Applications Area Report
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ROOT

The ROOT team is making steady progress toward the major ROOT 6 release, which has been delayed for few moths mainly to have more time for the completion of Cling, is now expected in the spring of 2013. In the meanwhile, the ROOT v5-34-02, 03 and 04 patch releases have brought last quarter several new features from the development trunk to the users of the stable release, like much improved LaTeX rendering via the TMathText class, an improved native MacOS X cocoa backend, many new features in PROOF and the mathematical packages like RooFit and TMVA. Development focuses now on the move from the old CINT C++ interpreter to the new Cling interpreter.

Persistency Framework

New releases of CORAL and COOL have been prepared in Q4 2012 for ATLAS (LCGCMT_61f) and LHCb (LCGCMT_64b and LCGCMT_64c), including important fixes and enhancements in both packages, as well as the upgrade to the Oracle 11.2.0.3.0 client. A major enhancement in both packages is the implementation of support for Oracle authentication using Kerberos. An improved handling of database connection glitches in the core CORAL software and in the CoralServerProxy component has been included to address issues observed in the ATLAS HLT system. Both packages also include several fixes for issues reported by the Coverity static code analyzer, as well as fixes for a few memory leaks that were identified thanks to the integration of valgrind in the test suites. Finally, the code bases have been ported to c++11 in gcc47 and to a more recent version of Boost.

The Oracle 12c beta client software has been tested for issues that had been observed in the use of the older 11g client with CORAL and COOL. The main focus of the tests was the redefinition in Oracle of GSSAPI and Kerberos symbols from the O/S libraries. It was found that the situation has somewhat improved with respect to 11g, but some issues are still pending and are being followed up in an Oracle Service Request with the help of IT-DB.

Working jointly with IT-GT, a first prototype of the HEPOSlibs 'meta-rpm' for SLC6 and of the corresponding quattor profile has been prepared. This meta-package is simply a list of all packages required by the four LHC experiments on their Linux boxes in addition to the minimal SLC6 installation, to be able to run their reconstruction and analysis software (as was done in the past for SLC5). The meta-rpm has been installed on a dedicated VObox where test accounts have been opened for computing experts of the four experiments and of the LCG AA projects.

Simulation

The new Geant4 release 9.6 was announced on schedule on November 30th 2012. Release 9.6 features full event reproducibility in all physics models used in production by LHC experiments, and is valid for the majority of the physics lists, including FTFP_BERT, QGSP_BERT and QGSP_FTFP_BERT. The WentzelVI multiple-scattering model is now used by default in all EM physics lists; this was done to provide

more accurate simulation for both small and large angles of high-energy charged particles. A universal interface to angular generators is established for all EM models (Bremsstrahlung, Rayleigh and PhotoElectric effect). The Seltzer-Berger model for Bremsstrahlung has been improved to adopt a more detailed grid of differential cross-sections and updated screening functions. Hadronic processes now trigger re-sampling of the interaction if energy/momentum non-conservation limits are exceeded. Diffraction dissociation in Fritiof (FTF) has been improved for protons, pions and kaons. The Bertini cascade model has been extended to handle nuclear capture at-rest of pi-, K-, Sigma-, Xi- and Omega- and direct photo-nuclear interactions and direct dependency on the CHIPS model has now been removed from most physics-lists. Barashenkov-Glauber-Gribov nucleon-nucleus inelastic cross sections are now used in most physics lists instead of Axen-Wellisch proton-nucleus and Laidlaw-Wellisch neutron-nucleus inelastic cross sections. A new optimized implementation of G4TessellatedSolid provides substantial CPU performance boost and reduced memory footprint, making it now suitable for import or reasonably complex structures (like the LHCb VELO foil) with hundreds thousands facets. Optimized tuning for parameters in G4SmartTrack, now used by default provides 4-5% reduction in total execution time for complex setups. The whole code has been subject to major cleanup for cases of variable shadowing.

The latest development release made in January also includes first merging of changes required for multi-threading, ported from the Geant4-MT prototype. The porting of Geant4-MT on MacOSX has been made with little modifications on the current available prototype, and a first simple application implementing event-level parallelism in Geant4-MT using the Intel Thread-Building-Blocks (TBB) library has been realized, demonstrating that Geant4-MT can be used within an external framework based on TBB. No changes were required in Geant4-MT itself, except for the addition of few simple classes in the application code. The Simplified-Calorimeter suite has been successfully ported on Geant4-MT. Reproducibility of events has been verified over the sequential version.

Validation results for the new release 9.6 are comparable to those obtained with the previous release series. The main change is observed in the hadronic showers for their lateral profile: showers in 9.6 are wider in Iron and Copper, and narrower in heavier absorbers, like Tungsten and Lead.

The GENSER project for Generator Services is moving to a new approach where the MC-Generators trees will now follow strictly the LCGCMT releases. This will assure that versions of all the external software packages used by the generators (like HepMC, FastJet, etc.) will be compatible with those used by the experiments.

SPI

In the LCG 64 cycle, two new releases (64b and 64c) were created, upgrading to new ROOT and CASTOR versions. Intel's Threading Building Blocks (TBB) library got added to the LCG externals, in preparation for LHC experiment activities on concurrency. The migration to EMI-2 components as external Grid software is almost finished. A patch release LCG 61f was prepared in December. In addition, another HEPSOFT 0.7 release was created. On compiler side, support for clang 3.2 was added. To support the CERN data preservation efforts, the CERNLIB library was ported to Scientific Linux 6.