

Linuxha.net

Installation Guide

This document provides detailed information covering the installation, upgrade and removal of the Linuxha.net product. This document expects a certain level of administrator experience – please see the warning section in the preface if you do not have significant Linux experience.

Revision History

Version	Date	Author	Change Summary
0.8.0	23 rd December 2004	S. Edwards	Initial version
0.8.1	5 th January 2005	S. Edwards	Incorporate changes based on user feedback.
0.8.3	19 th February 2005	S. Edwards	Cover changes introduced for 0.8.3. Incorporate changes from user feedback.
1.0.0	29 th April, 2006	S. Edwards	Updated for version 1.0.10.

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1 Preface

1.1 Introduction

The purpose of this document is to describe in detail the work necessary to install the Linuxha.net product ready for building of a two node cluster. Please note that this document does not cover anything more than the most basic concepts necessary to install the software – indeed the process of actually building the cluster and application configuration are dealt with in different texts.

This document aims to be generic and does not cover additional steps that may be necessary on certain distributions. Again, separate documents covering such differences will be available from the project home page when possible.

This document describes the installation process for version 1.0.10 and above. The Linuxha.net product is continuing to change at a significant rate - hence please ensure that this document is **not** used for installation of older versions - since some points documented here will not be relevant.

To check to ensure that this document (and the software being installed) is the most recent version please check on the product web-site.

<http://www.linuxha.net>

It is recommended that you visit the site for the latest available news, software and articles on “Linuxha.net” prior to any installation or upgrade.

1.2 Document Organization

This document is broken down into the following sections:

Part 1 – *Product Overview* – contains information on the software that will be installed and describes any expected software and operation system version / component dependencies.

Part 2 – *Software Installation* – describes the steps necessary to install the software, and the differences between the latest versions and earlier versions (in regards to use of the different data replication protocol that is now supported.)

Part 3 – *Customization* – covers any necessary steps once the software has been installed to work in different types of operating system environments. This section covers differences between LVM versions and kernel versions in more detail, for example.

1.3 Intended Audience

It is expected that the administrator responsible for installation of this software is experienced in either UNIX or Linux system administration. Although all stages of the installation are described in detail it is possible that the actual steps necessary may deviate from the text. In such cases the author will respond to requests for help; but sometimes knowledge of the operating system may provide the administrator with enough information to work through such problems.

1.4 Conventions

When entering a command that should be run as “root”, the start of the command will be preceded by a “#”, for example:

```
# clstat
```


When the command can be entered by a non-root user then the commands will be prefixed with a “\$” instead, for example:

```
$ ps -ef | grep cldaemon
```


Any output generated by commands is shown with the same font, but with a slightly different background colour, for example:

```
Cluster: cluster2 - DOWN
```

If a point is of particular interest it will be shown as a note, highlighted as follows:

 This is an important consideration of which you should be aware.

If a point is considered critically important it will appear as follows:

 If you ignore this you might lose all data.

1.5 Request for Feedback

This documentation and the associated software is available for free under the GNU GPL software license. However it would be a great benefit to the author and other potential users if the administrator is able to send details of their experiences (good or bad) to the following address:

simon.edwards@linuxha.net

All feedback is confidential and will be used purely to help improve the documentation and software.

1.6 Software Versions Covered

As stated previously only used this document to install version 1.0.10 or above of Linuxha.net. At the time of writing this was the most recent stable version of the software. Users of older versions are encouraged to upgrade as soon as possible.

