Discussion session

Discussion items and AOB's:

- dedicated training courses

- general HEP tools support, maintenance and development

- experiments' list

- publication venues

- CERN support

- next steps

Training opportunities organized at CERN

- **C++ training events**: https://indico.cern.ch/category/11733/
  - Two sets of courses "Essentials" and "Advanced", each training run usually once a year
  - 3 days course with morning lectures and afternoon hands-on sessions
  - organised by HEP volunteers for the HEP community
  - Indico page to register for information/announcements about future courses and special events: https://indico.cern.ch/event/1211412/

- **GPU programming course** (Stephan Hageboeck), recording available, https://indico.cern.ch/event/1293875/

- Lecture on **GPU architectures**, https://openlab.cern/node/65

- **C++ vectorization course** (Sebastien Ponce) at the Thematic CERN School of Computing, https://indico.cern.ch/event/1017080/contributions/4268632/

- Thematic CERN School of Computing (tCSC 2023) on "**Scientific Software for Heterogeneous Architectures**", https://indico.cern.ch/event/1244566/

- **Compute Accelerator Forum**, a meeting series meant to foster discussion and teaching about fundamental aspects of software engineering for compute accelerators and heterogeneous computing platforms, eg. Cadna, GPU abstraction layers, Madgraph4GPU, Celeritas/Adept, RISC-V, …: https://indico.cern.ch/category/12741/ (e-group sign-up link)

Training opportunities organized at CERN

- **HSF Training working group**, https://hepsoftwarefoundation.org/workinggroups/training.html
  - Various events and modules for self taught training on programming and tools (e.g. Python, CMake, CI/CD, Containers, …)
- Bertinoro school on **efficient scientific computing,** e.g. 2023 https://agenda.infn.it/event/36189/
- Training on perf profiling tool:
  - https://lms.cern.ch/ekp/servlet/ekp?TX=FORMAT1&LOTYPE=R&CID=EKP000044290
- A future **MCnet school** dedicated to this set of computing issues ?

General HEP tools support, maintenance and development

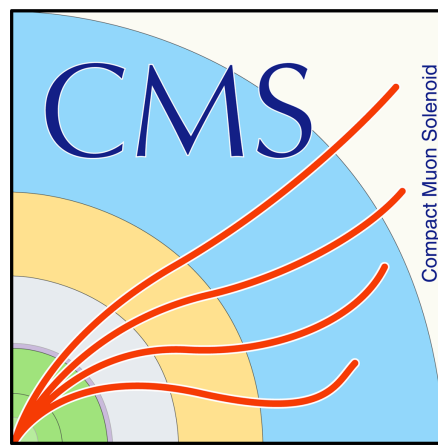- **Tools**
  - LHAPDF
  - Fastjet
  - Rivet
  - …
- **Standards/Interface**
  - LHEF (—> support for transition to LHEH5 ?)
  - HEPMC
  - BLHA
  - …
- **Other:**
  - Enrico: common, shared HPC/GPU workflows ?
  - …

Experiments' list

→ **Contribute experiment resources to generator development**

  → Offer authorship qualification projects to PhD students. How best to organise?

  → Test latest developments, speed-ups, -ve weights, data-parallel ports. How to improve interactions/speed of deployment?

→ **Give feedback from experiments on GEN performance in light of recent developments**

  → What is exactly needed? Relative numbers for each step?

→ **Better use expertise from EP/SFT/IT/TH for validation**

  → Can benefit from validation expertise, in e.g. G4, of the experiments

  → Closer interaction with generator authors for validation - e.g. Sharing run cards and outputs

→ **Open question: Where do we need N(N...)LO?**

  → How best to estimate HL-LHC projections more accurately

  → Highly depends on the physics of the measurement.

→ **Sharing of ATLAS and CMS samples**

  → Are we "happy" with the LHE format? HDF5? Rucio? Which samples? (Sherpa from ATLAS, MG from CMS)

A publication venue for developments emerging from these activities?

Computing and Software for Big Science

https://www.springer.com/journal/41781

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Will recommend addition of editors to cover expertise of Event Generators and TH tools

Is there interest to explore ?

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- **MORE**
  - **CI** support
  - **Gitlab** support
  - Support for access to dedicated **Hardware** (GPUs, HPCs)
  - … ?

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- From Daniel Maitre:

  - *"using surrogate models could be a workable "division of labour" between theorists and computer scientists: the theorist just need to get their code to work well enough to generate the training data for the surrogate (but don't need to worry too much about efficiency), the IT/HPC specialist can then take this surrogate and deploy it to scale to the right hardware, etc"*

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