Installing and Configuring the Foundation Monitor Toolkit

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The Foundation Monitor toolkit reports on the degree of availability provided by enterprise cluster components. The Foundation Monitor toolkit logs the start and end of downtime events together with relevant messages. A cluster availability report is generated if downtime events occur—that is, if cluster nodes, packages, or network components become unavailable.

This document explains the basic operation of the Foundation Monitor toolkit. Topics are as follows:

- Understanding the Foundation Monitor Toolkit
- Installing the Foundation Monitor Toolkit
- Setting Up the Foundation Monitor Toolkit
- Sample Files

Understanding the Foundation Monitor Toolkit

The Foundation Monitor toolkit monitors the status of mission critical environments similar to the one shown in Figure 0-1.

Figure 0-1 High Availability Cluster Environment

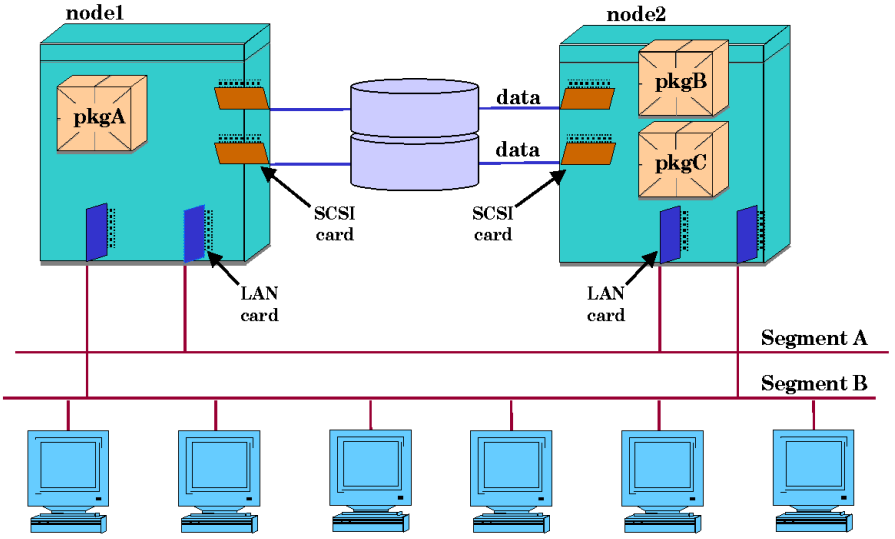


Table 0-1 lists the types of resource monitoring provided by the Foundation Monitor toolkit.

Table 0-1 Resources Monitored by the Foundation Monitor Toolkit

Availability of...	Foundation Monitor Toolkit Action
Nodes	Measures the total time the cluster node is available for use. Determines the most likely cause of any downtime event and logs the event message.
Packages	Logs the start and stop times of all packages. Determines the root cause of any downtime event and logs the event message.
Network Components	Logs the start and end of any network downtime event.

A single, daily, *summary report* on cluster availability is generated once per day if one or more downtime events occur on any of the resources listed in Table 0-1. A report is not generated if the status of the monitored items does not change. For example:

- If a node goes down, an event, then a report is generated.
- If the node stays down over the next 24 hours, an additional event is not generated and neither is an additional report.
- When the node returns to up status, an event, then a report is generated.

Refer to the following sections for additional information.

Cluster Node Availability Tracking

Use the Foundation Monitor toolkit *cluster node availability tracking* information to determine the cause of system reboots on any node in the cluster after any of the following events:

- shutdown
- panic
- power failure
- halt

The Foundation Monitor toolkit records cluster node availability as the total amount of uptime or downtime for each node in the cluster:

- *Total node uptime* is measured from the time the node was booted to the last time recorded in the `.time_stamp` file.
- *Total node downtime* is measured from the last time recorded in the `.time_stamp` file to the boot time.

