Install RAT

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SETUP

- Mostly follow RAT Documentation:
  - http://rat.readthedocs.org/en/latest/installation.html
- My PC:
  - Vagrant / Virtualbox
    - ubuntu/trusty64
    - Virtual memeroy: 2GB

```
$ gcc --version
gcc (Ubuntu 4.8.2-19ubuntu1) 4.8.2
```

```
$ cmake --version
cmake version 2.8.12.2
```

PYTHON

- Python 2.7.X with development headers

~ $ python --version
Python 2.7.6

~ $ sudo apt-get install python-dev

```
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following extra packages will be installed:
  libpython2.7 libpython2.7-dev libpython2.7-minimal libpython2.7-stdlib
  python2.7 python2.7-dev python2.7-minimal
Suggested packages:
  python2.7-doc binfmt-support
The following NEW packages will be installed:
  python-dev python2.7-dev
The following packages will be upgraded:
  libpython2.7 libpython2.7-dev libpython2.7-minimal libpython2.7-stdlib
  python2.7 python2.7-minimal
6 upgraded, 2 newly installed, 0 to remove and 87 not upgraded.
Need to get 26.9 MB of archives.
After this operation, 367 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

ROOT

- ROOT 5.34
  - https://root.cern.ch/download/root_v5.34.32.source.tar.gz

```
tar -xvzf root_v5.34.32.source.tar.gz

./configure --enable-python --enable-minuit2 --enable-gdml

make
```

  - ~ 30 min.

```
$ python -c "import ROOT; print ROOT.gROOT"
<ROOT.gROOTWrapper object at 0x7f570853d0d0>
```

QT4

- Needed for GEANT4 VIS
  - If use other vis engine then probably no need

```
sudo apt-get install libqt4-core libqt4-dev libqt4-gui
```

GEANT4

- GEANT 4.10
  - http://geant4.cern.ch/support/source/geant4.10.01.p02.tar.gz

```
DIR=$( cd "$( dirname "${BASH_SOURCE[0]}" )" && pwd)

tar -zxvf geant4.10.01.p02.tar.gz

mkdir geant4.10.01.p02-build && cd geant4.10.01.p02-build

cmake -DCMAKE_INSTALL_PREFIX=$DIR/geant4.10.01.p02-build
$DIR/geant4.10.01.p02 -DGEANT4_USE_SYSTEM_EXPAT=OFF -
DGEANT4_INSTALL_DATA=ON -
DGEANT4_BUILD_MULTITHREADED=ON -DGEANT4_USE_QT=ON

make –j1 && make install
```

  - ~ 50 min

Geant4 Additional (Optional)

- GDML
  - sudo apt-get install libxerces-c-dev
  - cmake -DGEANT4_USE_GDML=ON .
  - make && make install
- OpenGL x11:
  - sudo apt-get install xorg-dev
  - cmake -DGEANT4_USE_OPENGL_X11=ON .
  - make && make install
- (One can always re-configure as above to enable/disable options)

GEANT4

- For some reason the following script is not executable by default after installation
  - chmod 744 xxx/geant4.10.01.p02-build/InstallTreeFiles/geant4-config

GEANT4 Test

- Copy an example under xxx/geant4.10.01.p02-build/share/Geant4-10.1.2/examples/ to another location, e.g. TestEm/
  - mkdir TestEm-build && cd TestEm-build
  - cmake -DGeant4_DIR=xxx/geant4.10.01.p02-build/ ../TestEm
  - make
  - ./TestEm (interactive)
    - or ./TestEM xxx.mac

SCons

- RAT BUILD TOOL

sudo apt-get install scons

```
$ scons --version
SCons by Steven Knight et al.:
        script: v2.3.0, 2013/03/03 09:48:35, by garyo on reepicheep
        engine: v2.3.0, 2013/03/03 09:48:35, by garyo on reepicheep
        engine path: ['/usr/lib/scons/SCons']
```

RAT

- Setup ROOT and GEANT4 first
  - ROOT: source xxx/bin/thisroot.sh
  - GEANT4: source xxx/geant4.10.01.p02-build/InstallTreeFiles/geant4.sh
- git clone https://github.com/rat-pac/rat-pac

