LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

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CDS workstation setup using Scientific Linux 6

K. Thorne, M. Thomas

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This is an internal working note
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California Institute of Technology
LIGO Project – MS 18-34
1200 E. California Blvd.
Pasadena, CA 91125
Phone (626) 395-2129
Fax (626) 304-9834
E-mail: info@ligo.caltech.edu

Massachusetts Institute of Technology
LIGO Project – NW22-295
185 Albany St
Cambridge, MA 02139
Phone (617) 253-4824
Fax (617) 253-7014
E-mail: info@ligo.mit.edu

LIGO Hanford Observatory
P.O. Box 1970
Mail Stop S9-02
Richland WA 99352
Phone 509-372-8106
Fax 509-372-8137

LIGO Livingston Observatory
P.O. Box 940
Livingston, LA 70754
Phone 225-686-3100
Fax 225-686-7189

http://www.ligo.caltech.edu/

1 Introduction

The following document how to install the Scientific Linux 6 operating system on a computer and to then configure it with applications, etc. so it can be used as a workstation on the LIGO CDS networks at the observatories.

2 Background

The existing CDS workstations in use at the LIGO observatories mostly run the Ubuntu 12.04 LTS Linux distribution. This was chosen to build on existing experience with the distribution from the GC system administrators at the sites, and the ease with which it could be installed on the new workstation hardware purchased by aLIGO.

Other groups within the LIGO collaboration has standardized on different Linux distributions for data analysis on the large grid computers. Current choices are Debian and Scientific Linux.

The CDS system administrators need to provide workstations to support generation and control of hardware injections for the upcoming observing runs. Both the users and the software that does this have been developed for the grid computer environment. So, to ensure that the users can move their code and scripts to the hardware injection machines, it was decided at LLO to set these computers up as Scientific Linux 6 (SL6) machines, but running on the CDS network.

In the future, there is some desire to use the same operating systems in the control-rooms as is used on the data analysis grid computers. So figuring out how to do this for these machines is a step on that journey.

3 Scope

This will only cover installing the operating system using two methods (from installation media or using CDS PXE server). It will cover install of basic CDS control-room tools built for SL6. It will not cover the additional software and scripts to be installed by the users for hardware injections, nor how those users access the system remotely. We will not cover the basic setup of a PXE server, merely how we used it for SL6 installs within CDS.

4 Overview

We will first present OS installation using a CDS PXE server, and then subsequent note on configuration, CDS package installation. After that, notes on installing SL6 from source

5 Installing SL6 using PXE server

We are assuming use of an Ubuntu 12 PXE server. At LLO CDS this machine is 'opspxe'.

5.1 Set up Scientific Linux mirror on PXE server

Assuming an existing PXE server, we need to create a mirror with an SL6 iso image. Here are the setup commands at LLO CDS

```
mkdir /pub/iso
cd /pub/iso
curl -L -O http://ftp1.scientificlinux.org/linux/scientific/6.4/x86_64/iso/SL-
64-x86_64-2013-03-18-Install-DVD.iso
mkdir -p /var/www/mirror/scientificlinux/6.4/x86_64
mount -o loop -t iso9660 /pub/iso/SL-64-x86_64-2013-03-18-Install-DVD.iso
/var/www/mirror/scientificlinux/6.4/x86_64
```

5.2 Set up repo of SL6 RPMs on PXE server

We also need somewhere to keep RPM to support the LIGO DASWG and CDS packages we will be installing

```
aptitude install createrepo
mkdir -p /var/www/ligo/scientificlinux/6/x86_64
```

Now copy into this directory several useful RPMs (shown below). Then use the 'createrepo' tool in that directory to create repo index structures.