The Foundation Monitor toolkit uses the following files to record and track node availability:

- A time stamp file—`/home/hamon/.time_stamp`

  It is updated with the system clock time every 60 seconds.
- The summary report—`/hamon/hamon/reports/cluster_faults`

  The following is a sample summary report. It includes node status and node name:

```
Node Name:          monk
Down Time Start:    May 27, 1999 09:08:10
Up Time Start:      May 27, 1999 09:14:32
Total Down Time:    0:0:6:22
Event Message:      SHUTDOWN
```

- A crontab file—`/var/spool/cron/crontabs/root`

  It specifies when in the day the `cluster_faults` summary report is produced. The cron file must contain the following line:

  ```
  55 23 * * * /opt/cmcluster/toolkit/foundation/monitor cron
  ```

- A log file—`/home/hamon/data`

  It stores the type of reboot event, node uptime, and node downtime whenever a reboot occurs. The following is a sample log file entry:

  ```
  SYS:12647290:12647672:monk:down:May:27:1999:09:08:10:up:May
  :27:1999:09:14:32:0:0:6:22:"SHUTDOWN"
  ```

  Where—`Label 0` starts on the left, each label field is iterated across the record and separated by a colon (`:`). The `/home/hamon/data` log file has 23 system related label fields as listed in Table 0-2:

Table 0-2 Log File Fields for System Data Log

Label #	Field Name	Comments
label 0	SYS	used to let the script know it was a system related event
label 1	time down	calculated in seconds
label 2	time up	calculated in seconds
label 3	node name	name of the node where the event occurred
label 4	status down	
label 5	month down	
label 6	date down	
label 7	year down	
label 8	hour down	

Table 0-2 Log File Fields for System Data Log (Continued)

Label #	Field Name	Comments
label 9	minute down	
label 10	second down	
label 11	status up	
label 12	month up	
label 13	date up	
label 14	year up	
label 15	hour up	
label 16	minute up	
label 17	second up	
label 18	# of day down	
label 19	# of hour down	
label 20	# of minute down	
label 21	# of second down	
label 22	cause of event	options are: Panic, Halt, Reboot, and Power

Package Availability Tracking

Use the Foundation Monitor toolkit *package availability tracking* to determine the cause of package starts or halts issued by any of the ServiceGuard commands on any node in the cluster.

Package starting or halting is issued if one or more of the following events occur:

- node reboot
- package failure
- authorized person executes a ServiceGuard command

  Related ServiceGuard commands are listed in Table 0-3:

Table 0-3 ServiceGuard Package Halt and Start Commands

Command	Place package in state
cmruncl	started
cmrunnode	started
cmrunpkg	started
cmhaltcl	halted
cmhaltnode	halted
cmhaltpkg	halted

The Foundation Monitor toolkit uses the following files to record and track package status:

- Package log file

  Determination of the package starting time or halting time is based on the package log file associated with the package name.

- The summary report—`/hamon/hamon/reports/cluster_faults`

  The following is a sample report. It shows an example of package status for the package name `ping_pkg`:

```
Package Name:       ping_pkg
Start Event Time:   May 27, 1999 09:50:48
Event Message:      cmrunserv
Error Message:      NA
```

- A crontab file—`/var/spool/cron/crontabs/root`

  It specifies when in the day the `cluster_faults` summary report is produced. The cron file must contain the following line:

  ```
  55 23 * * * /opt/cmcluster/toolkit/foundation/monitor cron
  ```

- A log file—`/hamon/hamon/pkg_name/data`

  It records the package status changed to or from halted or started during the previous 24 hours. The following is a sample log file entry:

  ```
  PKG:ping_pkg:12736248:up:monk:May:27:1999:09:50:48:cmrunserv
  PKG:ping_pkg:12749295:down:monk:May:27:1999:13:28:15:cmhaltnode
  ```

  Where—`Label 0` starts on the left side and each label field is separated by a colon (`:`). The `/home/hamon/pkg_name/data` log file has 12 package related label fields as listed in Table 0-4:

Table 0-4 Log File Fields for Package Data Log

Label #	Field Name	Comments
label 0	PKG	used to let the script know it was a package related event
label 1	package name	
label 2	time up or time down	in seconds
label 3	status down or status up	
label 4	node name	
label 5	month down or month up	
label 6	date down or date up	
label 7	year down or year up	
label 8	hour down or hour up	
label 9	minute down or minute up	
label 10	second down or second up	

Table 0-4 Log File Fields for Package Data Log

Label #	Field Name	Comments
label 11	cause of event	options are: `cmhaltcl`, `cmhaltnode`, `cmhaltpkg`, `cmruncl`, `cmrunnode`, `cmrunpkg`, and `cmmodpkg`

