

GEANT4 9.6 highlights

kernel modules

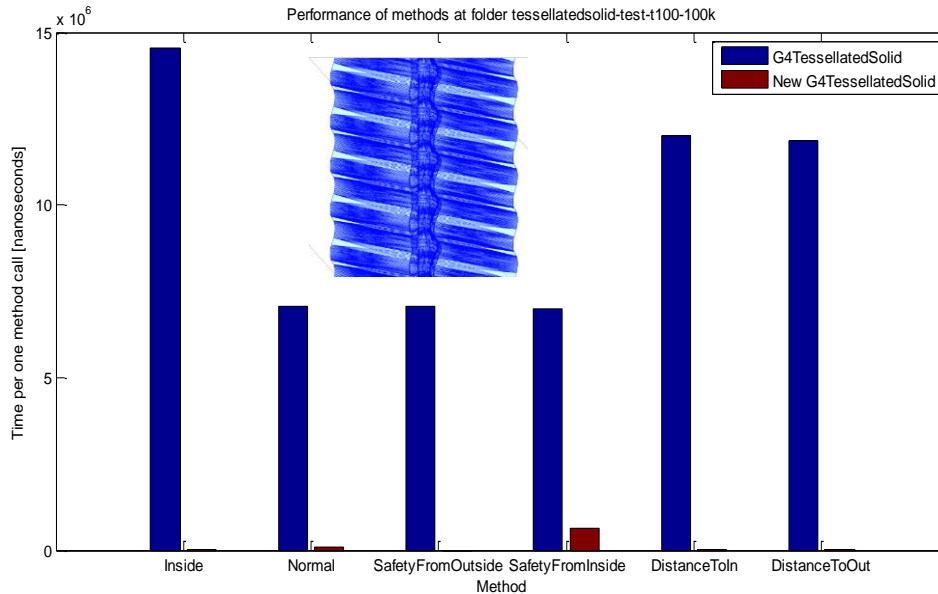
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for the [Geant4 Collaboration](#)

Outline

- Major features introduced in release 9.6
 - Geometry
 - Kernel & Interfaces
 - Visualization
 - Physics (see talks by V.Ivantchenko and A.Ribon)
- *Detailed release notes:*
 - <http://geant4.cern.ch/support/ReleaseNotes4.9.6.html>
- *All planned features for 2012:*
 - http://geant4.cern.ch/support/planned_features.shtml

Geometry



- New optimized implementation of the “*G4TessellatedSolid*” shape
 - Using voxelization for fast retrieval of facets
 - Great run-time speedup
 - Considerable reduction of memory footprint
- Part of the work going on within the [AIDA EU project](#)

Voxels / Case	1.1k facets	2.5k facets	164k facets
1	-51% (291kB)	-48% (575kB)	-50% (32.8M)
1000	-34% (391kB)	-23% (843kb)	-30% (46M)
10.000	-22% (462kB)	-15% (935kb)	-29% (47.2M)
100.000	+32% (907kB)	+45% (1.6MB)	-22% (51MB)
1.000.000	+523% (3.7MB)	+500% (6.6MB)	+6% (70M)

Geometry - more

- Refined algorithm (optional) for precise computation of safety
 - *To be used by physics processes (mainly EM) for measuring the exact safety value, not limited by voxels boundaries*
- Enhanced computation of point on surface for solids using polar coordinate parameterizations
 - *Now generating points with more uniform distribution*
- Added deprecation warnings for classes/methods planned for removal in next major release
 - *Classes in BREPs module*
 - *G4VCellScorer and G4VCellScorerStore classes*

Event reproducibility

- Full event reproducibility now provided in simulations with most physics lists
 - Allowing to restart a simulation from an intermediate event and obtain exactly the same results in different runs
- Event reproducibility valid for the majority of the physics lists, including FTFP_BERT, QGSP_BERT and QGSP_FTFP_BERT
 - Strict event reproducibility achieved in all physics models, with two exceptions: CHIPS stopping and neutron HP

Materials

- Definition of Isotopes
 - For all elements, a vector of *G4Isotopes* is always created using abundance values from NIST
 - in previous Geant4 versions, the vector of isotopes was created only for NIST materials
 - No longer needed to define natural composition of isotopes in the user code

Physics Lists

- New factory class implementing automatic registration of physics-lists
 - Instrumented EM and hadronic constructors
- New FTFP_BERT_HP physics list
 - Combining HP data-driven treatment for neutrons
- Removed direct dependency on CHIPS model from all physics lists, except QGSC* and CHIPS*
- Updated physics lists combinations and options

Performance & Q/A

- Optimized implementation for *G4StackTrack* and *G4StackedTrack*
 - Measured speedup of ~35% in simple test programs
- Optimized tuning of *G4SmartTrackStack* for the parameters, now enabled by default
 - Measured speedup of 4-5% total execution time in complex setups
- Cleared all cases of variables/parameters shadowing
- Addressing Coverity defects

Visualization

- Improved OpenGL rendering speed through major re-design of scene and transient processing
- Improved Qt interface and viewer
 - Introduced Qt tree, search widget a geometry-depth slider, ability to import icons, etc...
- Added new OpenInventor option OIXE
 - providing many new capabilities such as ability to set viewpoints and to fly along a trajectory path
- Improved handling of text

External libraries and data sets

- Updated to adopt new CLHEP version 2.1.3.1
 - Made explicit the HepLorentzVector(double) constructor
 - Cleared from variables/parameters shadowing
 - Still compatible with older CLHEP releases
- New data sets:
 - G4SAIDDATA1.1, evaluated data from SAID data-base
 - Mandatory and controlled by G4SAIDXSDATA environment variable for path
- Updated data sets:
 - G4EMLOW6.32
 - G4NDL4.2 (thermal data shipped separately)
 - G4NEUTRONXS1.2
 - RadioactiveDecay3.6
 - PhotonEvaporation.2.3

9.6: more ...

- Configuration (Cmake)

- Complete rewrite of data installation with support for custom install location
- Added support for Clang detection and possibility to specify C++ standard

- Run

- Enhanced *G4RunManager* for better integration with external frameworks
 - Enabling external frameworks with own event loop to execute each individual event and avoid code duplication

- Examples

- Completed reorganization of extended examples
- New documentation based on DoxyGen
- Anticipating steeper self-learning curve for new users and for experienced users on new features

Supported platforms for 9.6

- Linux SLC5, gcc-4.1.2, 4.3.X, 64 bits
- MacOSX 10.7, 10.8, gcc-4.2.1, 64 bits
- Windows 7, Visual C++ 10.0 (Visual Studio 2010)

- Also tested:
 - Linux SLC5/SLC6, gcc-4.6/4.7, icc-13
 - Linux Ubuntu 11/12, gcc-4.6
 - Windows 7, VC++-9.0
 - AIX 5.3, 6.1 with xlc 10.1

Thanks!