Please note that if you are currently running a version of Linuxha.net that is earlier than 0.7.3 then you will need to migrate your cluster from the ENBD to DRBD replication protocol. Relevant instruction can be found in the following guide;

Linuxha.net ENBD to DRBD Migration Guide

1.7 Understanding Linuxha Releases

Due to limited resources it is not possible to test every release of Linuxha.net against against every potentially supported configuration. However certain releases are tested more thoroughly than others:

- 1.0.x This is the current stable branch of Linuxha.net - these versions are recommended for production settings. These versions do not vary wildly - incremental releases do not impact core functionality and so upgrades typically little effort from the system administrator.
- 1.2.x This is a series of releases that are under active development and are not yet considered suitable for production environments. It is likely that during mid-2006 this will become the stable branch whilst 1.0.x versions enter a bug-fix only stage for several years.
- 1.9.x No such releases as yet exist - these will be pre-release code snapshots of version 2.0 of Linuxha.net which is still in an early development phase.

All packaged releases are done in a source format - as part of the installation any binary components are automatically compiled for the current host. This approach was taken since it fits in well with the large number of Linux variations that exist.

2 Product Overview

2.1 Product Components

The Linuxha.net product comes as a single package – though there are some dependencies that need to be taken care of before the software will install or function. Once the product has been installed the majority of the software resides in the following directories (on each host);

- `/sbin/cluster`
This directory structure contains the major components that must be in place for the cluster software to function. This directory consists of a combination of both Perl, Shell and binaries to provide the required functionality.
- `/etc/cluster`
This is the directory that contains the configuration of the cluster and any applications that are to run in the cluster. Also contains resource allocation and cluster status information.
- `/usr/local/cluster`
Contains third-party modules (including source code) for dependent modules.
- `/usr/local/cluster/lib/perl`
Contains the shared modules for the Perl components of the clustering software.

All the above directories will exist on both machines in the cluster and typically the contents are identical, though occasionally some of the sub-directories of “`/etc/cluster`” can be different depending on the exact cluster configuration or run status.

2.2 Package Management

Linuxha.net releases are performed in a series of formats;

- RPM package
- Autopackage
- Tar bundle
- TP2 Bundle
- Slackware package

If a package format supports a “post-installation” process the installation of that package will perform all necessary steps to ensure all binary components are built and installed. However, for those with distributions that do not support a native package format, and Tar Bundles or TP2 are not considered suitable this document describes a manual process of installation via a Tar Bundle as well.

2.3 Hardware Requirements

Prior to actually installing the necessary software there are some basic points that should be considered regarding required hardware. These considerations hold true whether building a virtual machine environment, (for example using “VmWare”, “QEMU”, “Bochs” or User Mode Linux), or a cluster consisting of two different physical machines.

- IP Connectivity

The environment must be configured to ensure that at least one, (ideally two or more) Ethernet network interfaces are available on each server. In theory it is possible to have different network topologies on both servers, but in practice this is not recommended since it increases complexity. If more than two cards are to be used on the same network (i.e. a “public” network to provide application IP addresses), one (and only one) of the cards should be configured with an IP address unique to that host.

- Network Throughput

Given that the basis of the clustered storage is provided by an IP-based replication scheme (i.e. “Shared Nothing”) it is important that the performance offered by the network used for this traffic exceeds the expected disk I/O for the replicated data. If this is not the case this network link can become a bottleneck. For larger applications cheaper Gigabit Ethernet cards are recommended – 32bit versions to fit in cheaper hardware are now less than £30 (about \$50 US) – and offer at least 3 times the throughput of 100Mbit/cards. High-end configurations making use of bonded 64bit PCI-X Ethernet cards are possible if throughputs of 100+ Mbytes/second are required.

- Memory

The majority of the software is actually written in Perl and so the largest overhead is actually the Perl binary. However beyond that most other requirements are very modest. The memory overhead of running the Linuxha.net software is expected to be around 20Mb on each node in the cluster.

- CPU Performance

In most instances the CPU overhead really depends on the number of clustered applications that are running on the same node. With no application running, but being part of the cluster the CPU overhead is around 1% on a typical modern CPU. For each additional running application on that node add an another 0.5% overhead for additional monitoring that each application might perform (though in many instances it is even less).

