The EIC Computing and Software Joint Institute

Status Report

DRAFT v0.1

Alexei Klimentov
aak@bnl.gov

David Lawrence
davidl@jlab.org

EIC Resources Review Board.
June 9-10, 2026

The EIC Computing and Software Joint Institute (ECSJI). Background

EIC Computing and Software Joint Institute provides for EIC computing and software matters:

1) A single entity to interface with the EIC program and the ePIC collaboration,

2) Maintains Service Level Agreements and statements of work outlining the host labs' contribution to the ePIC collaboration concerning computing resources, services, and
personnel assigned to work on ePIC computing and software deliverables,

3) A coordinating body for interacting with international partners providing computing resources as in-kind contributions. This includes assessing resources, managing the agreements of cooperation with the sites delivering resources (including service level agreements), and facilitating and assessing the delivery against the agreements,

4) Execution of host laboratories responsibilities

- Assessing resources.
- Managing the agreements with the sites delivering resources (including service level).
- Facilitating and assessing the delivery against the agreements.

List of abbreviations and glossary

ECSJI Progress and Priorities. Main Tracks Since the Last RRB

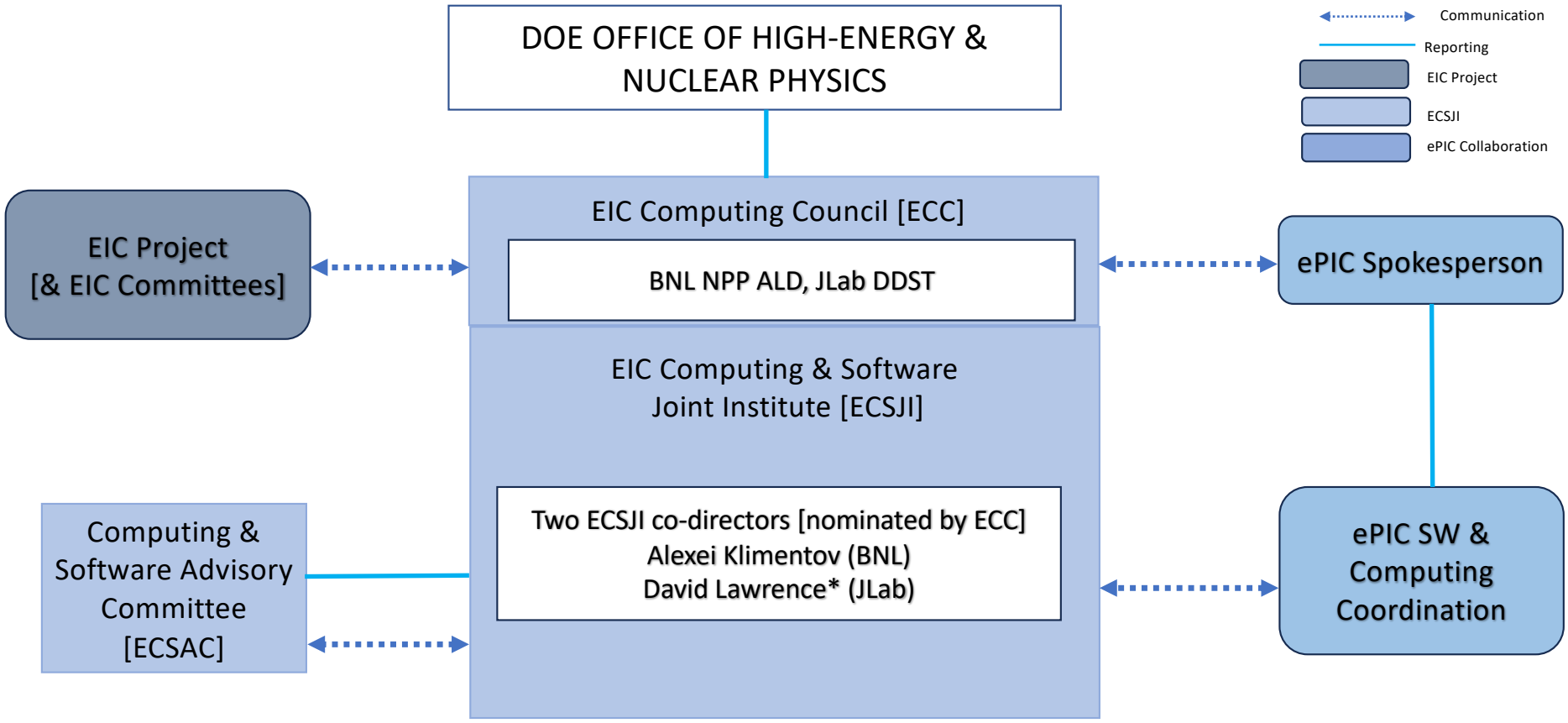
1. The EIC International Computing Organization (EICO) - Together with EICO Working Group
   - EICO Boards and Forums
   - EIC Computing in Global Context
   - ECSJI charter update
2. Echelon1 computing needs
   - BNL and JLab Requirements for ePIC/EIC Computing in 2027–2032
3. Echelon0 prototype at BNL, planned data challenges and Echelon0-Echelon1 joint tests

