



# LHC COMPUTING GRID

## LCFGNG SERVER INSTALLATION GUIDE

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*Abstract: Installation and set-up of a LCFGng installation server*

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## 1. OBJECTIVES OF THIS DOCUMENT

This document is addressed to Site Administrators in charge of LCG2 middleware installation and configuration.

Its purpose is to provide a complete guide to set up a LCFGng server in order to handle automatically the installation LCG middleware releases.



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## 2. INTRODUCTION

This procedure foresees some shell scripts to be used in order to reduce the amount of manual work involved. The aim of the procedure is to have a LCFGng server which runs a Red Hat 7.3 OS and which is able to install clients with Red Hat 7.3 via diskette or PXE. The main steps of the LCFGng server installation procedure are:

- Install the server with Red Hat 7.3 release
- Set up ssh and ntp
- Install edg-populate-serverng, edg-updaterep, updaterpms-static-server
- Run edg-updaterep to download the packages
- Install other packages needed by the server
- Build nginstallroot file system for 7.3
- Set up DHCP and NFS servers
- Set up HTTP server
- Prepare profiles for client computers
- Install a client using a diskette or via PXE



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### 3. PREREQUISITES

Before starting the server installation, in order to make the installation and testing proceed more smoothly, collect in advance the following information:

- IP address of gateway.
- IP address of DNS servers.
- Network mask for the site.
- Broadcast address.
- Name of time server (ntp).
- Hostname and IP address of LCFGng server.



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## 4. INSTALLATION OF RED HAT 7.3 RELEASE

Only few guidelines are listed here for the installation of Red Hat 7.3, which each site may implement according to its own policies and practices:

- Select Custom install.
- Partition your disk. Consider that you should reserve most of the space to /opt (it will be the software repository); if you have an additional disk, you could mount it here. /home directory should not use too much space on the LCFGng disk server. Finally /usr and /var should be given around 1.5GB-2GB and 0.5 GB respectively.
- Set time zone according to location. At Firewall Setup, the Medium Level option is to be chosen, making sure to also enable DHCP, SSH, and HTTP ports.
- Select the following package groups:
  - NFS File Server
  - Web Server
- In addition to the package groups listed above, go to "Select individual packages" and select "dhcp" from System Environment/Daemons category.

**WARNING:** in order to have mkxprof working properly after the installation, the node name reported by the `/bin/hostname` command should include the full domain name. Should the installation defaults differ, the configuration may be changed by editing the file `/etc/sysconfig/network`.

For example, if you are running at CERN the file `/etc/sysconfig/network` should contain the following line:

```
HOSTNAME=" <LCFGngserverHostName> .cern .ch "
```



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## 5. TIME SERVER CONFIGURATION

A general requirement for the LCFGng server is to be synchronized to the other nodes in the farm. This requirement may be fulfilled in several ways.

If your nodes run under afs, most likely they will be already synchronized. Otherwise, you can use the NTP protocol with a time server. Instructions and examples for a NTP client configuration can be found in [2].



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## 6. SSH CONFIGURATION

If it is not already started, the SSH daemon has to be enabled

- Start the SSH daemon

```
> /sbin/chkconfig --level 2345 sshd on  
> /sbin/service sshd start
```





---

## 7. INSTALLATION OF LCFGNG BASIC APPLICATIONS

Three packages have to be manually installed in order to start-up the complete set up of the LCFGng server.

- Download the three packages

- edg-populate-serverng
- edg-updaterep
- updaterpms-static-server

The following three command lines may be used for download:

```
> wget http://grid-deployment.web.cern.ch/grid-deployment/download \
    /RpmDir/LCFGng/edg-populate-serverng-1.0.23-edg1.noarch.rpm

> wget http://grid-deployment.web.cern.ch/grid-deployment/download \
    /RpmDir/LCFGng/edg-updaterep-2.0.9-edg1.noarch.rpm

> wget http://grid-deployment.web.cern.ch/grid-deployment/download \
    /RpmDir/LCFGng/updaterpms-static-server-1.0.2-1.i386.rpm
```

- Install the downloaded packages

```
> rpm -ihv updaterpms-static-server-1.0.2-1.i386.rpm \
    edg-updaterep-2.0.9-edg1.noarch.rpm \
    edg-populate-serverng-1.0.23-edg1.noarch.rpm
```



---

## 8. DOWNLOAD THE LCG PACKAGES VIA THE "UPDATEREP" OBJECT

Files needed for LCG releases are available from a CVS server at CERN. This CVS server contains the list of rpms to install and the LCFGng configuration files for each node type. Furthermore, in the release, also templates of site-specific configuration files (*cfgdir-cfg.h*, *local-cfg.h*, *site-cfg.h*, and *private-cfg.h*) are provided.

