# First EIC Computing & Software Advisory Committee meeting

Tuesday, December 6, 2022

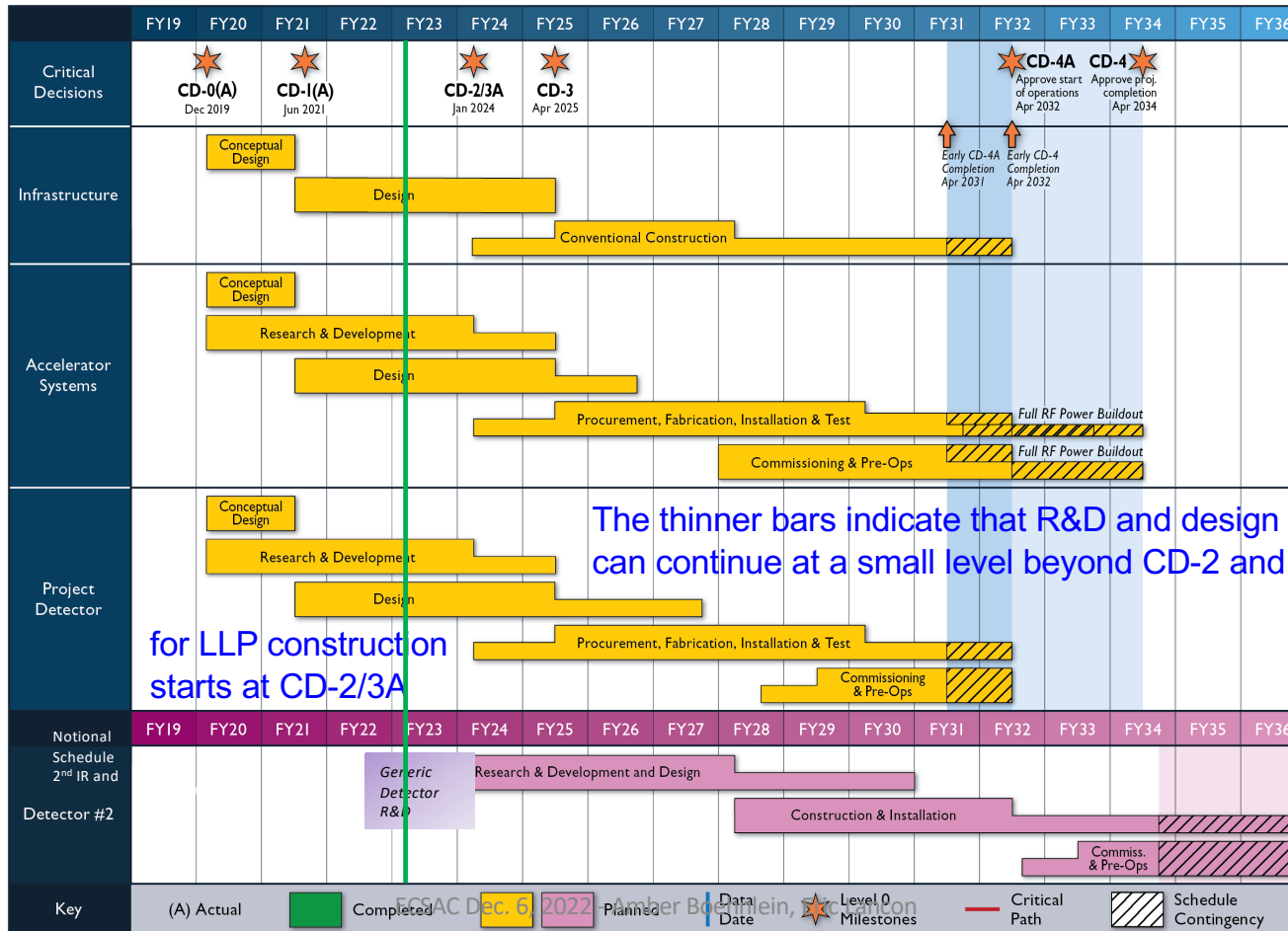Amber Boehnlein, Eric Lancon

The EIC

- The EIC mission need statement (CD-0) approved by DOE in Dec 201

- Approval of Alternative Selection and Cost Range (CD-1) in June 2021

- EIC scope includes the accelerator (in RHIC tunnel at BNL) and one interaction region outfitted with a major detector