```
cd rat-pac
./configure
source env.sh
scons
```

- ~10 min

RAT Setup

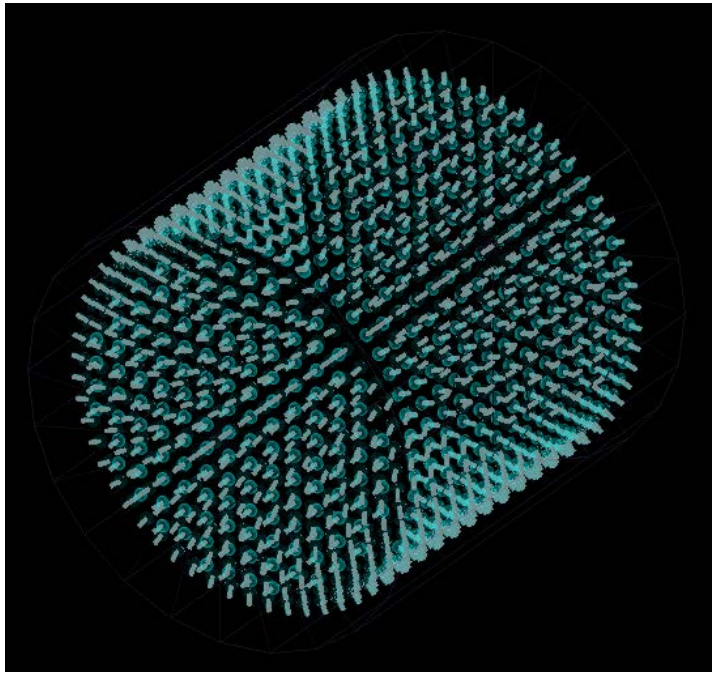
- After everything installed, only need 3 lines

```
$ cat ~/setup_rat.sh
source /home/vagrant/app/geant4/geant4.10.01.p02-
build/InstallTreeFiles/geant4.sh
source /home/vagrant/app/root/bin/thisroot.sh
source /home/vagrant/app/rat-pac/env.sh
```

RAT Test

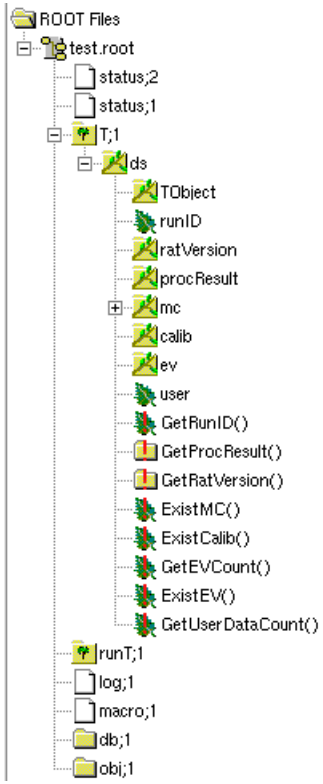
```
$ rat