The CVS archive can be reached directly from the LCG Deployment homepage  
<http://www.cern.ch/grid-deployment>

You can follow the *CVS Deployment* link on the left and then browse into the repository. The CVS area where the installation tools and documentation are kept is called *lcg2*.

WARNING: at the same location there is another directory called *lcg-release*: this area is used for the integration and certification software, NOT for production. Just ignore it!

Documentation about access to this CVS repository can be found in [1].

Set the CVSROOT and then check out the software release(s) you want on your server.  
For a single tag you can use

```
> cvs checkout -r <CURRENT\_TAG> -d <TAG\_DIRECTORY> lcg2
```

A good candidate for <TAG\_DIRECTORY> is for example <CURRENT\_TAG>.

In any case notice that the path of the directory must be local, because CVS does not allow absolute paths to be used with the -d option

Note: the -d <TAG\_DIRECTORY> option will create a directory named <TAG\_DIRECTORY> and copy there all the files. If you do not specify the -d parameter, the directory will be a subdirectory of the current directory named *lcg2*.

As the client nodes need to "see" the rpm lists, the content of the *rpmlist* subdirectory must be copied to */opt/local/linux/7.3/rpmcfg* on the LCFG server: this directory is then NFS mounted by all client nodes and it is visible as */export/local/linux/7.3/rpmcfg*

Once the rpms lists and LCFGng configuration files for all the node types are present, the corresponding rpms needed for the wanted release can be downloaded and installed using the *updaterep* object. In <TAG\_DIRECTORY>/tools two configuration files for this script can be found:

- *updaterep.conf*
- *updaterep\_full.conf*.

The former one makes *updaterep* download only the rpms which are actually needed to install the current tag, whereas the latter one yields a full mirror of the LCG rpm repository.

For the first case copy *updaterep.conf* to */etc/updaterep.conf* and run the *updaterep* command:



---

```
> cp <TAG_DIRECTORY>/tools/updaterep.conf /etc/  
> updaterep -v
```

By default all rpms will be copied to the `/opt/local/linux/7.3/RPMS` area, that is visible from the client nodes as `/export/local/linux/7.3/RPMS`.

You can change the repository area by editing `/etc/updaterep.conf` and modifying the `REPOSITORY_BASE` variable.

#### IMPORTANT NOTICE:

As the list and structure of Certification Authorities (CA) accepted by the LCG project can change independently from the middleware releases, the rpm list related to the CAs certificates and URLs has been decoupled from the standard LCG2 release procedure.

This means that the version of the `security-rpm.h` file contained in the `rpmlist` directory associated to the current tag might be incomplete or obsolete. Please go to the URL

<http://markusw.home.cern.ch/markusw/lcg2CAlist.html>

and follow the relevant links to update all the CA-related settings.

Changes and updates of these settings will be announced on the LCG-Rollout mailing list.



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## 9. INSTALLATION/UPGRADE OF SERVER PACKAGES

To make sure that all the needed object rpms are installed on your LCFG server, you should use the *lcfgng\_server\_update.pl* script, also located in `<TAG_DIRECTORY>/tools`. This script will report which rpms are missing or have the wrong version and will create the */tmp/lcfgng\_server\_update\_script.sh* script which you can then use to fix the server configuration.

- Run the script *lcfgng\_server\_update.pl* in the following way:

```
> lcfgng_server_update.pl <TAG_DIRECTORY>/rpmlist/lcfgng-common-rpm.h
> /tmp/lcfgng_server_update_script.sh
> lcfgng_server_update.pl <TAG_DIRECTORY>/rpmlist/lcfgng-server-rpm.h
> /tmp/lcfgng_server_update_script.sh
```

**WARNING:** please always check the script */tmp/lcfgng\_server\_update\_script.sh* verifying that all the rpm update commands look reasonable before running it.

The script */tmp/lcfgng\_server\_update\_script.sh* may encounter some problems with missing dependencies. Usually they are not critical and they are due to the fact that the script launches independent rpm statements. Since dependencies are supposed to have been checked before, an easy way to proceed is to run again the script until no more missing dependencies exist.



## 10. BUILD LIVEOS

The LiveOS is the Operative system to be mounted by client nodes during the initial boot phase and will be used to steer the whole node installation.

In order to install the LiveOS on the LCFGng server, you can use the released script

```
<TAG_DIRECTORY>/tools/lcfgng_installroot.pl .
```

This script uses configuration parameters read from the file *lcfgng\_installroot.cfg*, which must be in perl format.

