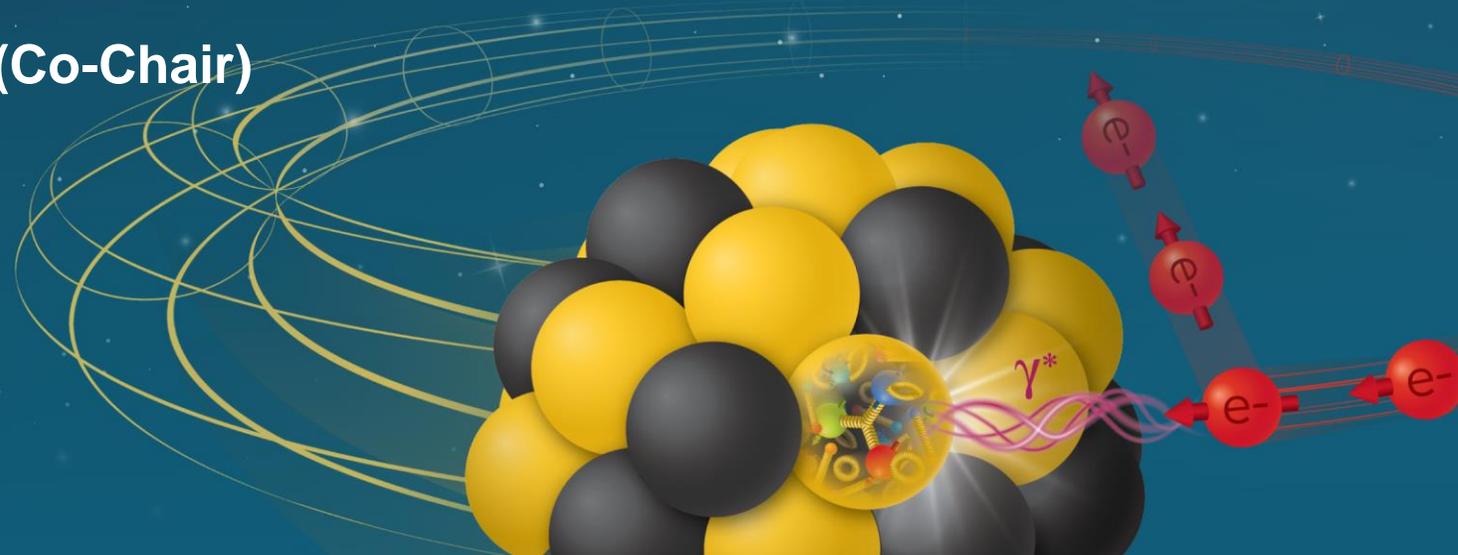


EIC International Accelerator Collaboration Commissioning Tool Workgroup

Status Update @ IPAC'25

Yue Hao (Co-Chair) and Jean-Luc Vay (Co-Chair)

