

Application Roll- over Facility for Linux

Administrator's Guide



NOVASCALE

Application Roll-over Facility for Linux Administrator's Guide

Software

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Chapter 1. Concepts and Components Overview

Application Roll-over Facility is designed to move easily an application and its environment from one system to another system for maintenance purpose, or in answer to hardware failure or system overload.

Application Roll-over Facility is based on classical high availability configuration using at least two Linux nodes and shared disk storage. *Application Roll-over Facility* is designed to detect system failure, to notify it to the system administrator which can check the situation and manage failover to a recovery node.

1.1 Functionalities

Application Roll-over Facility enables administrators to cleanly stop one or more applications running on a system, and to relocate them on another system. With *Application Roll-over Facility* it is possible to balance the workload across the nodes, to perform maintenance operations on a system keeping the applications available, or, in case of node failure, to move automatically applications. *Application Roll-over Facility* also detects and notifies node errors.

Application Roll-over Facility is based on two main functionalities:

- **heartbeat mechanism** to monitor the nodes availability,
- **application relocation** to move applications from one node to another, either automatically (in case of node failure) or under administrator control.

When the automatic take over mode is set for one or several applications, the heartbeat mechanism must be used (the monitoring daemon must be started). In case of node failure, the applications are taken over by the node defined as "take over node".

When the manual take over mode is used, the heartbeat mechanism and the application relocation work independently:

- The heartbeat mechanism warns the administrator in case of node unavailability,
- The administrator uses the application relocation if he decides to move the application from one node to another. It is the administrator's responsibility to relocate the application (it is not an automatic action).

1.1.1 Heartbeat Mechanism

On each node a daemon regularly sends heartbeats to the other daemons using each of the configured IP network to detect node failure and to warn the administrator of the node status.

To detect if a node is failed, when heartbeats are not received anymore by none of the networks, the local heartbeat daemon tries to ping several addresses located on the local area network. If other addresses are reachable, the node is probably failed or it has a network problem (for example an adapter failure). If addresses are not reachable, a local area network failure is detected.

If a node does not communicate with other nodes and with additional addresses (node isolation), it may be halted according to the configuration.

When a failed remote monitored node is detected, the local monitoring daemon checks if it has to recover an application or if it has just to warn the administrator of the node status.

In case of system outage, a notification allows the system administrator to determine whether the recovery action is desirable at the time of failure (for example a failure could result in an overloaded node). This manual failover mechanism allows the administrator to avoid such a situation. Once the take-over decision is made, the administrator must perform application failover using the appropriate ARF GUI menus. Sample application scripts and templates are provided with *Application Roll-over Facility*.

Application Roll-over Facility offers a set of tools to define the heartbeat environment and to activate and de-activate the monitoring.

1.1.2 Application Definition and Relocation

An application is associated with the environment needed to be executed correctly on a group of nodes.

The nodes can communicate each other through one or more networks and share storage subsystems. An address can be defined for each node, on each network, allowing to communicate with other nodes.

An application environment is composed of:

- Resources such as:
 - a list of specific addresses used by the clients of the application,
 - a list of file systems on shared disks containing application data.
- Methods to start and stop the application.

To activate an application means to make its resources available and to launch the application on a node previously defined. Before and after each step of application activation, it is possible to execute specific methods. If resources cannot be made available, the activation is aborted.

To de-activate an application means to stop application processes and to release its resources on a node, as wished.

Before and after each step of application de-activation, it is possible to execute specific methods. If resources cannot be released, the deactivation is aborted.

For management purpose, the execution of activation and de-activation is logged and main events are recorded.

Application Roll-over Facility offers a set of tools to define nodes and application environment, to activate and de-activate application, and to display information about the configuration.

1.1.3 A typical configuration

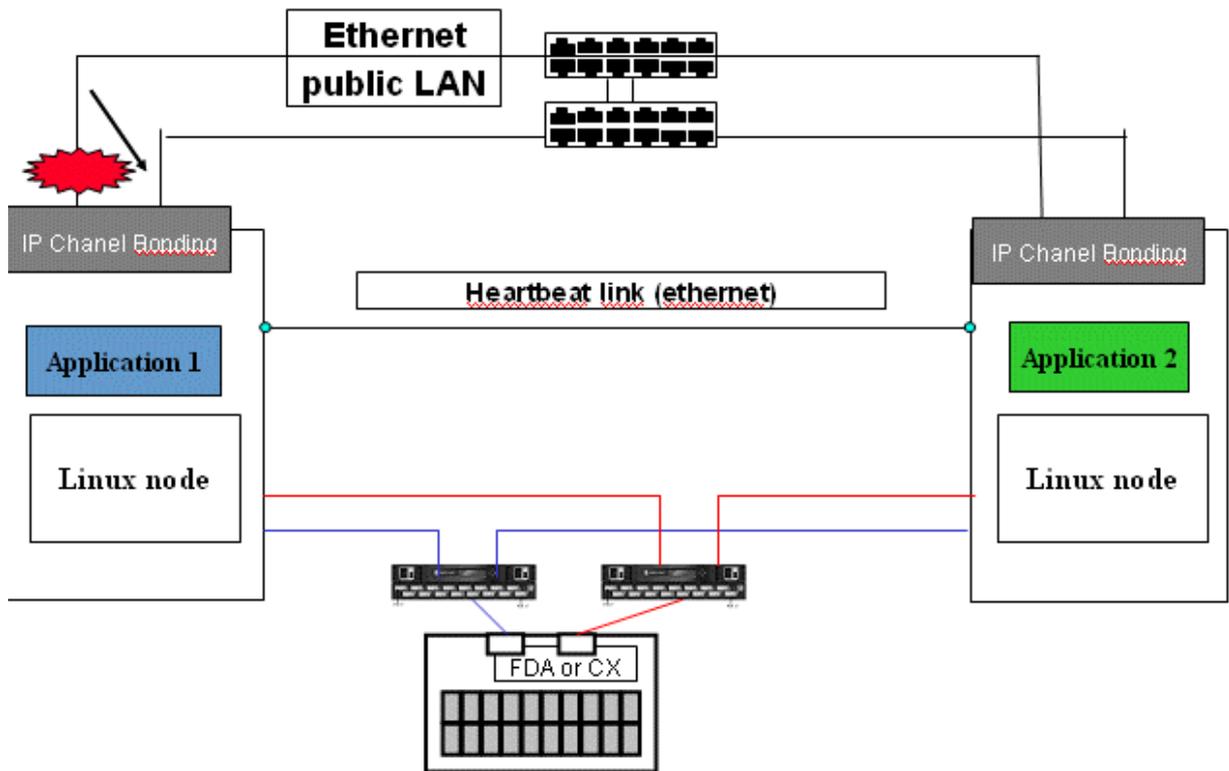


Figure 1-1. a typical Application Roll-over Facility configuration

1.2 Hardware Requirements

It is highly recommended, in order to have two physically different Ethernet networks, to make difference between network failure and node failure:

- a main network on which the application addresses will be aliased,
- a second network, used by the heartbeat mechanism to avoid cluster partitioning.

A standard hardware configuration requires:

- For the main network, at least two network adapters are needed to configure a redundant network access (network availability is ensured by IP Channel Bonding).

There is no limitation on the number of machines.

1.3 Software Requirements

- For restrictions on the different Linux distributions, refer to the *Software Release Bulletin (SRB) for Application Roll-over Facility*.
- **Webmin** is used for administration. **Webmin** is a standard Web-based administration tool on Linux.

Chapter 2. Overview of Installation and Configuration

This chapter describes how to use the standard installation and configuration procedure. The standard procedure, gives you the most flexibility for configuring *Application Roll-over Facility* to your specific requirements. You can use this procedure to:

- Install the *Application Roll-over Facility* software
- Configure nodes, applications, and events
- Verify the *Application Roll-over Facility* configuration.

2.1 Steps for Installing and Configuring an *Application Roll-over Facility* Node

This section identifies the steps required to set up, install, and configure an *Application Roll-over Facility* server. Each step is detailed in the chapters that follow.

Check installed Hardware

In this step you ensure that network adapters and shared external disk devices are ready to support an *Application Roll-over Facility* configuration. See *Hardware Requirements*, on page 3.

Define File Systems

In this step you modify the disk partition and create file systems for your *Application Roll-over Facility* configuration, as described in *Defining Shared LVM Components or File Systems*, on page 16.

Install *Application Roll-over Facility* Software

In this step you install and verify the *Application Roll-over Facility* software on each *Application Roll-over Facility* node, as described in *Installing Application Roll-over Facility Software*, on page 7.

Tailor LINUX for *Application Roll-over Facility*

In this step you review or edit various LINUX files to ensure a proper configuration for network options and for various host files, as described in *Tailoring LINUX for Application Roll-over Facility Software*, on page 9.

Configure the *Application Roll-over Facility* Software

In this step you define the components of your *Application Roll-over Facility* configuration as described in *Configuring an Application Roll-over Facility Environment*, on page 17.

2.2 Operating Environment

Application Roll-over Facility works with SMP (Symmetrical Multiprocessor System) servers in a "no-single-point-of-failure" server configuration. *Application Roll-over Facility* supports the Bull models designed for server applications and meets the minimum requirements for internal memory, internal disk, and I/O slots.

The minimum configuration and sizing of each machine is highly dependent on the user's database package and other applications.

Actual configuration requirements are highly localized according to the required function and performance needs of individual sites.

Chapter 3. Installing Application Roll-over Facility Software

This chapter gives some tips related to installation and configuration.

3.1 Terminology: Local Node / Remote Node

By convention:

- “**local node**” refers to the node on which you will run the tool to configure *Application Roll-over Facility*,
- “**remote node**” refers to the other node(s).

3.2 Read the Software Release Bulletin

Read the SRB (*Software Release Bulletin for Application Roll-over Facility*) that comes with the software. It includes environment requirements and restriction as well as late-breaking news. The SRB also includes the procedure to install the software.

To verify if *Application Roll-over Facility* software is effectively installed, carry out this check **on each node** of your configuration, by entering the command:

```
rpm -qa | grep Bull.approllf.*
```

3.3 LINUX Files Modified for *Application Roll-over Facility* Scripts

The following LINUX files must be modified to support *Application Roll-over Facility* product. They are not distributed with the product.

- **/etc/lvm/lvm.conf**
This file is modified by *Application Roll-over Facility* product installation. The following line is added to take into account the device mapper:

```
types = [ "device-mapper", 16 ]
```
- **/etc/rc.d/init.d/arf_monitor**
This file is added by *Application Roll-over Facility* product installation to allow to enable the ARF monitoring daemon service.
- **/etc/rc.d/init.d/barf_init0**
This file is added by *Application Roll-over Facility* product installation to allow to clean some internal ARF data during system startup.
- **/etc/rc.d/init.d/barf_init**
This file is added by *Application Roll-over Facility* product installation to allow to synchronize some internal ARF data during system startup.

A new **Webmin** module is added by *Application Roll-over Facility* product installation.

Chapter 4. Tailoring LINUX for Application Roll-over Facility Software

This chapter discusses several general tasks necessary to make sure that your *Application Roll-over Facility* environment works as planned.

4.1 Overview

The following LINUX items must be configured as expected in an *Application Roll-over Facility* configuration:

- Users and groups
- `/etc/hosts`
- Keys for ssh
- Defining File Systems (and LVM (Logical Volume Management, if it is used).

4.2 Checking Users, Groups and Passwords

If a node fails, users should be able to log on to the surviving nodes without experiencing problems caused by mismatches in the user or group IDs. To avoid mismatches, make sure that user and group information is propagated to nodes as necessary. User and group IDs should be the same on all nodes.

4.3 Updating `/etc/hosts` file

When applying configuration settings, the configuration tool must be able to access the remote nodes in order to run appropriate configuration commands on this node.

Consequently, for the configuration to work properly, you have first to update the `/etc/hosts`, on both local and remote nodes, even if a name server is used.

4.3.1 Editing the `/etc/hosts` File and Name Server Configuration

Make sure that all nodes can resolve all *Application Roll-over Facility* addresses.

Edit `/etc/hosts` on Local and Remote Nodes

- Add entries for all interfaces of the *Application Roll-over Facility* remote nodes:
Edit the `/etc/hosts` file on each node in *Application Roll-over Facility* configuration to make sure that the IP addresses of all *Application Roll-over Facility* interfaces are listed.
- Also, make sure that the `/etc/hosts` file has the following entry:

```
127.0.0.1          loopback    localhost
```

Check Name Server Configuration (optional)

If you plan to use a name server for addresses resolution, check that it is correctly configured on each node using the **Webmin** graphical interface (see *Graphical User Interface for Application Roll-over Facility* paragraph on page 12 for more information about **Webmin**).

In the **Webmin** interface, select **Networking** Tab, then **Network Configuration** icon, then **DNS Client** icon and fill-in the **DNS Client options** dialog; the resolution order must be Hosts then DNS. Click the **Save** button to validate (the files `/etc/resolv.conf` and `/etc/nsswitch.conf` are modified).

4.4 Generating Key Pairs for SSH

With the OpenSSH tools, the security of the system is enhanced; all communications using OpenSSH tools, including passwords, are encrypted.

The **ssh** command is used in many *Application Roll-over Facility* operations (activation, propagation, monitoring...). So, it is mandatory to generate an authorization key pair (either a RSA key or a DSA key). Key must be generated for user root, on each node.

4.4.1 Generating an RSA key Pair for Version 2

Use the following steps to generate an RSA key pair for version 2 of the SSH protocol. This is the default starting with OpenSSH.

1. Type the following command at the shell prompt:
ssh-keygen -t rsa
Accept the default file location of `~/.ssh/id_rsa`. Do not enter a pass phrase.
The public key is written to `~/.ssh/id_rsa.pub`
The private key is written to `~/.ssh/id_rsa`
2. Change the permissions of the `.ssh` directory:
chmod 755 ~/.ssh
3. Copy the contents of `~/.ssh/id_rsa.pub` to `~/.ssh/authorized_keys` on all remote systems. If the file `~/.ssh/authorized_keys` already exists, append the contents of `~/.ssh/id_rsa.pub` to the file `~/.ssh/authorized_keys` on all remote systems.
4. Change the permissions of `~/.ssh/authorized_keys`:
chmod 644 ~/.ssh/authorized_keys
5. Repeat these steps on each node.

4.4.2 Generating a DSA key Pair for Version 2

Use the following steps to generate a DSA key pair for version 2 of the SSH protocol.

1. Type the following command at the shell prompt:
ssh-keygen -t dsa
Accept the default file location of `~/.ssh/id_dsa`. Do not enter a passphrase.
The public key is written to `~/.ssh/id_dsa.pub`
The private key is written to `~/.ssh/id_dsa`
2. Change the permissions of the `.ssh` directory:
chmod 755 ~/.ssh
3. Copy the contents of `~/.ssh/id_dsa.pub` to `~/.ssh/authorized_keys` on all remote systems.
If the file `~/.ssh/authorized_keys` already exists, append the contents of `~/.ssh/id_dsa.pub` to the file `~/.ssh/authorized_keys` on all remote systems.
4. Change the permissions of the `~/.ssh/authorized_keys`:
chmod 644 ~/.ssh/authorized_keys
5. Repeat these steps on each node.

4.4.3 Authorizing Additional Nodes Addresses for SSH

If the node has several addresses defined in the *Application Roll-over Facility* configuration, you have to authorize each additional address on the other nodes for SSH.

Example:

- Node1 has two addresses: **node1** and **node1_a**
Node2 has two addresses: **node2** and **node2_a**
 - **node1** and **node2** addresses (hostnames) are already taken into account during the key pairs generation.
1. To authorize the additional address of node1 (**node1_a**), perform the following steps on **node2**:
 - Login as root.
 - Enter the following command:
ssh node1_a date
The first time you issue the command; the following message is displayed:
The authenticity of host 'node1_a (172.18.1.220)' can't be established.
RSA key fingerprint is
ed:6e:a5:32:55:84:d6:25:a6:11:d0:69:1d:0c:11:23.
Are you sure you want to continue connecting (yes/no)?
– Answer: **yes**
The following message is displayed and the result of `date` command is output:

```
Warning: Permanently added 'node1_a,172.18.1.220' (RSA) to
the list of known hosts.
```

```
Thu Oct 13 16:58:19 CEST 2005
```

```
(on node2, the ~/.ssh/known_hosts file is updated with node1_a address
authorization)
```

- Verify by entering again the command:
ssh node1_a date
The result of **date** command is immediately output.
- Repeat these steps for each additional address of the node.

2. To authorize the additional address of node2 (**node2_a**), perform the following steps on **node1**:

- Login as root
- Enter the following command:
ssh node2_a date
The first time you issue the command; the following message is displayed:
The authenticity of host 'node2_a (172.18.1.221)' can't be established.
RSA key fingerprint is
ed:6e:a5:32:55:84:d6:25:a6:11:d0:69:1d:0c:11:23.
Are you sure you want to continue connecting (yes/no)?
- Answer: **yes**
The following message is displayed and the result of **date** command is output:
Warning: Permanently added 'node2_a,172.18.1.221' (RSA) to
the list of known hosts.
Thu Oct 13 16:59:24 CEST 2005
(on node1, the ~/.ssh/known_hosts file is updated with **node2_a** address
authorization)
- Verify by entering again the command: **ssh node2_a date**
The result of **date** command is immediately output.
- Repeat these steps for each additional address of the node.

4.5 Graphical User Interface for Application Roll-over Facility

To configure and manage *Application Roll-over Facility*, a Graphical User Interface (GUI) based on **Webmin** is used.



Note: **Webmin** is a web-based interface for system administration for Linux.

To use the ARF GUI, a browser is necessary. The web browser must support the frames.

You can access the ARF GUI from your web browser by specifying an URL that has the following format:

```
https://IP-spec:10000
```

In this URL, `IP-spec` is either an IP label or an IP address that is reachable to connect to one *Application Roll-over Facility* node.

Example:

To access the ARF GUI on the *Application Roll-over Facility* node `foo`, whose IP label is `foo` and IP address is `192.9.200.1`, specify either:

```
https://foo:10000
```

or:

```
https:// 192.9.200.1:10000
```

When an appropriate URL has been specified, the corresponding HTTPS server is contacted on the involved node and you are prompted to enter a login and a password.

The illustration below shows the **Webmin** login page. In this example, the Mozilla browser has been launched on the local host.

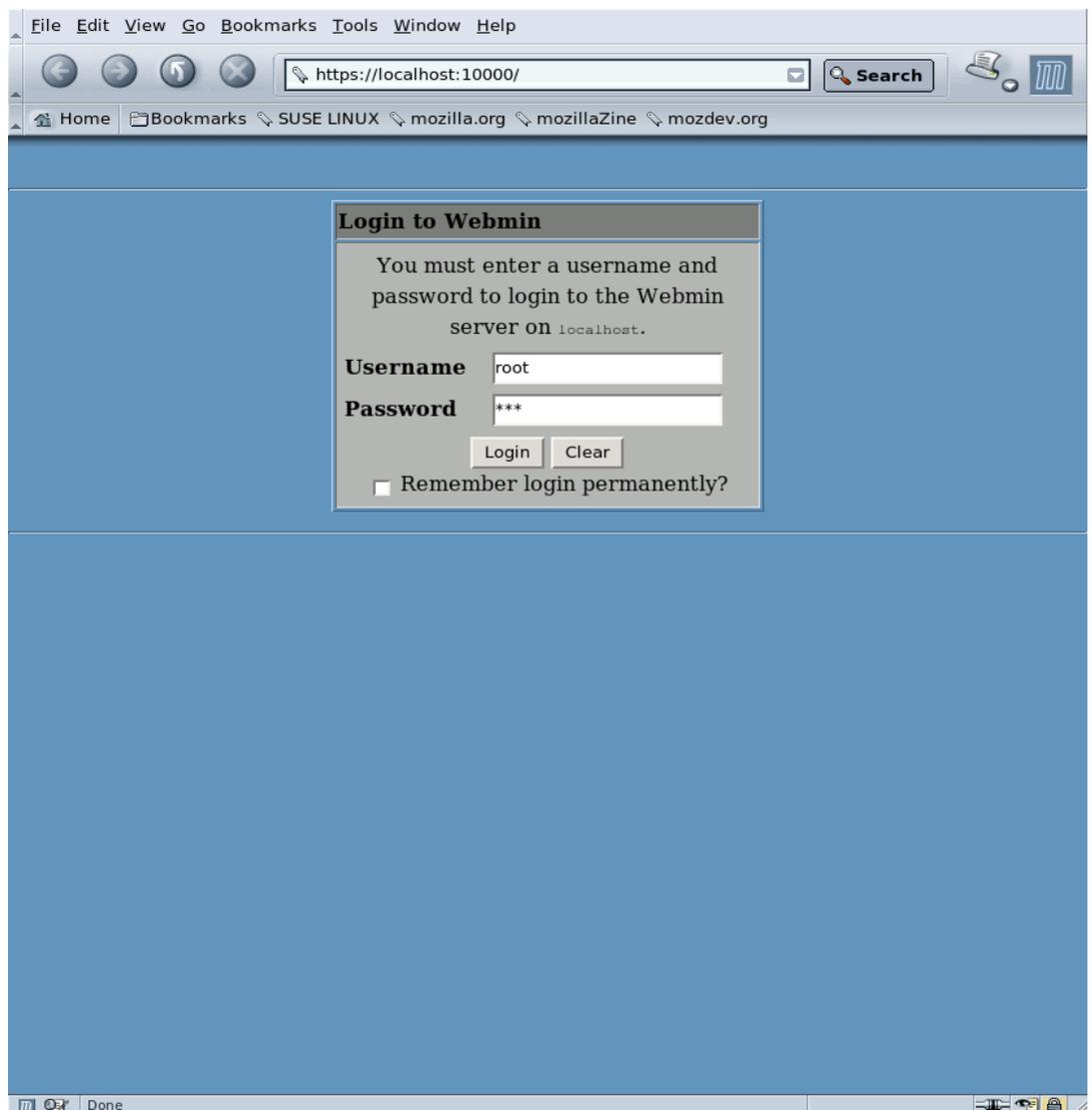


Figure 4-1. login prompt window

Webmin Main View

The illustration below shows the **Webmin** Main page.

