JENA Computing Workshop:

Executive summary and next steps

Joint ECFA-NuPECC-APPEC computing meeting took place on 12-14 June 2023. Agenda:

https://agenda.infn.it/event/34738/timetable/

There was a European focus, however, with worldwide implications. Many experts from the 3 research fields including several European WLCG members and Frank Wuerthwein from OSG were present (invitation only).

Motivation: at the Joint ECFA-NuPECC-APPEC (JENA) Seminar in May 2022 in Madrid (https://indico.cern.ch/event/1040535/), both the plenary presentations and the closed session of funding agency representatives revealed that there is an increased need for discussions on the strategy and implementation of European federated computing at future large-scale research facilities. In particular, synergies between the three areas should be identified.

Main goals: identify the computing requirements in the next decade and identify synergies that can benefit all the three communities (Particle Physics, Nuclear Physics and Astroparticle Physics) as well as neighbouring research fields like Astrophysics or Cosmology.

Conclusions at the Bologna-Workshop:

Five major areas for follow-up discussions were identified:

1. **HTC, WLCG and HPC (HPC)**: The relationship of the WLCG system with HPC centres and the integration of HPC resources with our current computing infrastructures. For Europe, there is a need to engage at a higher level with EuroHPC. Contrary to the past, there is an opportunity to shape the evolution and policies of HPC facilities towards the ECFA-NuPECC-APPEC (ENA) sciences' needs with the goal of both augmenting the computing capacity available for this community and facilitating the federation with existing data facilities.

2. **Software and Heterogeneous Architectures (Software):** There is a large spread of software used in ENA, from very generic to highly specific. One of the main challenges into the future is the fact that available computing will increasingly appear with heterogeneous architectures (as well as ARM, we have GPUs, perhaps FPGAs). In order to make effective use of these processors and increase the efficiency of our code by factors we will need Research Software Engineers and domain experts who optimise the current code and also who engage in exploratory software R&D activities, rethinking algorithms. There will be significant domain level differences in applications, but substantial overlap in skills and techniques. It is important to convey the message to funding agencies that it is crucial to invest in training, hiring and retaining people with this profile. This is also seen as one of the main opportunities to address sustainability.

3. **Federate Data Management, Virtual Research Environments and FAIR/Open Data (Data)**: very positive feedback about the work done in ESCAPE in this area. The ESCAPE collaboration should be leveraged to strengthen synergies between the three sciences around data management and federated identities. The ECFA, NuPECC and APPEC chairs are in the ESCAPE advisory board and will recommend that ESCAPE focuses on those areas and the evolution of the tools and services for the next decade.

4. **Machine Learning and Artificial Intelligence (AI):** These data analysis methodologies have seen a rapid expansion in the last years in most fields of science, including the ENA domains. A Working Group will be set up to follow the technologies in this fast evolving field, and analyse the potential impact on the ENA computing infrastructure needs. The focus will be to quantify the resource needs and to define the interfaces and services that are needed by physicists to run ML workloads (looking at both training and inference).

5. **Training, Dissemination, Education (TDE)**:
    a. Training: Leverage the experience in the HEP Software Foundation (HSF) training initiative and find common ground with other sciences. Share/reuse material and possibly understand if some common training event can be organised.
    b. Dissemination: we considered the idea to organise a conference on scientific computing similar to CHEP, but embracing more sciences (largely beyond ENA). In Europe there are five science clusters, ENVRI-FAIR, EOSC-Life, ESCAPE, PANOSC and SSHOC. They are working on common aspects of scientific computing and this would be a natural one.
    c. Education: ECFA has an initiative to set a European master program for detector physics. We discussed the idea to initiate a similar initiative on scientific software and computing. The EuroHPC JU started a similar initiative in 2022 named EUMAster4HPC through a H2020 project.

The working groups are organised via indico (also for registration):

HPC	https://indico.scc.kit.edu/e/JENA_computing_wp1/
Software	https://indico.scc.kit.edu/e/JENA_computing_wp2/
Data	https://indico.scc.kit.edu/e/JENA_computing_wp3/
ML	https://indico.scc.kit.edu/e/JENA_computing_wp4/
TDE	https://indico.scc.kit.edu/e/JENA_computing_wp5/