

Outcome of the Future Collider Software Workshop

INFN Bologna, 12-13 June 2019

Purpose

In a few different recent occasions, such as the AIDA-2020 annual week, the FCC-ee physics workshop, the CEPC EU workshop at Oxford and the discussions for the EP strategic software R&D at CERN, the question of a common software stack has been addressed and felt to be a very interesting and important issue. The same topic is also central to a request to NSF for funding for collaborative efforts on software activities made by the US HEP software community.

At the initiative of the INFN, the workshop has been organized to discuss more in depth this issue, gathering together the main software experts from several communities: LHC, ILC, CLIC, FCC (ee and hh), CEPC and from the HEP software foundation (HSF)¹.

The agenda, available at <https://agenda.infn.it/event/19047/>, included presentations on the existing software frameworks and the common software tools widely used, followed by a very constructive and open discussion session to review the needs and requirements of a common software framework.

It was suggested that a mention of this initiative is proposed for the forthcoming ESPP 'Infrastructure and Computing' briefing book.

Agreements

Consensus was reached among software and computing experts from all currently proposed future colliders on the following items:

Common Event Data Model (EDM4HEP)

Investigate the possibility to have a common event data model (EDM4HEP) for all future collider activities; the EDM could eventually be used for the Open Data of the current experiments.

The common EDM should be managed by a PODIO-like tool.

Care should be given to provide a series of "adapters" to migrate the existing data sets to the new EDM adiabatically.

The timescale for a first concrete version of EDM4HEP is 3-6 months.

¹ See [Appendix A](#) for the list of participants

Common Turnkey Software Stack (Key4HEP)

Contribute to the development of a Common Turnkey Software Stack (Key4HEP), connecting and extending the individual packages to enable a complete data processing framework.

The Key4HEP should be easy to use (for librarians, developers, users), easy to set up, easy to deploy, easy to extend.

It was agreed that Key4HEP should contain:

- HEP standard and new libraries / packages, such as ROOT, Geant4, HepMC, VecCore, VecMath, VecGeom, ...
- Externals, such as Boost, GSL, Eigen, ...
- EDM and Geo libraries, such as DD4Hep, PODIO
- Rec/Tracking libraries, such as ACTS, PandoraPFA, ...
- One framework

It was agreed to develop an EDM generated by PODIO as an essential component of the Key4HEP, which in content should be strongly inspired by LCIO.

With respect to the framework, it should be functionally complete (conditions data, geometry, edm, ...), portable to various computing resources, architectures and accelerators, and providing support for task-oriented concurrency. It was agreed that the best candidate to date is the Gaudi framework.

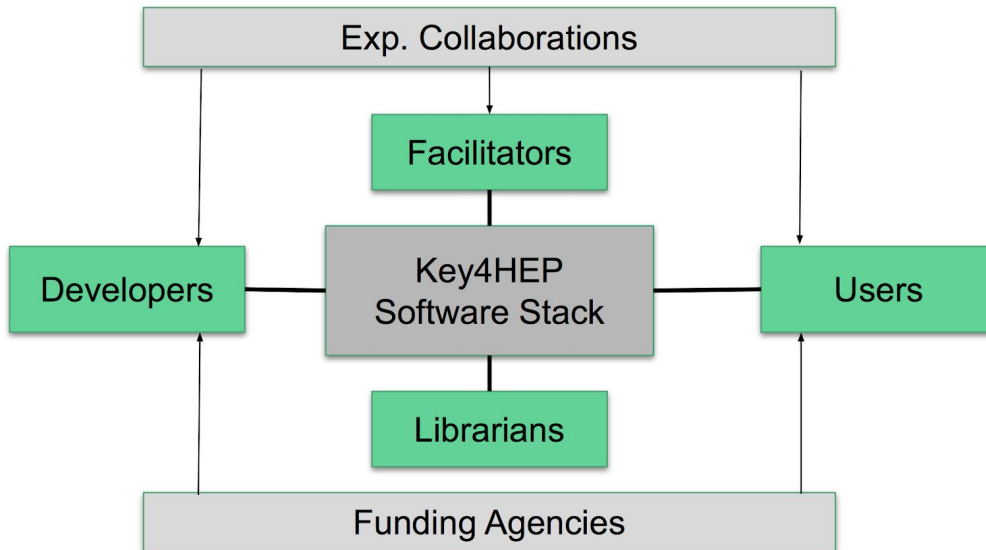
It was agreed that the MARLIN framework will continue to be used by the LC community while the Key4HEP is commissioned.

A first concrete milestone for the new Key4HEP is the full support for the IDEA detector in e+e- collisions, which can be used for physics studies initially by CEPC and FCC-ee, and eventually by LC and CLIC.

It was suggested that an Eol on the Common Turnkey Software Stack could be submitted to the AIDA++ program.

Management scheme

Agreed to have a simple management scheme for collaborating on a common software stack



The Facilitators will steer the development ensuring the collaboration by all the interested communities.

An initial list of facilitators has been identified in

- F. Gaede (ILC, DESY)
- W. Li (CEPC, IHEP)
- X. Huang (SCTF, Shandong)
- G. Ganis (FCC, CERN)
- A. Sailer (CLIC, CERN)
- D. Maximov (SCTF, Budker)
- D. Lange, X. Lou (USA)
- G. Stewart (HSF, CERN)
- T. Boccali (LHC, INFN Pisa)

The Facilitators will propose and call meetings as required in the same collaborative spirit as the first software workshop held in Bologna.

Appendix A - Organizers and list of participants

Organizers:

F. Bedeschi (INFN Pisa), M. Caccia (INFN and Univ. Insubria), P. Giacomelli (INFN Bologna)

Participants:

T. Boccali (INFN Pisa), E. Brondolin (CERN), M. Casarsa (INFN Trieste), F. Collamati (INFN Roma 1), B. Dimicco (INFN and Univ Roma 3), R Ferrari (INFN Pavia), F. Gaede (DESY), G. Ganis (CERN), A. Gianelle (INFN Padova), C. Grandi (INFN Bologna), J. Guimaraes (IHEP), C. Helsens (CERN), Xingtao Huang (SDU), D. Lange (Univ. Princeton), Li Gang (IHEP), Weidong LI (IHEP), Tao Lin (IHEP), Xinchou Lou (IHEP), P. Mato Vila (CERN), D. A. Maksimov (Budker INP), D. Menasce (Univ Milano Bicocca), C. Neubuser (CERN), L. Pezzotti (INFN Pavia), Manqi Ruan (IHEP), A. Sailer (CERN), L. Sestini (INFN Padova), G. A. Stewart (CERN), V. Vorobyev (Budker INP), wulh@ihep.ac.cn, A. Zhemchugov (JINR), Jiaheng Zou (IHEP)