Integrating Externally Developed Systems for SNS Linac Cooling and Vacuum

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Abstract

External contractors are developing the local **cooling and vacuum control systems** for the **Spallation Neutron Source** (SNS) linac. Soon these systems will be integrated into the facility-wide controls system. Allen-Bradley Logix5000 series programmable controllers, populated with appropriate input/output modules, were selected as the local controllers. These controllers will be interfaced to the facility-wide control system via VME systems with PowerPC processors running the Wind River VxWorks operating system and Experimental Physics and Industrial Control System (EPICS) front-end controller software. This paper describes the **interface and integration issues** driven by project, cooling system and vacuum system requirements and hardware selections.

Brief Background

SNS DTL and CCL RCCS and Vacuum Control Systems

OPIs

Intel based
Linux
EPICS
Operator Screens
Archiving
Logging
Alarm Management
Boot Hosts

MPS
Ethernet
Event Link/RTDL

IOCs

PowerPC
VME
VxWorks
EPICS IOC
Channel Access
Supervisory Control
Alarm Checking
MPS local inputs
Event Link/RTDL
EtherNet/IP to PLCs
RS-485

Programmable Controllers

AB ControlLogix
I/O Modules
Ladder Logic
Local Control
Closed Loop Control
PID
Interlocks
EtherNet/IP to/from IOC

Monitor, Control, Interlocks
Hardwire Interlocks
RS-485
Tank 1
Mod 1
2
3
4
5
6
I/O
LLRF
RGAs
Other Devices

DTL RCCS **DTL Vacuum** **CCL RCCS** **CCL Vacuum**

Interface Between IOC and PLC

- Selection of a communication protocol, EtherNet/IP
- Creating and reaching agreement on signal lists
- Mapping IOC process variables (PV) to PLC tags
- IOC issuing commands in the form of requests
- Creating and naming tags for transfer to IOC
- Optimizing data transfer between PLC and IOC

Serial Based Devices

- Decision to use serial ports on IOC rather than PLC
- Device driver development
- Serial type selected , RS-485, and network layout
- Distributed control

Control loops over Ethernet

- PID loops dispersed over IOCs and PLCs on non-dedicated networks

EPICS displays vs. PLC displays

- Cost, development and maintenance of local PanelView displays
- Redundant control screens on different platforms

Alarm Checking and Management

- The IOC as the appropriate location for alarm checking functions versus the PLC
- Alarm limit parameter maintenance in one place

The criteria used to make these decisions include:

- Meet system requirements
- Provide reliable operation
- Minimize equipment cost
- Minimize development and maintenance efforts

By working closely with external systems integrators we are able to consider these issues from an integrated system perspective.