Controls Scope

Karen S. White

Controls Group Leader &

Data Operations Manager

5/8/13

Integrated Control System

- ICS Scope: Controls, Timing and Protection Systems

  Accelerator   **Instruments**

  Target   **Conventional Facilities**
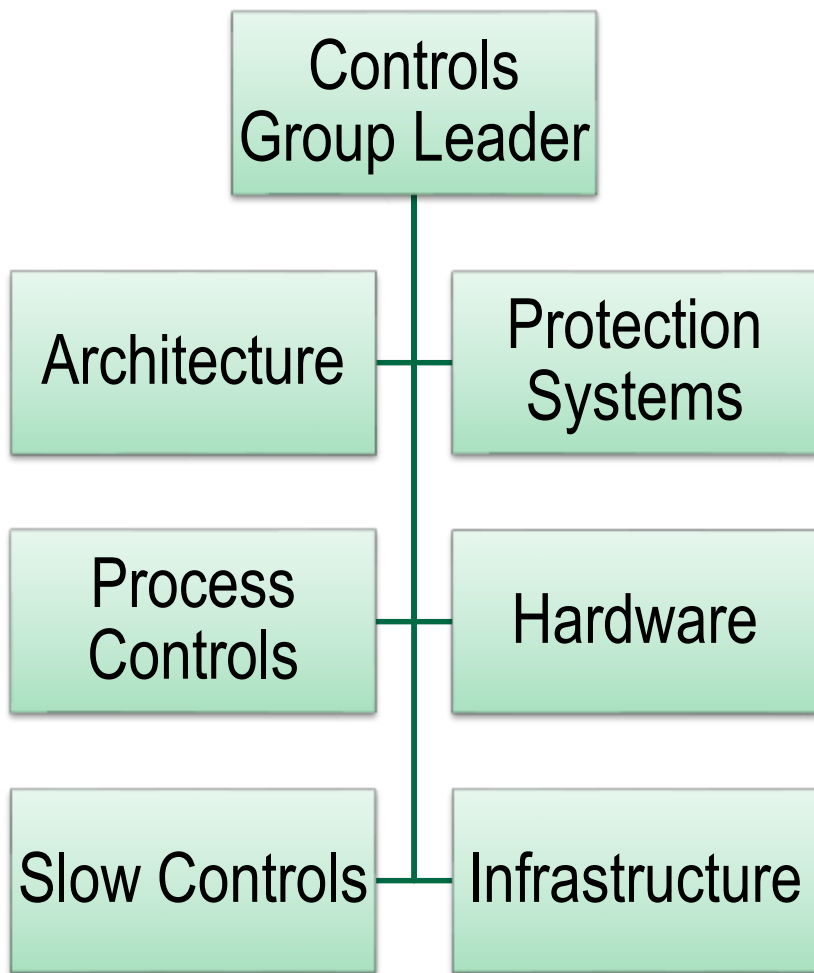
  Cryogenics   **Test Facilities**

- Large, distributed system based on the Experimental Physics and Industrial Control Systems (EPICS) toolkit and Control System Studio (CSS)

- EPICS provides a flexible, layered architecture and integrates a variety of front end platforms

- This scalable, distributed architecture allows:
  - new devices and functionality to be added as needed
  - growth to be managed by adding or upgrading CPUs

- Emphasis on commercial, configurable, collaborative solutions

By the Numbers

VxWorks IOCs	~170
Linux IOCs	~100
Windows IOCs	~400
PLCs	~160
Network Nodes	~1200
EPICS PVs	~500K
Archived EPICS PVs	~85K
Archived EPICS data	~1.5 TB/year
Machine Protection System Inputs	~1200

Organization Chart

```
        ┌──────────────────┐
        │    Controls      │
        │  Group Leader    │
        └────────┬─────────┘
                 │
┌────────────┐   │   ┌──────────────┐
│Architecture│───┼───│  Protection  │
└────────────┘   │   │   Systems    │
                 │   └──────────────┘
┌────────────┐   │   ┌──────────────┐
│  Process   │───┼───│   Hardware   │
│  Controls  │   │   └──────────────┘
└────────────┘   │
┌────────────┐   │   ┌──────────────┐
│    Slow    │───┴───│Infrastructure│
│  Controls  │       └──────────────┘
└────────────┘
```