3 Software Installation

Taking into account the statements shown previously software installation can now be performed. This section describes any dependencies that are needed as well. Given the differences between Linux 2.4 and Linux 2.6 and yet further differences between distributions it is likely that yet further detail could be added to this document. Hence it is recommended that if you do run into problems please contact the author – this is the best way of ensuring others hopefully do not fall foul of the same limits in the documentation.

3.1 Kernel Configuration Requirements

The Linuxha.net software has been designed to work on Linux 2.4 and Linux 2.6 based configurations. The testing is currently weighted towards Linux 2.6, though 2.4 testing does still occur though it is recommended that administrators chose a recent version (from 2.4.20 onwards) of that kernel for the best feature fit at present.

3.1.1 Logical Volume Manager Support

The clustering software is built around the use of a Logical volume Manager and so typically you would need to ensure that the relevant driver is statically installed as part of the kernel or that the required module is loaded once the machine is booted:

```
# lsmod | grep lvm
```

if this results in the following then you have LVM installed and ready (the numbers may be different on the right):

```
lvm-mod      12345  1
```

If the above process generates no results then the driver might be pre-compiled into the kernel (such is the case in Fedora Core 5 for example). In this case issue the following command:

```
# vgscan --version
```

If the binaries are installed then the output should appear similar to the following indicating LVM is indeed available;

```
LVM version:    2.02.01 (2005-11-23)
Library version: 1.02.02 (2005-12-02)
Driver version: 4.5.0
```

3.2 Secure Shell Functionality

Both machines must have OpenSSH configured and working between all interfaces that host IP addresses. For example consider machines “server1” and “server2”, each with a secondary interface, “server1b” and “serverb2” respectively. As root it must be possible to run all of the following

commands without being prompted for any authentication or passwords.

```
server1# ssh server2 ls
server1# ssh server2b ls
server2# ssh server1 ls
server2# ssh server1b ls
```

Essentially every interface that intends to be part of the cluster should accept “root” SSH communication from the other host. If any of the above commands fail firstly run the following command on each host to validate SSH daemons are running;

```
# ps -ef | grep sshd
```

The output should appear similar to the following; (with one or more processes listed);

```
root      107      1  0 Dec21 ?        00:00:00 /usr/sbin/sshd
```

If the daemon is not running it should be configured. It will then be a matter of configuration to ensure each host is able to communicate without further authentication. Various references on this topic can be found on the Web, for example;

<http://www.csua.berkeley.edu/ssh-howto.html>

It is also necessary to support “loopback” configuration - each node must be able to SSH to itself. For example continuing to use the previous sample configuration the following commands must work on “server1”:

```
server1# ssh server1 ls
server2# ssh server1b ls
```

Obviously similar functionality is required on the other node in the cluster also.

3.3 Perl

Almost all of the code that comprises of the main “linuxha” package is written in Perl. Thus the first requirement is to have a version of Perl which has been tested as compatible. Currently it is recommended that either of the following versions be used, (which are those for which it has currently been tested):

5.6.1

5.8.1 through 5.8.5

★ Testing on 5.8.0 has revealed that setting “\$0” does not change the text associated with the process name and arguments – this is used by Linuxha.net. Although the software does work around the problem it is not ideal and will issue warnings during cluster configuration activities.

★ Although 5.6.1 is “supported” - it is not recommended. It should work but some of the Linuxha.net commands may produce warnings when run.

☞ The current release of Linuxha.net does not make use of “ithreads”.

3.4 Development Tools

Since Linuxha.net is currently only available as a “source” package, following the software installation a “postinstall” script must be run to compile various components that might not be available. The post installation ascertains the currently available software status, and will compile/install the following Perl modules if necessary;

- Crypt::CBC
- Crypt::Blowfish
- Net::TCP::Server
- Time::HiRes
- XML::Parser
- Net::Interface

The source versions of these modules are included in the main package. Since “compilation” must take place the standard GNU development tool chain must be installed - thus “make” and “gcc” must be available.

