



# A Coordinating Panel for Software and Computing

presentation to HEPAP

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for the Division of Particles and Fields Executive Committee

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# Snowmass 2021 Computational Frontier (CompF)

- With the end of the Moore's Law era, we will be using co-processors/accelerators (GPUs, FPGAs, Vector units), parallelism within events, common systems, and High-Performance Computing Centers for production
- Software will change immensely with the advent of new methods including Machine Learning and Artificial Intelligence
- In addition to new challenges, they identified several problems that already exist (slide 4)

## CompF Conveners



Steven Gottlieb  
(Indiana U.)



Ben Nachman  
(LBNL)



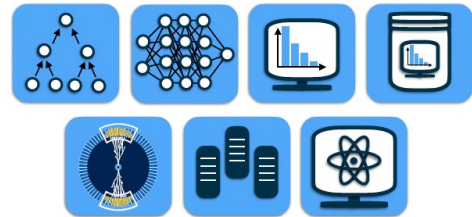
Daniel Elvira  
(FNAL)

arXiv:2210.05822v3 [hep-ex] 8 Nov 2022

**The Future of High Energy Physics  
Software and Computing**

Report of the 2021 US Community Study  
on the Future of Particle Physics

organized by the APS Division of Particles and Fields



v2.1; updated: November 9, 2022

Conveners: V. Daniel Elvira\*, Steven Gottlieb, Oliver Gutsche†, and Benjamin Nachman

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<sup>†</sup>Before Fall '21  
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<sup>#</sup>Before Fall '20

<https://arxiv.org/abs/2210.05822>

# 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.

# DPF Executive Committee Action

- The DPF chair-line agreed that sponsoring the CPSC is an appropriate role for DPF
  - Many people and groups urged DPF to take this on
  - It was discussed in my report to HEPAP in December 2022 on the outcome of Snowmass 2021
- The request from the large and representative CompF organization reinforces the need and encourages the belief that an effective organization would have broad support and engagement and could have a positive impact on scientific productivity
- The **DPF Executive Committee (EC)** decided as part of the 2023 (post-Snowmass) planning to undertake this task
  - I volunteered to initiate it and was encouraged to do so
- There are many comparisons between the proposed CPSC (**working name only**) and CPAD (original name DRDCP), the Coordinating Panel for Advanced Detectors, formed around 2012.
  - CPAD is sponsored by the DPF and its mission and governance is included in the DPF By-Laws (approved by APS)
    - These were worked out by a large task force that produced a report of approximately 50 pages discussing various aspects of the CPAD mission and operations
  - There are differences between S&C and Detector R&D

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

- The initial steps were taken by an “exploratory group”, consisting of the three CompF Conveners and for DPF, D. Elvira, S. Gottlieb, B. Nachman, Joel Butler, and Sekhar Chivukula, that
  - Interviewed the founders of CPAD and discussed the report they produced to define it
  - Discussed CPAD experience with Funding Agencies
  - Received advice from FAs and other S&C stakeholders on the formation of the CPSC
- 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.
- We are in the process of setting up a task force, the “**Formation Task Force (FTF)**” of between 12 and 20 members to write this report
- The exploratory group has also written a charge, approved by the EC, to guide the work of the FTF
- Nominations for membership in the FTF have been obtained, a chair has been chosen, and we are in the process of choosing the members from the nominees

It is crucial to keep in mind the distinction between the “Formation Task Force” (FTF) and the Coordinating Panel (CPSC). The FTF will produce a report that defines the structure and goals of the CPSC.

# 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.

# Status of appointment of FTF

- Nomination period for members ran from Sept 9 – Sept 30, 2023
- Result
  - 97 nominations were submitted
  - 61 people received one or more nominations
  - 40-45 people submitted nominations
- Comments
  - The candidates are of generally excellent quality and ~all are above the bar for having enough knowledge to carry out this task
  - The nominations were not distributed very evenly among stakeholders
    - Too many representatives from CMS and ATLAS, too few from DUNE and smaller experiments
    - Too many from FNAL (lesser issue for other labs),
    - Poor gender balance
    - Respectable representation from theory, LQCD
    - Respectable representation from cosmic frontier
    - Good representation from quantum and AI (counting experiment connections)
    - Good representation of leadership in S&C
  - However, there are good nominees from many sectors and some with a wide knowledge of the entire terrain



# The FTF Chairperson

- The EC concluded that we could choose from this group a representative FTF of 12 – 15~ members (and no larger than ~20) that will be capable of doing this task.
- The EC proposed that we appoint a chairperson from among the FTF nominees immediately so that they could have a say in the choice of the FTF members
  - We adopted that plan
- Choosing the chairperson – a critical first step
  - Must be highly qualified and have some level of recognition as a leader in the S&C community
  - Must have skills at getting a team to converge to a result in a timely fashion
  - **Must have the time to devote to this task in the next 3-4 months**
  - Must understand and accept the charge, especially what a DPF-sponsored panel can and cannot do
    - Once the chair is appointed, we can consider small adjustments
  - We (DPF chair line) proposed an initial list of ranked candidates for FTF chair, which was approved by the EC.