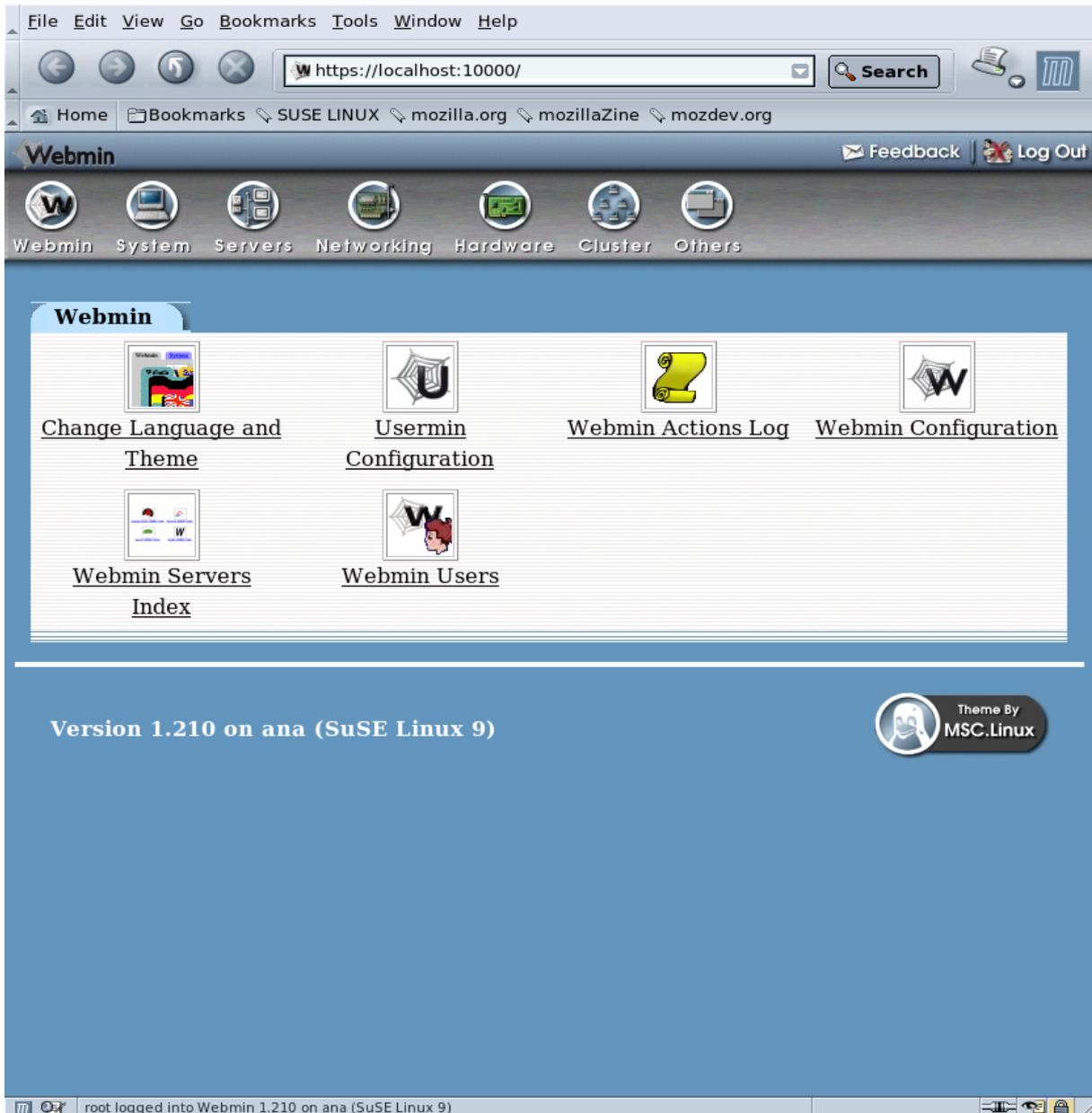


Figure 4-2. Webmin Main View window

Upon first login in, you'll see a row of tabs and a number of icons. The tabs are labelled **Webmin**, **System**, **Servers**, **Networking**, **Hardware**, **Cluster**, and **Others**.

To access to the *Application Roll-over Facility* Webmin module, select the **Cluster** tab.

Webmin Cluster View

The illustration below shows the **Webmin Cluster** page.



Figure 4-3. Webmin Cluster View window

To configure and manage *Application Roll-over Facility*, click the **ARF for Linux** icon.

Refer to *Configuring an Application Roll-over Facility Environment* on page 17.

4.6 Defining Shared LVM Components or File Systems

Refer to *Defining Shared LVM Components or File Systems*, on page 63.

4.7 Configuring Remote Power Management

If you do not use SCSI-reservation feature to protect disk data accesses, it is mandatory to configure the *Remote Power Management*, as described on page 77.

4.8 Configuring Ethernet Channel Bonding

Refer to *Configuring Ethernet Channel Bonding* on page 81.

Chapter 5. Configuring an *Application Roll-over Facility* Environment

This chapter describes how to configure an *Application Roll-over Facility* environment.

5.1 Overview

Perform the following steps to define the *Application Roll-over Facility* configuration:

- *Defining a Topology*, on page 17
- *Defining Applications*, on page 21
- *Customizing Log and Trace Files*, on page 26
- *Configuring the Monitoring*, on page 25
- *Verifying the Application Roll-over Facility Environment*, on page 29
- *Synchronizing the Application Roll-over Configuration*, on page 29.

5.2 Defining a Topology

Complete the following procedure to define the *Application Roll-over Facility* topology. You need to perform these steps only on one node. When you will propagate the configuration its definition will be copied to the other nodes.

5.2.1 Defining Nodes

To define the *Application Roll-over Facility* nodes:

1. Click the **ARF for Linux** icon in the **Webmin** interface. The following window appears:

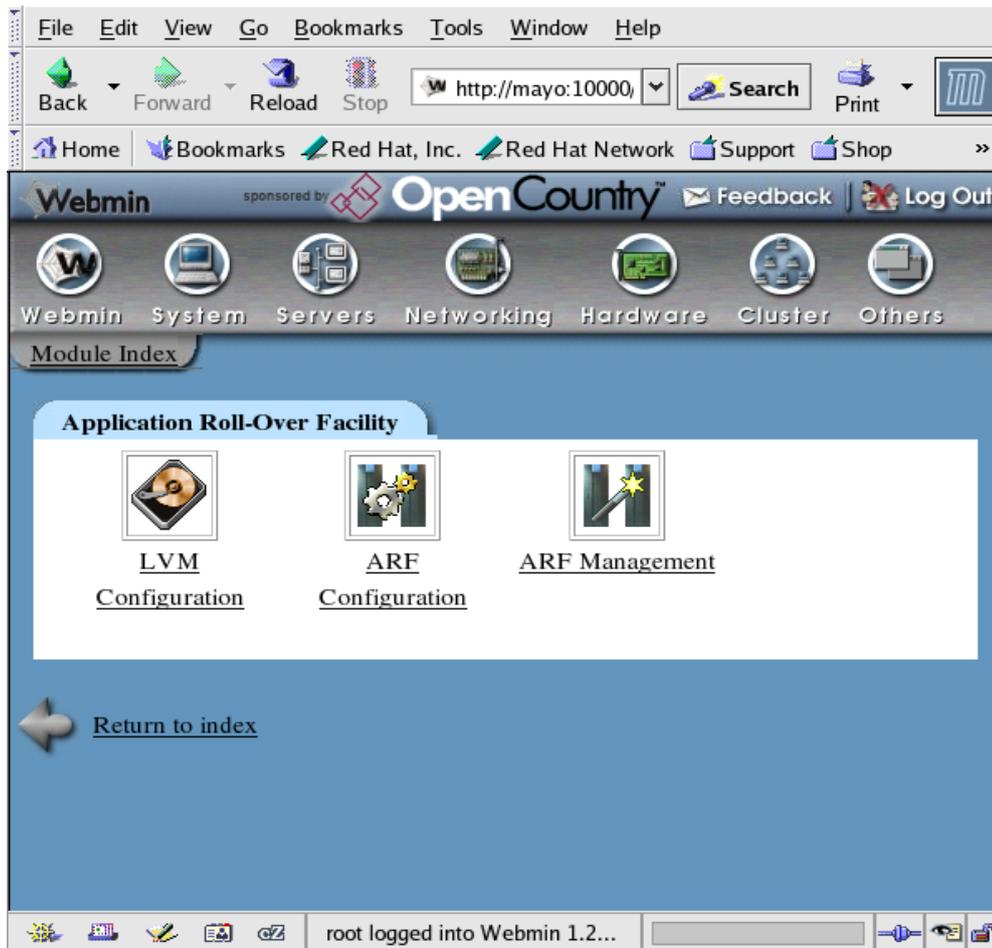


Figure 5-1. Application Roll-over Facility window

2. Select the **ARF Configuration** icon. The following window appears:



Figure 5-2. The Configuration Definition window

3. Select the **Configuration Definition** icon. The following window appears:

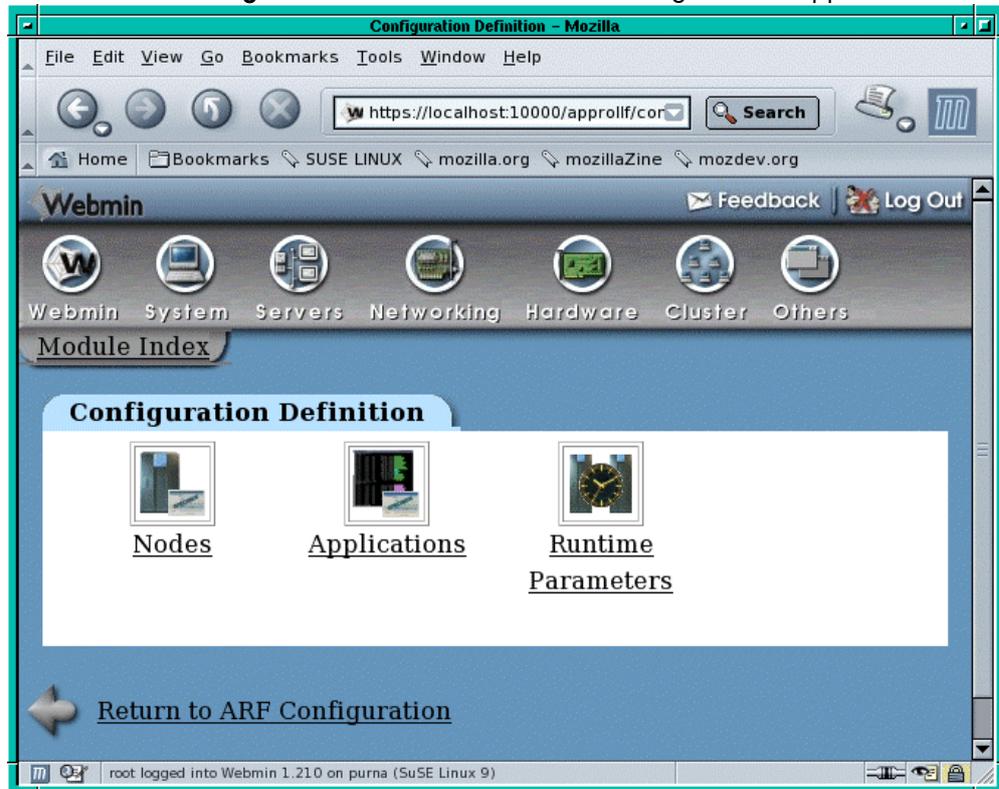
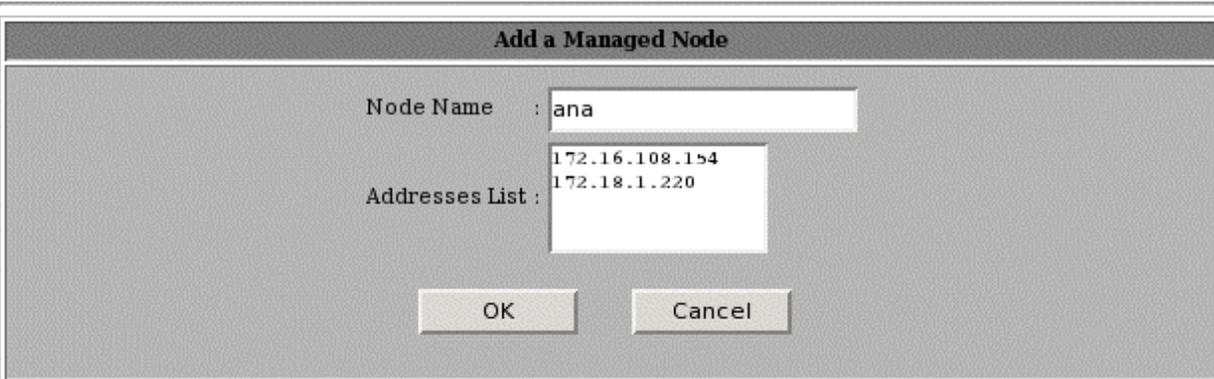


Figure 5-3. Configuration Definition window

4. Select the **Nodes** icon and scroll the displayed window if necessary to display the **Add a Managed Node** screen:



The screenshot shows a web-based configuration interface. At the top, there is a blue header with the text 'Nodes Configuration'. Below this is a dialog box titled 'Add a Managed Node'. Inside the dialog, there are two input fields. The first is labeled 'Node Name' and contains the text 'ana'. The second is labeled 'Addresses List' and contains two lines of IP addresses: '172.16.108.154' and '172.18.1.220'. At the bottom of the dialog, there are two buttons: 'OK' and 'Cancel'.

Figure 5-4. Add a Managed Node screen

Node Name name of the node. A name cannot exceed 31 characters. It is not mandatory to indicate the same name as the host name. It can include alpha and numeric characters and underscores.

Addresses List list of the addresses to reach the node (they must be known in the `/etc/hosts` file). Each address must correspond to a dedicated network physically different. You can enter addresses in dot format or IP label, one address by line.

5. Click the **OK** button.
6. Repeat this operation for all the nodes participating to the configuration.
7. Click the **Return to** link at the bottom to go back.

5.2.2 Synchronizing the Nodes Definition Across Nodes (optional)

The synchronization of nodes definition can be done now (see below) or later at the end of all configuration steps (see *Synchronizing the Application Roll-over Facility Configuration* paragraph on page 29).

To synchronize only the *Application Roll-over Facility Nodes Definition* across the nodes:

1. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Management** icon in the **Webmin** interface.

2. Scroll the window if necessary to display the **Propagate Configuration** screen.

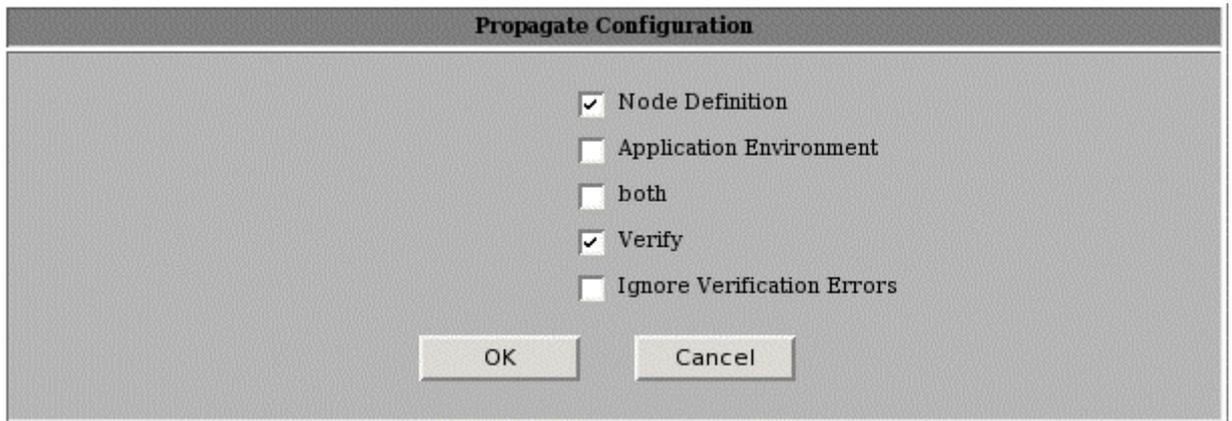


Figure 5-5. Propagate Configuration screen (node definition)

Node Definition	Choose this field to make only the synchronization of the nodes definition.
Application Environment	Do not select this field in this case.
both	Do not select this field in this case.
Verify	By default, this field is selected and the topology verification program is run. To save time in the synchronization process, do not select this field. Doing so, the verification will be skipped.
Ignore Verification Errors	By selecting this field, the result of the verification is ignored and the configuration is synchronized even if verification fails. By unselecting this field, the synchronization process terminates if errors are found; view the error messages in output window to determine the configuration problem.

3. Click the **OK** button. The *Application Roll-over Facility* definition (including all nodes information) is copied to the other nodes.
4. Click the **Return to** link at the bottom to go back.

5.3 Defining Applications

Configuring applications points the *Application Roll-over Facility* event scripts to the scripts that they call to start and stop the application, and takes into account the resources defined for each application.

Note that this section does not discuss writing the start and stop scripts. See the vendor documentation for specific product information on starting and stopping a particular application.

When defining applications, you can also configure custom events: *Application Roll-over Facility* custom events are scripts defined by the user, which can be executed before or after events, during activation or de-activation of an application.

The following events will be executed for each file system or alias: **mountfs**, **umountfs**, **configalias**, **unconfigalias**.

To configure events, you indicate the script that handles the event, as described below. You can define multiple customized pre-event and post-event scripts.

5.3.1 Adding Applications

Complete the following steps to create applications on any *Application Roll-over Facility* node.

1. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Definition** icon, then **Applications** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Add Application Environment** screen:

Add Application Environment

Application

Application Name

Start Command

Stop Command

Nodes List

alpa
mayo

all

Resources

Addresses list

Volume Groups List

alpavg1
mayovg1

Filesystem Device

Filesystems List

Filesystem Mount Point

Add FS Modify FS Remove FS

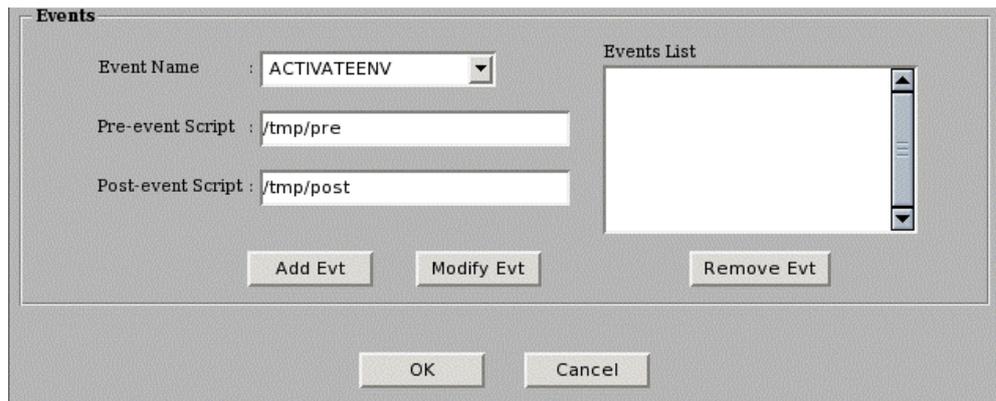


Figure 5-6. Add Application Environment screen

Application Name	Enter an ASCII text string that refers the application. This name can include alphabetic and numeric characters and underscores. Use no more than 31 characters.
Start Command	Enter the pathname of the script (followed by arguments) called by the event scripts to start the application. This script must be in the same location on each node that might start the application. The contents of the script, however, may differ.
Stop Command	Enter the pathname of the script called by the event scripts to stop the application. This script must be in the same location on each node that may start the server. The contents of the script, however, may differ.
Nodes List	Select the nodes on which the application can be running.
Addresses List	Enter the addresses associated to this application.
Volume Groups List	Select the volume group name that you want to configure for this application.

The two following fields allow to define all the file systems used by the application.

Filesystem Device	Select the filesystem device name that you want to configure.
Filesystem Mount Point	Enter the filesystem mount point.
	Click the Add FS button to add filesystem information (filesystems device and filesystems mount point) to the right list. To add other filesystems, fill again the 2 fields and click again on Add FS button.
	To modify filesystem information already entered, select the filesystem device in the right list; the related values are displayed in the 2 entry fields; you can modify them and click the Modify FS button to take into account the new values (the right list is updated with the new values).
	To remove filesystem information from the right list, select the filesystem device in the right list; the related values are displayed in the 2 entry fields; click the Remove FS button to remove definitively the filesystem information from the right list.

Click the **Add FS** button to add filesystem information (filesystems device and filesystems mount point) to the right list. To add other filesystems, fill again the 2 fields and click again on **Add FS** button.

