



Coordinating Panel for Software and Computing Status Report

presentation to DPF24/PHENO

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Snowmass 2021 Computational Frontier (CompF)

- CompF recommended the creation of a **standing Coordinating Panel for Software and Computing (CPSC)** under the auspices of **DPF**

The goal of Snowmass is to provide input for the Particle Physics Project Prioritization Panel (P5) with a ten year timescale. While S&C is clearly an enabler of the HEP science drivers, it is not managed like a 'project' as in the case of facilities, experiments, and surveys. S&C is no less important, often transcends traditional boundaries, and changes on a much faster timescale than Snowmass processes. For this reason, we have identified one central recommendation for the 2021 Snowmass:

We recommend the creation of a standing **Coordinating Panel for Software and Computing (CPSC)** under DPF, mirroring the panel for advanced detectors (**CPAD**) established in 2012.

Purpose: Promote, coordinate, and assist the HEP community on Software and Computing, working with scientific collaborations, grassroots organizations, institutes and centers, community leaders, and funding agencies on the evolving HEP Software and Computing needs of experimental, observational, and theoretical aspects of the HEP programs. The scope should include research, development, maintenance, and user support.

Further details of the community vision for the CPSC can be found in the body of this report.

Larger CompF context

Continued S&C support for facilities, experiments, surveys, and theoretical calculations is essential for the health of the HEP science program. This includes S&C personnel as well as computing power, storage, and networking.

CompF **identified four key areas of need**, where increased investment would significantly enhance the physics output of the US HEP community.

- 1) Long-term development, maintenance and user support of essential software
- 2) Support R&D efforts cutting across projects or discipline boundaries
- 3) Support for computing professionals to enable us to use heterogeneous resources effectively
- 4) Strong investment in career development for HEP S&C researchers

Computing is a global endeavor and addressing the above items should include coordination with worldwide partners. They also strongly supported continued, significant investment in computing technologies including quantum computing and machine learning, which were not part of the 2013 Snowmass process.

1. The US HEP community should take a leading role in **long-term development, maintenance, and user support** of essential software packages with targeted investment.

- A new structure is needed to fund modernization, maintenance, and user support of existing tools (grants typically only fund ground-breaking R&D or development of new software).
- Examples include (i) event generators and simulation tools like `Geant4` [2, 3, 4] that do not belong to a particular facility, experiment, or survey, (ii) S&C tools associated with one or more experiments, and (iii) data/software preservation after an experiment has ended.

2. Through existing, reshaped, and expanded programs, R&D efforts **cutting across project or discipline boundaries** should be supported from proof of concept to prototype to production.

- Computational HEP is a vehicle for cross-cutting R&D. Supporting research in this area at a variety of scales would be broadly impactful.
- Examples include S&C for theoretical calculations/generators; cosmological, accelerator, and detector modeling; machine learning methodology and hardware ecosystems; and algorithms and packages across experiment boundaries.

3. Support for computing professionals/researchers and physicists to conduct code re-engineering and adaptation will **enable us to use heterogeneous resources** most effectively.

- Most HEP software runs on a single computing platform, making it difficult to use the multitude of hardware accelerators and diverse computing resources like cloud, HPC, etc.
- To satisfy the needs of inherently serial algorithms that are still transitioning towards computing accelerators or are not cost-effective to port, an appropriate level of traditional CPU-based hardware should coexist with more powerful heterogeneous resources.

4. Strong investment in **career development** for HEP S&C researchers will ensure future success.

- Sustainable efforts in computation require continual recruitment and training of the HEP workforce. We need to create an environment that is inclusive, supportive, and welcoming in order to integrate diverse skill sets and experiences.
- Successful training events have been carried out through HEP experiments, institutes/organizations, and growing numbers of university courses. We need to continue and grow these efforts for documentation and training at multiple levels.
- Faculty/staff positions for physicists with expertise in S&C for HEP are scarce and person-power shortfall in this area endemic. Funding agencies can catalyze faculty-level appointments in S&C with joint appointments at national laboratories.

First steps: Exploratory Group and Formation Task Force (FTF)

- The initial steps were taken by an “**exploratory group**”, of the three CompF Conveners, D. Elvira, S. Gottlieb, B. Nachman, and for DPF, Joel Butler, and Sekhar Chivukula
 - The EC agreed that the CPSC should have a document similar in purpose to the one that defines CPAD’s charge, governance, internal organizational structure, and some initial activities, including some awards programs and community meetings.
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- The exploratory group wrote a charge, approved by the EC, to guide the work of the FTF
 - We have set up the “**Formation Task Force (FTF)**” of 21 members to write this report
 - Ian Fisk was selected to chair the FTF
 - The FTF held its first meeting on Jan. 11 of 2024 and has met ~biweekly since then.
 - The 9th meeting was on May 2.