Positions	
Management	1
Professional	21
Technician	6

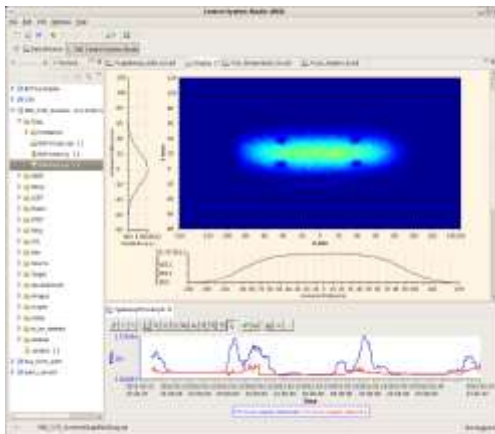| Budget	$K
Labor	8094
Procurements	1983
Total	10077

Organization

2 Engr

Architecture
Tools Development

System Architecture

EPICS/CSS

Alarms

Archiver/Browser

OPI/Web OPI

7 Engr
2 Tech

Process Controls
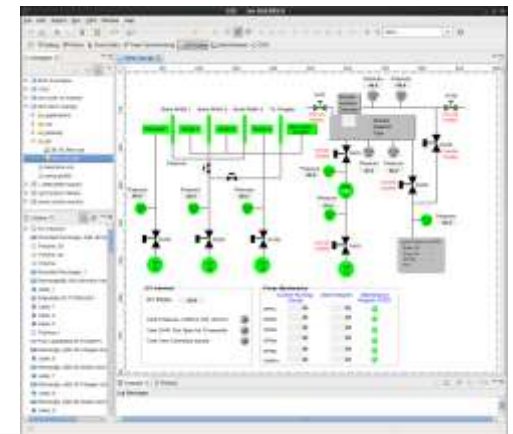**PLC Programming**

Cryogenic Systems

Target

Vacuum

Motion

Conventional Facilities

5 Engr

Slow Controls
IOC Programming

Low Level RF

High Level RF

Power Supplies

Vacuum

Front End

Organization

Protection Systems

2 Engr
2 Techs

Personnel & Target Protection

Radiation Monitoring

Oxygen Deficiency Monitoring

Custom Hardware Design/ FPGA

4 Engr
1 Tech

Timing

Machine Protection

Chopper Control

Custom Hardware

Controls System Infrastructure

1 Engr
1 Tech

Accelerator, Test & Development Networks

Linux System Administration

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Spares Strategy

- Established standards for hardware
  - Minimizes the number of supported modules
  - Allows for shared spares
  - Reduces unique maintenance and programming efforts

- Keep >= 10% spares on hand

- New designs address critical spares for custom hardware
  - Fiber/Fiber Fan-outs – deployment FY13 – FY14 (outage limited)
  - MPS Master – Deployment summer 2013
  - Chopper power supply interface – Deployment summer 2013

Maintenance

- Failures and performance tracked to guide preventative maintenance and upgrades
  - VME crate power supply and fans replacements – summer 2013
  - Most PLC processors replaced 2010
  - Upgraded selected VME IOCs (MVME2100 → MVME5500)

- Commercial computing equipment on planned refresh cycle

- Replacing non-standard front end controls interfaces with standard interface modules
  - In place on front end teststand
  - Production Deployment summer 2013

Obsolescence

- Timing System
  - New Master – prototype running in RFTF, production for accelerator FY14 (tested spare in place for old master)
  - Timing Receiver – deployment FY13 – FY16
  - Fiber/Copper Fan-outs – Prototype in testing; production FY14

- MPS
  - Unable to fabricate new units due to hardware reaching end-of-life
  - Limited ability to repair existing platforms
  - Existing system overly complex, high maintenance
  - New system design, prototyping FY14 - FY15

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