To modify filesystem information already entered, select the filesystem device in the right list; the related values are displayed in the 2 entry fields; you can modify them and click the **Modify FS** button to take into account the new values (the right list is updated with the new values).

To remove filesystem information from the right list, select the filesystem device in the right list; the related values are displayed in the 2 entry fields; click the **Remove FS** button to remove definitively the filesystem information from the right list.

Event Name	Select the event you want to custom, chosen from the events list.
Pre-event Script	Enter the name of a custom-defined script to run before the event command executes. This command provides pre-processing before the selected event occurs. Remember that the <i>Application Roll-over Facility</i> will not process the event until this pre-event script or command has completed.
Post-event Script	<p>Enter the name of a custom-defined script to run after the event command executes successfully. This command provides post-processing after an event.</p> <p>Click the Add Evt button to add event information (event name, pre and post event scripts) to the right list. To add other events, fill again the 3 fields and click again the AddEvt button.</p> <p>To modify event information already entered, select the event in the right list; the related values are displayed in the 3 entry fields; you can modify pre and post event scripts and click the Modify Evt button to take into account the new values (the right list is updated with the new values).</p> <p>To remove event information from the right list, select the event in the right list; the related values are displayed in the 3 entry fields; click the Remove Evt button to remove definitively the event information from the right list.</p>

3. Click the **OK** button.

4. Click the **Return to** link at the bottom to go back.

5.3.2 Synchronizing the Applications Definition Across Nodes (optional)

The synchronization of applications definition can be done now (see below) or later at the end of all configuration steps (see *Synchronizing the Application Roll-over Facility Configuration* paragraph on page 29).

To synchronize only the *Application Roll-over Facility* **Applications Definition** across the nodes:

1. Select **ARF** for Linux icon, then **ARF Configuration** icon, then **Configuration Management** icon in the **Webmin** interface.

2. Scroll the window if necessary to display the **Propagate Configuration** screen.

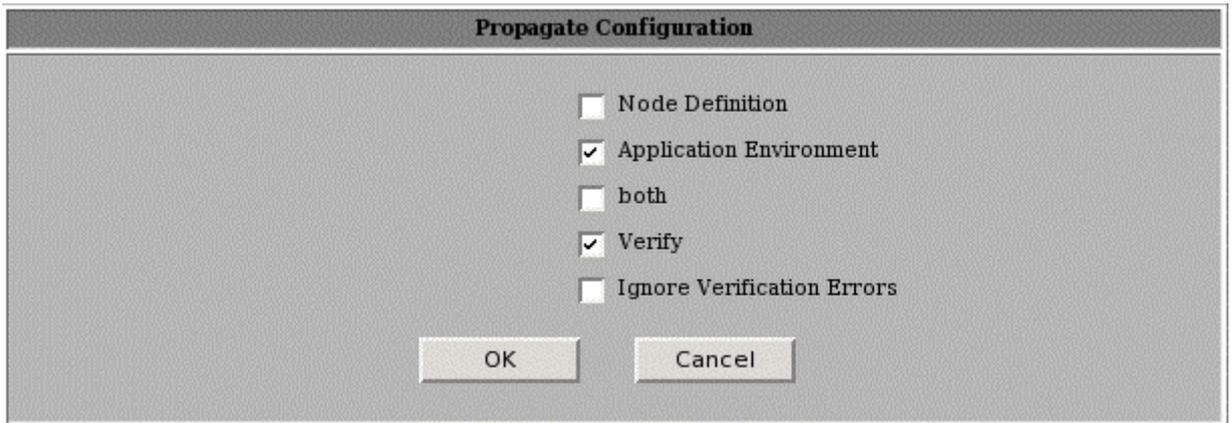


Figure 5-7. Propagate Configuration screen (application definition)

Node Definition	Do not select this field in this case.
Application Environment	Choose this field to make only the synchronization of the applications definition.
both	Do not select this field in this case.
Verify	By default, this field is selected and the topology verification program is run. To save time in the synchronization process, do not select this field. Doing so, the verification will be skipped.
Ignore Verification Errors	By selecting this field, the result of the verification is ignored and the configuration is synchronized even if verification fails. By unselecting this field, the synchronization process terminates if errors are found; view the error messages in output window to determine the configuration problem.

3. Click the **OK** button.
4. Click the **Return to** link at the bottom to go back.



Note:

Synchronizing does not propagate the actual new or changed scripts (start, stop, pre-event and post-event scripts); you must copy these to each node manually.

5.4 Configuring the Runtime Parameters

Configuring the runtime parameters means to accept or modify their default values.

The runtime parameters allow customizing log and trace files and configuring the monitoring.

5.4.1 Customizing Log and Trace Files

You can redirect log files and trace files from their default directory to a directory of your choice. If you do this, keep in mind that the requisite (upper limit) disk space for most log and trace files is 2MB. 14MB is recommended for *Application Roll-over Facility*.



Note:

Logs and traces should be redirected to local file systems and not to shared or NFS file systems. Having logs and traces on those file systems may cause problems if the file system needs to unmount during a failover event. Redirecting logs to NFS file systems may also prevent *Application Roll-over Facility* services from starting during node reintegration.

The mount point or mount-file system operation must have read-write access.

Be sure to synchronize the configuration directly before redirecting a log file in order to avoid failure of the redirection process.

5.4.2 Configuring the Monitoring

Configuring the monitoring means to accept or modify heartbeat parameters, to define additional addresses to ping and to define behavior on node isolation.

The monitoring daemon on each node, exchanges heartbeats across all reachable networks specified when configuring *Application Roll-over Facility* nodes.

When heartbeats are not received from remote node on one particular network, the monitoring daemon waits until communication resumes.

When heartbeats are not received from remote node on none of the networks, local monitoring daemon tries to ping one node IP address. If ping works, it is a remote monitoring daemon failure or the remote node is rebooting.

The monitoring daemon tries to ping additional IP address(es) to detect:

- **node isolation:** a node does not communicate with other nodes and additional address(es) via all networks.
- **global network failure:** all nodes do not communicate via one particular network with other nodes and additional address(es).
- **local (to a node) network failure:** other node(s) cannot communicate with one particular node via one particular network but can ping additional address(es).

When no communication is possible, node is declared down, according to failure detection delay parameters.

5.4.3 Modifying the Runtime Parameters

To change the runtime parameters for a node, do the following steps:

1. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Definition** icon, then **Runtime Parameters** icon in the **Webmin** interface.

The following window appears:

Parameter	Value
Additional list of addresses to ping	172.16.108.108
Log Files directory	/var/barf/log
Trace File directory	/var/barf/trace
Heartbeat Mailing list	root
Heartbeat IP Port	12345
Heartbeat Warn Program	
Heartbeat period	5
Heartbeat Timeout	12
Heartbeat Repeat	1
Heartbeat Acknowledgment	10
Heartbeat Event Log Retry	5
Halt on Node Isolation	1

Figure 5-8. The Change/Show Runtime Parameters window

Additional list of addresses to ping

This address (or list of addresses) allow to determine if a node failure or a lan failure occurs. If only one physical network (a lan) exists in the configuration, it is not possible to determine if a node failure or a lan failure occurs.

If this address (or list of addresses) located on the local area network is reachable, a node failure is detected, otherwise if no address is reachable a lan failure is detected.

So, in a configuration with only one physical network (a lan), it is recommended to configure an additional address to ping and to set **Halt on Node Isolation** parameter to 1.

Log Files Directory

Name of directory where the log files are registered. Default Value: **/var/barf/log**. Modify this parameter to indicate where you want to redirect the log files.

Existing log files will not be moved to the new location.

Trace File Directory	Name of the directory where the trace files are registered. Default Value: /var/barf/trace . Modify this parameter to indicate where you want to redirect the trace files. Existing trace files will not be moved to the new location.
Heartbeat Mailing List	List of email addresses where a message is sent when a node is unreachable. Each email address is separated by a space. Default Value: root .
Heartbeat IP Port	IP port of the monitoring daemon (numbers composed of digits). Default Value: 12345 .
Heartbeat Warn Program	Full pathname of the user-defined program to be run by the daemon when a node is unreachable (full pathname composed of letters, digits and slash).
Heartbeat Period	Time (in seconds) between the sending of two Heartbeats of the monitoring Daemon (time composed of digits). The period of sending a Heartbeat will be the maximum of the Heartbeat Timeout divided by two ($\text{Heartbeat Period} < \text{Heartbeat Timeout}/2$). Default Value: 5 .
Heartbeat TimeOut	Time (in seconds) to wait for a Heartbeat from the monitoring daemon (time composed of digits). As during the wait of the acknowledgement, no Heartbeat is sent, the Heartbeat Acknowledgement must be less than the Heartbeat Timeout ($\text{Heartbeat Acknowledgement} < \text{Heartbeat Timeout}$). Default Value: 12 .
Heartbeat Repeat	Acceptable number of times that a Remote Node is being unreachable (digit). The elapsed time is equal to the Node Heartbeat Period + the Node Heartbeat Timeout + the Node Heartbeat Acknowledgement (described hereafter). Minimum and default Value: 1 .
Heartbeat Acknowledgement	Time (in seconds) to wait for an acknowledgement from the monitoring Daemon (time composed of digits). Default Value: 10 .
Heartbeat Event Log Retry	Maximal number of time to retry to: <ul style="list-style-type: none"> - record an event in the clsmc.log file. - send a mail to the administrator in case of a node failure. - send a message to the system console in case of a node failure. - execute the customized Heartbeat Warn Program script in case of a node failure. If the value is 0, the event is always retried. Default Value: 5 .
Halt on Node Isolation	Node halt can be set with this parameter. Value 0 means no halt, Value 1 means halt. Default Value: 1 . In case of node isolation detection, to avoid application activation on a takeover node though application remains active on isolated node, isolated node will halt if this parameter value is set to 1.

2. Click the **Modify** button to modify the runtime parameters; click the **Initialize** button to reset parameters to default values.
3. Click the **Return to** link at the bottom to go back.
4. To propagate these new values to the other nodes, you must synchronize the configuration (select **Application Environment** or **both** in the dialog). See *Synchronizing the Application Roll-over Facility Configuration*, on page 29 for more information.

5.5 Verifying the *Application Roll-over Facility Environment*

This section describes how to verify the *Application Roll-over Facility* environment, including the node configurations. This process ensures that all nodes agree on topology and assignment of resources.

After defining the node environment, run the verification procedure on one node to check that all nodes agree on the assignment of *Application Roll-over Facility* resources.

To verify the node configuration:

1. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Management** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Verify Configuration** screen:
3. Click the **OK** button. The `barf_chk_conf` utility is executed. The output from the verification is displayed in a separate window. If you receive error messages, make the necessary changes and run the verification procedure again.
4. Click the **Return to** link at the bottom to go back

To synchronize all nodes, see *Synchronizing the Application Roll-over Facility Configuration*, on page 29 for more information.

5.6 Synchronizing the *Application Roll-over Facility Configuration*

This section describes how to propagate the configuration on the different nodes. This process ensures that all nodes agree on topology and assignment of resources.

This operation is required at this time of configuration if it has not already been done after each following configuration step:

- Defining Nodes
 - Defining Applications
 - Configuring the Monitoring
1. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Management** icon in the **Webmin** interface.

2. Scroll the window if necessary to display the **Propagate Configuration** screen.

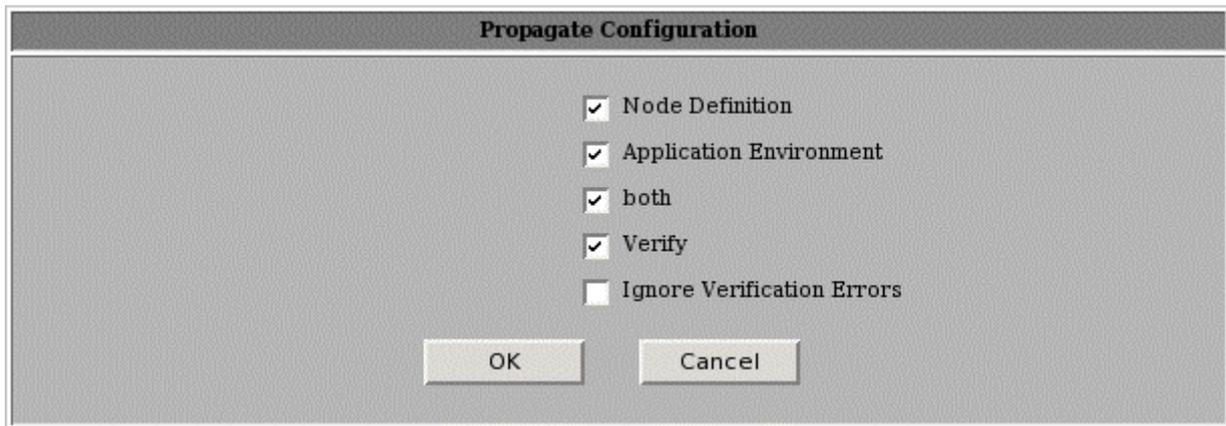


Figure 5-9. Propagate Configuration screen (Node and application definition)

Node Definition	Choose this field to make only the synchronization of the nodes definition.
Application Environment	Choose this field to make only the synchronization of the applications definition and runtime parameters.
both	Choose this field to make synchronization of the nodes and applications definition.
Verify	By default, this field is selected and the topology verification program is run. To save time in the synchronization process, do not select this field. Doing so, the verification will be skipped.
Ignore Verification Errors	By selecting this field, the result of the verification is ignored and the configuration is synchronized even if verification fails. By unselecting this field, the synchronization process terminates if errors are found; view the error messages in output window to determine the configuration problem.

3. Click the **OK** button.
4. Click the **Return to** link at the bottom to go back.

The *Application Roll-over Facility* configuration is now completed. See *Understanding Data Configuration Files* on page 59 for more information about configuration data.

Chapter 6. Maintaining an ARF Environment

This chapter describes the tasks you must perform to maintain an *Application Roll-over Facility* environment:

- *Starting and Stopping ARF Services*, on page 31
- *Node Failure*, on page 37
- *Ethernet Network Failure*, on page 39
- *Changing the ARF Topology*, on page 39
- *Changing the Application Environment*, on page 41
- *Changing the Custom Pre/Post Events*, on page 44
- *Verifying the Configuration*, on page 46.

6.1 Starting and Stopping ARF Services

Starting *Application Roll-over Facility* services means starting applications and their resources, and activating monitoring (the monitoring enables the coordination required between nodes). Starting *Application Roll-over Facility* services on a node also triggers the execution of certain *Application Roll-over Facility* scripts.

Stopping *Application Roll-over Facility* services means stopping applications and their resources, and de-activating monitoring between the nodes.

Before starting or stopping *Application Roll-over Facility* services, you must have created an *Application Roll-over Facility* configuration.

6.1.1 Activate / De-activate Monitoring Services

You can activate the monitoring even if no application is running.

To exchange heartbeats, monitoring daemons use each of the IP networks listed when configuring managed nodes.

If a disaster is diagnosed by the monitoring daemon, an appropriate alert is sent to the system administrator.

6.1.1.1 Start monitoring daemon

To activate monitoring on a node, perform the following procedure:

1. Select **ARF for Linux** icon, then **ARF Management** icon, then **Monitoring Management** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Activate Monitoring** screen.

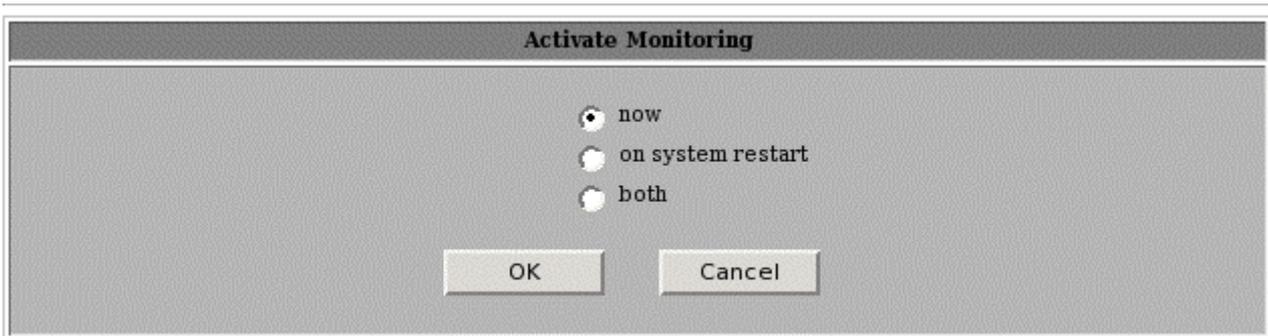


Figure 6-1. Activate Monitoring screen

- now,** If you select 'now', the monitoring daemon starts immediately but the
- on system restart** monitoring daemon will not be started after system reboot; the
- or both** **arf_monitor** service is not enable.
- If you select 'on system restart', the monitoring daemon will be started after each system reboot (the **arf_monitor** service is enable).
- If you select 'both', the monitoring daemon starts immediately and will be started after each system reboot (the **arf_monitor** service is enable).
- Note:** It is recommended to choose 'on system restart' or 'both'.

To check if the monitoring daemon is active on a node, use: `ps -e|grep clsm` or `/etc/init.d/arf_monitor status` (the result should be running)

To check if **arf_monitor** service is enable on a node, refer to *Software Release Bulletin (SRB)*.

3. Click the **OK** button.
4. Click **Return** to link at the bottom to go back.

6.1.1.2 Stop monitoring daemon

To de-activate monitoring on a node, perform the following procedure:

1. Select **ARF for Linux** icon, then **ARF Management** icon, then **Monitoring Management** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **De-Activate Monitoring** screen.



Figure 6-2. De-Activate Monitoring screen

forced or **normal** stopping mode; enables you to choose the way the monitoring is stopped. Select 'forced' when the configuration is in a critical state, in other cases select 'normal'.

3. Click the **OK** button.
4. Click **Return to** link at the bottom to go back.



Note:

If the monitoring daemon has been activated with the option 'on system restart' or 'both', the **arf_monitor** service is still enable: the monitoring daemon will be restarted at next boot time. If you want to definitively disable the **arf_monitor** service, refer to *Software Release Bulletin (SRB)*.

6.1.1.3 Re-Start monitoring daemon

To re-start monitoring on a node, perform the following procedure:

1. Select **ARF for Linux** icon, then **ARF Management** icon, then **Monitoring Management** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Re-Start Monitoring** screen.
3. Click the **OK** button.
4. Click **Return to** link at the bottom to go back.



Note: re-start monitoring means deactivate monitoring and activate monitoring.

6.1.2 Log for Monitoring

This log is an event history about the heartbeat mechanism. Its default pathname is:
/var/barf/log/clsmd.log

The structure of the event history file is as follows:

```
clsmd: date hour:minute:second year: daemon status: message text
```

For example:

```
clsmd: Wed Aug 23 10:43:13 2000: 10: node1: daemon monitoring  
node2 started.
```

The daemon status is described in *Troubleshooting*, on page 55.

To change the log file directory, use the **Change/Show Runtime Parameters** menu (see *Customizing Log and Trace Files*, on page 26).

For more information about the **clsmd.log** file, see *Understanding the Log Files*, on page 55.

6.1.3 Activate and De-Activate Applications on Nodes

As explained in Chapter *Concepts and Components Overview*, the application relocation function is to move applications from one node to another, either automatically (in case of node failure) or manually under administrator control.

You can activate the applications even if the monitoring is not running, but in this case, only the manual take-over mode is authorized.

6.1.3.1 Activate Applications

When an application is activated on a node, the file `/var/barf/ barf_activate_appli.status` is updated with the name of the application.

To activate an application and its resources on a node, perform the following procedure:

1. Select **ARF for Linux** icon, then **ARF Management** icon, then **Manage Application** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Activate Application Environment** screen.

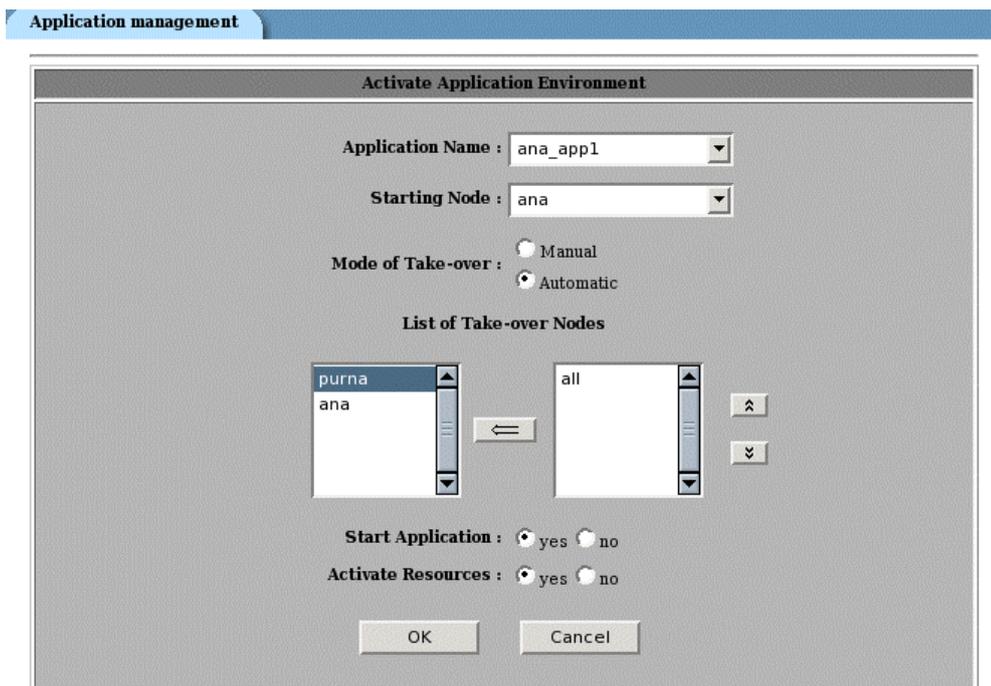


Figure 6-3. Activate Application Environment screen

Application Name	name of application you want to start.
Starting Node	node on which you want to start the application.
Mode of Take-over	mode to recover the application: either automatic or manual. Default Value: manual.

