

GeantV in CMS



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Early Tests of GeantV in CMS

We will discuss only the tests performed by the CMS experiment - towards potential integration in CMSSW

- In parallel, the GeantV team uses CMS examples for testing GV components and for performance benchmarking
- Integration tests of VecGeom for use in CMS with Geant4
 - Sunanda Banerjee with the aid of Soon Yung Jun
- Integration tests of the GeantV engine using a simplified “toy” CMSSW framework
 - Guilherme Lima with the aid of Chris Jones (may get a FNAL postdoc involved in the future)
(<https://github.com/Dr15Jones/toy-mt-framework.git>)

VecGeom in CMS

- **Stage 1: Standalone Tests**

- cmsExpMT-based (standalone CMS application used by G4 Collaboration for CP profiling and benchmarking)
 - ✓ CMS geometry (GDML), magnetic field map*, and physics list
 - ✓ Instrumented to measure time/memory performance, average number of tracks and steps per particle type and event
- Check potential failures and monitor performance (G4 10.2.p02), as VecGeom shapes are completed
- Redo tests with G4 10.3 at the end of the year, select generated samples to test both EM and Had physics

* Tracker parameterization and grid map outside the tracker extracted from CMSSW5XY.

VecGeom in CMS

- **Stage 2: CMSSW Tests**

- Integrate G4 10.2.p02, G4 10.3 with VecGeom into CMSSW
- Run physics validation tests using regular release validation samples

If tests are successful - migrate to G4-VecGeom (production) at the first opportunity

Expect time performance improvements with G4-VecGeom from better geometry code and (at a later stage) improved navigator - scalar mode though

GeantV in CMSSW

- Use Chris Jones' toy CMSSW MT framework
 - Includes dummy versions of GeantVProducer, tracker/calorimeter/muon digitizers
- Represents a simplified CMSSW MT infrastructure with a running .json configuration file

Goal: test/combine two independently-developed TBB environments

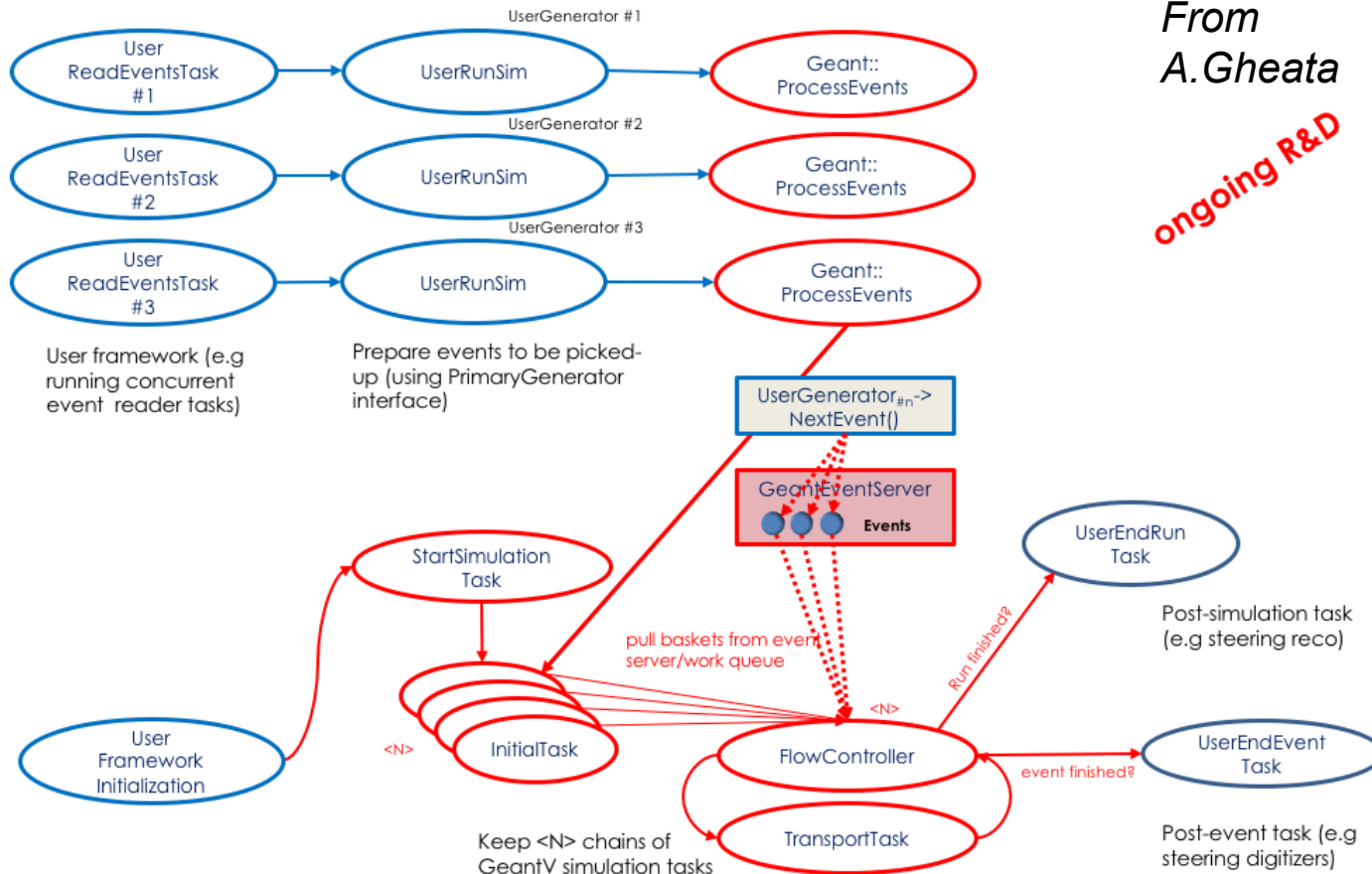
- test scalability of time performance with number of threads, event integrity after basketization, effect on throughput of wait for enough events to fill out baskets, MT implementation consistency in CMSSW and GeantV

GeantV in CMSSW

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ongoing R&D



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GeantV in CMSSW: Status

- GeantV driving classes have been instantiated from the toy framework
- CMake modified to link against GeantV libraries
- Serial part of GeantV initialization works
 - GeantV Tabulated Physics (extracted from Geant4)
 - CMS detector (2015 geometry)
 - HepMC primary events
- TBB-based event loop structure combination (on-going)

Upcoming milestone: working demo of GeantV within CMS toy MT framework in a couple of weeks

Next milestone: move UserApplicationGeantV to CMSSW