



FRIB

Beamline and Controls Interface Working Panel Update

Jeromy Tompkins
NSCL Physicist

MICHIGAN STATE
UNIVERSITY



U.S. DEPARTMENT OF
ENERGY

Office of
Science

Controls Interface Panel Members

Name	Affiliation	Experiment / Device Association
Daniel Bazin	NSCL	S800 / HRS
Chris Campbell	LBNL	GRETA
Daron Chabot	FRIB	Controls system
Kelly Chipps	ORNL	JENSA
Mario Cromaz	LBNL	GRETA
Marc Hausmann	FRIB	ARIS
Shea Mosby	LANL	HRS
Jeromy Tompkins	NSCL	Data acquisition



Report is Online for Community Review

https://www.phy.ornl.gov/fribdaq/script/Panels/Controls/ControlsInterface_Panel_Report_final.html

Please provide feedback to tompkins@nscl.msu.edu.



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Overview

- Expectations for FRIB
- Design decisions of FRIB controls system
- Experiment requirements and recommendations
- Tools for interfacing

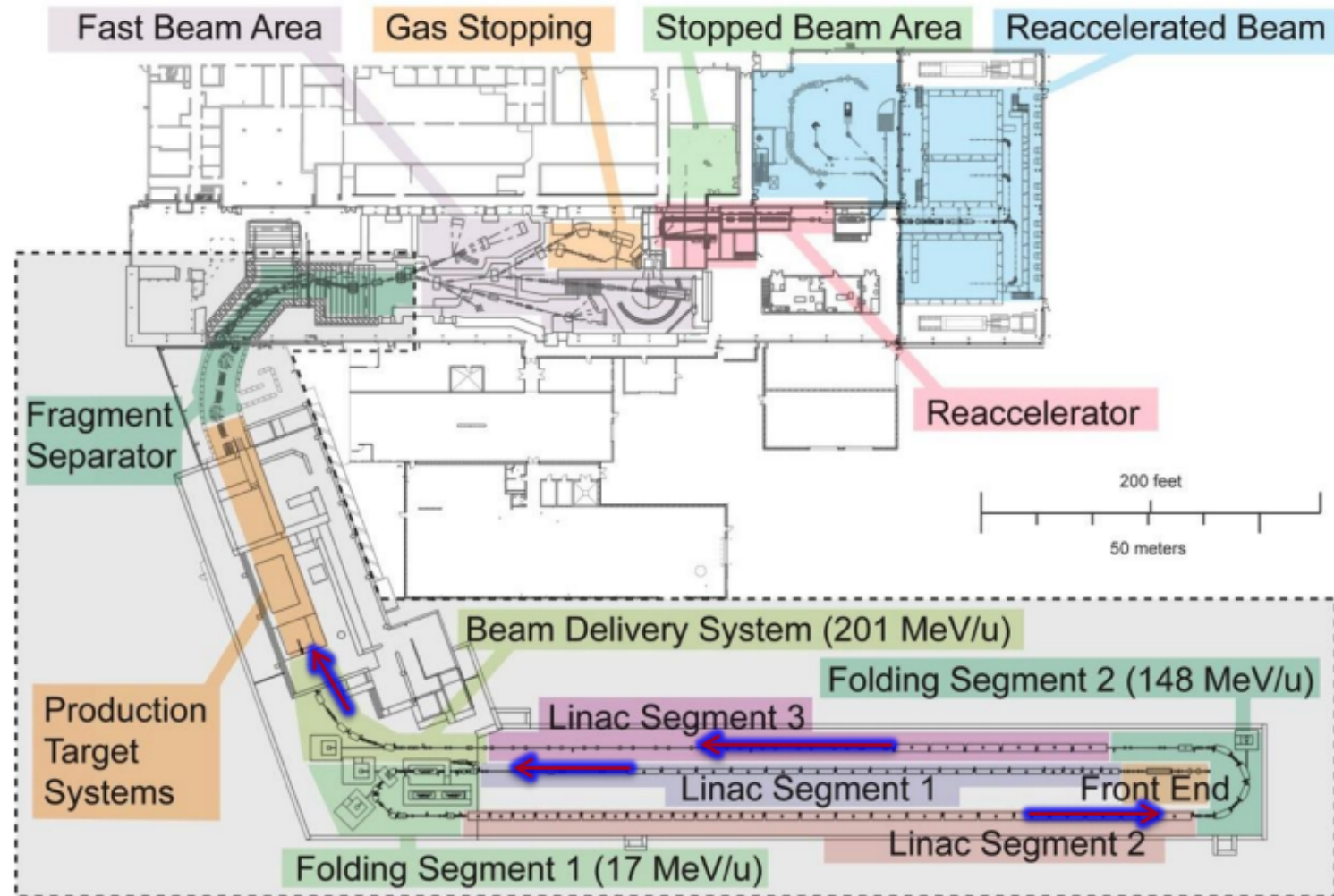


Expectations about FRIB

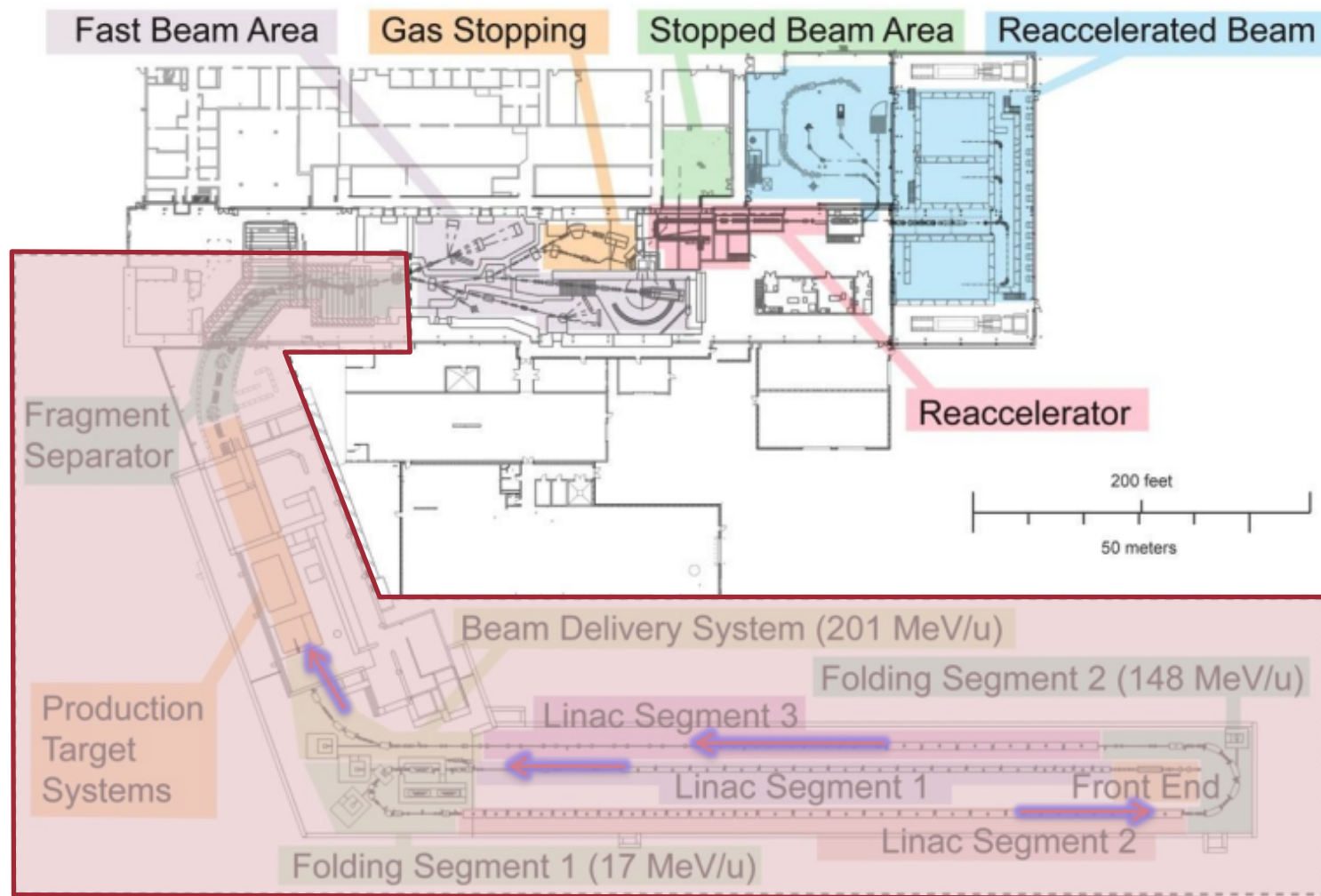
1. Experiment detector systems will interact with the controls system
2. FRIB experiments are expected to involve greater remote participation than NSCL experiments.
3. FRIB experiments are expected become more complex and device experts may be offsite
4. FRIB network will be separated into a controls and DAQ network
5. Detector systems permanently installed at FRIB will be integrated into the FRIB controls system. Other detector systems requiring a controls system will have to provide their own independent system.