List of Take-over Nodes	<p>in case of automatic take-over mode, ordered list of nodes on which the application has to be recovered. Select items in the left list, they appear in the right list. To re-order the list of nodes in the right list, select a node and use the up and down array buttons on the right.</p> <p>If the value all is selected, the default list is the nodes list defined in the <i>Add or Change/Show Application Environment</i> menu (list of nodes on which the application can be running). It is sorted in alphabetical order.</p> <p>You can specify a list of takeover nodes only if the mode of takeover is automatic.</p>
Start Application	if yes, the starting script of the application is running.
Activate Resources	if yes, all the resources of the application (ex: addresses, file system, ...) will be up.

3. Click the **OK** button.
4. Click **Return to** link at the bottom to go back.

6.1.3.2 De-Activate Applications

You can only locally de-activate an application; it means only on the node where the application is running.

To de-activate an application on the local node, perform the following procedure:

1. Select **ARF for Linux** icon, then **ARF Management** icon, then **Manage Application** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **De-Activate Application Environment** screen.

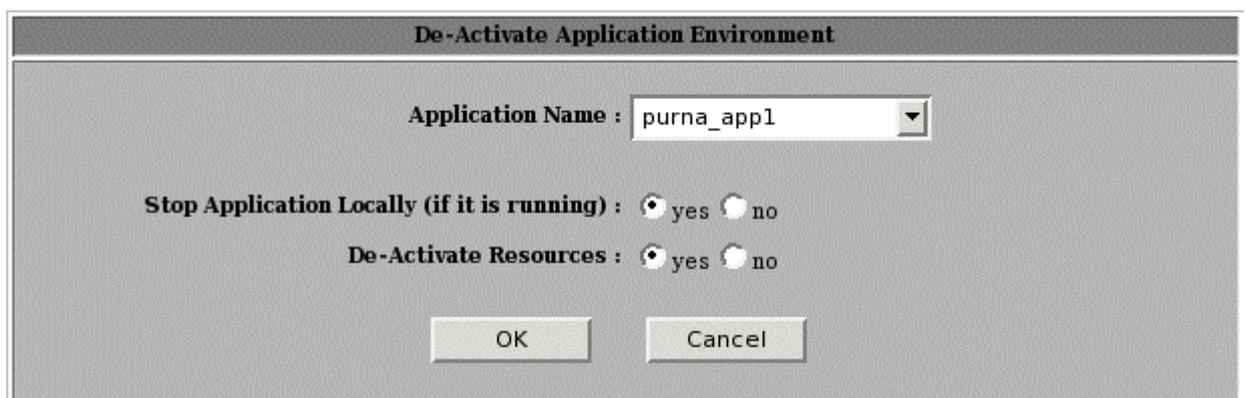


Figure 6-4. De-Activate Application Environment

Application Name	the name of application you want to stop.
Stop Application Locally (if it is running)	if yes, the stopping script of the application will be run.
De-Activate Resources	if yes, all the resources of the application (addresses, file system...) will be down.

3. Click the **OK** button.
4. Click **Return to** link at the bottom to go back.

6.1.3.3 Roll-over Applications

You can move applications from one node to another node either automatically or manually under administrator control. You can move an application to another node only from the node where the application is running.

You can only locally roll-over an application; it means only on the node where the application is running.

To roll-over an application from the node where the application is running to another node, perform the following procedure:

1. Select **ARF for Linux** icon, then **ARF Management** icon, then **Manage Application** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Roll-over Application** screen.

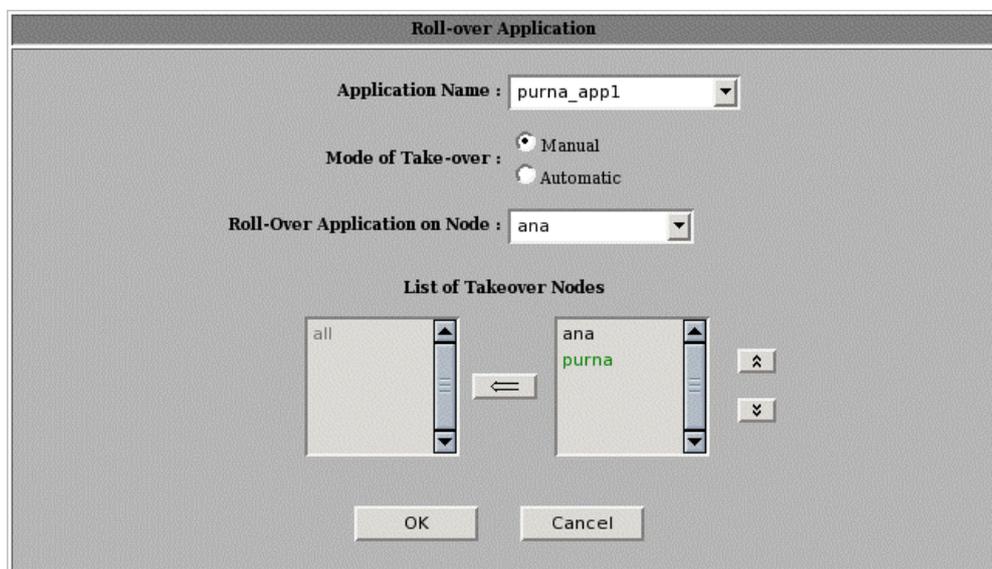


Figure 6-5. Roll-over Application screen

Application Name	The name of application you want to move to another node. Only active applications are displayed.
-------------------------	---

Mode of Take-over	Mode to restart the application: either automatic or manual. The displayed value is the mode defined when the application has been activated previously. You can select the other mode if you want.
Roll-over Application on Node	Destination node where the application will be moved.
List of Takeover Nodes	The displayed value is the takeover nodes list defined when the application has been activated previously. In addition, the node where the application is currently activated appears in green colour. You can modify this list as explained in <i>Activate Applications</i> paragraph on page 34.

3. Click the **OK** button.
4. Click **Return to** link at the bottom to go back.

6.1.4 Log and Trace Files

Each time an application is activated or deactivated, the scripts executed by *Application Roll-over Facility* log messages into log and trace files (standard text files) located by default under `/var/barf/log` and `/var/barf/trace` directories.

To change the log and trace files directory, use the **Change/Show Runtime Parameters** menu (see *Customizing Log and Trace Files*, on page 26).

For more information about the `barf.log` file and trace files, see *Understanding the Log Files*, on page 55.

6.2 Node Failure

6.2.1 Failure of Node

Let's assume that *Node1* fails:

If applications (for example *Application1*) were started specifying automatic failover mode (see how to proceed below), they will be taken over by the next node in the take-over list (*Node2*).

To activate automatic failover mode on *Application1*, run the following procedure (from any node):

1. Select **ARF for Linux** icon, then **ARF Management** icon, then **Manage Application** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Activate Application Environment** screen.
3. Complete the fields as follows:

Application Name	<i>Application 1</i>
Starting Node	<i>Node 1</i>
Mode of Take-over	<i>automatic</i>
List of Take-over Nodes	<i>Node2 Node1 (see note)</i>
Start Application	<i>yes</i>
Activate Resources	<i>yes</i>

4. Click the **OK** button.
5. Click **Return to** link at the bottom to go back.



Note: *Application 1* will fail over first to *Node2* which was specified in the ordered **List of Takeover Nodes**.

6.2.2 Node Return after Failure

Let's assume that *Node 1* is restarted (monitoring is active).

The applications normally belonging to *Node 1* (for example *Application 1*) must be **MANUALLY** stopped on *Node 2* to be re-activated on *Node 1*.

From *Node 2* run the following procedure:

1. Select **ARF for Linux** icon, then **ARF Management** icon, then **Manage Application** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Roll-over Application** screen.

Application Name	<i>Application 1</i>
Mode of Take-over	<i>automatic</i>
Roll-over Application on Node	<i>Node 1</i>
List of Takeover Nodes	<i>Node2 Node1 (see note)</i>
Stop Application Locally (if it is running)	<i>yes</i>
De-Activate Resources	<i>yes</i>

3. .Click the **OK** button.
4. Click **Return to** link at the bottom to go back.



Note: **Roll-over application on Node** value is in fact a destination node. Specifying automatic means that if destination node (*Node 1*) fails, *Application 1* will fail over to *Node 2* which was specified in the ordered **List of Takeover Nodes**.

6.3 Ethernet Network Failure

6.3.1 Failure of Ethernet Network Monitored by ARF

1. Check on each node that the monitoring is active:

```
vi /var/barf/log/clsmd.log
clsmd: Tue Jan 20 17:01:18 2004: 2: marie: 1.0.0.5: node
daemon monitoring galante: 1.0.0.20
```
2. On a node, disconnect the Ethernet cable for the network monitored by *Application Roll-over Facility*.
3. Check that the resources remain in place: FS, IP aliases and applications.
4. Check in `/var/barf/log/clsmd.log` file of each node, that the defect is registered and corresponds to the failed IP address of the network (address of the unplugged Ethernet cable) declared in *Application Roll-over Facility* configuration.

Expected results

- As an example following is an extract of the log file one of the nodes:

```
vi /var/barf/log/clsmd.log
clsmd: Thu Jan 22 10:19:48 2004: 85: marie: ERROR detected. A
network problem occurs between the local IP address 1.0.0.5
and the remote IP address 1.0.0.20
```
- Check with `ifconfig` command that the failing network corresponds to the network registered in the `/var/barf/log/clsmd.log` file.

6.3.2 Repair of Ethernet Network Monitored by ARF

Plug back the cable you previously unplugged.

The monitoring of the previously failed network will automatically start again as follows:

```
clsmd: Fri Jul 30 13:39:04 2004: 41: marie: 1.0.0.5 is receiving
again heartbeats from galante: 1.0.0.20
```

6.4 Changing the ARF Topology

Changing the topology means modifying information about the nodes of the configuration. You must propagate the configuration across all the nodes after each change.

To change the topology you must stop and restart *Application Roll-over Facility* services.

You can change the application configuration or migrate application to other nodes dynamically using **Webmin** interface.

When you configure an *Application Roll-over Facility* cluster, configuration data is stored in specific data configuration files.

These data configuration files are stored in the default configuration directory: `/etc/objrepos`.

As an *Application Roll-over Facility* system administrator, you may need to perform any of the following tasks relating to nodes:

- Adding one or more nodes
- Changing the attributes of a node
- Removing a node.

6.4.1 Adding a Node

You can add a node to an active *Application Roll-over Facility* configuration. You do not need to stop and restart *Application Roll-over Facility* services for the node to become part of the configuration.

To add a node, refer to the procedure described in *Defining Nodes*, on page 17.

6.4.2 Changing the IP Address List of a Node

You cannot change the IP address(es) of a node from an active configuration. You must first stop the *Application Roll-over Facility* services on the node; it means stopping the applications and the monitoring if they are running.

To change the IP address(es) of a node, perform the following procedure:

1. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Definition**, then **Nodes** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Change/Show a Managed Node** screen.

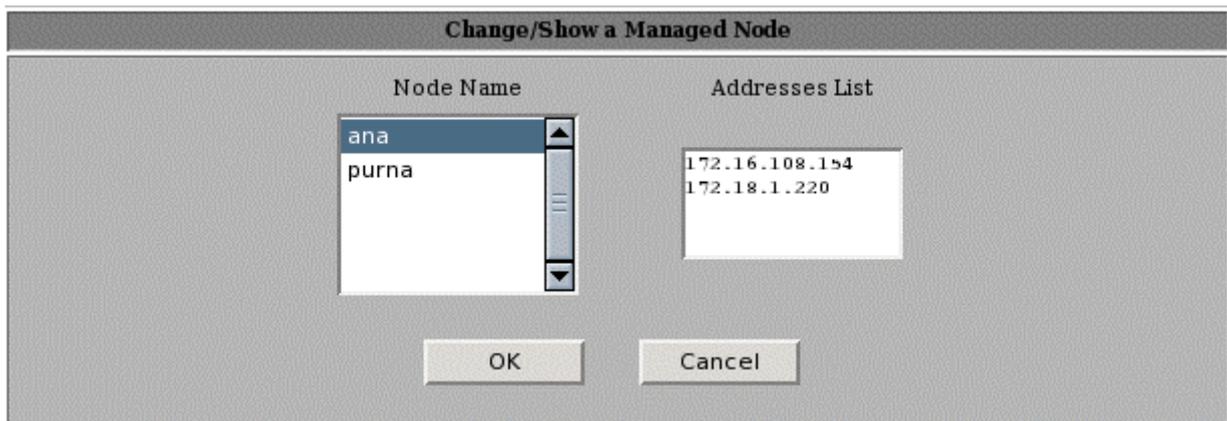


Figure 6-6. Change/Show a Managed Node

3. Select the node in the list and modify its address(es): enter the new addresses (or complete those existing) for the node in the **Addresses List** field. Then click the **OK** button to validate the new addresses.

4. After the command completes you must synchronize the topology (see *Synchronizing the Application Roll-over Facility Configuration* on page 29).

6.4.3 Removing a Node

You cannot remove a node from an active configuration. Before removing a node from the configuration, you must follow these steps:

1. Stop the *Application Roll-over Facility* services on the node to be removed. It means to stop the applications and the monitoring if they are running.
2. Remove the node from any application in which it participates. See *Changing the Application Environment*, on page 41 for more information.
3. On the local node, remove the node from the topology definition.
4. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Definition**, then **Nodes** icon in the **Webmin** interface.
5. Scroll the window if necessary to display the **Remove a Managed Node** screen.

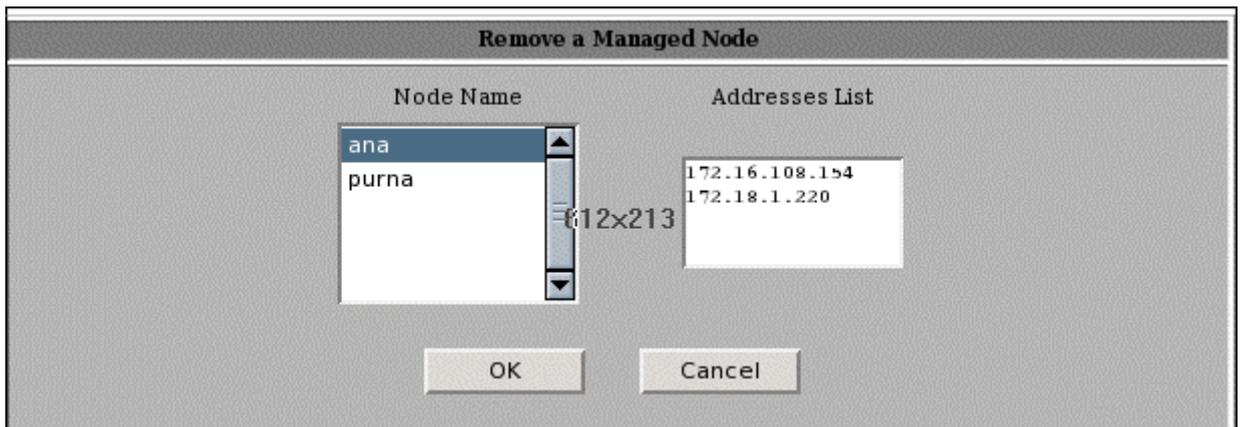


Figure 6-7. Remove a Managed Node screen

6. Select the node you want to remove in the list and click the **OK** button to remove the node from the topology definition.
7. Synchronize the topology **and** the applications (see *Synchronizing the Application Roll-over Facility Configuration* on page 29). When the synchronization completes, the node is removed from the topology definition.

6.5 Changing the Application Environment

As a system administrator, you may need to perform any of the following tasks relating to applications:

- Adding one or more application
- Changing the resources of an application
- Removing an application.

6.5.1 Adding an Application

You can add an application to an active configuration. You do not need to stop and restart *Application Roll-over Facility* services.

To add a new application refer to *Adding Applications*, on page 22. When a new application is added you must synchronize the applications (see *Synchronizing the Application Roll-over Facility Configuration* on page 29).

6.5.2 Changing an Application

You cannot make changes to a running application. You must first stop the application on the node where it is running.



Note: See *Show Applications Status*, on page 48 to know if an application is running.

Then, to change an application, perform the following steps:

1. Select ARF for Linux icon, then ARF Configuration icon, then Configuration Definition, then Applications icon in the Webmin interface.
2. Scroll the window if necessary to display the **Change/Show Application Environment** screen.

Change/Show Application Environment

Application

Application Name:

Start Command:

Stop Command:

Nodes List

Resources

Addresses list

Volume Groups List

Filesystem Device:

Filesystems List:

Filesystem Mount Point:

Events

Event Name:

Pre-event Script:

Post-event Script:

Events List

Figure 6-8. Change/Show Application Environment screen

3. Select the application you want to modify in the list: the current values of the application definition are displayed.
4. You can modify one or several values of the application: start or stop scripts, nodes list, resources. For event modification, refer to *Changing the Custom Pre/Post Events* on page 44. Click the **OK** button to validate the new values.
5. After the command completes you must synchronize the applications (see *Synchronizing the Application Roll-over Facility Configuration* on page 29).

6.5.3 Removing an Application

You cannot remove a running application. You must first stop the application on the node where it is running.



Note: See *Show Applications Status*, on page 48 to know if an application is running.

Then, take the following steps to remove an application:

1. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Definition**, then **Applications** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Remove Application Environment** screen.

The screenshot shows the 'Remove Application Environment' dialog box. It contains the following fields and values:

- Application Name:** A dropdown menu with 'alpa_app1' selected and 'mayo_app1' as an option.
- Start Command:** /home/ha/scripts_ha/start
- Stop Command:** /home/ha/scripts_ha/stopl
- Nodes List:** A dropdown menu with 'all' selected.
- Addresses list:** 172.16.108.152
- Volume Groups List:** A dropdown menu with 'alpavg1' selected.
- Filesystems List:** A dropdown menu with '/dev/alpavg1/alpavg1lv1' and '/halfs1' selected.
- Events List:** An empty dropdown menu.

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

Figure 6-9. Remove Application Environment screen

3. Select the application you want to remove in the list: the current values of the application definition are displayed.
4. Click the **OK** button to remove the application from the configuration definition.
5. After the command completes you must synchronize the configuration (see *Synchronizing the Application Roll-over Facility Configuration* on page 29).

6.5.4 Changing the Custom Pre/Post Events

As an *Application Roll-over Facility* system administrator, you may need to perform any of the following tasks relating to applications:

- Add a Custom Pre/Post-event
- Change/Show Custom Pre/Post-event

- Remove Custom Pre/Post-event.

These tasks can be done dynamically, but if an application is running the changes will be effective the next time the application will be activated.

6.5.5 Adding a Custom Pre/Post Event

You can add custom events to an active configuration. You do not need to stop and restart ARF services, but the changes will be effective the next time the application will be activated. To add a new custom event refers to *Adding Applications*, on page 22.

After the task is performed you must synchronize the topology; refer to *Synchronizing Application Roll-over Facility Configuration* on page 29.

6.5.6 Change/Show a Custom Pre/Post-event

You can only change and show the pre or post-script of an event. Take the following steps:

1. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Definition**, then **Applications** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Change/Show Application Environment** screen.
3. Select the event to modify in the list of events already customized (right list).
4. The current values of the selected event are displayed in **Pre-event Script** and **Post-event Script** fields. Modify the values of the pre and/or post-event scripts.
5. Click the **Modify Evt** button to update the list of events with the new pre- and post-event scripts (right list).
6. You can add a new event to the list: select the event name and fill the **Pre-** and **Post-event Scripts** fields. Click the **Add Evt** button to add the new event to the event list.
7. Click the **OK** button to take into account the new and modified custom pre-events and/or post-events for the application.
8. After the command completes you must synchronize the applications (see *Synchronizing the Application Roll-over Facility Configuration* on page 29).



Note: Synchronizing does not propagate the actual new or changed scripts; you must add these to each node manually.

6.5.7 Remove a Custom Event

You can remove a custom event dynamically, but the changes will be effective the next time the application will be activated.

Take the following steps to remove a custom event:

1. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Definition**, then **Applications** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Change/Show Application Environment** screen.
3. Select the event to remove in the list of events already customized (right list) and click the **Remove Evt** button.
4. Click the **OK** button to remove the custom pre-event and/or post-event for the application.
5. After the command completes you must synchronize the applications (see *Synchronizing the Application Roll-over Facility Configuration* on page 29).

6.6 Verifying the Configuration

Verifying the configuration assures you that all resources used by *Application Roll-over Facility* are validly configured, and that ownership and takeover of those resources are defined and in agreement across all nodes. You should verify the configuration after making changes to a node.

Refer to *Verifying the Application Roll-over Facility Environment*, on page 29.

6.7 Removing the Configuration

You must first:

- Stop all the applications on all the nodes where these applications are running.
- Stop the Monitoring daemon on all the nodes.