The chairperson of the FTF is **Ian Fisk of the Flatiron Institute/Simons Foundation**

# Next step - the FTF members

- With the chair, myself, and a small group of 5 DPF EC members who are not nominees, we selected 21 proposed members of the FTF
  - We focused heavily on representation/balance and ability to work effectively on a task force like this
  - **We are in the process of getting EC feedback on the choices by email, due on Friday.**
  - After EC feedback, we will contact the candidates
  - 15 members are viewed as an optimal size, but Ian is prepared to work with 21 if they all accept
  - If we have too few people who have accepted, we have a list of alternates, but representation will be diminished

# Some Considerations for representation on the FTF

- Experiments:
  - Big /Small experiments
  - Frontiers, especially Energy, Neutrino, Rare Processes and Precision Measurements, and Cosmic
  - LHC: ATLAS /CMS, LHCb
- Theory , including LQCD
- Quantum Computing
- AI/ML
- National Labs/Universities: FNAL, LBL, LBNL,PNNL, SLAC , ANL, ORNL
- Gender balance
- Career status
- Existing S&C projects, e.g. IRIS-HEP
- ....

# Development, Acceptance, and Implementation

- The FTF's draft report is due in the spring, ~4 months after the panel is appointed, and is expected to be no longer than 50 pages.
  - A more specific target completion date will be given to the EC after the FTF makes its initial workplan.
  - We expect during this period that the FTF, with the help of the EC, will consult broadly with relevant S&C communities and stakeholders so they can participate in the creation of a CPSC that meets their needs and that they will support.
- The draft report will be presented to the EC for comments and possible 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.**
- **We hope and expect that it will help advance the role and practice of computing in HEP!**

