

Computing Infrastructure at the Electron-Ion Collider: Present Status and Future Plans of the ePIC Collaboration

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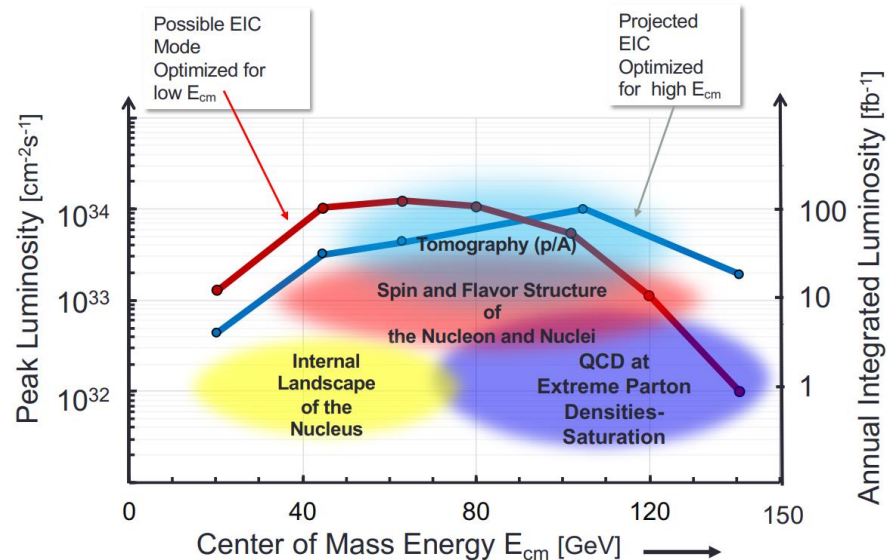
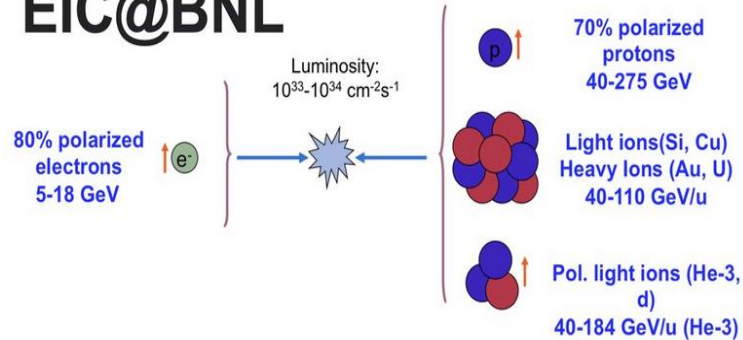
On Behalf of the ePIC Software and Computing Effort

12 July 2023

EIC At-a-Glance

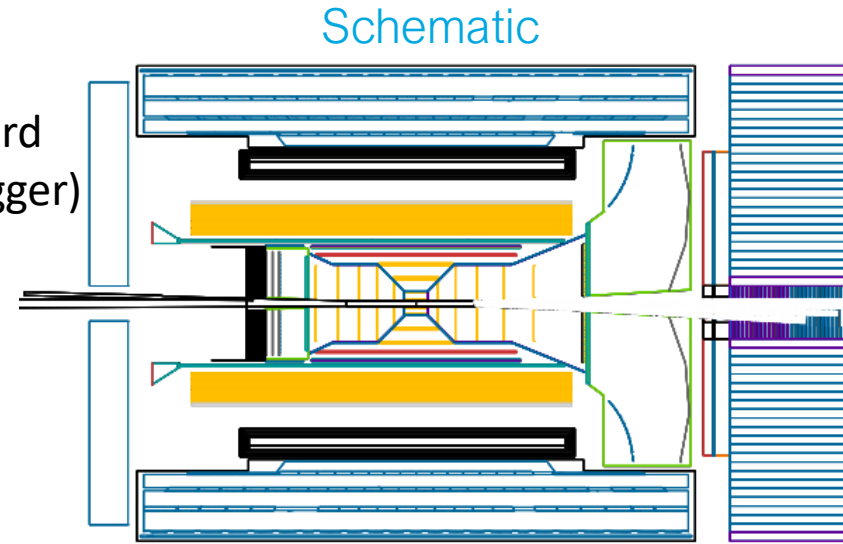
- Frontier accelerator facility in North America in the 21st century
- Precision study of the nucleon and the nucleus at the scale of sea quarks and gluons with polarized beams.