/rat/db/set DETECTOR experiment "cylinder"
/rat/db/set DETECTOR geo_file "cylinder/cylinder.geo"
/run/initialize
/vis/scene/create
/vis/open OGLIQt
/vis/drawVolume
```

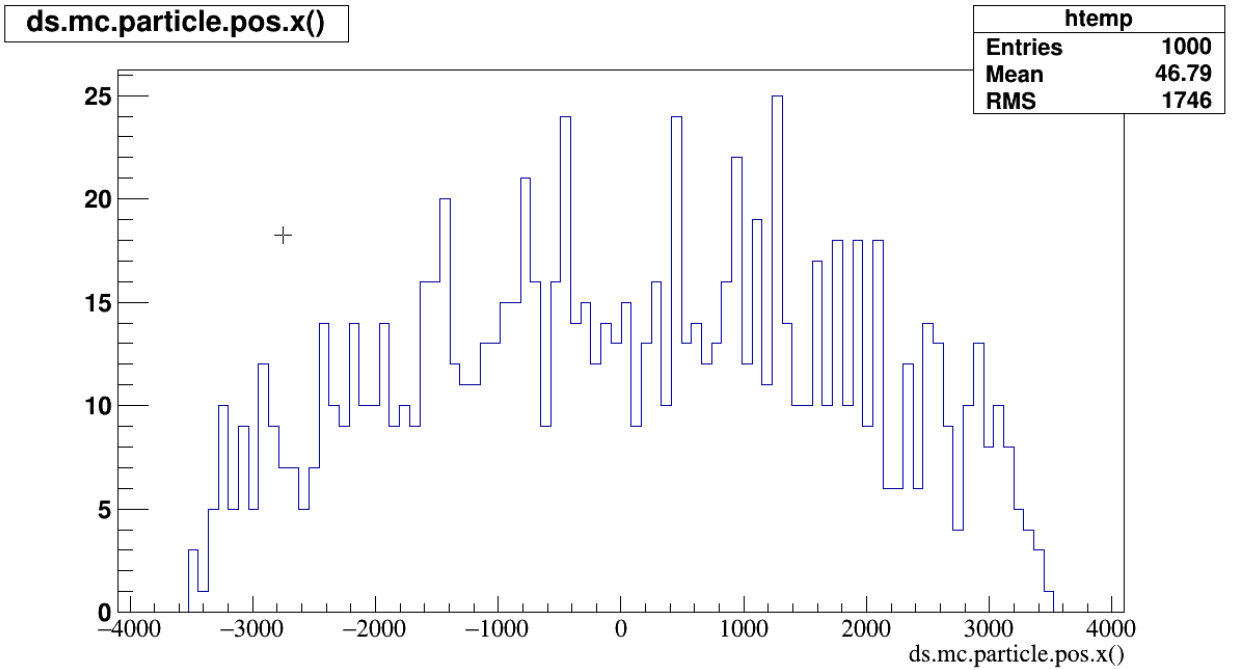
GOOD!

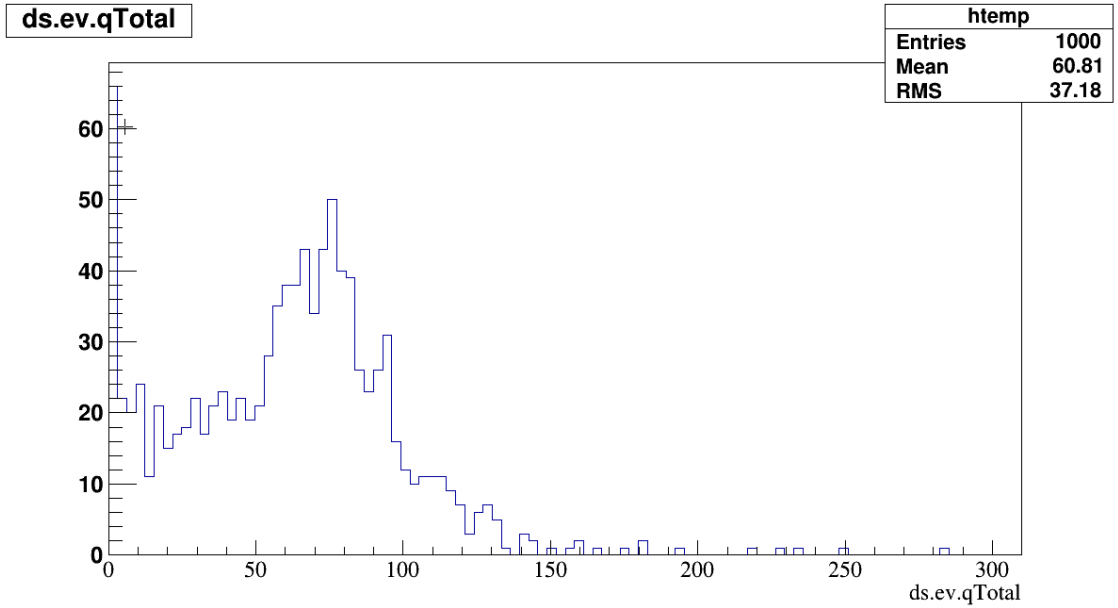


Electron Gun, output to ROOT file

```
$ cat electron_demo_cylinder.mac
/glg4debug/glg4param omit_muon_processes  1.0
/glg4debug/glg4param omit_hadronic_processes  1.0

/rat/db/set DETECTOR experiment "cylinder"
/rat/db/set DETECTOR geo_file "cylinder/cylinder.geo"

/run/initialize

# BEGIN EVENT LOOP
/rat/proc simpledaq
/rat/proc count
/rat/procset update 10

# Use IO.default_output_filename
/rat/proclast outroot
#END EVENT LOOP

/generator/add combo gun2:fill
/generator/vtx/set e-  0 0 0 0 10.0 10.0
/generator/pos/set 0 0 0

/run/beamOn 1000
```


ROOT Files
test.root
status;2
status;1
T;1
ds
TObject
runID
ratVersion
procResult
mc
calib
ev
user
GetRunID()
GetProcResult()
GetRatVersion()
ExistMC()
ExistCalib()
GetEVCount()
ExistEV()
GetUserDataCount()
runT;1
log;1
macro;1
db;1
obj;1


ds.mc.particle.pos.x()
htemp
Entries 1000
Mean 46.79
RMS 1746
25
20
15
10
5
0
−4000
−3000
−2000
−1000
0
1000
2000
3000
4000
ds.mc.particle.pos.x()


ds.ev.qTotal
htemp
Entries 1000
Mean 60.81
RMS 37.18
60
50
40
30
20
10
0
0
50
100
150
200
250
300
ds.ev.qTotal