Controls System Progress

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Current Efforts

- Requirements writing
- Slow Controls network planning
  - Integration
  - Example
- Equipment selection

Requirements Writing

- Standardizing requirements for controls performance
    - Control data parameter list
    - Subdetector system descriptions
    - Interlock description
- Specification for EPICS server underway:
    - Initial estimation of data load complete
    - Equipment selection in progress

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Common Parameter Requirements

- HV/LV bias
- Leakage current
- ASIC/crystal/board temperature
- Gas & Cooling
  - Flow
  - Pressure
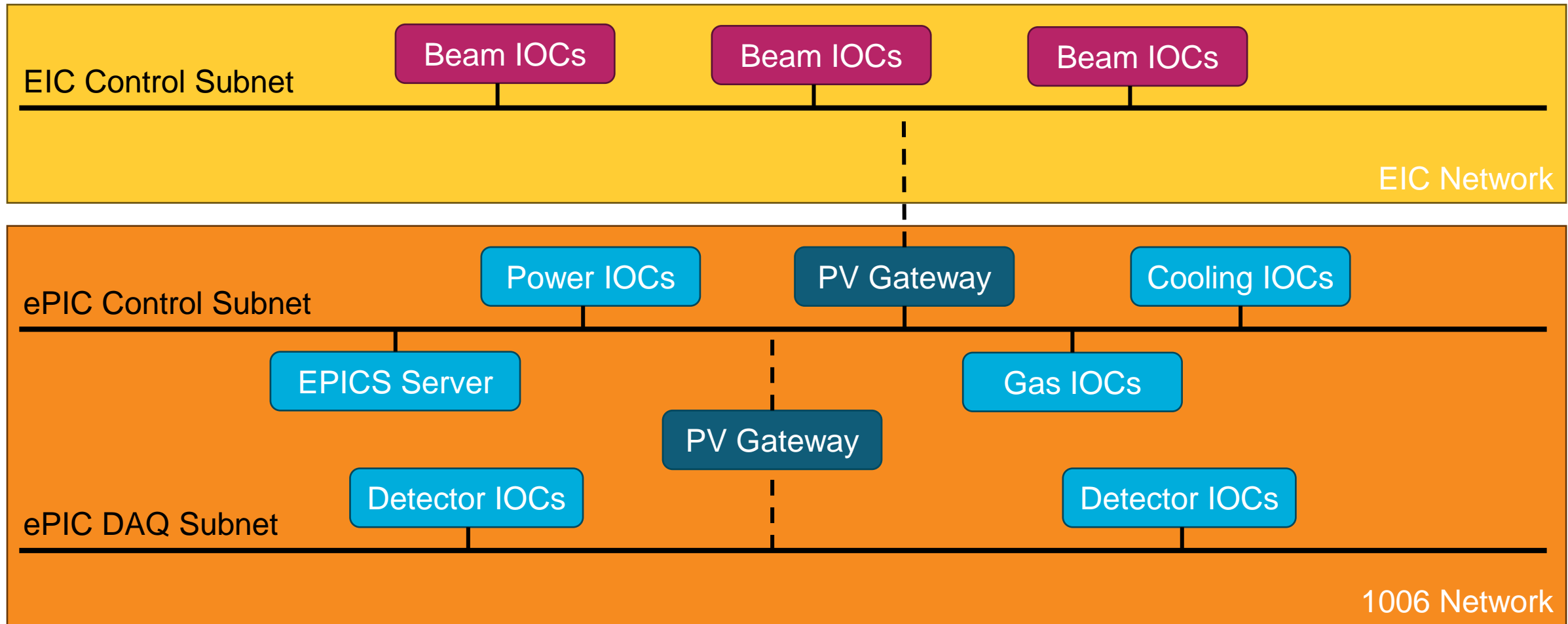 - Temperature
  - Humidity
  - Dew Point

