New Developments in the VMC Project

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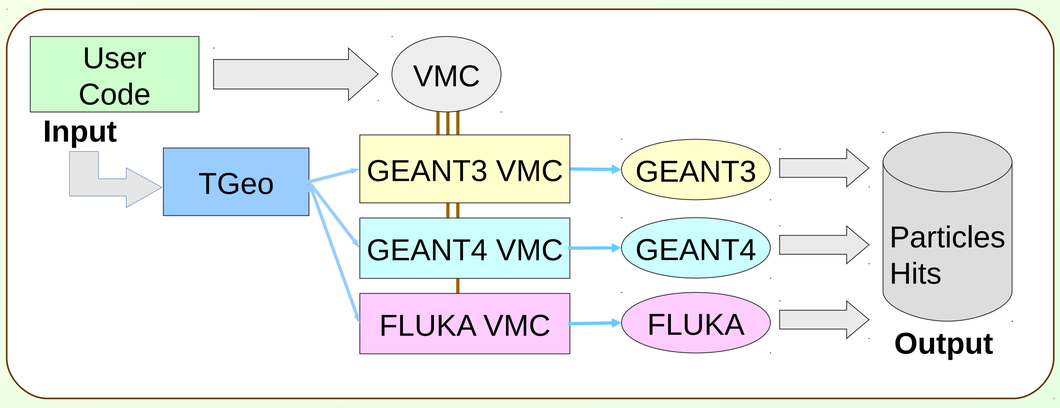
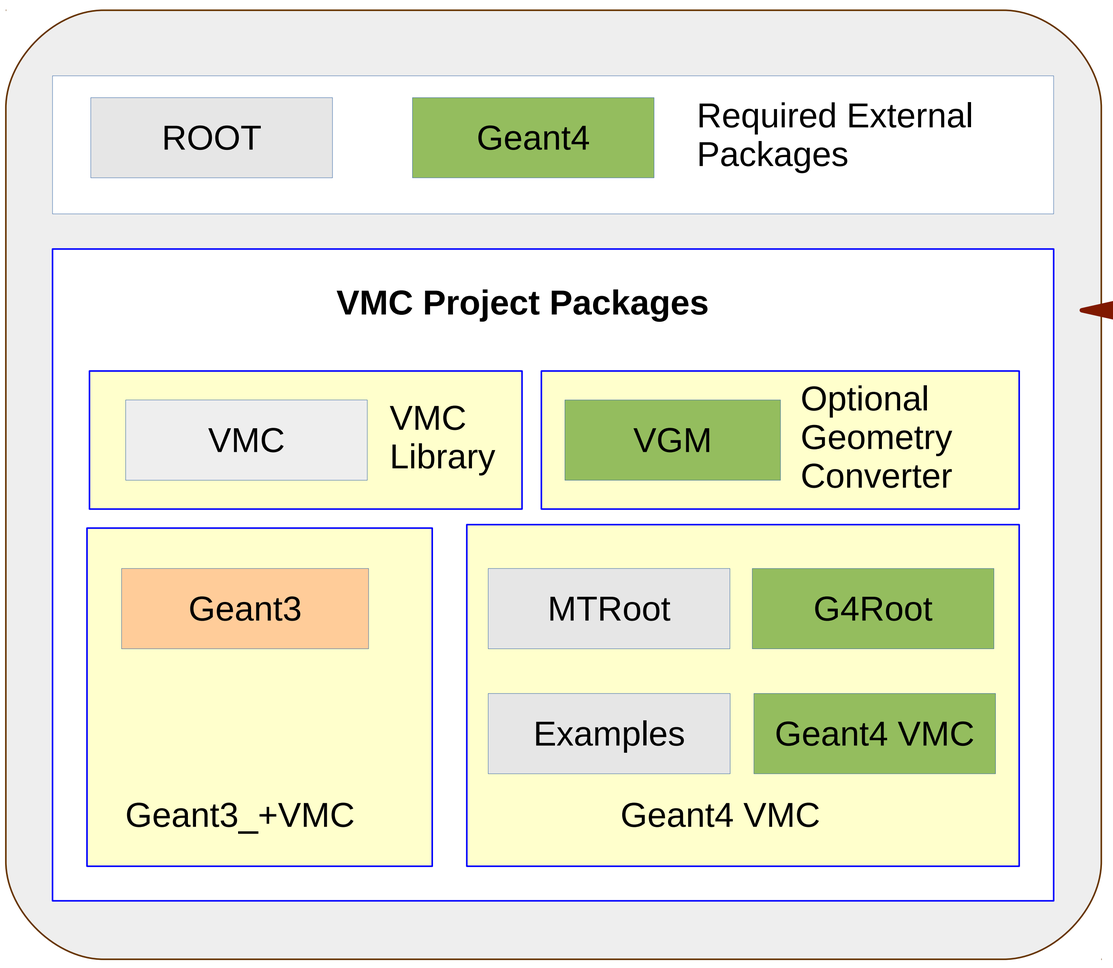
VMC Concept

- The Virtual Monte Carlo interface (VMC) allows to run simulation with different Monte Carlo codes from the same user application
  - Developed by the ALICE Offline Project and further included in ROOT
  - Reached stability during the last decade and has become a foundation for other detector simulation frameworks, the FAIR facility experiments framework being among the first and largest





VMC Project on GitHub

- 2017: **vmc-project GitHub organization** created with
  - Geant3 and Geant4 VMC projects moved from the ROOT git server and
  - Virtual Geometry Model (VGM) moved from SourceForge; *see also the CHEP19 contribution #324*
- 2019: root/montecarlo/vmc separated from the ROOT source into a **new stand-alone VMC package** in the vmc-project GitHub
  - Gain in flexibility, faster workflow
  - The VMC in ROOT is deprecated since version 6.18 and will be removed in the future

https://vmc-project.github.io/

- The **VMC Documentation** was migrated from ROOT Drupal into Hugo
- The documentation source at the vmc-documentation GitHub project in the vmc-project organization
- Deployment via GitHub pages

New in VMC

- Simulation can be performed by **multiple engines** (deriving from TVirtualMC)
  - *See also the CHEP19 contribution #359*
- Added support for **user defined sensitive detectors**
- **E03 example split in three options:**
  - a - scoring via old way,
  - b - scoring via new sensitive detectors,
  - c - sharing event simulation among multiple engines

New in Geant4 VMC

- Geant4 VMC 3.0 with the integration of multithreading processing was presented at CHEP in 2015, new features included in version 4.0 and beyond:
- Improved support for **magnetic fields**
  - Local magnetic fields, cached magnetic field and related UI commands, user defined magnetic field equation of motion and its integrator, user defined zero magnetic field associated with tracking media
- Integration of **various specific physics models**:
  - Fast simulation, support for transition radiation physics, a new special UrbanMsc model adapted for ALICE EMCAL by V. Ivantchenko, monopole physics classes extracted from the Geant4 monopole example
- New VMC examples demonstrating these new features, and serving also for tests:
  - **Gflash**, **Garfield**, **TR** (transition radiation), **Monopole** example (working only with Geant4)
- The work towards **the code quality**
  - Improved test suites
  - Introduced clang-format