Formation Task Force

- Chairperson:

- Ian Fisk , *Flatiron Institute, Simons Foundation*

- Members:

- Tulika Bose, *University of Wisconsin*
- Peter Boyle, *Brookhaven National Laboratory*
- Joel Butler*, *Fermi National Accelerator Laboratory*
- Gavin Davies, *University of Mississippi*
- Peter Elmer, *IRIS-HEP/Princeton University*
- Daniel Elvira**, *Fermi National Accelerator Laboratory*
- Matthew Feickert, *University of Wisconsin*
- Steven Gottlieb**, *Indiana University*
- Salman Habib, *Argonne National Laboratory*
- Michael Kirby, *Brookhaven National Laboratory*

- Members:

- Charles Leggett, *Lawrence Berkeley National Laboratory*
- Adam Lyon, *Fermi National Accelerator Laboratory*
- Verena Martinez Outschoorn, *University of Massachusetts, Amherst*
- Maria Elena Monzani, *SLAC National Accelerator Laboratory*
- Ben Nachman**, *Lawrence Berkeley National Laboratory*
- Amy Roberts, *University of Colorado*
- Liz Sexton-Kennedy, *Fermi National Accelerator Laboratory*
- Giordon Stark, *University of California, Santa Cruz*
- Jan Strube, *Pacific Northwest National Laboratory*
- Ruth S Van De Water, *Fermi National Accelerator Laboratory*
- Michael Williams, *Massachusetts Institute of Technology*

*CompF convener , ** DPF liaison

Charge to FTF

The Formation Task Force is an **ad hoc subcommittee of the EC**. It was requested to address and define

- the scope of the CPSC and its charge;
- the general areas of engagement, including the people with whom they are likely to interact;
- the proposed organization of the CPSC, namely the size, selection process for members, method for selecting chairpersons, terms and term limits for members and chairpersons, etc.;
- a possible initial set of working groups;
- the types of activities that it should promote;
- the ways of communicating and being available as a resource to the HEP S&C community; and
- the draft text for the DPF By-laws.

The FTF should propose ways in which the DPF can help promote the work of the Panel and advance S&C in the DPF/HEP community.

The CPSC will be expected to respond to requests from DPF, HEPAP or the funding agencies when they wish to make use of the expertise of the CPSC or the expertise that the CPSC can muster. The CPSC should also take the initiative to launch studies when its members think there are important issues that must be examined, and their findings publicized.

Development, Acceptance, and Implementation

- The FTF's draft report is due in the spring, ~4 months after the panel was appointed
- There is now a very first draft that is being edited and which we hope to submit for comment to the DPF EC in the next week for initial reactions and comments
 - We expect this will lead to some revisions
- After approval by the EC, the DPF will prepare any modifications to the DPF by-laws needed to accommodate the CPSC and will submit them to the APS for approval.
- **Once the report is approved by the EC, the work of the FTF is finished, and the EC will begin the process of establishing the CPSC as a standing body of DPF**
 - As has been done in the past, the Panel can get started informally while the APS approval process is going on

Realities

- The CPSC does not have a budget and will likely never control resources directly
 - Drives activities toward communication, community engagement, training, and identifying common challenges facing the community
- Value of the panel will be its ability to engage with the S&C community and to be a resource for informed advice to the funding agencies
 - Many of the proposed initial panel activities are aimed at non-technical challenges facing the community
 - Technical activities are likely to come in the form of reports and assessments

Foundation Task Force Draft Report

- The report is divided into organization, initial areas of focus, and suggestions for how to engage the community and complete the mission
 - Membership and Governance
 - Communication and Partnerships
 - Career Development
 - Developing an Inclusive Workforce
 - Implementation Strategies
- The membership and governance is a set of instructions for the formation of the panel and will eventually be approved by the DPF-EB
- The rest are areas the FTF identified as being valuable to improve, but are suggestions and will evolve over the life of the panel

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- Status
 - Report is currently ~20 pages long
 - Missing
 - Executive Summary
 - Concluding paragraph
 - Acknowledgements
 - Incomplete
 - Appendices

Panel Governance and Organization - I

- The CPSC will be a standing committee of the DPF, reporting to the EC
 - It will have 15 members appointed to 3-year terms, implemented with a stagger so that 5 members will be elected each year except for the first year.
 - Open solicitation of nominations, panel members chosen from nominees by selection committee consisting of a total of six EC representatives and Panel members including the Panel chair
 - For the first year, there is not yet a CPSC so the DPF EC will set up a procedure to choose the initial members and chairperson
 - Guidance for selection of Panel members
 - **The broad representation that is desired cannot be accomplished with a small panel which is, however, considered desirable for agility, unless special attention is given to the type of member that is chosen**
 - **When choosing members for the CPSC it should be remembered that within the overall field of scientific S&C there are many more common needs for communication, training, community, career advancement, and DEI improvements than there are sub-field-specific needs.**
 - The EC and the chairperson, with the help and advice of the Panel membership, will ensure the committee is composed of people who have a broad viewpoint, connect to more than one constituency, and avoid representing too vigorously their own professional interests.

