

D3PD Making

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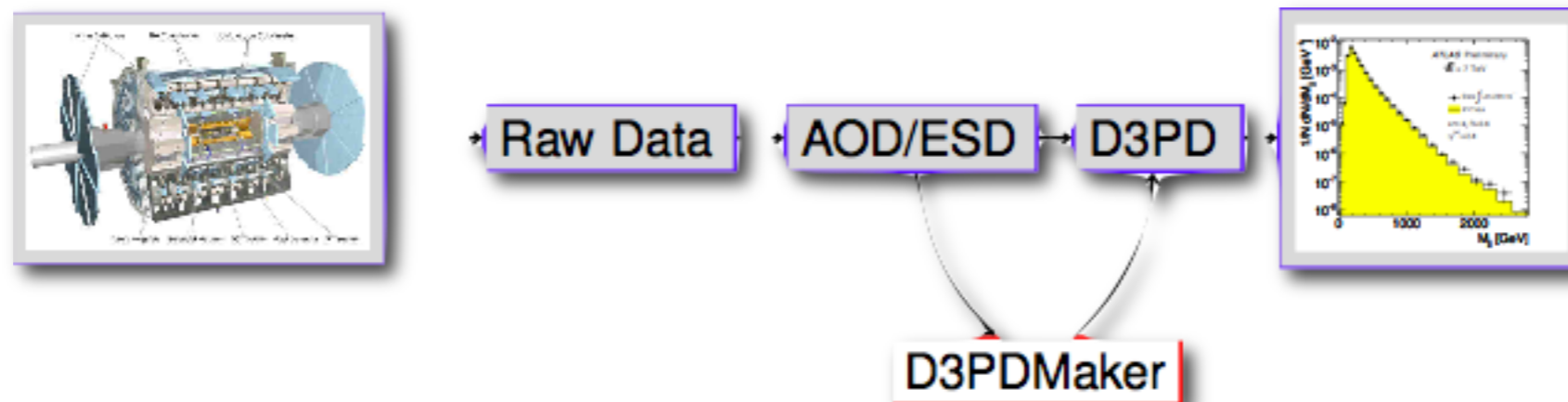


- Based on slides from Haifeng Li



Overview

- Ultimately almost all analysis is done in simple framework
 - (i.e. ROOT).
- Requirement for Quick, interactive development cycles in final stages of the analysis
 - Small size of files, with simple methods of data member access
 - Limited dependencies on external packages.
 - Not dependent on high-speed network access -
 - Can make plots on the plane.
- Using Athena directly to produce all histograms, fits, etc. can be slow
 - Tuning cuts may require many cycles of running code.
- D3PD Making packages developed to satisfy final analysis using common set of tools, producing small output 'flat' ntuples.
 - Maintained by physics performance experts.