These include LIGO DASWG RPMs

gds-core-2.16.5-5.x86_64.rpm
gds-crtools-2.16.5-5.x86_64.rpm
gds-devel-2.16.5-5.x86_64.rpm
gds-monitors-2.16.5-5.x86_64.rpm
gds-pygds-2.16.5-5.x86_64.rpm
gds-services-2.16.5-5.x86_64.rpm
gds-web-2.16.5-5.x86_64.rpm
ldas-tools-1.19.32-2.x86_64.rpm
ldas-tools-diskcacheAPI-1.19.32-2.x86_64.rpm
ldas-tools-diskcacheAPI-devel-1.19.32-2.x86_64.rpm
ldas-tools-diskcacheAPI-python-1.19.32-2.x86_64.rpm
ldas-tools-filters-1.19.32-2.x86_64.rpm
ldas-tools-filters-devel-1.19.32-2.x86_64.rpm
ldas-tools-frameAPI-1.19.32-2.x86_64.rpm
ldas-tools-frameAPI-devel-1.19.32-2.x86_64.rpm
ldas-tools-framecpp-1.19.32-2.x86_64.rpm
ldas-tools-framecppc-1.19.32-2.x86_64.rpm
ldas-tools-framecppc-devel-1.19.32-2.x86_64.rpm
ldas-tools-framecpp-devel-1.19.32-2.x86_64.rpm
ldas-tools-framecpp-doc-1.19.32-2.x86_64.rpm
ldas-tools-framecpp-python-1.19.32-2.x86_64.rpm
ldas-tools-general-1.19.32-2.x86_64.rpm
ldas-tools-general-devel-1.19.32-2.x86_64.rpm
ldas-tools-genericAPI-1.19.32-2.x86_64.rpm
ldas-tools-genericAPI-devel-1.19.32-2.x86_64.rpm
nagios-plugins-dir-1.0-1.el6.x86_64.rpm

CDS needed RPMS
epel-release-6-8.noarch.rpm
cdssoft-release-6-1.el6.noarch.rpm
ligo-release-6-1.el6.noarch.rpm
fglrx-x11-drv-13.1-1.el6.elrepo.x86_64.rpm
geeqie-1.1-11.1.x86_64.rpm
grace-5.1.22-1.el6.src.rpm
grace-5.1.22-1.el6.x86_64.rpm
grace-debuginfo-5.1.22-1.el6.x86_64.rpm
kmod-fglrx-13.1-1.el6.elrepo.x86_64.rpm
pdftk-1.44-2.el6.x86_64.rpm
pylon-2.3.3-1.el6.x86_64.rpm
python-networkx-1.5-2.el6.noarch.rpm
rpmfusion-free-release-6-1.noarch.rpm
rpmfusion-nonfree-release-6-1.noarch.rpm