Network Availability Tracking

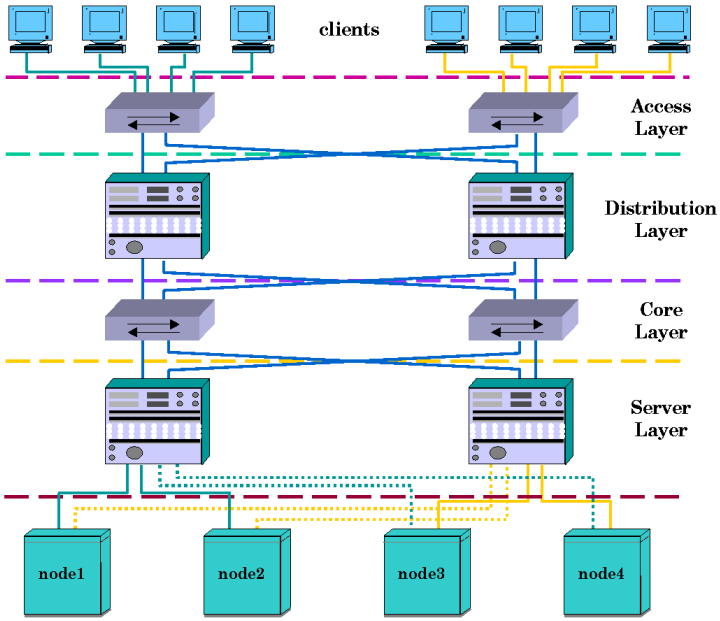
Use the Foundation Monitor toolkit *network availability tracking* to monitor the availability of the networking connections.

In High Availability network farms the network connectivity is from the server nodes to the client's wiring closet through the customers' intranet environment. The layers in the network farm are:

- The *Access* layer switch (wiring closet) which handles the client connectivity to the access layer switch
- The *Distribution* layer (Layer 3) switch for aggregating high-speed access from the client's (access layer)
- The *Core* layer switch (backbone) is interfaced to the upstream distribution layer and to the downstream server distribution.
- The *Server* distribution layer switch (data center) which handles the server connectivity to the network switch within the Local Area Network.

Figure 0-2 illustrates the network layers.

Figure 0-2 **High Availability Network Farm**



The Foundation Monitor toolkit records and tracks network connection status through the Access Layer switch as follows:

- The Foundation Monitor toolkit sends ping packets every 30 seconds from the server node to each of the Access Layer switches.

  This process verifies the continuous availability of network communication on every node in the cluster.

  A successful return of the packet marks the Access Layer switch status as up for the availability of network connectivity.

- If the packet is not returned, then ping packets are sent to each client node that is associated with the Access Layer switch.

  — If one client node responds, then the Access Layer switch status is marked as up for the availability of network connectivity.

  — If none of the client nodes respond, then the Access Layer switch status is marked as down for inaccessible network connectivity.

The Foundation Monitor toolkit uses the following files to record and track network connection status:

- The summary report—/hamon/hamon/reports/cluster_faults

  The following is a sample report. It shows an example of network switch status for the network switch name netsw1:

```
Network Name:       netsw1
IP Address:         192.11.11.100
Start Down Time:    Aug 19, 1999 08:12:24
Start Up Time:      Aug 19, 1999 08:13:19
```

- A crontab file—/var/spool/cron/crontabs/root

  It specifies when in the day the cluster_faults summary report is produced. The cron file must contain the following line:

```
55 23 * * * /opt/cmcluster/toolkit/foundation/monitor cron
```

- A log file—/hamon/hamon/network/data

  It records the network connection status of the Access Layer switch status whenever a down event occurs. The following is a sample line log file entry:

```
NET:19987944:down:192.11.11.100:netsw1:Aug:19:1999:08:12:24
:up:Aug:19:1999:08:13:19
```

  Where—Label 0 starts on the left side and each label field is separated by a colon (:). The /home/hamon/network/data log file has 19 Access Layer switch related label fields as listed in Table 0-5:

Table 0-5 Log File Fields for Network Data Log

Label #	Field Name	Comments
label 0	NET	used to let the script know it is a network related event
label 1	time down	
label 2	status down	
label 3	ip address	address of the device that is down
label 4	switch name	