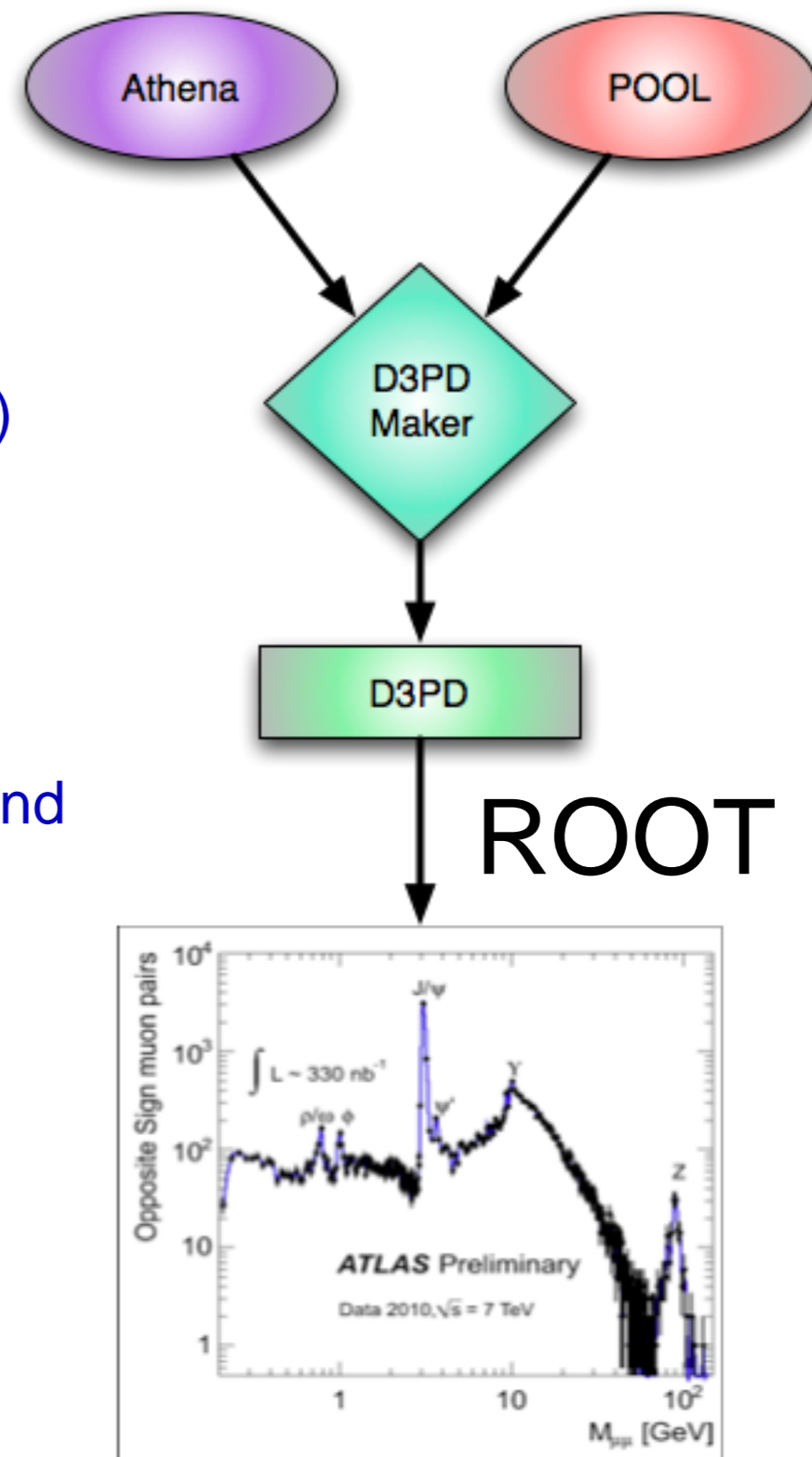


D3PDMaker

- Common approach to n-tuple 'dumping'
 - **Validated code**
 - Responsible persons for each object,
 - Performance physics experts creates and maintains code for each group, simplifies your
 - **Highly configurable:**
 - Select which Analysis objects to dump (e.g. muons, jets, etc.)
 - Define Level of detail dumped by each object;
 - 4-mom, hit-information?
- Can dump information at either AOD or ESD level.
- User controlled using python jobOptions, with code stored in Athena release
 - **No need to re-compile the D3PD making code.**
- Does not provide access to conditions data or other Athena services

Structure of D3PDMaker

- Data object and *knowledge module* are separated in ATLAS EDM.
- Have to use Athena (knowledge module) to access Data via StoreGate.
- As with any standard Athena job
- D3PDMaker combines the Data object and knowledge module to produce a
- new format \rightarrow D3PD.
- Use ROOT to get physics plots.