Requirements Writing – Progress

Detector Group	Detector	Contact	Survey Response	1st Draft	1st Draft Review	2nd Draft	2nd Draft Review	CD2 Final Draft
Forward/Back	Far Forward	nathaly.santiesteban@unh.edu; ajentsch@bnl.gov;	Y	Complete	In Progress	Pending	Pending	Pending
	Far Backward	simon.gardner@glasgow.ac.uk; kenneth.livingston@glasgow.ac.uk;	Y	Complete	In Progress	Pending	Pending	Pending
	Luminosity	Nick.zachariou@york.ac.uk	N	Complete	Complete	In Progress	Pending	Pending
Ecal	Forward ECal	gvisser@indiana.edu	Y	In Progress	Pending	Pending	Pending	Pending
	Barrel Imaging Ecal (BIC)	sjoosten@anl.gov; zurek@anl.gov; jmetcalfe@anl.gov;	Y	Complete	Pending	Pending	Pending	Pending
	Backwards Ecal	munoz@jlab.org	Y	Complete	Complete	In Progress	Pending	Pending
Hcal	Forward Hcal	Friederike.Bock@cern.ch; Miguel.arratia@ucr.edu;	N	In Progress	Pending	Pending	Pending	Pending
	Barrel Hcal	stefan.bathe@baruch.cuny.edu; mconnors@gsu.edu;	Y	Complete	Pending	Pending	Pending	Pending
	Backwards Hcal	Leszek.kosarzewski@gmail.com	Y	In Progress	Pending	Pending	Pending	Pending
Polarimetry	Polarimetry	frathmann@bnl.gov	Y	In Progress	Pending	Pending	Pending	Pending
PID	TOF	geurts@rice.edu	Y	Complete	Pending	Pending	Pending	Pending
	pfRICH	ayk@bnl.gov	Y	In Progress	Pending	Pending	Pending	Pending
	dRICH	mcontalb@fe.infn.it	N	In Progress	Pending	Pending	Pending	Pending
	hpDIRC	kalicy@cua.edu	N	Complete	In Progress	Pending	Pending	Pending
Trackers	Si Trackers	Epsichtermann@lbl.gov; Laura.gonella@cern.ch;	N	Complete	Pending	Pending	Pending	Pending
	Gas Trackers	Kagnanvo@jlab.org; maxence.vandenbroucke@cea.fr;	N	Complete	Pending	Pending	Pending	Pending

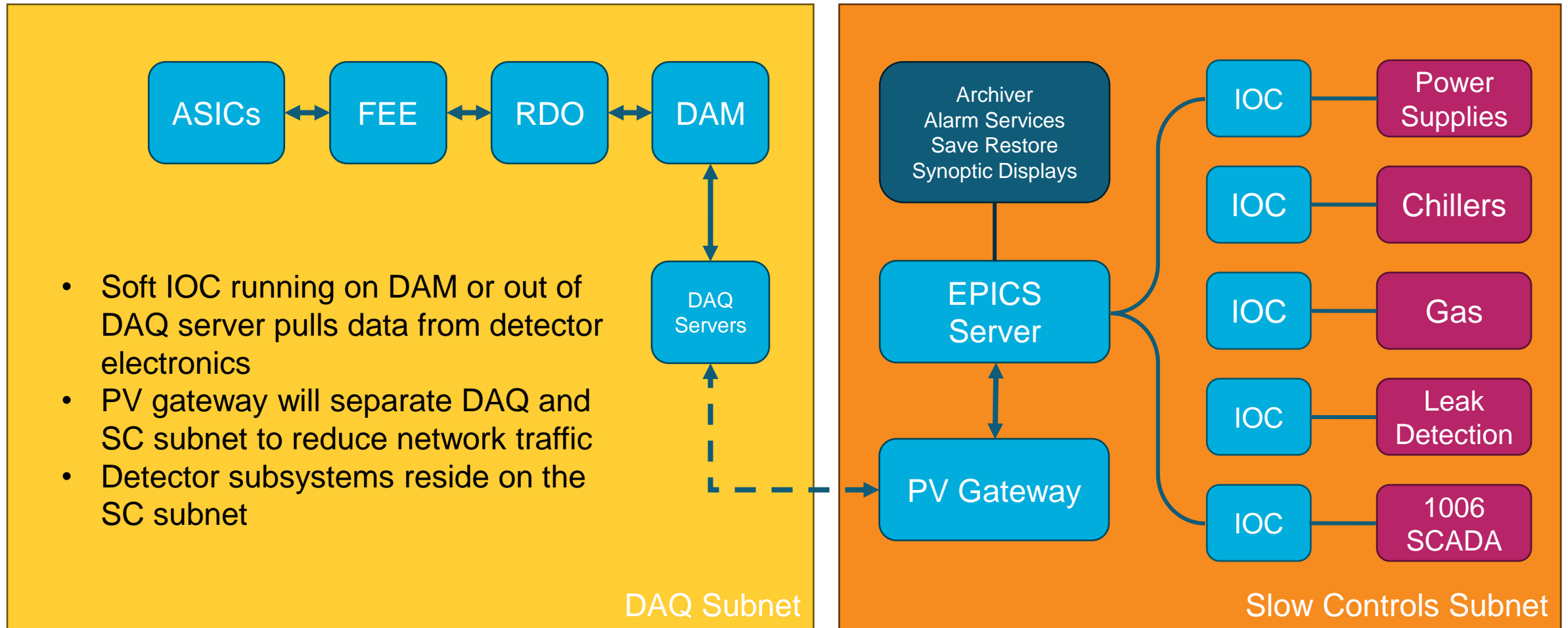Brookhaven
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Requirements Writing – Expected Load

