

GEANT4 10.2 highlights

kernel modules

Gabriele Cosmo, CERN PH-SFT
for the [Geant4 Collaboration](#)



Outline

- Features and fixes introduced in release 10.2
 - Kernel modules
 - EM Physics (see talk by V.Ivantchenko)
 - Hadronic physics (see talk by A.Ribon)

➤ *Detailed release notes:*

- <http://cern.ch/geant4/support/download.shtml>

➤ *List of planned features for 2015:*

- http://geant4.cern.ch/support/planned_features.shtml

Geometry

Geometrical primitives

- Updated USolids library now part of VecGeom
 - Optional replacement of original Geant4 solids
 - Selection made at configuration
 - External library VecGeom v.00-01-00
 - <https://gitlab.cern.ch/VecGeom/VecGeom/tree/v00-01-00>
 - Possibility to choose adoption of USolids (default) or VecGeom (under development) revised implementation
 - Added shapes (from VecGeom) since last release: Paraboloid, Torus

Geometry

Volumes, Navigation & Transportation

- Enabled parameterisation by solids type in MT mode
 - Feature not supported in previous 10 release series
 - Assumes solids being parameterised are declared thread-local in the user's parameterisation class and allocated just once
- Enabled volume divisions in MT mode
 - Addressing problem reports [#1743](#) and [#1750](#)
- Revised implementation of *EstimateIntersectionPoint()* in *G4MultiLevelLocator* for keeping consistent candidate intersection
 - Better treatment of looping tracks in field and improved diagnostics
 - Addressing cases of negative steps and convergence problems with field observed in ALICE

Analysis & Persistency

- Analysis:
 - Added "batch plotting" facility
 - Added classes for management of users parameters
 - Added ability to send/receive histograms through MPI
- Persistency
 - New GDMML schema version 3.1.3
 - Added 'userinfo' field to allow 'global' auxiliary fields; extended auxiliary field by `auxunit` and pointer to sub-auxiliary fields with no limit on the number of levels
 - Added optional field 'copynumber' to physical volumes for specifying copy-numbers associated to normal volume placements
 - Implemented import/export of geometrical regions associated to volumes for importing and storing production cuts and user-limits
 - Added support for writing and reading copy-numbers associated to placements
 - Fixes issues of misplaced volumes in exported geometries of complex detectors
 - Re-enabled detector object persistency
 - Binary persistency using Root I/O with Root-6

Materials, Particles, Track

- Materials:
 - Corrected density effect parameterisation when density of a simple (one component) material differs from the nominal value
 - Addressing problem report [#1765](#)
- Particles:
 - Taking into account mass width in Phase Space Decay when daughter particles are resonant particles
 - Dynamic mass given to daughter particles according to the Breit-Wigner formula
 - Removed hard-coded state data for nuclides, now retrieved from the mandatory G4ENSDFSTATE data set
- Track:
 - New G4VAuxiliaryTrackInformation class to be associated to a G4Track
 - Migrated generic biasing code to use G4VAuxiliaryTrackInformation for improved bookkeeping of tracks to be biased

Global, Run, Digits&Hits

- Global:
 - Added treatment of units for fluids (from CLHEP) in G4UnitsTable
 - liter, L, dL, cL, mL
- Run:
 - Increased granularity of MT methods to allow easier sub-classing of run-manager classes and ease integration with external frameworks
 - Added new UI commands for treatment of random numbers
- Digits&Hits:
 - Added G4MultiSensitiveDetector functionality, allowing to assign multiple sensitive-detectors to a single logical-volume
 - Calls to the sensitive-detectors methods are forwarded to all user-defined sensitive-detectors that are added

Visualization & Data sets

- Visualization:
 - Revised visualization system for multi-threading: now adopting dedicated thread for visualization, allowing also for continuous visualization of tracks during event generation
 - New UI commands specific for MT applications
- Data sets:
 - New versions: `G4EMLOW-6.48`, `G4ENSDFSTATE-1.2`, `G4RadioactiveDecay-4.3`, `G4PhotonEvaporation-3.2`
 - `G4ENSDFSTATE` data for nuclides is a mandatory data-set
 - New optional data set `G4TENDL-1.0` for high-precision incident particles

Configuration & Externals

- Cmake:
 - Requiring CMake v3.3 or higher
 - Making use of CMake “Compile Features” to determine and setup the correct C++ standard to use
 - C++11 features now enabled by default
- CLHEP:
 - New version 2.3.1.0 or 2.3.1.1 required
 - Forcing use of C++11
 - New MixMax random engine implementing the “Matrix Generator of Pseudorandom Numbers”
- Updated zlib (1.2.8) and expat (2.1.0) external modules

Platforms for 10.2

- Linux, gcc-4.8.3, 4.9.X, 5.2.X, 64 bits
- MacOSX 10.11, clang-3.7, 64 bits
- Windows 7, Visual C++ 14.0 (Visual Studio 2015)
- Also tested:
 - Linux SLC6/CentOS7, icc-15, icc-16
 - Linux Ubuntu 14, gcc-4.8
 - Linux for Intel Xeon Phi with Intel-icc 15.0, 16.0 (gcc-4.9 compatibility layer)
 - MacOSX 10.9/10.10, clang-3.5/3.6
 - Windows 7, VC++12.0

Thanks!