Configuring the SFS Environment with the Menu System [3]

This chapter describes how to configure Cray Research systems to use the SFS feature and how to create shared file systems by using the UNICOS installation and configuration menu system. If you want to configure your SFS software manually, see Chapter 4, page 25.

The menu system does not support GigaRing-based I/O configurations.

For this chapter, it is assumed that your Cray Research systems are up and running, and that they support the menu system.

When initializing the SFS environment with the menu system, you perform the following tasks:

1. Configure the SFS device nodes on one system in the SFS cluster

2. Indicate which hosts systems are connected to the SFS device nodes

3. Create the SFS device nodes and the SFS configuration file you have defined

4. Define the disk device nodes for the SFS cluster

5. Define the file systems for the SFS cluster

6. Copy the configuration information from the system where it has been defined to each of the systems you want to add to your SFS cluster

7. Correct machine-specific information for each of the systems that receives a copy of the configuration information

3.1 Before You Begin

Before you run the UNICOS installation and configuration menu system to configure your SFS environment, you should be sure that you have all the information at hand that the menu system will request.

For each SFS semaphore device that you configure, you will need to provide the following information:

```
/dev/hdd/smp I/O cluster (IOC) number       ___
/dev/hdd/smp IOP number                      ___
/dev/hdd/smp I/O channel number              ___
/dev/hdd/smp Ifield                          ___
/dev/smp port number                         ___
/dev/dsk/slr minor device number             ___
/dev/hdd/slr minor device number             ___
/dev/hdd/slr HIPPI disk device type          ___
/dev/hdd/slr I/O cluster (IOC) number        ___
/dev/hdd/slr IOP number                      ___
/dev/hdd/slr IOP Channel number              ___
/dev/hdd/slr starting sector number          ___
/dev/hdd/slr number of sectors               ___
/dev/hdd/slr HIPPI facility address          ___
/dev/hdd/slr HIPPI Ifield                    ___
SFS Arbiter                                  ___
```

You will also need to provide an associated host name for each SFS semaphore device
that you define, on a screen in the following format:

```
Host name                               ___ Connected Arbiter
```

For each disk that you will use in an SFS configuration, you will be asked for the
following information:

```
Device name                              ___
Device type                              ___
I/O cluster (IOC) number                 ___
IOP number                               ___
IOP Channel number
Alternate path?                          ___
Alternate I/O cluster (IOC) number
Alternate IOP number
Alternate IOP channel number
Unit                                     ___
Size in blocks
HIPPI Facility (Unit bits 0-8)           ___
HIPPI Raid Partition (Unit bits 9-15)    ___
HIPPI disk Ifield                        ___
SSD spare memory chip configuration file
```

The device names are limited to 14 characters. ND devices can be configured as
HD-16, HD-32, and HD-64 devices. HD-16 is used for HIPPI disk devices with a 16
kbyte sector size, HD-32 is used for HIPPI disk devices with a 32 kbyte sector size,
and HD-64 is used for HIPPI disk devices with a 64 kbyte sector size.

For each physical slice on a disk, you will be asked for the following information:

```
Slice name                                   ___
Physical device name                         ___
Minor device number                          ___
Starting number                              ___
Size of slice                                ___
Slice unit of measure is depicted in         ___
```

For each logical device you are configuring, you will be asked for the following
information:

```
Logical device name                          ___
Logical minor number                         ___
Member device type                           ___
Member device name(s)                        ___
```

For each SFS file system you are defining, you will be asked for the following
information:

```
Logical disk device name                     ___
File system mount point                      ___
File system type                             SFS
Backup frequency (in days)                   ___
File system check pass number
Read only option
Quota control file
User defined option
Mount at multi-user startup?
Mount point owner                            ___
Mount point group                            ___
Mount point mode                             ___
```

Note that you need to specify SFS as the file system type.

3.2 Initializing the SFS environment on the first system

To initialize the SFS environment on the first system in the SFS cluster, follow this procedure:

1. Verify that the existing disk and file system configuration information in the menu system is valid and complete. The SFS configuration information is appended to the existing system information.

2. Start the UNICOS installation and configuration menu on the first system in the cluster from the `/etc/install` directory using the special `./configsfs` program rather than the standard `./install` program.

   Note: You cannot run the `configsfs` program and the standard `install` program at the same time, unless you are running one of the programs in read-only mode. If you are running one of these utilities to configure the system, and you want to run the other to configure the system, you must first exit the utility you are currently running.