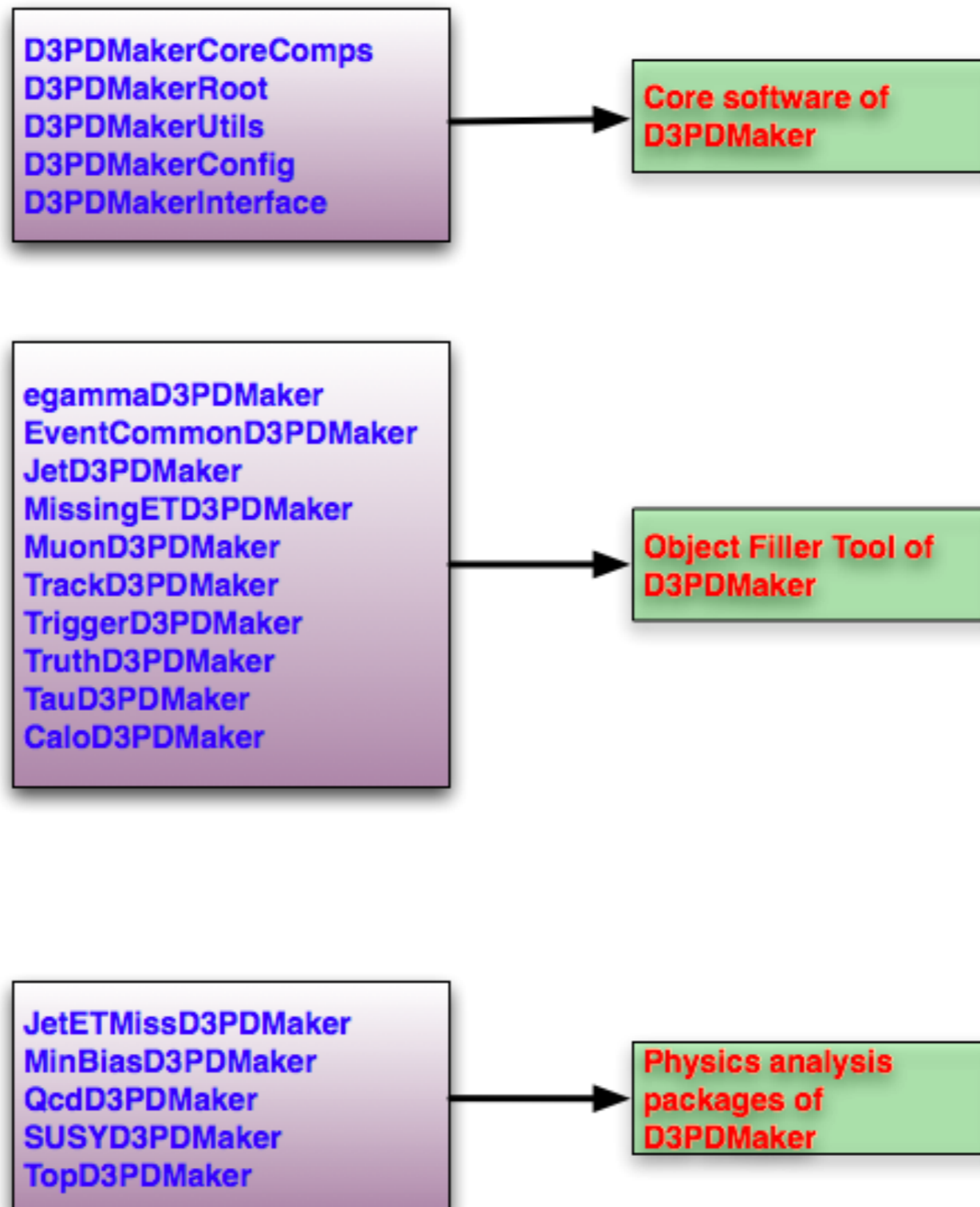


Code Structure

- Only one Athena Algorithm: MakerAlg
 - Makes a TTree.
 - Handle all the tools defined by D3PDMaker packages.
 - Built with each Athena release (no need to compile code).
- Object filling (or dumping) is done by Athena Tools.
 - ObjFillerTool → single object (e.g. Event info)
 - VectorFillerTool → collections (e.g. all muons in an event)
- Object filling tools use Getter Tools
 - SGObjGetterTool → Get single object from StoreGate.
 - SGDataVectorGetterTool → Get collection from StoreGate.
- Different variables are grouped to Blocks.
 - egammalsEMFillerTool, egammaDetailFillerTool,
 - JetMomentFillerTool, JetSamplingFillerTool.
- Performance group responsible for own section of D3PDMaker
 - developers have to maintain these Tools.