What follows is a list of the configurable actions done by the script:

- Set the root directory where all LiveOS versions will be installed (default: */opt/local/linux/nginstallroot*). Notice that this directory needs to be created explicitly!.
- Create the file containing the list of RPMs to install on the LiveOS (the default list is the *LIVEOS-rpm*, that should be part of the release itself. It's not recommended to change it).
- Set the directory where the rpm lists reside (default: */opt/local/linux/<RH-version>/rpmcfg* )
- Set the path of the rpm command to use (def: */bin/rpm*)

The required steps to install and configure the LiveOS on a LCFGng server are outlined below:

- Install the LiveOS on the LCFGng server

```
> cd <TAG_DIRECTORY>/tools  
> lcfgng_installroot.pl
```

WARNING: The script *lcfgng\_installroot.pl* must be launched within the *<TAG\_DIRECTORY>/tools* directory so that its configuration file can be found.

It is advisable to save the output into a log file as the output size is considerable.

- Set up the local installation parameters  
In order to set up local installation parameters (e.g. keyboard, time zone) edit the file

```
/opt/local/linux/nginstallroot/7.3/etc/installparams
```

The default *installparams* file assumes the US keyboard and the CET time zone.

You can use the default values provided by executing:

```
> cd /opt/local/linux/nginstallroot/7.3/etc  
> cp installparams.default installparams
```



---

If you want to use a different set of defaults, you should edit the *installparams* file.



---

## 11. SET UP LCFGNG INTERFACE SERVICES (DHCP, WEB AND NFS SERVERS)

### 11.1. CONFIGURE DHCP DEAMON

In order to set-up the dhcp daemon, the file */etc/dhcpd.conf* has to be configured. You can find an example of */etc/dhcpd.conf* in */etc/dhcpd.conf.ngexample*. The *user-class* option contains the URL of the installation server.

IMPORTANT NOTICE: in order to avoid problems with your network and security administration NEVER omit (even in a test environment) to insert the row

```
deny unknown-clients;
```

at the beginning of your dhcp configuration file.

An example of *dhcp.conf* file is

```
deny unknown-clients;
    not authoritative;
    option domain-name
"cern.ch";

    # These 3 lines are needed for the installation via
PXE
    option dhcp-class-identifier "PXEClient";
    option
vendor-encapsulated-options 01:04:00:00:00:00:ff;
    filename "pxelinux.0";

    subnet 137.138.0.0 netmask 255.255.0.0 {
        option
routers 137.138.1.1;
        option domain-name-servers
137.138.16.5,137.138.17.5;
        host lxshare0403 {

fixed-address lxshare0403.cern.ch;
            hardware ethernet
00:E0:81:04:E1:DE;
            option user-class
"http://lxshare0402.cern.ch/profiles/";
        }
    }
```

```
}
```

## 11.2. CONFIGURE HTTP SERVER (APACHE)

- Stop the web server (Apache) if it is running:

```
> /etc/rc.d/init.d/httpd stop
```

- A default configuration of HTTP server can be obtained by replacing the file

```
/etc/httpd/conf/httpd.conf
```

with the file

```
/etc/httpd/conf/httpd.conf.ngexample73
```

```
> cp /etc/httpd/conf/httpd.conf.ngexample73 /etc/httpd/conf/httpd.conf
```

In this default configuration, the apache server running on your LCFG server will allow access from anywhere on the net. This is a potential security breach as LCFG node configuration files contain sensible information (e.g. encrypted root passwords). To limit access to nodes belonging to your domain you should edit the apache configuration file `/etc/httpd/conf/httpd.conf`, and apply the following changes:

- In the section delimited by these two lines:

```
<Directory "/var/obj/conf/server/web">  
...  
</Directory>
```

find the line “*Allow from all*” and replace it with “*Allow from <domainname>*” where `<domainname>` is your network domain (e.g. at CERN this gives “*Allow from cern.ch*”).

- Repeat the same operation in the section delimited by lines:

```
<Directory "/var/obj/conf/server/web/install/">  
...  
</Directory>
```





- The proposed default configuration allows the use of PXE installation. The `install.cgi` script provides a basic interactive interface to select which nodes should be installed by changing the `pxelinux` configuration files to be used (install the machine/boot from the hd): The script is protected by a user/password access. The defined user is `lcfgng`.  
The encrypted password has to be stored into the `AuthUserFile` (Default: `/etc/httpd/.htpasswd`).

In order to create the password file you need to issue the following command:

```
> htpasswd -c /etc/httpd/.htpasswd lcfgng
```

Of course you can change the location of the password file, the user name and password or setup a better protection of this simple web interface. Another script (`ack.cgi`) is called by the clients when at the end of the installation to restore the boot from the hard disk.

