Minutes of the ABP Computing Working Group meeting

11th May 2017

Participants: D. Arominski, X. Buffat, L. Deniau, R. De Maria, G. Iadarolla, A. Latina, K. Li, L. Mether, E. Métral, A. Oeftiger, D. Pellegrini, G. Rumolo, B. Salvant, F. Schmidt, D. Schulte

- G. Rumolo reminded LSF users to migrate to HTCondor.
- G. Rumolo reported that the HPC machine has been approved by the DG, it will be available by the end of the year. Bologna clusters are getting ready, G. Iadarolla is currently testing it. Different projects financed this machine, the shares will be defined accordingly. LSF will be used for job scheduling.
- B. Salvant reported that 3D drawings of equipments at CERN are currently handled with CATIA and stored in a common database. These 3D designs are used within ABP by the impedance team, in particular CST and HFSS simulations can be performed based on such drawings. A change of strategy was announced at the LMC, the impact of which is limited as it only affects the way the models are accessed in the database, not the drawing themselves. It is not planned to change the strategy concerning the design tools, at least before 2025. The evolution of these technologies is critical for ABP, in particular since investments are done in training for CATIA.
- G. Rumolo reminded that next two meetings will be on Wednesdays.

D. Schulte presented the Generator of Unwanted Interactions for Numerical Experiment Analysis - Programme Interfaced to GEANT (GUINEA-PIG), mentioning that publications including the code name in the title are not recommended to avoid confusion with experimentations on animals, as he learned the hard way. GUINEA-PIG simulates the interaction of two colliding ultra-relativistic beams containing electrons, positrons and photons. It models the pinching of the beams, the emission of beamstrahlung, the production of incoherent pair background, bremsstrahlung, the production of coherent pair background and the production of hadronic background. The two beams are modelled by macroparticles, sorted into longitudinal slices interacting consecutively. The interaction of two slices is modelled via a reduction in boxes, where the fields and their effect is computed, together with the generation of secondary particles.
GUINEA-PIG plays a central role in the design of most linear collider projects. It is also used for circular electron-positron or hadron-lepton colliders. It models the luminosity and luminosity spectrum, giving input for both detector (backgroud, physics optimisation) and machine (performance, imperfection) design.
The code is written in C in a functional manner. It can be compiled suing GCC and requires FFTW2 or 3. No parallelisation is implemented. The code is available via SVN.
The current resources are appropriate for most of the applications, as few seconds to few minutes are usually needed. A parallelisation scheme might be needed to study long term effects.

- R. De Maria asked whether GUINEA-PIG could be used for luminosity evaluation in hadron machine. D. Schulte answered that it is meant for cases where the beam is dynamically changing during the collision (strong-strong), this is not the case in hadron-hadron collider. The accuracy might not be as good as a numerical evaluation of the overlap integral.

R. De Maria reported few outcomes of a workshop on HPC for discovery accelerator facilities in the UK. The slides, or even the name of the speakers are mostly not available on the web. It appeared that Google services are used by groups working on medical applications with rather positive outcome. Automatised optimisation of FEL was found to perform better than manual ones. For such applications, the computational needs are highly non-uniform in time, favouring options such as Google services, where the computing power is paid per unit time, without having to invest in large infrastructures that remain idle. MPI is for the moment not available via Google services.

R. De Maria presented a benchmark of a trivially parallel tracking code (Sixtrack) using OpenCL on several machines, on double precision. A. Oeftiger asked whether the kernel is split, R. De Maria answered negatively. The improvement of the splitting of the kernel, avoiding the limitation of the register size, has to be balanced with the load of starting the kernel. D. Pellegrini mentioned that he is currently experimenting with similar codes, removing the switches within the elements that significantly reduce the performance of GPUs.
Techlab at CERN provides several GPU types for testing.