Strategy and Implementation of the ePIC Simulation Campaigns

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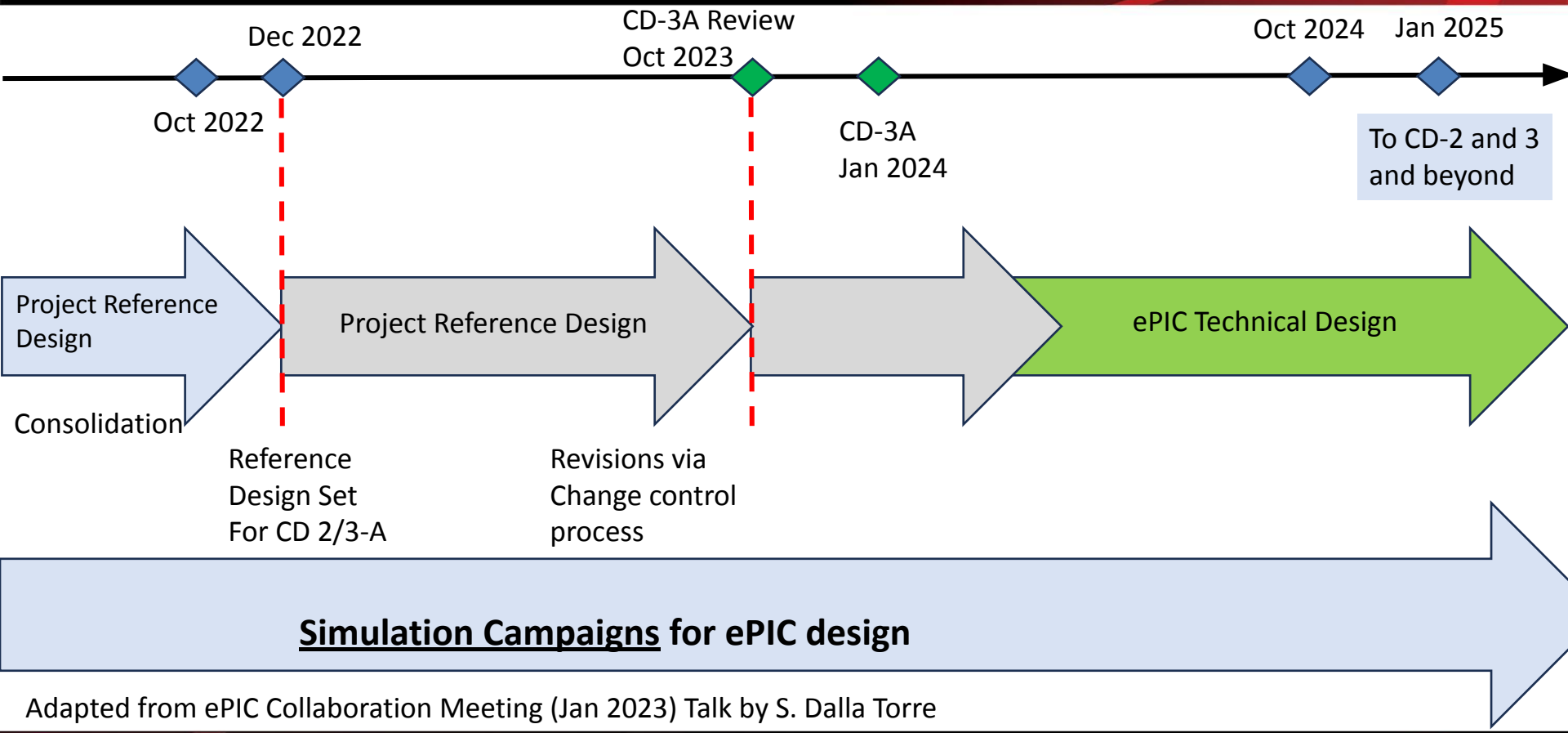
ePIC Detector Consolidation and Optimization Process



Adapted from ePIC Collaboration Meeting (Jan 2023) Talk by S. Dalla Torre

Different Needs for Different People/Groups

- A simulation workflow, in particular, is used in all steps of an experiment
  - From design to analysis
  - From software development to validation