   When you run the `configsfs` program, the following screen appears. The default values of the SFS configuration screens are the values entered at the last invocation of the menu system.

```
                      Shared File System (SFS) Configuration


 A-> Configure SFS semaphore device nodes ==>
     SFS hosts ==>
     Create SFS device nodes ...

     Disk configuration ==>
     File system (fstab) configuration ==>
     Encapsulate SFS device information ...

     Merge SFS devices to Disk Configuration ...
     Remove SFS devices from Disk Configuration ...

     Remove SFS device nodes ...
     Import root mount point



     Keys:   ^? Commands   H Help   Q Quit   V ViewDoc   W WhereAmI
```

3.2.1 Configuring SFS device nodes

To configure the SFS semaphore device nodes, perform the following steps:

1. Go to the `Configure SFS semaphore device nodes` menu.

   ```
   Shared File System (SFS) Configuration
        ->Configure SFS semaphore Device Nodes
   ```

   A form screen appears indicating which SFS arbiters have been defined for this
   system.

```
                    Configure SFS Semaphore Device Nodes


    hdd/smp IOC   hdd/smp IOP   hdd/smp channel   hdd/smp Ifield   smp port   dsk/s
    -----------   -----------   ---------------   --------------   --------   --- >




    Keys:    ^? Commands    H Help    Q Quit    V ViewDoc    W WhereAmI



        File "cfdb/sfsnode.cfg" is empty. Use the 'n' key to add a record.
```

2. To add a new arbiter, press the `n Return` keys. The following screen appears,
   showing a new record which you must edit.

```
                          Configure SFS Semaphore Device Nodes

 S-> /dev/hdd/smp I/O cluster (IOC) number          0
     /dev/hdd/smp IOP number                        0
     /dev/hdd/smp I/O channel number                030
     /dev/hdd/smp Ifield                            0
     /dev/smp port number                           0
     /dev/dsk/slr minor device number               1
     /dev/hdd/slr minor device number               1
     /dev/hdd/slr HIPPI disk device type            HD16
     /dev/hdd/slr I/O cluster (IOC) number          0
     /dev/hdd/slr IOP number                        0
     /dev/hdd/slr IOP Channel number                030
     /dev/hdd/slr starting sector number            0
     /dev/hdd/slr number of sectors                 0
     /dev/hdd/slr HIPPI facility address            2
     /dev/hdd/slr HIPPI Ifield                      0
     SFS Arbiter                                    __change__




     Keys:   ^? Commands   H Help   Q Quit   V ViewDoc   W WhereAmI



                               Record 1 of 1
```

This record view requests machine-specific information that is used by the
system to define the /dev/hdd/smp, /dev/smp, and the /dev/hdd/slr device
nodes. The screen first appears with default values, which you must modify for
your system.

The /dev/hdd/smp node is the HIPPI-disk node that contains the low-level I/O
path and the HIPPI I-field that are used for physically accessing the SFS arbiter.

The /dev/smp node is the low-level interface to the semaphore device.

The /dev/hdd/slr node defines the area of the shared media pool that you will
use for the Shared Lock Region, an area that is used by UNICOS SFS to record
common information such as semaphore assignment and system state.

SFS Arbiter indicates the user-provided name of the SFS arbitration device
you are defining.

Note: The `SFS Arbiter` entry must be a number. For the first arbitration
device, set this field to 0; for the second arbitration device, set this field to 1, and
so forth.

3. Enter the requested information for the device node you are configuring.

   Note: You must modify any field that appears as __change__ to create a
   functional SFS cluster.

4. Go to the `Shared File System Hosts` record screen.

   ```
   Shared File System (SFS) Configuration
        ->SFS Hosts
   ```

   The `Shared File System Hosts` form appears as follows:

```
                         Shared File System Hosts


      host name   arbiter name
      ---------   ------------




      Keys:    ^? Commands    H Help    Q Quit    V ViewDoc    W WhereAmI




         File "cfdb/sfshost.cfg" is empty. Use the 'n' key to add a record.
```

5. To enter the host name, press the `n Return` keys, and the `Shared File
   System Hosts` record appears.

```
                            Shared File System Hosts

    S-> Host name                                        __change__
        Connected Arbiter                                __change__




        Keys:    ^? Commands    H Help    Q Quit    V ViewDoc    W WhereAmI




                            Record 1 of 1
```

6. Enter the requested information. This information will be used to create the
   `/etc/config/sfs` file.

   Note: You must modify any field that appears as __change__ to create a
   functional SFS cluster.

