

Geant 4

A view from Geant4 developers

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Preamble

- Geant4 is a toolkit of simulating elementary particles and nuclides passing through and interacting with matter. Its areas of application spans from high energy and nuclear physics including all LHC experiments, as well as studies in accelerator, shielding, space, medical and material sciences for both academic and commercial purposes.
- The development of Geant4 (RD44) started in 1994 and the international Geant4 Collaboration was formed in December 1998 at the time of the first production-ready release of Geant4. Since then, the Geant4 Collaboration has taken responsibility for further development, maintenance and user support of the Geant4 simulation toolkit.
- The Geant4 Collaboration is one example of an international collaboration that aims at producing open source software of general usage with a user community far larger than the collaboration itself.
- We present a few ideas that we believe are quite helpful for a software collaboration like Geant4 if the HEP Software Foundation could provide.
- This view does not represent the whole collaboration of ~120 scientists but just two of us who have been heavily involving to Geant4 since the beginning to current.

Technical Forum and workshop

- Geant4 collaboration has been operating what we call "Geant4 Technical Forum" since more than a decade where we explain our development plan to the users and learn their requirements, concerns, suggestions and priorities.
 - Two general forums per year plus two smaller forums associated with user events.
 - This is one of the most efficient and valuable communication channels we have in our collaboration.
- It would be quite beneficial if HSF could host this way of communication between Geant4 (and all the other software projects) and the users.
 - User requirement that is on the boundary between more than one software could be efficiently discussed if HSF hosts such forum.
 - Geant4 would become one of the projects participating to this kind of forum host.
- In the same manner, there were two Simulation Workshops organized by LPCC. The recent one was in March last year. In these workshops we could share quite a lot of information among Geant4 Collaboration and LHC experiments and some other experiments such as CALICE.
 - We believe it makes lots of sense for HSF to organize the successors of this workshop, with extended coverage to other software functions.

Ctest/Cdash and other development tools

- Geant4 code development relies upon Ctest/Cdash system.
- Since we adopted it, our code testing has been significantly automated and become quite more efficient.
 - Within tens of minutes, newly tagged code is automatically tested with some test cases on several platforms.
 - Then Nightly test validates selected tags for wider coverage.
- This Ctest/Cdash system is built and maintained by CERN/SFT group.
 - Other tools such as Bugzilla, JIRA, HyperNews, etc. are also quite valuable, but they also require support efforts.
- It would be quite beneficial if HSF could offload such tools (and future more convenient tools) from software projects and centrally manage/maintain.
 - Tutorials of such tools would be quite appreciated.
 - Tutorials on other development tools, such as Valgrind etc. would also be useful.

GRID resource and other computing resources

- Geant4 is one of the software projects that require massive computing resources for validation.
 - Physics generators such as PYTHIA, HERWIG, etc., could be another cases.
- Geant4 currently has a small amount of GRID resources voluntarily donated by some collaborating HEP institutes.
- It would be quite helpful if HSF could be a broker so that participating projects could get their necessary GRID resources.
- It's not easy for a software project to verify its code on many different platforms.
 - Geant4 now has a few combination of compilers with some OS/platform (Linux, Mac OS, Windows, Xeon Phi)
 - It would be quite beneficial if HSF could host some commonly-used OS/platforms/compilers so that a software project could use.