Further some binaries are also built when the package is installed. Again these require the standard GNU development tool chain.

Finally the kernel module and user-space tools that provide the data replication protocol “DRBD” may also need to be installed if it is not found. Due to the use of parser tools, the following utilities must also be installed in order to compile this software:

- Bison
- Flex

3.5 Required Linuxha.net Packages

Before the installation can start the following software must be available in the “/tmp” directory on each server;

- linuxha,N-N-N.tar.gz - Version 1-0-8 or higher

If the user intends to use a generic packaging solution, such as “tarp”, then the following will also be required. (Tarp requires just a “ksh” compatible shell - it allows tar-ball installations);

- tarp,N-N-N.tar.gz - Version 1-3-2 or higher

If the user wishes to use the “TP2” package type (a Perl-based) highly flexible package manager they will need to download;

- tp2+N.N.N.tp2 - Version 0-5-0 or higher

The “tarp” packages can be found at:

http://linuxha.net/wcodemgr2/index.cgi/project_home?tarp

If the “trendy packager” version is required (a Perl-based package manager), then the latest version can be found via the following link:

http://linuxha.net/wcodemgr2/index.cgi/project_home?tp2

The actual Linuxha.net packages above can be found from the Linuxha.net website;

<http://www.linuxha.net>

4 RPM Based Installation

If your distribution supports RPM packages - such as Redhat Enterprise or clones, Fedora Core or Suse Linux - then installation of the RPM package is recommended. Simply download the latest available RPM package from the web-site and install on each machine in turn, for example;

```
# cd /tmp
# rpm -Uvh linuxha-1.0.10-1.noarch.rpm
```

If available please read the distribution-specific installation instructions before attempting the installation. These will highlight any required dependencies prior to installation that should be available.

The biggest problem typically is lack of kernel development headers which might not be installed by default (certainly for Redhat based distributions for example).

5 Autopackage Based Installation

Autopackage is a popular format for installation of “3rd Party” software and is fully supported with Linuxha.net releases. To install the Autopackage based solution firstly autopackage itself needs to be installed. However, any required software is automatically installed if possible simply by running the installation of Linuxha.net, for example;

```
# cd /tmp
# ./linuxha-1.0.10.x86.package
```

If Autopackage is not installed something similar to the following will be shown;

```
The installation of this software requires some additional support
code to be installed.
```

```
A] If the support code is found in a local directory, it will be used.
   The file containing the support code will be called:
```

```
"autopackage.tar.bz2"
```

```
or

B) If there is an active Internet connection, the support code will be
downloaded from:

    "http://autopackage.org/downloads/latest/autopackage.tar.bz2"

Proxy users should ensure the http_proxy environment variable is
set, otherwise the download may fail.

Selection B --> OK to download and install support code now? (Y/n):
```

Simply hit “y” and Autopackage will install itself and then Linuxha.net.

Following installation check the “/root/postinstall-linuxha-N.N.N.stdout” and check the end of the log appears similar to the following;

```
DRBD Kernel module      : OK
Machine reset (duspb)   : OK
MII fallback binary     : OK
Send ARP fallback binary: OK
mitoollib               : OK
Crypt-CBC-2.08          : OK
Crypt-Blowfish-2.09     : OK
Net-ext-1.011           : OK
Net-Interface-0.04_2    : OK
```

If this does not appear, but no “FAIL” messages appear then all necessary software is already installed (for example if the software is being upgraded), then no more work is necessary.

6 Slackware Package Based Installation

To install from the Slackware based package simply download the required software and install via the install-pkg routine, for example;

```
# cd /tmp
# installpkg linuxha-1.0.10-i486-1.tgz
```

As usual check the “/root/postinstall-linuxha-N.N.N.stdout” to ensure no failures have occurred. If they have re-check the dependencies for Linuxha.net described earlier in this document.