Panel Governance and Organization - II

- Selection of Chairperson and Deputy
 - Chairperson is chosen from members for a term of 3 years
 - Report does not yet list chairperson's functions
 - The Chairperson, in consultation with the DPF EC, will choose a deputy, whose main responsibility is to substitute for the chairperson if they become unavailable and to otherwise assist them in delegated tasks.
- Possibility of appointing observers, consultants, and affiliates to broaden representation, especially to other nations and international organizations
- Possibility of creating task forces and working groups to accomplish the real work and also to expand participation
- There was a consensus to not initially specify an organization with a boxology but to see how the Panel develops

Membership

- Two categories of criteria for balance the panel were identified
- Viewpoint and experience (these should always be represented and balanced)
 - Duration and stability of position (laboratory staff, university research staff, faculty, soft money, project supported)
 - Stage of career, including early career
 - Diversity of technical skills and expertise
- Scientific Activities (these should be balanced when averaged over time)
 - Roughly equal numbers of lab and university-employed members
 - Roughly equal fractions of experimental and theoretical computation developers
 - Representatives from each of the major experimental programs in roughly equal numbers, covering all experimental frontiers and including a representative from small experiments
 - Representatives of all major theoretical computation activities

Communication and Partnerships Objectives

- Encourage and facilitate strategic partnerships with computing research institutions, industry, and other scientific communities.
- Improve internal communication between different programs within and across funding agencies.
- Make CPSC a valuable resource for the community and funding agencies through workshops, working groups, and consensus building.
- Strengthen interactions with industry to help HEP benefit from technology advancements and best practices.
- Advocate for the support and development of public data and software repositories to make HEP research more accessible

Career Development Objectives

- Increase visibility and prestige of S&C contributions within HEP.
 - Campaign to increase the number of stable positions at universities and research institutions for individuals specializing in S&C within HEP.
 - Help advertise job opportunities, including to those in academic jobs in computer science and in industry
 - Provide career resources for jobs in HEP S&C
 - Gather statistics at different career stages, as well as highlight example success stories
 - Facilitate discussions on recruitment, training, retention, and the improvement of opportunities within HEP. Provide arguments and materials for institutes and universities to make the case for hires, such as example funding models for scientists.
 - Improve the training and education available for emerging scientists in S&C skills.
 - Facilitate the community discussion to develop pathways for individuals who have transitioned to industry or other fields to return to academic or research positions in HEP.
 - Develop pathways and support connections to industry for those who wish to move beyond academia. Having a range of career options is also a good tool to recruit people into S&C

Improving Representation in S&C

- Objective:
To foster a diverse, equitable, and inclusive environment within the CPSC and the broader computational science and software development community in HEP to ensure the most innovative problem-solving teams and to maximize the participation of the entire potential workforce

Some Implementation Suggestions

- Form Technical Working Groups (TWG) to study issues of concern
- Appoint advisors and consultants
- Conduct Annual Meetings
- Conduct Virtual Town Meetings
- Administer Prizes and Awards (to be discussed with DPF)

Naming the “Panel”

- The working name “Coordinating Panel for Software and Computing” and its acronym “CPSC” will be replaced with the winner of a competition for the most appropriate name and acronym/abbreviation
 - We hope the competition will create some initial buzz about the Panel
 - This was done for CPAD
 - DPF ran a competition for Snowmass Logo
- From the Internet, criteria for naming an organization:
 - Tell people what your organization is all about
 - Sound like something that people want to be part of
 - Be easy to pronounce, remember, and spell
 - Be unambiguous
 - Not use words that your organization could outgrow

CompF request
(conveners)

Initial exploratory
Team, CPAD experience,
agencies – Conveners and Joel,
Sekhar

Exploratory team makes initial pass
at stakeholder list

Status report to EC. EC discussion

Exploratory team makes initial pass
at charge

Status report to EC
EC discussion of Task Force charge.
Approve charge (new name)

EC discussion of Formation Task
Force (FTF) Selection process

Dec 23

Create and populate FTF

FTF produces draft report

May 24

We are now nearing the end

EC discusses, approves report,
including draft modifications to
DPF bylaws

Report is made available
(presented) to HEPAP,
for their information

Chair and members of the
CPSC are chosen by the
process in the report

Panel has first meeting

We are working on the draft
document and hope to have
a complete, reviewable draft
by the end of May

There will be a report to part
of the community at DPF24/
Pheno on May 14

Conclusions

- The FTF is carrying out its task and has made significant progress towards producing its report
- The draft report will go to the EC soon (in a week or two)
- After the EC is ok with it, it can be shared with other readers, yet to be determined, before being finalized.
- This is only step 1 and we hope people will nominate themselves to serve on the actual panel

Ultimately, we hope that the CPSC will help advance the role and practice of computing in HEP and all of Particle Physics!