Table 0-5 Log File Fields for Network Data Log

Label #	Field Name	Comments
label 5	month down	
label 6	date down	
label 7	year down	
label 8	hour down	
label 9	minute down	
label 10	second down	
label 11	status up	
label 12	month up	
label 13	date up	
label 14	year up	
label 15	hour up	
label 16	minute up	
label 18	second up	

Installing the Foundation Monitor Toolkit

The Foundation Monitor toolkit is provided as part of the Enterprise Cluster Master Toolkit product. Install the Enterprise Cluster Master Toolkit on every node within the cluster that requires tracking of the cluster node, network, and package availability.

Prior to installing the Foundation Monitor toolkit, ensure the system meets all of the prerequisites listed in Table 0-6:

Table 0-6 Foundation Monitor Toolkit Installation Perquisites

Cluster Environment Requirement	HP-UX Prerequisite
HP9000 High Availability Server	2 to 16 node
LAN Interface	Minimum 2 LAN card per cluster node
High Availability Network Switch	Minimum 6 network switch
High Availability Network Routing Switch	Minimum 2 network routing switch
HP-UX Operating System	HP-UX 10.20 or later
MC/ServiceGuard	Supported on HP-UX 10.20 or later
Disk Space	100 Mbytes for the `/home/hamon` directory

To install the Enterprise Cluster Master Toolkit on HP-UX:

1. Log on as root user on the target system.
2. Mount the CD containing the Enterprise Cluster Master Toolkit. Use `sam(1M)` or `mount(1M)` to mount the disk.
3. Execute `swinstall`.
4. From the `Software Selection` window in `swinstall`, select the Enterprise Cluster Master Toolkit bundle:

   `B5139BA, Enterprise Cluster Master Toolkit`

   It is recommended that you install the entire bundle. To do this, use the `Action:Mark For Install` to mark the bundle for installation.

Setting Up the Foundation Monitor Toolkit

To set up the Foundation Monitor toolkit:

1. Ensure your system meets all the prerequisites listed in the following section.
2. Execute the Foundation Monitor toolkit setup script.
3. Verify the monitor processes are running on each node in the cluster.

Foundation Monitor Toolkit Prerequisites

Prior to executing the Foundation Monitor toolkit setup script, prerequisites for the following must be satisfied.

- High Availability Monitors
- ServiceGuard
- Network Addressing
- `crontab` File

Refer to the following sections for specific information.

High Availability Monitors User Prerequisites

The High Availability Monitors (hamon) user prerequisites are:

- Create an `hamon` user login account on every node within the cluster.

  Use proper UID/GID and place the login in the `/etc/passwd` file. For example:

  ```
  hamon:password:UID:GID:Hamon User:/home/hamon:/usr/bin/ksh
  ```

NOTE The UID/GID must be consistent across all of the systems.

- Create a `hamon` user home directory on every node within the cluster.

  Use `mkdir /home/hamon`.

- Mount `/home/hamon` to a drive with a designated 100MB disk space.

- Create a `/home/hamon/.rhost` file that contains every host name within the cluster.

  Each entry in the `/home/hamon/.rhosts` file is in a single line (no continuation). For example:

  ```
  [hostname.domainname [username]] [# comment]
  ```

  Refer to the man page on `.rhosts` for additional information.

ServiceGuard Prerequisite

The ServiceGuard cluster must be configured and functioning prior to starting the setup of Foundation Monitor toolkit.

Information about cluster status is stored in the status database which is maintained on each individual node within the cluster. Use the `cmviewcl -v` command to display the status information of the cluster. The output of the cluster status information on each node must be identical.

Refer to the man page on `cmviewcl` and *Managing MC/ServiceGuard* (HP Part Number B3936-90026) for information on examples of cluster and package states.

Network Prerequisites

The following network criteria must be met prior to configuring the network information during the Foundation Monitor toolkit setup.

- The IP addresses and hostnames of the clients, cluster nodes, network switches, and network routing switches illustrated in Figure 0-2 must be resolved by the Domain Name Server.
- The client's IP address must all use the same subnetwork as the network Access layer switch.