- Two host Labs: BNL & JLAB
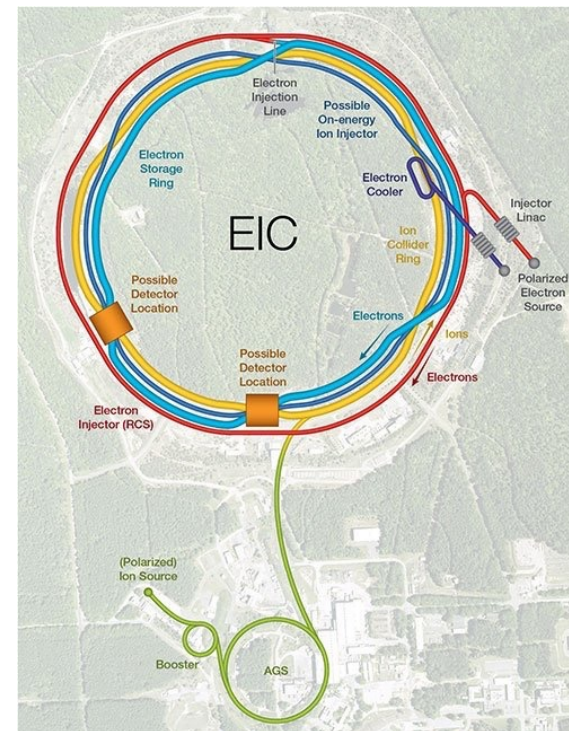
Current High-Level Reference EIC Schedule

E. C. Aschenauer, Rolf Ent

The thinner bars indicate that R&D and design can continue at a small level beyond CD-2 and CD-3

for LLP construction starts at CD-2/3A

CD-2 actually between CD-3A & CD-3

EIC environment from Computing & Software perspective

- ## The host Labs: BNL & JLAB
  - Computing and Software Departments supply services, infrastructure and some algorithms
  - Complementary strengths

- ## The EIC project
  - Makes sure EIC as a project (accelerator and detector 1) delivers on time and within budget
  - The project ends with the first collisions
  - Computing and Software are not part of the EIC project (DAQ is)

- ## The ePIC collaboration
  - The scientific collaboration around Detector 1
  - Anticipate Computing and Software coordinators
    - Organize collaboration efforts and requirements
   - Interface with the EIC-JI-CS (next slide)

The Joint Institute (EIC-JI-CS)

- BNL & JLAB as co-host Labs propose to setup the EIC Join Institute for Computing and Software (EIC-JI-CS)
  - A single entity to interface with the EIC project and the detector collaboration(s),
  - A coordinating body for interacting with international partners providing computing resources as in-kind contributions. This includes assessing resources, managing the MOUs with the sites delivering resources (including service levels), and facilitating and assessing the delivery against the MOUs,
  - Execution of Host Lab responsibilities

- Our goal is to transition to the new proposed organization by the time of CD-2 (performance baseline approval)
  - Between now and CD-2, intense detector simulation campaigns will be needed