EIC@BNL



ePIC: EIC Project Detector

Far Backward
(low Q² tagger)



Far Forward
(B0 solenoid and trackers, Off-Momentum Detectors, Roman Pots, Zero-Degree Calorimeter)

Central Detector

(1.7 T Solenoid, Si Trackers and Calorimeters)

Forward-Looking Software and Computing

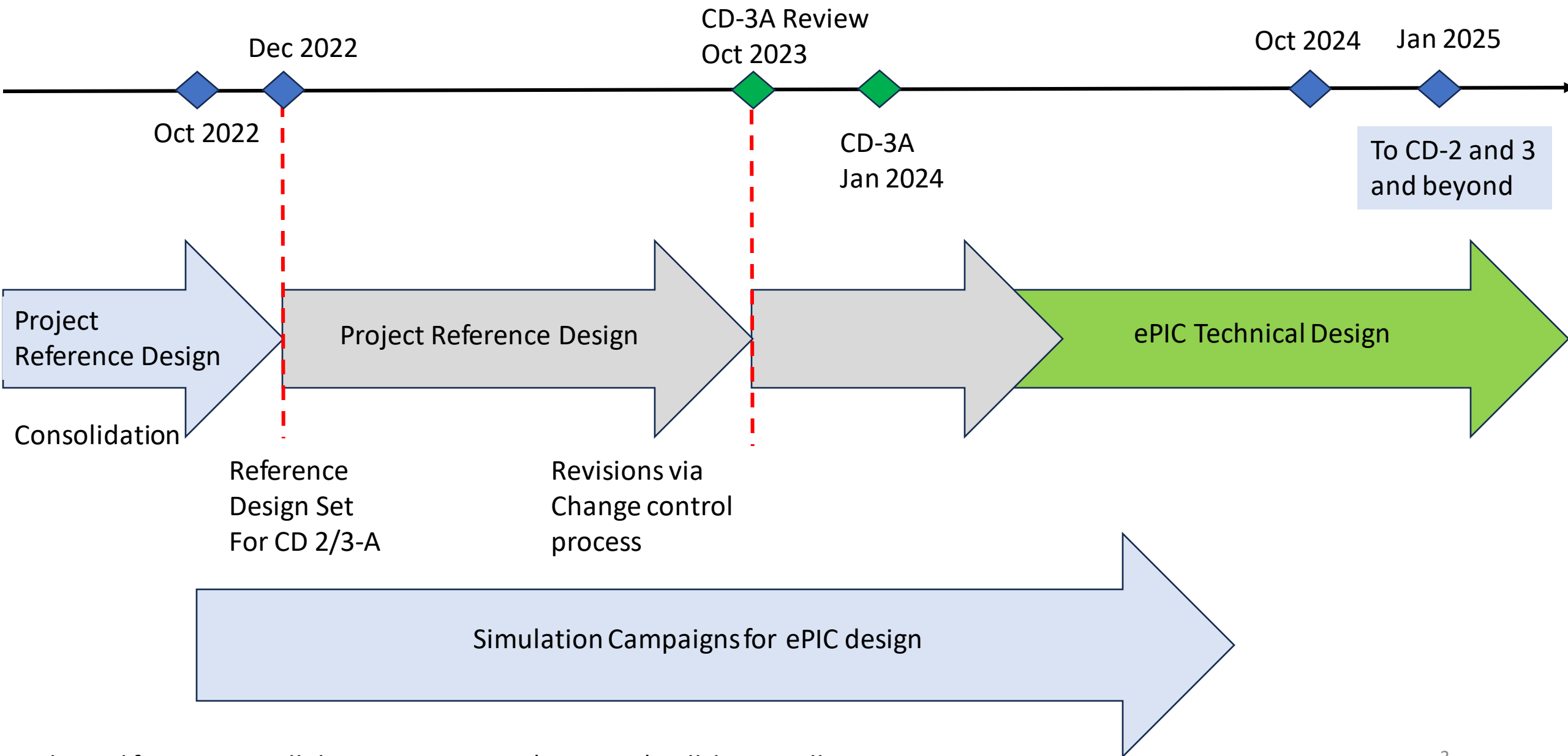
DD4hep for simulation

AI/ML for Detector Design, Clustering and Reconstruction

JANA2 based EICrecon for event reconstruction

Develop robust workflow to leverage distributed computing resources