5.3 Create kickstart file for SL6 installation

In the PXE area, we need to create a kickstart file (workstation_sl6.cfg) for the install. This will partition the hard drive, install the operating system, and packages we want. Here is the current one at LLO. Other sites will have to customize it. We configure the workstation with the same LIGO.ORG authentication (and LDAP overlay) as the other workstations.

```
install
reboot
lang en_US.UTF-8
keyboard us
url --url http://opspxe/mirror/scientificlinux/6.4/x86_64/ --proxy
http://squid:3128
network --onboot yes --device eth0 --bootproto dhcp
rootpw  --iscrypted
$6$.1GxX5Ew$FSEOtELWn21.92tlvxGNrIjDv.BNiFnNrcKOs.R6RvIiQSJnpyptO90oKUiCIpjRIbY
lEss/VNN7p8/E7ftK8.
firewall --disabled
authconfig --enableldap --enablekrb5 --ldapserver=ldaps://ldap.cds.ligo-
la.caltech.edu --ldapbasedn=dc=ligo,dc=org --krb5realm=LIGO.ORG --
krb5kdc=cdskdc0.cds.ligo-la.caltech.edu,cdskdc1.cds.ligo-la.caltech.edu
selinux --permissive
timezone --utc America/Chicago
#bootloader --location=partition --driveorder=sdb --append="crashkernel=auto
rhgb quiet"
bootloader --location=mbr --append="crashkernel=auto rhgb quiet"
# The following is the partition information you requested
# Note that any partitions you deleted are not expressed
# here so unless you clear all partitions first, this is
# not guaranteed to work
clearpart --all
#part / --fstype=ext4 --asprimary --grow --size=10000
#part swap --size=1024
part / --fstype=ext4 --asprimary --size=50000
part /tmp --fstype=ext4 --size=50000
part /var --fstype=ext4 --size=50000
part swap --size=4096
part /opt --fstype=ext4 --grow --size=200

# These repositories are only used during install time.  You must install
# the appropriate *.repo files if you wish to continue to use them after
# the host has been installed.
repo --name="lscsoft_install" --baseurl=http://www.lsc-
group.phys.uwm.edu/daswg/download/software/scientificlinux/6.1/x86_64/
repo --name="LDG_EPEL6_install" --baseurl=http://www.lsc-
group.phys.uwm.edu/epel/6/x86_64
repo --name="LDG_SL6.1-base_install" --baseurl=http://www.lsc-
group.phys.uwm.edu/linux/scientific/6x/x86_64/os/
repo --name="LDG_SL6.1-securityupdates_install" --baseurl=http://www.lsc-
group.phys.uwm.edu/linux/scientific/6x/x86_64/updates/security/
repo --name="ligocds_install" --
baseurl=http://opspxe/ligo/scientificlinux/6.4/x86_64/
repo --name="epel" --
baseurl=http://download.fedoraproject.org/pub/epel/6/x86_64/

%packages
@base
```

```
@client-mgmt-tools
@core
@debugging
@basic-desktop
@desktop-debugging
@desktop-platform
@directory-client
@fonts
@general-desktop
@graphical-admin-tools
@input-methods
@internet-applications
@internet-browser
@java-platform
@legacy-x
@misc-sl
@network-file-system-client
@office-suite
@print-client
@remote-desktop-clients
@scalable-file-systems
@server-platform
@x11
mtools
pax
oddjob
wodim
sgpio
genisoimage
device-mapper-persistent-data
samba-winbind
certmonger
pam_krb5
krb5-workstation
gnome-pilot
libXmu
SL_desktop_tweaks
openldap-clients
policycoreutils-python
nagios-plugins
nagios-plugins-perl
tcllib
nrpe
xinetd
ssmtp
ganglia-gmond
emacs
flex
bison
bzip2-devel
gimp
inkscape
pdfedit
expect
git
eclipse
telnet
geeqie
```

```
pdftk
ipython
nagios-plugins
nagios-plugins-linux_raid
nagios-plugins-disk
nagios-plugins-file_age
nagios-plugins-users
nagios-plugins-procs
nagios-plugins-load
nagios-plugins-perl
#puppet
# EPEL
root
root-graf3d
root-physics
yum-plugin-priorities
# Required for CDS control room software
subversion
gcc-c++
libtool
python-devel
readline-devel
libXmu-devel
libXpm-devel
libXaw-devel
libtiff-devel
xz-devel
pcre-devel
doxygen
graphviz
swig
openssl-devel
mesa-libGL-devel
mesa-libGLU-devel
libxml2-devel
expat-devel
tcl
tsclient
xterm
python-argparse
perl-Time-HiRes
python-pydot
# Only in the LDG repos
lapack-devel
glew-devel
gsl-devel
gd-devel
fftw-devel
t1lib-devel
openmotif-devel
re2c
ldg-repo-config
# In the local CDS SL6 repository
pylon
epel-release
ligo-release
cdssoft-release
rpmfusion-free-release
```

```
rpmfusion-nonfree-release
fglrx-x11-drv
kmod-fglrx
nagios-plugins-linux_raid
nagios-plugins-dir
tclnagios
python-networkx
%end

%post --log /root/ks-post.log

cat > /etc/resolv.conf <<EOFA
nameserver 10.110.10.7
nameserver 10.110.10.8
domain cds.ligo-la.caltech.edu
search cds.ligo-la.caltech.edu ligo-la.caltech.edu
EOFA

echo "priority=50" >> /etc/yum.repos.d/cdssoft.repo
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-sl
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-sl6
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-cern
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-EPEL-6
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-rpmfusion-free-el-6
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-rpmfusion-nonfree-el-6
#rpm -ivh http://download.fedoraproject.org/pub/epel/6/i386/epel-release-6-
8.noarch.rpm
#rpm -ivh http://opspxe/sl/6/grace-5.1.22-1.el6.x86_64.rpm
#rpm -ivh http://opspxe/sl/6/pylon-2.3.3-1.el6.x86_64.rpm