To remove the Configuration, perform the following procedure:

1. Select **ARF for Linux** icon, the **ARF Configuration**, then **ARF Configuration Management** icon, in the **Webmin** interface.
2. Scroll the window if necessary to display the **Remove Configuration** screen.
3. Click the **OK** button.
4. Click the **Return to** link at the bottom to go back.



Note:

The Configuration is removed on all the nodes, so it is not necessary to propagate the modifications on all the nodes.

Chapter 7. Viewing the Configuration

This chapter describes the tasks that enable the administrator to view the configuration:

- *Displaying configuration*, on page 47
- *Showing applications status*, on page 48
- *Showing monitoring status*, on page 49.

7.1 Displaying Configuration

To view the configuration, perform the following procedure :

1. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Management** icon, in the **Webmin** interface.
2. Scroll the window if necessary to display the **Display Configuration** screen.

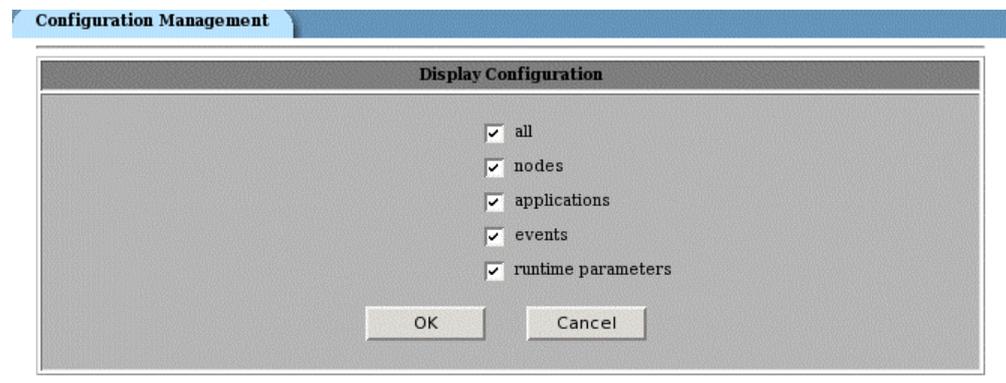


Figure 7-1. Display Configuration screen

This screen allows you to choose the type of information: enables you to choose which view of the cluster you want to see. Select one of these options:

all	to display complete information about the configuration including the nodes, their IP address, the applications, the runtime parameters and the events.
nodes	to display the name of all the machines included in the configuration and their IP addresses.
applications	to display information about the different applications included in the configuration.
events	to display information about the different custom events configured.
runtime parameters	to display information about the runtime parameters.

3. Click the **OK** button.
4. Click the **Return to** link at the bottom to go back.

7.2 Showing Applications Status

To display the status of the different applications, perform the following procedure :

1. Select **ARF for Linux** icon, then **ARF Management** icon, then **Manage Application** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Show Application Status** screen.

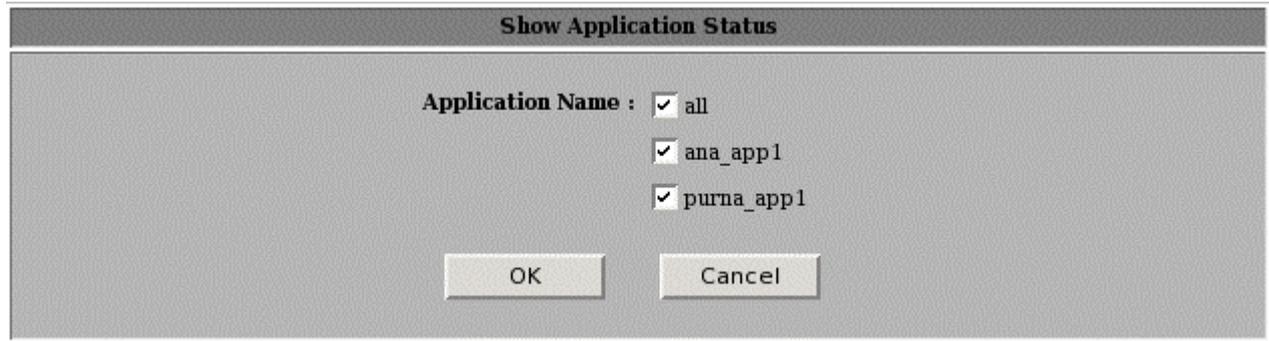


Figure 7-2. Show Application Status screen

Application Name select **all** or the name of one or more applications.

3. Click the **OK** button. The following information is displayed:
 - **Application State:** its name, if it is running or not, on which node it runs, the take-over mode and the list of take-over nodes.
 - **Application Resources:** IP address(es), name and status (mounted or not) of file systems.

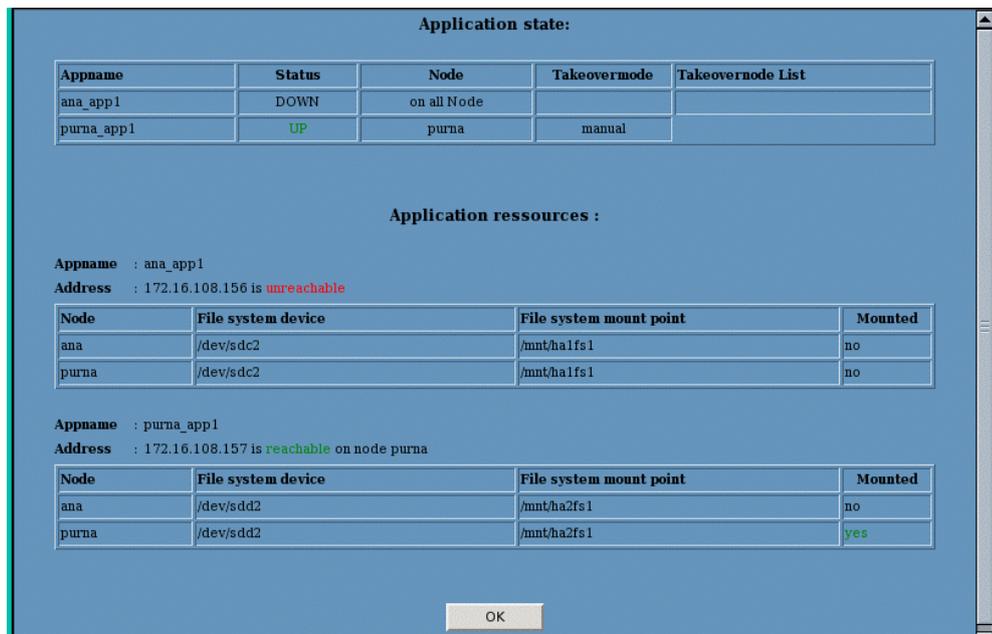


Figure 7-3. Application status example

7.3 Showing Monitoring Status

To know if the monitoring daemon is running or not, perform the following procedure:

1. Select **ARF for Linux** icon, then **ARF Management** icon, then **Monitoring management** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Show Monitoring Status** screen.
3. Click the **OK** button: the status of the monitoring daemon (active or inactive) is displayed.
4. Click the **Return to** link at the bottom to go back.

Chapter 8. Saving and Restoring Configurations

This chapter explains how to use the **snapshot** utility to save and restore *Application Roll-over Facility* configurations.

8.1 Overview

When a topology and resources configuration is completed, you can save it. This configuration can later be restored if necessary.

The **snapshot** utility saves in a file a record of all the data that define a particular configuration. This facility enables you to recreate a configuration (using a process called **Apply a Snapshot**), assuming that the nodes have the requisite hardware and software to support this configuration.

Because the snapshots are simple ASCII files that can be sent via e-mail, they can make remote problem determination easier.

8.1.1 Information Saved in a Snapshot

The primary information saved in a snapshot is the data stored in the *Application Roll-over Facility* data configuration files. This is the information useful to recreate the configuration when a snapshot is applied.

The snapshot does not save the following items:

- any user-customized scripts
- applications or other non-*Application Roll-over Facility* configuration parameters
- any device- or configuration-specific data which is outside the scope of *Application Roll-over Facility*
- the Remote Power Management configuration (**BARFrpm** file), which is specific for each node.

For example, the name of an application and the location of its start and stop scripts are stored in the **BARFapp** data configuration file. This file is saved in the snapshot but, the scripts themselves as well as any application they call are not saved.

8.1.2 Format of a Snapshot

The *Application Roll-over Facility* snapshot utility stores the data in the `/usr/sbin/barf/snap` directory, in the two following files (where `snap_xxx` is a name chosen by the user):

snap_xxx.odm This file contains all the data stored in the *Application Roll-over Facility* data configuration files. Because the data configuration information must be largely the same on every node, the snapshot saves the values from one node only. Refer to *Snapshot Data File*, on page 59 for more information.

snap_xxx.info This file contains the output from standard LINUX and *Application Roll-over Facility* system management commands.

8.2 Creating a Snapshot

You can initiate snapshot creation from any node. You can create a snapshot on a running node, and you can create multiple snapshots. The snapshot facility retrieves information from each node. Accessibility to all nodes is required.

Because of the large amount of data which must be retrieved when creating the snapshot, the time and memory consumed may be substantial, especially when the number of nodes is high. The snapshot files typically require approximately 5 Kb per node.

To create a cluster snapshot perform the following steps:

1. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Management** icon in the **Webmin** interface.
2. Scroll the window if necessary to display the **Snapshot** screen (Create a Snapshot area).

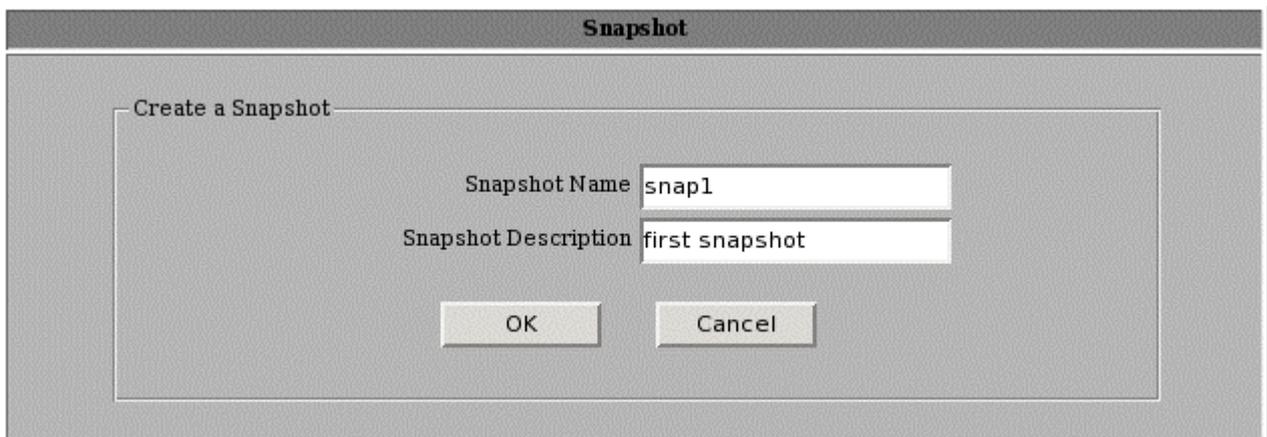


Figure 8-1. Create a Snapshot screen

Snapshot Name Enter the name you want for the basename for the snapshot files. The directory path for storage and retrieval of the snapshot is **/usr/sbin/barf/snap**. You cannot create a snapshot using an existing snapshot file name.

Snapshot Description Enter any descriptive text you want inserted into the snapshot. You can specify any text string up to 255 characters in length.

3. Click the **OK** button.
4. Click the **Return to** link at the bottom to go back.

8.3 Applying an Application Roll-over Facility Snapshot

Applying an *Application Roll-over Facility* snapshot overwrites the data in the existing data configuration files on all nodes with the new data contained in the snapshot. You can apply a snapshot from any node. Applying a snapshot may affect both LINUX and *Application Roll-over Facility* data configuration and system files, as well as user-defined files.

To apply a cluster snapshot, perform the following steps.

1. Select **ARF for Linux** icon, then **ARF Configuration** icon, then **Configuration Management** icon in the **Webmin** interface.
2. Scroll the window until the **Snapshot** screen displays (**Apply a Snapshot** area).

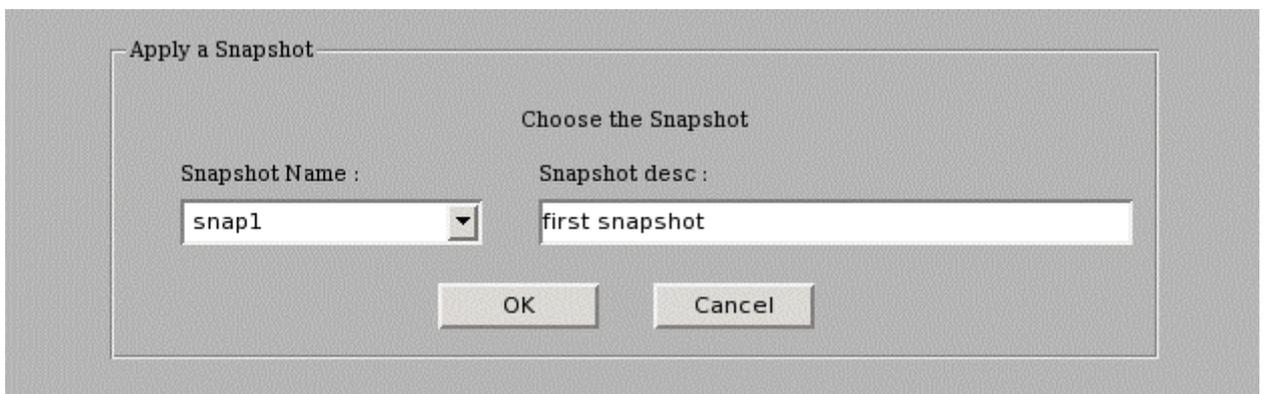


Figure 8-2. Apply a Snapshot screen

Snapshot Name Select in the list the snapshot that you want to apply. The list contains all the snapshots that exist in the `/usr/sbin/barf/snap` directory.

Snapshot Description Informational field indicating snapshot description.

3. Click the **OK** button.
4. Click the **Return to** link at the bottom to go back.

Undoing an Applied Snapshot

Before the new configuration is applied, the snapshot facility saves the current configuration in a file called `~barf_snap.n.odm`, where `n` is either 1, 2, or 3. The saved snapshots are cycled so that only three generations of snapshots exist. If the apply process fails, you can re-apply the previous configuration. These saved snapshots are stored in the `/usr/sbin/barf/snap` directory.

Removing a snapshot deletes both of the ASCII files that define the snapshot from the snapshots directory (`/usr/sbin/barf/snap`). You must remove the two files manually by using the following commands:

```
rm /usr/sbin/barf/snap/snap_file.odm
rm /usr/sbin/barf/snap/snap_file.info
```

Chapter 9. Troubleshooting

This chapter describes the different tools that help you to diagnose configuration problems.

9.1 Understanding the log Files

Your first approach to diagnose a problem affecting a configuration should be to search for messages output by the *Application Roll-over facility* subsystems in the *Application Roll-over facility* log files. These messages can provide invaluable information toward understanding the current state of an application.

The following sections describe the types of messages output by the *Application Roll-over facility* software and the log files into which the system writes these messages.

To change the log files to another destination, refer to the section *Customizing Log and Trace Files*, on page 26. Log and Trace destination directories changes will take effect when you synchronize configuration and the next time *Application Roll-over facility* services are restarted.



Note:

Existing log and trace files will not be moved to the new location.

9.1.1 The barf.log File

The `/var/barf/log/barf.log` file is a standard text file. When checking this file, first find the most recent error message associated with your problem. Then read back through the log file to the first message relating to that problem. Many error messages cascade from an initial error that usually indicates the problem source.

When scripts start, complete, or encounter error conditions, the *Application Roll-over facility* software generates a message. For example, the following fragment from the log file illustrates the start and completion messages for several *Application Roll-over facility* scripts. The messages include any parameters passed to the script.

```
Fri Oct 7 10:44:04 CEST 2005: purna_app1: STARTING EXEC of
barf_activate_resource purna_app1
Fri Oct 7 10:44:05 CEST 2005: purna_app1: STARTING EXEC of barf_mount_fs
purna_app1 /dev/sdc2:/mnt/halfs1
Fri Oct 7 10:44:05 CEST 2005: purna_app1: SUCCESSFULL EXEC of
barf_mount_fs
SUCCESSFULL EXEC of purna_app1
SUCCESSFULL EXEC of /dev/sdc2:/mnt/halfs1
Fri Oct 7 10:44:05 CEST 2005: purna_app1: STARTING EXEC of
barf_config_alias purna_app1 172.16.108.157
Fri Oct 7 10:44:05 CEST 2005: purna_app1: INFO: check if alias
172.16.108.157 is already configured ...
Fri Oct 7 10:44:09 CEST 2005: purna_app1: INFO: configure address alias
172.16.108.157 on network interface eth0.
```

```

Fri Oct 7 10:44:10 CEST 2005: purna_app1: SUCCESSFULL EXEC of
barf_config_alias
SUCCESSFULL EXEC of purna_app1
SUCCESSFULL EXEC of 172.16.108.157
Fri Oct 7 10:44:10 CEST 2005: purna_app1: SUCCESSFULL EXEC of
barf_activate_resource
SUCCESSFULL EXEC of purna_app1
Fri Oct 7 10:44:10 CEST 2005: purna_app1: STARTING EXEC of
barf_start_appli -n purna_app1 -t manual -T 'ana,purna'
Fri Oct 7 10:44:10 CEST 2005: purna_app1: INFO: check if application
purna_app1 is already started on remote node ana ...
Fri Oct 7 10:44:10 CEST 2005: purna_app1: STARTING EXEC of
barf_launch_appli purna_app1 manual 'ana,purna'
Fri Oct 7 10:44:10 CEST 2005: purna_app1: SUCCESSFULL LAUNCH of
barf_launch_appli in background
SUCCESSFULL LAUNCH of purna_app1 in background
SUCCESSFULL LAUNCH of manual in background
SUCCESSFULL LAUNCH of 'ana,purna' in background
Fri Oct 7 10:44:11 CEST 2005: purna_app1: STARTING EXEC of
/tmp/start_appli
Fri Oct 7 10:44:11 CEST 2005: purna_app1: SUCCESSFULL LAUNCH of
/tmp/start_appli in background
Fri Oct 7 10:44:11 CEST 2005: purna_app1: STARTING EXEC of
barf_sync_class BARFsync set purna_app1
Fri Oct 7 10:44:11 CEST 2005: purna_app1: The local synchronization lock
for node purna and application purna_app1 has been successfully set!
Fri Oct 7 10:44:11 CEST 2005: purna_app1: INFO: Synchronizing BARFsync
set class on all available nodes.
Fri Oct 7 10:44:11 CEST 2005: purna_app1: INFO: Synchronization of
BARFsync class successfully done on all available nodes.
.....

```

9.1.2 The Trace Files

In addition to the start, completion, and error messages generated by scripts, the *Application Roll-over facility* software generates a detailed report of each step of script processing. In verbose mode, which is the default, the shell generates a message for each command executed in the script, including the values of all arguments to these commands.

This file is created in the directory `/var/barf/trace` and its name is composed of the name of the application and the date/hour of the operation. Example:

```
appli_name.trace.MMDDYY_HHMMSS
```



Note:

This trace corresponds to operation executed on the node itself. For example, in case of application moving from one node to another node, de-activation is traced on one node, re-activation is traced on the other node.

The following fragment from a trace file illustrates the verbose output of the start application script:

```
Fri Oct 7 10:44:04 CEST 2005: STARTING EXEC of barf_activate_resource
purna_appl

[9] . /usr/sbin/barf/lib/barf_lib

[6]
PATH=/bin:/usr/bin:/sbin:/usr/sbin:/usr/local/bin:/usr/sbin/barf/Utils/:
/usr/sbin/barf/bin:/usr/sbin/barf/Utils:/usr/sbin/barf/bin:/usr/sbin/barf/Utils:/usr/sbin/barf/Utils/

[1] basename /usr/sbin/barf/bin/barf_activate_resource

[8] PROG=barf_activate_resource

barf_activate_resource[9] export 'PS4=$PROG[$LINENO] '

barf_activate_resource[9] PS4=$PROG[$LINENO]

barf_activate_resource[12] typeset -r PATH_BARF_BIN=/usr/sbin/barf/bin

barf_activate_resource[13] typeset -r PATH_BARF_LIB=/usr/sbin/barf/lib

barf_activate_resource[14] typeset -r
PATH_BARF_UTILS=/usr/sbin/barf/Utils

barf_activate_resource[15] typeset -r PATH_BARF_DATA=/usr/sbin/barf/data

barf_activate_resource[16] typeset -r
FILE_BARF_STATUS=/var/barf/barf_activate_appli.status

barf_activate_resource[1] basename
/usr/sbin/barf/bin/barf_activate_resource

barf_activate_resource[11] PROGRAM=barf_activate_resource

barf_activate_resource[12] ODMDIR=/etc/objrepos

barf_activate_resource[13]
PATH=/bin:/usr/bin:/sbin:/usr/sbin:/usr/local/bin:

/usr/sbin/barf/Utils:/usr/sbin/barf/bin:/usr/sbin/barf/Utils:/usr/sbin/
barf/bin:/usr/sbin/barf/Utils:/usr/sbin/barf/Utils:/usr/sbin/barf/bin:/u
sr/sbin/barf/Utils

barf_activate_resource[14] APP=purna_appl

.....
```

9.1.3 The clsmd.log File

When the *Application Roll-over facility* monitoring is started, stopped or when its state changes, it generates messages. These messages can be informational, such as a warning message, or they can report a fatal error.

