

# **EIC Computations and Simulations**

## **a few thoughts**

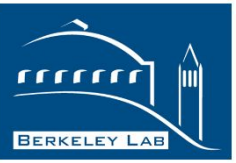
Shujie Li & Jim Thomas

May 31<sup>th</sup>, 2022

# EIC – Detector 1 Software Meeting

5/25/2022

- Hosted by David Lawrence at JLAB (24 attendees) Shujie, Tanja Horn, Or Hen, Kolja Kauder, Jeff Landgraf, etc.
  - Live Notes: <https://docs.google.com/document/d/1eOG5UnxFrBZajkucGgjq2ryPukI2yE5BPsmQOZ-GpGM/edit?usp=sharing>
  - software WG wiki page: <https://wiki.bnl.gov/eic-project-detector/index.php/SC>
- Goal: Single software stack for Detector One by October (not sure why this is a milestone)
  - software decision schedule [https://docs.google.com/spreadsheets/d/1KvH\\_I6LnrFs5o9E46wecqtl4YrQrqi3i8X5GF-BNDzE/edit#gid=0](https://docs.google.com/spreadsheets/d/1KvH_I6LnrFs5o9E46wecqtl4YrQrqi3i8X5GF-BNDzE/edit#gid=0)
- Two presentations on code repositories for software and simulations environment & management
  - GitLab (Whitney Armstrong)
    - Hosted at Argonne lab, used by ATLAS and LHCb
    - Available world wide, free to EIC users, etc.
    - EIC Web is an analysis factory with Integrated CI/CD (continuous integration and continuous delivering), only requires a web browser
    - need dedicated maintenance commitment.
  - GitHub (Jin Huang)
    - Commercially hosted, widely used by CMS, ALICE, STAR, sPHENIX
    - Available world wide, free to EIC users with limited accounts, paid service for very large activities
    - CI is possible via GitHub Actions, but requires non-trivial effort to set up; not for large file storage, use CVMFS or xRootd instead
- Extensive Pro/Con discussion
  - People are encouraged to continue writing into Live Notes
  - Need working replacements for two existing software stacks ... need it working by October
  - Think about Code Repository issues but also identify other critical decisions need to make before July 27th



- Hosted by Wouter Deconinck at W&M (~10 attendees) Shujie, Bill Li, John Lajoie, Alex, Kolja, Jim, etc.
  - LiveNotes: [https://demo.hedgedoc.org/RADqjS6\\_SROuV3VXNdvzmzg?both](https://demo.hedgedoc.org/RADqjS6_SROuV3VXNdvzmzg?both)
  - Mattermost will be preferred developer collaboration tool. Hosted (and bills paid by) CNFS (SUNYSB)
  - Working by tomorrow. Code of conduct: <https://www.stonybrook.edu/cfns/charter/conduct>

- Goal: Centralized production of simulated events – ideally with a single software stack

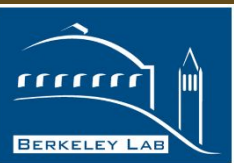
- This meeting was devoted to infrastructure, and how to get started
- A request went out to specify simulations needed in Q3 (June-Sept)
- Three (and only three) working groups responded (on indico page)

- Chicken and Egg problem

- Most working groups doing simulations in their own “sandbox”, so how do we get them to participate in a centralized effort?
- Non-centralized simulations are Fast and Efficient but this presents the obvious problem of irreproducible results in the future due to geometry changes that are not centrally maintained (etc.)
- Need to evaluate design and detector design choices ... all agree this should be done in centralized way
  - Shujie probed whether obvious detector configuration changes have been adopted (e.g. Si barrel) The answer is ‘not yet’ and this highlighted the need for the tracking WG (and others) to more fully participate
- Detector group participation needed to update geometries.
- Conclude that Simulation group should start work with tools in hand and draw in new groups based on success
- Future: Clearly communicate deadlines to WG. Not yet done/communicated well. Sim schedule needs to be part of weekly convenor meeting discussion. When to have detector frameworks ready? etc. Mattermost will help.

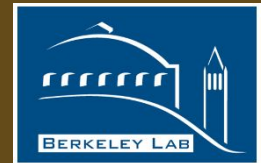
### 2022-Q3 Resource Requests (June-September)

- **Inclusive**
  - Djangoh ep NC for 5x41, 10x100, 18x275;  $Q_2 > 1, 2, 10, 50, 100, 500, 1000$
  - Needs far-backwards in fun4all
- **SIDIS**
  - Pythia6 ep for 5x41, 10x100, 18x100, 18x275; all,  $1 < Q_2 < 100, 100 < Q_2$  (varying number of events, 1M to 20M)
  - Pythia6 with/without IFS/FSR, settings as above, but lowest/highest energies only (similar number of events)
  - Lambda generator (2M)
  - Needs ECCE in dd4hep
- **Jets/HF**
  - Pythia8 ep NC for 5M each in 5x41, 10x100, 18x275;  $Q_2 > 1, 10, 100$
  - Pythia8 ep CC for 5M each in 5x41, 10x100, 18x275;  $Q_2 > 100$
  - Needs ECCE in dd4hep



- ECCE and ATHENA ... recognize need to coalesce activities
- ECCE – simulations are “quick and dirty” and acknowledge that better developed systems exist
  - Github based
  - Non-the-less, large simulation campaigns going on at BNL, JLAB, ORNL
  - Fun4All didn't have far forward detectors included, Bill Li did this 'by hand'
- ATHENA – more distinctly Grid based
  - open science grid with interactions via htcondor, slurm, Panda, etc.
    - htcondor has 2 hr cpu limit, slurm 20 hours
    - condor jobs need to be chopped < 10k events, slurm easier to copy large input files, etc. Much technical discussion.
    - so each suits different tasks
- One takeaway – the basic unit for simulations is 100 M events
  - DIS group requested 100 M events for each of  $Q^2 = 10, 100, 1000$  etc.

**Opportunities for LBL/Berkeley, but the train is moving fast ...**



## An unanticipated opportunity from the early days at RHIC

- LBL was a leading partner in the development of RHIC and its detectors
- Computational needs at RHIC were initially (greatly) underestimated
  - A need arose for additional capabilities
- PDSF – Parallel Distributed Systems Facility
  - A major resource for STAR simulations as well as RNC & UC physics analyses
  - It was a computer 'Farm' & testbed for RHIC computations ... switched off in 2019
- It came to Berkeley as surplus in 1996/97 due to the demise of the SSC
  - 'Physics Detector Simulation Facility', once hailed as 'biggest in the world'
  - Today we would probably call it a 'Tier II' data center
- The facility grew and went through many upgrades
  - In the early days, it was a large facility that was staffed by ~ten people
  - It was a pioneering facility which became more specialized as time went by
  - The rest is history (for many of us)



# ELC Meetings



**A nice box**