Electron-Ion Collider



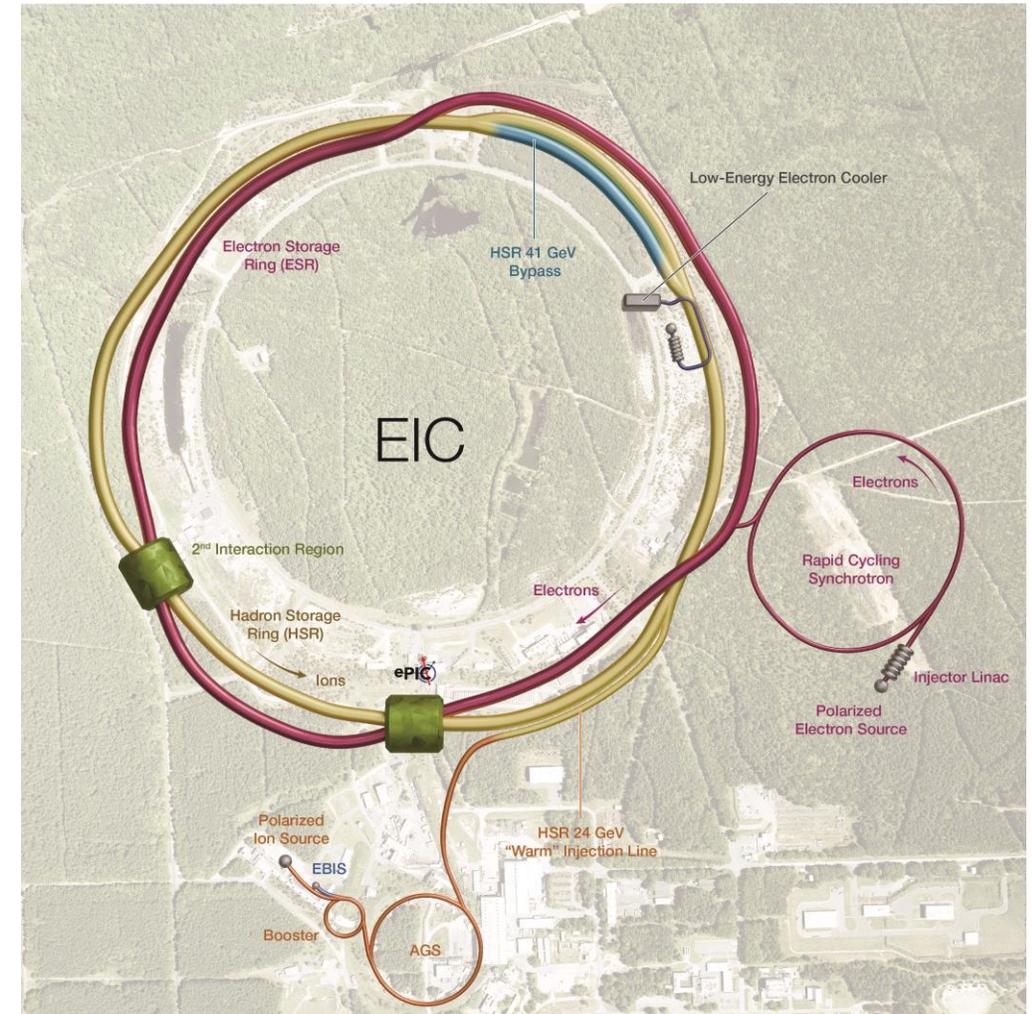
Commissioning Tool Working Group

- 26 participants from 10 institutes actively participate in the discussion
- Community effort, benefit EIC and member's home facilities
 - Brew new developments to attract R&D and other off-project fundings
- Kick off meeting in March 2025, followed by monthly meeting
- Discussion Topics
 - High level physics application(HLPA) and Virtual Accelerator (VA)
 - Interfacing with EPICS control system
 - Machine Portal for multiple design/beam dynamics software
 - AI/ML integration and path forward to digital twins
- We welcome anyone with an interest in these topics to participate