ePIC CONSOLIDATION and OPTIMIZATION

EPIC Design Towards CD2/3A

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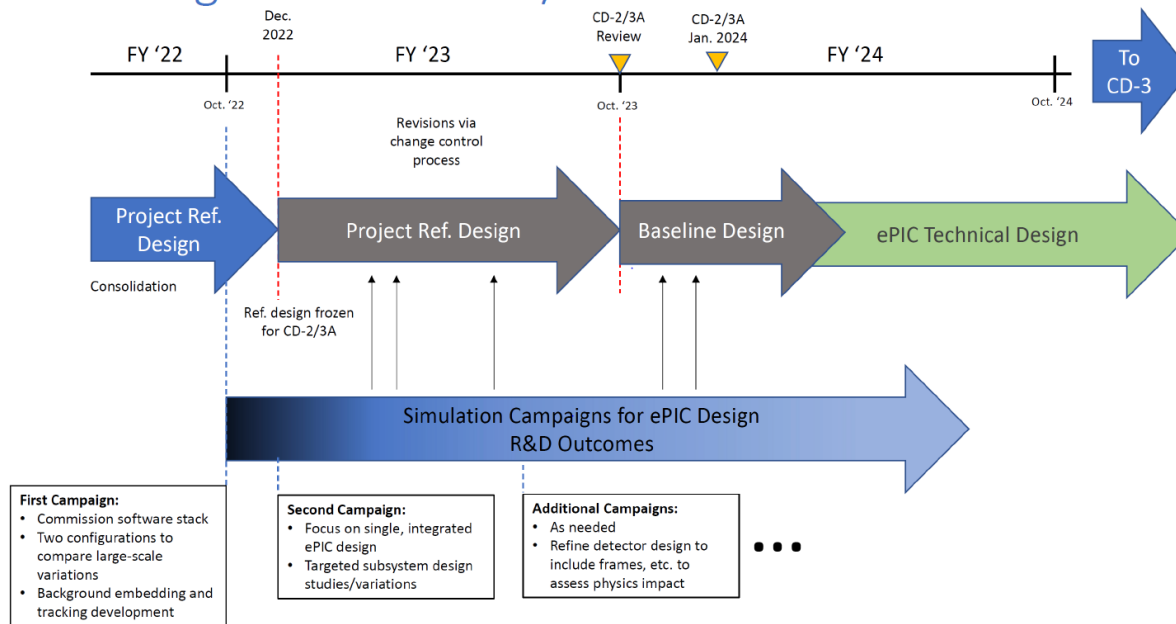
Status of Computing and Software for EIC

- So far Computing and Software have been organized by the EIC User Group (http://www.eicug.org/) the scientific community around the EIC project together with the EIC project
  - The coordination group comprises Host Labs contacts, software representatives, and Detector 1 working groups contacts
  - http://www.eicug.org/content/wg.html#computingcoordination
- Computing resources provided by BNL & JLAB (3PB, 2k cores each) + Open Science Grid have been vital for the detector proposals
  - ECCE (the recommended proposal) published a detailed computing plan https://arxiv.org/pdf/2205.08607.pdf

https://arxiv.org/pdf/2205.08607.pdf

Resource needs (ECCE as an example)

ECCE Runs	year-1	year-2	year-3
Luminosity	$10^{33}\text{cm}^{-2}\text{s}^{-1}$	$2 \times 10^{33}\text{cm}^{-2}\text{s}^{-1}$	$10^{34}\text{cm}^{-2}\text{s}^{-1}$
Weeks of Running	10	20	30
Operational efficiency	40%	50%	60%
Disk (temporary)	1.2PB	3.0PB	18.1PB
Disk (permanent)	0.4PB	2.4PB	20.6PB
Data Rate to Storage	6.7Gbps	16.7Gbps	100Gbps
Raw Data Storage (no duplicates)	4PB	20PB	181PB
Recon process time/core	5.4s/ev	5.4s/ev	5.4s/ev
Streaming-unpacked event size	33kB	33kB	33kB
Number of events produced	121 billion	605 billion	5,443 billion
Recon Storage	0.4PB	2PB	18PB
CPU-core hours (recon+calib)	191Mcore-hrs	953Mcore-hrs	8,573Mcore-hrs
2020-cores needed to process in 30 weeks	38k	189k	1,701k

Table 7: Estimate of raw data storage and compute needs for first 3 years of ECCE, assuming ramp up to full luminosity by year 3.

Calibration, reprocessing,
analysis,… no included

None of the above requirements are challenging for
BNL & JLAB in the 2030+ timescale

One 2020-core ~ 12 HS06
1,000 k cores < 100 kHS06

The ePIC collaboration

- ePIC: the scientific collaboration around Detector 1 (the EIC project detector)