7 TP2 Based Installation

TP2 is a generic packaging format that uses Perl to work across any number of UNIX flavours including any distribution of Linux. A working version of Perl 5.6 or later is required (which is necessary for Linuxha.net anyway), as well as the following modules;

- Digest::SHA1
- XML::Parser

The 2nd is required for Linuxha.net anyway, whilst most distributions include the first. The first step is to download a version of TP2 into “/tmp” - for example “/tmp/tp2+0.5.0.tp2”. To install TP2 (assuming the above Perl modules are present), issue the following commands;

```

# cd /tmp
# mkdir tp2 && cd tp2
# tar xzf ../tp2+0.5.0.tp2
# chmod +x bin/* utils/*
# mkdir /var/adm
# export TP2_LIBS=/tmp/tp2/bin
# utils/mktp2env
Created directory /var/adm/tp2
Created directory /var/adm/tp2/ns
Created directory /var/adm/tp2/ns/root
Created directory /var/adm/tp2/ns/root/meta
Created directory /var/adm/tp2/ns/root/pkg
Created directory /var/adm/tp2/ns/root/log
Created directory /var/adm/tp2/ns/root/spool
Created "root" namespace configuration file.
# utils/tp2mkns --owner root --root /usr/local --name usrlocal --ver
Log : Created directory /var/adm/tp2/ns/usrlocal.
Log : Created directory /var/adm/tp2/ns/usrlocal/meta.
Log : Created directory /var/adm/tp2/ns/usrlocal/pkg.
Log : Created directory /var/adm/tp2/ns/usrlocal/log.
Log : Created directory /var/adm/tp2/ns/usrlocal/spool.
Log : Created "usrlocal" namespace configuration file.
# mkdir -p /opt/perl/bin
# ln -s /usr/bin/perl /opt/perl/bin/perl

```

The above creates the “root” and “usrlocal” namespaces - locations where packages can be installed. Finally TP2 installs itself into the “usrlocal” namespace:

```

# bin/tp2repos --repos /tmp
# export PATH=/tmp/tp2/bin:$PATH
# bin/tp2install --pkg tp2 --verbose --namespace usrlocal --verbose --repos /tmp
Log : Obtaining lock[write] on usrlocal ... Got it.
Log : Getting dependencies for tp2.
Log : tp2 [from /tmp, version 0.5.0]
Log :
Log : Check installed/selected compatibility ... Done.
Log : Getting tp2 [file=tp2+0.5.0.tp2 , version=0.5.0] from /tmp
Log :
Log : All software retrieved to spool directory - checking space requirements.
Log :
Log : Installation calculates following disk space requirements:
Log :
Log : File system Space During Install
Log : / 368 Kb
Log :
Log : Installation of tp2 starting - please wait.
Log : Package file : tp2+0.5.0.tp2
Log : Log file : install+tp2+11223
Install utils/tp2mkns ##### 100% #####
Log : Installation of tp2 was successful.
Log : [Use "tp2log --namespace usrlocal --show install+tp2+11223" for details]
Log :

```

Now that TP2 has been installed add the following to “/root/.bash_profile”:

```

export TP2_LIBS=/usr/local/bin
export PATH=$PATH:/usr/local/bin

```

Now log out and log back in again to pick up the environment variables, and then clear down the temporary tp2 files:

```
# rm -rf /tmp/tp2*
```

Now copy the required version of Linuxha.net in the “tp2” package format to “/tmp”, (for example “linuxha+1.0.10.tp2”) rebuild a repository index and install the package:

```
# tp2 repos --repos /tmp  
# tp2 install --pkg linuxha --verbose --repos /tmp --namespace root
```

The above instructions must be followed on both machines to insure TP2 and then Linuxha.net is installed on both machines.

8 Tarp Based Installation

All instructions given below should be completed on the first server and then repeated on the second one.