- A successful strategy for managing simulation should:
  - Account for different priorities
  - Be scalable
  - Be accessible
  - Avoid contention

Overall Strategy: Planes, Trains, and Automobiles

- Major central campaigns (**Trains**)
  - Run without user intervention
  - Runs on time
    - Within our control
  - Pre Established “flavors”

- Special interest runs (**Charters**)
  - WG level requests
  - Needed for design/development

- Bespoke (**Taxis**)
  - Individual user needs (think specific analyses)

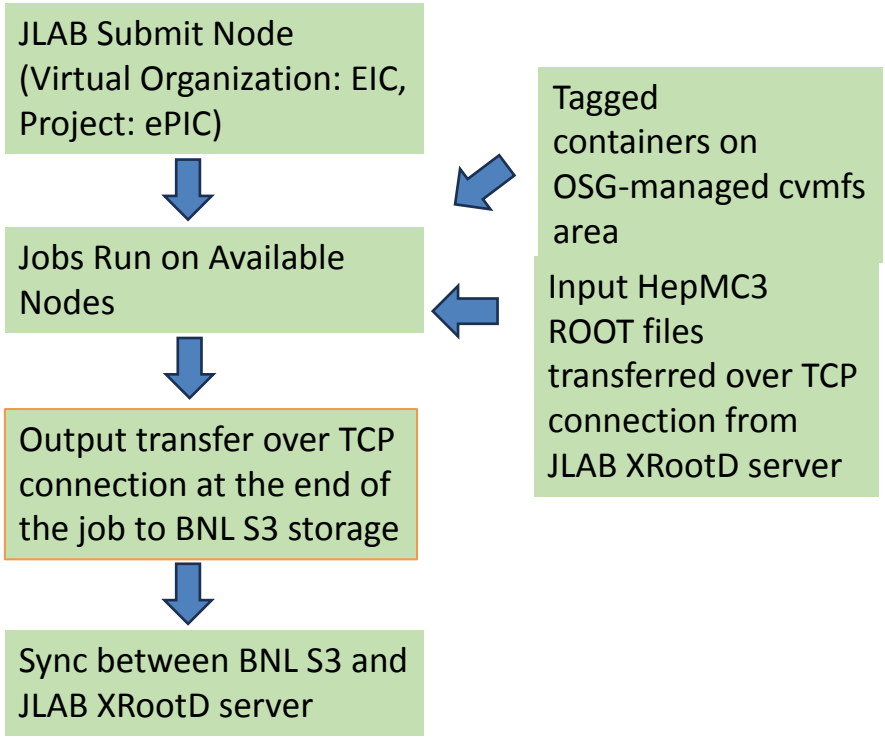
Central campaigns (Trains)

- 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 diskspace.

