status.info = 0x0

ERROR: failed to init adaptor port for IOCTL call

Error Count: 2 Run Time: 70 secs
>>>>> ERROR, please ensure the port has a shelf or plug.
```
<table>
<thead>
<tr>
<th>If the system-level diagnostics tests...</th>
<th>Then...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resulted in some test failures</td>
<td>Determine the cause of the problem.</td>
</tr>
<tr>
<td></td>
<td>a. Exit Maintenance mode by entering the following command: <em>halt</em></td>
</tr>
<tr>
<td></td>
<td>b. Perform a clean shutdown and disconnect the power supplies.</td>
</tr>
<tr>
<td></td>
<td>c. Verify that you have observed all the considerations identified for running system-level diagnostics, that cables are securely connected, and that hardware components are properly installed in the storage system.</td>
</tr>
<tr>
<td></td>
<td>d. Reconnect the power supplies and power on the storage system.</td>
</tr>
<tr>
<td></td>
<td>e. Repeat Steps 1 through 5 of <em>Running device failure diagnostics</em>.</td>
</tr>
<tr>
<td>Resulted in the same test failures</td>
<td>Technical support might recommend modifying the default settings on some of the tests to help identify the problem.</td>
</tr>
<tr>
<td></td>
<td>a. Modify the selection state of a specific device or type of device on your storage system by entering the following command: *sldiag device modify [-dev devtype</td>
</tr>
<tr>
<td></td>
<td>b. Verify that the tests were modified by entering the following command: <em>sldiag option show</em></td>
</tr>
<tr>
<td></td>
<td>c. Repeat Steps 3 through 5 of <em>Running device failure diagnostics</em>.</td>
</tr>
<tr>
<td></td>
<td>d. After you identify and resolve the problem, reset the tests to their <em>default</em> states by repeating substeps 1 and 2.</td>
</tr>
<tr>
<td></td>
<td>e. Repeat Steps 1 through 5 of <em>Running device failure diagnostics</em>.</td>
</tr>
</tbody>
</table>
If the system-level diagnostics tests...

<table>
<thead>
<tr>
<th>Were completed without any failures</th>
<th>Then...</th>
</tr>
</thead>
</table>

There are no hardware problems and your storage system returns to the prompt.

a. Clear the status logs by entering the following command: `sldiag device clearstatus [-dev devtype|mb| slot slotnum]`

b. Verify that the log is cleared by entering the following command: `sldiag device status [-dev devtype|mb| slot slotnum]`

The following default response is displayed:

```
SLDIAG: No log messages are present.
```

c. Exit Maintenance mode by entering the following command: `halt`

d. Enter the following command at the Loader prompt to boot the storage system:

```
boot_ontap
```

You have completed system-level diagnostics.

**After you finish**

If the failures persist after repeating the steps, you need to replace the hardware.
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Index

C

comments
  how to send feedback about documentation 26

D
device failures
  running diagnostics after 20
diagnostics
  running after device failure 20
  running after hardware installation 17
  running after slow system response 14
  running after system installation 7
  running after system panic 11
documentation
  how to receive automatic notification of changes to 26
  how to send feedback about 26

F

failures
  running diagnostics after device 20
feedback
  how to send comments about documentation 26

H

hardware installations
  running diagnostics after 17

I

information
  how to send feedback about improving documentation 26

O

online command-line help 5

R

requirements
  for running system-level diagnostics 4
running
  system-level diagnostics 4
running diagnostics
  after device failures 20
  after hardware installations 17
  after slow system responses 14
  after system installations 7
  after system panics 11
  system-level 4
  system-level requirements for 4

S

slow system response
  running diagnostics for 14
suggestions
  how to send feedback about documentation 26
system-level diagnostics
  requirements for running 4
systems
  running diagnostics after installation failures 7
  running diagnostics after panics 11
  running diagnostics for slow response 14

T

troubleshooting
  device failures 20
  hardware installations 17
  requirements for running system-level diagnostics 4
  running system-level diagnostics 4
  slow system response 14
  system installation 7
  system panics 11
Twitter
  how to receive automatic notification of documentation changes 26