

# Instructions for Installing Geant 4 on CentOS 5 for Complete PEN Geometry Simulations

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## 1 Getting Started

You will need the root password for your local machine. Completing these instructions may take a few hours.

Do a *complete* installation of CentOS 5, including all components and subcomponents. If you install in graphical mode, put a check mark in the box next to every component, and all of its subcomponents. This is critical to avoid conflicts with missing libraries or software, such as OpenMotif.

Next update the whole OS using yum:

```
[username@pc ~]$ yum update
[username@pc ~]$ yum clean all
```

## 2 Installation

Note that everywhere in the following procedure, you must replace “username” with your username.

Download `distr.tar.gz` from PEN website (password protected), and save it in your working directory, i.e., `/home/username`. Uncompressing this file will create a directory `distr` that will contain everything you need to complete these instructions.

```
[username@pc ~]$ tar zxvf distr.tar.gz
```

## 2.1 Installing a Few Preliminary Applications

Supposing you are working with bash, you must update your environment variables.

```
[username@pc ~]$ cd distr
[username@pc distr]$ su
Password:
[root@pc distr]# cp bashrc /etc
cp: overwrite '/etc/bashrc'? y
```

Now you must modify this file in two places. Change

```
export VGM_INSTALL /home/v/vgm/vgm}
```

to

```
export VGM_INSTALL /home/username/vgm
```

and

```
export LD_LIBRARY_PATH /home/v/vgm/vgm/lib/Linux-g++
```

to

```
export LD_LIBRARY_PATH /home/username/vgm/lib/Linux-g++
```

Now we extract cernlib to the top directory of CentOS. Note the option `-C /` in the `tar` command.

```
[root@pc distr]# cd cernlib-2006
[root@pc cernlib-2006]# tar -zxvf cernlib_2006.e15.tar.gz -C /
```

This allows us to use Geant3 and PAW in CentOS 5.

Now install Adobe flash player,

```
[root@pc /]# cd /home/username/distr/Adobe_flash_player_9_linux/
[root@pc Adobe_flash_player_9_linux]# rpm -Uvh flash-plugin-9.0.48.0-release.i386.rpm
Preparing...          ##### [100%]
   1:flash-plugin      ##### [100%]
```

and `djvu`,

```
[root@pc Adobe_flash_player_9_linux]# cd ../djvu/
[root@pc djvu]# rpm -Uvh djvulibre-3.5.19-1.i386.rpm
Preparing... ##### [100%]
   1:djvulibre ##### [100%]
```

and unrar,

```
[root@pc djvu]# cd ../unrar/
[root@pc unrar]# rpm -Uvh unrar-3.7.4-1.el5.rf.i386.rpm
warning: unrar-3.7.4-1.el5.rf.i386.rpm: Header V3 DSA signature: NOKEY, key ID 6b8d79e6
Preparing... ##### [100%]
   1:unrar ##### [100%]
```

## 2.2 Installing castor and gsl

Next you must install castor,

```
[root@pc distr]# cd ../castor/
[root@pc castor]# rpm -Uvh *
warning: CASTOR-client-2.1.2-4.i386.rpm: Header V3 DSA signature: NOKEY, key ID 1d1e034b
Preparing... ##### [100%]
   1:castor-lib ##### [ 4%]
Flushing firewall rules: [ OK ]
Setting chains to policy ACCEPT: filter [ OK ]
Unloading iptables modules: [ OK ]
Applying iptables firewall rules: [ OK ]
Loading additional iptables modules: ip_conntrack_netbios_ns [ OK ]
   2:castor-rtcopy-messages ##### [ 8%]
   3:castor-rtcopy-client ##### [ 12%]
   4:castor-commands ##### [ 15%]
   5:castor-devel ##### [ 19%]
   6:castor-ns-client ##### [ 23%]
   7:castor-rfio-client ##### [ 27%]
   8:castor-stager-client ##### [ 31%]
   9:castor-stager-clientold##### [ 35%]
  10:castor-tape-client ##### [ 38%]
  11:castor-upv-client ##### [ 42%]
  12:castor-vdqm-client ##### [ 46%]
  13:castor-vmgr-client ##### [ 50%]
  14:castor-scriptlets ##### [ 54%]
  15:castor-lib-compat ##### [ 58%]
```

```

16:castor-doc                ##### [ 62%]
17:CASTOR-client            ##### [ 65%]
18:castor-config            ##### [ 69%]
19:castor-db-config         warning: group st does not exist - using root
##### [ 73%]
20:castor-dlf-web           ##### [ 77%]
21:castor-hsmttools         ##### [ 81%]
22:castor-msg-client        ##### [ 85%]
23:castor-rfio-server       ##### [ 88%]
24:castor-rmmaster-client   ##### [ 92%]
25:castor-sacct             ##### [ 96%]
26:castor-sysconfig         ##### [100%]

