HSF Reco & SW triggers kick-off meeting: Introduction

26th April 2023

What is the HEP Software Foundation?

- Community-lead group of people that facilitates **coordination** and **common efforts** in high energy physics (HEP) software and computing internationally.
- Consists of **working groups** as forums to identify & discuss common topics of interest across experiments, so ideas & resources can be shared, wheels not re-invented.
- Published Community White Paper in 2017 in Computing and Software for Big Science (and arXiv:1712.06982)
  - 310 authors from 124 institutes, 14 chapters
  - Roadmap for software & computing for HL-LHC and HEP general
- Engagement in European Strategy Update, LHCC review of HL-LHC & US Snowmass [1,2]
- Activities include software training (together with IRIS-HEP), PyHEP workshops, Google Summer of Code, Season of Docs..

HSF Working Groups

HSF Role: Information Conduit

- Follows interesting and common work being done
- Provides space for technical comments and discussions
- Encourages cooperation across experiments.

-> This is enacted via the working groups (WG) with focus topics:

- Data Analysis
- Detector Simulation
- Frameworks
- Physics Generators
- PyHEP - Python in HEP
- Reconstruction and Software Triggers
- Software Developer Tools and Packaging
- HSF Training

WGs are community-lead groups who organise activities in their domains encouraging communication between developers, providing platform to promote ideas & foster common solutions.

- Each WG has 3 conveners usually from different experiments.
- Clearly overlaps in WG topics and collaborations encouraged.

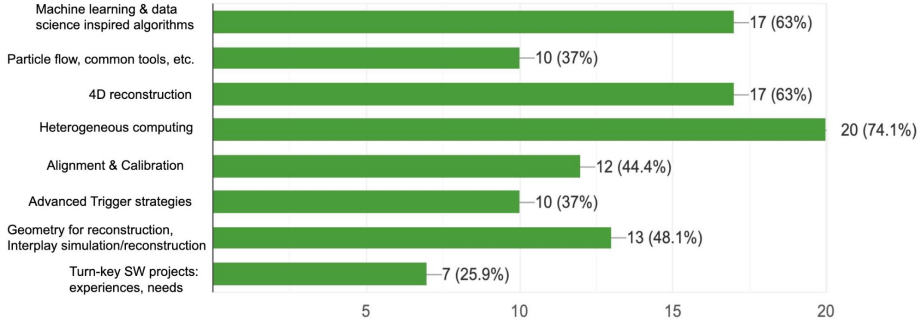
The Reconstruction & Software Triggers WG

- This working group was one of the first formed, focusing on topics & ideas related to data reconstruction and triggering in software.
- The HEP community white paper on Reco & Trigger, arXiv:1802.08638, highlights the challenges of data reconstruction both online & offline commonly faced by all HEP experiments with tremendous scaling in computing resources for upgrade/future projections (for instance, HL-LHC).
- The working group aims to address these challenges, but also identify other relevant & common topics.

Past activities

See [complete indico agenda]

Which topics would you like to see covered by HSF



[Survey at 2021 kick-off meeting]

3

Several meetings organised in past covering a variety of areas:

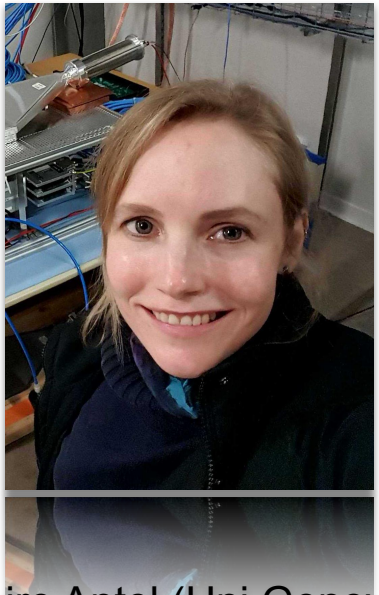
- Real-time analysis
- Multithreading & code optimisation
- Presentation of Reco/DAQ Frameworks (variety of experiments - once joint with LLP forum)
- 4D tracking (variety of experiments)
- Accelerated tracking (joint with Compute Accelerator Forum)
- Tracks with GNN, RICH PID

Where recent meetings motivated by 2021 survey highlighting Heterogeneous computing, ML & 4D (spatial+time) reconstruction as topics of high interest.