ECSJI Progress and Priorities. Important Events

Important events (since the last RRB)	2026
ECSJI talk at ePIC collaboration meeting	January 24
Regular meetings with **LHCONE** and ESnet (EIC network infrastructure)	Feb, Apr, May
EIC International Computing Organization annual meeting	May 18-19
Host Labs Responsibilities for collaborative services and tools (technical discussion)	June 17
Data streaming and workflow orchestration Technical Meeting (ESnet, BNL and JLab)	July 30 - 31
Echelon-0 (DAQ) first racks will be installed at the BNL Data Center	August
ECSAC review : ePIC and ECSJI software and computing review at BNL	October 13-14
EIC Computing (Echelon0 and Echelon1) workshop at BNL	October 15

*The **LHCONE** is a dedicated network architecture inter-connecting participating Resource Centre (RC) sites and allowing those sites to pool their computing resources for a more efficient distribution, storage, processing and analysis of physics data. Acceptable Use Policy ensures an appropriate secure scientific use of the overlay network and to protect the connected sites.* **Many EIC sites are LHCONE sites**

EIC Computing, DOE Context



v0.3 May 27, 2026

*)Amber Boehnlein (JLab) stepped down as co-director of ECSJI. David Lawrence (JLab) took over this role on 1 April 2026.

Progress and Priorities. Track 1 : EIC International Computing Organization I

- The RRB meetings in 2024/25 discussed international contributions for the EIC's extraordinary computing needs. The EICO charter was approved by the RRB at the November 2025 meeting.
- EICO (together with ePIC SW&C and ECSJI) is working on a mechanism for managing the contributions at a technical level is the EIC International Computing Organization to include representatives of the organizations contributing resources,
- Regular EICO/ECSJI meetings in 2024/26. These meetings are held every two weeks
  - The following points have been discussed :
    - Organization of funding for Nuclear and Particle Physics computing at the national level. Funding opportunities
    - International partners view and prospects on ePIC/EIC computing. Structure of computing for the EIC and for ePIC within each respective country. Existing support and commitment for EIC computing.
    - Echelon1 and Echelon2 roles
    - ePIC Streaming Computing Model
    - EIC Computing in global context (WLCG, OSG, LHCONE,…)
    - EICO boards and forums
    - EICO and RRB communication
    - Intellectual property

