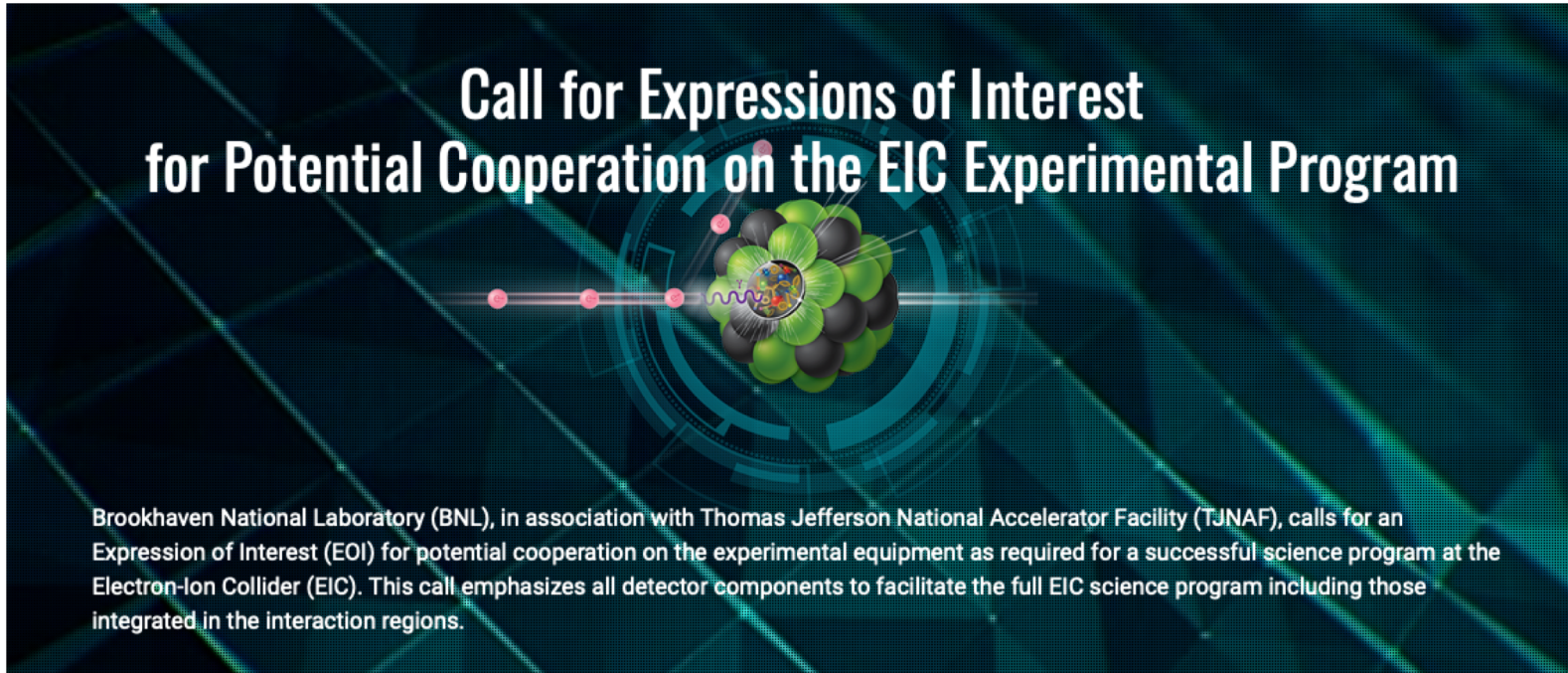


Expression of Interest for Software

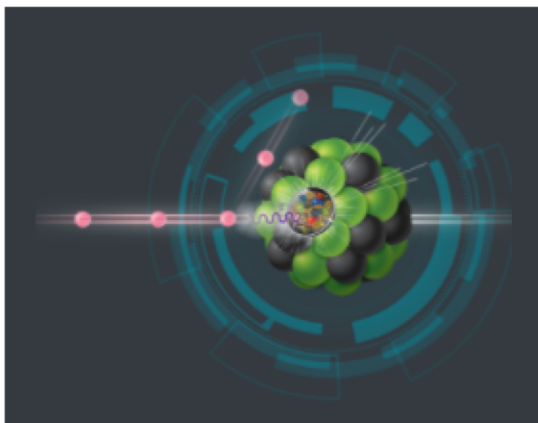
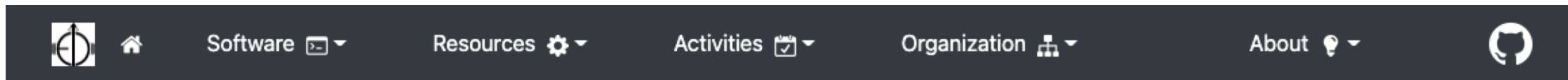


**Call for Expressions of Interest
for Potential Cooperation on the EIC Experimental Program**

Brookhaven National Laboratory (BNL), in association with Thomas Jefferson National Accelerator Facility (TJNAF), calls for an Expression of Interest (EOI) for potential cooperation on the experimental equipment as required for a successful science program at the Electron-Ion Collider (EIC). This call emphasizes all detector components to facilitate the full EIC science program including those integrated in the interaction regions.

Andrea Bressan (Trieste), Markus Diefenthaler (JLAB), Torre Wenaus (BNL)

EICUG Software Working Group (<https://eic.github.io>)



Purpose of this site

This is the main portal to the EIC software, repositories, documentation and resources. It is developed and maintained by the EIC Software Group.

Questions? Contact the EICUG Software Working Group Conveners:
eicug-software-conveners@eicug.org

News

Software News July	2020-07-31
Software News June	2020-06-24
Software News April	2020-04-07

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Site built at 2020-11-30 16:23:42 -0500

Science problem space in Nuclear Physics

- Focus on non-perturbative QCD phenomena
- MC event generators for spin-dependent measurement, including novel QCD phenomena (GPDs, TMDs)
- **Analyses considering large number of signal events simultaneously** (or multiple times)
 - **Contrary** to separating a few events from a large number of background events
 - **Example** complexity of multi-dimensional, strongly correlated relationships among data opposed to search of rare events with novel topologies
 - **Example** high-precision results which require complex analyses to control systematic uncertainties