   For each SFS arbiter selection that you defined with the `Configure SFS
   Semaphore Device Nodes` menu, you must define at least one associated host
   with the `Shared File System Hosts` menu.

   The name of the `Connected Arbiter` must match one of the numbers you
   defined as the `SFS Arbiter` in the `Configure SFS Semaphore Device
   Nodes` menu. If the host is connected to more than one SFS arbiter, then the list
   of names or numbers should be comma-separated.

7. Return to the main `Shared File System (SFS) Configuration` menu and
   execute `Create SFS device nodes`. This creates the SFS nodes that you have
   configured and the `/etc/config/sfs` file that contains the names of the SFS
   hosts and arbiters.

   The following is a sample of the output that selecting this action yields.

```
Corrected output of action SFS device nodes actions:


Preparing to create the needed SFS device nodes

Creating /etc/config/sfs hostfile
Done creating the host section of /etc/config/sfs hostfile
Preparing to create arbiter #0 SFS device nodes

Verifying /dev/hdd/smp-0's existence
Node name /dev/dsk/smp-0 being created
Verifying /dev/smp-0's existence
Node name /dev/smp-0 being created
Verifying /dev/hdd/slr-0's existence
Node name /dev/dsk/slr-0 being created
Verifying /dev/dsk/slr-0's existence
Node name /dev/dsk/slr-0 being created
Verifying /dev/sfs-0's existence
Node name /dev/sfs-0 being created
Verifying /dev/smnt-0's existence
Node name /dev/smnt-0 being created


Done making the SFS device nodes
Finished creating /etc/config/sfs
```

8. To verify that you have configured you device nodes correctly, you can run the
`sfs_start` command from a different window. This will yield errors if there are
problems with the device nodes.

For information on the `sfs_start` command, see Chapter 5, page 33.

3.2.2 Configuring disk devices

To configure the disk devices for an SFS cluster, perform the following steps. This
procedure is identical to the procedure for configuring disk devices for a standard file
system.

1. Go to the `Disk Configuration` menu.

```
Shared File System (SFS) Configuration
    ->Disk Configuration
```

The `Disk Configuration` menu appears as follows:

```
                             Disk Configuration

 M-> Physical devices ==>
     Physical device slices ==>
     Logical devices (/dev/dsk entries) ==>
     Mirrored devices (/dev/mdd entries) ==>
     Striped devices (/dev/sdd entries) ==>
     Logical device cache ==>
     Verify the disk configuration ...
     Review the disk configuration verification ...
     Dry run the disk configuration ...
     Review the disk configuration dry run ...
     Update disk device nodes on activation?       YES
     Allow active root node updates?               NO
     Import the disk configuration ...
     Activate the disk configuration ...




     Keys:   ^? Commands   H Help    Q Quit   V ViewDoc   W WhereAmI
```

The process of defining disk configuration for shared file systems is identical to
the process of defining disk configuration for file systems that will not be shared.

First define the physical devices, then the physical device slices, then the logical
devices.

⚠ **Caution:** The device names you define for shared file systems must be the same
for all of the systems in the SFS cluster.

2. To define physical devices, go to the `Physical Devices` menu.

```
Shared File System (SFS) Configuration
    ->Disk Configuration
        ->Physical Devices
```

3. To enter a new physical device, press the `n Return` keys and the following screen
appears.

```
                              Physical Devices


 S-> Device name                                    0130
     Device type                                    DD60
     I/O cluster (IOC) number                       0
     IOP number                                     0
     IOP Channel number                             030
     Alternate path?                                NO
     Alternate I/O cluster (IOC) number
     Alternate IOP number
     Alternate IOP channel number
     Unit                                           0
     Size in blocks
     HIPPI Facility (Unit bits 0-8)
     HIPPI Raid Partition (Unit bits 9-15)
     HIPPI disk Ifield
     SSD spare memory chip configuration file
     Note:  The device names are limited to 14 characters.


     Keys:   ^? Commands   H Help   Q Quit   V ViewDoc   W WhereAmI




                         Record 1 of 1
```

4. Enter the information for each device you are configuring.

   When defining physical devices on CRAY EL series systems or CRAY J90 series
   systems, you do not need to define the I/O cluster number (IOC) or I/O processor
   number (IOP).