EICO Working Group


W.Deconick


C.Munoz Camacho


F.Bossu, A.Bressan, D.Elia, F.Noferini


T.Gunji

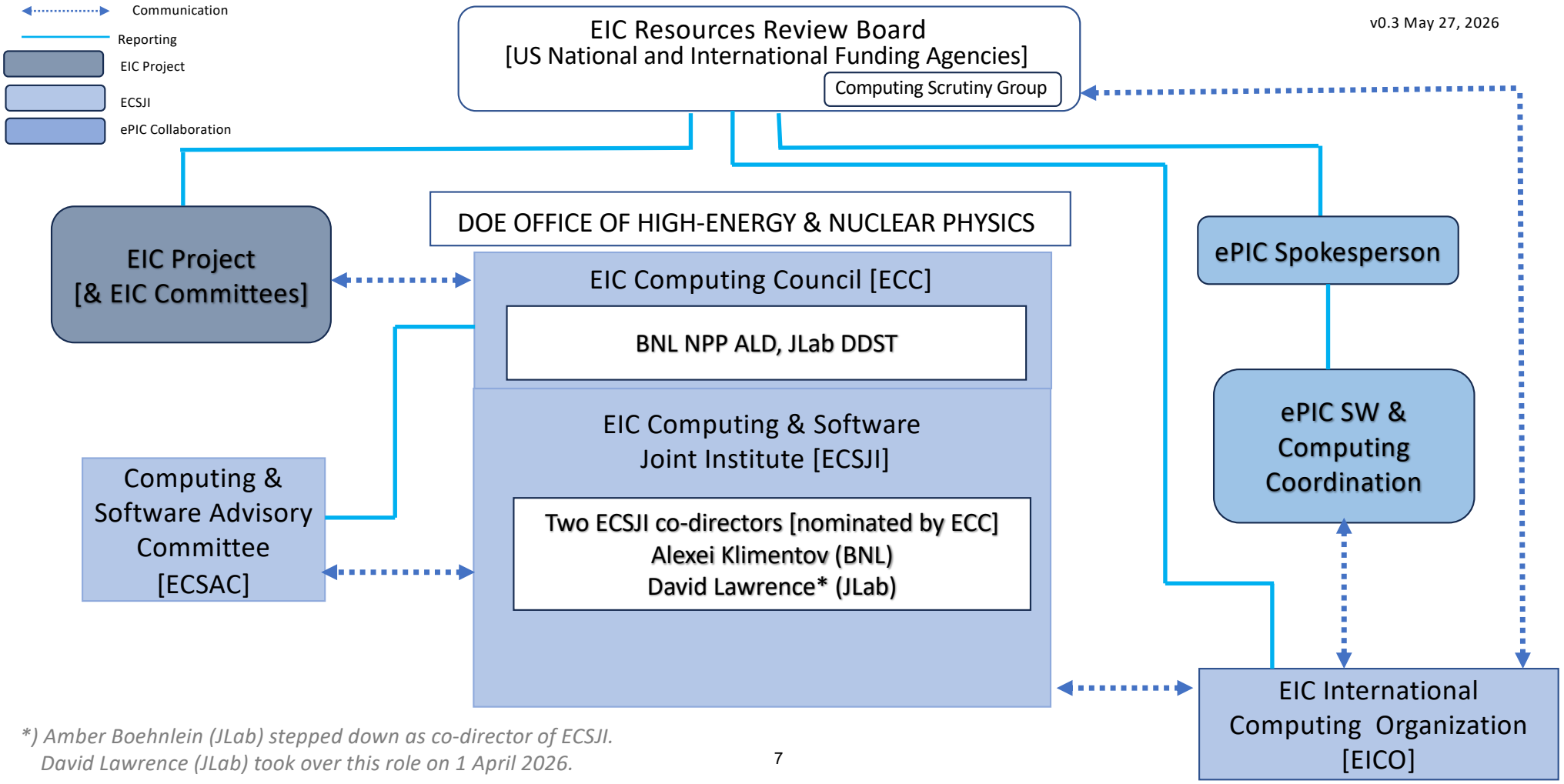

E.Yen


R.W.L.Jones, D.Sokhan

Host Labs and ePIC Reps

A.Boehnlein
M.Diefenthaler,
A.Klimentov,
D.Lawrence

EIC Computing, International Context



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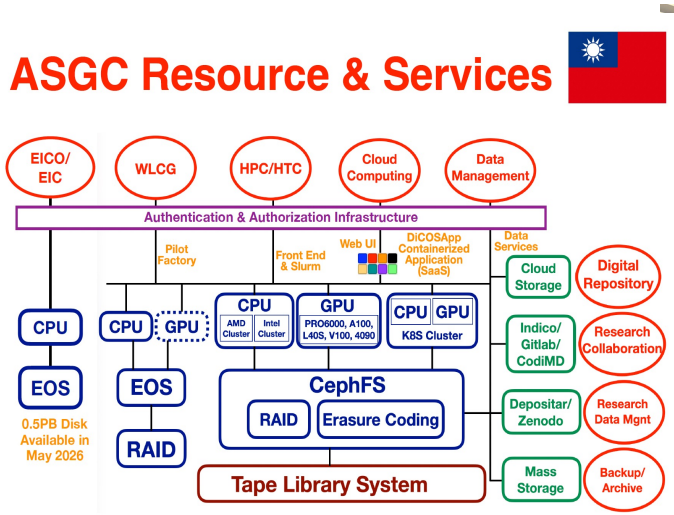
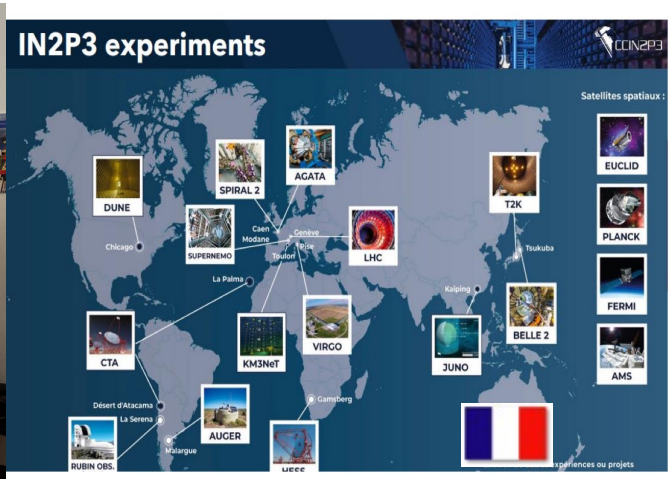
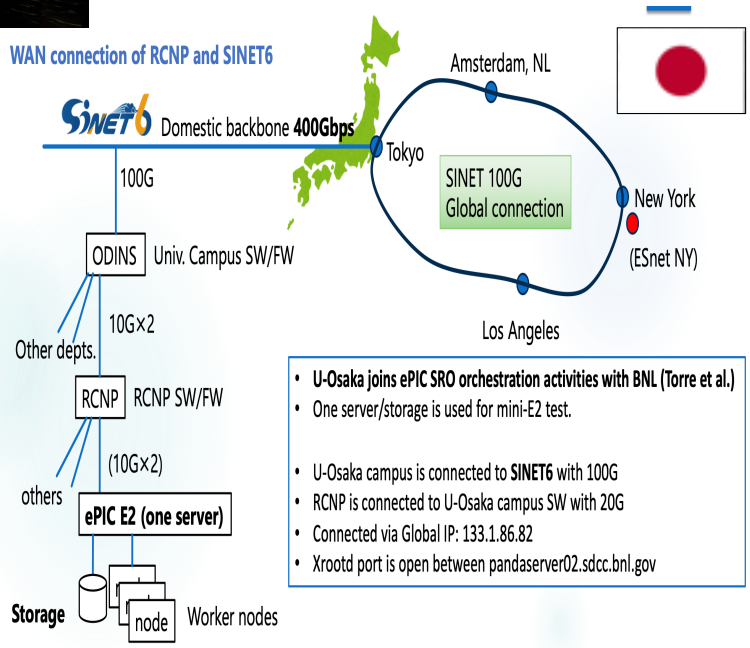

ASGC Resource & Services
EICO/ EIC
WLCG
HPC/HTC
Cloud Computing
Data Management
Authentication & Authorization Infrastructure
Pilot Factory
Front End & Slurm
Web UI
DiCOSApp Containerized Application (SaaS)
Data Services
CPU
EOS
0.5PB Disk Available in May 2026
CPU
GPU
EOS
RAID
CPU
AMD Cluster
Intel Cluster
GPU
PRO6000, A100, L40S, V100, 4090
CPU
GPU
K8S Cluster
CephFS
RAID
Erasure Coding
Tape Library System
Cloud Storage
Digital Repository
Indico/ Gitlab/ CodiMD
Research Collaboration
Depositar/ Zenodo
Research Data Mgnt
Mass Storage
Backup/ Archive


EICO Annual Meeting
May 18-19, 2026


IN2P3 experiments
Satellites spatiaux :
DUNE
SPIRAL 2
AGATA
T2K
EUCLID
PLANCK
SUPERNEMO
LHC
FERMI
CTA
KM3NeT
VIRGO
JUNO
BELLE 2
AMS
AUGER
RUBIN OBS.