If you wish to make use of the automated installation process via the “tarp” (tar-ball) format then the first step is to install and configure the “tarp” package. This software might already be installed; it can be checked using the command;

```
# [ -x /usr/local/bin/tplist ] && echo found
```

If the above commands prints out the following then move to the next step - “Removal of Older Versions”.

```
found
```

This indicates that a version of “tarp” already exists. Hence the rest of this sub-section (which deals with the installation of “tarp”) can be skipped.

Otherwise firstly make a sub-directory and change to it:


```
# mkdir /tmp/install  
# cd /tmp/install
```

Now extract the files from the archive available in the parent directory (change the package version as appropriate):

```
# tar xvzf ../tarp,1-3-2.tarp.gz
```

Now the local copy of the “tpinstall” command can actually be used to install the “Tarp” package itself. This is done using the following command:

```
# usr/local/bin/tpinstall -d /tmp -i -p tarp -v
```

 In the above command the missing initial “/” is intentional!

This should produce output similar to the following:

```
MSG : Package database directory: /var/adm/tarpdb
MSG : Installing from file tarp,1-3-2.tarp.gz
MSG : Checking for /var/adm/tarpdb/tarp
MSG : Using temporary directory /var/adm/tarpdb/tpinstall-3389
MSG : No dependencies required for package.
MSG : Number of dependencies to install: 0
MSG : Beginning package extract to /var/adm/tarpdb/tpinstall-3389...
MSG : Package extraction completed successfully.
MSG : Saving files that will be overwritten...
MSG : No files required saving.
MSG : Installing package files...
MSG : Files installed: 15
MSG : Setting Correct package permissions + ownerships...
MSG : Removing spooled package files...
MSG : Package tarp installed successfully.
MSG : Package tarp successfully committed.
MSG : No TMP_BUNDLE_DEPOT defined (no tmp depot to remove)
MSG : Cleaning up directory /var/adm/tarpdb/tpinstall-3389
```

☞ Once this step has been performed on both machines, please ensure that the PATH variable includes the directory “/usr/local/bin” directory – this should be added to the root user's profile if necessary before continuing.

It is recommended that the administrator log out and then back in again to pick up the modified PATH mentioned in the above note. Once that has been done check that the software has been successfully installed run the following command:

```
# tplist
```

This should produce output similar to:

Package	Version	Status	Description
tarp	1.3.2	Committed	Simplified package manager

The manual pages for the packaging programs are installed into the following directory:

```
/usr/local/share/man/man1m
```

Some Linux distributions do not include the “1m” section by default, and if this is the case please update one of the following files (only one will exist):

- man.conf
- man.config

In file is likely to be found in one of the following directories, depending on the distribution in use;

- /usr/share/misc
- /etc

Ensure that the directive “MANSECT” is updated to include the “1m” section, for example:

```
MANSECT 1:8:2:3:4:5:6:7:9:tcl:n:l:1m:p:o
```

Finally the temporary directory used for the installation of the “Tarp” tools can be removed:

```
# cd /tmp
# rm -rf install
```

Before performing the steps mentioned in this section please ensure that root's PATH variable contains the correct settings by running the following command:

```
# which tpininstall
```

This should generate the following;

```
/usr/local/bin/tpinstall
```

If it does not then add to “/usr/local/bin” directory to the current PATH setting;

```
# export PATH=$PATH:/usr/local/bin
```

Assuming that the software packages were installed in “/tmp”, run the following commands to install Linuxha.net;

```
# cd /tmp
# tpininstall -i -p linuxha -v
```