 - Require unique software and computing strategies

Community input for Expression of Interest

Software Needs

Requirements What software needs for EIC Software would you like to highlight now, in a few years, and for the completion of the EIC project?

Technologies & Techniques What software technologies and techniques should be considered for the EIC?

Meeting Software Needs

What resources can your group contribute?

Expression of Interest for Software

1

Expression of Interest (EOI) for Software

Please indicate the name of the contact person for this submission:

Conveners of the Software Working Group:

- A. Bressan, M. Diefenthaler, and T. Wenaus
- eicug-software-conveners@eicug.org

Please indicate all institutions collectively involved in this submission of interest:

ANL	Argonne National Laboratory	29 institutions
BNL	Brookhaven National Laboratory	
CEA/Irfu	IRFU at CEA /Saclay institute	
EIC-India	Akal University, Central University of Karnataka, DAV College Chandigarh, Goa University, Indian Institute of Technology Bombay, Indian Institute of Technology Delhi, Indian Institute of Technology Indore, Indian Institute of Technology Patna, Indian Institute of Technology Madras, Malaviya National Institute of Technology Jaipur, Panjab University, Ramkrishna Mission Residential College Kolkata	
IMP-CAS	Institute of Modern Physics - Chinese Academy of Sciences	
INFN	Istituto Nazionale di Fisica Nucleare	
JLab	Thomas Jefferson National Accelerator Facility	
LANL	Los Alamos National Laboratory	
LBNL and UC Berkeley	Lawrence Berkeley National Laboratory and University of California, Berkeley	
NCBJ	National Centre for Nuclear Research	
OhioU	Ohio University	
ORNL	Oak Ridge National Laboratory	
SBU	Stony Brook University	
SLAC	SLAC National Accelerator Laboratory	
SU	Shandong University	