  An IP address consists of a class number, a network number, a subnetwork number, and a host number. Table 0-7 lists the network class A IP network address of 15.144.133.122 and describes each number:

Table 0-7 IP Network Address Prerequisite

Class Number	Network Number	Subnetwork Number	Host Number
15	144	133	122

Cron Prerequisite

Log on as root and add the following line to the root `crontab` file, `/var/spool/cron/crontabs/root`, on each node in the cluster.

```
55 23 * * * /opt/cmcluster/toolkit/foundation/monitor cron
```

To add a cron entry, perform the following:

```
# crontab -l > /tmp/rootcron
# echo "55 23 * * * opt/cmcluster/toolkit/foundation/monitor
cron" >> /tmp/rootcron
# crontab /tmp/rootcron
```

Running the Foundation Monitor Toolkit Setup Script

Setup the Foundation Monitor toolkit to enable cluster availability tracking.

To setup the Foundation Monitor toolkit:

1. Log on as root on each node within the cluster.
2. Execute the following script:

   ```
   #/opt/cmcluster/toolkit/foundation/monitor setup
   ```

   The setup script then prompts for information.

```
3. The Foundation Monitor Toolkit measurement of availability
   is based on one year from the cluster production date.
   Is the cluster ready to go production: [yes] or [no]? n
```

If the answer is `Y`, the script creates a `/home/hamon/time_stamp` file with a date of one year from today.

If the answer is `N`, the script does not create a `/home/hamon/time_stamp` file. This prompt appears every time the script is executed until a timestamp file is created.

NOTE To reset the `time_stamp` file date, re-run the `setup` script.

```
4. Please enter Access Layer Switch 1 IP Address: 15.8.232.1
   You entered 15.8.232.1.  Is this correct: [yes] or [no]: y

5. Please enter client 1 of Access Switch 1: 15.14.224.6
   You entered 15.14.224.6.  Is this correct: [yes] or [no]? y
```

6. `Enter another client: [yes] or [no]: n`

   If the answer is `Y`, the script prompts for another client IP address. This repeats until `N` is entered.

7. `Enter another Access Switch: [yes] or [no]: n`

   If the answer is `Y`, the script prompts for an additional Access Layer Switch IP Address and repeats the steps 4, 5, and 6.

   If the answer is `N`, the script exits and setup is complete.

   Refer to the section “Sample Files” for additional information.

Verifying the Foundation Monitor Toolkit Processes

After the Foundation Monitor toolkit setup script has completed, run the following command to verify the monitor processes are running on every node within the cluster:

```
#ps -ef | grep monitor | grep -v grep
/opt/cmcluster/toolkit/foundation/monitor ./monitor time
/opt/cmcluster/toolkit/foundation/monitor ./monitor netmon
```

Sample Files

This sections provides the following samples:

- Foundation Monitor Setup Output
- Data Log File

Foundation Monitor Setup Output

```
#./monitor setup

Checking root capabilities....

Checking monitor parameters....

The Foundation Monitor Toolkit measurement of availability is
based on one year from the cluster production date.  Is the
cluster ready to go production: [yes] or [no]? n

Checking cluster status....

Checking remote access....

Remote access to "thx1138" as "hamon" id(7692) suceeded.

Checking /etc/inittab parameters....

Checking time stamp parameters....

Time stamp function already running, PID = 17811!

Setting up cron....

Network setup section....

Please enter Access Layer Switch 1 IP Address: 15.8.232.1
You entered 15.8.232.1.  Is this correct: [yes] or [no]? y

Please enter client 1 of Access Switch 1: 15.14.224.6
You entered 15.14.224.6.  Is this correct: [yes] or [no]? y

Enter another client: [yes] or [no]? n
```

```
Enter another Access Switch: [yes] or [no]? n

Starting Network Monitoring function....

Monitor setup Complete.
```

Data Log File

```
PKG:vpn_pkg:20395302:down:monk:Aug:24:1999:01:21:42:cmhaltserv
PKG:ste_pkg:20395328:up:shorter:Aug:24:1999:01:22:08:cmrunserv
SYS:20681165:20682006:shorter:down:Aug:28:1999:08:46:05:
up:Aug:28:1999:09:00:06:0:0:14:1:"POWER"
```