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Introduction to Athena

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Overview

- Setting up the release in the ATLASXX computers
- Set up and run athena "hello world"
- Run the Analysis Skeleton
- Compile and modify the Analysis Skeleton example

Setting up the release in the ATLAS computers

- Assuming that you are already login in one of the ATLAS computers
- I assume that you use Bash shell, create a set.sh file in your home with:

We will be using this release in the tutorial

```
#!/bin/bash
export AVERS=15.4.0 # set atlas release here
export TEST_AREA=$HOME/testarea # your work area

source /share/grid/app/asc_app/asc_rel/1.0/setup-script/set_atlas.sh
```

You must create the directory `$HOME/testarea/15.4.0/` in your home

- And then of course execute this file
- You can find more information:
  - https://atlaswww.hep.anl.gov/twiki/bin/view/Workbook/SettingUpAccount

Set up and run athena "hello world"

- Get a kerberos ticket by typing:
```
[atlas18 17] 15.4.0 > kinit username@CERN.CH
```
- Check the tag for this release:
```
[atlas18 17] 15.4.0 > cmt show versions PhysicsAnalysis/AnalysisCommon/UserAnalysis
```
- Check out the proper tag
```
… > cmt co -r UserAnalysis-00-13-18 PhysicsAnalysis/AnalysisCommon/UserAnalysis
```
- Go to the cmt directory:
```
… > cd PhysicsAnalysis/AnalysisCommon/UserAnalysis/cmt
```
- Source the setup of the package:
```
… > source setup.sh
```
- Go to the run directory:
```
… > cd ../run/
```
- Get the runtime files :
```
… > get_files -jo HelloWorldOptions.py
```
- Run athena :
```
… > athena.py HelloWorldOptions.py
```

Set up and run athena "hello world"

- These instructions assume that:
  - you have an lxplus account
  - your login in the ATLAS machines is the same as the login in lxplus.
- If you don't have an lxplus account you can get the package from my home directory: `~torregrosa/tutorial/PhysicsAnalysis.tbz`
- If your logins don't match you can do as before or solve the prlbem following the instruction here (Setting Up CVS to access CERN repository)

  https://atlaswww.hep.anl.gov/twiki/bin/view/Workbook/CVSAccess

Set up and run athena "Analysis Skeleton" on an AOD file

…and produce a root n-tuple!!!

- Once the “hello word” example works, we can start using AODs (ESDs), built root files and make plots.
- Get the Analysis Skeleton python script:

```
… > get_files -jo AnalysisSkeleton_topOptions.py
```

- The job options in a nutshell:

```
ServiceMgr.EventSelector.InputCollections = [ "/tmp/jgoncalo/AOD.065738._00001.pool.root.1"]
```

The AOD input file

```
AnalysisSkeleton.McParticleContainer = "SpclMC"
AnalysisSkeleton.ElectronContainer = "ElectronAODCollection"
AnalysisSkeleton.MissingETObject = "MET_RefFinal"
AnalysisSkeleton.DeltaRMatchCut = 0.2
AnalysisSkeleton.MaxDeltaR = 0.9999
AnalysisSkeleton.ElectronEtCut  = 10.0*GeV
AnalysisSkeleton.ElectronEtaCut = 2.5
AnalysisSkeleton.ElectronCone   = 0.9
AnalysisSkeleton.bjetWt_IP3DSV1Cut = 6
AnalysisSkeleton.bjet_etaCut = 2.5
AnalysisSkeleton.bjet_etCut = 15.0*GeV
AnalysisSkeleton.MissingETCut = 20.0*GeV
AnalysisSkeleton.OutputLevel = INFO
AnalysisSkeleton.IsAtlFastData = IsAtlfast
AnalysisSkeleton.SusyJetMinEt      = 50*GeV
```

The analysis skeleton configuration parameters

You can find input AOD files here:

Please do symbolic links instead of copy

```
/data/nas2/users/ryoshida/sep_jamboree_mc/mc08.005144.PythiaZee.recon.AOD.e323_s400_d99_r474/
```

Set up and run athena "Analysis Skeleton" on an AOD file

…and produce a root n-tuple!!!

```
##############################################
# setup TTree registration Service
# save ROOT histograms and Tuple
from GaudiSvc.GaudiSvcConf import THistSvc
ServiceMgr += THistSvc()
ServiceMgr.THistSvc.Output = [ "AANT DATAFILE='AnalysisSkeleton.aan.root' OPT='RECREATE'" ]
from AnalysisTools.AnalysisToolsConf import AANTupleStream
topSequence += AANTupleStream()
AANTupleStream = AANTupleStream()
AANTupleStream.ExtraRefNames = [ "StreamESD","Stream1" ]
AANTupleStream.OutputName = 'AnalysisSkeleton.aan.root'
AANTupleStream.WriteInputDataHeader = True
AANTupleStream.OutputLevel = WARNING

# Set output level threshold (2=DEBUG, 3=INFO, 4=WARNING, 5=ERROR, 6=FATAL )
ServiceMgr.MessageSvc.OutputLevel = INFO

# Number of Events to process
theApp.EvtMax = -1
#theApp.EvtMax = 5
```