<https://indico.bnl.gov/event/8552/contributions/43221/>

Common Projects

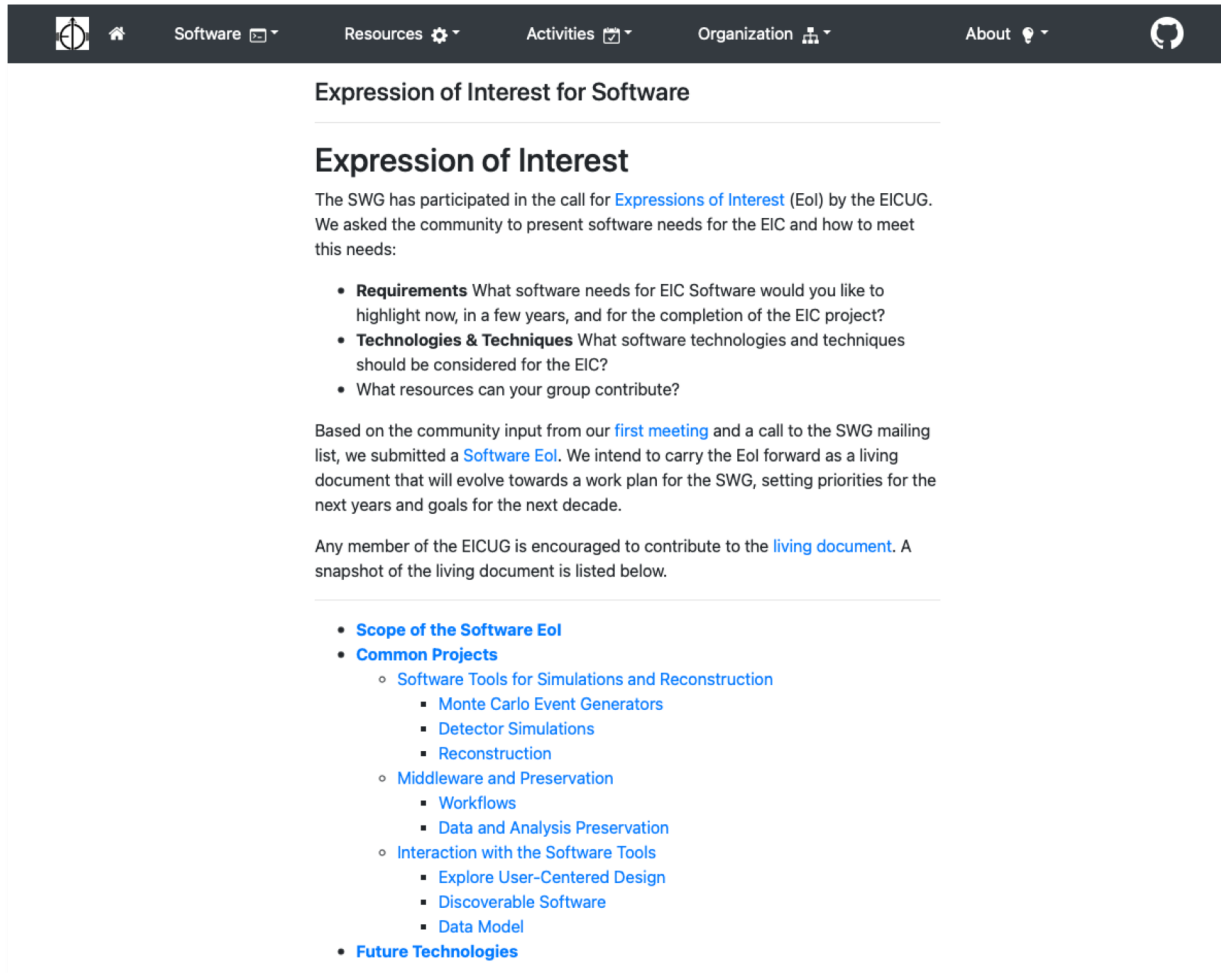
- **Software Tools for Simulations and Reconstruction**
 - Monte Carlo Event Generators
 - **Detector Simulations**
 - Reconstruction
- **Middleware and Preservation**
 - Workflows
 - Data and Analysis Preservation
- **Interaction with the Software Tools**
 - Explore User-Centered Design
 - Discoverable Software
 - Data Model

