

# CERN-EP R&D Initiative Software Working Group

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# EP R&D Programme

- R&D programme on new Detector Technologies
  - Spans a 5-years period from 2020 onwards (with a possible extension by another 5 years)
  - Detector hardware, electronics and **software** for new experiments and detector upgrades beyond LHC phase II
- Working groups are for the key themes
  - To study the state of the art, limitations and main challenges
  - Define an **ambitious** and **focused** work programme with milestones, deliverables and resource estimates.
- Open Process
  - Interested colleagues - no matter if engineer or physicist, staff or user, at CERN or elsewhere - are invited to contribute to the definition of the R&D programme
  - *Today we continue with our second round of lightning talks*

# Timeline

You Are Here

- 20 November 2017 - Kick off meeting

<https://indico.cern.ch/event/677108/>

Working groups form and start to develop first ideas

- 16 March 2018 - First Workshop

<https://indico.cern.ch/event/696066/>

WG meetings and preparation of their chapter

- October 2018 - Second Workshop
- November 2018 - Deliver final report

Future funding will be based on this report



**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 would span a 5-year period from 2020 onwards (with a possible extension by another 5 years), and cover detector hardware, electronics and software for new experiments and detector upgrades beyond LHC Phase II.

**8 working group sessions**  
**Special R&D proposals**

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

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

Please register!  
<http://indico.cern.ch/e/EP-RD-Workshop1>

 Experimental Physics  
Department  
R&D on Experimental Technologies

# Working Group Core/Editing Team

- We have put together a core team of experts to help filter ideas, find links and to (eventually) write the chapter
- [EP-RDET-WG7-Software-Core@cern.ch](mailto:EP-RDET-WG7-Software-Core@cern.ch) ←  if you would like to contact that group

Jakob Blomer (Convener)	Danilo Piparo (ROOT, Concurrency)
Graeme Stewart (Convener)	Witek Pokorski (Geant, Generators)
Marco Cattaneo (LHCb)	Radu Popescu (Other languages)
Dirk Duellmann (IT expertise and link)	André Sailer (CLiC, LCD)
Benedikt Hegner (FCC)	Andreas Salzburger (ATLAS, FCC, Tracking)
Mario Lassnig (ATLAS, Data Management)	Niko Neufeld (LHCb, DAQ, FPGAs)
Maurizio Pierini (CMS, Machine Learning)	David Rohr (ALICE, GPUs)

# Themes Emerging (*Very Preliminary* - presented to convenors group last week)

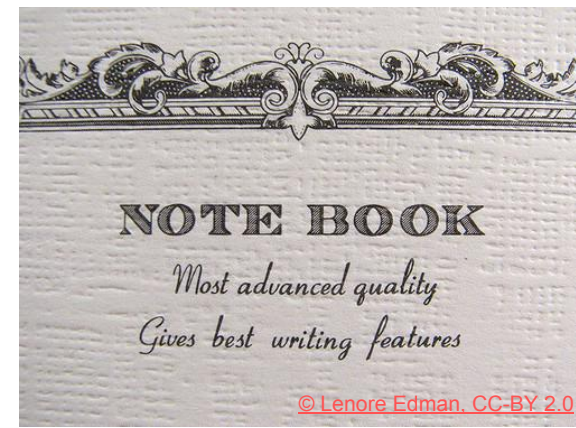
- Algorithms and data flow scheduling for highly concurrent and heterogeneous hardware
- Interfaces from software domain to advanced mass storage
- Machine learning – cross-cutting technology with relevant applications in simulation, reconstruction, analysis
- Flexible infrastructures and modular turnkey systems

This is still very provisional - will be updated in the light of what we hear today when the core group meets tomorrow

After 16th March meeting we envisage more focused sessions on potential themes, but we are still open to more novel ideas (X-Point Memory? Data Compression? Quantum Algorithms?)

# Today's Topics

- Another very varied selection of interesting themes
- 10' slots - thanks to the speakers for their discipline
- Live notebook:
  - [https://docs.google.com/document/d/19WKF84w7Sn\\_vLMfoXsTJjUkJthOyt-RFgfwmk2b3PgE/edit](https://docs.google.com/document/d/19WKF84w7Sn_vLMfoXsTJjUkJthOyt-RFgfwmk2b3PgE/edit)
- This is very useful for recording the discussion and making your thoughts known to the rest of the group - *we encourage you to use it!*
- It is also be a place where speakers can respond and add clarifications



# Backup

# Software R&D Group

- Mailing list
  - [EP-RDET-WG7-Software@cern.ch](mailto:EP-RDET-WG7-Software@cern.ch)
- Sharepoint site
  - <https://espace.cern.ch/ep-rdet-wg7-software/>
- Indico
  - <https://indico.cern.ch/category/10015/>
- 16th March 1st Workshop
  - <https://indico.cern.ch/event/696066/>



# Questions and Inspiration!

- Physics motivation for a particular technology to be developed?
- New technologies might we be obliged to use in the future?
- A concrete piece of software that to be expected within 2 years?
- An educated guess about the potential of the technology in the next 5-10 years?
- Can we carry out the R&D work roughly within the current resource envelope?

[HSF Community Roadmap](#)

[OpenLab white paper](#) on future challenges

[Software technology forum](#)

[Diana-HEP](#) meetings

- HEP algorithm toolbox for computing accelerators
- Machine learning for analysis, fast simulation, I/O tuning; error estimation and predictable system behavior
- Turn-key systems for future experiments; framework modularization and ready-made analysis facilities
- High-level programming paradigms and abstractions; declarative programming, software correctness guarantees, domain-specific languages, etc.