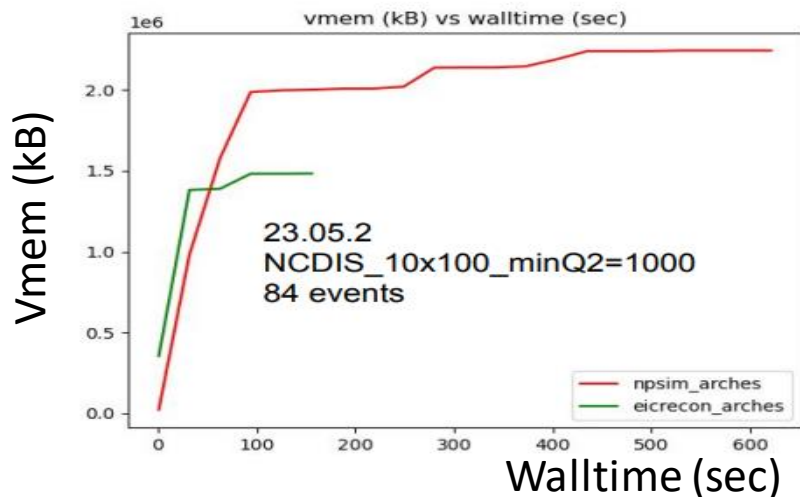
ePIC Detector Consolidation and Optimization Process



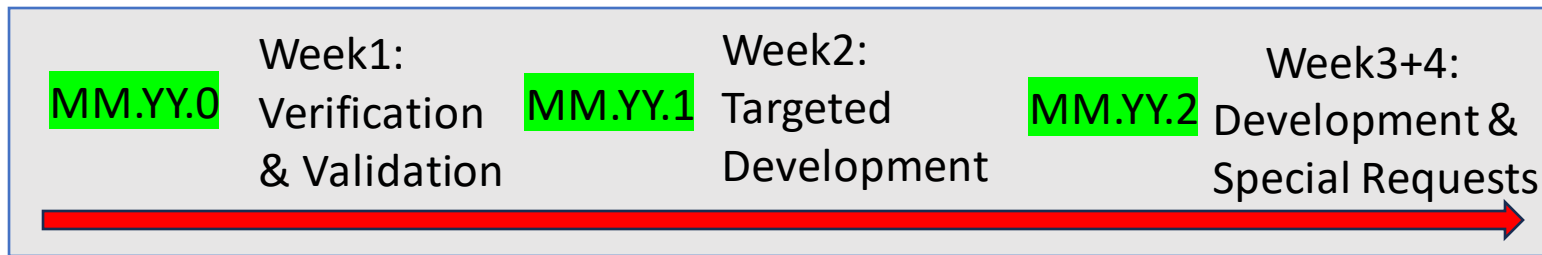
Computing Needs

- 2-3 tagged production campaigns per month
- 1 default detector config but multiple test configs is possible based on demand
- Benchmarked core year estimates for different campaigns for default config:
 - MM.YY.0 ~ 20 coreyears
 - MM.YY.1 ~ 30 coreyears
 - MM.YY.2 ~ 100 coreyears
- Each job requests ~3 GB memory and 2 hours on remote node., Output may occupy ~2GB disk space.