- Network requirements based on SC survey results
    - DB storage on the order of 10s of TB/year
    - Data rates on the order of 100Mbps – 1Gbps

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SC Network Planning – DAQ Integration

- Soft IOC running on DAM or out of DAQ server pulls data from detector electronics
- PV gateway will separate DAQ and SC subnet to reduce network traffic
- Detector subsystems reside on the SC subnet

ASICs ↔ FEE ↔ RDO ↔ DAM

DAQ Servers

DAQ Subnet

Archiver
Alarm Services
Save Restore
Synoptic Displays

EPICS Server

PV Gateway

IOC — Power Supplies
IOC — Chillers
IOC — Gas
IOC — Leak Detection
IOC — 1006 SCADA

Slow Controls Subnet

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SC Network Planning – Rack Integration Plan 1

- ## Use AB Micro850 PLCs
  - ### Stored in rack within IR
  - ### Pros
    - #### High flexibility
    - #### Minimizes rack integration efforts
  - ### Cons
    - #### High cost
    - #### Needs EPICS driver development
    - #### No redundancy support

Magnet PSU — Ctrl Room — Pump Room — Facility — Gas — HVAC (Infrastructure)

Slow controls subnet

IR

Rack 1A1 · Rack 1B1 · Rack 1C1
Rack 2A1 · Rack 2B1 · Rack 2C1

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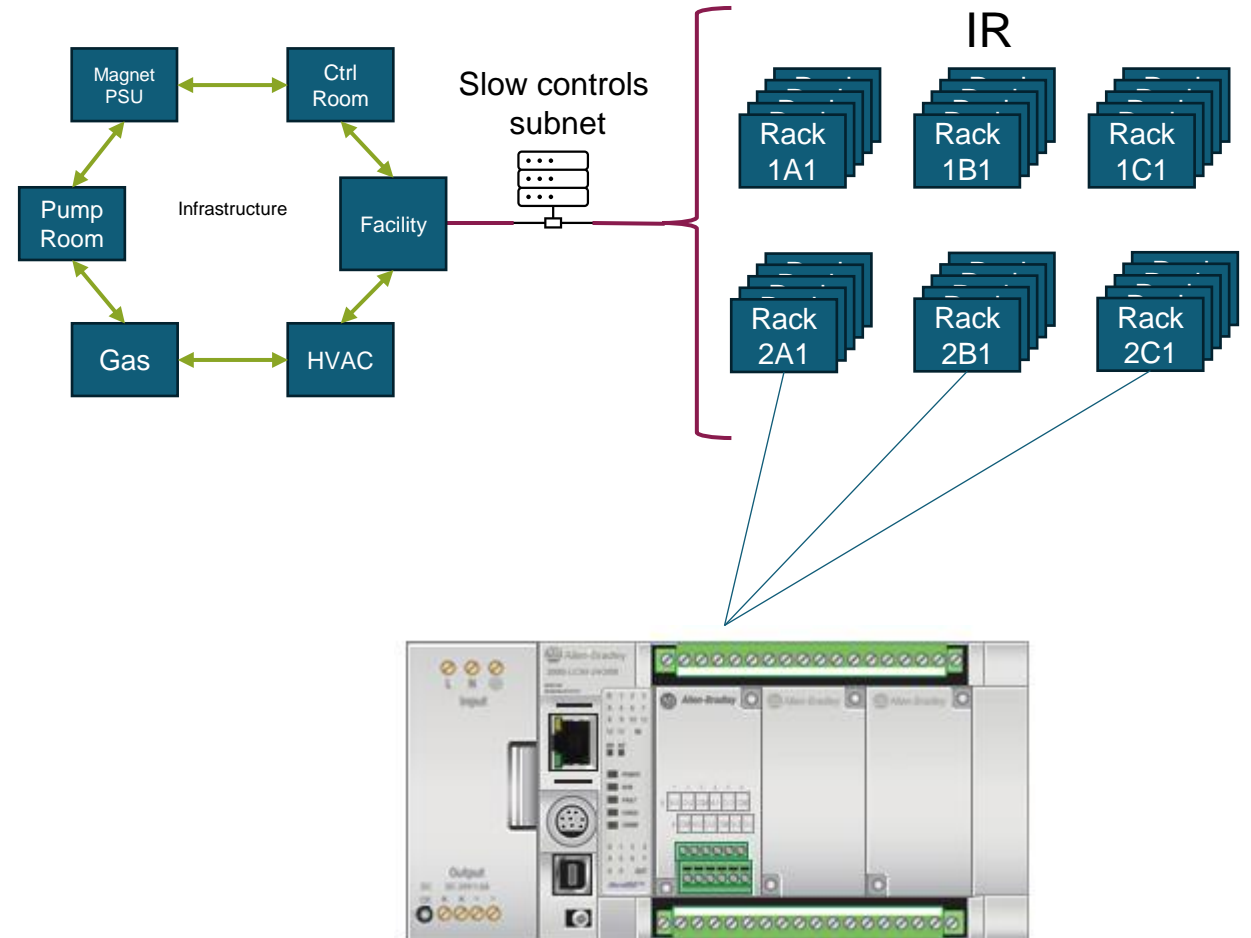
SC Network Planning – Rack Integration Plan 2

