Experiments' Feedback on SFT PoWs

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Architects' Forum Meeting 4th April 2023

This talk

- At the SFT Group meetings, the **programmes of work (PoWs) of ROOT, Simulation, "CernVM Systems and Services", HSF, Key4HEP and EP R&D were presented**

- This talk summarizes the **feedback of ALICE, ATLAS, CMS and LHCb combined together**
  - Experiments' representatives ("we" in the following): **G. Eulisse** (ALICE), **N. Styles-J. Catmore** (ATLAS), **D.P.-J. Letts** (CMS) and **M. Clemencic** (LHCb)
  - We collected feedback on a shared document (10 pages, will not be shared), and various conversations/meetings.

- Objective: **help SFT to prioritize its activities based on experiments' needs**

General Considerations

General Remarks

- **Experiments are grateful for the opportunity to express their view on the PoWs**
- **We do not see major issues**, but rather opportunities for improvement!
- **A significant effort to express the voice of all experiments**
  - **Remarkable unanimity** on most points presented today
  - Virtually no conflict/disagreement.
- Feedback in this talk is organised per project
- The **collaboration with SFT is very fruitful**, and we should develop it further
  - An experiment independent software development unit of the Experimental Physics Department, in close contact with LHC Experiments.
- **All activities contributing to meet the HL-LHC challenge are of strategic importance**
  - E.g. what would be the impact of the activity on the storage, compute and network needs of experiments and on the flexibility of their computing models?
  - ATLAS and CMS, but also ALICE and LHCb (never idle! Preparing an Upgrade II!)

The Architects' Forum Meeting

- We appreciate the AF meetings: **getting together 10 times per year is useful**
- The current format seems to aim to share information (which is very useful). **We propose that the AF also becomes the high level strategic liaison between SFT and the experiments**, in order to
  - Provide the entry point to talk to SFT projects
  - Steer ongoing R&D projects
  - Have actionable actors present, e.g. project leaders
- Of course, at the AF, experiments want to continue to attentively **listen to SFT feedback, e.g. group needs, wishes or changes in the previously agreed PoWs.**
- Direct communication with SFT projects works and will continue.

This is not a revolution. From the original AF mandate: " *[…] Through this forum the experiments participate directly in the planning, management, and architectural and technical direction of applications area project activities. […]"*

Projects

Simulation

- Expertise and support of the tool should experience no disruption. Adequate staffing as well as well thought succession plans have to be guaranteed.
- Not very easy to extract list of concrete work items from the plans presented, even if the talks were clear
- **A common need: active engagement of (at least) a member of the G4 team in each experiment is crucial**, for example to:
  - Work out promptly any regression in physics (e.g. pi energy resolution) and runtime (e.g. issue with surfaces) performance
  - Tie fast simulation development to the real detectors, directly integrated in frameworks
- **Experiments welcome the R&D program, e.g. vectorization and usage of accelerators, and**
  - **Clear milestones/deliverables/decision points are somewhat missing** from the PoW
  - **Usage of accelerators should be integrated in G4**, even at the cost of losing some efficiency
- New intra-event parallelization plans
  - In principle welcome, also to facilitate offload to accelerators
  - **Must be done in constant contact with experiments' frameworks experts** to avoid idiosyncrasies in the design and implementation (first integration of G4MT was a lot of work and not always pleasant)
- **Suggestions for prioritization:**
  - Speedup G4 startup time, e.g. Physics Lists: in some configurations this is a problem
  - Integration with Fluka w/o VMC-like solutions: all the power of G4+Fluka in a sustainable formula
- Analysis at HL-LHC will need very high precision: **work on physics models need to provide the highest fidelity is required**

ROOT

- **Overall positive impression of the ROOT workplan - it looks thorough and complete**
- The team is committed to the experiments and always helpful. Issues are swiftly addressed.
- Expertise and support of the tool should experience no disruption. Adequate staffing as well as well thought succession plans have to be guaranteed.
- **Common concerns about effort available:**
  - Crucial development effort should not need to rely on R&D money
  - Ambitious program, no delays but obtaining new features faster would be useful to prepare for HL-LHC
- **All new developments (e.g. Minuit2) should be thought with the usage of ROOT libraries in a multithreaded environment**
  - Again communication with framework experts is key
- **Suggestions for prioritisation:**
  - TBufferFile >1 GB: a problem for storing TPC clusters
  - Upstream cling to clang-repl: long term sustainability, simplification in sw stacks (1 single clang instead of 2 built and deployed)
  - BulkIO for RNTuple: otherwise this is a regression wrt TTree
  - More support for Python interfaces: not only PyROOT and Pythonisation, but a need for more Python in analysis
  - C++ inference engine to be used in reco/sim: fear about long term sustainability of ONNX, difficulty to use at runtime fwks such as TF
- **Suggestions for de-prioritisation:**
  - TMVA (except its interoperability with other ML tools)
  - Windows support

CernVM and CVMFS

- **CVMFS is central to all deployment models, including the one of container images**
  - Priority on bug fixes, client and Stratum 0 speedup rather than new features
  - Limitations imposed to users wrt the behaviour expected from local filesystems should be avoided if possible
- **ATLAS and LHCb also rely and plan to rely on CernVM**
  - E.g. Offline usage of HLT farm at P1 or simply to run applications on the Grid

Systems and Services

LCG Releases:

- ATLAS and LHCb rely on LCG releases for their data processing stacks
- **CMS relies on them for analytics**: SWAN is heavily used, also in conjunction with Spark
  - Evidence of some analysis using LCG releases to set up environments

Spack:

- **Widespread interest in a Spack discussion**, with some caveats:
  - **CMS and ALICE will most likely retain ownership of the sw stack**
  - **Spack promising for LHCb, provided that it comes with SFT support**, e.g. with a Spack baseline (same as LCG releases)

Key4HEP

- ALICE and CMS are not direct customers

- **ATLAS and LHCb may profit from the improvements to Gaudi** developed in the context of the project

- **Any advancement which can benefit experiment in the short and medium term should be prioritized.**

More Feedback

HSF

- **A useful list of activities foreseen to be discussed during in 2023**
  - No committed effort to the various activities (by construction!)
- **Nice to have events to spread new and technical insights** (Computer Accelerator Forum, Frameworks WG, SW Tools and Packaging WG)
  - Perhaps to be held more regularly?

HSF: Foundation or useful Forum?

- E.g. it gathers together people from various communities to share ideas and discuss possible synergies, for example in the areas of trainings (e.g. C++).

EP R&D

- Given the nature of the activity, **not a real PoW but more a status report**

- Interesting ideas, but not clear today how experiments can benefit in Run 3 or beyond

- Common question: **how can running LHC experiments also take advantage of the EP R&D program?**

- An opportunity to clarify how experiments can be involved. For example:
  - Requirements for early adoption? Maybe it's not too difficult to consider them w/o changing the direction of the research activities.
  - Provide real life testing scenarios?

- **Any advancement which can benefit experiments in the short and medium term should always be prioritized**

Conclusions

- Experiments worked together on this talk to provide feedback on the SFT PoW's

  - We are grateful for the opportunity!

- Remarkable convergence an almost every point, no disagreement to arbitrate/document

  during the entire process!

- The overall feedback is positive, with some opportunities for improvement

  - New roles for the AF and HSF discussed

- It would be useful to continue this process, e.g. for the 2024 PoW's