

Community White Paper: a roadmap for the HSF?

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Where does HSF go from here?

Pere has just described the current status of the HSF and the activities that have been taking place in the past ~ 1.5 years. In this presentation I'd like to go back to a subset of the original objectives he listed:

- Catalyze new common projects
- Promote commonality and collaboration in new developments to make the most of limited resources
- Provide a framework for attracting effort and support to S&C common projects (new resources!)
- Provide a structure to set priorities and goals for the work

and in particular the next steps we could make.

Where does HSF go from here?

The HSF has demonstrated some initial collaborative activities between people working on different experiments. However what is needed to address the future HEP software/computing challenges (HL-LHC and others) is additional dedicated resources for projects.

There *are* a couple of “common” software-focused projects today which have acquired “new” resources: DIANA-HEP and the software WP of AIDA2020. Neither of these was really proposed or funded “as part of” HSF, but they are the kinds of projects we want to foster under the HSF umbrella. How concretely do we go about doing that?

Where does HSF go from here?

We should build on where we are with the HSF today. The most direct fashion would be to prepare a **community roadmap** for HEP Software and Computing. This type of document of course serves as the basis for discussions with funding agencies and subsequent specific proposals.

For example, in the U.S. the Particle Physics Project Prioritization Panel (P5) issued the *Strategic Plan for U.S. Particle Physics* in May 2015. This is the basis on which a number of projects are being pursued, including upgrades, experiments in preparation, etc..

The next obvious step for HEP S&C to prepare for the challenges of the 2020s is to prepare such a community consensus document, and use it as the basis for discussions of resources with funding agencies, industry, etc. (We have such an opportunity with the US NSF, more on that later.)

Community White Paper (CWP)

A **Community White Paper (CWP)** should describe a global vision for software and computing for the HL-LHC era and HEP in the 2020s; this should include discussions of elements that are common to the HEP community (LHC community, etc.) as a whole and those that are specific to the individual experiments. It should also discuss the relationship of the common elements to the broader scientific computing communities.

Community White Paper (CWP)

- a broad overview of the grand challenge science (HL-LHC, HEP);
- how new approaches to computing and software can enable and radically extend the physics reach of the detectors;
- what computing and software research will be required so that (for example) computing and software Technical Design Reports can be prepared several years before Run 4 of the LHC begins; this will include studies of hardware and software architectures and life-cycle processes and costs.
- identify specific software elements and frameworks that will be required for the HL-LHC era which can be built and tested during Run 3.
- organizational issues for the common software and for coordinating research of common interest, even when the final products will be specific to individual experiments.
- software development and documentation tools for writing sustainable software;

Derived Plans and Proposals

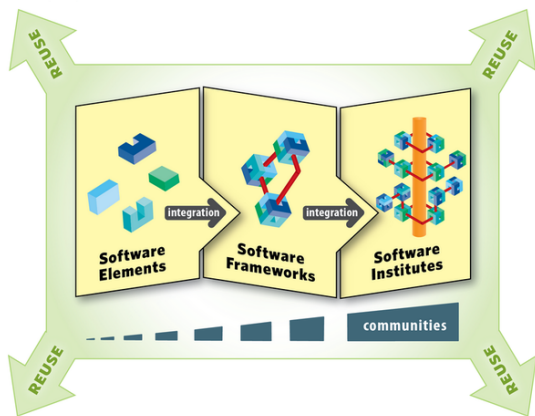
The CWP should be the document from which specific plans/proposals can be derived. For example we will derive a “Strategic Plan” for an NSF “Software Institute” (next slide).

It should also provide a better context for engaging computer scientists, other sciences and industry (e.g. through CERN Openlab)

As a community we should be pursuing and preparing the ground for these opportunities in parallel to the preparation of the CWP.

NSF SI2

US NSF Software Infrastructure for Sustained Innovation (SI2) program:



The DIANA-HEP project is a “Software Framework”. The process we are describing allows us (for example) to build towards a “Software Institute”.

NSF “Software Institute” Strategic Plan (Example)

This will include agency specific discussions which are not (necessarily) relevant to the large community; topics will include:

- where does the U.S. university community already have expertise and important leadership roles;
- which software elements/frameworks would provide the best educational/training opportunities for students and postdoctoral fellows;
- what types of programs (short courses, short-term fellowships, long-term fellowships, etc.) might enhance the educational reach of an S^2I^2 ;
- possible organizational, personnel and management structures and operational processes;
- how the investment in an S^2I^2 can be judged and how the investment can be sustained to assure the scientific goals of the HL-LHC.

CWP Process

We propose a series of workshops over the next year to build the community roadmap:

- A “kick-off” workshop, in the fall in the U.S.
- Several dedicated “topical” workshops in the fall, winter, spring covering software required in the various areas:
 - Detector Simulation, Triggering, Event Reconstruction and Visualization
 - Data Access and Management, Workflow and Resource Management
 - Physics generators, Data Analysis and Interpretation, Data and Software Preservation
- A final workshop, probably next summer (near CERN?)

These should be HSF-branded workshops, should build on existing community activities when possible (e.g. DPHEP, Reco Algorithms Forum/CTD, IML) and should be supported by dedicated working groups.

Working groups - example questions to address

In addition to addressing issues specific to a given topic, each group should presumably address questions which cut across boundaries, including:

- What are the specific challenges for the HL-LHC (IF, etc.)?
- What opportunities exist to exploit new or advanced algorithms (e.g. deep learning)?
- How can emerging architectures improve the bang-per-buck and what software evolution is needed to exploit them?
- Which problems are specific to individual experiments and which are common to (for example) the HL-LHC experiments or to HEP and nuclear physics experiments more generally?
- What is required to make common software packages sustainable?

What could an explicit CWP process support?

Going back to the subset of HSF goals I listed earlier:

- Catalyze new common projects
- Promote commonality and collaboration in new developments to make the most of limited resources
- Provide a framework for attracting effort and support to S&C common projects (new resources!)
- Provide a structure to set priorities and goals for the work

The CWP process, an eventual CWP and (simultaneously) the pursuit of specific plans/proposals will support precisely these goals.

Documents

In addition to the final deliverable(s) just described, the process of putting together these documents should generate a series of narrower topical documents from the working groups. (Much like the Snowmass process, for example.)

Existing public documents are something we will build upon, e.g. the Snowmass Computing documents, the DOE HEP-FCE documents, the WLCG Computing Model Update, the CERN Openlab whitepaper, etc.

New documents could be HSF Technical Notes.

Recognition/Endorsement of the CWP (and HSF)

One important thing we will presumably need to accomplish is eventual recognition and endorsement of the CWP (and in some more formal sense, HSF) by various entities: funding agencies, labs, experiments, ICFA, etc.

How do we do that?

Conclusion

- During this HSF workshop we would like to begin a discussion of the CWP roadmap document
- How do we put together a process to write a CWP over the next year?
- What should the CWP actually look like?
- What opportunities we can create and pursue which leverage both the process of putting together a CWP and the eventual CWP itself?