Monthly Campaigns Strategy

Workflow

Current Setup



Goals for the future

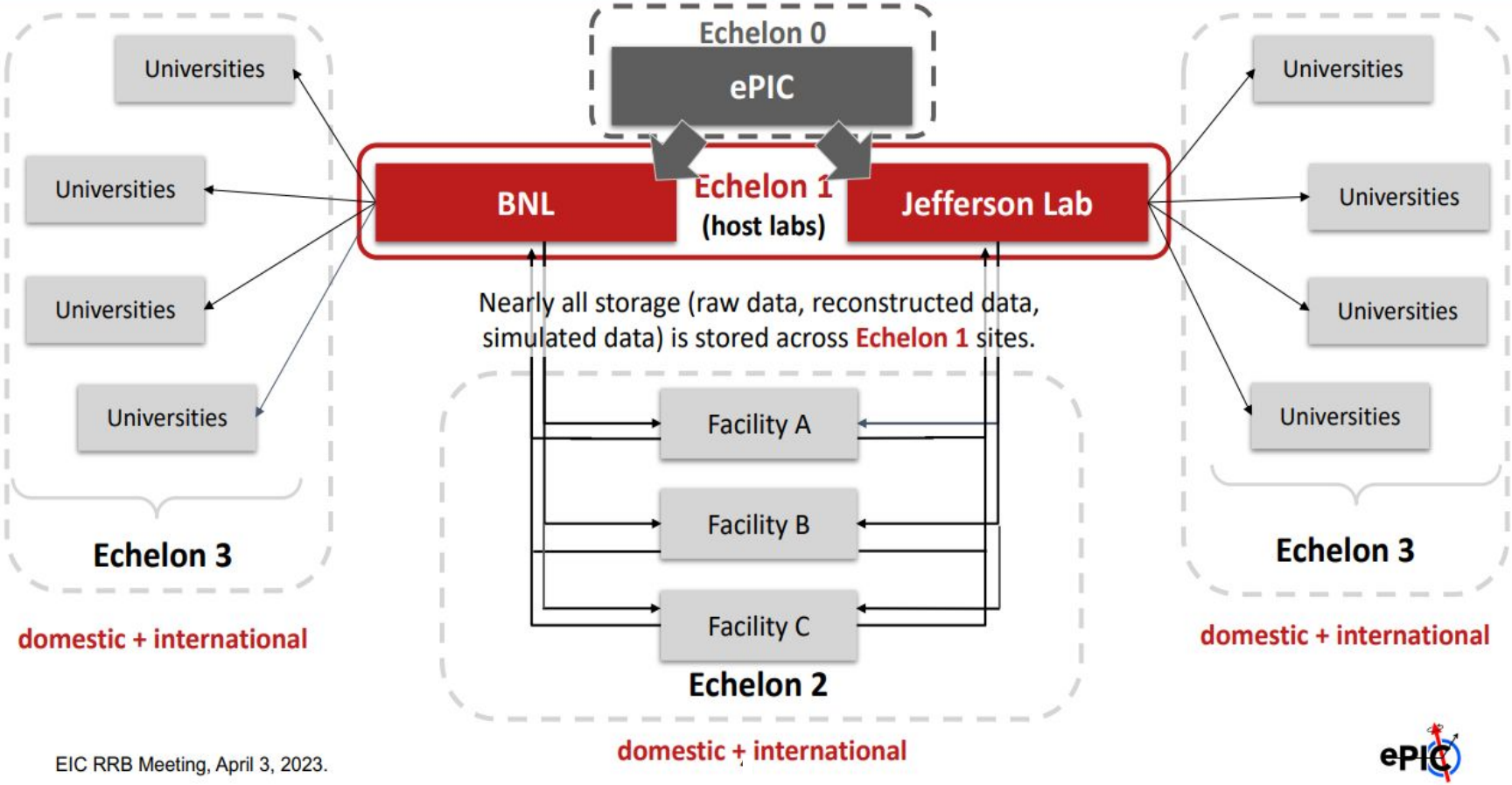
1) **Integrate additional submit nodes and allocated resources into workflow**. Near term prospects: BNL, Alliance Canada, etc. More probable foreign contributions post-RRB (Resource Review Board) meeting in December 2023.

