

ATLAS-D Meeting 2013 - Würzburg

ATLANTIS

M. Böhler

September 24th 2013

Albert-Ludwigs-Universität Freiburg



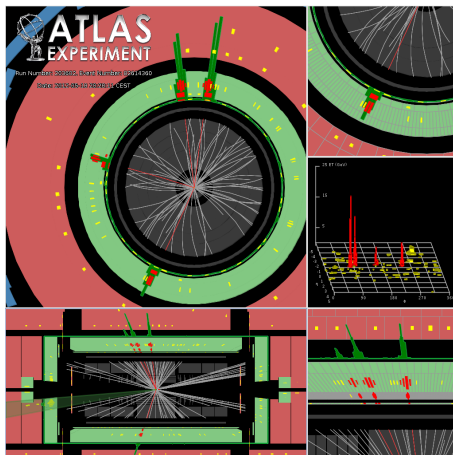
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Outline

Structure of Atlantis

JiveXML Package

Event Viewer

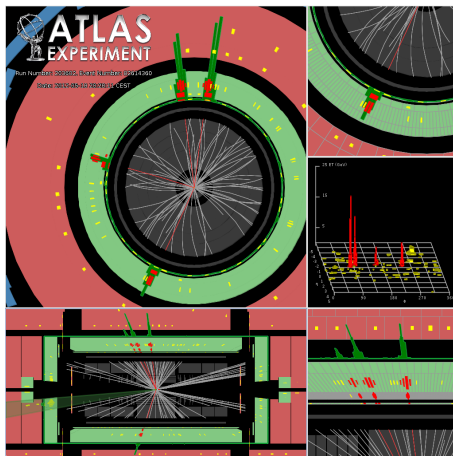


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What is ATLANTIS?

- ▶ Atlantis provides a graphical representation of an event
- ▶ aims to display complete ATLAS events in an intuitive way
- ▶ to make fast and correct conclusions about the underlying physics processes

- ▶ Within ATLAS it is used for:
 - ▶ Monitoring data taking in the control room
 - ▶ Analysis of individual events (debugging)
 - ▶ Creating images for publications

- ▶ Outside ATLAS it is used for:
 - ▶ Outreach
 - ▶ Master classes



Structure of ATLANTIS

- ▶ The Atlantis application consists of two programs/packages:
 1. The event file generator, JiveXML, running inside Athena
 2. The event viewer, Atlantis, which runs locally



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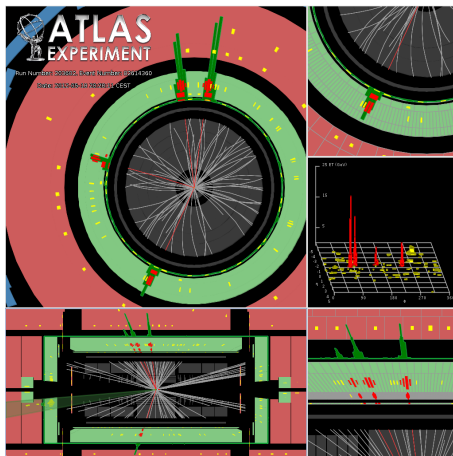
1. JiveXML packages can convert RAW/ESD/AOD events into single-event XML files. These XML files can be read by the viewer.
 - ▶ Athena jobs produce one XML file per event
this can be done by:
 - ▶ JiveXML_jobOptions_PhysicsRAW.py
 - ▶ JiveXML_jobOptions_PhysicsAOD.py
 - ▶
→ According to the detail level of the input files (RAW,AOD),
the event display is more or less detailed
 - ▶ Instructions on JiveXML can be found on the TWiki:
<https://twiki.cern.ch/twiki/bin/view/AtlasComputing/Atlantis>
2. The event viewer is presented in the second part of this session

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JiveXML Package - Hands-on (local default setup)

more detail in:
CERN Tutorial [TWiki](#)

Setup ATHENA (this time the following Version):

```
mkdir eventPickingTest
cd eventPickingTest
asetup 17.2.3.5,here,slc5
```

Retrieve JiveXML_jobOptions files:

```
get_files -jo JiveXML_jobOptions_PhysicsAOD.py
```

Run ATHENA with the a JiveXML jobOption file:

```
athena JiveXML_jobOptions_PhysicsAOD.py
```



