Future Blueprint Topics: Year 3 + Year 2 Plans and Year 4,5 Topics

Mark Neubauer

University of Illinois at Urbana-Champaign

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Blueprint Activity

Utility

- To inform development and evolution of the IRIS-HEP strategic vision
- To build (or strengthen) partnerships among our stakeholders, organizations and communities → through these partnerships we affect these communities (developing a coherent vision, community whitepapers, CDR/TDRs, …)

Process

- A series of workshops that bring together IRIS-HEP team members, key stakeholders and domain experts from disciplines of importance to our mission
  - Discussions are captured and inform key outcomes which are summarized in a short report made publically available

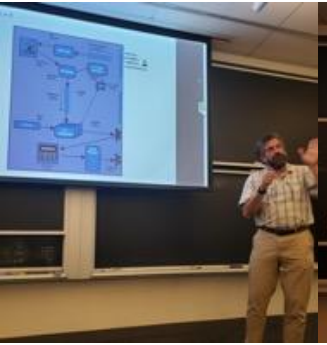
Blueprint Workshops

Year 1

- Analysis Systems on Scalable Platforms (*report*)

Year 2

- Fast Machine Learning and Inference (*report*)
- A Coherent Ecosystem for HL-LHC Computing R&D (*summary slides*)
- Software Training (*report*)



Blueprint Impacts (two examples)

Year 1

- Analysis Systems on Scalable Platforms
  - ***Kubernetes*** as a common denominator technology for the SSL to our maximize our R&D capability through a flexible infrastructure that federates contributions from resource providers
  - A vision for an SSL that serves as an innovation space for IRIS-HEP AS developers and a testbed to prototype next generation infrastructure patterns for future HEP computing environments

Year 2

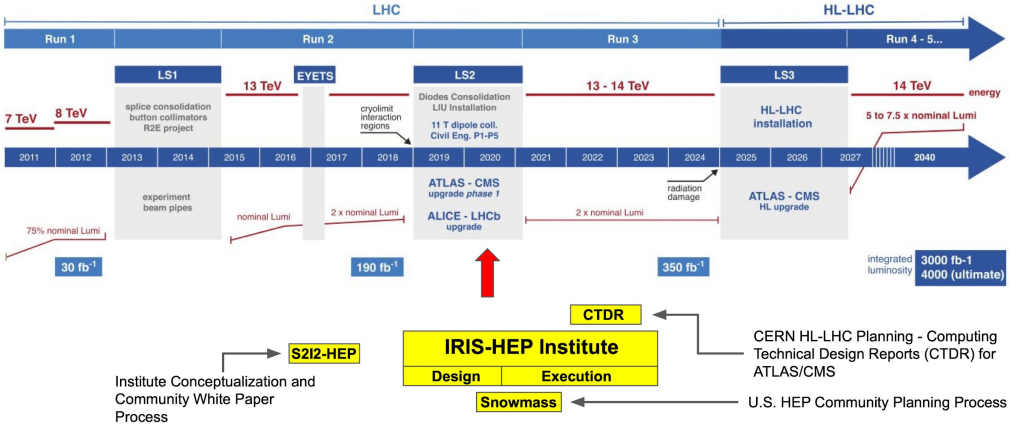
- Fast Machine Learning and Inference
  - Identified key ***fast machine learning*** use cases for HEP trigger and reconstruction, including *GraphNNs* (e.g. tracking, calorimetry) *pileup suppression*, *particle flow*, and improved *L1 MET*
  - Produced a White Paper to lay out a vision for ***fast machine learning for fundamental physics*** and engage with the broader scientific community (IRIS-HEP members are authors)

Blueprint looking forward

- Viewed favorably by our stakeholders. We should build our success!

New Elements

- COVID-19 ;(This put up a roadblock for our 2020 planning of in-person Blueprint meetings. We turn this around into an opportunity to have a larger number of more targeted Blueprint meetings conducted virtually which can be organized comparatively quickly (not require long-lead planning around travel and venue)
- IRIS-HEP Grand challenges
- Computing Technical Design Reports for ATLAS & CMS
- Snowmass
  - Opportunity for theorists & experimentalists to collaborate on a shared HEP vision



Blueprint looking forward

Design phase → *Execution Phase*

- During the design phase, it has been important to solicit input broadly and to help inform our direction and look for new opportunities
- As we move into the execution phase, these are still important, but the emphasis will shift more toward:
  - Targeted planning around the execution on our R&D toward adoption within the experiments (closer to “real” blueprints)
  - Planning around the Grand Challenges
  - Increased efforts on engaging the experiment operations programs and broadening adoption and user base

Planning (feedback from the retreat)

Year 2

- Future Facilities for Data Analysis (our highest priority for some time)
  - Likely multiple meetings (accelerated columnar data/caching, columnar data, computational storage, deploying/sustaining user tools e.g. jupyter notebooks, ...)

