Analysing FCC Data Files in SWAN

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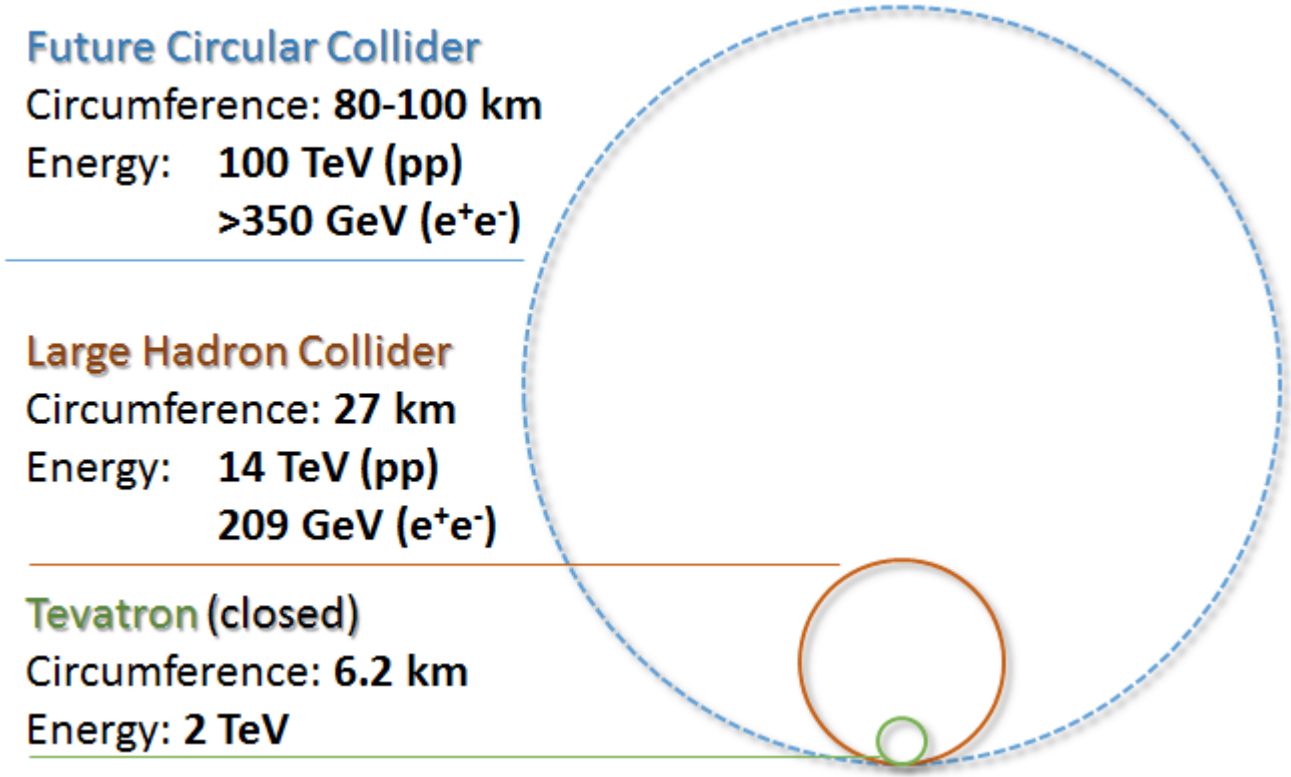
FCC

-Future Circular Collider-

- A Future Circular Collider could open a window for exploring the unknown 95% of the Universe
- Reaching higher energies and unprecedented luminosities would allow us to explore the fundamental laws of nature and probe yet unexplained observations.

The **F**uture **C**ircular **C**ollider Study

- It develops options for potential high-energy frontier circular colliders at CERN for the post-LHC era.
- The FCC study is organised as a global collaboration under the auspices of the European Committee for Future Accelerators (ECFA) and will produce a conceptual design report to be delivered in time for the next update of the European Strategy for Particle Physics, foreseen by 2018.



The SWAN Service

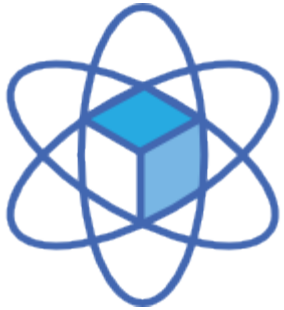
- No Installation required : only a web browser
- ROOT with Only a web browser

- Platform Independent ROOT based data Analysis
- Calculations, input and results “in the CLOUD”
- Data analysis with ROOT “as a service”
- Access service at : https://swan.cern.ch

The SWAN Service

- Jupyter Notebooks as **Interface**

- Allows easy sharing of Scientific results : plots, data and code through CERNBox .
  https://cernbox.cern.ch



How much of this can be done for FCC ?

