2012 Development Plan

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2012 Development Plan

- Detail of proposed 2012 development plan is found at
  http://geant4.cern.ch/support/planned_features.shtml
- Highlights
  - Geometry
  - Detector responses
  - Generic processes
  - Standard EM physics
  - Low-E EM physics
  - Hadronics
  - Visualization
  - Examples
  - Collaboration-wide
- Supporting platforms for version 9.6
- Longer term developments

Geometry / detector responses / generic process

- Geometry
  - Review of field classes and of design for field accuracy settings
- Detector responses
  - Migration to statistic-double for some quantities of command-based scoring
- Generic process
  - Review, unify and enrich existing biasing options
    - Review interface between processes and tracking for forced-interaction and forced-flight biasing
    - Prototype of (multi-)differential cross-section for process-based biasing and reverse-MC
  - First implementation of phonon physics processes for mK temperature
  - First implementation of electron/hole drift processes for semiconductor

Standard EM / Low-E EM

- Standard EM
  - Improving EM shower shape reproduction
    - Bremsstrahlung – angular generator
    - Multiple-scattering
    - Cross sections for gamma processes
  - Optimization of ComputeSafety()

- Low-E EM
  - Atomic de-excitation in Penelope
  - Microdosimetry models in Si
  - Extension of Geant4-DNA Physics models

Hadronic physics

- Replacing CHIPS in production physics lists
  - Stopping model
    - π^-, K^-, Σ^- stopping and capture:
      - Bertini versions now being validated and appear to be better and faster than CHIPS
    - anti-proton stopping and capture:
      - FTF model to replace CHIPS now being validated
  - All CHIPS cross sections currently used in production physics lists to be separated from body of CHIPS code and separately maintained
  - Replace hadronic part of CHIPS gamma-nuclear and electro-nuclear models with Bertini
    - Validation underway
  - EM part (virtual gamma spectrum generation) of electro-nuclear: either
    - extract CHIPS implementation to separately maintained code, or
    - develop new code based on Binary Cascade for virtual gamma spectrum

Visualization / examples

- Visualization
  - New driver to produce image files in batch
  - Full support for visualization of Boolean shapes (*)
  - Integrated visualization of field lines (electric, magnetic, ...) (*)

- Extended examples
  - Review of extended examples to reduce code duplication, apply coding guidelines and rationalize functionalities/features

- Advanced examples
  - Complete review of physics models implemented in all the examples

Collaboration-wide developments

- Performance improvements
  - Design iterations for some kernel classes
    - Cache-hit-rate improvement, reduction of virtual layers, etc.
    - Transparent to user's code (at least for average users)
  - Review physics implementations
- Reproducibility
  - Event/track level full reproducibility
- G4MT
  - A few more alpha releases for every Geant4 patch releases in 2012
    - G4MT v9.5-p01 will be released in two weeks
  - Improving usability in particular for external "frameworks"
    - Split G4ParallelRunManager into two
  - Catching up all performance improvements by design iterations
  - Confirming no performance penalty for single-thread execution
  - G4MT v9.6 at the end of 2012 or early 2013 will be the final alpha release
  - In 2013 we will merge G4MT into the main development repository

Proposed supporting platforms for version 9.6

- SLC5
  - GCC 4.3, (native 4.1)
- SLC6
  - GCC 4.6, 4.7, (native 4.4)
- Mac
  - GCC 4.2.1 or later native compiler
- Windows
  - VC++10

- Proposing to drop 32-bit compiler support for all Linux and Mac

Longer-term developments

- We anticipate version 9.6 at the end of this year will be the final minor release of Geant4 version 9 series.
  - Release of 2013 will be a major release

- Geant4 version X (name t.b.c.)
  - Multi-thread capable
  - Minimal migration cost
  - Still C++
  - Neutral to computing architecture