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Then copy the newly produced xml files to your desy web directory:

```
mkdir -p ~/www/EventPicking/AOD
fs setacl -dir ~/www -acl desy-hosts read      (<-- this has to be done only once)
cp JiveXML_*.xml ~/www/EventPicking/AOD
```

Later on you can examine your events via the url:

```
http://www.desy.de/~<user name>/EventPicking/AOD/JiveXML_*.xml
```

Event Picking - with pAthena

create text file (here *rrr.txt*) with run *space* event numbers; e.g:

```
215414 33764295
215414 33763743
215414 33765718
```

more detail in:
CERN Tutorial [TWiki](#)

for this example, we will use pAthena:

Setup the pAthena environment (in a new shell)

```
cd eventPickingTest
asetup 17.2.3.5,here,slc5
localSetupPandaClient
```

Retrieve the job option file:

```
athena JiveXML_jobOptions_PhysicsRAW.py
```

Submit command to find the events from the text file *rrr.txt*

```
pathena JiveXML_jobOptions_PhysicsRAW.py --eventPickEvtList rrr.txt \
--eventPickDataType RAW --outDS user.<nickname>.AtlantisRAW_test \
--extOutFile "JiveXML*.xml" --eventPickStreamName physics_Muons \
--supStream=GLOBAL,ESD
```



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```



► What if my events are only on tape?

- ..you will receive a message and email, informing you that the files will attempt to be staged to disk and you can then **retry sometime later**
- if you see this message, submit the job as shown below, with the additional `--eventPickStagedDS` argument

```
pathena JiveXML_jobOptions_PhysicsRAW.py --eventPickEvtList rrr.txt \
--eventPickDataType RAW --outDS user.<nickname>.AtlantisRAW_test \
--extOutFile "JiveXML*.xml" --eventPickStreamName physics_Muons \
--eventPickStagedDS user.<nickname>.tutorial.eventPick --supStream=GLOBAL,ESD
```



Event Picking - with Ganga

Running the same job within Ganga, you need to setup Ganga instead (please use another shell):

```
cd eventPickingTest
asetup 17.2.3.5,here,slc5
localSetupGanga
```

And then submit the jobs (either via command line):

```
ganga athena --pickevent --pick_event_list rrr.txt \  
--pick_data_type RAW --pick_stream_name physics_Muons \  
--pick_dataset_pattern '*physics_Muons*' --extOutFile "JiveXML_*.xml" \  
JiveXML_jobOptions_PhysicsRAW.py
```

more detail in:
CERN Tutorial [TWiki](#)



Event Picking - with Ganga

Running the same job within Ganga, you need to setup Ganga instead (please use another shell):

```
cd eventPickingTest
asetup 17.2.3.5,here,slc5
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```

And then submit the jobs (either via command line):

```
ganga athena --pickevent --pick_event_list rrr.txt \
--pick_data_type RAW --pick_stream_name physics_Muons \
--pick_dataset_pattern '*physics_Muons*' --extOutFile "JiveXML_*.xml" \
JiveXML_jobOptions_PhysicsRAW.py
```



or through the IPython interface:

```
j = Job()
j.application=Athena()
j.application.option_file=['JiveXML_jobOptions_PhysicsRAW.py' ]
j.application.prepare()

j.inputdata=EventPicking()
j.inputdata.pick_data_type = 'RAW'
j.inputdata.pick_stream_name = "physics_Muons"
j.inputdata.pick_dataset_pattern = "*physics_Muons"
j.inputdata.pick_event_list = 'rrr.txt'

j.outputdata=DQ2OutputDataset()

j.splitter=DQ2JobSplitter()
j.splitter.numsubjobs = 10

j.backend=Panda()
j.backend.extOutFile = ['JiveXML_*.xml']

j.submit()
```



more detail in:
CERN Tutorial [TWiki](#)

JiveXML Package - Hands-on run on your own data

- ▶ Create file containing the run number and the event number of your final events:
 - ▶ this you can do by scanning your output ntuple:

```
root -l filtered.d3pd.root
root [1] MySkimmedD3PD->Scan("RunNumber:EventNumber")
*****
*   Row   * RunNumber * EventNum *
*****
*     0 *   189090 *   416755 *
*     1 *   189090 *   480342 *
*     2 *   189090 *   502881 *
*     3 *   189090 *   502806 *
*     4 *   189090 *   492178 *
*     5 *   189090 *   523277 *
....
```

- ▶ Write the run number and the event number into a *events.txt* file
- ▶ Submit either via pAthena or Ganga the EventPicking script (as described on previous pages) to the Grid
- ▶ RAW data is mainly stored on tape, this might take some days
 - ▶ so we have to skip that - it should give you an idea, how to produce your own event displays in a non tutorial environment

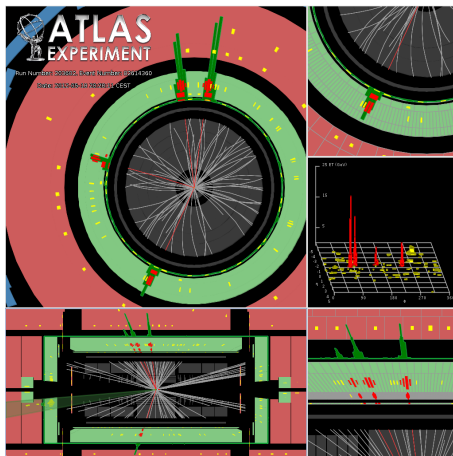


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Getting ATLANTIS up and running

- ▶ Atlantis can be started in several ways
 - ▶ Directly from the Athena environment by typing atlantis (not recommended unless you have Athena installed locally)
 - ▶ From <http://cern.ch/atlas/download>
 - ▶ Starting it directly using Java WebStart
 - ▶ Downloading it as a tgz archive
- ▶ We are using the tutorial version today
 - ▶ loads automatically the right events

1. Download: [AtlantisJava-09-16-04-05-tutorial.tgz](#)

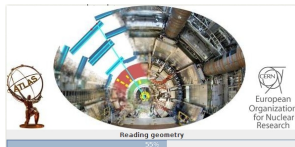
2. Extract ATLANTIS

```
tar xfv AtlantisJava-09-16-04-05-tutorial.tgz
```

3. Start the java app with:

```
java -Dapple.awt.graphics.UseQuartz=false -jar atlantis.jar
```

- ▶ You should see the start screen.....



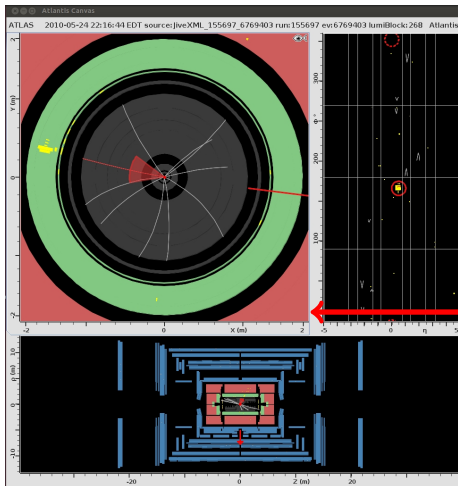
<http://www.hep.ucl.ac.uk/atlas/atlantis/>

Tutorial version: AtlantisJava-09-16-04-05-tutorial

- Download: [AtlantisJava-09-16-04-05-tutorial.tgz](#), [AtlantisJava-09-16-04-05-tutorial.zip](#)
- Webstart

User interface basics

▶ Canvas



▶ GUI

Atlantis GUI

File Preferences Lists Reset Demo Previous Next Help

lunal.webstart/events/test_events.zip@JiveXML_155697_6769403.xml

Interaction tools: W, S, R, L, M, R, U, D, B, 7, 8, 9, 0

Projection: Data Cuts Indet Calo MuonDet Objects Geometry

Track Segment Zoom Next Track

Name	Value
Track Collections	Tracks
Objects	Objects
Color Function	25
Constant Color	14
Unconnected	0
Shared	1
Line Width	Helix
Drawn As	0
Next Track	1.08 m
p Track as Helix	0.0 um
p Track linearly	3.38 m
Z Track	

Information window:

C.V. mesonL1TriggerCluster	1
LVL1TriggerTower:TriggerTowers	5
MBTS	32
MDT	43
PixelCluster	479
RecVertex	2
RecVertex:V0Candidate	2
SCT_Cluster	2001
SpacePoint	1318
TauJet:TauRecContainer	1
TILE	141
TriggerInfo	1
TWT_DriftCircle	13475

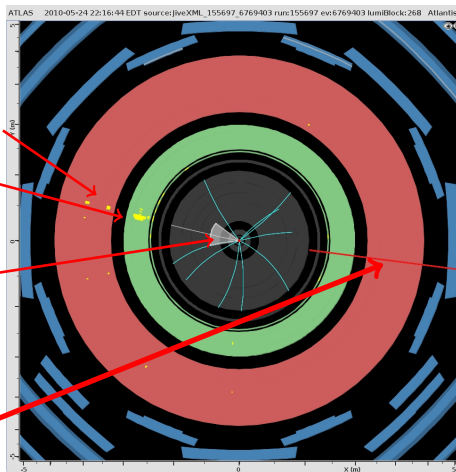
▶ interaction tools

▶ tabs contain setting and cuts

▶ projections in $\phi\eta$, yx , ρz

▶ information window

Looking at your first event

 xy projection, transverse view

- ▶ Calorimeter energy deposits (**hadronic**, **electromagnetic**)
- ▶ Jet with only 1 track
- ▶ Direction of MET

Interaction Tools:**The zoom tool:**

lets you zoom in on the interaction point. The point you click stays under the mouse, drag it in or out to zoom.

**The rubberband tool:**

lets you select an area on the canvas, you can then select to zoom in on this area.

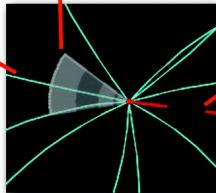
Looking at your first event

- ▶ Now select the pick tool and look at the details of some of the objects we see