Year 3 includes

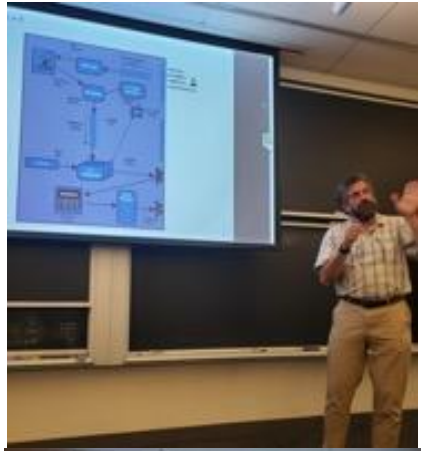
- Strengthening Theory & Experiment Connections (also timely with Snowmass!)
- Sustainable Software and Workforce Development
- The IRIS-HEP Grand Challenge(s)
- Training and Carpentries
- IA topics around trigger and reconstruction, etc. graphs, ML algos, accelerators

Some Year 4/5 Topics

- Coherent Ecosystem redux, benchmarking & adoption of projects, user engagement

Extras

Analysis Systems R&D on Scalable Platforms (June 2019)



Workshop Webpage & Report

Key Outcomes

- Communication of AS plans → to a set of requirements to the SSL team
- ***Kubernetes*** identified as a common denominator technology for SSL to our maximize innovation capability through a flexible infrastructure
- Plans for a multi-site ***SSL substrate project*** to federate SSL contributions from multiple resource providers, offering the AS area a platform for service deployment at scales needed to test the viability of system designs
- A vision for an SSL that serves as an innovation space for AS developers and a testbed to prototype next generation infrastructure patterns for future HEP computing environments

Impact (example)

- The approach of leveraging Kubernetes and container-delivered services on for SSL and the broader LHC facilities is increasingly widespread.

Fast Machine Learning and Inference (Sept 2019)

Workshop Webpage & Report

Key Outcomes

- Exchange of technical ideas between IRIS-HEP, the wider HEP community and leaders in academia and industry in ***fast machine learning***
- Identified key ***fast machine learning*** use cases for HEP trigger and reconstruction, including *GraphNNs* (e.g. HLT tracking, pixel seeding, road finding, calorimeter clustering, jet/τ reconstruction and lepton isolation), *pileup suppression*, *particle flow*, and improved *L1 MET*
- Plans for an HLT demonstrator based on Kubernetes and integrated into the SSL to facilitate shared development

Impact (example)

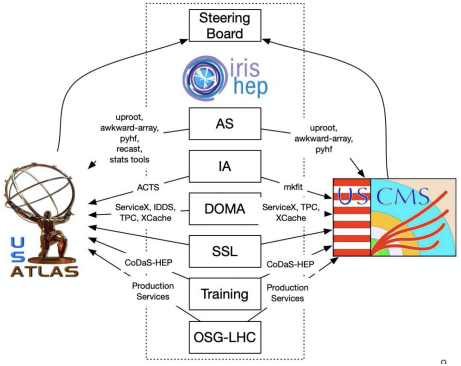
- Produced a White Paper to lay out a vision for ***fast machine learning for fundamental physics*** and engage with the broader scientific community (IRIS-HEP members Markus Atkinson, Phil Harris, M. Neubauer are authors)

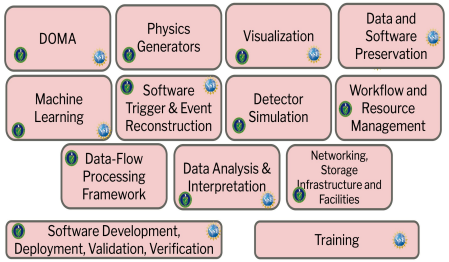
A Coordinated Ecosystem for HL-LHC Computing R&D (Oct 2019)

Workshop Webpage & Summary slides

Key Outcomes

- A crisp set of final outcomes awaits the final report
- ***My take on a few:***
  - Exploring the relationship between our efforts and those in US ATLAS & US CMS Operations Programs
  - Exploring specific ways that IRIS-HEP can engage with other NSF and DOE (particularly ECP and HEP-CCE) efforts
    - E.g. potential interest in joint CCE/IRIS-HEP Blueprint meetings
  - Agreement that this type of meeting is a useful thing for all parties involved ;)





Software Training (Feb 2020)

Workshop Webpage & Report

Key Outcomes

- Three types of modules for training HEP newcomers/learners
  - Modules developed/maintained by *The Carpentries*
  - *HEP-customize modules from The Carpentries* (make sure things stay in sync with them, maintained by us)
  - *HEP modules* (maintained by us)
- "Training Material Hackathon" involving our training instructors, possibly co-located with CoDaS-HEP
- Develop modules mentioned above
- Integrate Sustainability
  - Training & best practices beyond just coding
  - Project-level guidance - how to start and maintain projects, how to build community
  - Policy, including how to provide credit to software developers and maintainers