5. To define the physical device slices, go to the `Physical Device Slices` menu.

```
Shared File System (SFS) Configuration
    ->Disk Configuration
          ->Physical Device Slices
```

6. To enter a new physical device slice, press the `n Return` keys and the following
   screen appears.

```
                         Physical Device Slices


 S-> Slice name                                    slice1
     Physical device name                          0130
     Minor device number                           1
     Starting number                               0
     Size of slice                                 0
     Slice unit of measure is depicted in          sectors


     Notes:  Any SSD or RAM slices must have blocks as the unit.
             HIPPI disks are recommended to use blocks.
             The slice names are limited to 14 characters.


     Keys:    ^? Commands    H Help    Q Quit    V ViewDoc     W WhereAmI




                           Record 1 of 1
```

7. Enter the information for each device slice you are configuring.

   When defining physical device slices for `/dev/hdd` devices, you must ensure that
   the minor numbers are unique.

8. To define the logical devices, go to the `Logical Device (/dev/dsk)`
   `Configuration` menu.

```
Shared File System (SFS) Configuration
    ->Disk Configuration
          ->Logical Device (/dev/dsk) Configuration
```

9. To enter a new logical device, press the `n Return` keys and the following screen
   appears.

```
                      Logical Device (/dev/dsk) Configuration

 S-> Logical device name                           ldd1
     Logical minor number                          1
     Member device type                            hdd
     Member device name                            slice1


     Note:  The logical device names are limited to 14 characters.




     Keys:   ^? Commands   H Help   Q Quit   V ViewDoc   W WhereAmI



                            Record 1 of 1
```

10. Enter the information for each device you are configuring.

    Select the `Mirrored devices (/dev/mdd entries)`, `Striped devices
    (/dev/sdd entries)`, and `Logical device cache` entries, as necessary, and
    provide the requested information.

11. Before leaving the `Disk Configuration` menu, make sure that the `Update
    disk device nodes on activation` is set to `YES`; you will not be able to
    complete the process of defining your SFS configuration otherwise.

12. Select the menu options to perform the following tasks, reviewing them as
    desired:

    • `Verify the disk configuration`

    • `Dry-run the disk configuration`

    • `Activate the disk configuration`.

    When you perform any of these tasks, you may receive the warning
    `gap/overlap <before slice sfs>`. This could indicate that the menu
    system has reserved space on the disk because the SFS feature requires a
    portion of the HIPPI device for the Shared Lock Region. If you receive additional
    `gap/overlap` warnings, however, you may need to check your configuration.

13. After configuring the disk devices, you can run the `ddstat`(8) command to verify
    that the configuration was successful.

3.2.3 Defining an SFS file system

You define an SFS file system just as you define a file system that is not to be shared, using the same Standard File Systems Configuration menu.

1. Select the File System (fstab) Configuration menu from the main Shared File System (SFS) Configuration menu.

   ```
   Shared File System (SFS) Configuration
        ->File System (fstab) Configuration
   ```

   The File System (fstab) Configuration menu appears as follows:

   ```
                         File System (fstab) Configuration


    M-> Standard file systems ==>
        NFS file systems ==>
        Shared file system ==>
        Import fstab configuration ...
        Activate fstab configuration ...


        Keys:   ^? Commands   H Help   Q Quit   V ViewDoc   W WhereAmI
   ```

2. From this menu, select the Standard file systems entry and the following screen appears.

   ```
                   Standard File System Configuration


    Device Name          Mount Point                          FsType  Freq  Pas
    ------------------   --------------------------------   ------  ----  - >




        Keys:   ^? Commands   H Help   Q Quit   V ViewDoc   W WhereAmI
   ```

3. To add a new file system, press the n Return keys and the following screen appears.

```
                    Standard File System Configuration


 S-> Logical disk device name                       /dev/dsk/fs
     File system mount point                        /mnt
     File system type                               SFS
     Backup frequency (in days)                     1
     File system check pass number                  2
     Read only option
     Quota control file
     User defined option
     Mount at multi-user startup?                   NO
     Mount point owner                              root
     Mount point group                              root
     Mount point mode                               0755




     Keys:   ^? Commands   H Help   Q Quit   V ViewDoc   W WhereAmI



                            Record 1 of 1
```

4. Enter your file system information just as you would for a file system that is not
   to be shared, with the exception that you use SFS as the File system type
   instead of NC1FS. A file system name must be the same on all the systems in the
   SFS cluster.

5. Go to the File System (fstab) Configuration menu:

   ```
   Shared File System (SFS) Configuration
       ->File System (fstab) Configuration
   ```

6. To create the /etc/fstab file, select Activate fstab configuration.

3.2.4 Checking the SFS configuration

To check the SFS configuration, move to another window or exit the menu system and
perform the following procedure:

1. Run the mkfs(8) command on the file systems you have created, being sure to
   use -q and the -s # options. The -s # option indicates that this is an SFS file
   system and specifies the number of semaphores to assign to the file system. For
   information on using the mkfs command to create shared file systems, see
   Section 4.2.3, page 30.

