

Foundation for HEP Software

(Richard Mount, 19 May 2014)

Preamble:

Software is central to all aspects of modern High Energy Physics (HEP) experiments and therefore to their scientific success. Offline software serving HEP ranges from analysis code written by individual scientists to meet their scientific goals, through reconstruction algorithms and frameworks, Monte Carlo simulation applications, to distributed computing data and workflow management systems on top of GRID middleware layers.

The need for agile software, coping with different detector technologies and the need to meet critical deadlines within stringent application-dependent physics performance and resource constraints has, for most of the current experiments, resulted in exploring a mix of common software solutions and custom code.

HEP has a successful track record of producing common software solutions and toolkits, such as Geant4, ROOT or even CERNLIB in the past. Many of those are also used extensively by other communities outside HEP. Projects like the LCG Application Area have helped in the past to foster common software solutions. It is the aim of the Foundation for HEP Software to learn from successful, and of course less successful, common software projects and to further promote common software solutions to the future challenges in HEP software and computing.

Mission:

Promote and facilitate the creation, maintenance and lifecycle management of high-quality common software of value to HEP and beyond. Provide a forum for collaboration between software developers within HEP and with other sciences or endeavors.

Approach:

Build upon the existing successful common software projects and the expertise across the HEP software community at large. Offer an evolving portfolio of services to support them and to facilitate new common HEP software developments.

The use of individual services will be optional in the view of the Foundation. They may be mandated by individual projects or organizations participating in it.

The initial portfolio of services will reflect the needs the stakeholders that participate in the Foundation and the resources that the Foundation can attract.

Services Portfolio:

The Foundation provides different levels of services to support software projects:

- Formal recognition of software projects

- Acknowledgement of the project, its software products and its relevance to the goals of the Foundation for HEP Software
- Organization of reviews
 - Process for organizing or endorsing peer-reviews, particularly aimed at cross-cutting projects with no single experiment or funding-source owner
 - Includes experimental approaches such as an open invitation to review code
- Software project oversight and/or management support at the request of the participating project
 - Includes Maintenance/lifecycle management
 - Support for software integration
- “SWAT Team on demand”
 - Specialist help to projects for a limited time

The Foundation needs to provide an infrastructure for software development and distribution:

- Software development tools (build system, release infrastructure, etc.)
- Public repository service hosting software products from participating projects

The Foundation needs to establish communication and information services:

- Creation, maintenance and evolution of a Web-based information system for HEP software offering:
 - An HEP face
 - A public face aimed at non-HEP science
 - Links to relevant existing resources (e.g. concurrency.web.cern.ch, geant4.cern.ch, root.cern.ch, HepForge.org)
- User-developer communications tools:
 - Tools to help support user-developer communications
- User-developer forum organization
 - User-developer Forum ‘events’ likely specific to individual areas or projects
- Topical workshop organization
 - Exploring potential opportunities for collaborative work and fostering new common developments and R&D

Foundation services to support the HEP software community at large:

- Intellectual property support
 - Offering template licenses and intellectual-property management processes for HEP software
- Software developer career support

- Career opportunities listings
- Exploring how to bring HEP career prospects more in balance with the importance of software to HEP
- Outreach to other sciences and industry
 - Ensuring a coherent view of HEP software is made available to other sciences and industry
 - Exploring collaboration opportunities
- Outreach to funding agencies
 - Supporting the presentation of a coherent view of HEP software to funding agencies
 - Identifying funding opportunities and supporting coordinated responses

Formal Processes/Governance:

The Foundation will require a modest, but essential, amount of dedicated effort to ensure the provision of the Services Portfolio. This, in turn, requires a process for ensuring that this effort is available, and for ensuring that the work is responsive to the Foundation needs.

Attempts to describe a formal structure explicitly addressing the needs of the various stakeholder constituencies (see Appendix) appear to lead to inappropriate complexity, at least for the first years of the Foundation's existence. A good illustration of the complex issues is the role of Experiments. Experiments efficiently represent a large fraction of the user and developer communities, but other legally constituted entities have formal responsibility for the work of all the people involved.

Taking account of these issues, the proposed initial structure consists of:

- 1) A Governing Board with membership open to interested stakeholders. The board should choose its chair by consensus if possible.
- 2) The people whose full or partial effort has been committed to the Foundation by "Resource Providers". The management structure for this effort should be set up by the Governing Board and its chair.

Resource Providers could include individuals committing their own efforts, or entities (from research groups to funding agencies) that can commit effort.

Governing Board meetings should be announced, and should also be minuted, on the Foundation website once this exists. Other open or closed meetings (for example among resource providers) should also be recognized, with encouragement to note the existence of the meetings, with brief minutes when possible, on the Foundation website.

More formal governance, probably involving agreements, formal resource accounting, advisory bodies and a more formally composed Governing Board, should be proposed and developed as needed. It is highly desirable that the Foundation be able to endorse (or not) projects, and be able to act as an incubator

for new projects. These functions probably require the legitimacy and resources arising from a more formal engagement of the stakeholders.

APPENDIX: Stakeholders Concerns and Meeting Stakeholder Needs

Stakeholder Concerns

- Individual users
 - o Strong need for bi-directional communications with developers
 - o Major shifts in HEP software usage are often triggered by exploration and tentative adoption at the user level.
- Individual software developers
 - o Need personal satisfaction – does my work have a large impact,
 - o Need career development,
 - o Need recognition,
 - o Need freedom and encouragement to pursue wild ideas (responsibly),
 - o Need some entity to take care of tedious details – IP, repositories, web presence, ...
- Experiments
 - o *de facto* managers of most of HEP software development resources
 - o *de facto* representatives of most of HEP users
 - o Accustomed to facing cost and risk based decisions on common projects versus go-it-alone (but no clear evidence that experiments or any other entities excel in making good decisions)
- Software collaborations (existing now or in the future)
 - o Don't fix what ain't broke
 - o Learn what works and what doesn't
 - o Find out where the Foundation could help
- Resource providers
 - o Need accountability for resources provided
 - o Need processes to ensure that their resources support their mission
 - o Often need peer-reviewed proposals for new or continued work
 - o Recognize the need for wild ideas, but worry about how to manage them
- Other Sciences and Industry
 - o Wary of HEP arrogance
 - o Usually don't understand HEP-speak (and vice versa)
 - o Nevertheless have many issues in common with HEP

Meeting Stakeholder Needs:

| Service | Individual users | Individual software developers | Experiments | Software Collaboration | Resource Providers | Other Sciences and Industry |
|--------------------------------------------------------|-------------------------|---------------------------------------|--------------------|-------------------------------|---------------------------|------------------------------------|
| Services to Support Software Projects | | | | | | |
| Formal recognition | | | | X | X | |
| Organization of reviews | | | X | X | X | |
| Oversight/management support | | | | X | X | |
| SWAT Team on demand | | | X | X | | |
| Infrastructure for development and distribution | | | | | | |
| Software development tools | | X | X | X | | |
| Repository service | | X | X | X | | |
| Communication and information | | | | | | |
| Web-based information system | X | X | X | X | X | X |
| User-developer communications tools | X | X | | X | | |
| User-developer forum organization | X | X | X | X | | X |
| Topical workshop organization | X | X | X | X | X | X |
| HEP Software community support | | | | | | |
| Intellectual property support | | X | X | X | X | X |
| Software developer career support | | X | X | X | | |
| Outreach to other sciences and industry | | | X | X | X | X |
| Outreach to funding agencies | | | X | X | X | X |