



Efficient Computing for High Energy Physics

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Goals of ECHEP

- Discuss the challenges of the HEP software stack (focused on HL-LHC but others welcome)
- Inform ourselves on alternative architectures
 - Reach out to industry
- Discuss work already done/ongoing to address this, within the UK and internationally
 - Engage with existing organisations e.g. HSF, IRIS-HEP
- Identify proof-of-principle demonstrations of new platforms
- Form a new community of experts in the UK with international engagement
 - Requires engaging with, and providing, training opportunities
- Establish working parties with defined deliverables
- Detailed plan and impact strategy for subsequent three year R&D project will be written

Resources and Governance

- This is a small* project funded in December by the STFC Opportunities Call, £50K budget, start 1st January 2020
- Some funding for 2 workshops
- One day per week is bought out for 3 PDRAs
 - Luke Kreczko (CMS), Tim Martin (ATLAS), Manuel Schiller (LHCb)
- PI (Sinead Farrington, ATLAS) co-I's (Conor Fitzpatrick, LHCb and Dave Newbold, CMS)
- In addition the postdocs will be tasked to co-lead areas, and we will seek candidates to co-lead with them who can commit some time to the project
- The resource is small, but a major goal is to bring out what has already been done, all are welcome to contribute, *this was a community effort proposal

First Workshop

- Registration is open: <https://indico.ph.ed.ac.uk/event/66/>
 - 17-18 February 2020, Edinburgh
- Agenda is in (mature) draft
 - International efforts
 - The software stack
 - Generators
 - Simulation
 - Trigger
 - Reconstruction
 - Analysis codes
 - Architectures (industry– good contacts for most areas but haven't got one for ARM, please get in touch if you have, or other links)
- Aiming to draw out existing UK expertise and have invited international experts so that we are fully engaged
 - UK speakers will be invited in the coming days

Link to other projects + overall plan

- There are ongoing efforts to seek future funding (Davide Costanzo is PI of both)
- Excalibur (<https://epsrc.ukri.org/funding/calls/excalibur-high-priority-use-cases-phase-1/>)
 - Case is being put together (deadline 22 January) to address the Excalibur call –(EXascale Computing ALgorithms and Infrastructures Benefitting UK Research)
 - ~relatively small pilot project is being proposed, this could lead to substantial further future funding
- Statement of Intent submission to STFC's Science Board
 - Case is being put together (aiming at deadline of 30th March)
 - This can be broader, it is following the standard Sol approach to SB (having been approved to proceed to submission by the STFC particle physics programme manager) seeking permission to apply to PPRP (Project Peer Review Panel) later this year
 - But it cannot be infinite! Maximum resource indication is 400K per year for 4 years. Should identify UK unique expertises.

Link to other projects + overall plan

- ECHEP is intended to feed information and plans to the Sol submission in March
 - Workshop will help with this as it is >1 month before submission
 - This can help identify areas where the UK is interested
 - Note that UK is also heavily involved and expert in infrastructure which is not a part of this project
- ECHEP aims to provide substantial information to the PPRP proposal (timing is right as PPRP submission is usually invited around 6 months after Sol submission)
 - Part of ECHEP's proposal to the opportunity call, was that it will provide a detailed plan of work for a 3 year R&D project to follow it, together with impact plans
 - This needs to be realistic in the international context and not solve problems in a silo, or ignore already-existing solutions

How this project will operate

- Hold open overall meetings like this one every month to discuss the work of that month, what the PDRAs are doing and the working groups around them
- Hackathons/training events/mini-meetings (always open and advertised on our mailing list) to be set up as needed – part of the task of the funded postdocs
- Set aside time at our first workshop to define concrete deliverables and reporting structure
- The people responsible are the PI/Co-I's/funded PDRAs who will be area co-leaders and we will invite other co-leaders per project area (next slides)

Webpage

- Working on host location
- To draw together
 - Training events (in UK and beyond)
 - Training material
 - Link to articles/talks of interest

PDRAs

- Role of the 3 PDRAs who are partially bought out for this project
 - Look at work within their collaborations already done to speed-up for HL-LHC era
 - Identify mini proofs-of principle (SF in consultation with HSF on useful areas to contribute to)
 - Train up on methods and computing solutions, talk to industry to achieve this, and engage with “horizon-scanning”
 - Play an active role in the workshops
 - Organise hackathons as necessary
 - Attend an international workshop during the 6 months with the aim of reporting back to UK community
 - Be a co-leader of one of our identified working groups

Horizon Scanning

- Identified areas, please contribute your ideas for more
 - Development areas, each of which must address developments in that area including GPU, FPGA, ARM etc
 - 1) Analysis methods (UpROOT etc)
 - 2) Simulation (both fast simulation and approaches to vectorise full simulation)
 - 3) Generators (adaptation to multi-threaded methods, address negative weights issues – phase space sampling)
 - 4) Trigger/Reco
 - Tech horizon-scanning area:
 - This area should
 - A) Keep up to date with technical developments of the GPU/FPGA/ARM technology
 - B) Look out for new technologies not on the list above

We will converge this list this week and then send a call for co-leader nominations/volunteers to work with the PDRAs.

How you can get involved

- Volunteer (or nominate) as an area co-leader –email will follow with details on the working groups
- Follow the mailing list announcements about hackathons and mini-meetings
- Come to the workshop, speak up on your interests and current work (what you'd like to get involved with)
- Already start thinking about where this can go after the 6 month project is over – what resource would be needed to turn your ideas into something real
 - Is the work doable within the six months with resource you already have (your own time...)
 - Does it need dedicated funding
 - What training is needed that you currently can't access either nationally or internationally