```
Jet (id: 0 index: 0)
storegate key: AntiK14TopoJets
ET = 36.481 GeV
E = 41.241 GeV
η = 0.505
Φ = 166.090° (2.899 rad)
Selection: isGood=1 0/isRad=0 0 isLInlv=0 0)
```

```
InDetTrack (id: 35 index: 35)
storegate key: Tracks
numHits = 44
d0 = -0.062 ± 0.002 cm
z0 = -8.372 ± 0.011 cm
|z0-zVtx| = 0.019 cm
phi0 = 169.044 ± 0.017° (2.950 ± 0.000 rad)
η = 0.536 ± 0.001
tL = 0.562 ± 0.001
pT = 10.07 GeV ± 0.144 GeV
p = 11.55 GeV
chi2/numDoF = 0.6738268
numPixelHits = 2
numSCTHits = 10
numTRTHits = 32
```

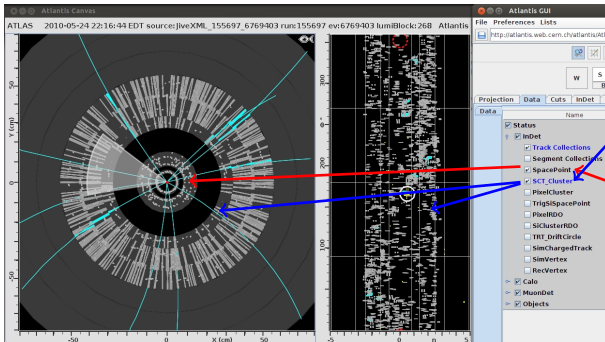
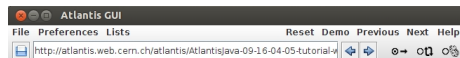