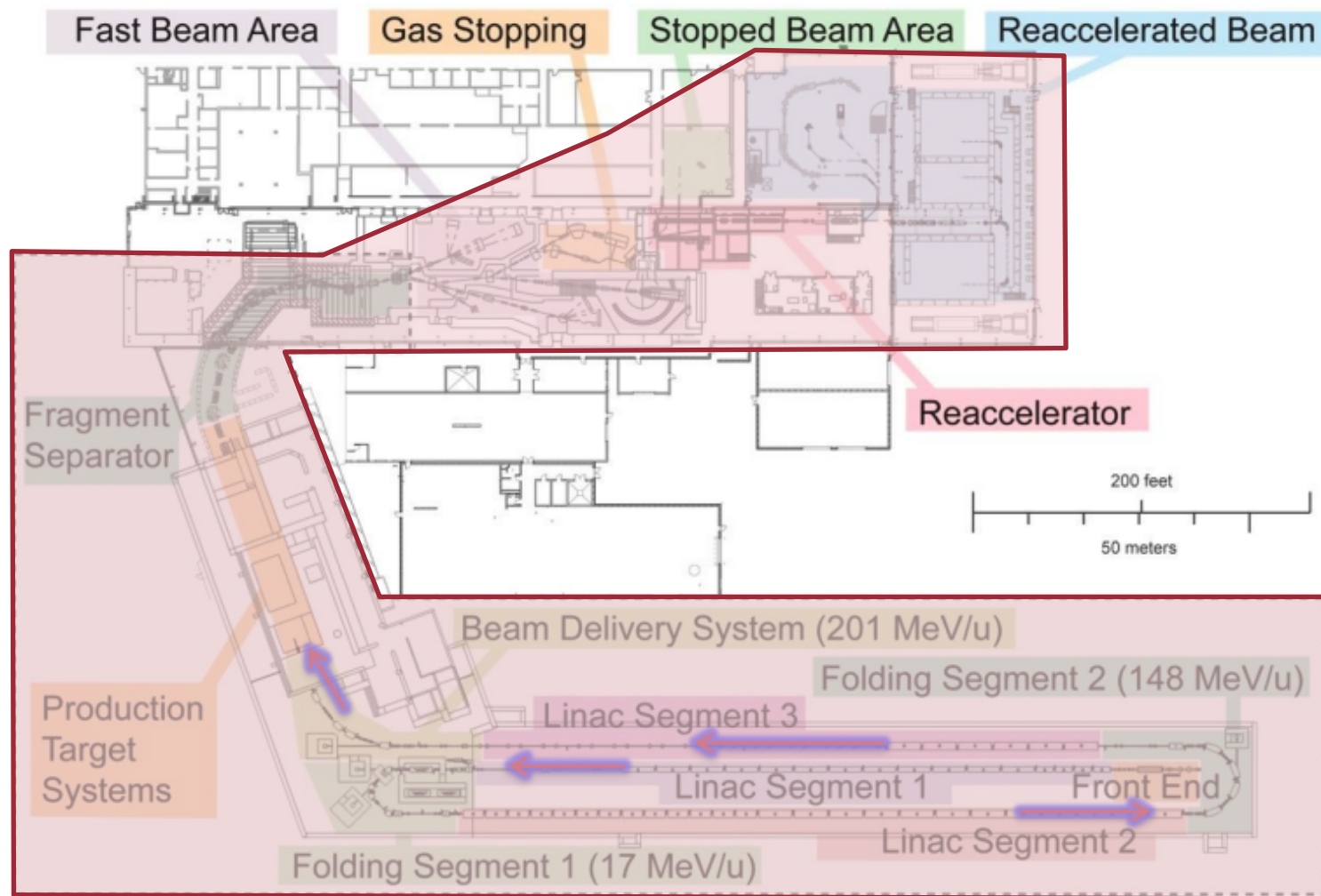
Extent of FRIB Central Controls Network?