```

Then install gsl,

```

[root@pc castor]# cd ../gsl/
[root@pc gsl]# rpm -Uvh *
Preparing...                ##### [100%]
 1:gsl                      ##### [ 50%]
 2:gsl-devel                 ##### [100%]

```

Now we copy some shared libraries to our local library directory.

```

[root@pc distr]# cp /home/username/distr/pythya/libPythia6.so /usr/local/lib/
[root@pc distr]# cp /home/username/distr/venus/libVenus.so /usr/local/lib/

```

## 2.3 Installing ROOT

Now comes the installation of ROOT version 5.17.

```

[root@pc distr]# cp root_v5.17.01.el5.tar.gz /usr/local/
[root@pc distr]# cd /usr/local/
[root@pc local]# tar zxvf root_v5.17.01.el5.tar.gz

```

If you wish, you may create a test directory and copy some test files into it that will allow you to test paw++ and root.

```

[root@pc local]# cd /home/username/
[root@pc username]# mkdir test
[root@pc username]# cp /home/username/distr/paw++/* /home/username/test/
[root@pc username]# cp /home/username/distr/root/* /home/username/test/

```

## 2.4 Installing MIDAS

The following commands will install MIDAS.

```
[root@pc distr]# cp midas\=trunk-18.08.2007/midas-trunk-18.08.2007.tar.gz /usr/local/
[root@pc distr]# cp midas\=trunk-18.08.2007/mxml-trunk-18.08.2007.tar.gz /usr/local/
[root@pc distr]# cd /usr/local/
[root@pc local]# tar zxvf midas-trunk-18.08.2007.tar.gz
[root@pc local]# tar zxvf mxml-trunk-18.08.2007.tar.gz
[root@pc local]# cd /usr/local/midas
[root@pc midas]# make
```

You shouldn't get *any* errors. If you do, you should fix them now before proceeding with these instructions.

## 2.5 Installing Geant

```
[root@pc midas]# cp /home/username/distr/geant4/OpenInventor/Coin3D.el5.tar.gz /usr/local/
[root@pc distr]# cd /usr/local/
[root@pc local]# tar zxvf Coin3D.el5.tar.gz

[root@pc local]# cp /home/username/distr/geant4/OpenScientist/OpenScientist-15-0.el5.tar.gz /usr/local/
[root@pc local]# tar zxvf OpenScientist-15-0.el5.tar.gz

[root@pc local]# cd /usr/lib
[root@pc lib]# cp /home/username/distr/geant4/OpenScientist/libg2c.tar.gz /usr/lib/
[root@pc lib]# tar zxvf libg2c.tar.gz

[root@pc lib]# cd /usr/local
[root@pc local]# cp /home/username/distr/geant4/aidajni-3.2.6/aidajni-3.2.6-i386-Linux-g++.tar.gz /usr/local/
[root@pc local]# tar zxvf aidajni-3.2.6-i386-Linux-g++.tar.gz

[root@pc local]# cp /home/username/distr/geant4/clhep/clhep-2.0.3.1.el5.tar.gz /usr/local/
[root@pc local]# tar zxvf clhep-2.0.3.1.el5.tar.gz

[root@pc local]# cd /usr/local/bin
[root@pc bin]# cp /home/username/distr/geant4/david/david_1.36a_bin_el5.tar.gz /usr/local/bin/
[root@pc bin]# tar zxvf david_1.36a_bin_el5.tar.gz
[root@pc bin]# cp /home/username/distr/geant4/dawn/dawn_3.88a_bin_el5.tar.gz /usr/local/bin/
[root@pc bin]# tar zxvf dawn_3.88a_bin_el5.tar.gz

[root@pc bin]# cd /usr/bin
[root@pc bin]# cp /home/username/distr/geant4/dawn/ggv_el5.tar.gz /usr/bin/
[root@pc bin]# tar zxvf ggv_el5.tar.gz
```

```

[root@pc bin]# cd /usr/local/
[root@pc local]# cp /home/username/distr/geant4/gdml/GDML2-el5.tar.gz /usr/local/
[root@pc local]# tar zxvf GDML2-el5.tar.gz

[root@pc local]# cd /home/username/distr/geant4/gdml/Xerces-C/rpms/
[root@pc rpms]# rpm -Uvh *
warning: xerces-c-2.7.0-1.el5.rf.i386.rpm: Header V3 DSA signature: NOKEY, key ID 6b8d79e6
Preparing... ##### [100%]
 1:xerces-c ##### [ 50%]
 2:xerces-c-devel ##### [100%]

[root@pc rpms]# cd /usr/local/
[root@pc local]# cp /home/username/distr/geant4/jaida-3.3.0-4/jaida-3.3.0-4-bin.tar.gz /usr/local/
[root@pc local]# tar zxvf jaida-3.3.0-4-bin.tar.gz

[root@pc local]# cp /home/username/distr/geant4/jas3/jas3-Linux-0.8.3.tar.gz /usr/local/
[root@pc local]# tar zxvf jas3-Linux-0.8.3.tar.gz

[root@pc local]# cd /usr/local/bin/
[root@pc bin]# cp /home/username/distr/geant4/vrmlview/vrmlview_linux.tar.gz /usr/local/bin/
[root@pc bin]# tar zxvf vrmlview_linux.tar.gz

[root@pc bin]# cd /usr/lib
[root@pc lib]# cp /home/username/distr/geant4/vrmlview/libstdc++-libc6.el5.tar.gz /usr/lib
[root@pc lib]# tar zxvf libstdc++-libc6.el5.tar.gz

[root@pc distr]# cd /home/username/distr/Java\ 2\ Runtime\ Environment/
[root@pc Java 2 Runtime Environment]# rpm -Uvh *
Preparing... ##### [100%]
 1:sun-javadb-common ##### [ 14%]
 2:jdk ##### [ 29%]
Unpacking JAR files...
  rt.jar...
  jsse.jar...
  charsets.jar...
  tools.jar...
  localedata.jar...
  plugin.jar...
  javaws.jar...
  deploy.jar...
 3:sun-javadb-client ##### [ 43%]
 4:sun-javadb-core ##### [ 57%]
 5:sun-javadb-demo ##### [ 71%]
 6:sun-javadb-docs ##### [ 86%]
 7:sun-javadb-javadoc ##### [100%]