### 11.3. CONFIGURE NFS

To configure NFS add to the file `/etc/exports` the lines

```
/opt/local/linux/7.3 *(ro,no_root_squash)  
/opt/local/linux/nginstallroot/7.3 *(ro,no_root_squash)
```

(the lines above can also be copied from `/etc/exports.ngexample73`)

### 11.4. START ALL LCFGNG INTERFACE SERVICES

- NFS

```
> chkconfig nfs on  
> chkconfig nfslock on  
> /etc/rc.d/init.d/nfs start  
> /etc/rc.d/init.d/nfslock start
```

- HTTPD

```
> chkconfig httpd on  
> /etc/rc.d/init.d/httpd start
```

- DHCP

```
> chkconfig dhcpd on  
> /etc/rc.d/init.d/dhcpd start
```



## 12. PXE SET-UP

The installation via PXE is done with pxelinux. The first step is to put the pxelinux loader (provided by the package syslinux) in the */tftpboot* directory :

```
> cp /usr/lib/syslinux/pxelinux.0 /tftpboot/
```

TFTP is used by PXE NIC to download the *pxelinux.0* loader and then by this one to download its configuration file (from */tftpboot/pxelinux.cfg* ) and a Linux kernel (from */tftpboot/kernel*).

The *edg-pxelinux-supp* rpm provides two linux kernels usable for boot.

If you want any other kernel to be used on your nodes during the first phase of the installation, you can just copy your own Linux kernel into the directory

*/tftpboot/kernel*

Different node installation flavours, dealing with different parameters to be passed to the kernel are also possible.

Installation modes are defined by configuration files stored in the directory

*/tftpboot/pxelinux.cfg*

The *edg-pxelinux-supp* rpm provides there the configuration file */tftpboot/pxelinux.cfg/lcfg-install-nointeract-73*

With respect to the default configuration file provided, you will probably need, in order to have your OS starting on a ram disk, to increase the maximum size of the ram disk itself. That is done by setting-up the kernel parameter *ramdisk\_size*.

Two examples of alternative pxelinux configuration, with a short description follows (the *append* lines in the examples have been broken with a “backslash” character for readability reasons, but they have to be written on a single line)

- file:lcfg-install-nointeract-nosmp-noserial-73.cfg

```
default linux
label linux
kernel kernel/kernelboot-2.4.20-19.serial
ipappend 1
append root=/dev/nfs nfsroot=/opt/local/linux/nginstallroot/7.3 \
init=/etc/rc_install nointeract=yes pxe_http_ack=/install/ack.cgi \
ramdisk_size=32768
```



---

In this example a different linux kernel is used. The kernel "kernelboot-2.4.20-19.serial" had previously been stored into the */tftpboot/kernel* subdirectory, as it is referenced in the configuration file by the *kernel* parameter.

Furthermore, the maximum size of the ram disk has been increased by setting the kernel parameter *ramdisk\_size* up to 32768 kB.

- file:lcfg-install-nointeract-nosmp-serial-73.cfg

```
default linux
serial 0,9600n8
label linux
kernel kernel/kernelboot-2.4.20-19.serial
ipappend 1
append root=/dev/nfs nfsroot=/opt/local/linux/nginstallroot/7.3 \
init=/etc/rc_install nointeract=yes pxe_http_ack=/install/ack.cgi \
console=tty0 console=ttyS0,9600 ramdisk_size=32768
```

In this example, with respect to the previous one, the output of the node to be installed to a serial line connected to a central node which can be used in order to follow the installation process remotely.

Note that that particular kernel version has been used with this aim.

For each configuration file you put into the */tftpboot/pxelinux.cfg* directory, the corresponding installation option will be shown by the installation GUI (see afterwards).

Check the flag "disable" in the configuration file */etc/xinetd.d/tftp* to be set to "=no", then tun the command

```
> service xinetd restart
```

to make sure that tftp is up and running.



### 13. FIREWALL CONFIGURATION

If you are using a firewall consider that the LCFGng server needs the following ports to be opened.

Service	Port	Protocol	open-to
tftpd	69	tcp, udp	site
httpd	80	tcp	site
sunrpc/portmap	111	tcp, udp	site
nfsd	2049	tcp, udp	site

For example, if you are using ipchains for firewall configuration, you can do this by inserting, before the first "REJECT" line into the file */etc/sysconfig/ipchains*, the lines

```
-A input -s 0/0 -d 0/0 80 -p tcp -y -j ACCEPT
-A input -s 137.138.0.0/16 -d 0/0 69 -p tcp -y -j ACCEPT
-A input -s 137.138.0.0/16 -d 0/0 69 -p udp -j ACCEPT
-A input -s 137.138.0.0/16 -d 0/0 111 -p tcp -y -j ACCEPT
-A input -s 137.138.0.0/16 -d 0/0 111 -p udp -j ACCEPT
-A input -s 137.138.0.0/16 -d 0/0 2049 -p udp -j ACCEPT
-A input -s 137.138.0.0/16 -d 0/0 2049 -p tcp -y -j ACCEPT
```

After this, the ipchains service has to be restarted:

```
> service ipchains restart
```



---

## 14. REBOOT THE NODE

Although a reboot of the node is not mandatory, you can do it in order to be sure that all the needed services to be up and running after re-starting.

```
> shutdown -r now
```



## 15. HOW TO START USING THE LCFGNG SERVER

This section is meant to be very basic introduction to the use of LCFGng server to set-up client nodes. If you are already skilled with LCFGng use there will be likely nothing new to you.