ePIC
SFU fir
600 c-yr
ePIC
UM grex
1k c-yr
to Asia Pacific and Americas
vers l'Asie-Pacifique et l'Amérique
Digital Research Alliance of Canada


4 National Laboratories
20 Divisions
11 Groups
1 Computer Science Center
1 Tier1 & 9 Tier2
3 Other Institutions
LHC-Tier2 Milano
Milano-Bicocca
Trento
LHC-Tier2 Torino
Milano
Brescia
LHC-Tier2 Legnaro (PD)
Udine
Torino
Pavia
Padova
Trieste
Alessandria
Ferrara
LNF-National Laboratory Legnaro (PD)
Parma
INFN – CNAF Computer Science Center - Bologna
Genova
Bologna
LHC-Tier1 CNAF-Bologna
LHC-Tier2 Pisa
Pisa
Firenze
GGI Galileo Galilei Institute for Theoretical Physics - Arcetri (FI)
Perugia
LNGS-Gran Sasso National Laboratory - Assergi (AQ)
L'Aquila
LHC-Tier2 Roma
LHC-Tier2 Frascati (RM)
Roma I
LNF-National Laboratory Frascati (RM)
Roma II
Roma III
Sanità
Bari
Napoli
LHC-Tier2 Napoli
Salerno
Cagliari
Cosenza
Ettore Majorana Foundation and Centre for Scientific Culture - Erice (TP)
Messina
Catania
LHC-Tier2 Catania
LNS- Sud National Laboratory - Catania
Portopalo di Capo Passero (SR) Control Centre
WWW.GARR.IT


WAN connection of RCNP and SINET6
SINET6
Domestic backbone 400Gbps
Amsterdam, NL
Tokyo
SINET 100G Global connection
New York
(ESnet NY)
Los Angeles
100G
ODINS
Univ. Campus SW/FW
10G×2
Other depts.
RCNP
RCNP SW/FW
(10G×2)
others
ePIC E2 (one server)
Storage
node
Worker nodes
• U-Osaka joins ePIC SRO orchestration activities with BNL (Torre et al.)
• One server/storage is used for mini-E2 test.
• U-Osaka campus is connected to SINET6 with 100G
• RCNP is connected to U-Osaka campus SW with 20G
• Connected via Global IP: 133.1.86.82
• Xrootd port is open between pandaserver02.sdcc.bnl.gov

Progress and Priorities. Track 1 : EIC International Computing Organization II

EICO and ECSJI 2026 Annual Meeting at CERN May 18-19, 2026 (agenda, access code EICO@CERN2026)

Agenda

- ePIC Computing Model
- EIC Computing : Echelon1 and Echelon2 needs
- International partners view and prospects on ePIC/EIC computing
- Meeting with WLCG Leadership Team
- EIC Networking (LHCONE and ESnet infrastructure)
- EICO evolution : Overview Board composition and EIC Computing Technical Forum
- Preparation to EIC RRB in June

Meeting highlights and action items

- ✓ EIC Computing Technical Forum is established. Co-Chairs : F.Noferini (U & INFN Bologna) and A.Panta (JLab)
- ✓ WLCG Leader (T.Boccali) invited EICO and ePIC to be WLCG Associated members
- ✓ JLab will begin the formal process of transitioning to LHCONE
- ✓ EICO Overview Board. We will begin forming the EICO OB with the aim of completing it by January 2027. EICO members will hold discussions within EIC national groups and with funding agencies, and will propose one OB member per country.
- ✓ Six national teams (CA, FR, IT, JP, TW and UK) started (will start) a formal process to request Echelon2 resources
  - ✓ Potential Echelon2 centers are defined, 🇨🇦 E2s are already in production
  - ✓ Discussion about Cooperative Agreement (CRADA)
- ✓ Joint data challenges will be planned by ECSJI, EICO and ePIC
  - ✓ EICO members are already participating in many E1 activities

Progress and Priorities. Track 2 : Echelon1s computing needs I

The white paper, 'Estimate of BNL and JLab requirements for the ePIC/EIC computing in 2027-2032' (A.Boehnlein, M.Diefenthaler, and A.Klimentov), was written in response to the DOE Office of Nuclear Physics' request at the June 2025 EIC RRB meeting.

