Hands-on sessions

Participants are expected to bring their own laptop, which should be setup ahead of time, following the instructions provided below.

The tutorials will rely on a VirtualMachine image for VirtualBox: https://farmsmon.pi.infn.it/fcschool/ G4Tut104p02-VM-DropBox.ova
This image will provide a linux environment, with ROOT and Geant4 pre-installed.
System requirements: 20 GB of free disk.

Install VirtualBox

Follow the instructions: https://www.virtualbox.org/wiki/Downloads .
Binaries are available for several different platforms (**Linux**, **OS X**, **Windows**). We have tested the installation on the following systems:
- macOS High Sierra 10.13.6 : it might be necessary to modify Security & Privacy settings: System Preferences -> Security & Privacy -> General -> Allow apps downloaded from Oracle
- PC Ubuntu 16.10 : no issue reported

Configuration of the system

Download the .ova image and double click on it to open it with VirtualBox, then import:
https://cernvm.cern.ch/portal/vbinstallation#ova
Very important: set the number of virtual cores to 2.

IMPORTANT: While using the virtual image, whenever a system window pops up asking you whether you want to upgrade to Ubuntu 18.04, refuse to upgrade.

Setup of additional packages

After logging into the virtual image, you can complete the configuration of the system.
In the following items you'll find the instructions to configure: ROOT6, Geant4, Delphes, Python and Jupyter

- **ROOT6** : pre-installed
- **Geant4** : pre-installed ; download the exercises: https://farmsmon.pi.infn.it/fcschool/geant4.tgz
- **Delphes** : must be installed by issuing the following commands:

  (the following commands will install Delphes in $HOME/Delphes-3.4.1)

  ```
  cd $HOME
  wget http://cp3.irmp.ucl.ac.be/downloads/Delphes-3.4.1.tar.gz
  tar -zxf Delphes-3.4.1.tar.gz
  cd Delphes-3.4.1
  make -j 4
  ```

(the following commands will install Pythia8 in $HOME/pythia8235 and configure Delphes to also run Pythia8)

```
cd $HOME
wget http://home.thep.lu.se/~torbjorn/pythia8/pythia8235.tgz
tar xzvf pythia8235.tgz
cd pythia8235
./configure --prefix=$HOME/Pythia8
make install
export PYTHIA8=$HOME/Pythia8
cd $HOME/Delphes-3.4.1
make HAS_PYTHIA8=true DelphesPythia8
```

(the following commands sets the environment variables that will be set at login)
```
cd $HOME
echo PYTHIA8=\"\$HOME/Pythia8\" >> $HOME/.bashrc
```

(the following commands check that the binaries are there)
```
cd $HOME/Delphes-3.4.1
./DelphesHepMC
./DelphesPythia8 cards/delphes_card_CMS.tcl \
examples/Pythia8/configNoLHE.cmnd delphes_nolhe.root
```

More details are reported in the Delphes WorkBook:

https://cp3.irmp.ucl.ac.be/projects/delphes/wiki/WorkBook/QuickTour

https://cp3.irmp.ucl.ac.be/projects/delphes/wiki/WorkBook/Pythia8

- **Python / Jupyter packages** (for ML tutorial): a full list of packages will be provided before the start of the school. They can be installed with the following commands (python 2.7):

```
python -m pip install --user --upgrade pip
python -m pip install --user jupyter
python -m pip install --user Tensorflow
python -m pip install --user keras
python -m pip install --user sklearn
python -m pip install --user matplotlib
python -m pip install --user pillow
```

Test that jupyter works, by typing the following command (a browser window should open):

```
jupyter notebook
```