The structure of the event history file is as follows:

```
clsmd: date hour:minute:second year: daemon status: message text
```

The following example illustrates heartbeat messages output by the heartbeat daemon.

```
clsmd: Thu Sep 29 12:29:38 2005: 0: purna: 172.18.1.221: daemon
monitoring ana:172.18.1.220 started.
```

```
clsmd: Thu Sep 29 12:29:38 2005: 1: purna: 172.18.1.221: node daemon on
standby: waiting for heartbeats from ana: 172.18.1.220.
```

```
clsmd: Thu Sep 29 12:29:43 2005: 0: purna: 172.16.108.155: daemon
monitoring ana: 172.16.108.154 started.
```

```

clsmd: Thu Sep 29 12:29:43 2005: 1: purna: 172.16.108.155: node daemon on
standby: waiting for heartbeats from ana: 172.16.108.154.

clsmd: Thu Sep 29 12:29:49 2005: 22: purna: 172.16.108.155: Node ana:
172.16.108.154 ready.

clsmd: Thu Sep 29 12:29:49 2005: 2: purna: 172.16.108.155: node daemon
monitoring ana: 172.16.108.154.

clsmd: Thu Sep 29 12:29:51 2005: 22: purna: 172.18.1.221: Node ana:
172.18.1.220 ready.

clsmd: Thu Sep 29 12:29:51 2005: 2: purna: 172.18.1.221: node daemon
monitoring ana: 172.18.1.220.

clsmd: Thu Sep 29 12:31:17 2005: 85: purna: ERROR detected. A network
problem occurs on node: ana between the local IP address 172.18.1.221 and
the remote IP address 172.18.1.220.

clsmd: Thu Sep 29 12:31:17 2005: 80: purna: node ana unreachable.

.....

```

9.1.4 The mail Message

When the Monitoring daemon detects a node failure it sends a mail to the administrator according to the **Heartbeat Mailing list** declared in the runtime parameters.

The following example illustrates the mail message:

```

Message 1:
From root@purna.site Thu Sep 29 14:22:34 2005
X-Original-To: root
Delivered-To: root@purna.site
Date: Thu, 29 Sep 2005 14:22:34 +0200
To: root@purna.site
Subject: CAUTION: DISASTER DETECTED
User-Agent: nail 10.6 11/15/03
MIME-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
From: root@purna.site (root)

```

9.1.5 The Console System Message

When the Monitoring daemon detects a node failure it sends a message to the system console.

The following example illustrates the system console message:

```

CAUTION: DISASTER DETECTED!
clsmd: Thu Oct 10 11:05:45 2005: 84: purna: 172.16.108.155 ERROR
detected. The node ana: 172.16.108.154 is failed.

```

9.2 Understanding Data Configuration Files

The *Application Roll-over facility* configuration is saved in the following data configuration files under `/etc/objrepos` directory:

BARFtopo	Node information including names of participating nodes, and addresses list corresponding to each node.
BARFapp	Application information including names, and the depending resources.
BARFevent	Event information including the name, description, and names of pre- and post-processing scripts.
BARFrtmp	Runtime information including logs and heartbeat parameters.
BARFservice	Service information including the value of the Inactive takeover attribute.
BARFlogs	Log information including trace file for each operation on an application.
BARFactiveapp	Active Application information including names, list of take-over nodes and current node on which the application is currently running.
BARFsync	Synchronization information.
BARFrpm	Remote Power Management information (if this feature is used).

You can use the following command to check the contents of the configuration files:

```
/usr/sbin/barf/utills/odmget BARF<xxx> (where BARF<xxx> is the name of a configuration file)
```

9.2.1 Snapshot Data File

The snapshot data file suffixed by `.odm` is an ASCII text file divided into three delimited sections:

Version section	This section identifies the version of the cluster snapshot. The characters <code><VER</code> and <code></VER</code> delimit this section. The version number is set by the snapshot software.
Description section	This section contains user-defined text that describes the cluster snapshot. You can specify up to 255 characters of descriptive text. The characters <code><DSC</code> and <code></DSC</code> delimit this section.
Data section	This section contains the ARF configuration data. The characters <code><ODM</code> and <code></ODM</code> delimit this section.

The following is an extract from a sample snapshot data file.

```

<VERSION
1.0
</VERSION

<DESC
first snapshot
</DESC

<ODM
BARFtopo:
nodename = "purna"
nodeaddr = "172.16.108.155"

nodename = "ana"
nodeaddr = "172.16.108.154"

EndBARFtopo:
BARFrtmp:
parname = "address"
parvalue = "172.16.108.108"

parname = "logdir"
parvalue = "/var/barf/log"

.....

.....
</ODM

```

9.3 Daemon Status for Monitoring

Following are the different daemon status that can be displayed when you run the monitoring daemon:

Status number	Message name	Message text	Comment
0	Node started	<local node>: daemon monitoring <remote node> started.	The monitoring node daemon is started on the local node.
1	Node standby mode	<local node>: node daemon on standby: waiting for heartbeats from <remote node>.	The monitoring node daemon is waiting for heartbeats from the other remote nodes to begin the monitoring.
2	Node normal mode	<local node>: node daemon monitoring <remote node>.	The local node daemon is monitoring the remote node.
4	Node stopped	<local node>: node daemon monitoring <remote node> stopped.	The monitoring daemon running on the node has been stopped.
20	Monitoring begins	<local node> monitored by <remote node>.	The node is monitored by a daemon on the remote node.
21	Local node ready	<local node>: local node ready.	The monitoring daemon has been started on the local node.
22	Remote node ready	Node on <remote node> ready.	The daemon on the remote node is started.
24	No more monitoring	<local node> no more monitored by <remote node>.	The daemon on the other node is stopped.
33	Forced stop successful	<local node>: stop successful. Warning: <remote node> was not informed.	The daemon has been stopped but the daemon on the remote node does not know it.

34	Stop operation canceled	<local node>: stop operation canceled because <remote node> is unreachable.	The daemon to be stopped cannot contact the daemon on the remote node.
40	No more heartbeat	<local node>: no more heartbeat received from <remote node>.	The two nodes were exchanging heartbeats. A heartbeat timeout occurred because no more heartbeat was received.
41	Heartbeat received	<local node> is receiving again heartbeats from <remote node>.	After a heartbeat timeout has occurred, the heartbeats are received again.
50	LAN failure. Node isolated	<local node>: LAN failure. The node is isolated, no network is reachable.	The node daemon cannot ping any other host.
80	Remote node unreachable	<local node>: node on <remote node> unreachable.	The monitoring daemon on the node cannot communicate with the daemon running on the remote node.
84	Node failed	<local node>: ERROR detected. The node <remote node> is failed	A node failure has been diagnosed: the monitoring daemon on the remote node has been unreachable by network too many times.
85	Network Problem	<local node>: ERROR detected. The node <remote node> is unreachable. A network problem occurs between the local IP address and the remote IP address.	A network problem has been diagnosed.
86	Local IP Address Failed	<local node>: ERROR detected. The node <remote node> is unreachable from the local IP address. This address is failed.	A Local IP Address Failed has been diagnosed.
87	Daemon no more running	<local node>: ERROR detected. The monitoring node daemon is no more running on node <remote node>.	The Monitoring Node Daemon is no more running.
88	Local network unreachable	<local node>: ERROR detected. A network problem occurs on the local node. The network from the local IP address is unreachable.	A local network problem has been diagnosed.

Table 9-1. Daemon Monitoring Status

Chapter 10. Defining Shared LVM Components or File Systems

This chapter describes how to define the LVM (Logical Volume Management) components or File Systems shared by the nodes in an *Application Roll-over Facility* configuration.

LVM is the Logical Volume Management for the Linux operating system.

Logical volume management provides a higher-level view of the disk storage on a computer system than the traditional view of disks and partitions. This gives the system administrator much more flexibility in allocating storage to applications and users.

After shared disk storage hardware has been setup, you can either configure the LVM or define File Systems without configuring the LVM.

10.1 SCSI Reservation

The SCSI-reservation feature is used to protect disk data accesses and is based on SCSI-3 (so-called “persistent”) reservation functions of the SCSI protocol.

The Multipathing feature is needed by the SCSI-reservation feature.

To install the Multipathing feature, please refer to *Storeway Multipath for Linux User’s Guide*, available on *Storeway Multipath for Linux* CD.

10.2 Configuring the Logical Volume Management

Creating the physical volumes, volume groups, logical volumes, and file systems shared by the nodes in an *Application Roll-over Facility* configuration requires that you perform some steps on one node of the cluster.

10.2.1 Configure the Logical Volume Management

1. Click the **ARF for Linux** icon in the Webmin interface. The following window appears:

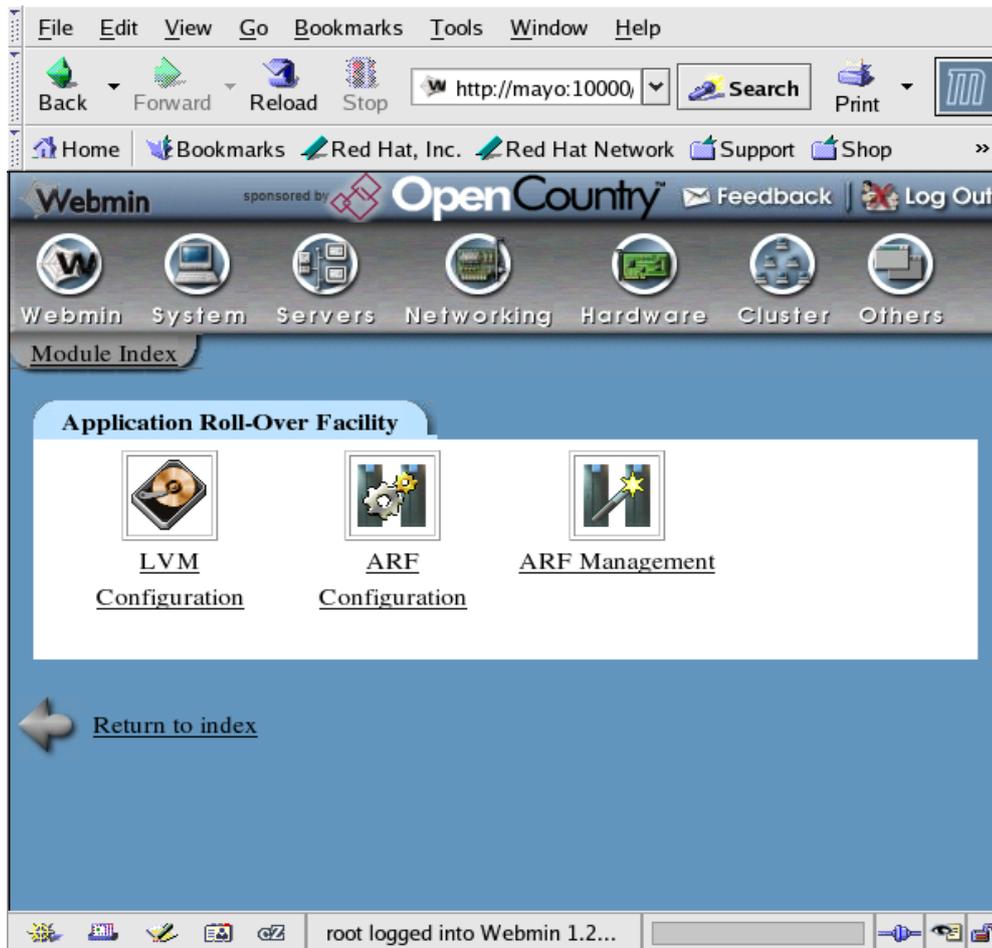


Figure 10-1. Application Roll-over Facility window

2. Select the LVM Configuration icon. The following window appears:

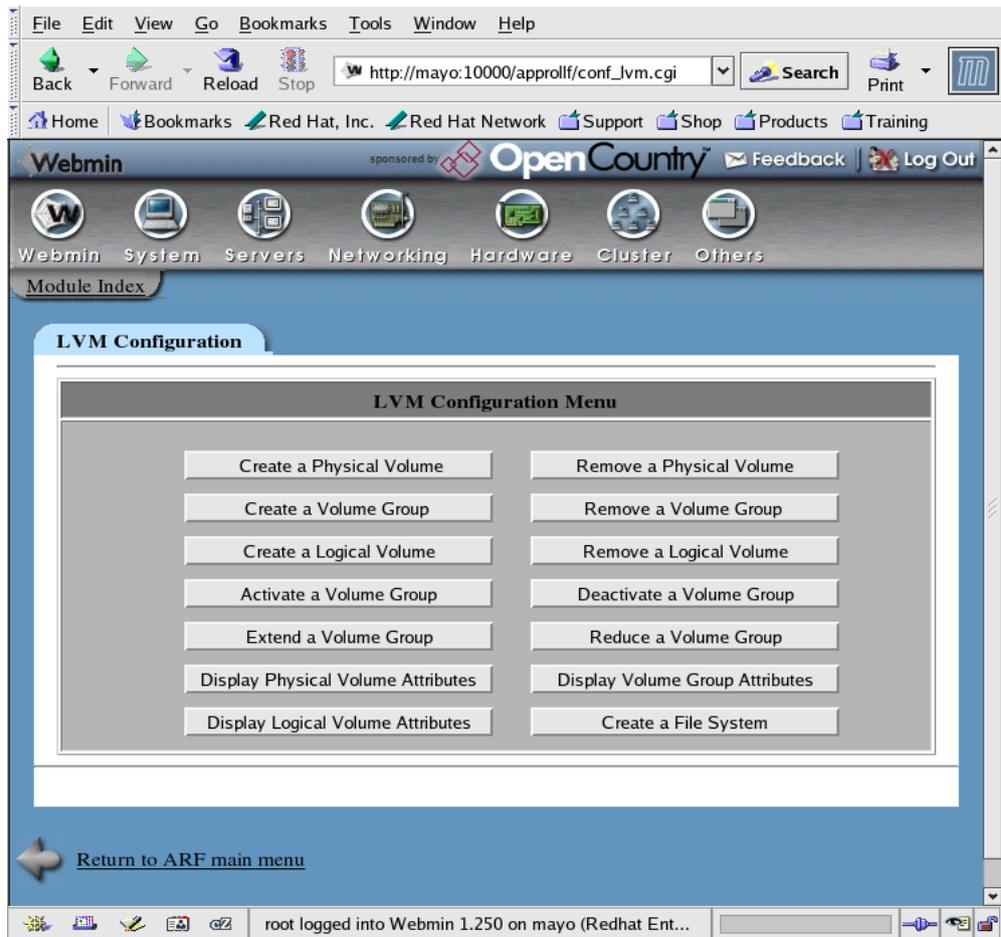


Figure 10-2. LVM Configuration Menu .

10.2.2 Create a Physical Volume

Initializes a disk for use by LVM.

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Create a Physical Volume** button. The following window appears:

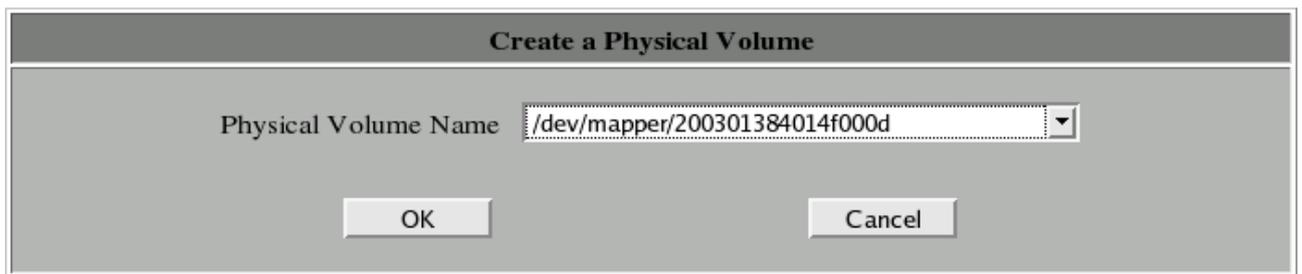


Figure 10-3. Create a Physical Volume screen.

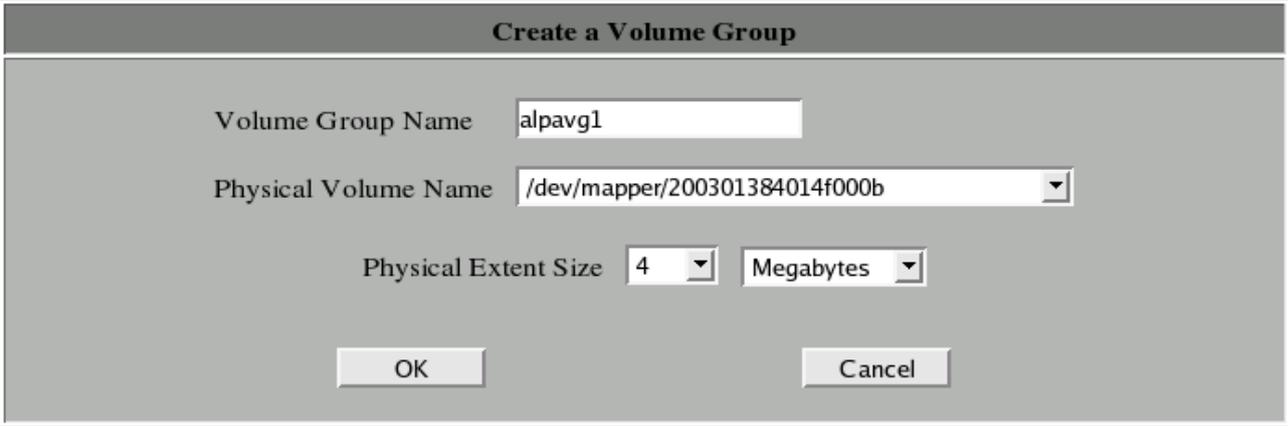
3. Select the Physical Volume Name that you want to create.
4. Click the **OK** button

5. Click **Return to** link at the bottom to go back.

10.2.3 Create a Volume Group

Creates a new volume group using the block special device (Physical Volume) previously configured for LVM.

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the: **Create a Volume Group** button. The following window appears:



The screenshot shows a dialog box titled "Create a Volume Group". It has three main input fields: "Volume Group Name" with the text "alpavg1", "Physical Volume Name" with a dropdown menu showing "/dev/mapper/200301384014f000b", and "Physical Extent Size" with a dropdown menu showing "4" and a unit dropdown menu showing "Megabytes". At the bottom are "OK" and "Cancel" buttons.

Figure 10-4. Create a Volume group screen.

- | | |
|-----------------------------|---|
| Volume Group Name | Enter an ASCII text string that refers the volume group. This name can include alphabetic and numeric characters and underscores. Use a maximum of 31 characters. |
| Physical Volume Name | Select the Physical Volume Name on which the volume group will be created. |
| Physical Extent Size | Sets the physical extent size on a physical volume of this volume group. Values can be from 8 Kilobytes to 16 Gigabytes in powers of 2. The default value is 4 Megabytes. |

3. Click the **OK** button.
4. Click **Return to** link at the bottom to go back.

10.2.4 Create a Logical Volume

Creates a new logical volume in an existing volume group by allocating logical extents from the free physical extent pool of that volume group.

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Create a Logical Volume** button. The following window appears:

Figure 10-5. Create a Logical Volume screen.

- Logical Volume Name** Enter an ASCII text string that refers to the logical volume. This name can include alphabetic and numeric characters and underscores. Use a maximum of 31 characters.
- Volume Group Name** Select the Volume Group Name in which the logical volume will be created.
- Access Permissions** Set access permissions to read only or read and write. Default is Read and Write.
- Maximum Free Physical Extents** Gives the maximum number of extents to allocate for the new logical volume.
- Maximum Free Physical Size** Gives the maximum size to allocate for the new logical volume.
- Logical Volume Size** Enter either the size or the number of extents that you want to allocate to the new logical volume.

3. Click the **OK** button.
4. Click **Return to link** at the bottom to go back.

10.2.5 Create a File System

Builds a Linux file system on a device.

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Create a File System** button. The following window appears:

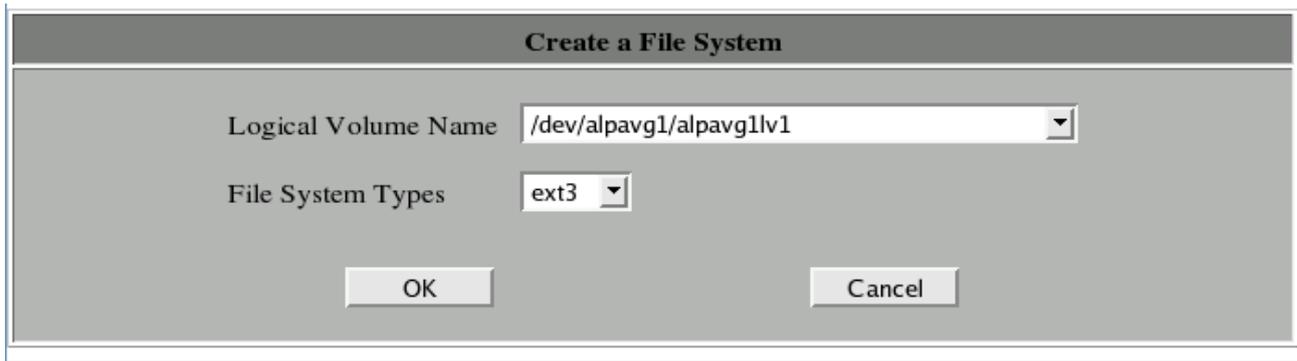


Figure 10-6. Create a File System screen.

