Introduction to ATLAS Offline Software

- Offline overview
- Athena Basics
  - components
  - job-options/scripting
- Data formats: ESD and AOD

Offline Overview

Offline software must handle:

- Event Generation
- Detector simulation
- Event reconstruction
- Data analysis
- Detector description
- Calibration corrections
- Event display/visualization
- Online/Event-Filter

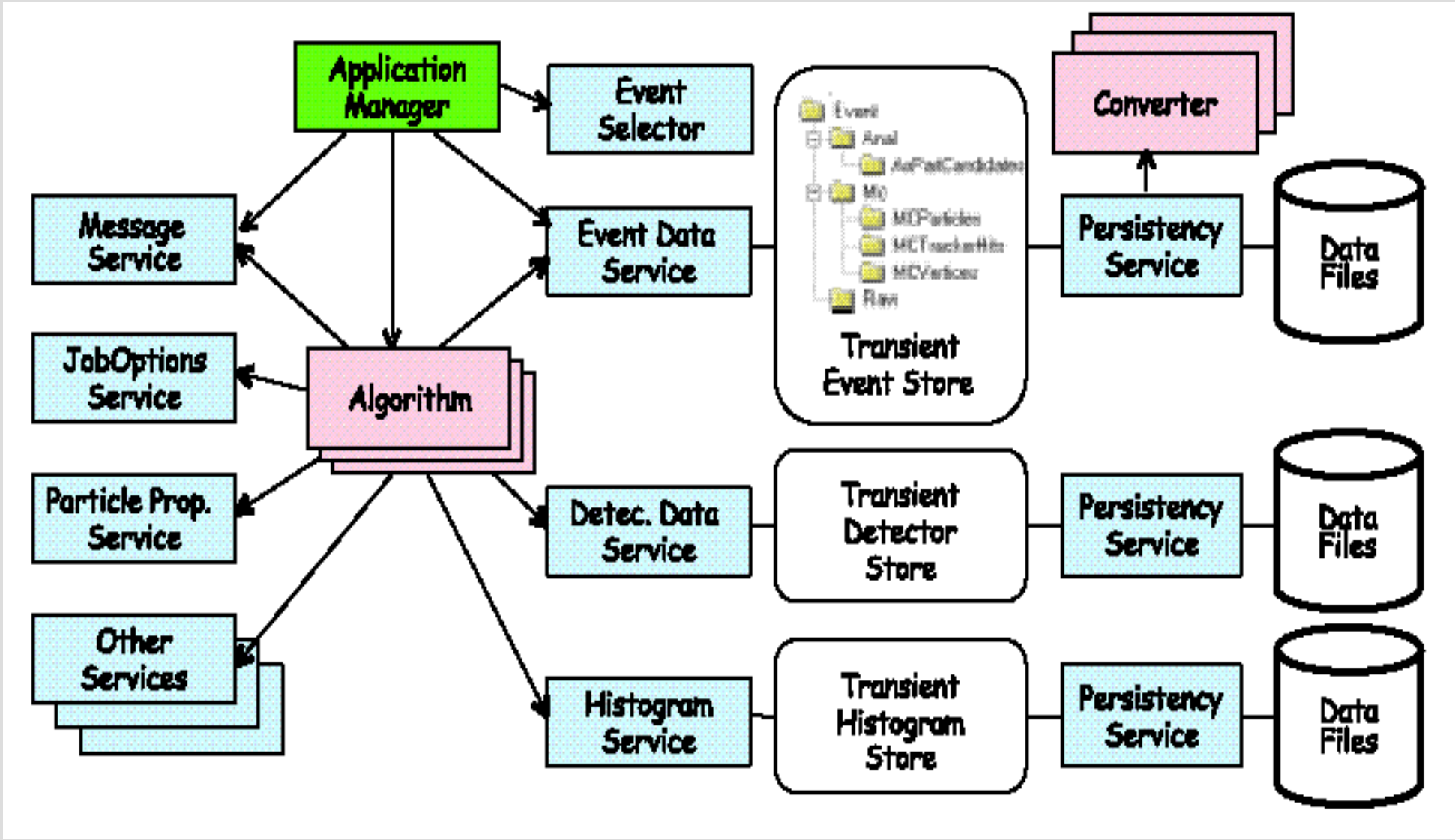
Offline software should be

- Maintainable & flexible
- Easy to use
  - for physicist programmer
- Independent of technology
  - data storage
  - histogramming, fitting
- Performant
- Portable

Athena/Gaudi – main features

- Strict separation of algorithms and data
- Strict separation of transient and persistent storage
- Service-oriented approach
- Configuration of executable at runtime via Python scripts (JobOptions):
  - dynamic loading of shared libraries needed
  - setup of properties (I/O files, parameters, ...)
  - sequence of algorithms