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FRIB Controls System Design and Policy Decisions

- FRIB controls system will be based on EPICS
- Controls system devices will receive clocks from the FRIB Global Timing System at high and low accuracy.
- Communication between DAQ and central controls network will be limited and unidirectional from controls network to the DAQ network.



Experiment Requirement #1

Requirement:

Experimenters must be able to use software to interface to the controls system from the DAQ network.

Panel recommends:

Use available EPICS client API and language bindings.



Experiment Requirement #2

Requirement:

Experiment devices connected to the DAQ network must be able to synchronize their clocks (i.e. wall time) to match the controls system clock. The synchronization accuracy must be at least as good as the time distributed across the central controls network via network time protocol.

Panel recommends:

Devices on the DAQ network that must interact with the controls system should use the NTP server in the global timing system to receive their system time.



Experiment Requirement #3

Requirement:

Well-defined process for experimenters to consult and contract qualified FRIB staff to assist with the controls system interaction of their experiment.

Panel recommends:

Start discussion with policy makers at FRIB



Experiment Requirement #4

Requirement:

Read access (polling or subscription) to any EPICS channel on the controls system from a device on the DAQ network.

Polling must succeed for up to 200 channels accessed at rates of 1 Hz.

Panel recommends:

Utilize an EPICS channel access gateway.

Experiment Requirement #5

Requirement:

Write access (with proper authorization) to EPICS channels relevant to experiment success.

Panel recommends:

Utilize an EPICS channel access gateway.
Start discussion with FRIB policy makers.



Experiment Requirement #6

Requirement:

Controls system must protect itself against unreasonable access patterns by authorized experimenters.

Controls system can throttle the number of accesses.

Panel recommends:

Utilize an EPICS channel access gateway.

Experiment Requirement #7

Requirement:

The controls system must prevent write access to EPICS channels that an experimenter is not authorized to control.

Panel recommends:

Utilize an EPICS channel access gateway with appropriate permissions.

Tools for Interacting with Controls System

- EPICS data integration into live data stream
- EPICS channel lookup tool
- Live EPICS data visualizer (strip charts, etc.)
- EPICS channel archiver
- EPICS state preservation/restoration tool
- Sequencer with DAQ run control integration
- Electronic logbook with control system integration
- Tool to facilitate graphical control and monitoring panels.



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Thank you

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Backup Slides



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Charge to the Panel

The accelerator and beamline controls interface panel will be formed to ensure that the needs of FRIB experiments for interacting with the accelerator and beamline controls system are well defined. The panel will identify the parameters and information to which the data acquisition needs to have read and/or write access and the constraints for which this access is useful and safe. It will then recommend the means by which the access to the parameters is granted or achieved. The panel will submit a report that documents the results of their work.



Experiment Requirements and Findings

Requirement	Finding
Experimenters must be able to use software to interface to the controls system from the DAQ network.	There is already support available to interact with EPICS as a client in C/C++/C#, Java, LabView, Matlab, Perl, Python, and Tcl/Tk.
Experiment devices connected to the DAQ network must be able to synchronize their clocks (i.e. wall time) to match the controls system clock. The synchronization accuracy must be at least as good as the time distributed across the central controls network via network time protocol.	Devices on the DAQ network that must interact with the controls system should use the NTP server in the global timing system to receive their system time.
There must be a well-defined process for experimenters to consult and contract qualified FRIB staff to assist with the controls system interaction of their experiment.	Start discussion with policy makers at FRIB



Experiment Requirements and Findings

Requirement

Experimenters must be able to read any EPICS channel on the central controls network from a device on the DAQ network using polling or subscription methods. Polling must succeed for up to 200 channels accessed at rates less than or equal to 1 Hz.

Authorized experimenters must be able to write to EPICS channels relevant for their experiment's success from the central controls network and the DAQ network.

The controls system must protect itself against unreasonable access patterns by authorized experimenters, even if that involves throttling the number of their accesses.

Findings

Utilize an EPICS channel access gateway.

Utilize an EPICS channel access gateway. For gaining authorization, begin discussion with FRIB policy makers.

Utilize an EPICS channel access gateway.



Experiment Requirements and Findings

Requirement

The controls system must prevent write access to EPICS channels that an experimenter is not authorized to control.

Findings

Utilize an EPIC channel access gateway with appropriate permission settings.