Warning: Do not run the `mkfs`(8) command on a mounted file system.

2. Bring up the SFS system to see if the environment has been successfully initialized by executing the `sfs_start` command. For information on the `sfs_start` command, see Chapter 5, page 33.

3.2.5 Encapsulating SFS configuration information

In order to copy the SFS configuration information to the other systems in the cluster, you must encapsulate the configuration information into a file. Use the following procedure:

1. Return to the menu system, go to the main `Shared File System (SFS) Configuration` menu, and select `Encapsulate SFS device information`. This creates the `sfs_encap` file in the `/etc/install` directory. This file contains the encapsulated device information that the other systems in the SFS cluster will use.

2. Exit the menu system.

3.3 Initializing the SFS environment on additional systems

For each additional system in the SFS cluster, perform the following steps.

1. Copy the `sfs_encap` file from the system on which you created it to the `/etc/install` directory of the other systems in the SFS cluster with the `ftp` or `cp` command. Note that you must change the permissions on the `sfs_encap` file before copying it.

2. Log in to a different system in the cluster and start the `configsfs` program from the `/etc/install` directory, which contains `sfs_encap`.

3. From the main `Shared File System (SFS) Configuration` menu, perform the action `Merge SFS devices to Disk Configuration`.

4. Go to the `Configure SFS Semaphore Device Nodes` menu.

```
Shared File System (SFS) Configuration
    ->Configure SFS semaphore Device Nodes
```

5. Provide the machine-specific information for the `/dev/hdd/smp`, `/dev/smp`, and `/dev/hdd/slr` device nodes that need to be changed for the current system.

⚠ **Caution:** When defining the physical device driver port for `/dev/smp`, take care
to ensure that the port number is unique for every machine in the cluster. The
valid port number range is 0 to 63. The menu system itself does not ensure that
each `/dev/smp` port number is unique for each machine in the cluster.

6. Go to the `Physical Devices` menu.

```
Shared File System (SFS) Configuration
      ->Disk Configuration
            ->Physical Devices
```

The menu appears as follows:

```
                         Physical Devices


      Name            Type  Ioc         Iop         Chn          Alt?  AltIoc  AltI
      ------------    ----  ----------  ----------  ----------   ----  ------  -- >
      0230.0          DD62  0           2           030          NO
      0334.16.0.13    HD16  0           3           034          NO
      0334.16.0.21    HD64  0           3           034          NO
E->   0334.18.0.13    HD16  __change__  __change__  __change__   NO



      Keys:   ^? Commands   H Help   Q Quit    V ViewDoc   W WhereAmI



            Use the + and - keys to access other pages within this menu.
                      Record 4 of 4 Page 1 of 1
```

7. Change the information in the categories indicated with the text string
   `__change__`. The following fields will need to be changed:

   Column numbers 3, 4, 5, 12, 13, and 14 must have the correct information for
   each system's access to the SFS device. The specifications to be changed for SFS
   devices are:

   • I/O cluster (IOC) number

   • IOP number

   • IOP Channel number

   • HIPPI Facility (Unit bits 0-8)

   • HIPPI Raid Partition (Unit bits 9-15)

(If you will not be using this partition, leave the default values as they first
appear or the system will not allow activation.)

- HIPPI disk switch address

8. Go back to the `Disk Configuration` menu.

```
Shared File System (SFS) Configuration
    -> Disk Configuration
```

9. Make sure that the `Update disk device nodes on activation` is set to
`YES`.

10. Select the menu options to perform the following tasks:

- `Verify the disk configuration`

- `Dry-run the disk configuration`

- `Activate the disk configuration.`

When you perform any of these tasks, you may again receive the warning
`gap/overlap <before slice sfs>`. This indicates the space that the menu
system has reserved on the HIPPI device for the Shared Lock Region.

11. After configuring the disk devices, you can run the `ddstat`(8) command to verify
that the configuration was successful.

12. Go to the `File System (fstab) Configuration` menu.

```
Shared File System (SFS) Configuration
    ->File System (fstab) Configuration
```

13. Select `Activate fstab configuration`. This creates the `/etc/fstab` file.

Remember to repeat steps 1 through 13 for each additional system in the SFS cluster.