Future Technologies

- Artificial Intelligence
- Heterogeneous computing
- New languages and tools
- Collaborative software

Evolving the Eol towards a work plan for the SWG

<https://eic.github.io/activities/eoi.html>



The screenshot shows the top navigation bar with links for Software, Resources, Activities, Organization, and About. The main content area is titled "Expression of Interest for Software" and contains the following text and lists:

Expression of Interest

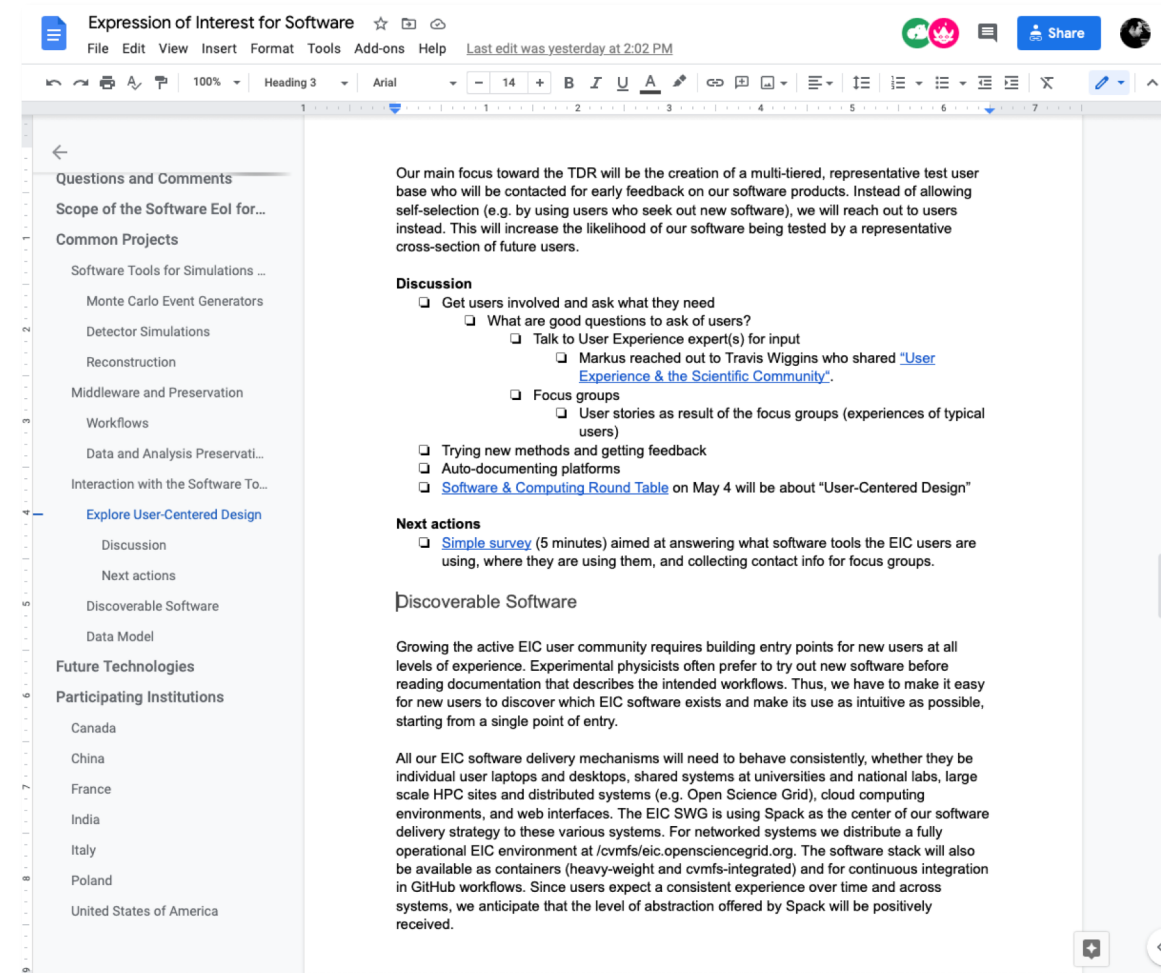
The SWG has participated in the call for [Expressions of Interest](#) (Eoi) by the EICUG. We asked the community to present software needs for the EIC and how to meet this needs:

- **Requirements** What software needs for EIC Software would you like to highlight now, in a few years, and for the completion of the EIC project?
- **Technologies & Techniques** What software technologies and techniques should be considered for the EIC?
- What resources can your group contribute?

Based on the community input from our [first meeting](#) and a call to the SWG mailing list, we submitted a [Software Eoi](#). We intend to carry the Eoi forward as a living document that will evolve towards a work plan for the SWG, setting priorities for the next years and goals for the next decade.

Any member of the EICUG is encouraged to contribute to the [living document](#). A snapshot of the living document is listed below.

- **Scope of the Software Eoi**
- **Common Projects**
 - [Software Tools for Simulations and Reconstruction](#)
 - [Monte Carlo Event Generators](#)
 - [Detector Simulations](#)
 - [Reconstruction](#)
 - [Middleware and Preservation](#)
 - [Workflows](#)
 - [Data and Analysis Preservation](#)
 - [Interaction with the Software Tools](#)
 - [Explore User-Centered Design](#)
 - [Discoverable Software](#)
 - [Data Model](#)
- **Future Technologies**





The screenshot shows the same content as the previous image but in a rich text editor interface. The editor title is "Expression of Interest for Software" and it includes a menu bar with options like File, Edit, View, Insert, Format, Tools, Add-ons, and Help. The content is identical to the website screenshot, including the navigation bar, title, introductory text, bullet points, and lists.


Towards the next-generation Nuclear Physics research model


FUTURE TRENDS IN
**NUCLEAR PHYSICS
COMPUTING**

SYMPOSIUM: MAY 2 • 1:00 p.m.
Main Auditorium • Free Admission


 NUCLEAR PHYSICS IN A DECADE
Donald Geesaman (ANL)

 NUCLEAR PHYSICS COMPUTING IN A DECADE
Martin Savage (INT)

 MONTE-CARLO EVENT SIMULATION IN A DECADE
Stefan Hoeche (SLAC)

 SYNERGY OF COMPUTING AND THE NEXT GENERATION
OF NUCLEAR PHYSICS EXPERIMENTS
Rolf Ent (JLAB)

RECEPTION TO FOLLOW

WWW.JLAB.ORG/CONFERENCES/TRENDS2017 



Donald Geesaman (ANL, former NSAC Chair) “*It will be **joint progress of theory and experiment** that moves us forward, not in one side alone*”

- All scientists of all levels, worldwide, should be enabled to actively participate in the NP data analysis.
- To achieve this goal, we must develop analysis toolkits using modern and advanced technologies while hiding that complexity (**Explore User-Centered Design**).
- We must emphasize **data** as much as **analysis**. Experimental data must be open access, **readily accessible** and in self-describing formats.