What is needed?

Required Steps for using it for FCC data

- For FCC we need to provide **data** and **software** to read it.
- **Software :**

  - Providing an installation
  - Allowing users to set the runtime environment
- **Data :**

  - Locating available data
  - Using the data

Required Software

- For reading FCC data files two packages are required:
  - **PODIO** : plain-old-data I/O, is a C++ library to support the creation and handling of data models in particle physics. It provides a (ROOT assisted) Python interface.
  - **FCC-EDM** : the concrete data model chosen by FCC

Providing the software to users

- Additional software needs to be compatible with the software SWAN uses, e.g. its Python and ROOT versions
- Not every user can and should install software for SWAN

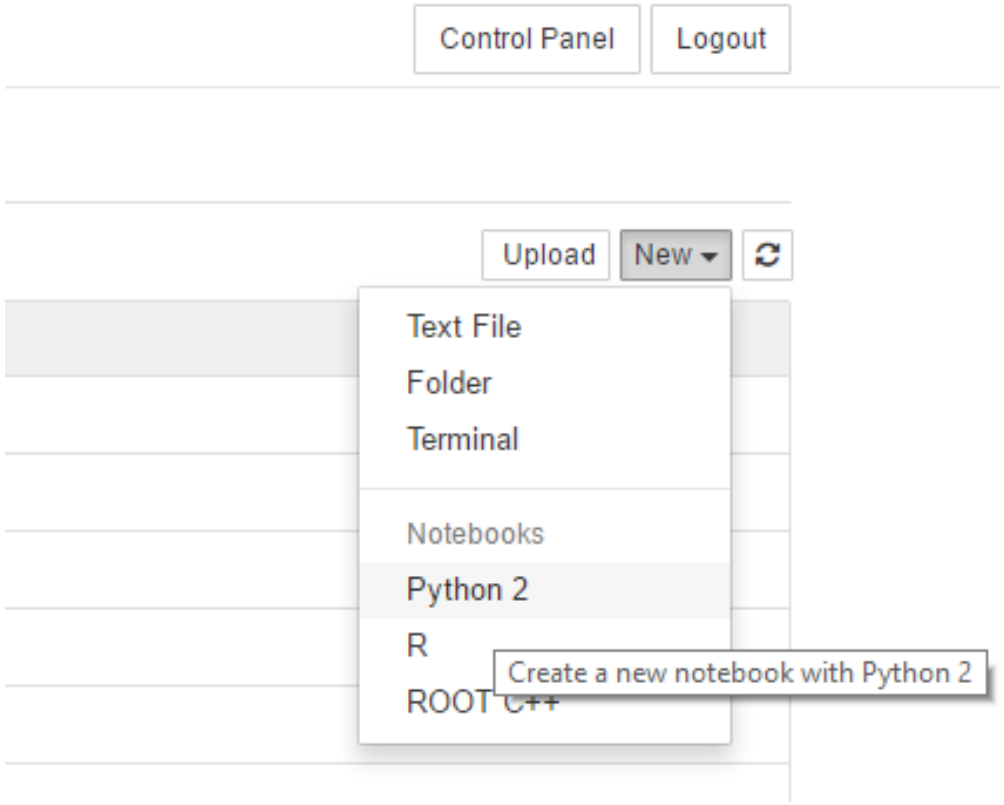
==> Provide that as a central service

- In my project we
  - first tested the software within SWAN
  - then created a central installation in CVMFS:
    /cvmfs/fcc.cern.ch/sw/swan/

Setting up the software in a session

- To use the FCC software various environment variables need to be set
- SWAN allows setting such additional environments at startup via **environment scripts for all notebooks of a given user**
- Can one do that for each notebook individually?

Yes, Python is powerful enough



Open a New
Jupyter Notebook

Untitled7 Last Checkpoint: a few seconds ago (unsaved changes)

Control Panel Logout

File Edit View Insert Cell Kernel Help Python 2

Code CellToolbar

In [1]:
```
import fcc
```

Welcome to the FCC SWAN interface

Documentation

```
Available environments:
  '0.1/85_swan3' : /cvmfs/fcc.cern.ch/sw/swan/0.1/85_swan3
  'local' : /eos/user/n/ngajam/fcc/install


Environments can be activiated via fcc.load( label )
```

In [4]:
```
fcc.load('local')
```

```
Loading FCC environment 'local'

Welcome to JupyROOT 6.07/07
  Loading podio 0
  Loading datamodel 0
```

In [ ]:

Locating data

- SWAN uses eos for user data: /eos/user/...
- FCC uses eos for its data: /eos/fcc/…
- Working on some convenience functions to help with finding and opening data for analysis

This is yet to be implemented !!