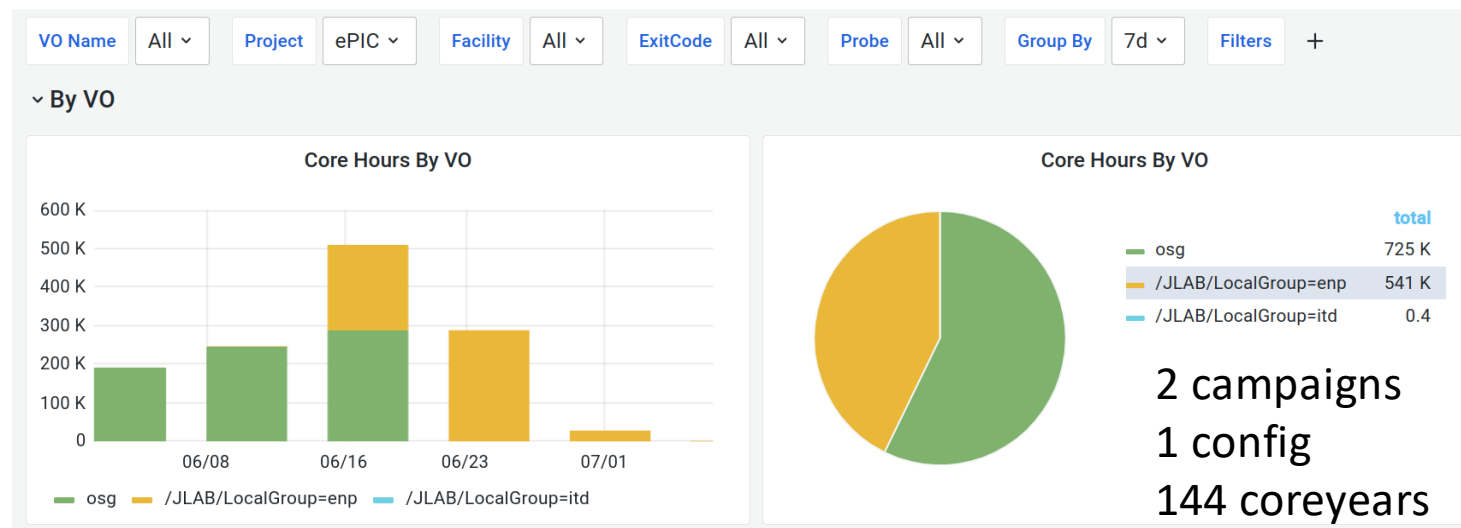
Memory Usage over Time Per Job



Monthly Campaigns Strategy

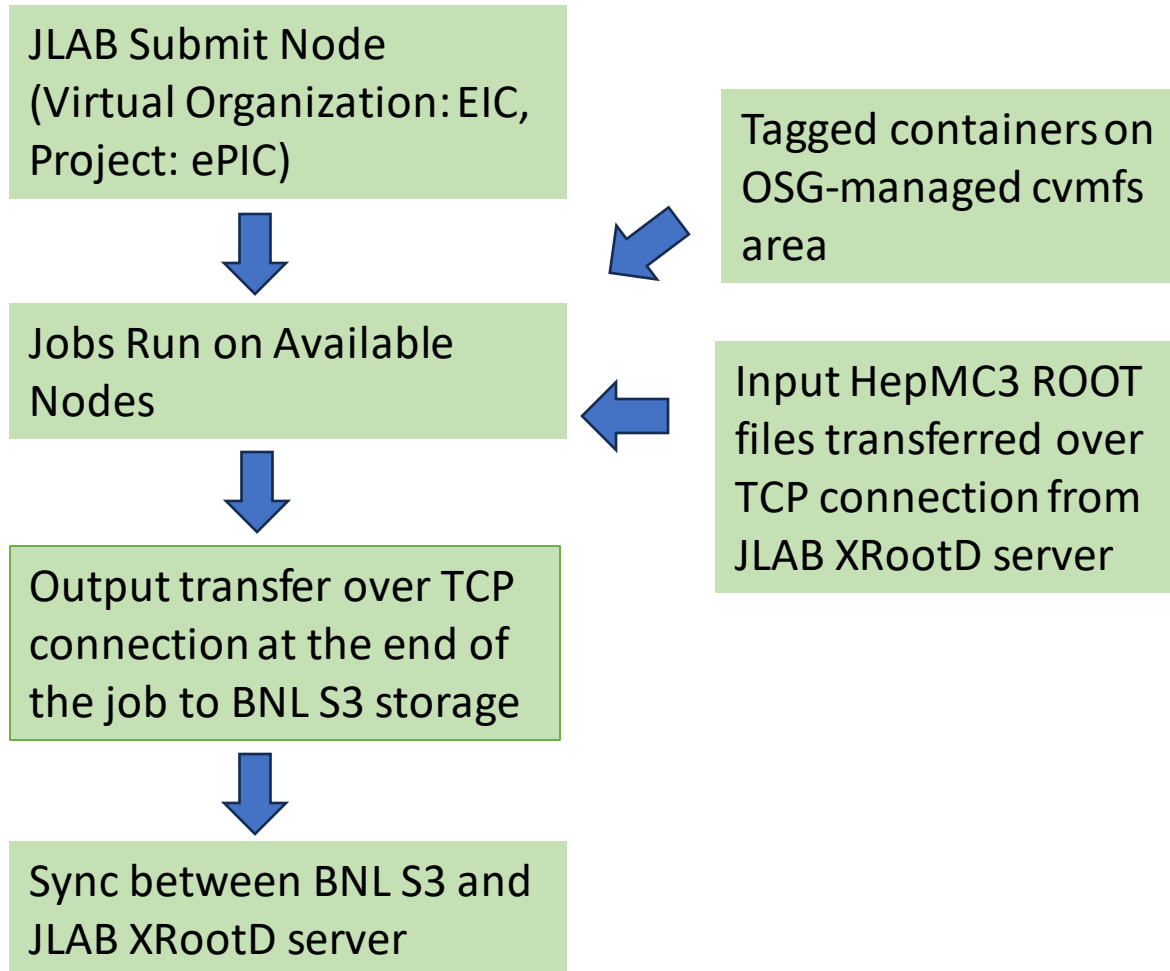


Compute Usage in June, 2023



Workflow

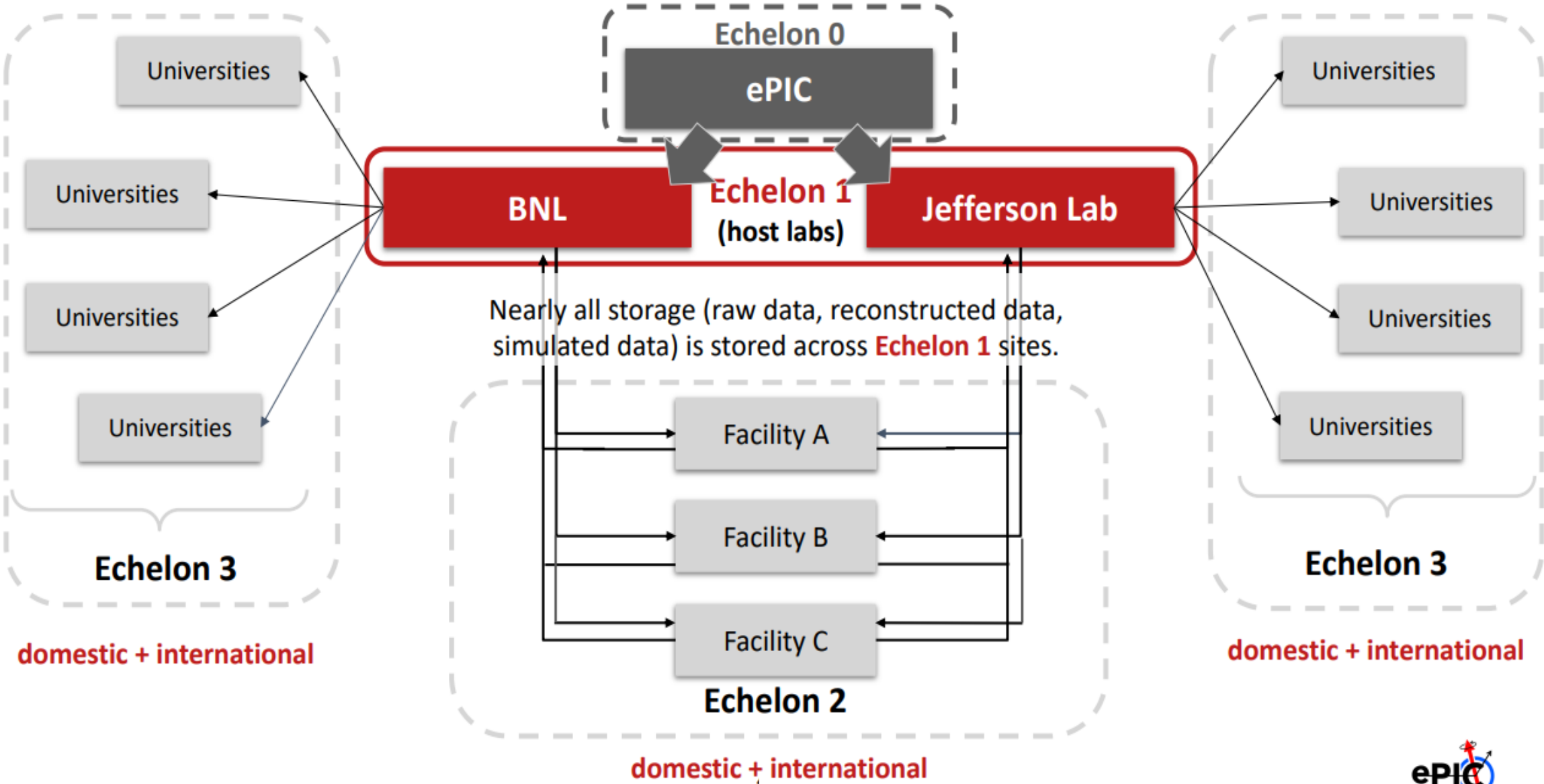
Current Setup



Goals for the future

- 1) Integrate additional submit nodes and allocated resources into workflow. Near term prospects: BNL, Alliance Canada, etc. More probable foreign contributions post-RRB (Resource Review Board) meeting in December 2023.
- 2) RUCIO for data management. Proof of principle in next month or two. Pieces in place. Need to ensure mutual connectivity and integration.
- 3) Write to JLAB XRootD directly during jobs (load balancing, not prone to bulk transfer failures at the end of completed jobs, etc.)
- 4) Develop tools for better (automated) monitoring of workflow performance

Distributed Computing Model



Conclusion

- Rapid evolution in ePIC experimental design, and requires rapid feedback to engineers -> need a computing effort that evolves rapidly to meet demand
- Ensure ease of entry for new contributing facilities and new participating collaborators -> seamless integration of multiple submit nodes and external resources
- Improved workflow monitoring, xrootd writing and rucio integration -> near term goals for more robust workflow and data management