#rpm -ivh http://download1.rpmfusion.org/free/el/updates/6/i386/rpmfusion-free-
release-6-1.noarch.rpm
#rpm -ivh http://download1.rpmfusion.org/nonfree/el/updates/6/i386/rpmfusion-
nonfree-release-6-1.noarch.rpm
# Can this be put into our package list without downloading a copy of the RPM?
yum -y install gstreamer-ffmpeg grace gds-crtools
yum -y remove NetworkManager NetworkManager-gnome
sed -i -e '/^\[main\]/aproxy=http:\/\/squid:3128' /etc/yum.conf
sed -i -e 's/ENABLED=.*/ENABLED="false"/' /etc/sysconfig/yum-autoupdate

#echo "10.110.0.0/16 via 10.110.10.2" >> /etc/sysconfig/network-scripts/route-
eth0
#echo "10.100.0.0/16 via 10.110.10.2" >> /etc/sysconfig/network-scripts/route-
eth0
sed -i -e 's/NM_CONTROLLED=.*/NM_CONTROLLED="no"/' /etc/sysconfig/network-
scripts/ifcfg-eth0
echo "DNS1=10.110.10.7" >> /etc/sysconfig/network-scripts/ifcfg-eth0
echo "DNS2=10.110.10.8" >> /etc/sysconfig/network-scripts/ifcfg-eth0
echo "DOMAIN=\"cds.ligo-la.caltech.edu ligo-la.caltech.edu\"" >>
/etc/sysconfig/network-scripts/ifcfg-eth0

cat >/etc/openldap/ldap.conf <<EOFB
BASE    dc=ligo,dc=org
URI     ldaps://ldap.cds.ligo-la.caltech.edu
TLS_REQCERT demand
TLS_CACERT /etc/pki/tls/cert.pem
EOFB

cat > /usr/lib64/firefox/defaults/preferences/sysprefs.js <<EOFC
```

```
# Do not delete this first line
lockPref("autoadmin.global_config_url","file:///ligo/cds/llo/scripts/desktop/fi
refox.cfg");
lockPref("autoadmin.append_emailaddr",false);
EOFC

cat > /usr/lib64/firefox/firefox.cfg <<EOFD
# Do not delete this first line
lockPref("autoadmin.global_config_url","file:///ligo/cds/llo/scripts/desktop/fi
refox.cfg");
lockPref("autoadmin.append_emailaddr",false);
EOFD

echo "cdsadmin        ALL=(ALL)       ALL" >> /etc/sudoers


mkdir /ligo /cvs /data /web /opt/rtcds
cat >>/etc/fstab <<EOFE
llo1file:/export/ligo   /ligo   nfs     rw,noacl        0       0
llo1file:/users/home    /home   nfs     rw,noacl        0       0
llo1file:/export/cvs    /cvs    nfs     rw,noacl        0       0
llo1file:/export/data   /data   nfs     rw,noacl        0       0
llo1file:/export/web    /web    nfs     rw,noacl        0       0
l1boot:/opt/rtcds       /opt/rtcds      nfs     rw      0       0
EOFE

mkdir -p /usr/local/home
groupadd -g 1000 cdsadmin
groupadd -g 1001 controls
useradd -c "Controls" -g 1001 -M -u 1001 -p
'$6$.1GxX5Ew$FSEOtELWn21.92tlvxGNrIjDv.BNiFnNrcKOs.R6RvIiQSJnpyptO90oKUiCIpjRIb
YlEss/VNN7p8/E7ftK8.' controls
useradd -c "CDS Administrator" -g 1000 -d /usr/local/home/cdsadmin -u 1000 -p
'$6$.1GxX5Ew$FSEOtELWn21.92tlvxGNrIjDv.BNiFnNrcKOs.R6RvIiQSJnpyptO90oKUiCIpjRIb
YlEss/VNN7p8/E7ftK8.' cdsadmin

cat >/etc/cron.daily/update-cds-group <<'EOFF'
#!/bin/sh

if [ -e /etc/sysconfig/update-cds-group ] ; then
    . /etc/sysconfig/update-cds-group
fi

cdsMembers=`ldapsearch -x -LLL '(!(loginShell=/sbin/nologin))' uid | grep uid:
| sed -e 's/uid: //' | sort | xargs echo controls $EXTRA_CDS_MEMBERS | tr ' '
,`
controlsMembers=`ldapsearch -x -LLL '(!(loginShell=/sbin/nologin))' uid | grep
uid: | sed -e 's/uid: //' | sort | xargs echo controls $EXTRA_CONTROLS_MEMBERS
| tr ' ' ,`
foundCDSGroup=`getent group cds | wc -l`

if [ "${foundCDSGroup}" = 0 ] ; then
        echo "cds:x:1050:$cdsMembers" >> /etc/group
fi

sed -i -e "s/^cds:.*/cds:x:1050:$cdsMembers/" \
    -e "s/^controls:.*/controls:x:1001:$controlsMembers/" /etc/group
```

```
EOFF
chmod 755 /etc/cron.daily/update-cds-group
/etc/cron.daily/update-cds-group

echo "10.110.10.4" > /etc/ntp/step-tickers
cat >/etc/ntp.conf <<EON
driftfile /var/lib/ntp/drift
restrict default kod nomodify notrap nopeer noquery
restrict -6 default kod nomodify notrap nopeer noquery
restrict 127.0.0.1
restrict -6 ::1
server 10.110.10.4
includefile /etc/ntp/crypto/pw
keys /etc/ntp/keys
EON

chkconfig ntpd on

cat >>/usr/share/fonts/X11/misc/fonts.alias <<EOFONT

widgetDM_4   -misc-fixed-medium-r-normal--8-60-100-100-c-50-iso8859-1
widgetDM_6   -misc-fixed-medium-r-normal--8-60-100-100-c-50-iso8859-1
widgetDM_8   -misc-fixed-medium-r-normal--9-80-100-100-c-60-iso8859-1
widgetDM_10  -misc-fixed-medium-r-normal--10-100-75-75-c-60-iso8859-1
widgetDM_12  -misc-fixed-medium-r-normal--13-100-100-100-c-70-iso8859-1
widgetDM_14  -misc-fixed-medium-r-normal--14-110-100-100-c-70-iso8859-1
widgetDM_16  -misc-fixed-medium-r-normal--15-120-100-100-c-90-iso8859-1
widgetDM_18  -sony-fixed-medium-r-normal--16-120-100-100-c-80-iso8859-1
widgetDM_20  -misc-fixed-medium-r-normal--20-140-100-100-c-100-iso8859-1
widgetDM_22  -sony-fixed-medium-r-normal--24-170-100-100-c-120-iso8859-1
widgetDM_24  -sony-fixed-medium-r-normal--24-170-100-100-c-120-iso8859-1
widgetDM_30  -adobe-times-medium-r-normal--25-180-100-100-p-125-iso8859-1
widgetDM_36  -adobe-helvetica-medium-r-normal--34-240-100-100-p-176-iso8859-1
widgetDM_40  -adobe-helvetica-bold-r-normal--34-240-100-100-p-182-iso8859-1
widgetDM_48  -adobe-helvetica-bold-r-normal--34-240-100-100-p-182-iso8859-1
widgetDM_60  -adobe-helvetica-bold-r-normal--34-240-100-100-p-182-iso8859-1
EOFONT
%end
```