ATHENA Components



Athena – jobOptions example

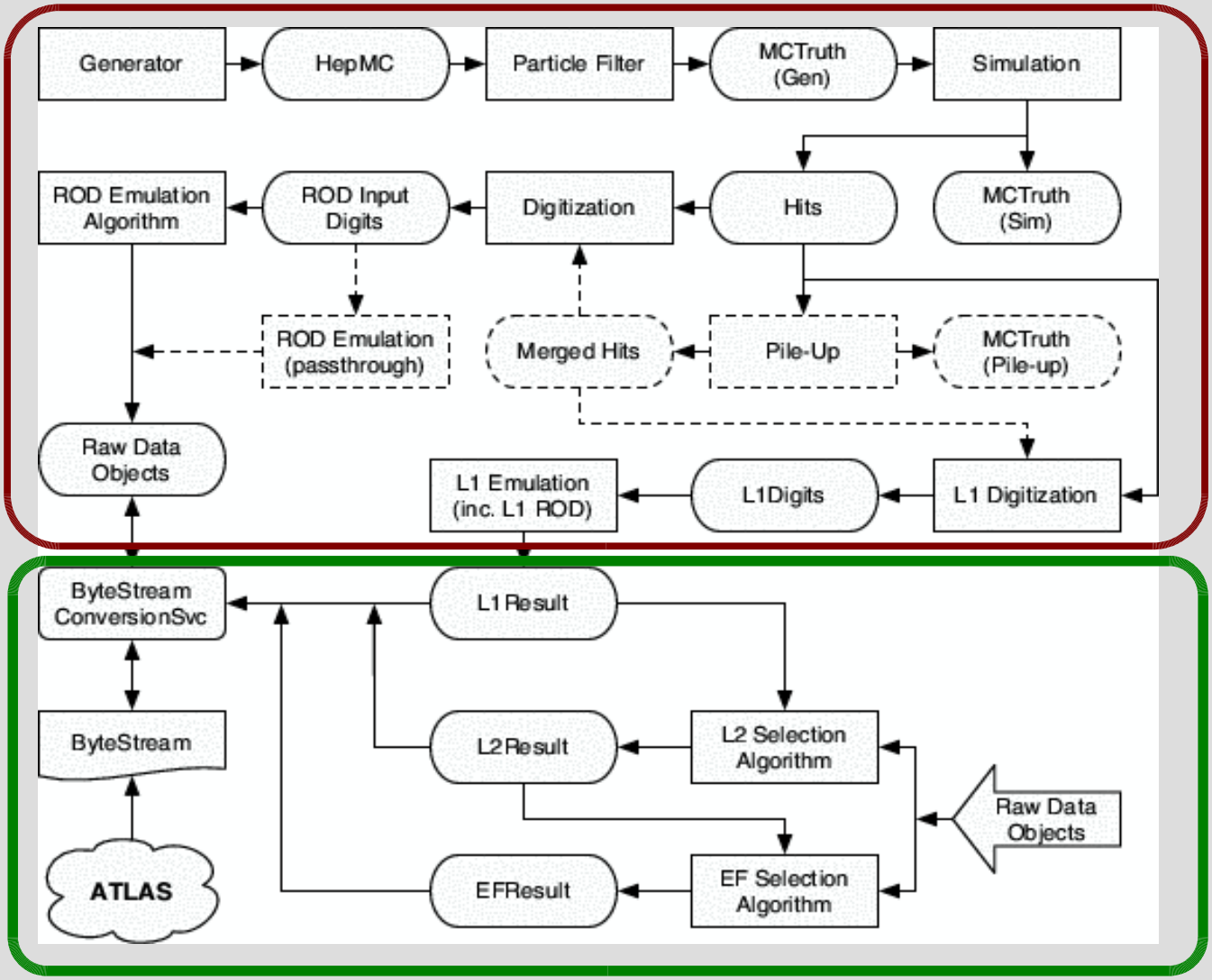
```
# AnalysisSkeleton_jobOptions.py
# Event selector
include( "AthenaPoolCnvSvc/ReadAthenaPool_jobOptions.py" )
EventSelector = Service( "EventSelector" )
# the POOL converters
include( "ParticleEventAthenaPool/AOD_PoolCnv_jobOptions.py")
# Read in the AOD from POOL - AOD.pool.root
EventSelector.InputCollections = [ "AOD.pool.root" ]
# The user analysis algorithm to be executed
theApp.Dlls   += [ "AnalysisTools" ]
theApp.Dlls   += [ "UserAnalysis" ]
theApp.Dlls   += [ "TruthParticleAlgs" ]
theApp.TopAlg   += [ "AnalysisSkeleton" ]
AnalysisSkeleton = Algorithm( "AnalysisSkeleton" )
# set the names of the particle containers to be retrieved from StoreGate
AnalysisSkeleton.ElectronContainer = "ElectronCollection"
# ...
# electrons
AnalysisSkeleton.ElectronEtCut  = 10.0*GeV
AnalysisSkeleton.ElectronEtaCut = 2.5
AnalysisSkeleton.ElectronCone   = 0.9
# message level for AnalysisSkeleton
AnalysisSkeleton.OutputLevel = ERROR
# Set output level threshold (2=DEBUG, 3=INFO, 4=WARNING, 5=ERROR, 6=FATAL )
MessageSvc = Service( "MessageSvc" )
MessageSvc.OutputLevel = INFO
# Number of Events to process
theApp.EvtMax = 10000
# Root Ntuple output file and name
theApp.Dlls += [ "RootHistCnv" ]
theApp.HistogramPersistency = "ROOT"
HistogramPersistencySvc = Service( "HistogramPersistencySvc" )
HistogramPersistencySvc.OutputFile = "AnalysisSkeleton.root";
```