- ## Use Control/CompactLogix PLC for each detector
  - ### PLC stored in counting house RIO distributed as needed
  - ### Pros
    - PLCs can share RIO
    - Redundancy supported*
    - Existing EPICS drivers
  - ### Cons
    - Enclosure planning
    - Cabling efforts

Slow controls subnet

Magnet PSU

Control Room

Facility Redundant Ring

Pump Room

Gas

HVAC

Counting House

Facility Ctrl

Det Ctrl 1

Det Ctrl 2

Det Ctrl 3

Det Ctrl 4

Det Ctrl 5

RIO 1

Detector Redundant Ring

Rack 1A1

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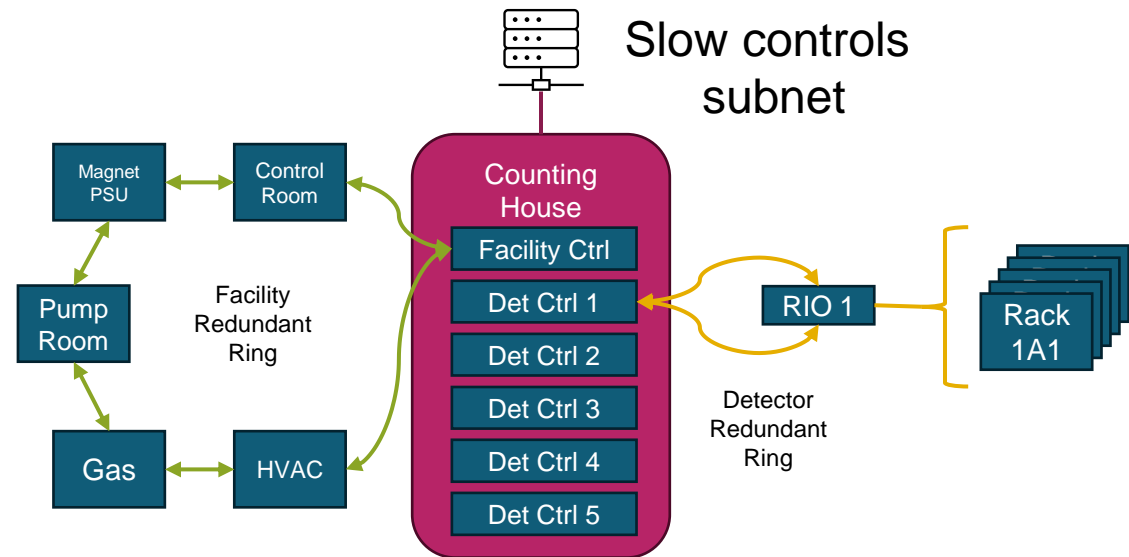
SC Network Planning – Subsystem Integration

- Recommend ControlLogix or CompactLogix models for EPICS integration
- ControlLogix supports redundancy
- PLCs reside in DAQ room, RIO reside in the IR