In [3]:
```
fcc.list_datasets()
```

```
Local data files:
  ee_ttbar.root
Central datasets:
```

In [4]:
```
store = fcc.open("ee_ttbar.root")
```

In [5]:
```
import ROOT
```

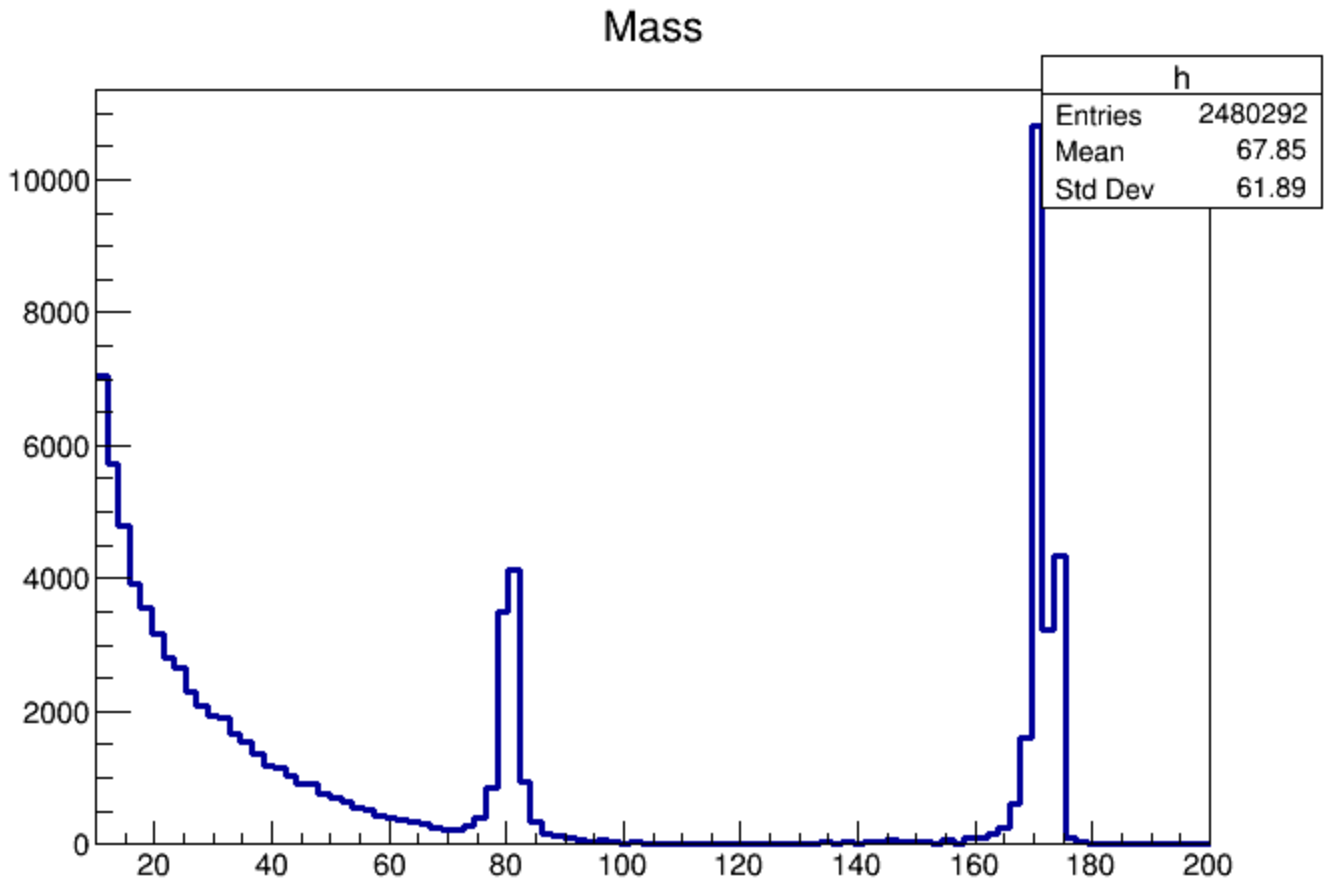
In [6]:
```
c = ROOT.TCanvas("c")
```

In [7]:
```
h = ROOT.TH1F("h","Mass",100,10,200)
```

In [36]:
```
store = EventStore(["ee_ttbar.root"])
for event in store:
  genparticles = event.get("GenParticle")
  for particle in genparticles:
    h.Fill(particle.Core().P4.Mass)
```

In [37]:
```
h.Draw()
```

In [38]:
```
c.Draw()
```


Mass
h
Entries 2480292
Mean 67.85
Std Dev 61.89
10000
8000
6000
4000
2000
0
20
40
60
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120
140
160
180
200

Thank you !

Questions ?