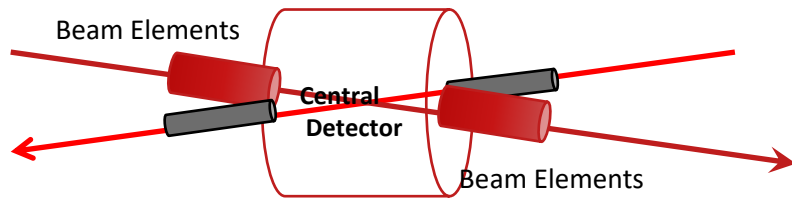
Compute-detector integration to deliver **analysis-ready data from the DAQ system**:

- responsive alignment and calibrations in *real time / online*
- *real-time / online* event reconstruction and filtering
- *real time / online* physics analysis

Machine-Detector interface (MDI)

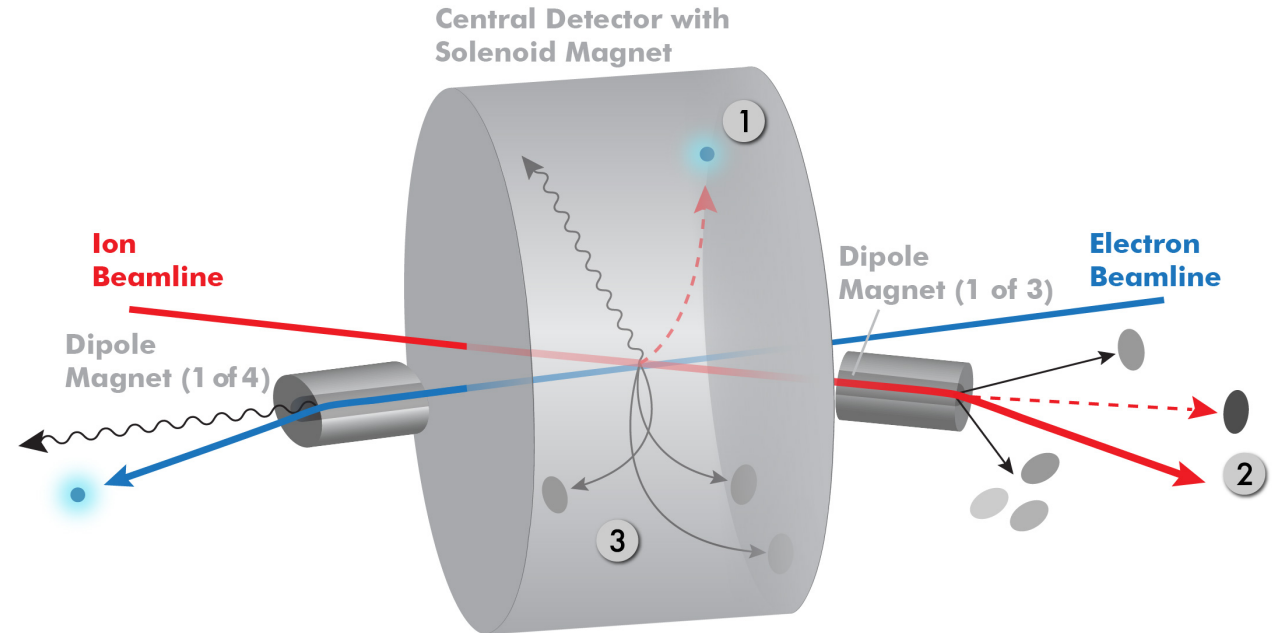
Integrated interaction region and detector design to optimize physics reach

The aim is to get **~100% acceptance** for all final state particles, and measure them with good resolution.



Experimental challenges:

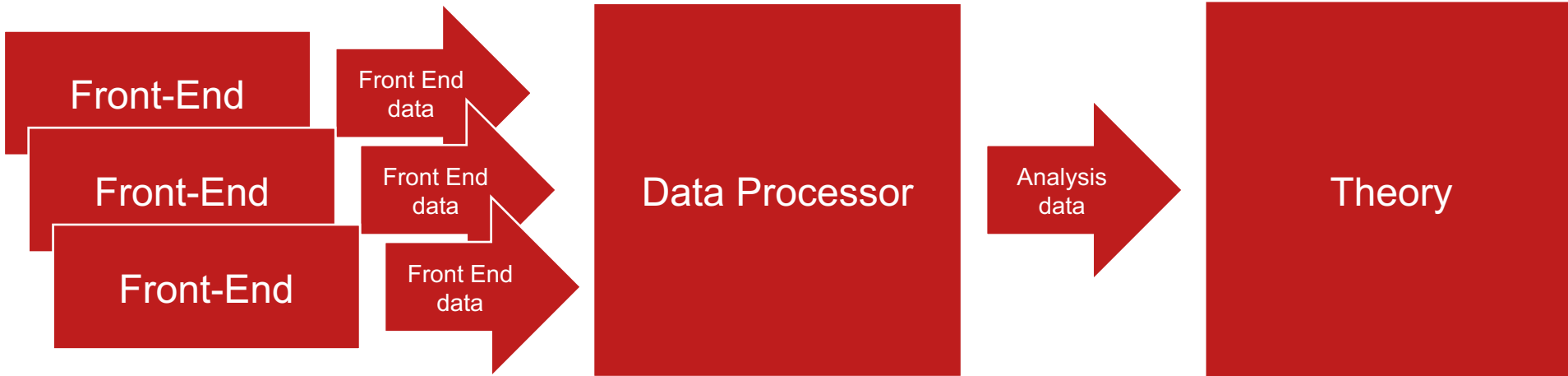
- beam elements limit forward acceptance
- central Solenoid not effective for forward



Possible to get ~100% acceptance for the whole event.

Beyond Machine-Detector Interface

Integration of DAQ, analysis and theory to optimize physics reach



research model with seamless data processing from DAQ to data analysis

- not about building the best detector
- but the best detector that fully supports streaming readout, fast alignment and calibration, and reconstruction algorithms for near real-time analysis

Community building

BROOKHAVEN NATIONAL LABORATORY & **Jefferson Lab**

FUTURE TRENDS IN NUCLEAR PHYSICS COMPUTING

SEPT. 29 - OCT. 1, 2020

The workshop focuses on the Nuclear Physics Software & Computing community. We will identify what is unique about our community and we will discuss how we can strengthen common efforts and chart a path for Software & Computing in Nuclear Physics for the next ten years.

TOPICS:

- Common Scientific Software
- The Role of Data Centers in Scientific Discovery
- Unique Software Challenges for Nuclear Physics

PROGRAM COMMITTEE:

Alexander Kiselev (BNL)
Amber Boehnlein (JLAB)
Graham Heyes (JLAB)
Mark Ito (JLAB)
Markus Diefenthaler (JLAB)
Ofer Rind (BNL)
Paul Laycock (BNL)
Torre Wenaus (BNL)

<https://indico.bnl.gov/event/9023/>

BROOKHAVEN NATIONAL LABORATORY & **Jefferson Lab**

WORKSHOP REPORT

FUTURE TRENDS IN NUCLEAR PHYSICS COMPUTING

SEPT. 29 - OCT. 1, 2020

EDITORS

Alexander Kiselev (BNL)	Markus Diefenthaler (JLAB)
Amber Boehnlein (JLAB)	Ofer Rind (BNL)
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<https://indico.bnl.gov/event/9023/>

BROOKHAVEN NATIONAL LABORATORY & **Jefferson Lab** & **HSF**


SOFTWARE & COMPUTING *round table*

Exploring the future of Software & Computing in HEP, NP, and beyond.

Encouraging knowledge transfer and promoting common projects in the scientific community.

Emphasizing the interplay of Software & Computing and science.

01/12	Community Activities
02/09	I/O for the Future
03/02	Best Practices: Tools
04/06	Data on the Network
05/04	User-Centered Design
06/01	Analysis Workshop
07/06	Streaming readout

 www.jlab.org/roundtable

Report **Draft** (28 pages and growing)

Software Eol

SWG conveners

eicug-software-conveners@eicug.org

- **All aspects of software**
 - From physics and detector simulations to online and offline analysis,
 - but not computing infrastructure.
- Based on the input from the EICUG at large and with contributions from 29 member institutions.
- The SWG carries the Eol forward as a living document that is evolving towards a work plan for the SWG, setting priorities for the next years and goals for the next decade.
- **Many opportunities to get involved!**