Subdetector PLC — **Subdetector RIO**

EPICS Server
- Alarm handler
- Archiver
- Control GUIs (CSS)
- Save Restore

ePIC HSSD

High Voltage Biases

Low Voltage Biases

Slow Controls Subnet

Control Room RIO

Assembly Hall RIO

Gas Corridor RIO

IR RIO

Pump Room RIO

Magnet PSU RIO

Infrastructure PLC
- Monitors global interlocks for the facility (i.e. pump room, HVAC, experimental power, etc.)
- Remote IO (RIO) and PLC make a redundant ring network
- PLC and RIO are backed up by UPS

Networked Detector Hardware
- Chillers, circulators, blowers, sensors, etc.
- Common hardware environment

UPSs

HVAC Building Control Unit

Water Leak Detection Systems
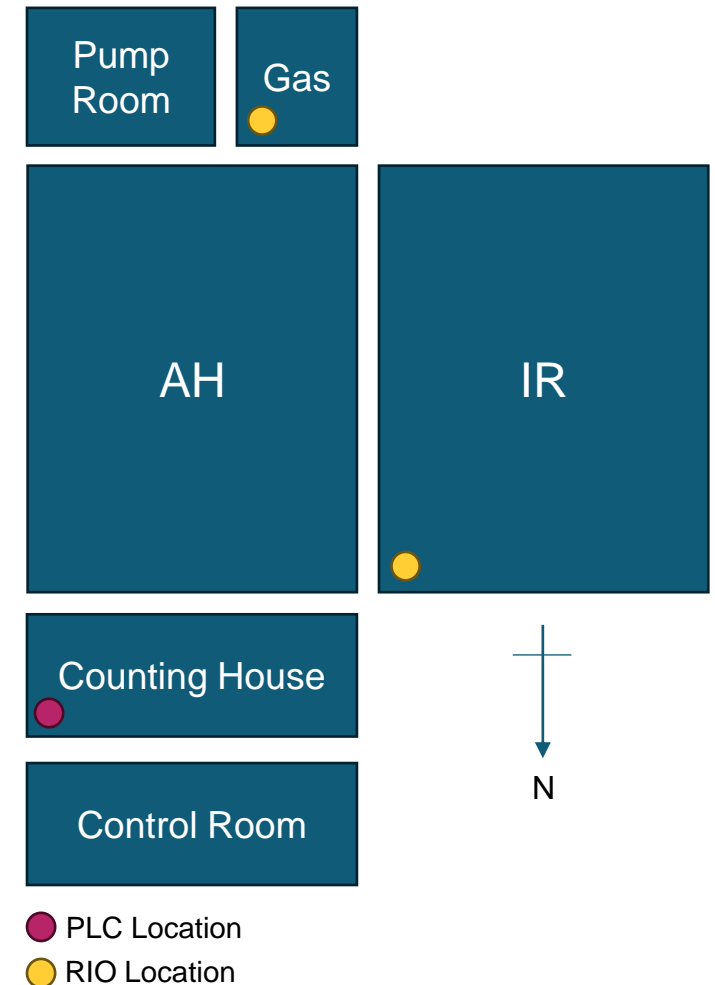
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Example Implementation - pfRICH

- Power Supplies (Saverio Minutoli)
  - Weiner LV mainframe and modules
  - CAEN HV mainframe and stackable power supplies
- Gas System (Prashanth Shanmuganathan)
  - Dry nitrogen system
  - Supply & vent side pressure transducers
  - Flow meter
  - Hygrometer*
- Cooling (Dan Cacace)
  - Chilldyne circulator
  - Polyscience chiller
- Detector Operation
  - Light system for calibration

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Example Implementation - pfRICH

- Subsystem integration plan
  - CompactLogix PLC & Point IO remote modules interface with power, gas, and cooling
  - Custom hardware is reduced to circuitry needed for front end monitoring & calibration
- Reoccurring need for front end HW across detectors
  - Light system for cal
  - Front end temp

Pump Room

Gas

AH

IR

Counting House

Control Room

N

● PLC Location
● RIO Location

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Equipment Selection & Equipment Approval Process

- New effort started in the last weeks for approved equipment selection

- Goals:
  - A systematic means of approving hardware for the project
  - A reference table of approved hardware
  - A common hardware environment:
    - Simplified system integration
    - Smaller knowledge base for troubleshooting
    - Reduced development effort

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Equipment Selection & Equipment Approval Process

- What will be evaluated?
  - Power supplies
  - Chillers/circulators
  - Motor controllers
  - PLCs
  - Sensors
  - Protocol gateways
- Who can help?
  - Anyone that is interested

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Thank you

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