New Developments in the VMC Project

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 GitHub
- 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

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