Packages for D3PD Maker

- Packages for D3PD contained within PhysicsAnalysis/D3PDMaker area



Example of Filler Tool: egammaDetailFillerTool

- Python configuration file for each tool:
 - **egammaD3PDMaker/ElectronD3PDObject.py**

```
ElectronD3PDObject.defineBlock (2, #detail level
                                'Rings', # block name
                                egammaD3PDMaker.egammaDetailFillerTool ,
                                # filler tool
                                Details = [egammaParameters.estringnoisedR03Sig2 , # ROOT dictionary
                                            'EtringnoisedR03sig2', # variable name
                                            egammaParameters.estringnoisedR03Sig3 ,
                                            'EtringnoisedR03sig3',
                                            egammaParameters.estringnoisedR03Sig4 ,
                                            'EtringnoisedR03sig4',
                                ])
```

- From top jobOption add in the **ElectronD3PDObject** to be included in the output D3PD:

```
from egammaD3PDMaker.ElectronD3PDObject import ElectronD3PDObject
alg += ElectronD3PDObject(**_args (level, 'Electron', kw))
```

- Set the `level` to determine the amount of detail dumped to the D3PD.

Current status of Ntuple-making

- Methods to create standard Ntuples exist in all groups
- **D3PD maker already a popular format**

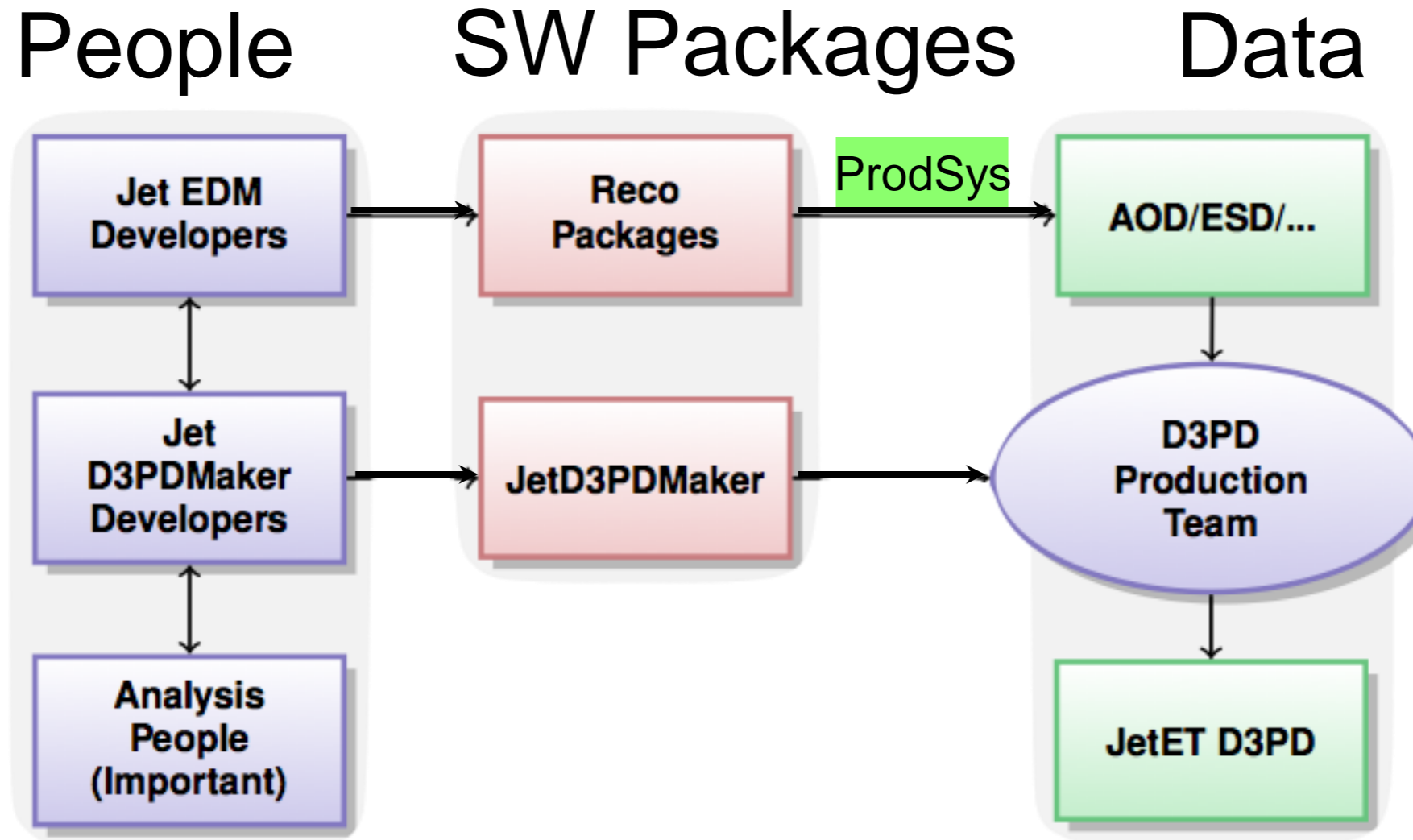
ROOT data formats (ii) 20

	PAT group D3PD makers used for main formats?	Athena code making main output data is common in group?	Athena code stored on EVNT	ROOT analysis code stored on EVNT?	Physics analysis cache used?
ll-physics	✗	✓	✓	✓	✗
Top	(✓)	(✓)	✓	✓	✓
SUSY	(✓)	(✓)	(✓)	✗	✗
W/Z, W/Z +jets, soft QCD, B-jets	✓	✓	✓	✓	✗
Electro- weak	(✓)	(✓)	(✓)	✗	✗
Higgs	(✓)	(✓)	(✓)	(✓)	✗

