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Input of the German Community to the ESPP Update

in the area of Computing, Software & ML

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KET Concluding Workshop in preparation
of the input to the ESPP update
Bad Honnef 20.1. 2025

Reminder: Input to last ESPP Update

Advances in Technology

Research and development in accelerator and detector technologies, as well as in computing and software, are a prerequisite for all future projects.

Many of the topics and projects discussed above require substantial developments in the areas of accelerator, detector, computing and software technology. Examples in accelerator R&D are high field magnets, energy recovery structures and plasma wake field acceleration. Examples in detector R&D are extremely fast, radiation hard and cost-effective detectors with high granularity. Unprecedented data rates and volumes will require the exploitation of state of the art computer science methods to develop adequate computing concepts and innovative algorithms for data handling, reconstruction and analysis. Due to the very long time scales of many of the currently proposed projects, it will be essential to keep and further develop the technological expertise within the community.

9 lines abut R&D, 3 lines about computing and software out of 4 pages total text in original format

I think this time we should aim at a separate paragraph and longer statement.
The community input can have a total length of up to ten pages.

Way to get here

- Presentation by Frank Gaede at KET(+Terascale Alliance) Germany Community Meeting
  “Future Collider at CERN”, Bonn, 22-24.5.2024

- Presentation by Lukas Heinrich at KET Strategy Workshop "The future of Collider Physics"
  in preparation of the ESPP update, DESY, 27.-29.11.2024

- Preparation of draft with input from selected people
  (F. Gaede, L. Heinrich, G. Duckeck, T, Kuhr) until 6.1. 2025.

- Presentation and discussion in KET Computing&Software (C&S) Panel on 7.1. 2025

- Iteration of draft within KET C&S Panel

- This panel, which advices KET in issues related to computing and software,
  reached consensus on the proposed draft text, which will be presented on the next slides

Draft for discussion (1)

Unprecedented data rates and data volumes in the Exabyte regime will become available for physics analysis. The full exploitation of the unique physics potential of these data sets requires the development and application of state-of-the-art software and machine learning methods and the provisioning of increasing compute and storage resources beyond the increase provided by technological evolution. At the same time scientific computing has to become C02-neutral by 2050 in order to mitigate the impact on climate change and to meet the agreed on climate goals within the European Union. Hence, a timely development of novel computing concepts and innovative algorithms for data handling, simulation, reconstruction and analysis taking into account the criteria of the magnitude of the to be collected data and of the required compute power and of environmental sustainability is imperative.

Draft for discussion (2)

The option of interdisciplinary usage of large IT infrastructures e.g. in the context of the EOSC shall be investigated and be carefully evaluated. Necessary software frameworks for orchestration and accounting shall be developed. The costs for provisioning and operation of the required hardware resources shall be included in the the M&O planning of the experiment.

Modern AI concepts are essential options for simulation and reconstruction methods. Experiment overarching software frameworks for simulation, reconstruction and data analysis such as KEY4HEP are highly desirable. The development of new concepts and software libraries shall continuously be supported

To be able to profit from future technological developments in computing, software, and data analysis, which may be fundamental and disruptive, it is essential to keep the relevant expertise in the community. This can only be achieved by a recognition of work in this area, in particular by experimental early career researchers, at the same level as for R&D in detector and accelerator technologies and for data analysis.

Further comments not yet implemented

Günter Duckeck:
Nur ein Aspekt vermisse ich, die Einbettung unserer C&S Aktivitaeten in community übergreifende Projekte auf nationaler und internationaler Ebene (PUNCH/NFDI, ErUM-data, JENA, WLCG), d.h. vlt ergaenzend ein Satz:
"Interdisciplinary cooperation in S&C projects on national and international level (such as PUNCH4NFDI, ErUM-Data, WLCG, JENA, EOSC) shall be continued and further enhanced."

Thomas Kuhr: suggested to add at the end
The investment in this area is not only required for advances in fundamental physics,
but also an important contribution to the transfer to industry and society.

Lukas Heinrich asked:
- whether event generation shall be mentioned separately.
- wherer onlien and offlien reconstruction shall be mentioned separately.