The following introduction, of course, IS NOT a replacement of the LCG Release Notes [3]. They are the official reference for LCG sites installation, and must be carefully read before starting the installation of a production site.

A complete example of installation of a Worker Node using the LCFGng server is produced as well. A summary of the values used in the example follows:

```
<CURRENT_TAG>=LCG-2_0_0
<TAG_DIRECTORY>=LCG-2_0_0
<FULL_TAG_DIRECTORY>=/root/tags/LCG-2_0_0
<LOCAL_DIR>=/root/source/LCG2_SIMPLE_SITE_040419
<LCFGngServer>=adc0013.cern.ch
```

The installation of a LCG on client nodes using LCFGng can be done in six logical steps:

### 15.1. DOWNLOAD THE CURRENT TAG FROM CVS

WARNING: This step has already been described in section 8..

If you have just done it there is no need to do it again unless a new LCG tag had been issued in the meanwhile.

#### *STEP DESCRIPTION*

- Set the CVSROOT variable and check out from CVS [1] from CVS the current LCG2 tag into a local directory on the LCFGng server.  
There will be saved, among others, all the files needed for this step.

```
> cvs checkout -r <CURRENT_TAG> -d <TAG_DIRECTORY> lcg2
```

Note: the *cvs checkout* command does not allow an absolute path to be used as a parameter of the *-d* option. So *<TAG\_DIRECTORY>* is the basename. From now on, each time we will refer to the absolute path in the instructions, we will use the label *<FULL\_TAG\_DIRECTORY>*.

#### *EXAMPLE (bash)*

```
> export CVSROOT=:pserver:anonymous@lcgdeploy.cvs.cern.ch:/cvs/lcgdeploy
> mkdir /root/tags
> cd /root/tags/
> cvs checkout -r LCG-2_0_0 -d LCG-2_0_0 lcg2
```



## 15.2. UPDATE RPM LISTS AND RPM REPOSITORY

The aim of this step is to have the lists of rpm to install and the local rpm repository synchronized with the current tag of the LCG software.

**WARNING:** Actions needed to perform this logical step have already been described in section 8.. If you have just done them, there is no need to repeat them again unless a new LCG tag had been issued in the meanwhile.

Anyway doing them twice is not harmful for the system.

### *STEP DESCRIPTION*

- copy the content of the `<FULL_TAG_DIRECTORY>/rpmlist` subdirectory to the directory

```
/opt/local/linux/7.3/rpmcfg
```

on the LCFG server. This directory is NFS-mounted by all client nodes and is visible as `/export/local/linux/7.3/rpmcfg`. It contains all the lists of rpms.

```
> cp <FULL_TAG_DIRECTORY>/rpmlist/* /opt/local/linux/7.3/rpmcfg/
```

- get from the tag the up-to-date version of the `updaterep` object configuration file

```
> cp <FULL_TAG_DIRECTORY>/tools/updaterep.conf /etc/
```

- run the `updaterep` object

```
> updaterep -v
```

By default all rpms have now been copied to the `/opt/local/linux/7.3/RPMS` directory, that is visible from the client nodes as `/export/local/linux/7.3/RPMS`.

(You can change the repository area by editing `/etc/updaterep.conf` and modifying the `REPOSITORY_BASE` variable)

### *EXAMPLE (bash)*

```
> cp =/root/tags/LCG-2_0_0/rpmlist/* /opt/local/linux/7.3/rpmcfg/  
> cp =/root/tags/LCG-2_0_0/tools/updaterep.conf /etc/  
> updaterep -v
```



### 15.3. INSTALLATION/UPGRADE OF SERVER PACKAGES

The aim of this step is to be sure to have the LCFGng server itself up-to-date to the current version.

WARNING: This step has already been described in section 9..

If you have just done it there is no need to do it again unless a new LCG tag had been issued in the meantime.

#### *STEP DESCRIPTION*

- Check (and eventually update) your LCFGng server installation

```
> cd <FULL_TAG_DIRECTORY>/tools
> ./lcfgng_server_update.pl ../rpmlist/lcfgng-common-rpm.h
> /tmp/lcfgng_server_update_script.sh
> ./lcfgng_server_update.pl ../rpmlist/lcfgng-server-rpm.h
> /tmp/lcfgng_server_update_script.sh
```

NOTE: the file

*/tmp/lcfgng\_server\_update\_script.sh*

is produced only if updates are revealed to be done. Please, before running, check the script in order to verify that all the rpm update commands look reasonable.

The script */tmp/lcfgng\_server\_update\_script.sh* may encounter some problems with missing dependencies. Usually they are not critical and they are due to the fact that the script launches independent rpm statements. Since dependencies are supposed to have been checked before, an easy way to proceed is to run again the script until no more missing dependencies exist.