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

Create and populate FTF

FTF produces draft report

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

Report is presented to HEPAP,  
for their information

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

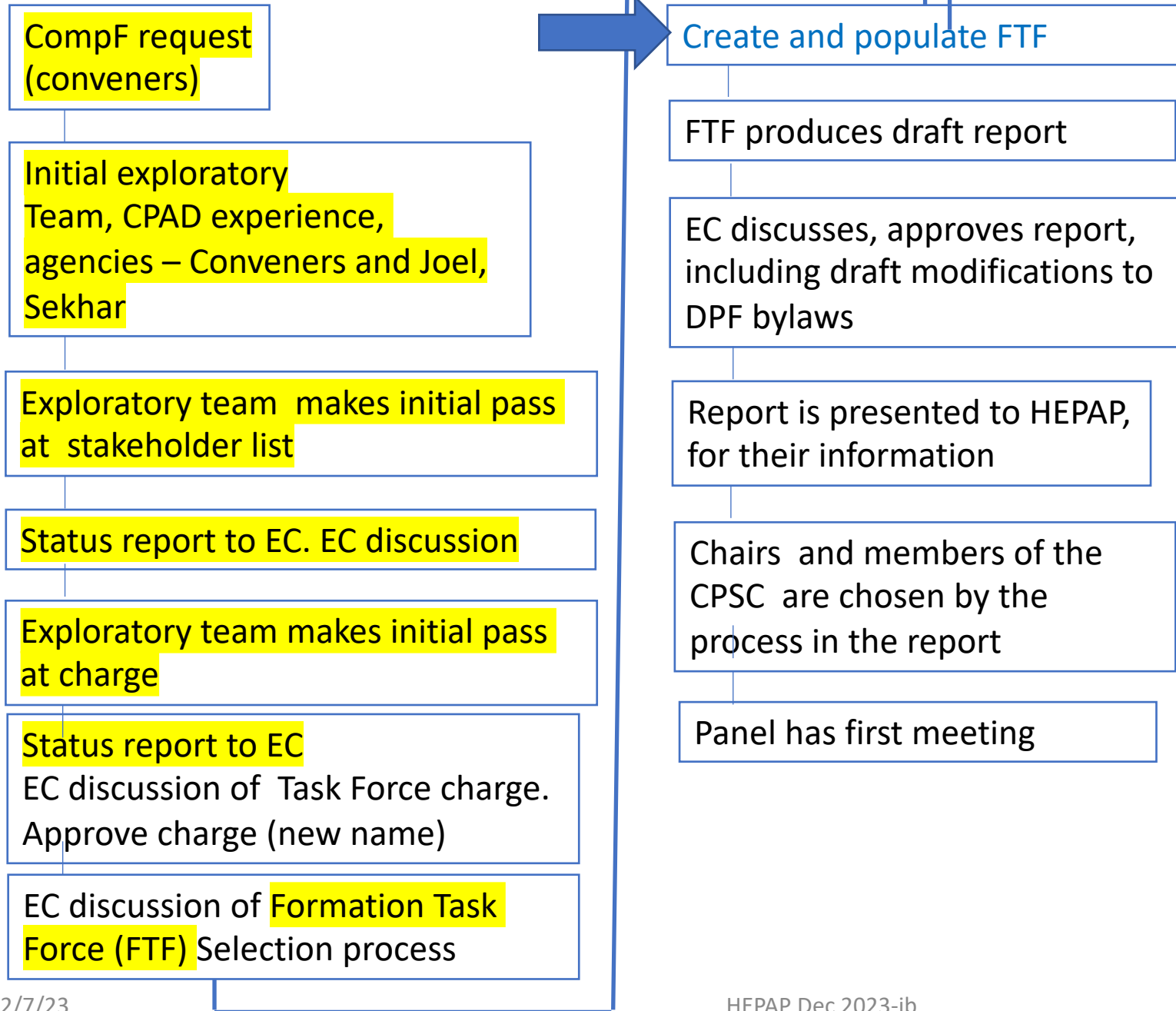
Panel has first meeting

Notes:

- This is not an open-ended panel design effort – it is supposed to connect to the US FAs in a manner similar to CPAD
- Some additional input beyond what was received from Snowmass is desirable and it is up to the FTF to solicit it
- Socialization of the report is important, and the FTF and EC should make a plan and do it.
- The name of the panel should be revisited, and a final name included in the TF report
  - There was a **competition** that produced the name "CPAD"

Thank you for your attention! I am looking forward to your questions and comments.

# Backup



Notes:

- This is the result of a request to DPF from the Snowmass CompF
- This is a national organization which will have international participation
- This is not an open-ended panel design effort – it is supposed to connect to the US FAs in a manner similar to CPAD
- Some additional input beyond what was received from Snowmass is desirable and it is up to the FTF to solicit it
- Socialization of the report is important, and the FTF and EC should make a plan and do it.
- **The name of the panel should be revisited, and a final name included in the TF report**
  - There was a competition that produced the name CPAD

# DPF Issues in charge to FTF

The DPF Executive Committee (EC) agreed to undertake the creation of the CPSC as a standing committee of the DPF. A small ad hoc exploratory committee consisting of the three Snowmass CompF conveners, and the past chair of the DPF was formed to develop a plan to establish the CPSC. They have now presented their plan and a proposed timeline to the EC for accomplishing this. The EC approved this plan at their May 2022 monthly meeting. The plan calls for the appointment of a **Formation Task Force (FTF), which is an ad hoc committee of the EC, to write a report that will serve as a formal mandate and organizational plan for the CPSC.**

The CPSC will work within the mandate of the DPF and DPF by-laws. It will be a standing committee of DPF and will report to the EC. Its main goal is to facilitate communication among S&C stakeholders and to help identify issues and problems and coordinate responses among subsections of the HEP computing ecosystem. It is not a funding agency with a budget, although if asked by an agency or organization to administer funds for a specific purpose, subject to approval or concurrence by the EC, this would be acceptable. It is not a provider of computing services. It does not itself execute projects, although it might help assemble or convene a group to do one or more of them. It does not, by itself, select among competing projects or approaches, or directly make decisions or recommendations. If directly asked for advice by an organization or funding agency, it can respond directly or, more likely, arrange a task force or committee to produce a response. The CPSC can sponsor activities that aid in communication or coordination, such as workshops, meetings, or schools, and it can help promote similar activities sponsored by other organizations. It can undertake initiatives that advance software and computing and that fall within the mission of the DPF.

Establishing the CPSC will be done in the same open and transparent manner by which the Snowmass process was carried out and will borrow from the successful deployment in 2012 of CPAD, which is also sponsored by DPF. The Formation Task Force we are establishing must operate within the parameters described above, which define in a general way the appropriate scope for the DPF-sponsored Panel. The FTF shall not redefine the Panel in a manner that would be inconsistent with its position within DPF.