This should generate output similar to the following;

```
MSG : Package database directory: /var/adm/tarpdb
MSG : Installing from file linuxha,0-8-3.tarp.gz
MSG : Checking for /var/adm/tarpdb/linuxha
MSG : Using temporary directory /var/adm/tarpdb/tpinstall-2975
MSG : No dependencies required for package.
MSG : Number of dependencies to install: 0
MSG : Beginning package extract to /var/adm/tarpdb/tpinstall-2975...
MSG : Package extraction completed successfully.
MSG : Running pre-install script...
MSG : Pre-install script completed successfully.
MSG : Saving files that will be overwritten...
MSG : Files Saved: 251 (3452 Kb)
MSG : Installing package files...
MSG : Files installed: 253
MSG : Setting Correct package permissions + ownerships...
MSG : Running post-install script...
MSG : Post-install script completed successfully.
MSG : Removing spooled package files...
MSG : Package linuxha installed successfully.
MSG : Pre installation script output can be found in /tmp/tpinstall-pre-linuxha-2975.stdout
MSG : Pre installation script errors can be found in /tmp/tpinstall-pre-linuxha-2975.stderr
MSG : Post installation script output can be found in /tmp/tpinstall-post-linuxha-2975.stdout
MSG : Package linuxha successfully committed.
MSG : No TMP_BUNDLE_DEPOT defined (no tmp depot to remove)
```

```
MSG : Cleaning up directory /var/adm/tarpdb/tpinstall-2975
```

Once the above commands are completed use the following command to ensure that the required packages are installed and available:

```
# tplist -p linuxha -l
```

The output generated should be similar to the following;

```
linuxha:  
  Version: 1.0.10  
  Description: Linux Replicated HA  
  Vendor:  
  License: GPL  
  Files: 344  
  Size(Kb): 3264
```

As always please check the end of the file “/root/postinstall-linuxha-1.0.10.stdout” for any failures. If any are present please double check the prerequisites mentioned earlier in this document.

9 Removing Linuxha.net

If you no longer wish to use Linuxha.net then this section describes the process of removing the software. The first step is to archive the cluster configuration - just in case it is needed at a later date, or you wish to build a similar cluster on different hardware. To archive the configuration issue the following command on **both** machines;

```
# tar cvzf ~/cluster-config-backup.tgz /etc/cluster
```

The file kept in the home directory records the cluster configuration, and only occupies a few Kb normally.

9.1 Pre-Remove Checks

The first step is to check the software is actually installed! This can be done using the following command;

```
# [ -x /sbin/cluster/clstat ] && installed
```

If the above command does not produce the output shown below the rest of this section can be ignored – since it means the product is not currently installed.

```
installed
```

Since the software is installed and must be removed the administrator should ensure that the existing cluster software is stopped. Run the following command on either node to ensure that this is the case;

```
# /sbin/cluster/clhalt --force
INFO 22/12/2004 15:37:41 Validated checksum for cluster configuration.
INFO 22/12/2004 15:37:41 Attempting to halt cluster cluster1...
INFO 22/12/2004 15:37:41 Attempting to contact a cluster daemon...
INFO 22/12/2004 15:37:41 Cluster already appears to be down.
```

9.2 Removing the Tarp Package

If the package was installed via the generic “tarp” packaging tools, then check the package is installed using the command;

```
# /usr/local/bin/tplist
```

If output similar to the following appears then Linuxha.net is indeed installed and can be removed using the “tremove” command.

Package	Version	Status	Description
tarp	1.3.2	Committed	Simplified package manager
linuxha	1.0.10	Committed	Linuxha

The “tremove” command to use is:

```
# /usr/local/bin/tpremove -r -p linuxha -v
```

This should produce output similar to the following;

```
MSG : linuxha is a package
MSG : Package linuxha in state committed will be removed.
MSG : Removing package linuxha
MSG : Backing up files to remove ...
WARN : File //./usr/src/cluster/perl/XML-Parser-2.31.tar.gz.uu not found.
WARN : File //./usr/src/cluster/perl/Crypt-CBC-2.08.tar.gz.uu not found.
WARN : File //./usr/src/cluster/perl/Crypt-Blowfish-2.09.tar.gz.uu not found.
WARN : File //./usr/src/cluster/perl/Net-ext-1.011.tar.gz.uu not found.
WARN : File //./usr/src/cluster/perl/Time-HiRes-1.43.tar.gz.uu not found.
WARN : File //./usr/src/cluster/expat/expat-1.95.6.tar.gz.uu not found.
MSG : Removing package files...
MSG :      10 files removed successfully.
MSG : Removing package definition from database.
MSG : Successfully removed package linuxha
```