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

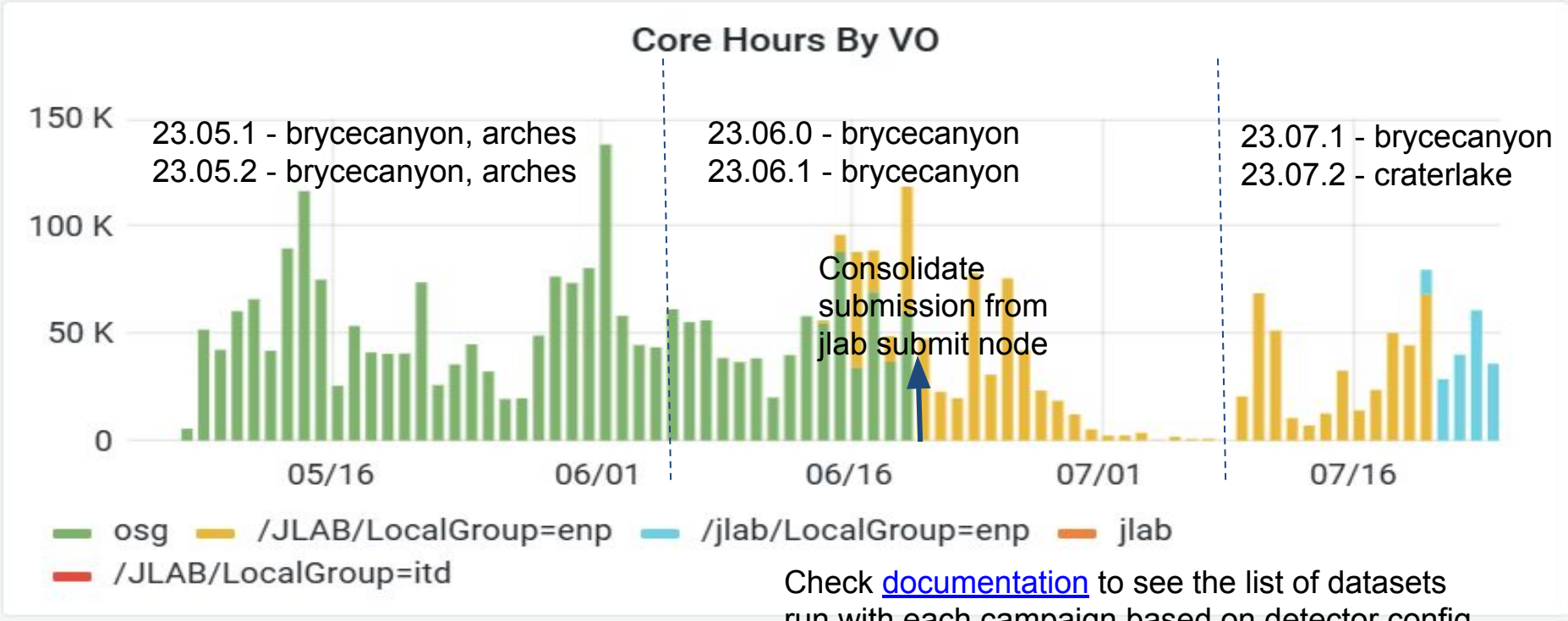
Distributed Computing Model



Trains over time

Source: [gracc dashboard]

By VO



Check [documentation] to see the list of datasets run with each campaign based on detector config

Charters

- Working Group level needs for specific studies
  - Run along side trains
- Requests for charters should be made to the coordinators:
  - Wouter Deconinck
  - Markus Diefenthaler
- MUST be given to the Production WG as hepmc3 root files
- Questions about generating events?
  - Kolja Kauder

Taxis

- Bespoke simulations for individuals or small groups
  - Think efficiencies for a cross-section analysis

- Currently **individuals run their own taxis**
  - As ePIC evolves over the next decade we expect demand for taxis to grow

- In the future we hope to offer a centralized way to submit/request taxis
  - This will keep production optimized
  - One of the rare cases where you want a single point of failure
    - Not some collaborators fixed a bug and other collaborators are using different code which still contains it

Data Mirroring

- Data is currently additively sync'd between both Echelon1 locations
  - BNL (S3)
  - JLAB (XrootD) ← preferred

BNL (S3)

1) Install minio client
2) ~/bin/mc config host add S3 https://eics3.sdcc.bnl.gov:9000 with your read credentials
3) mc ls S3/eictest/EPIC
4) Or mc cp S3/eictest/EPIC/…..

JLab (XrootD)

1) Install XrootD client or load into eic-shell
2) xrdfs root://dtc-eic.jlab.org to look around
3) xrdcp root://dtn-eic.jlab.org//work/eic2/EPIC/…/[file] ./

Workflow Developments & Plans

- Working on instrumenting workflows to enable better quantitative monitoring of jobs
- Writing back to jlab via XrootD as a safety mechanism against BNL S3 connectivity issues (and JLab xrd)
  - OSG suggests an OSDF
- Make data access from all collaborators regardless of geographical location easier
  - Ruccio for data management/cataloging
- Make use of international compute resources
  - Targeting Compute Canada through the OSG to start
- Make the submission and managing of projects easier, more automated

Conclusions

- The production working group was left in a good spot to carry the baton of production.

- Ongoing production trains/charters primarily done from JLab submit node
    - July Trains can be found either by S3 or XrootD:
        - In directories labeled **23.07.1**, and **23.07.2**
            - E.g. root://dtn-eic.jlab.org//work/eic2/EPIC/RECO/23.07.1/

- Main efforts to develop a robust workflow that follows the overall production strategy
    - Multiple submit hosts
    - Mainly automated with good monitoring for quick diagnosis of problems
    - Redundancies for robustness