Exploratory group members who wrote the charge that has been approved by the EC.  
From CompF: V. Daniel Elvira, Steven Gottlieb, Benjamin Nachman, From DPF: Joel Butler, Sekhar Chivukula



# Charge to the Task Force to establish the plan for a Coordinating Panel for Software and Computing

## Background

The central recommendation from the Computational Frontier (Co) of the Snowmass 2021 Community Planning Process was

“ ... 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”*

The CompF Snowmass Summary Report provides additional details of the community vision for the CPSC which includes career and work force development, recognition of accomplishments in S&C, and topics of diversity, equity, and inclusion.

V. Daniel Elvira, Steven Gottlieb, Oliver Gutsche, Benjamin Nachman, et al., The Future of High Energy Physics Software and Computing, arXiv:2210.05822 [hep ex]

# Some communications details

- Currently, the team consists of the CompF conveners and (just now) the DPF chair line
  - We will start sending to EC list as well
- We have a mailing list
  - [computing\\_coordinating\\_panel@fnal.gov](mailto:computing_coordinating_panel@fnal.gov)
- SLACK channel
  - CSCP\_chat in Snowmass
- we have an indico slot
  - <https://indico.fnal.gov/category/1533/>
    - Not yet accessible. I have to establish protections that are compliant with FNAL rules.
    - EC will have access
- We have a googledoc for the stakeholders and the charge
  - <https://docs.google.com/document/d/1TpQuvE3BeKZMlpS0LVO4C4dpaE6xCNUfKp5PIUt-sDk/edit>
  - **EC is invited to add to or comment on the the stakeholders list**
  - The charge is still under discussion by the small exploratory group, so do not edit or comment yet
- The Task force is the key driver and may require a lot of people
  - CPAD had about 15 committee members and many advisers, so about 60 people overall
- Although I do not like it, we will use this as the place we will store documents

# CompF Snowmass Summary outline

- *1 Introduction* . . . . .
- **2 Experimental Algorithm Parallelization** . . . . .
- **3 Theoretical Calculations and Simulation** . . . . .
- **4 Machine Learning** . . . . .
- **5 Storage and processing resource access** . . . . .
- **6 End user analysis** . . . . .
- **7 Quantum computing** . . . . .
- **8 Reinterpretation and long-term preservation** . . . . .
- *9 Personnel and Training* . . . . .
- *10 Diversity and Climate within Computing in HEP* . . . . .
- *11 Recommendations* . . . . .
- *12 Conclusions and Outlook* . . . . .

# From the charge to the FPF

- What the the CPSC is and is not
  - It reports to the DPF EC
  - Its main goal is to facilitate communication, to help identify issues and problems and coordinate responses among subsections of the HEP computing ecosystem
  - It is not a funding agency with a budget
    - Although if asked by an agency to administer some funds for a specific purpose. This is subject to approval or concurrence by the DPF EC
  - It is not a service provider
  - It does not do projects
    - Although it might help assemble or convene a group to do a project
  - It does not, by itself, select among competing projects or approaches, or directly make decisions or recommendations.
    - If directly asked for advice by an organization or agency, it can respond or arrange a taskforce or committee to produce a response
  - It can sponsor activities that aid in communication or coordination activities, such as workshops or schools
  - It can undertake activities that advance software and computing and that fall within the mission of the DPF
- The FTF has to operate roughly within these constraints and cannot redefine the CPSC in a manner that would be inconsistent with its position in DPF
  - Some changes within theses limits can be made in the report and final charge

# From the charge to the FTF

- The Task Force we are discussing has to operate within these parameters and cannot redefine the Panel in a manner that would be inconsistent with its position in DPF

Panel that is being created is working within the mandate of the DPF Executive Committee and DPF by-laws. It reports to the DPF EC. Its main goal is to facilitate communication, to help identify issues and problems and coordinate responses among subsections of the HEP computing ecosystem. It is not a funding agency with a budget, although if asked by an agency to administer some funds for a specific purpose, subject to approval or concurrence by the DPF EC, this would be considered appropriate. It is not a provider of computing services. It does not itself execute projects, although it might help assemble or convene a group to do one or more of them. It does not, by itself, select among competing projects or approaches, or directly make decisions or recommendations. If directly asked for advice by an organization or agency, it can respond or arrange a taskforce or committee to produce a response. It can sponsor activities that aid in communication or coordination activities, such as workshops, meetings, or schools. It can undertake activities that advance software and computing and that fall within the mission of the DPF.