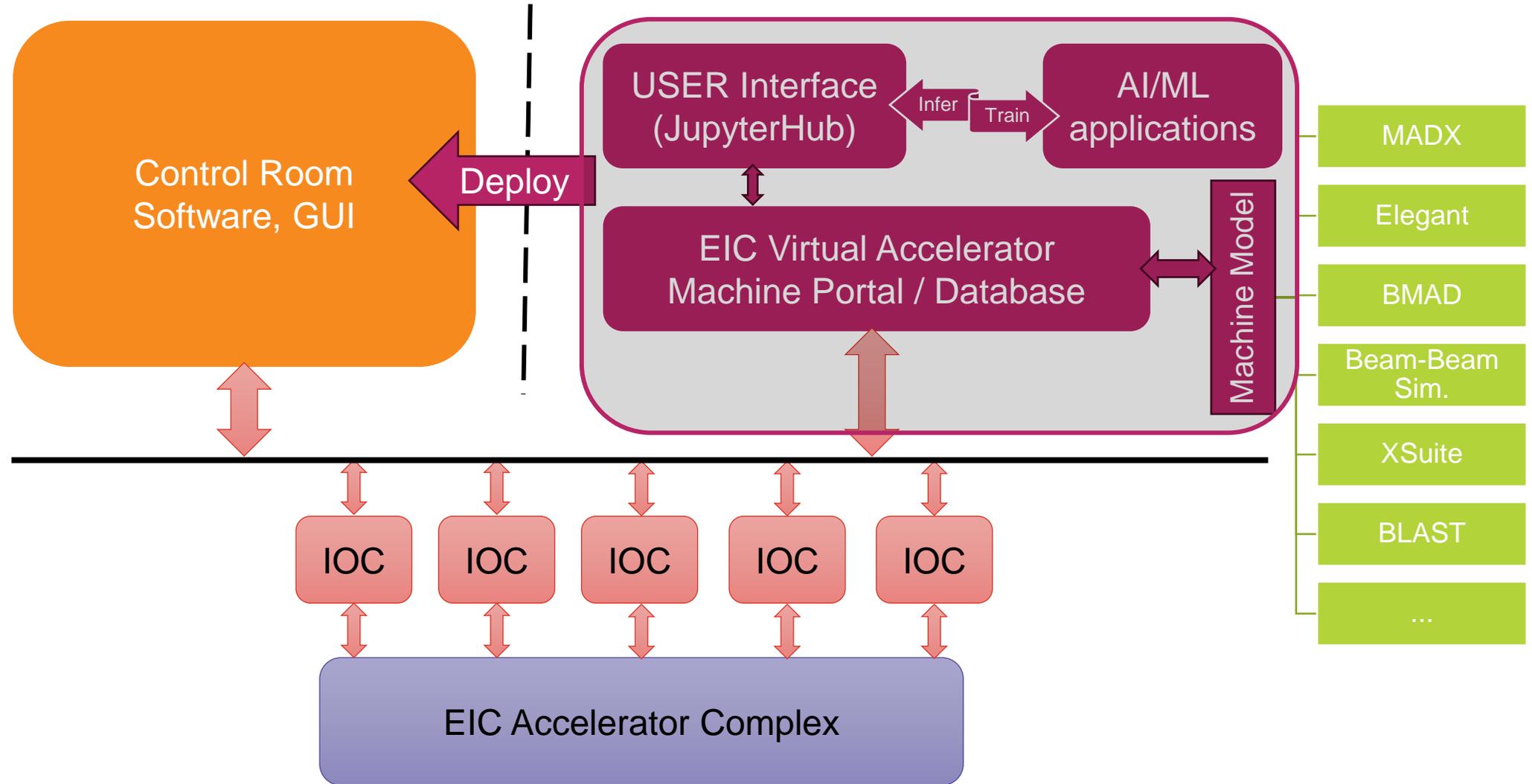
Requirement for EIC Virtual Accelerator

Facilitate efficient development, test and integration of commissioning tools:

- Multi-fidelity simulations at various time-scale beam quality optimization.
- Start-to-end online model with (multiple) real-time simulation tools for orbit, optics, crabbing properties and spin, injection / extraction and synchronization.
- Migrate mature tools to control room applications.
 - W/ a user-friendly interface to the EPICS control system.
- Ready for data-driven/Machine learning model, training and inference, and development towards digital twin.



Plans for EIC VA



EIC VA is benefiting from the Community

- EIC VA is learning from the experiences of other accelerator facilities.

Name of the virtual	Which control system protoc	Which simulation cod	Are there any paper, t	What are the main feature of the current V	What are the main cha	Please share you com
Advanced Photon Sourc	EPICS, but no real VA.	No real VA. Primary codes	N/A	We have a live lattice model that is sometimes r	Magnet hysteresis is signifi	We had several virtual acce
CBetaV	EPICS	Bmad/Tao	C. Gulliford, D. Sagan, A. B	The flexibility built into the Bmad toolkit and th	Computation speed at the electron gun where space c	
virtaccel	EPICS Channel Access	Tracy, and pluggable with	https://accelconf.web.cer	Provide simulated beam behavior through EPIC	Performance. Also, emulat	Start early, define scope, ar
Virac	EPICS	PyORBIT	USING A PARTICLE-IN-CELL	Can be run as a live server that has identical com	Balancing customization v	The scope of a virtual accele
Virtual accelerator CBET	CBETA-V with EPICS, CESR-V with	Bmad in CBETA-V and in CE	Short notes on CBETA-V an	Full models of CBETA and of CESR that are const	Our systems are largely use	Our Digital Twins and the B
NSLS-II	Epics	tracy and elegant	I think G Shen wrote a con	It is only good to test high level applications for	No collective beam effects	The synchronization of timi
BELLA Complex	BELLA GEECS (homegrown)	BLAST: WarpX and Impact	https://indico.cern.ch/ev	Since simulations for plasma-based acceleration	Limitations:- Cost of individual simulations (~10 min	
Beam, pLasma & Accele	BELLA GEECS (homegrown)	BLAST codes: WarpX, Imp	WarpX: https://blast-warp	Simulations of particle beams generation, acceleration, transport and crossing. BLAST codes have been		

- EIC plans to adopt (& help develop) the new accelerator standard PALS, to fit the need of multi-physics modeling needs.
 - <https://github.com/campa-consortium/pals>

Particle Accelerator Lattice Standard (PALS)

This standard is an effort to create a standard to promote lattice information exchange for particle accelerators.

PALS Standard

- [Overview](#)
- [What PALS Is](#)
- [What PALS Is Not](#)
- [Introduction](#)
- [Conventions](#)

Thank you!

Please reach out if you are interested in joining this effort.