Logical Volume Name Select the Logical Volume Name on which you want to create the file system.

File System Types Select the type of file system that you want to create. Default value is ext3.

3. Click the **OK** button.
4. Click **Return to** link at the bottom to go back.

10.2.6 Verifying the File System

To run a consistency check on each file system information:

1. Enter:
`fsck <logical volume name>`
 For example:
`fsck /dev/alphavg1/alphavg1lv1`
2. Verify that you can mount the file system by entering:
`mount <logical volume name> <File system mount point>`
 For example:
`mount /dev/alphavg1/alphavg1lv1 /ha1fs1`
3. Verify that you can unmount the file system by entering :
`umount <logical volume name>`
 For example:
`umount /dev/alphavg1/alphavg1lv1`

10.2.7 Deactivate a Volume Group

Allows you to deactivate a Volume Group.

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Deactivate a Volume Group** button. The following window appears:

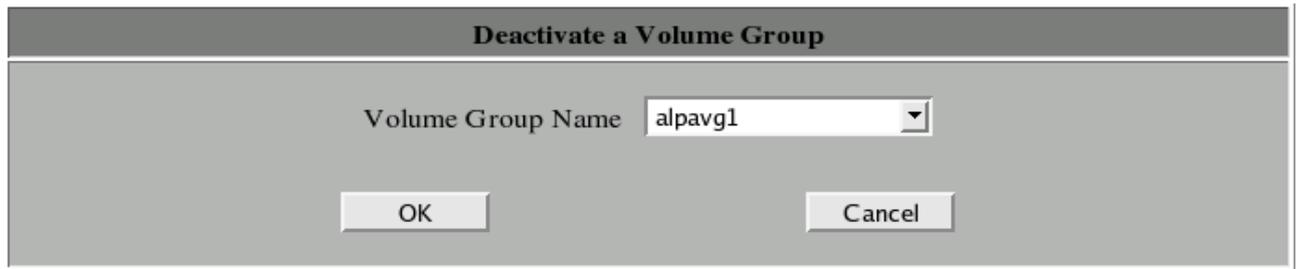


Figure 10-7. Deactivate a Volume Group screen

Volume Group Name Select the Volume Group Name that you want to deactivate.

3. Click the **OK** button.
4. Click **Return to** link at the bottom to go back.

10.2.8 Display Logical Volume Attributes

Allows you to see the attributes of a logical volume like size, read/write status, etc.

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Display Logical Volume Attributes** button. The following window appears:

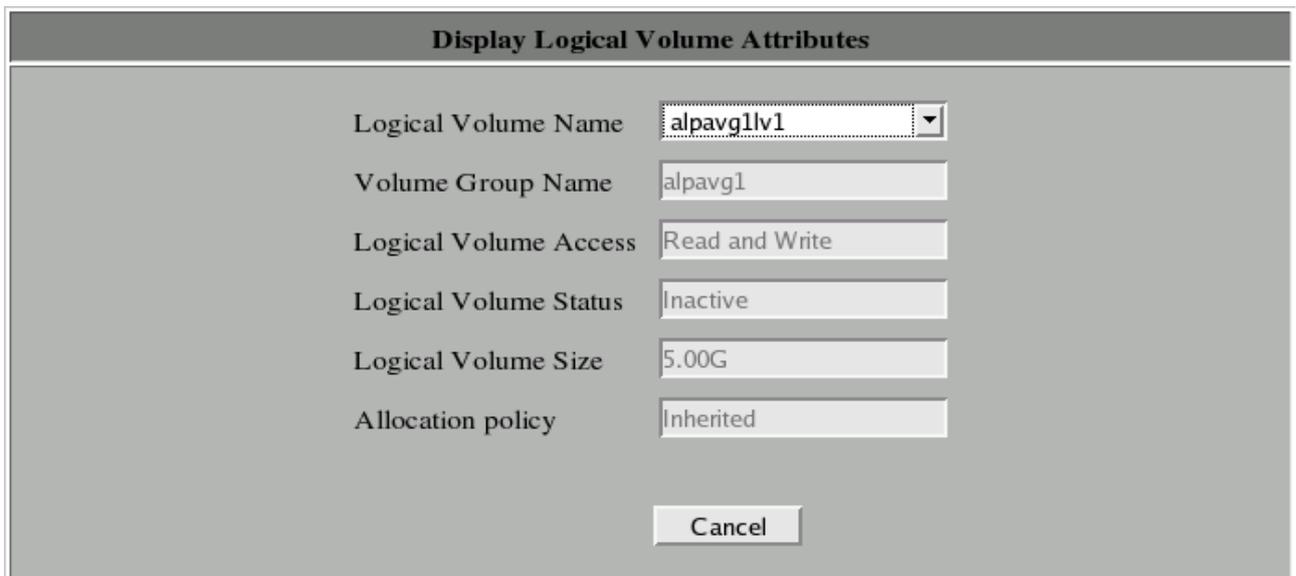


Figure 10-8. Display Logical Volume Attributes screen

Logical Volume Name Select the Logical Volume Name that you want to display.

Volume Group Name Gives the Volume Group Name on which the Logical Volume is created.

Logical Volume Access Gives the access permissions of the Logical Volume, either Read and Write or Read only.

Logical Volume Status Gives the status of the Logical Volume, either, Inactive, or Active, or Active Device Open.

Logical Volume Size Gives the size of the Logical Volume.

Allocation Policy Gives the Allocation Policy of the Logical Volume, either contiguous, normal, anywhere or inherited. Inherited is the default value for the Logical Volume.

3. Click the **Cancel** button to return to the LVM Configuration menu or to **Return** link at the bottom to go back.

10.2.9 Activate a Volume Group

Allows you to activate a Volume Group.

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Activate a Volume Group** button. The following window appears:

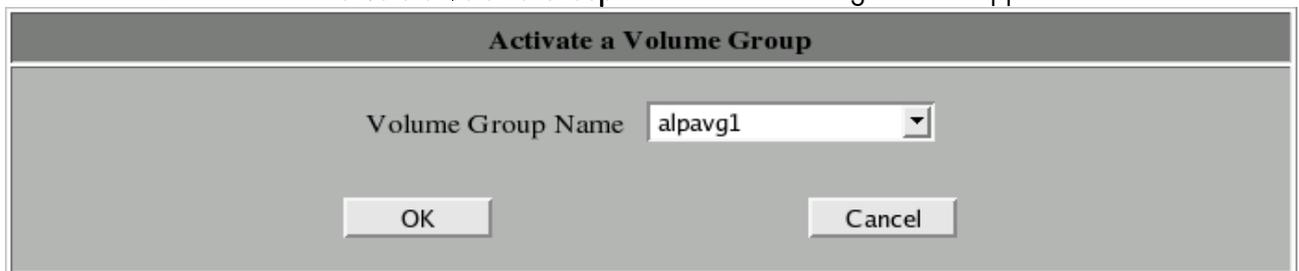


Figure 10-9. Activate a Volume Group screen

Volume Group Name Select the Volume Group Name that you want to activate.

3. Click the **OK** button.
4. Click **Return** link at the bottom to go back.

10.2.10 Extend a Volume Group

Add physical volumes to a volume group.

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Extend a Volume Group** button. The following window appears:

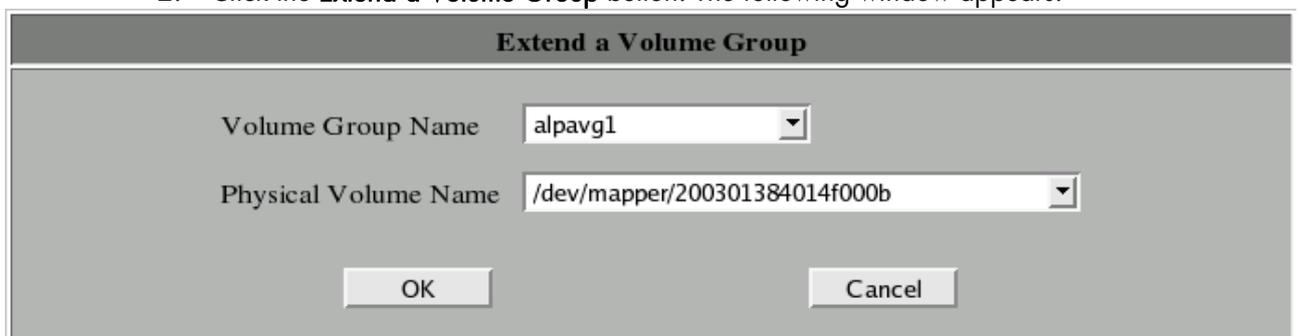


Figure 10-10. Extend a Volume Group screen

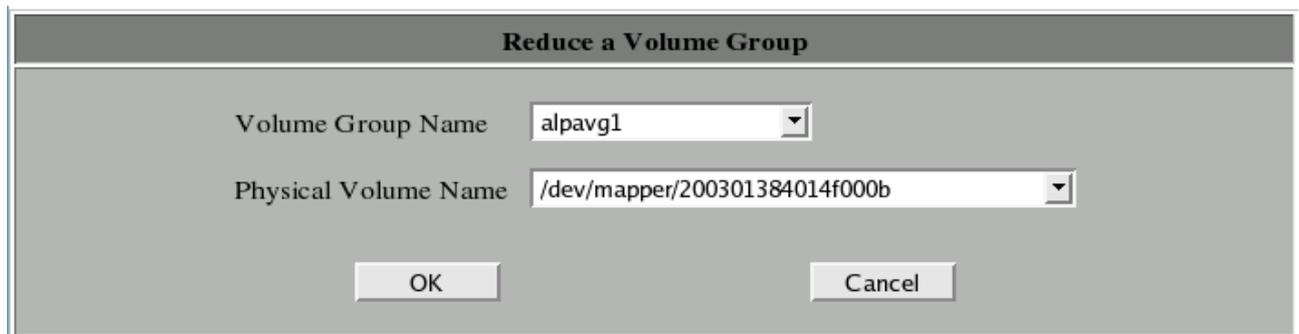
Volume Group Name Select the Volume Group Name that you want to extend.
Physical Volume Name Select the Physical Volume that you want to add in the Volume Group.

3. Click the **OK** button.
4. Click **Return to** link at the bottom to go back.

10.2.11 Reduce a Volume Group

Allows you to remove one or more unused physical volumes from a volume group.

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Reduce a Volume Group** button. The following window appears:



The screenshot shows a dialog box titled "Reduce a Volume Group". It has two dropdown menus. The first is labeled "Volume Group Name" and has "alpvgl" selected. The second is labeled "Physical Volume Name" and has "/dev/mapper/200301384014f000b" selected. At the bottom of the dialog are two buttons: "OK" and "Cancel".

Figure 10-11. Reduce a Volume Group screen

Volume Group Name Select the Volume Group Name that you want to reduce.
Physical Volume Name Select the Physical Volume that you want to remove in the Volume Group.

3. Click the **OK** button.
4. Click **Return to** link at the bottom to go back.

10.2.12 Display Physical Volume Attributes

Allows you to see the attributes of one physical volume (size, physical extent size, space used for the volume group descriptor area and so on).

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Display Physical Volume Attributes** button. The following window appears:

Display Physical Volume Attributes	
Physical Volume Name	<input type="text" value="/dev/mapper/200301384014f000b"/>
Device Mapper Name	<input type="text" value="/dev/dm-2"/>
Volume Group Name	<input type="text" value="alpavg1"/>
Physical Volume Status	<input type="text" value="Allocatable"/>
Physical Volume Size	<input type="text" value="10.00G"/>
Physical Extent Size (kilobytes)	<input type="text" value="4096"/>
Total number of Physical Extents	<input type="text" value="2559"/>
Free number of Physical Extents	<input type="text" value="5.00G"/>
Allocated number of Physical Extents	<input type="text" value="1280"/>
<input type="button" value="Cancel"/>	

Figure 10-12. Display Logical Volume Attributes screen

Physical Volume Name	Select the Physical Volume Name that you want to display.
Device Mapper Name	Gives the corresponding Device Mapper Name of the Physical Volume.
Volume Group Name	Gives the Volume Group Name in which the Physical Volume is created.
Physical Volume Status	Gives the Status of the Physical Volume, either allocatable or exported.
Physical Volume Size	Gives the size of the Physical Volume.
Physical Extent Size	Gives the extent size of the Physical Volume.
Total number of Physical Extents	Gives the total number of Physical Extents.
Free number of Physical Extents	Gives the free number of Physical Extents.
Allocated number of Physical Extents	Gives the allocated number of Physical Extents.

3. Click the **Cancel** button to return to the LVM Configuration menu or to **Return to** link at the bottom to go back.

10.2.13 Display Volume Group Attributes

Allows you to see the attributes of one Volume Group (its physical and logical volumes, their sizes, etc).

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Display Volume Group Attributes** button. The following window appears:

Display Volume Group Attributes	
Volume Group Name	alpvag1
Volume Group Access	Read and Write
Volume Group Status	Resizable
Volume Group Size	10.00G
Allocated Size of Volume Group	5.00 G
Free Size of Volume Group	5.00G
Total number of Physical Extents	2559
Allocated number of Physical Extent	1280
Free number of Physical Extent	1279
Current Count of Physical Volume	1
Current Count of Logical Volume	1
Physical Extent Size	4.00M
Volume Group State	Inactive
Open Count of Logical Volume	0

Cancel

Figure 10-13. Display Volume Group Attributes

Volume Group Name	Select the Volume group that you want to see the attributes.
Volume Group Access	Gives the Volume Group access permissions, either Write and Read or Read only.
Volume Group Status	Gives the Volume Group status, either resizable, exported or partial.
Volume Group Size	Gives the size of the Volume Group.

Allocated size of Volume Group	Gives the Allocated size of Volume Group.
Free Size of Volume Group	Gives the free Size of Volume Group.
Total number of Physical Extent	Gives the total number of Physical Extents.
Allocated number of Physical Extent	Gives the allocated number of Physical Extents.
Free number of Physical Extents	Gives the free number of Physical Extents.
Current count of Physical Volume	Gives the current count of Physical Volume.
Current count of Logical Volume	Gives the current count of Logical Volume.
Physical Extent Size	Gives the size of the Physical Extents.
Volume Group State	Gives the state of the Volume Group, either Active or Inactive.
Open count of Logical Volume	Gives the number of the Open Logical Volume.

3. Click the **Cancel** button to return to the LVM Configuration menu or to **Return to** link at the bottom to go back.

10.2.14 Remove a Physical Volume

Remove a physical volume. Wipes the label on a device so that LVM will no longer recognize it as a physical volume.

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Remove a Physical Volume** button. The following window appears:

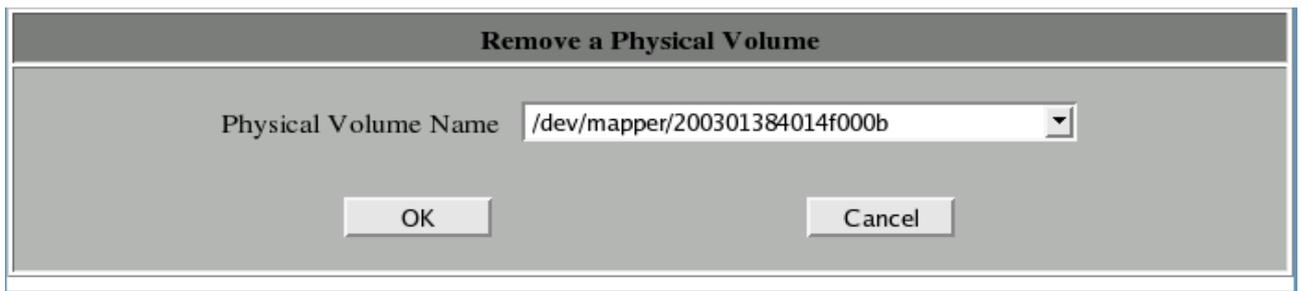


Figure 10-14. Remove a Physical Volume screen.

3. Select the Physical Volume Name that you want to remove.
4. Click the **OK** button.
5. Click **Return to** link at the bottom to go back.

10.2.15 Remove a Volume Group

Allows you to remove one volume group. The volume group must not have any logical volumes allocated:

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Remove a Volume Group** button. The following window appears:

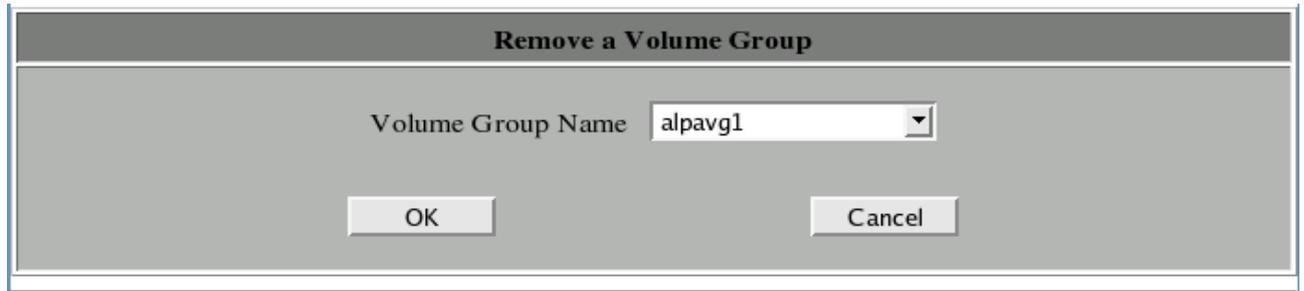


Figure 10-15. Remove a Volume Group screen.

3. Select the Volume Group Name that you want to remove.
4. Click the **OK** button.
5. Click **Return to** link at the bottom to go back.

10.2.16 Remove a Logical Volume

Remove one Logical Volume. A logical volume cannot be removed while it is open (e.g. if it contains a mounted file system).

1. Select **ARF for Linux** icon, then **LVM Configuration** icon in the Webmin interface.
2. Click the **Remove a Logical Volume** button. The following window appears:

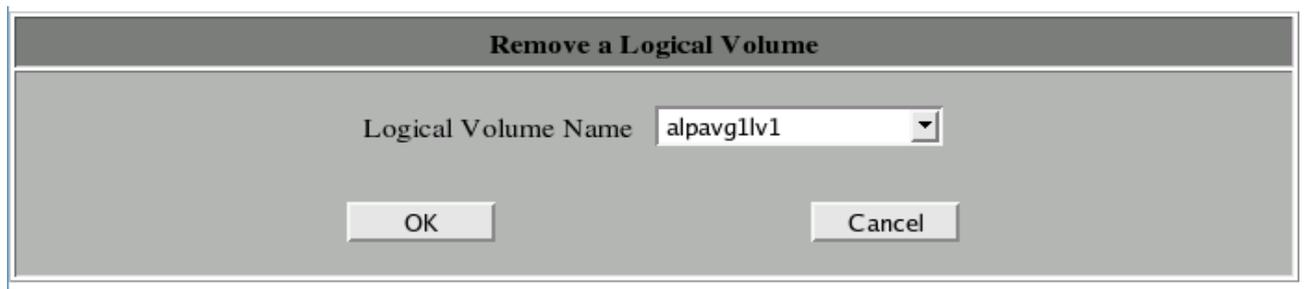


Figure 10-16. Remove a Logical Volume screen.

3. Select the Logical Volume Name that you want to remove.
4. Click the **OK** button.
5. Click **Return to** link at the bottom to go back.

10.3 Defining File Systems without configuring the LVM

After shared disk storage hardware has been setup, create the File Systems so they can be used by *Application Roll-over Facility*.

Refer to Software Release Bulletin (SRB) for restrictions about file systems on the different Linux distributions.

10.3.1 Creating File Systems

Use the **mkfs** command to create a file system. For example:

```
mkfs -j /dev/mapper/200301384014f0000
```

Refer to the man page of the **mkfs** command for more information.

Reboot the other nodes to take into account the disk partitioning.

10.3.2 Verifying the File System

To run a consistency check on each file system information:

1. Enter:
fsck <file system device name>
For example:
fsck /dev/mapper/200301384014f0000
2. Verify that you can mount the file system by entering :
mount <file system device name> <File system mount point>
For example:
mount /dev/mapper/200301384014f0000 /ha1fs1
3. Verify that you can umount the file system by entering :
umount <file system device name>
For example:
umount /dev/mapper/200301384014f0000

Chapter 11. Configuring Remote Power Management

This chapter describes how to configure Remote Power Management.

The configuration of the Remote Power Manager must be set on each node of the cluster. This configuration is different on each node, so no synchronization process is done.

