


EP R&D Software

Graeme and Jakob



R&D
**on EXPERIMENTAL
TECHNOLOGIES**

CERN's Experimental Physics Department has launched a process to define its R&D programme on new Experimental Technologies. The R&D work will span a 5 year period from 2020 onwards with a possible extension for another 2 years and cover detector hardware, electronics and software for new experiments and detector upgrades beyond LHC Phase-II.

1st Workshop
16 March 2018 (full day)
CERN, main auditorium

Please register!
<http://indico.cern.ch/e/EP-RD-workshop1>

6 working group sessions
Special R&D proposals

- Silicon detectors
- Gas detectors
- Calorimetry and light based detectors
- Detector Electronics
- IC Technologies
- High Speed Links
- Software
- Detector Magnets

 Experimental Physics
Department
HEAD OF EXPERIMENTAL TECHNOLOGIES

Personnel News

- For the Faster Simulation task, Dalila Salamani started in January 2021
 - A warm welcome to her
- For the Reconstruction Tracking task
 - Moritz Kiehn will leave at the end of this month
 - Thanks to him for the work he did in the last year (see the [report in the last Software WP meeting!](#))
 - Paul Gessinger-Befrut will take over as the tracking fellow on 1 April

Website

- <https://ep-rnd.web.cern.ch/topic/software>
- Just a reminder to let us know if you have any talks, proceedings or papers that are relevant
 - At the moment the turnkey stack is way in the lead...

DOCUMENTS AND LINKS



Key4hep Documentation^{sr}



Key4hep and EDM4hep Meetings
(Indico)



Key4hep GitHub Project^{sr}



EDM4hep common event data model
repository^{sr}

PRESENTATIONS



Key4hep - Plans for Deployment
(Valentin Volk, Pre-GDB, 5 May
2020)



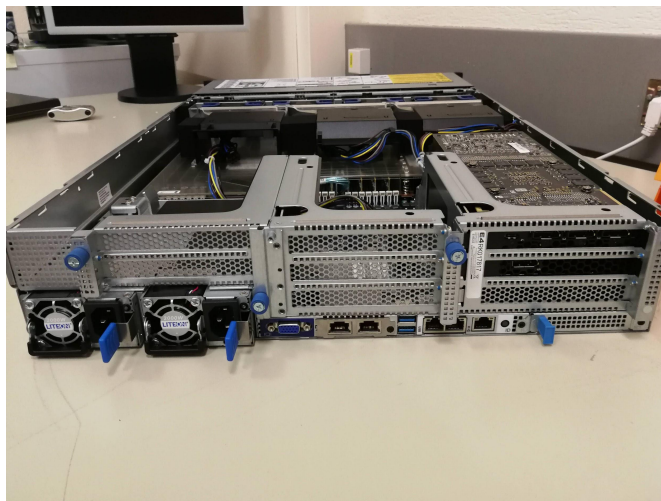
CERN R&D on Spack and the
Turnkey Stack (Valentin Volk,
HSF Workshop 19 Nov 20...



Status of the key4hep Software
Development (Valentin Volk, IAS
Program on High...

Hardware Status

- Machine for Simulation Task available
 - Powerful GPU setup, twin NVIDIA RTX8000 GPUs
 - 2 x AMD EPYC Rome 16 core 2.8GHz
- Machine for Tracking Task available
 - Multi-thread, AMD Ryzen Threadripper 3970X 32 core
 - With an NVIDIA T4 GPU
- Machine for Analysis Task in acceptance testing
 - AMD Epyc with 64 cores
 - ~~2x40~~ 1x100 Gbit NIC, RAID of 5GB/s SSD
 - Thanks to IT colleagues for upgrading the network interface
- We created an OpenStack Ironic project to manage access to the machines, egroup: ep-rdet-wp7-software-server-access
- Overall process takes somewhat longer than we expected, but we're almost there now...



Happy Birthday R&D

- We had a staggered start, but now all of the tasks are on the go
- Christian will be preparing a 1st year report
 - Two to three pages per work package
 - We therefore ask you for ½ page per task, plus a nice picture, if you have one
 - Simulation is exempt
 - Jakob and I will write a short overview
- Also, please let us know if you are applying for the CERN summer student programme or Google Summer of Code
 - Got input so far from Tracking and Sim, we are collecting this [here](#)



Plans for 2021...

- Worthwhile to make a short review of what we hope to achieve in 2021
- Are we still on track re. the milestones and goals we set?
 - Are there more concrete targets that are being aimed for?
 - Conference opportunities (vCHEP, ACAT, EPS-HEP, CTD, ...)
 - Publication opportunities



Turnkey Stack

- Work on EDM4hep and podio, adapt as needed
- Packaging: work with SPI on the Spack build stacks
- Adapt iLCSoft algorithms to Key4hep (Gaudi, EDM4hep)
 - On-the-fly and in memory conversion between LCIO → EDM4hep to
 - Run LCFIPlus Flavour Tagging based on Delphes output
 - Run CLIC reconstruction inside the Gaudi framework, starting with wrapper, then going to native algorithms
 - Use adapted algorithms also in FCC reconstruction (e.g., PandoraPFA)
- Adapt FCCSW to Key4hep
- Integrate other EP RnD software projects
- Integrated with a distributed computing solution (iLCDirac) for validation and physics studies
- Conference/Workshop submission options
 - vCHEP, International Linear Collider WS, FCC WS, ACAT

Faster Analysis

Note: this covers only the *EP R&D* contribution to the complete [RNTuple PoW](#)

1) Main Milestones

- Merging of the Intel DAOS object store backend.
Includes unit and integration tests, data mover, in-depth performance validation (see dissemination plan), if possible large-scale test at Argonne
- Performance comparison to HDF5, if time allows also Apache Arrow & Parquet
- In collaboration with Key4HEP: RNTuple prototype generator for podio
- GSoC project: TTree to RNTuple converter (supervised by Javier)
- IRIS-HEP project: RNTuple nanoAOD generation (Max Orok)

2) Dissemination

- vCHEP 2021: RNTuple DAOS performance evaluation
- Towards the end of the year: RNTuple overview paper (journal to be selected, e.g. Computing & Software for Big Science, Frontiers in Big Data, Platform for Advanced Scientific Computing ACM-PASC)
- ROOT I/O Workshop (tba)

This Meeting and Future Ones

- Today we look at progress in the Analysis Task
- We think that the rhythm of each task reporting about every six months is a good one
 - This means about a meeting a month, with summer and winter holidays
- We should hear from the Simulation task soon
 - Laying out the startup goals
- Any other task like to volunteer to present in the next few months?