The output root file

The output level of information

The # of events to process

- Change the input file name to the AOD you want to analyze, change the properties as you wish, and the number of events you want to analyze and then run athena

```
… > athena.py AnalysisSkeleton_topOptions.py
```

- This should produce a root file ready to be analyzed

Modifying analysis skeleton

- Analysis skeleton consists in two files:
  - **AnalysisSkeleton.cxx** (in 15.4.0/PhysicsAnalysis/AnalysisCommon/UserAnalysis/src)
  - **AnalysisSkeleton.h** (15.4.0/PhysicsAnalysis/AnalysisCommon/UserAnalysis/UserAnalysis)
- It is basically a c++ class, you can browse around the code and try to understand what it does. I'll explain an example of it in the afternoon
- Now as an exercise you can try a modified version of AnalysisSkeleton and compile it

```
… > mv AnalysisSkeleton.cxx AnalysisSkeleton.old
```

```
… > cp ~ryoshida/tmp/jamboree/AnalysisSkeleton.cxx .
```

In the **src** directory

```
… > mv AnalysisSkeleton.h AnalysisSkeleton.old
```

```
… > cp ~ryoshida/tmp/jamboree/AnalysisSkeleton.h .
```

In the **UserAnalysis** directory

```
… > gmake
```

In the **cmt** directory

```
… > athena.py AnalysisSkeleton_topOptions.py
```

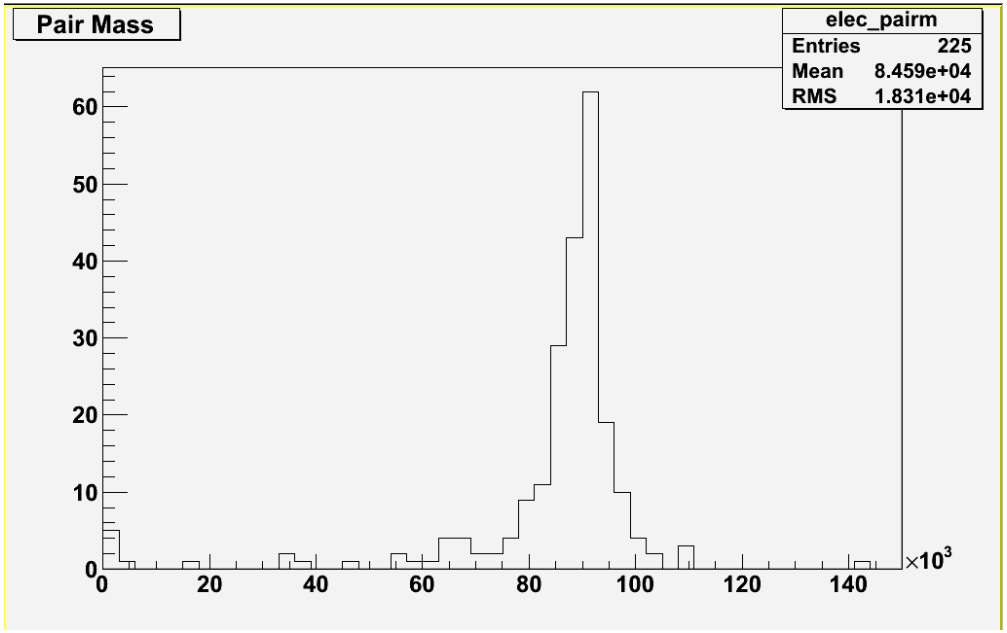
In the **run** directory

Modifying analysis skeleton

- Again if you feel curious have a look at the code in **`AnalysisSkeleton.cxx`** and **`AnalysisSkeleton.h`**
- The modified version reconstructs the invariant mass of the Z in Z+jets events
- It changes the output ntuple format booking a new histogram and filling it with the invariant mass of the Z

- The goal of this part is to get this plot running on

```
/data/nas2/users/ryoshida/sep_jamboree
_mc/mc08.005144.PythiaZee.recon.AOD.e3
23_s400_d99_r474/
```



At the moment we have learnt

- We know how to setup athena
- We know how to check that it works
- We know how to run the Analysis Skeleton package and produce a root ntuple
- We know how to compile a modified version of the Analysis Skeleton package and use it
- In the next talk we will learnt:
  - how an Athena algorithm (like Analysis Skeleton) is implemented
  - how we can modify it to make exactly the analysis we want
  - how to change the format of the output file