- The first draft was ready by mid-October 2025.
- The draft was discussed in detail at various meetings, including:
  - ePIC/ESCJI SW&Computing review (draft was supported by ECSAC)
  - EIC collider team
  - ePIC/EIC workshop, as well as with R.Ent and E.Aschenauer, and with the BNL ALD and JLab DDST.
- The paper was sent to Paul Mantica on 28 October 2025 and his comments were addressed.
- It was presented at the ePIC collaboration plenary session in January 2026 and discussed with ePIC DAQ (Echelon0) Leaders
- The draft was shared with the EICO Working Group and Discussed at EICO Annual Meeting in May 2026

Progress and Priorities. Track 2 : Echelon1s computing needs II

The computing request covers the period between 01/01/2027 until 12/31/2032. Computing procurement and deployment are aligned with the overall EIC Project schedule and the associated timelines for the development and deployment of the ePIC DAQ, Echelon1 computing, and AI components (and to have computing and SW compatible with Genesis mission [and AmSC]).

There are needs for ePIC/EIC computing in 2026-2029

- ePIC detector and physics performance studies for pre-TDR and Early Science report.
- Accelerator and beam-induced background studies
- EIC machine protection simulation (FLUKA)
- Simulations related to radiation studies
- DAQ data challenges and data streaming prototyping
- Data management and workload management services deployment and operations
- Development of the Echelon 0-1 Interface and related prototyping

EIC Computing

- Echelon0 computing facilities – funded by the EIC Project
- Echelon1 computing facilities – will be funded by EIC Operations
- Echelon2 extraordinary computing resources – will be funded by EIC International Computing Organization members

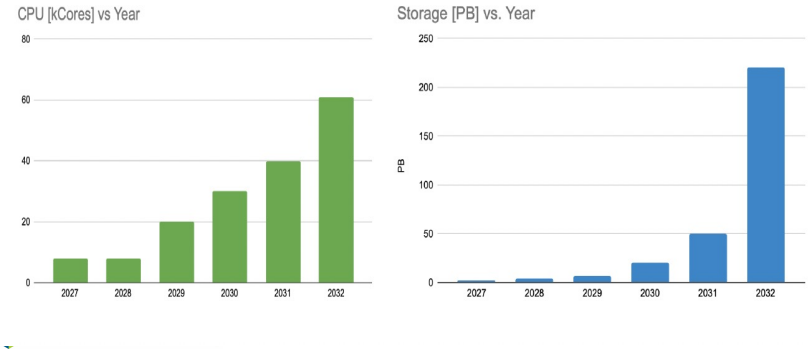
ePIC/EIC growth of computing needs at BNL and JLab [2027-2029]

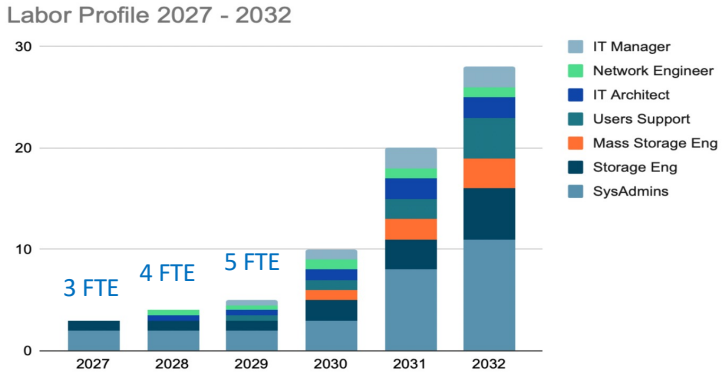
CPU and **Storage** Estimates 2027-2032

	Total ePIC/EIC need	Requested to US Echelon1	Total ePIC/EIC need	Requested to US Echelon1	Total ePIC/EIC need	Requested to US Echelon1
Year	computing [cores]	US Echelon1 computing [cores]	disk storage [PB]	US Echelon1 disk storage [PB]	tape storage [PB]	US Echelon1 tape storage [PB]
2027	16,000	8,000	10	2	-	-
2028	16,000	8,000	10	4	-	-
2029	40,000	20,000	15	7	1	1
2030	80,000	30,000	40	20	4	4
2031	120,000	40,000	100	50	40	40
2032	160,000	61,000	400	220	200	200