5.4 Install from the PXE boot server

Now boot the new computer from the PXE boot server and install using the ‘workstation_sl6’ config.

6 Installing SL6 from media

If you don't have PXE boot server set up, you can still install from SL6 media or a network copy.

6.1 Install the Base OS

The base OS should be installed using the Desktop package, as presented in the SL installation screens.

6.2 Install additional RPM packages

Now install RPM packages that we need

```
rpm -Uvh http://download.fedoraproject.org/pub/epel/6/i386/epel-release-6-8.noarch.rpm
yum install subversion gcc-c++ libtool python-devel readline-devel libXmu-devel openmotif-devel gsl-devel libXpm-devel gd-devel libXaw-devel libtiff-devel xz-devel pcre-devel lapack-devel doxygen graphviz swig openssl-devel fftw-devel glew-devel mesa-libGL-devel mesa-libGLU-devel libxml2-devel expat-devel tcl t1lib-devel
rpm -ivh http://opspxe/sl/6/re2c-0.13.2-1.rf.x86_64.rpm
rpm -ivh http://opspxe/sl/6/grace-5.1.22-1.el6.x86_64.rpm
rpm -ivh http://opspxe/sl/6/pylon-2.3.3-1.el6.x86_64.rpm
```

Set up rpmfusion so that we can get the ffmpeg encoder/decoder for the GigE camera software:

```
rpm -ivh http://download1.rpmfusion.org/free/el/updates/6/i386/rpmfusion-free-release-6-1.noarch.rpm
rpm -ivh http://download1.rpmfusion.org/nonfree/el/updates/6/i386/rpmfusion-nonfree-release-6-1.noarch.rpm
yum install gstreamer-ffmpeg
```