James Clavonre Physics Analysis Tools workshop 29th September 2010

- Likely that for your Analysis or performance studies some ntuple format such as D3PD has already been defined (and validated!)

Example from JetETMiss Group



Physics Results Taking JetET D3PD as main input

- Exotic dijet paper
- Dijet angular paper
- Inclusive jet and dijet paper
- Lots of CONF notes

Luminosity determination from D3PD

- Powerful functionality within D3PD format to store luminosity information
 - Why is this needed? – after all we have the Luminosity web-page
 - <https://atlas-datasummary.cern.ch/lumicalc/>
- Not all events (luminosity blocks) may make it through to your final sample.
- Events(T0 processed) > Events(reprocessed) > Events(dumped D3PD)
 - E.g. grid failures, code crashes, missing data
- Methodology
 - D3PDMaker : Dumps LumiBlock meta data from Pool file.
 - Store these LumiBlock information as xml file within the D3PD.
- Format is similar with GoodRunsLists.
 - Use official lumi calculation tools to calculate integrated luminosity on D3PD.
- Calculating Luminosity from final ntuples, ensures correct determination.
- Still need to apply GoodRunsLists, and define a trigger for your analysis

Summary

- The D3PDMaker package is widely used in ATLAS.
- D3PD is official now.
- Many groups are supporting D3PD production.
- Advantages
 - You have lots of already configured D3PD tools to use.
 - Many groups already centrally producing D3PDs
- Disadvantages
 - Your analysis is not connected with Athena framework.
 - You don't know whether the D3PD production manager has made any mistakes in the code
 - However, with people using common tools, bugs will be more quickly found and fixed.
- It's a good idea to know how your analysis variables are filled in D3PDMaker.
- Always need to go back to Athena to check what is going on.