- *There is a gap in the funding of IT resources between the EIC project and EIC operations, and the DOE's OHENP is aware of this. According to DOE OHENP it is necessary that the laboratories prioritize their allocation of facility operations funds to address this gap*
- *The computing requirements of the host laboratories appear reasonable, and the DOE (in collaboration with BNL and JLab) is working on how IT costs for the period 2027–2029 could be incorporated into the EIC portfolio.*
- *The DOE does not foresee any fundamental issues regarding Echelon 1 funding from the CY2027 onwards. However, EIC compute needs will have to the addressed within the constraints the program has shared with the laboratory leadership*

CPU and **Storage** profiles 2027-2032





Progress and Priorities. Track 2 : Echelon1s computing needs. Summary

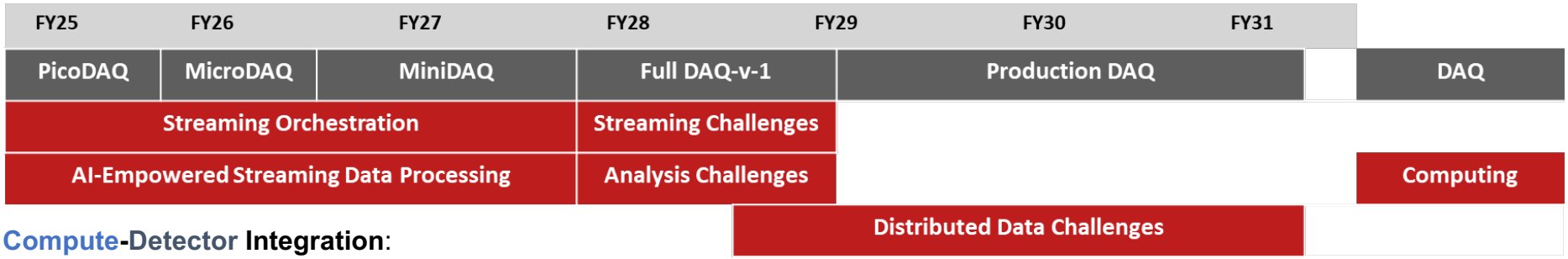
1. There is a request for dedicated ePIC and EIC project (collider) computing resources (compute, storage, tape, operational support) at both labs today.
   - EIC project storage needs are small for the next 2-3 years, but CPU needs are a few-1000 CPU x86 (cores), as compared to core needs for EIC/ePIC streaming and data challenges and stress tests (8000, 8000 and 20000 cores, for US Echelon-1 in 2027, 2028 and 2029, resp.)
   - The ePIC simulation requires significant CPU resources and growing storage capacity, some of which could be opportunistic or EICO resources. However, there is no opportunistic storage, This requires dedicated storage resources from host laboratories and international partners.

2. There are DAQ (Echelon0) plans for early prototyping starting from summer 2026.

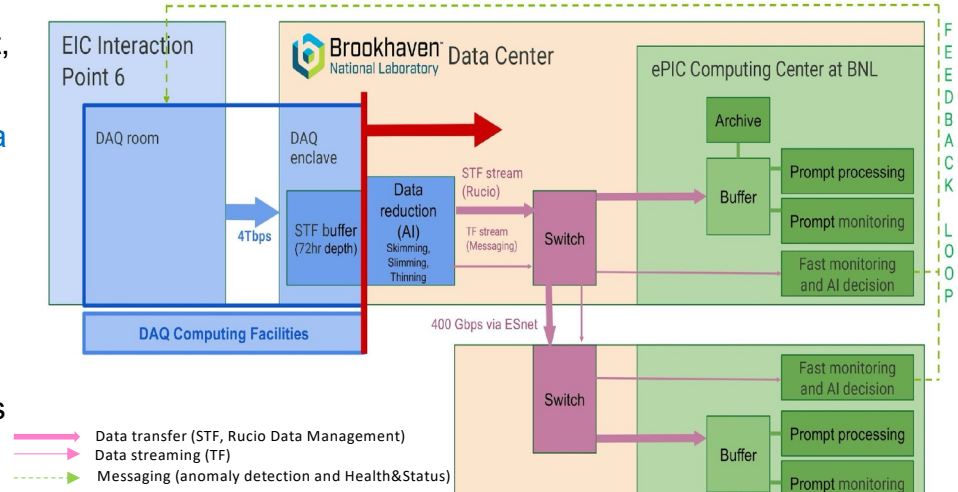
3. BNL and JLab work on the plan to bridge the gap in computing in 2027-2029