#### *EXAMPLE*

```
> cd /root/tags/LCG-2_0_0/tools
> ./lcfgng_server_update.pl ../rpmlist/lcfgng-server-rpm.h
> /tmp/lcfgng_server_update_script.sh
> ./lcfgng_server_update.pl ../rpmlist/lcfgng-server-rpm.h
> /tmp/lcfgng_server_update_script.sh
```

### 15.4. CUSTOMIZE YOUR SITE CONFIGURATION

The aim of this step is to set-up your "site profile" (e.g. hostnames, path of directories, ...) into a set of LCFGng general configuration files to be included in node profiles definition (see 15.5.).





To do a complete site configuration requires you to have a clear view of how you want to organize your LCG site. Hints and release-specific guidelines for site configuration are from time to time provided in the LCG Installation [3]. In this example we will limit ourselves to use the provided template files provided doing the minimal configuration actions to have a WN installed by LCFGng. So, we will suppose that you do not have got previous versions of these files to re-use.

The files you will need to create in this case are:

**cfgdir-cfg.h** It defines the directory from which all configuration files will be read.

**local-cfg.h** It contains all site-wide settings to be done by LCFGng as additions to or replacement of standard settings of Red Hat 7.3 (defined in *redhat73-cfg.h*).

**private-cfg.h** It is used to define the site-wide root password and possibly other security-related parameters. This file should NOT be checked into CVS.

**site-cfg.h** It contains the whole site-specific configuration.

All the LCFGng configuration files look very similar, apart from the LCFGng proprietary configuration language, to a cpp-preprocessor-like style with some important differences to be taken in account.

The LCFGng preprocessor, for instance, requires all the string definitions to be included within ""'. So, if you want to define a string as a juxtaposition of two macros (it is the case, shown later, of the CFGDIR macro), you have to leave the string open in the first macro and then to close it when the trailer is joined.

*E.g .*

```
#define CFGDIR "/root/tags/LCG-2_0_0/source"
....
....
#include CFGDIR/include-file.h"
```

In the directory *<FULL\_TAG\_DIRECTORY>/examples*, a set of templates of the files needed to configure a default, very basic, LCG site can be found.

If your site has a more complex configuration (e.g. you use disk servers or have more than one batch system) then node configuration files will have to be modified accordingly. Please refer to the LCFG objects man pages to find out how to do this.

It's worth noticing explicitly that the site configuration template *site-cfg.h.template* contains only example values for the various parameters. It needs extensive editing before being actually usable at your site. Of course, a general prerequisite for site configuration is to have a clear view of how you want to organize your LCG site.

#### *STEP DESCRIPTION*

- Create a directory, referred from now on as *<LOCAL\_DIR>*, where to keep your local configuration files.



```
> mkdir <LOCAL_DIR>
\end{verbatim}
\item from the tag directory make a copy of the up-to-date version of the
templates for the configuration files and rename them from
\em xxx.h.template \em to \em xxx.h \em into the  $\$<LOCAL\_DIR>\$$ 
\begin{verbatim}
> cp <FULL_TAG_DIRECTORY>/examples/* <LOCAL_DIR>
> cp <LOCAL_DIR>/xxx.h.template <LOCAL_DIR>/xxx.h
> ...
```

- cd to <LOCAL\_DIR>
- Edit the file *cfgdir-cfg.h*  
Uncomment the define line of CFGDIR macro, after modifying the directory path in

```
#define CFGDIR "<FULL_TAG_DIRECTORY>/source"
```

WARNING: CFGDIR has to be defined starting with a " but then the string must be left open and must be closed when the macro is used to define a full file name, e.g.

```
#include CFGDIR/macros-cfg.h"
```

Be very careful not to leave blank spaces after the last character in the definition of CFGDIR. Opening the *cfgdir-cfg.h* with 'vi' and moving the cursor on the right, it has to stay on the last character (the 'e' in the example)

- Edit the file *local-cfg.h*  
Unless you have changed the position of the *rpmlist* directory (see 8. and 15.2.) you do not need to make any change in this file for this configuration example.
- Edit the file *private-cfg.h*  
You must add here your own root password or you will not be able to log on your nodes as root  
Encode your desired root password in MD5 format by the command

```
> openssl passwd -1
```

you will be required to enter the new password and you will be given an encrypted value in output. Copy the output encrypted password in the file *private-cfg.h* modifying the *+auth.rootpwd* attribute as follows:

```
+auth.rootpwd <Your_encrypted_root_password_here>
```



- Edit the file *site-cfg.h*

For this simple configuration example, you can leave the template unchanged and set up just the macros in the section 'COMMON SITE DEFINITIONS' of the file. The template assumes you want to run the PBS batch system without sharing the /home directory between the CE and all the WNs. This is the recommended setup.

