A Case Study with Jets in the sPHENIX Software Environment

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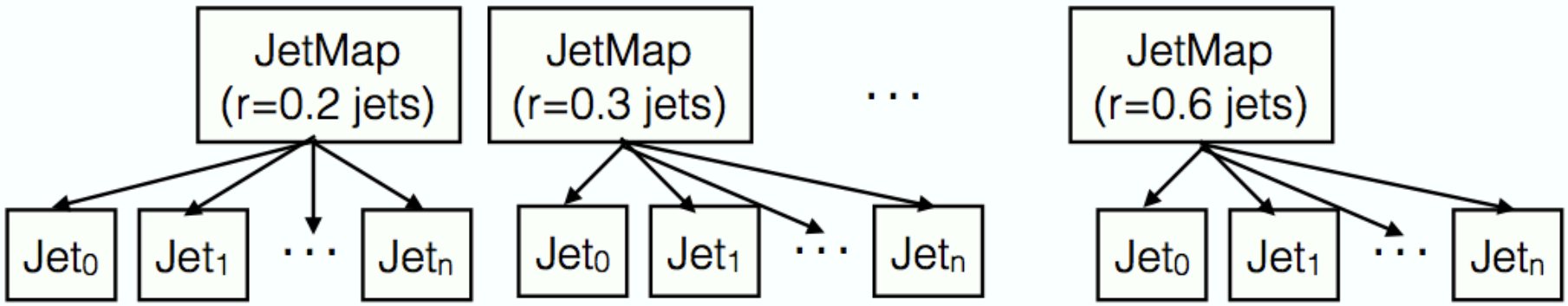
sPHENIX Simulations Meeting – May 26th 2015

Motivation

Learn from our experience in PHENIX

Need for standardized jet reconstruction, storage and output



M. McCumber: https://indico.bnl.gov/getFile.py/access?contribId=2&resId=0&materialId=slides&confId=1147

Mike developed Jet and JetMap (container) objects. Versioned by Jin to JetV1. Available in Git:

`coresoftware/simulation/g4simulation/g4jets/`

The Jet Object in a Nutshell

Jet

Algorithm

- None
- KT
- Anti-KT
- Cone

Any others?

Sources Used for Reconstruction

- Tracks
- Towers (CEMC, HCALIN, HCALOUT)
- Clusters (CEMC, HCALIN, HCALOUT)

Kinematics

- p_x
- p_y
- p_z
- E

Other Properties

- R
- Mass
- Charge
- B Fraction

A Module for Reconstructing Flow Jets - PHFlowJetMaker

```
TOP (PHCompositeNode)/
   DCM (PHCompositeNode)/
   DST (PHCompositeNode)/
      PHG4INEVENT (PHDataNode)
      G4HIT_HCALOUT (PHIODataNode)
      G4HIT_ABSORBER_HCALOUT (PHIODataNode)
      G4HIT_SVTX (PHIODataNode)
      G4HIT_SVTXSUPPORT (PHIODataNode)
      G4HIT_CEMC (PHIODataNode)
      G4HIT_HCALIN (PHIODataNode)
      G4HIT_ABSORBER_HCALIN (PHIODataNode)
      G4HIT_HCALIN_SPT (PHIODataNode)
      G4HIT_MAGNET_0 (PHIODataNode)
      G4HIT_BH_1 (PHIODataNode)
      G4TruthInfo (PHIODataNode)
      JETS (PHCompositeNode)/
         FLOW_JETS (PHCompositeNode)/
            FlowAntiKtJetsR0p3 (PHIODataNode)
            FlowAntiKtJetsR0p4 (PHIODataNode)
            FlowKtJetsR0p3 (PHIODataNode)
            FlowKtJetsR0p4 (PHIODataNode)
      PHHepMCGenEvent (PHIODataNode)
      G4CELL_SVTX (PHIODataNode)
      G4CELL_CEMC (PHIODataNode)
      G4CELL_HCALIN (PHIODataNode)
      G4CELL_HCALOUT (PHIODataNode)
      TOWER_CEMC (PHIODataNode)
      CLUSTER_CEMC (PHIODataNode)
      TOWER_HCALIN (PHIODataNode)
      CLUSTER_HCALIN (PHIODataNode)
      TOWER_HCALOUT (PHIODataNode)
      CLUSTER_HCALOUT (PHIODataNode)
      SVTX (PHCompositeNode)/
         SvtxHitMap (PHIODataNode)
         SvtxClusterMap (PHIODataNode)
         SvtxTrackMap (PHIODataNode)
         SvtxVertexMap (PHIODataNode)
```

`PHFlowJetMaker(algorithm, R)`

Take tracks and clusters in all calorimeters to make flow jets using input parameters.

Create and populate a JetMap with reco jets.

JetMap

`std::map<unsigned int, Jet*>`

Put jet container in Node Tree using appropriate naming and hierarchy conventions.

Users can iterate over tree to find desired jet objects.

A Module for Reconstructing Flow Jets - PHFlowJetMaker

Example

```
PHFlowJetMaker *flowJetMaker1 = new PHFlowJetMaker("PHFlowJetMaker","anti-kt",0.3);

se->registerSubsystem(flowJetMaker1);
```

Location in GitHub

`tutorials/jetreco/src`

Questions?

Comments?