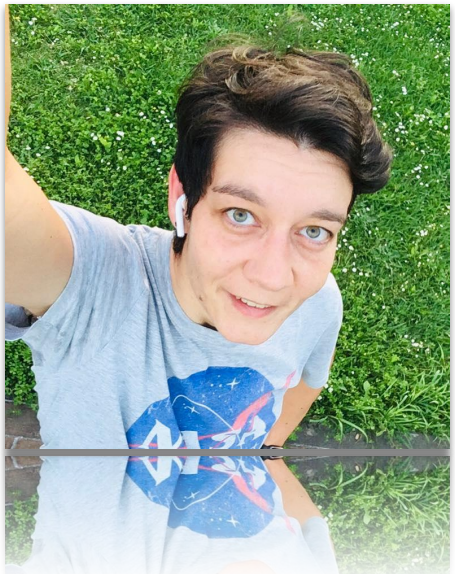
Who are we?

2023 WG Conveners

Christina Agapopoulou (CERN):
LHCb @ LHC



Claire Antel (Uni Geneva):
ATLAS & FASER @ LHC



Giulia Casarosa (Uni Pisa):
Belle II @ SuperKEKB

Plans/ideas for the near future

TODAY

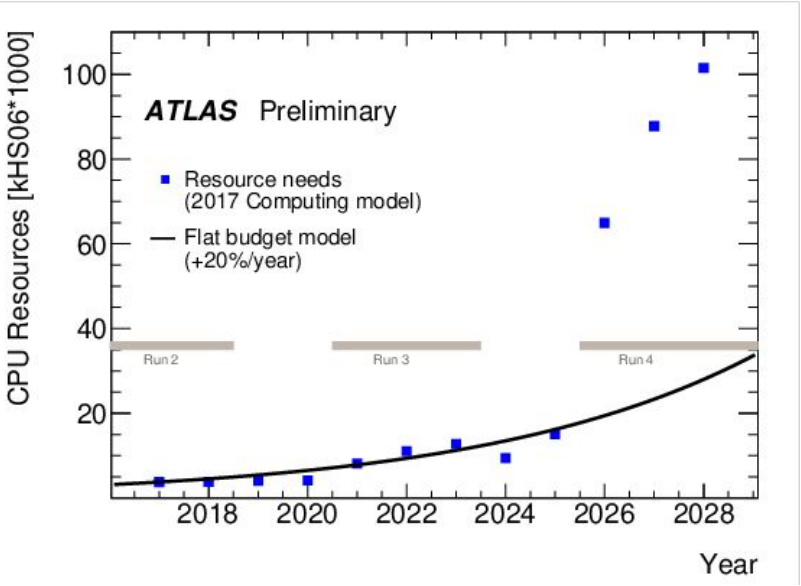
- Promote the group
  - Please forward mailing lists & this agenda to people (*any* HEP experiment!)
- Learn what interests the community

TOMORROW

- Organise meet ups on topics of interest
  - We contact individuals/groups based on pursued topic.
  - Even better: You come to us.

So, here we are

Estimated CPU resources (in kHS06) needed for the years 2018 to 2028 for both data and simulation processing for ATLAS.



What brings us together?

- Big Data challenges
  - Bandwidth/CPU/storage constraints
    - ultimately only constrained by cost, or something else?
    - Demand from future experiments momentous.
  - Lots of data processing for reconstruction:
    Online, offline & simulation
- Heavy reliance on efficient and reliable software
  - Particularly in the trigger, where need low latencies..
  - Tracking a big component, but calorimeter reconstruction and particle flow also significant.
- Search for rare & new:
  - Interest in trigger & reconstruction techniques not only to keep up but to open up new phase space
- ….

We'll explore these points further today - feel free to contribute to the google doc at any time on your experiment-specific challenges!

What might set us apart?

- Collaboration size and funding
- Site access
- Reconstruction load online vs offline
- Background rate: Degree of selective triggering
- Reliance on beam, clocks & synchronisation
- Beam/background conditions
- ….

Let’s keep in touch!

- Reco & SW Triggers WG google group: https://groups.google.com/forum/#!forum/hsf-recotrigger
- HSF google group: http://groups.google.com/d/forum/hsf-forum
- HSF Reco & SW Triggers website: https://hepsoftwarefoundation.org/workinggroups/recotrigger.html