Create the LDG yum repository files by following the instructions at https://www.lsc-group.phys.uwm.edu/daswg/download/repositories.html - sl61user

6.3 Install CDS setup scripts

Do not perform this step if you are using the shared /ligo area from the main CDS file server! Create the csdcfg configuration area:

```
mkdir /ligo
svn co https://redoubt.ligo-wa.caltech.edu/svn/controls/trunk/cdscfg
cd cdscfg/install
.cfg_ws.sh
```

Follow the prompts for your installation

7 Post-install configuration

7.1 Change passwords, machine name, network

After the initial installation, you will need to change the local user (controls, cdsadmin, root) passwords. You will also need to make sure the correct machine name is used. Modify /etc/sysconfig/network-scripts/ifcfg-eth0 with the correct network settings. Make sure all the NFS mounts are working. Test that the controls user can log in.

7.2 Configure for CDS environment, applications

At LLO, all the CDS applications are stored on the main file server, a different directory for each OS revision. We extended this to SL6 by creating '/ligo/apps/sl6' on the NFS server to hold CDS-built applications. The CDS configuration scripts detect that a user is on a Scientific Linux system by using the 'proctype','uname' and 'lsb_release' commands thusly (example from "/ligo/cdscfg/<site>/<ifo>/stdrc_linux.sh")

```
#  First determine OS_ARCH
proctype=`uname -m`
# define apps folder
if [ -e /etc/gentoo-release ] ; then
    # define apps folder
    export APPSROOT=${APPSBASEDIR}
    export OS_ARCH=linux-x86_64
else
    # add breakdown by Ubuntu,SL release
    uburel=`lsb_release -rs`
    if [ "$proctype" == "x86_64" ]; then
        if [[ "$uburel" == "12."* ]]; then
            export OS_ARCH=ubuntu12
        elif [[ "$uburel" == "11."* ]]; then
            export OS_ARCH=linux-x86_64
        elif [[ "$uburel" == "6."* ]]; then
            export OS_ARCH=sl6
        elif [[ "$uburel" == "10."* ]]; then
            if [ -f /opt/config/UBUNTU10 ]; then
                    export OS_ARCH=ubuntu10
            else
                export OS_ARCH=linux-x86_64
            fi
        else
            export OS_ARCH=linux-x86_64
        fi
    else
        export OS_ARCH=linux-x86
    fi
    # Define APPSROOT based on OS_ARCH
    export APPSROOT=${APPSBASEDIR}/${OS_ARCH}
fi
```

You can verify this is working by logging on as the 'controls' user and echoing the APPSROOT environment variable. It should be '/ligo/apps/sl6'.

7.3 Get SL6 builds of CDS control-room applications

Many of the applications required for hardware injection will come with the DASWG RPMs. However, they do not include EPICS nor control-room specific GDS, etc. To install these, we need to get the tar-balls of pre-compiled code from the CDS DAQ storage, which is currently at https://llocds.ligo-la.caltech.edu/daq/software/binary/apps/sl6.

The following packages are currently there

```
awgstream-2.15.10_sl6.tar.gz
dv-2.8.1_sl6.tar.gz
epics-3.14.12.2_long_sl6.tar.gz
gds-2.16.12_sl6.tar.gz
guardian-0+r582_sl6.tar.gz
ligodv-1.12_sl6.tar.gz
mDV-20130731_sl6.tar.gz
nds2-client-0.10.4_sl6.tar.gz
root_v5.34.03_sl6.tar.gz
tds-2.14.2_sl6.tar.gz
```

To install these, download them to a directory (/ligo/apps/sl6/tarfiles), expand them and then set up generic soft-links. For example

```
su controls
cd /ligo/apps/sl6
mkdir tarfiles
cd tarfiles
```

Now download tar-balls to this folder.

```
cd /ligo/apps/sl6
tar –xzf tarfiles/epics-3.14.12.2_long_sl6.tar.gz
ln –s epics-3.14.12.2_long epics
tar –xzf dv-2.8.1_sl6.tar.gz
ln –s dv-2.8.1 dv
```

und so wieter..

Logout from the user account and login back in to get the CDS environment correct.