4. We believe that we should start the early deployment of computing facilities at both labs in CY27, ramping up slowly (depending on the EIC schedule). The slower ramp-up of computing needs in the period of 2027-2029 may need to be bridged while DOE support for computing needs to ensure later Echelon-1 readiness for outyears is secured and while the team strives to be ready to run the host labs' facilities (including the new generation of leaders).

Progress and Priorities. Track 3 : Echelon0 planned data challenges and Echelon0-Echelon1 joint tests



- **Compute-Detector Integration**:
  - Joint deliverables between DAQ (Echelon-0) and computing (Echelons-1) to develop integrated systems for detector readout, data processing, and ultimately physics analysis.
- DAQ is planning to install the first DAQ Enclave prototype at BNL Data Center in Jul-Aug 2026
- ePIC streaming orchestration testbed prototype at BNL should be available for Echelon0-Echelon1 tests by September 2026
- Mini-Data Challenges between BNL and JLab will begin in the fall of 2026 (together with ESnet)
- MiniDAQ available in FY27, work ongoing on streaming orchestrations
- First version Full DAQ available in FY28/FY29, **Streaming and Analysis Challenges** required
- Production DAQ available in FY29/FY30, Initiate **Distributed Data Challenges**



Data Orchestration and Data streaming testbeds/demos scope is right of the red line. Also part of AmSC demos (BNL and JLab lead them)

Summary

- The EIC Computing and Software Joint (BNL and JLab) Institute is working in close collaboration with the EIC, ePIC SW&Computing and International Computing groups. The importance of the Joint Institute for EIC computing was acknowledged by the EIC Computing and Software Advisory Committee, EIC project and ePIC.

- The EIC International Computing Organization is progressing rapidly. The next step will be to establish closer collaboration with the WLCG and the LHCONE (ESnet)
  - An EICO Overview Board and an EIC Computing Technical Forum will be formed this year
  - Draft version of Cooperation Agreement will be developed by EICO working group

- The main priority for 2026/27 is to set up the Echelon 1 prototype in the host laboratories, in order to support the EIC Project and ePIC activities, including first data challenges with Echelon 0.

Acknowledgments

This talk drew on materials, discussions, comments, input from many. Thanks to all, including those we've missed…

- EICO working group : *F.Bossu, A.Bressan, W.Deconick, D.Elia, R.W.L.Jones, C.Munoz Camacho, F.Noferini, D.Sokhan, T.Gunji, E.Yen*
- ePIC SW&Computing coordination : *M.Diefenthaler and T.Wenaus*
- BNL and JLab colleagues : *E.Aschenauer, A.Boehnlein, D.Dean, A.Deshpande, J.Dunlop, J.Elmsheuser, R.Ent, B.Sawatsky*
- DOE OHENP : *P.Mantica*

Glossary and Abbreviations

- AHM – All Hands Meeting
- ALD – Associated Laboratory Director
- AmSC – American Science Cloud DOE project
- CM – Computing Model
- DDST – Deputy Director for Science and Technology
- E0, E1, E2 – Echelon0, 1, 2 sites according to ePIC computing model
- ECC - EIC Computing Council
- ECSAC – EIC Computing and Software Advisory Committee
- EICO – EIC International Computing Organization
- ECSJI – EIC Software and Computing Joint Institute
- IKC – in-kind contribution
- LHCONE – LHC centers dedicated network
- MB – Management Board
- NPP – Nuclear and Particle Physics
- OB – Overview Board
- OHENP – DOE Office of High-Energy & Nuclear Physics
- OSG - Open Science Grid (NSF supported computing consortium)
- RRB – Resource Review Board
- SLA – Service Level Agreement
- SW&C – Software and Computing
- TF – Technical Forum
- TIM – Technical Interchange Meeting
- WLCG – World LHC Computing Grid