Namely, the macros to change are:

```
#define GRID_TRUSTED_BROKERS "<Subject-of-the-RB-host-certificate>"
```

Note: the host certificate is stored, by default, in the file  
/etc/grid-security/hostcert.pem on the machine

```
#define CE_HOSTNAME           <ComputingElement hostname>
#define SE_HOSTNAME          <StorageElement hostname>
#define SITE_LOCALDOMAIN     <local domain>
#define SITE_MAILROOT        <address-to-send-root-mail>
#define SITE_ALLOWED_NETWORKS <list-of-comma-separated-network-addresses>
#define SITE_GATEWAYS        <default-gateway>
#define SITE_NAMESERVERS     <list-of-space-separated-dne-server>
#define SITE_NETMASK         <net-mask>
#define SITE_NETWORK         <site-network-address>
#define SITE_BROADCAST       <site-broadcast-address>
#define SITE_NTP_HOSTNAME    <NTP-time-server-hostname>
#define SITE_TIMEZONE        <time-zone>
#define SITE_NAME_           <site-name-for-the-information-server>
#define SITE_EDG_VERSION     <current-tag-name>
#define SITE_INSTALLATION_DATE_ <installation-date-YYYYmmDDhhmissZ>
#define SITE_LCFG_SERVER     <LCFGng-server-hostname>
#define SITE_WN_HOSTS        <space-separated-list-of-WN-hostnames>
#define SITE_GIIS            <site-giis-name-for-the-information-server>
#define SITE_BDII_HOST       <BDII-hostname>
#define SITE_BDII_PASSWD     \"<BDII-encrypted-root-passwd>\"
#define SITE_BDII_PASSWD_PLAIN <BDII-plain-passwd>
#define SITE_BDII_URL        <url-of-the-new-BDII-configuration-file>
```

#### EXAMPLE

```
> mkdir /root/source/LCG2_SIMPLE_SITE_040419
> cp /root/tags/LCG-2_0_0/examples/*.template \
    /root/source/LCG2_SIMPLE_SITE_040419
> cd /root/source/LCG2_SIMPLE_SITE_040419
> cp cfgdir-cfg.h.template cfgdir-cfg.h
> cp local-cfg.h.template local-cfg.h
```



```
> cp private-cfg.h.template private-cfg.h
> cp site-cfg.h.template site-cfg.h

> vi cfgdir-cfg.h
-----
#define CFGDIR "/root/tags/LCG-2_0_0/source"
-----
> openssl passwd -1
Password: new_root_password
      $1$8eKiuqo2$eZI/zygW6chJ7zDkVYIDn/

> vi private-cfg.h
-----
+auth.rootpwd $1$8eKiuqo2$eZI/zygW6chJ7zDkVYIDn/
-----

> vi site-cfg.h
-----
...
#define GRID_TRUSTED_BROKERS "/O=Grid/O=CERN/OU=cern.ch/CN=host/lxshare0410.
...
#define CE_HOSTNAME          adc0025.cern.ch
#define SE_HOSTNAME          adc0016.cern.ch
#define SITE_LOCALDOMAIN    cern.ch
#define SITE_MAILROOT        Antonio_Retico@cern.ch
#define SITE_ALLOWED_NETWORKS 127.0.0.1, 137.138., 128.141.
#define SITE_GATEWAYS        137.138.1.1
#define SITE_NAMESERVERS     137.138.16.5 137.138.17.5
#define SITE_NETMASK         255.255.0.0
#define SITE_NETWORK         137.138.0.0
#define SITE_BROADCAST       137.138.255.255
#define SITE_NTP_HOSTNAME    ip-time-1.cern.ch
#define SITE_TIMEZONE        Europe/Zurich
#define SITE_NAME_           LCG2-SIMPLE-TEST-SITE
#define SITE_EDG_VERSION     LCG-2_0_0beta
#define SITE_INSTALLATION_DATE_ 20040419115700Z
#define SITE_LCFG_SERVER     adc0013.cern.ch
#define SITE_WN_HOSTS        adc*.cern.ch
#define SITE_GIIS            lcg2manualtestlcfg
...
#define SITE_BDII_HOST       adc0009.cern.ch
#define SITE_BDII_PASSWD     \"{SSHA}z2q23+xm9n7MFj1l+T9nYUAO27TtCyUH\"
#define SITE_BDII_PASSWD_PLAIN nevertotell
#define SITE_BDII_URL        http://grid-deployment.web.cern.ch/ \
```



---

grid-deployment/gis/lcg2-bdii-update.conf

...

## 15.5. SET-UP NODE PROFILES

The aim of this step is to have a set of XML profiles each one of them dealing with a single node to be handled by LCFGng.

Among the files you have copied into the directory `<LOCAL_DIR>` from the directory `<FULL_TAG_DIRECTORY>/examples` you can find example configuration files for each node type you may want to install at your site.