```

```
[root@pc local]# cp -r /home/username/distr/geant4/wired/ /usr/local/
[root@pc local]# cd /usr/local/wired/
[root@pc wired]# java -cp . install
```

A GUI will launch. When you're asked where to install, type in:

```
/usr/local/wired instead of /root/wired
```

```
[root@pc wired]# cd /home/username/distr/geant4
[root@pc geant4]# cp aidajni-setup.* /etc
[root@pc geant4]# cp aida-setup.* /etc
[root@pc geant4]# cp env.* /etc

[root@pc geant4]# cp geant4.9.0.trng-trap.el5.tar.gz /
[root@pc geant4]# cd /
[root@pc /]# tar zxvf geant4.9.0.trng-trap.el5.tar.gz
```

Now ROOT v5.17 is installed.

## 2.6 Installing VGM

For the following, make sure you are *NOT* root.

```
[root@pc /]# exit
exit
[username@pc ~]$ cd ~
[username@pc ~]$ cp /home/username/distr/vgm.3.00.tar.gz /home/username/
[username@pc ~]$ cd ~
[username@pc ~]$ tar zxvf vgm.3.00.tar.gz
```

## 2.7 Setting Up Your Local Environment

The final task is to edit your `.bashrc` file.

```
[username@pc ~]$ emacs .bashrc &
```

Now add the following lines,

```
. /etc/env.sh

. /usr/local/OpenScientist/v15r0/aida-setup.sh
```

### 3 Comments

In the directory `/vgm/examples/PSI07c` there is the most up to date PEN simulation template, with the full geometry.

In the directory `/distr/G4PionPlus` there are libraries containing three variants of the  $\pi^+$  decay.

The first time I tried to compile `PSI07c` I received SELinux errors about memory and text relocation. SELinux tells you how to ignore these by typing the following commands in your terminal.

```
[root@pc ~]# chcon -t textrel_shlib_t /usr/local/OpenScientist/v15r0/expat/v1r11p4/Linux-i686/Libosc_expate.so
[root@pc ~]# chcon -t textrel_shlib_t /usr/local/OpenScientist/v15r0/Rio/v7r0/Linux-i686/libRio.so
```

After entering these commands, `PSI07c` compiled with no errors. It can be executed with command,

```
[username@pc PSI07c]$ pibeta
```

Then in the GUI, one can type

```
/control/execute vis.mac
```

followed by

```
/control/execute run1.mac
```

and you will see the visualization of the tracks in the PEN detector.

### 4 Acknowledgments

Many thanks go to Vladimir Volnykh, whose work on this is invaluable.