Charge for Producing a HSF Community White Paper

15 July 2016

The HL-LHC project anticipates significant upgrades to both the accelerator and large detectors which will extend the LHC physics programme through the 2030s. Realizing the full physics potential of these investments requires commensurate attention also to software, which is ubiquitous in the process by which data is acquired, managed, processed and analyzed to produce physics results from the LHC experiments.

Data volumes and needs for computing cycles are expected to dramatically increase in comparison to LHC Run 2, and will increase more quickly than what could be met by reasonable Moore's Law extrapolations from today's technology and more or less constant operational budgets. In addition to this potential growth in resource needs, several major software sustainability challenges exist: the nature of computing hardware (processors, storage, networks) is evolving, the complexity of the data and/or detectors will increase, and much greater sophistication of analyses will be required to maximize the physics yield from larger datasets. Thus we must anticipate also a "software upgrade" in preparation for HL-LHC. This should be seen as one strand of a combined strategy to revolutionize the experiment's computing models to address these challenges over the coming decade.

A proposed "community white paper" (CWP) on software and computing should present the overall strategy and roadmap for this software upgrade. While the ultimate focus should be on HL-LHC, the roadmap should identify research required to prepare the experiment Technical Design Reports in advance of HL-LHC as well as elements which could be built, tested and used by experiments in LHC Run3. More specifically the CWP should identify and prioritize the software research and development investments required:

1) to achieve improvements in software efficiency, scalability and performance and to make use of the advances in CPU, storage and network technologies

2) to enable new approaches to computing and software that could radically extend the physics reach of the detectors

3) to ensure the long term sustainability of the software through the lifetime of the HL-LHC

It is important that we engage the community in this process through a series of workshops, and that the LHC experiments, the HEP Software Foundation, CERN openlab, and eventually other interested HEP stakeholders be fully involved.

As part of the preparation of this CWP, we should also critically re-examine the organizational processes by which the HEP community and the experiments collaborate to address these problems, and work together with national and international funding agencies to identify opportunities to obtain resources to work on these challenging areas.

A final version of the CWP is anticipated by the end of August, 2017.