9.3 Removing the RPM Package

Removal of the RPM package is simply a matter of running;

```
# rpm -ve linuxha
```

9.4 Removing the Autopackage Version

To remove an autopackage installation of Linuxha.net simply run;

```
# package remove linuxha
```

9.5 Removing the Slackware Package Version

To remove the Slackware package simply run;

```
# removepkg linuxha
```

9.6 Removing the TP2 Package

To remove the TP2 package simply run the following command;

```
# tp2 remove --pkg linuxha --verbose --namespace root
Log : Obtaining lock[write] on root ... Got it.
Log : Getting dependency list for package [name=linuxha,version=1.0.10]... Done [0
packages].
Log : Removal of package linuxha starting - please wait.

Log : Removal of linuxha was successful.
Log : [Use "tp2log --namespace root --show remove+linuxha+11766" for details]
Log :
```

10 Updating Linuxha.net

If a version of Linuxha.net is already installed then simply repeat the package installation command given above in the relevant section. Assuming the installation is a minor increment (for example “1.0.7” to “1.0.8”), then the upgrade can be performed online unless the releases notes indicate otherwise.

11 Customization

At this point all necessary to build and use a cluster should be in place. However there are various steps that should be considered if you wish to ensure the cluster works in the best way possible.

11.1 Update the Superuser's PATH

All of the standard commands that are expected to be run from the command line can be found in the following directory:

```
/sbin/cluster
```

Hence it is recommended that the following lines are added to the end of the “/root/.profile” or “/root/.bashrc” - depending on whether Korn shell or Bash is used as the login shell.

```
export PATH=/sbin/cluster:$PATH
export MANPATH=/usr/local/cluster/man:$MANPATH
```

11.2 Manual Page Configuration

Some Linux distributions do not include the “1m” section by default, and if this is the case please update whichever of the following files exist in the distribution:

```
/usr/share/misc/man.conf
/etc/man.conf
```

Ensure that the directive “MANSECT” is updated to include the “1m” section, for example:

```
MANSECT      1:8:2:3:4:5:6:7:9:tbl:n:l:1m:p:o
```

Validate this has worked correctly by checking some of the manual pages, for example;

```
# man clform
```

This should then start producing a typical manual page as shown on the next page;

clform(1M)

clform(1M)

NAME

clform - Linuxha Cluster Formation tool

SYNOPSIS

clform [--force] [--noapps] [--config file]
[--nolocking] [--timeout secs]
Form a new cluster

clform [--force] [--join] [--nolocking]
[--timeout secs]
Join an existing cluster

clstat -?
Show brief usage information

DESCRIPTION

This utility is designed to allow the formation of clusters as simple as possible. The list of command line arguments supported is quite limited to reflect the high-level nature of this command.

The typical usage of running this is command is simply to specify the a cluster.

Some output is always sent to the standard output showing the progress of the command. Unless there are problems cluster formations takes less than 20 seconds. If one of the nodes is not available, then it may take as long as the timeout value defined for the cluster, after which a failure message will be shown.

12 Next Steps

Now that the cluster software has been installed the next steps depend on the current environment configuration.

12.1 New Installation

If this is a new installation, please refer to the following documents next;

- *Building a New Linuxha.net Cluster* - describes the concepts, conditions and recommendations of how a cluster should be built, and then describes a typical build in detail.
- *Assigning Applications to a Linuxha.net Cluster* - describes in detail the process of adding an application to a Linuxha.net cluster.