```
ETMis
storegate key: MET_RefFinal
Sum-ET = 144.899 GeV
ET-Mis = 38.592 GeV
ETx-Mis = 38.265 GeV
ETy-Mis = -5.017 GeV
Φ = 352.531° (6.153 rad)
```

- ▶ We have a 36 GeV jet balancing the missing ET, containing one track of only 10 GeV.
 - ▶ What can this be?

Displaying/hiding datatypes

- ▶ you can undo all changes by **Reset**
- ▶ go to the next event in this folder by **Next**



Settings and cuts differentiate between **Global** and **Local**

- ▶ **Global** settings (blue in setting window) apply to all windows
- ▶ **Local** settings (black in setting window) only to the selected window
- ▶ Right click on any setting to switch local/global

Applying cuts

- ▶ all cuts on this slide are applied **globally** → to all windows
- ▶ cuts can be applied on detector subsystems as well as on physics objects

Name	Value
PT	> 1.0 GeV
d0	< 2.5 mm
z0	< 20.0 cm
d0 Loose	< 2.0 cm
z0-zVtx	< 2.5 mm
Layer	> 0
Number Pixel Hits	>= 2
Number SCT Hits	>= 7
Number TRT Hits	>= 15
Sim. Particle PDG-ID	< 40
Sim. Particle Barcode	= 0
Sim. Particle Type	charged hadron
SimVertex	= 0
SCT/Pixel	All
TRT_DriftCircle	All

Name	Value
Jet ET	> 15.0 GeV
Jet EMfraction	< 0.95
Jet VxFraction	> 0.75
BTagger	None
BTag weight	> 0.0
ETMs	> 15.0 GeV
Electron PT	> 5.0 GeV
Electron isEM	= 0
Electron isEMString	Tight
Electron eOverp	> 0.0
Electron hasTrack	
Muon PT	> 5.0 GeV
Muon chi2	< 0.0
Photon PT	> 5.0 GeV
Photon isEM	= 0
Photon isEMString	Loose
Taujet PT	> 5.0 GeV
Taujet Charge	= 1
Taujet NumTracks	<= 3
Taujet isTauString	TauCutMedium
Bjet Pt	> 5.0 GeV
Bjet lhSig	> 0.9
Bjet weight	> 0.0
Taujet isolFrac	> 0.3
Taujet logLhRatio	> -2.0

- ▶ Try raising the track pT cut from 1 to 5 GeV

Associations

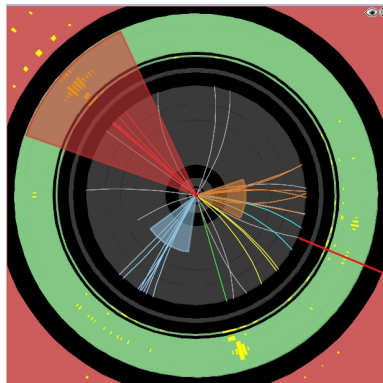
- ▶ Atlantis also knows about associations between objects, for example the tracks that are associated to a jet

Give each jet a different color (color by index)...

Projection	Data	Cuts	InDet	Calo	MuonDet	Objects	Geometry
Jet	Name		Value				
ETMis							
BJet	Jet Collections		AntiKt4Topojets				
Electron	Color Function		Index				

...then color the tracks by associated object

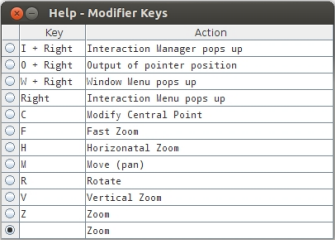
Projection	Data	Cuts	InDet	Calo	MuonDet	Objects	Geometry
Track			Zoom Next Track				
Segment							
SpacePoint	Name		Value				
PixelCluster	Track Collections		Tracks				
SCT_Cluster	Color Function		Objects				
TrigSiSpacePoint	Constant Color		25				
PixelRDO							



- ▶ Associations work the same for hits and tracks, try coloring the hits by track

Mouse modifiers

- ▶ Mouse modifiers are keys you hold down to change the default behavior of an interaction tool
- ▶ For example: hold down the M key when using the zoom tool to change zooming into moving, or R to rotate the detector
- ▶ The modifier keys for the currently active interaction can be shown if you select modifier keys from the help menu



Key	Action
<input type="radio"/> I + Right	Interaction Manager pops up
<input type="radio"/> O + Right	Output of pointer position
<input type="radio"/> W + Right	Window Menu pops up
<input type="radio"/> Right	Interaction Menu pops up
<input type="radio"/> C	Modify Central Point
<input type="radio"/> F	Fast Zoom
<input type="radio"/> H	Horizonatal Zoom
<input type="radio"/> M	Move (pan)
<input type="radio"/> R	Rotate
<input type="radio"/> V	Vertical Zoom
<input type="radio"/> Z	Zoom
<input checked="" type="radio"/>	Zoom

Hands-on Session

- ▶ Now it is time for you to explore the rest of the events on your own
- ▶ In the events we have given you, you can find:
 - ▶ Single W and Z bosons
 - ▶ WZ and W events
 - ▶ Top quark pairs
 - ▶ Leptonic Higgs decays
- ▶ You can also look at the events you have produced yourself on the grid
- ▶ We will be walking around to help, do not hesitate to ask questions
- ▶ Also feel free to ask us about anything specific to your analysis or subdetector, there are many more features that we can show you
- ▶ **Bonus:** Can you reproduce the design from page 2?

More Informations

- ▶ If you want to learn more about Atlantis:
 - ▶ Sign up for the hypernews hn-atlas-AtlantisDisplay@cern.ch
 - ▶ Sign up for one of our (yearly) advanced tutorials to discover many more features that can help you to better understand your events
 - ▶ Check out <http://atlas-live.cern.ch> and go to Collaboration site to download XML files of the most recent collisions