11.1 Configure Remote Power Management

1. Select the **ARF for Linux** icon, then **ARF Configuration** icon, then **ARF Configuration Definition** icon in the Webmin interface. The following window appears:

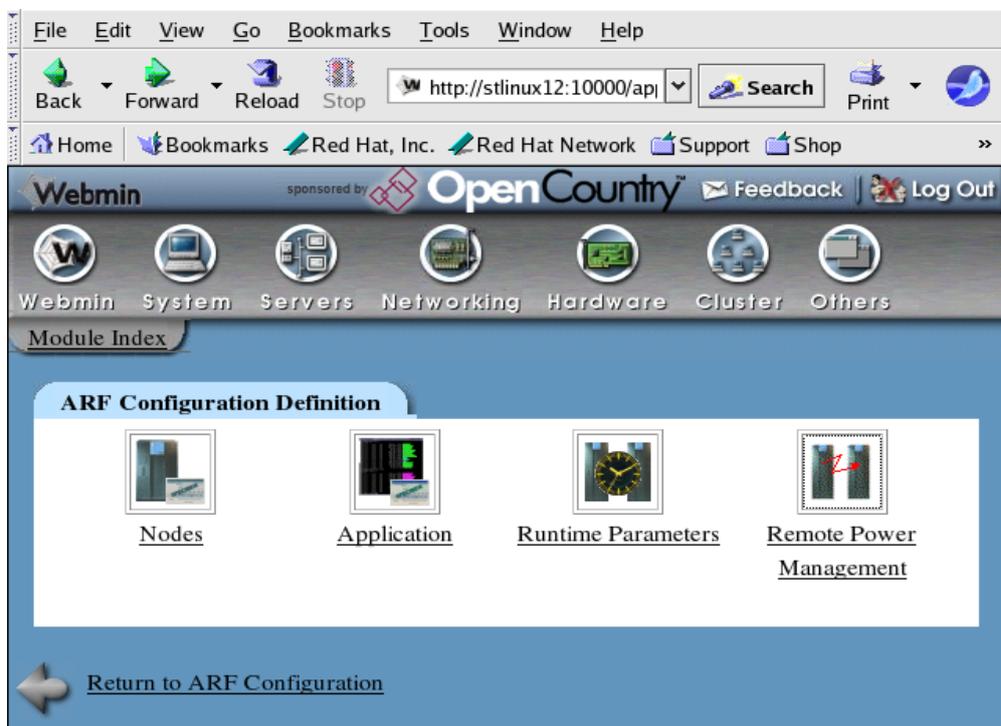


Figure 11-1. The ARF Configuration Definition window

2. Select the **Remote Power Management** icon and scroll the displayed window if necessary to display the **Configure Remote Power Management** screen:

Configure Remote Power Management

Remote Power Manager Node Name: stlinux15

Remote Power Manager Server Model: fame

Remote Power Manager IP Address: 172.16.113.27

Remote Power Manager Domain Name: 8w-cell1

Remote Power Manager User: administrator

Remote Power Manager Password: *****

OK Cancel

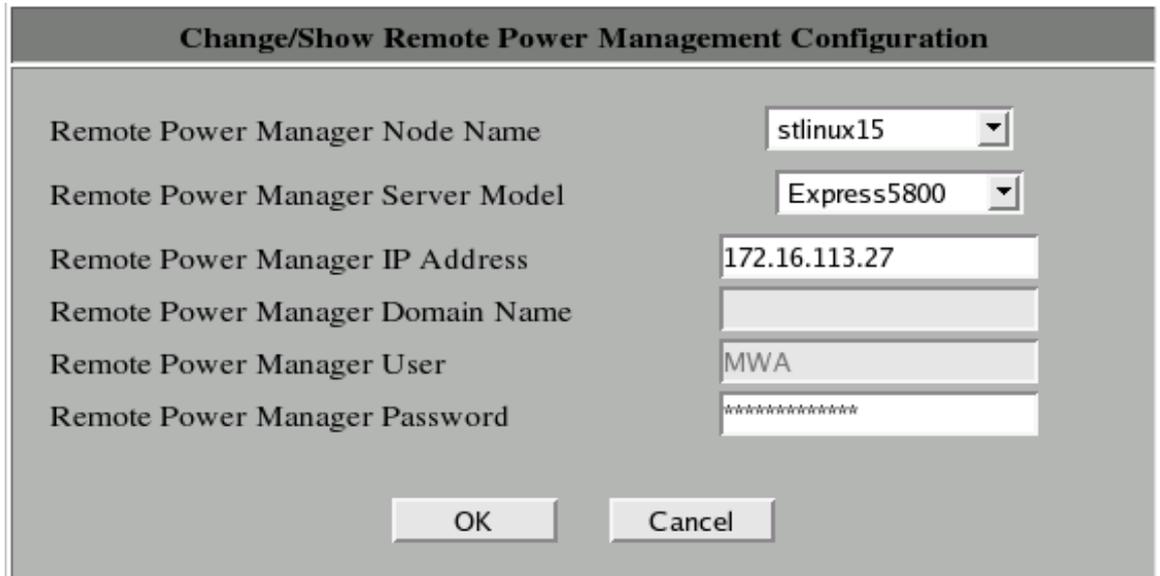
Figure 11-2. Configure Remote Power Management screen

- Remote Power Manager Node Name** Select the name of the remote node.
- Remote Power Manager Server Model** Select the model of the remote node.
- Remote Power Manager IP Address** Enter the IP Address of the remote node.
- Remote Power Manager Domain Name** For NovaScale Fame model only, enter the remote domain name.
- Remote Power Manager User** Enter the user name of the Remote Power Manager. For the Express5800 model, the user name cannot be modified.
- Remote Power Manager Password** Enter the password of the Remote Power Manager.

3. Click the **OK** button.
4. Click the **Return to** link at the bottom to go back.

11.2 Change/Show Remote Power Management Configuration

1. Select the Remote Power Management icon and scroll the displayed window if necessary to display the **Change/Show Remote Power Management Configuration** screen:



The screenshot shows a dialog box titled "Change/Show Remote Power Management Configuration". It contains several input fields and two buttons at the bottom. The fields are:

- Remote Power Manager Node Name: A dropdown menu with "stlinux15" selected.
- Remote Power Manager Server Model: A dropdown menu with "Express5800" selected.
- Remote Power Manager IP Address: A text box containing "172.16.113.27".
- Remote Power Manager Domain Name: An empty text box.
- Remote Power Manager User: A text box containing "MWA".
- Remote Power Manager Password: A text box containing "*****".

At the bottom of the dialog box, there are two buttons: "OK" and "Cancel".

Figure 11-3. Change/Show Remote Power Management Configuration screen

Remote Power Manager Node Name Select the name of the remote node to change.

Remote Power Manager Server Model Select the model of the remote node.

Remote Power Manager IP Address Enter the IP Address of the remote node.

Remote Power Manager Domain Name For NovaScale Fame model only, enter the remote domain name.

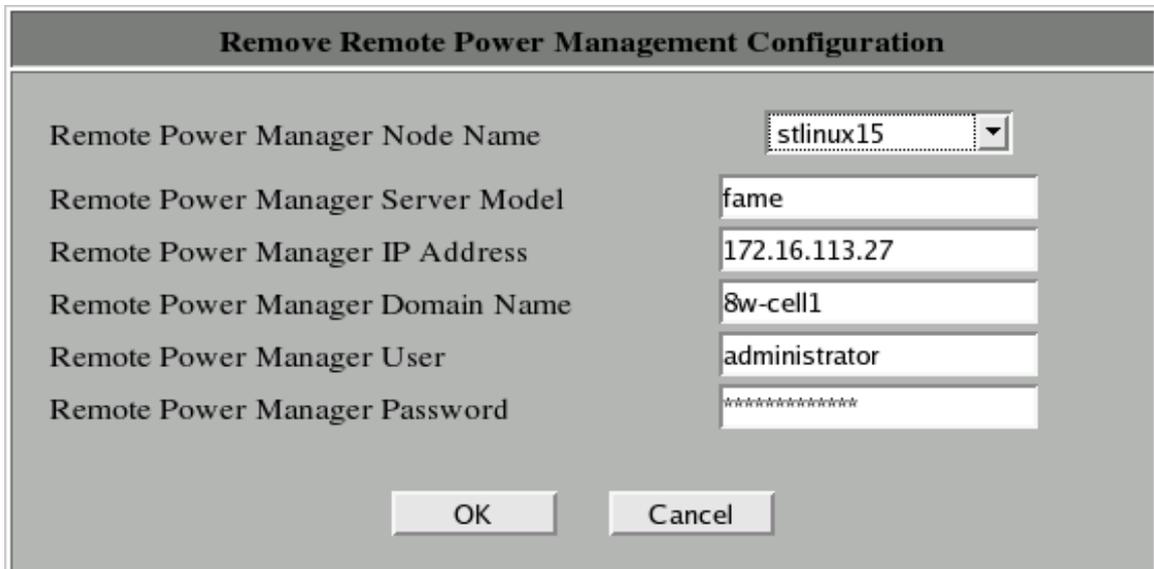
Remote Power Manager User Enter the user name of the Remote Power Manager. For the Express5800 model, the user name cannot be modified.

Remote Power Manager Password Enter the password of the Remote Power Manager.

2. Click the **OK** button.
3. Click the **Return to** link at the bottom to go back.

11.3 Remove Remote Power Management Configuration

1. Select the **Remote Power Management** icon and scroll the displayed window if necessary to display the **Remove Remote Power Management Configuration** screen:



Remove Remote Power Management Configuration	
Remote Power Manager Node Name	stlinux15
Remote Power Manager Server Model	fame
Remote Power Manager IP Address	172.16.113.27
Remote Power Manager Domain Name	8w-cell1
Remote Power Manager User	administrator
Remote Power Manager Password	*****
OK Cancel	

Figure 11-4. Remove Remote Power Management Configuration screen

Remote Power Manager Node Name Select the name of the remote node to remove.

Once a node is selected, the current configuration values for this node are displayed.

2. Click the **OK** button.
3. Click the **Return to** link at the bottom to go back.

Chapter 12. Configuring Ethernet Channel Bonding

Ethernet Channel Bonding driver provides a method for aggregating multiple network interfaces into a single logical “bonded” interface, and increase network bandwidth and availability. The resulting channel bonded interface ensures that in the event that one Ethernet device fails, the other device will become active. This type of channel bonding, called an active-backup mode allows connection of both bonded devices to one switch or can allow each Ethernet device to be connected to separate hubs or switches, which eliminates the single point of failure in the network hub/switch.

12.1 Configuration with initscripts Support

The network initialization scripts have some knowledge of bonding, and can be configured to control bonding devices.

Network script files are located in the directory:
/etc/sysconfig/network-scripts

The file name must be prefixed with “**ifcfg-eth**” and suffixed with the adapter’s physical adapter number.

1. Edit the **/etc/sysconfig/network-scripts/ifcfg-ethX** configuration file for every **ethX** device, so that the files show identical contents. For example:

```
DEVICE=ethX
USERCTL=no
ONBOOT=yes
BOOTPROTO=none
MASTER=bond0
SLAVE=yes
```

The **DEVICE=** line will be different for every **ethX** device and must correspond with the name of the file, i.e, **ifcfg-eth1** must have a device line of **DEVICE=eth1**. The setting of the **MASTER=** line will also depend on the final bonding interface name chosen for your bond .

2. Create a bond network script.

The file name for this script will be **/etc/sysconfig/network-scripts/ifcfg-bondX** where **X** is the number of the bond. For bond0 the file is named “**ifcfg-bond0**”, for bond1 it is named “**ifcfg-bond1**”, and so on. Within that file, place the following text:

```
DEVICE=bond0
IPADDR=172.16.108.154
NETMASK=255.255.255.0
NETWORK=172.16.108.0
BROADCAST=172.16.108.255
ONBOOT=yes
BOOTPROTO=none
USERCTL=no
```

Be sure to change the networking specific lines (IPADDR, NETMASK, NETWORK and BROADCAST) to match your network configuration.

3. Edit the `/etc/modprobe.conf` file to load the bonding module with your desired options when the `bond0` interface is brought up. For example:

```
alias bond0 bonding
options bonding miimon=100 mode= active-backup
```

Replace the sample parameters with the appropriate set of options for your configuration.

4. Finally run `/etc/rc.d/init.d/network restart` as root. This will restart the networking subsystem and your bond link should be now up and running

For more information about Ethernet Channel Bonding, refer on your system to the files:

- `/usr/share/doc/kernel-doc-2.6.9/Documentation/networking/bonding.txt`
- `/usr/share/doc/iputils-20020927/README.bonding`

12.2 Example of an Ethernet Channel Bonding Configuration

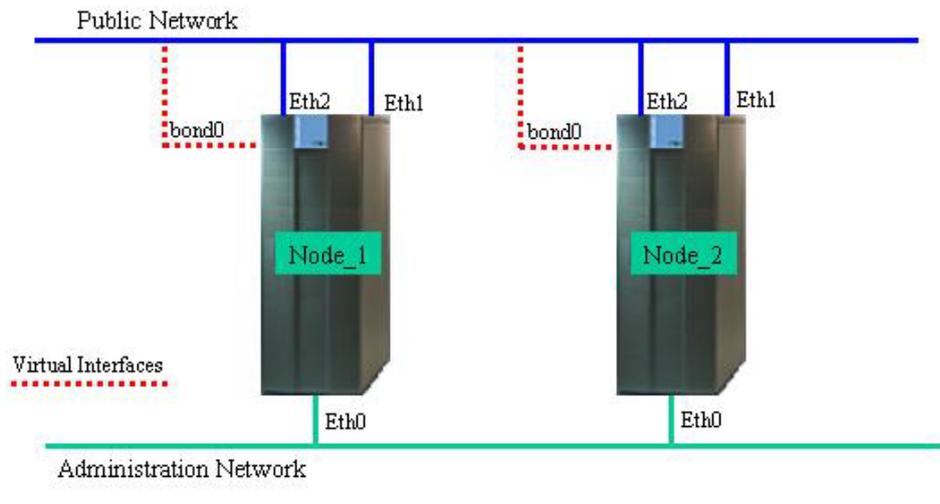


Table 12-1. Ethernet Channel Bonding Configuration

Ethernet Interface	IP Address	IP Label
bond0 (Node_1)	172.16.108.154	Node_1
Eth1 (Node_1)		
Eth2 (Node_1)		
bond0 (Node_2)	172.16.108.154	Node_2
Eth1 (Node_2)		
Eth2 (Node_2)		

12.3 Bonding Information Files

The bonding driver information file resides in the `/proc/net/bonding` directory.

Sample contents of `/proc/net/bonding/bond0` after the driver is loaded is shown below:

```
Ethernet Channel Bonding Driver: v2.6.3 (June 8, 2005)
Bonding Mode: fault-tolerance (active-backup)
Primary Slave: None
Currently Active Slave: eth1
MII Status: up
MII Polling Interval (ms): 100
Up Delay (ms): 0
Down Delay (ms): 0
Slave Interface: eth1
MII Status: up
Link Failure Count: 0
Permanent HW addr: 00:04:23:ae:00:5c
Slave Interface: eth2
MII Status: up
Link Failure Count: 0
Permanent HW addr: 00:04:23:ae:00:5d
```

12.4 Network Verification

The network configuration can be verified using the `ifconfig` command. In the example below, the `bond0` interface is the master (MASTER) while `eth1` and `eth2` are slaves (SLAVE).

```
bond0  Link encap:Ethernet HWaddr 00:04:23:AE:00:5C
       inet addr:172.16.108.154 Bcast:172.16.108.255 Mask:255.255.255.0
       inet6 addr: fe80::200:ff:fe00:0/64 Scope:Link
       UP BROADCAST RUNNING MASTER MULTICAST MTU:1500 Metric:1
       RX packets:18272 errors:0 dropped:0 overruns:0 frame:0
       TX packets:2060 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:0
       RX bytes:1303608 (1.2 MiB) TX bytes:235741 (230.2 KiB)

eth0   Link encap:Ethernet HWaddr 00:0E:0C:30:76:C0
       inet addr:172.18.1.220 Bcast:172.18.1.255 Mask:255.255.255.0
       inet6 addr: fe80::20e:cff:fe30:76c0/64 Scope:Link
       UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
       RX packets:4852 errors:0 dropped:0 overruns:0 frame:0
       TX packets:4862 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen:100
       RX bytes:402178 (392.7 KiB) TX bytes:402910 (393.4 KiB)
       Base address:0x5cc0 Memory:fbfe0000-fc000000
```

```

eth1   Link encap:Ethernet HWaddr 00:04:23:AE:00:5C
       inet6 addr: fe80::204:23ff:feae:5c/64 Scope:Link
       UP BROADCAST RUNNING SLAVE MULTICAST MTU:1500 Metric:1
       RX packets:10155 errors:0 dropped:0 overruns:0 frame:0
       TX packets:2057 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen: 100
       RX bytes:766984 (749.0 KiB) TX bytes:235519 (229.9 KiB)
       Base address:0xac80 Memory:ddfc0000-ddfe0000

eth2   Link encap:Ethernet HWaddr 00:04:23:AE:00:5C
       inet6 addr: fe80::204:23ff:feae:5c/64 Scope:Link
       UP BROADCAST RUNNING SLAVE MULTICAST MTU:1500 Metric:1
       RX packets:8117 errors:0 dropped:0 overruns:0 frame:0
       TX packets:3 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen: 100
       RX bytes:536624 (524.0 KiB) TX bytes:222 (222.0 b)
       Base address:0xacc0 Memory:ddfe0000-de000000

lo     Link encap:Local Loopback
       inet addr: 127.0.0.1 Mask:255.0.0.0
       inet6 addr: ::1/128 Scope:Host
       UP LOOPBACK RUNNING MTU:16436 Metric:1
       RX packets:2259 errors:0 dropped:0 overruns:0 frame:0
       TX packets:2259 errors:0 dropped:0 overruns:0 carrier:0
       collisions:0 txqueuelen: 0
       RX bytes:2383286 (2.2 MiB) TX bytes:2383286 (2.2 MiB)

```

You will see error messages about Ethernet Channel Bonding in the `/var/log/messages` file.

For example:

```

Jul 18 13:22:50 purna kernel: e1000: eth1: e1000_watchdog_task:
NIC Link is Down
Jul 18 13:22:50 purna kernel: bonding: bond0: link status
definitely down for interface eth1, disabling it
Jul 18 13:22:50 purna kernel: bonding: bond0: making interface
eth2 the new active one.

```

In this example, the Ethernet slave bonding interface eth1 is down, so the traffic has been switched to the Ethernet slave bonding eth2 interface.

Chapter 13. Customizing the Warning Program File of the ARF Monitoring Daemon

The **Heartbeat Warn Program** is a user-defined program to be run by the ARF Monitoring daemon when the following events are detected:

1. A **Node Failure** has been diagnosed.
Status number: **84**
The monitoring daemon on the remote node has been unreachable by network too many times.
2. A **Network Problem** has been diagnosed.
Status number: **85**
A Network problem occurs between the local IP Address and the remote IP Address.
3. A **Local IP Address Failed** has been diagnosed.
Status number: **86**
A failure has been detected on the LAN adapter.
4. A **Local Network Problem** has been diagnosed.
Status number: **88**
The network from the local IP address is unreachable.

For this ARF Monitoring events previously described, you can customize the Warning Program File to execute some actions like send email, send messages, ...



Important:

To use this user-defined script, it is mandatory to register its full pathname in the **Heartbeat Warn Program** field of the Runtime Parameters. Refer to *Configuring the Runtime Parameters* on page 25.

An example of this script is given here after:

```

#!/bin/bash
#
#####
#
# Heartbeat Warn Program : This script is a user-defined program to be run by the
#                          ARF Monitoring daemon when the following events are
detected:
#
#                          - Node Failed
#                          - Network Problem
#                          - Local IP Address Failed
#                          - Local Network Problem
#
#                          The full pathname of this script must be registered in the
#                          Heartbeat Warn Program field of the Runtime Parameters.
#
#
# Event Monitoring Description      Param #1: Status  - Param #2      -      Param #3
#
# Node Failed                      84                LocalNodeName
RemoteNodeName
# Network Problem                  85                LocalIPAddr
RemotelPAddr
# Local IP Address Failed          86                LocalNodeName
LocalIPAddr
# Local Network Problem           88                LocalNodeName
LocalIPAddr
#
typeset Status=$1
typeset LocalNodeName=""
typeset RemoteNodeName=""
typeset LocalIPAddr=""
typeset RemotelPAddr=""

case $Status in
    84)

```

```

#
# Node Failed. A node failure has been diagnosed.
# The monitoring daemon on the remote node has been
# unreachable by network too many times.
#
LocalNodeName=$2
RemoteNodeName=$3
#
# Action to do in case of a Node Failed. (must be customized)
# For example, send email, console message, call script, ...
#
# For test purpose
#
# echo $Status $LocalNodeName $RemoteNodeName at $(date) >>
/var/barf/log/res_warn_program

```

::

85)

```

#
# A Network Problem has been diagnosed.
# A Network problem occurs between the local IP Address
# and the remote IP Address.
#
LocalIPAddr=$2
RemoteIPAddr=$3
#
# Action to do in case of a Network Problem. (must be customized)
# For example, send email, console message, call script, ...
#
#
# For test purpose
#
# echo $Status $LocalIPAddr $LocalIPAddr at $(date) >>
/var/barf/log/res_warn_program

```

::

86)

```

#
# A Local IP Address Failed has been diagnosed.
# A failure is detected on the LAN adapter
#
LocalNodeName=$2
LocalIPAddr=$3

#
# Action to do in case of a local IP Address Failed. (must be customized)
# For example, send email, console message, call script, ...
#

#
# For test purpose
#
# echo $Status $LocalNodeName $LocalIPAddr at $(date) >>
/var/barf/log/res_warn_program

;;

88)

#
# A Local Network Problem has been diagnosed.
#
LocalNodeName=$2
LocalIPAddr=$3

#
# Action to do in case of a Local Network Problem. (must be customized)
# For example, send email, console message, call script, ...

#
# For test purpose
#
# echo $Status $LocalNodeName $LocalIPAddr at $(date) >>
/var/barf/log/res_warn_program

;;

esac

exit

```

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