### STEP DESCRIPTION

- For each node type you want to install, copy the example file for that node to a file named with the hostname the node you want to install. Then edit it replacing the default definition of `HOSTNAME` with the hostname of the node. E.g. to install a Worker Node on a node named `<WN-hostname>` do:

```
> cd <LOCAL_DIR>
> cp WN_node <WN-hostname>
```

and then edit the file `<WN-hostname>` replacing the line

```
#define HOSTNAME WN_node
```

with

```
#define HOSTNAME <WN-hostname>
```

Note: for this operation always use the node name WITHOUT its domain extension. The domain extension will be added, where needed, according to the definition of the macro 'SITE\_LOCALDOMAIN' in `site-cfg.h`.

- Create the XML profile for the node(s)

```
> cd <FULL_TAG_DIRECTORY>/tools
> ./do_mkxprof.sh <WN-hostname> [<list-of-nodes>]
```

If you get an error status for one or more of the configurations, you can get a detailed report on the nature of the error by looking into the URL



---

`http://<Your_LCFGng_Server>/status/`

and clicking on the name of the node with a faulty configuration (a small red bug should be shown beside the node name).

#### *EXAMPLE*

```
> cd /root/source/LCG2_SIMPLE_SITE_040419
> cp WN_node adc0004

> vi adc0004
-----
.....
#define HOSTNAME adc0004
.....
-----

> do_mkxprof.sh adc0004
```

## 15.6. INSTALL THE NODES

Once all node configurations are correctly published, you can proceed and install your nodes. Two methods are possible in order to install the LCFGng client on client nodes:

- Automatic installation (via PXE)
- Manual installation (via image floppy)

#### **Automatic installation (via PXE)**

In order to apply this method the configuration described in 12. have to be done.

If all the listed steps have been correctly performed, the installation of a node can be easily driven by a common web browser.

- Go to the URL

`http://<LCFGngServer>/install/install.cgi`

The required username and password are the one defined during the configure of the HTTP server (see 11.2.).



- Choose the installation type for your nodes:  
The choices proposed in the drop-down box correspond to the different PXE configurations done in section 12..
- Enable the boot via PXE on the machines.

Select the *Apply Changes* button

The node will be installed as soon as it is rebooted.

- To check if the process is working you can check the file

*/var/log/messages*

on the LCFGng server.

After the initial installation is completed (expect two automatic reboots in the process), each node type requires a few manual steps, detailed in the LCG Release Notes [3].

After completing these steps, some of the nodes need a final reboot which will bring them up with all the needed services active.

When needed, this final reboot is explicitly stated in the release nodes.

### **Manual installation (via image floppy)**

This method is to be applied only if you are not using PXE Linux and you are installing your nodes via a floppy disk.

On the client node do the following steps:

- Download a LCFGng image diskette

```
> cd /tmp
> wget http://grid-it.cnaf.infn.it/packages/gridit/wp03/ \
    bootdisk_rh73_11022004.img
> dd if=bootdisk_rh73_22112002.img of=/dev/fd0 bs=1024
```

- Mount the floppy

```
> mount /dev/fd0 /floppy
```



- Edit the GRUB configuration on the image to increase the *ramdisk\_size* value to be passed to the kernel

```
> vi /floppy/boot/grub/grub.conf
-----
kernel (fd0)/kernelboot-2.4.20-20.7 root=/dev/nfs
nfsroot=/opt/local/linux/nginstallroot/7.3 init=/etc/rc_install
ip=dhcp
ramdisk_size=32768
-----
```

See 12. for further examples of configuration of the Linux Loader.

- Re-boot the client node





---

## CHANGE HISTORY

Table 1: Change History

<i>version</i>	<i>date</i>	<i>description</i>
v1.0	30/Jan/04	First Release.
v1.1	02/Apr/04	CVS references updated.
v1.2	22/Apr/04	13.: section with firewall configuration inserted and numbering shifted up. 15.:introduction to use of LCFGng server added.
v2.0	7/May/04	15.6.: Installation of client node via image diskette added. Document format changed.
v2.1	14/Jul/04	12.: tftp service re-start instruction changed.



---

## REFERENCES

[1] "CVS User Guide"

Louis Poncet (Louis.Poncet@cern.ch)

<http://grid-deployment.web.cern.ch/grid-deployment/cgi-bin/index.cgi?var=documentation>

[2] "NTP client Installation & Configuration"

Alessandro Usai, Antonio Retico

```
cvsvs:
  module: ''lcg2''
  directory: ''manual-install''
  file: ''NTP_install.txt''
```

[3] "LCG-2 Installation notes"

Emanuele Leonardi, Markus Schulz

<http://grid-deployment.web.cern.ch/grid-deployment/cgi-bin/index.cgi?var=releases>