- A collaboration charter has been proposed and is currently being discussed. https://indico.bnl.gov/event/17732/contributions/70597/attachments/44428/74975/EPIC_Charter-v1.0.pdf
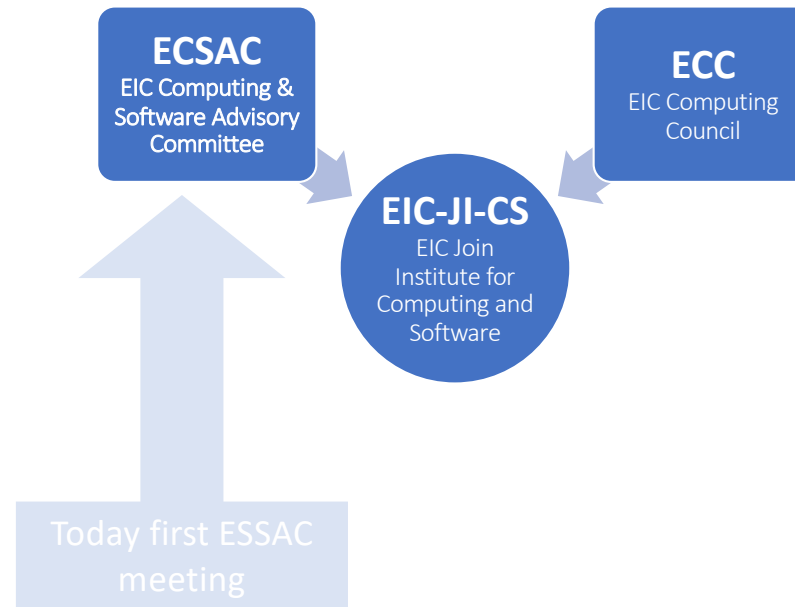
- Not yet a collaboration with management in place (Spokesperson, deputies, computing and Software coordinator,…)

- A temporary collaboration board exists, the EIC-JI-CS proposal has been presented to the board

Proposed - Host Labs responsibilities

- Oversight of the detector collaborations' software and computing designs and execution,
- Provisioning and operating standard infrastructure solutions consistent with currently supported Lab infrastructure and with community best practices,
- Support for the EIC distributed computing international organization,
- Interface for local resources and policies at the respective Labs,
- On-going computing operations in support of the accelerator and detectors design and construction,
- Operational Support Functions for
  - experimental data curation,
  - first-pass processing,
  - data analysis,
  - support of collaboration(s) and users,
  - accelerator and detector simulations.
- It is currently envisaged to set up a distributed Tier-0 between the 2 Labs

Proposed EIC-JI-CS organization

Experts:
Advice, guidance, and counsel on the strategy and objectives of the Institute

ECSAC
EIC Computing & Software Advisory Committee

ECC
EIC Computing Council

EIC-JI-CS
EIC Join Institute for Computing and Software

Stakeholders:
Approve strategic direction, leadership changes, annual budgets, resource allocations, and performance milestones

Today first ESSAC meeting

Details in the document posted on today's indico page

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Anticipated responsibilities of collaboration(s)

- Articulating and documenting a cost-effective computing model tailored to the experiment's needs, with the concurrence of the host Labs,

- Developing and maintaining multi-year resource plans,

- Providing a Point of Contact to interact with the EIC-JI-CS,

- Identifying Computing and Software coordinators with input from the EIC-JI-CS,

- Developments of Software Algorithms,

- Production operations.

Some of forthcoming challenges

- Still an early stage of the project, and the schedule is fluid
  - CD-2 (Performance baseline) ~end 2024
  - Risk of lock-in, data taking in 10+ years
  - Must plan for transitions and continuity while retaining flexibility
- Lab efforts in computing and software are funded on operations funds
  - These will be constrained esp. in the middle years
  - The transition from the current projects at BNL & JLAB to EIC operation delicate
  - Currently no identified funding for EIC Computing & Software
- 'Cultural' issues
  - The two labs have different ways of working and different scales
  - Some users from loosely organized small research groups and short-duration experiments.
    - Less computing/software savvy
- Changing DOE environment
  - Cyber Security, Zero trust
  - IPv6 mandates

ECSAC charter

- The EIC Computing and Software Advisory Committee is chartered to propose advice, guidance, and counsel on the strategy and objectives of the Institute.

- The ECSAC reports to the EIC-JI-CS management and serves as the Institute management's external advisory committee

- It will initially meet **at least twice a year or as requested** by the Institute management.

- The proposed responsibilities are:
  - Review the strategy and objectives of the Institute to support EIC Computing and Software,
  - Evaluate the adequacy of the infrastructure and resources to meet the requirements of the collaboration(s),
  - Evaluate proposed technical solutions and their implementation,
  - Identify opportunities to increase effectiveness and efficiency,
  - Provide recommendations on technical and organizational matters.

Seeking your feedback and advice on the following topics

- What are the Host Lab's responsibilities in the computing and software areas critical for the success of the EIC?

- How to articulate the Host Labs & collaboration(s) respective responsibilities in matter of Computing & Software?

- What a cost-effective organization to support the computing and software of the EIC could be?

- How to organize and acknowledge potential external contributions to EIC computing and software?