ATLAS Online & Simulation Data Flow

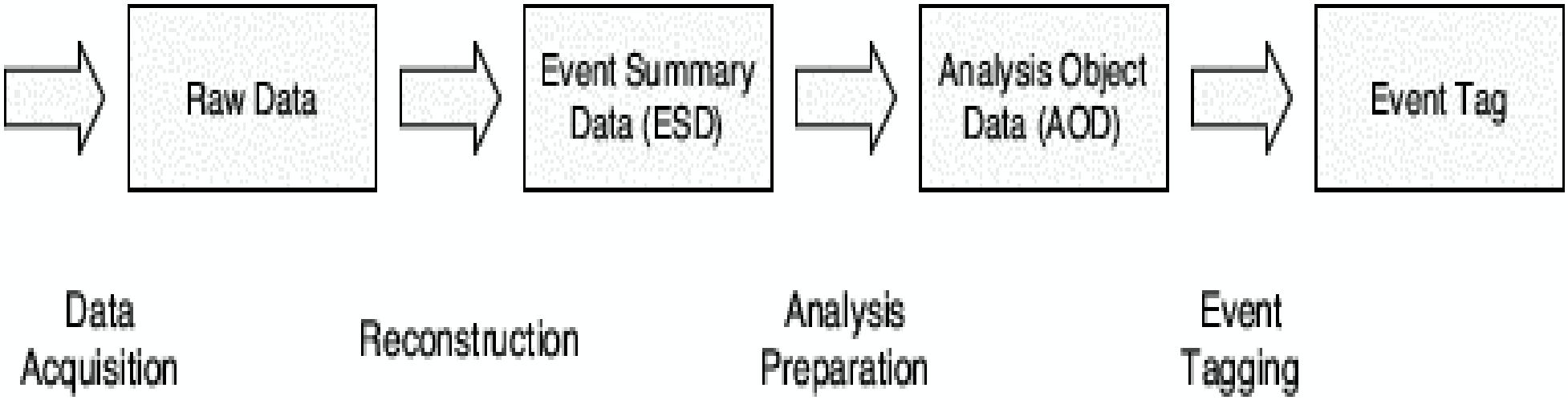
Simulation

Recon-struction

Online

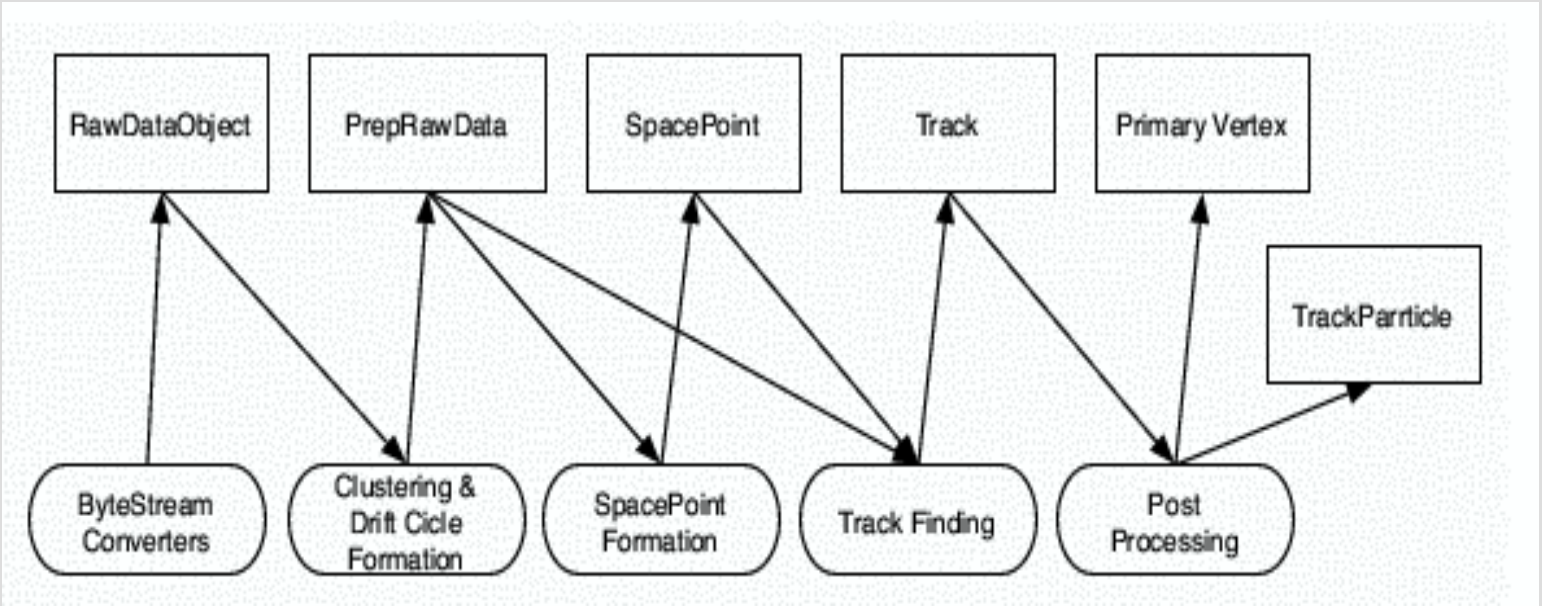


Athena Reconstruction Chain

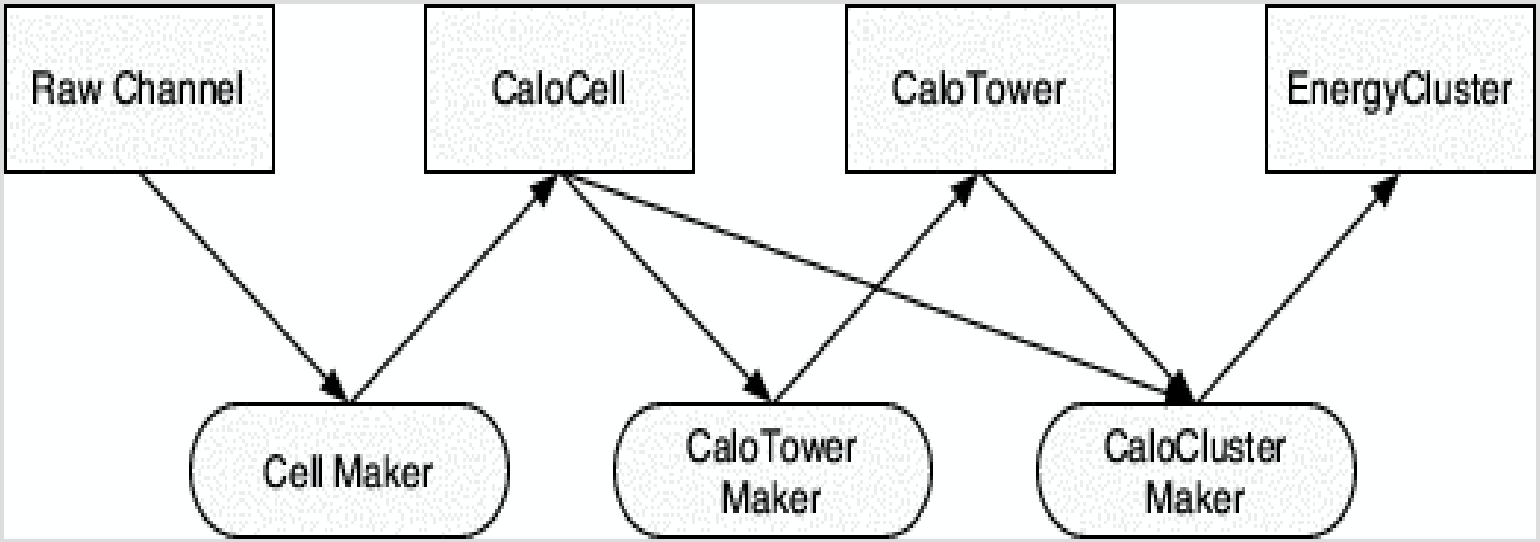


Athena Reconstruction in Detail

Tracking Reco Chain



Calo Reco Chain



Reco Output: ESD vs AOD

AOD:

Reconstructed Physic Objects:

- Electrons
- Muons
- Jets
- ...

ESD:

AOD + underlying Reco Objects:

- Tracks
- Vertex
- Calo Info
- ...

Navigation AOD --> ESD possible in principle !