

# MCTruth Developments

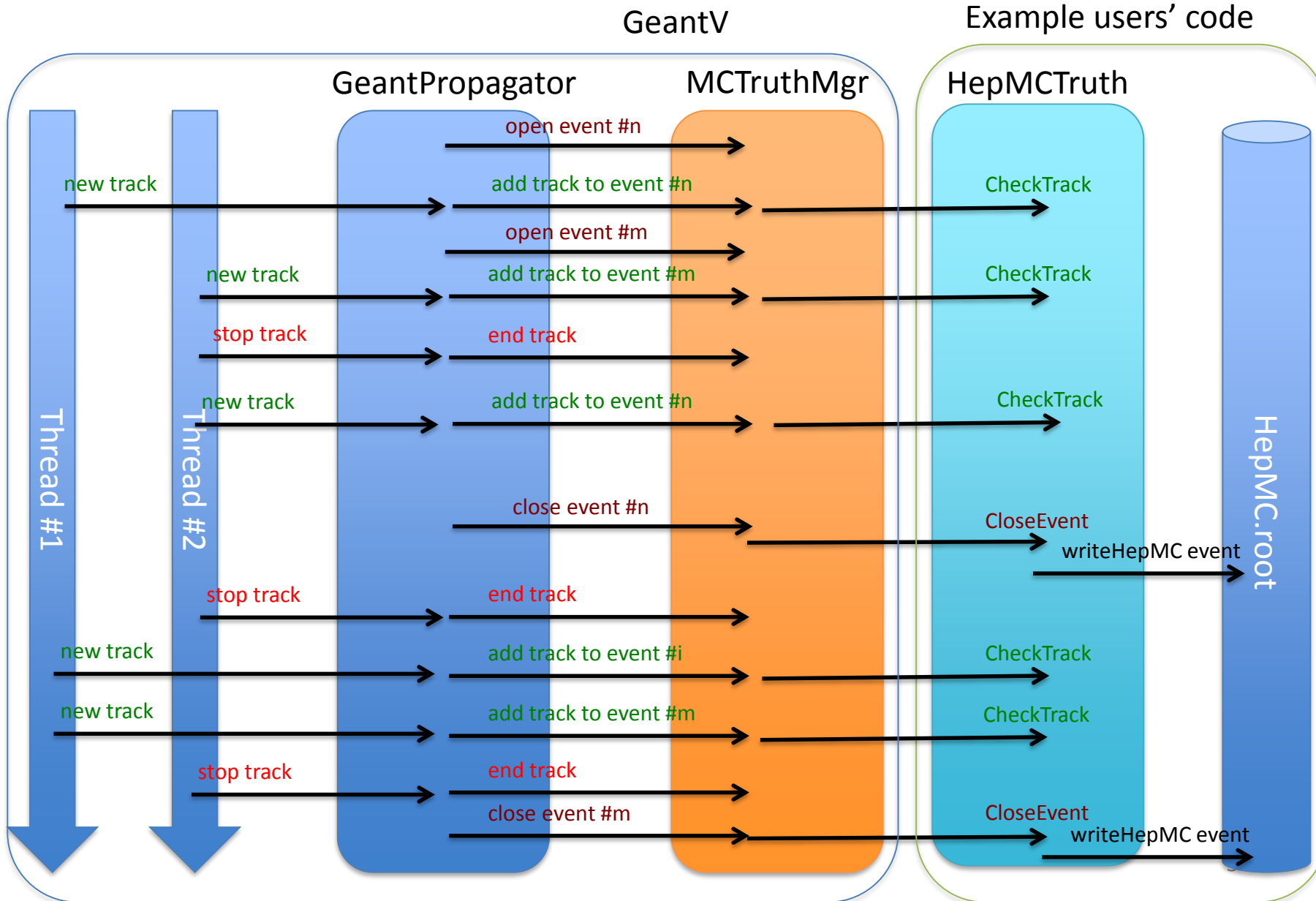
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# Our goal

- be able to store simulated events
  - primary particles
    - easy, they are already in ‘input’ events
  - (some of the) secondary particles
    - produced during simulation by GeantV physics
  - links between mother – daughters particles
    - to be able to walk down particle ‘trees’
  - vertices
    - to be able to ‘localize’ the production of new particles
  - links between hits and particles

# Two layers



# new class MCTruthMgr

- base class for concrete implementation of MCTruth persistency
  - it builds in memory a transient event tree
  - implements `AddTrack()` and `EndTrack()` methods called from `GeantPropagator`
    - filters out particles according to user's algorithm implemented in `CheckTrack` method
    - builds mother-daughters links and vertices
  - does not implement `CloseEvent()`
    - it's up to concrete MCTruth implementation to do something with event
  - does not implement `CheckTrack` method

# example user implementation

## HepMCTruth (added to TestEm3)

- inherits from MCTruthMgr
- concrete implementation of ‘particles persistency’
  - this is, normally, user’s code introducing dependency on his software framework
- this particular example based on HepMC3
  - allows to save GeantV events in .hepmc3 and .root files
- implements CheckTrack() and CloseEvent() methods
  - translates the transient event into HepMC3 event

# Usage example – TestEm3

```
if(mctruth0n)
{
    std::string mc(mctruthFile);
    userapplication::HepMCTruth* mctruth = new userapplication::HepMCTruth(mc);
    mctruth->fEMin = mctruthminE;

    runMgr->SetMCTruthMgr(mctruth);
}
```

Usage: TestEm3 [OPTIONS] INPUT\_FILE

```
-a --det-number-of-absorbers  det-number-of-absorbers
-b --det-number-of-layers    det-number-of-layers
-c --det-set-absorber        det-set-absorber
-d --det-set-sizeYZ          det-set-sizeYZ
-e --det-prod-cut-length     det-prod-cut-length
-f --gun-primary-energy       gun-primary-energy
-g --gun-primary-type        gun-primary-type
-B --mctruth-store           mctruth-store
-C --mctruth-minE            mctruth-minE
-D --mctruth-file            mctruth-file
-m --config-number-of-buffered-events  config-number-of-buffered-events
-n --config-total-number-of-events      config-total-number-of-events
-o --config-number-of-primary-per-events  config-number-of-primary-per-events
-p --config-number-of-threads            config-number-of-threads
-q --config-number-of-propagators        cor
-r --config-run-performance
-A --process-MSL-step-limit              process-MSL
-h --help
```

-----  
GenEvent: #8

Momentum units: GEV Position units: MM

Entries in this event: 2 vertices, 3 particles, 0 weights.

Position offset: 0, 0, 0, 0

	ID	PDG ID	( px,	GenParticle Legend py,	pz,	E )	Stat	ProdVtx
Vtx: -1	stat: 0		(X,cT): -20 0 0 2.1					
I: 1	22		+1.00e+00,+0.00e+00,+0.00e+00,+1.00e+00	1	-2			
0: 2	11		+3.25e-01,-1.30e-03,+9.77e-04,+3.25e-01	1	-1			
	3	-11	+6.75e-01,+1.30e-03,-9.77e-04,+6.75e-01	1	-1			
Vtx: -2	stat: 0		(X,cT): -22 0 0 0					
0: 1	22		+1.00e+00,+0.00e+00,+0.00e+00,+1.00e+00	1	-2			

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Info in <EventTransported>: = task 0 completed event 5 with 3 tracks

# Status and plans

- MC truth handling ported to V3 and further debugged
  - provides the necessary hooks for users to implement their concrete MC truth strategies and formats
- TestEm3 extended to demonstrate MC truth handling using HepMC3
- ready for the Alpha tag
- another review possible before Beta tag