PacTrk Internals

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PacTrk Design Overview

Event Data

Simulated

GTrack	generated particle
PacSimTrack	particle trajectory after detector interaction
PacSimHit	particle interaction with one detector element

Reconstructed

TrkRecoTrk	Reco. track + hits
PacDirc?	Dirc ring (and hits?)
PacEmc?	Emc cluster
PacIfr?	Ifr cluster?

Environment Data

DetectorModel

DetElem	Physical detector element (material)
PacDetElem	connect PacMeasure with DetElem
PacMeasure	Detector element active response description

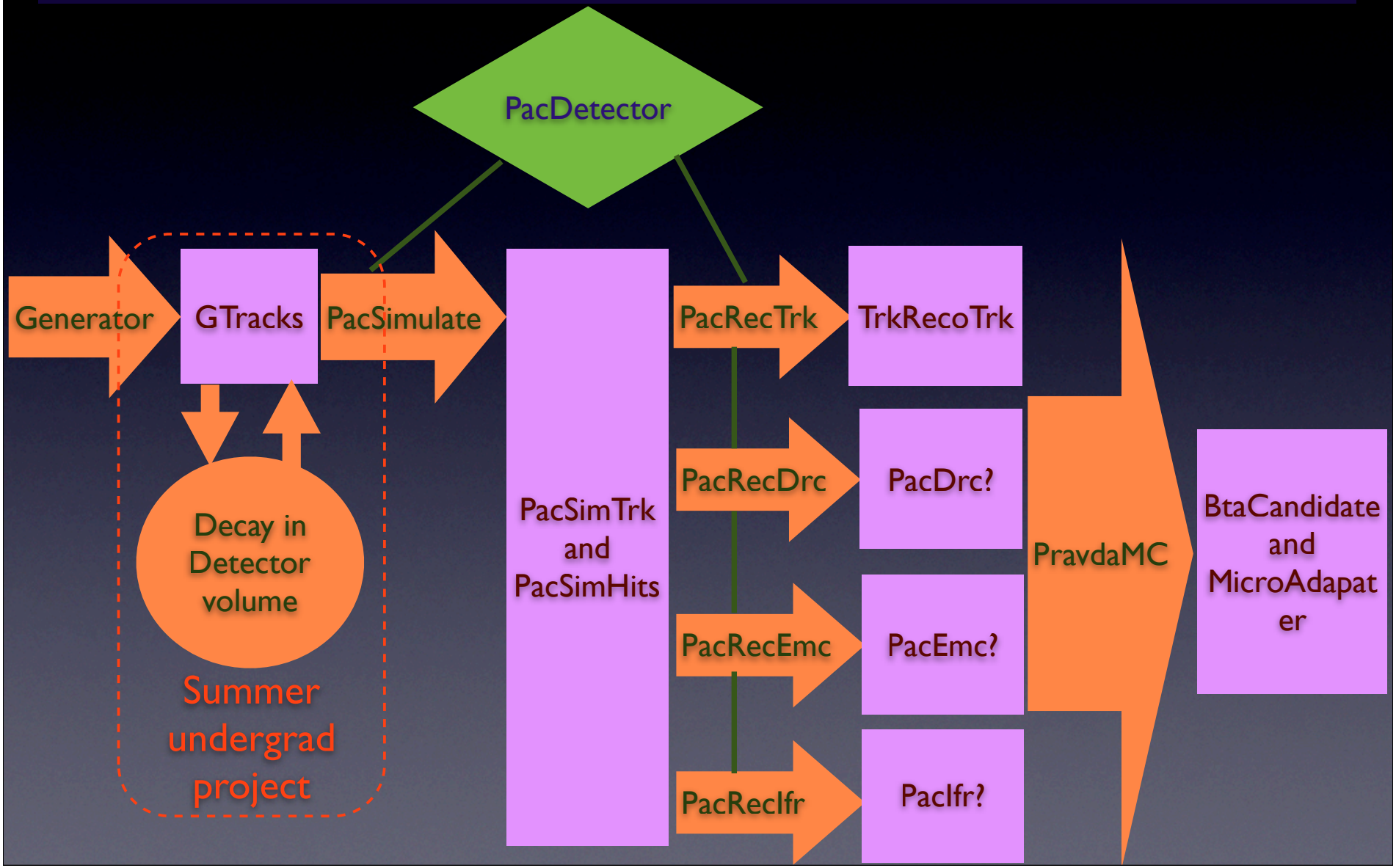
PacSimulate

GTrack → PacSimTrack

PacReconstruct

PacSimTrack → XxxReco

Data Flow


PacDetector
Generator
GTracks
PacSimulate
Decay in Detector volume
Summer undergrad project
PacSimTrk and PacSimHits
PacRecTrk
PacRecDrc
PacRecEmc
PacRecIfr
TrkRecoTrk
PacDrc?
PacEmc?
PacIfr?
PravdaMC
BtaCandidate and MicroAdapater

PacSimulate

- Model particle through PacDetector elements
  - Scattering and energy-loss at each material of charged and neutral particles
  - Interaction probability, including conversion
    - Mother particle stops, daughter particles created
      - How to model daughter creation?
  - Showering probability given X_0, $N_{interaction}$
    - EM and/or Hadronic showers as appropriate
    - Modeled energy loss fraction in material
      - Need a generic longitudinal shower profile
    - Does this overlap physically with the above?
  - Bremsstralung

PacReconstructXxx

- Convert PacSimTrack to appropriate ‘reco’ object for detector Xxx
- Provide a common base class?
  - return void* reco object
  - specialize return type in subclasses
  - Provide type key for return type

PacMeasure

- (was PacMeasurement)
- Subclasses describe how active detector element responds to particle passage
- Appropriate subclass Invoked by PacReconstructXxx
  - Looks for PacSimHit with PacDetElem with relevant measurement type in PacSimTrack
  - Returns relevant Xxx reco ‘hit’ object
  - can be same as Xxx reco object returned by PacReconstructXxx

Detector Configuration

- Controlled by ascii file
  - ‘arrays’ describing material, geometry, measurement properties of elements
  - Can be easily extended
  - Processed by PacCylDetector constructor
- Replace current format with ‘EDML’ eventually
- Currently supports only cylindrical elements
  - Extend to include Plane, Cone, other shapes?
    - Requires specializing intersection function

Performance

- ‘realistic’ BaBar simulation
- EvtGen has very slow ‘initialization’ routines
  - EvtGen:EvtBtoXsgammaKagan: calculating new hadronic mass spectra. This takes a while...
  - Runs with more events are more efficient

```
AppAST:    0.00 |   10000 |    15.16 |     1.51600 |   0.00 |BtaMicroPidKilling
AppAST:    0.00 |   10000 |    21.72 |     2.17200 |   0.00 |BtuTupleMaker
AppAST:    0.00 |   10000 |    15.48 |     1.54800 |   0.00 |RacTestInput
AppAST:    0.00 |   10000 |    51.88 |     5.18800 |   0.00 |PmcReconstruct
AppAST:    0.00 |   10000 |     9.81 |     0.98100 |   0.00 |PmcSimulate
AppAST:    0.00 |   10000 |   107.89 |    10.78900 |   0.00 |GflEvtGen
```

+ ~ 3 msec/event total from other modules
total ~25 msec/event

100 times faster with specialized intersection routine

Package Organization