

Project Status



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EPICS Collaboration Meeting @ ICALEPCS 05

The Spallation Neutron Source



- Collaboration of six laboratories, located in Oak Ridge, Tennessee
H⁺ Source, 1 GeV Linac (~300m, 15 NC, ~80 SC cavities), e⁻ Strip Foil, Proton Accumulator Ring, Mercury Target
⇒ Pulsed Neutrons (1ms @ 60Hz)
- At 1.4 MW it will be ~8x ISIS, the world's leading pulsed spallation source
- CD1 for upgrade to 3MW planned for end of FY05, contemplating 2nd target.
- Close to High Flux Isotope Reactor,
new Joint Institute for Neutron Sciences, Center for Nanophase Materials Sciences

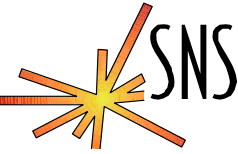
Overall Status



- **Partners have all finished – we are “on our own.”**
- **All buildings in place – bagels & coffee cart now available in the central office and lab building**
- **Superconducting Linac cooled to 4K and then 2K**
- **Achieved 925 MeV beam to end of Linac**
 - » **Now highest energy proton linac in the world**
 - » **But... low current and duty cycle**
- **Ring Commissioning scheduled for January, 2006**
- **Beam on Target scheduled for April 2006**



General Issues



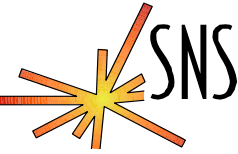
- **Outside of Control System**
 - » Too little time left
 - » Coffee & bagels too expensive
 - » Power outages, breaker trips
 - » Cooling tower fans
 - » Water leaks
- **Controls Infrastructure**
 - » **Network**
 - CISCO switch firmware bug (fixed)
 - SNMP “snooping” & “pruning” interfered with Allen-Bradley PLC-to-PLC multicasts
 - » **Computers**
 - Control Room stations w/ 4 or 6-headed displays required video card upgrades
 - Archive computer appeared to reach limits of disk performance, turned out to be too little RAM and hence swapping
 - Java apps (physics) need designated multi-CPU machine

Control System Issues



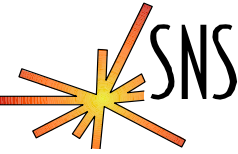
- **Equipment is in place, manual “remote control” OK, but many algorithms for automation still being developed, and control loops need to be optimized**
 - » Automation of high-power RF turn-on and turn-off
 - » Resonance control cooling system control loop
 - » 2K cold-box turn-on; control heaters to compensate tripped RF
 - » Low-Level RF loop setup and trip recovery
 - »
- **Nature of Commissioning**
 - » Control system personnel working both on installation and operational support
 - » Almost everything that was planned never to require an “override” or “disable” required just that.
- **vxWorks**
 - » SNS now on 5.5.1/Tornado 2.2.1
 - » Added auto-retry on boot-up if boot server is unavailable.
 - » After upgrade, MVME2100 showed some strange network disconnects; solved by avoiding task priorities above ‘tNetTask’. Still a BSP or network stack issue?

EPICS Issues



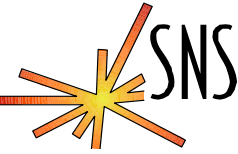
- **Alarm handling**
 - » ALH not accepted; investigating alternatives based on database logic for latching/acknowledging alarms.
- **EPICS Integration**
 - » Pretty much everything is integrated, e.g. conventional facilities and target were included from the start.
 - » **Mostly MVME2100 CPUs (>100)**
 - VME64X or VXI crates all used like VME
 - Many AllenBradley “ControlLogix 5000” PLCs via Ethernet
 - Some Beckhoff I/O via Ethernet
 - » **Increased use of Soft-IOCs**
 - 2 designated Linux hosts
 - 31 Soft IOC instances
 - About 20150 PVs, 1260 SNL instances
 - » That’s all good, yet hard to keep track of the pieces...

EPICS Issues...



- **EPICS Integration...**
 - » **Diagnostics (~90)**
 - **Headless MS Windows PCs:
LabVIEW, shared-mem interface to soft IOC for EPICS
Integration.**
**Some conceptual disagreement of how these “message
box” records should behave.**
 - » **Ring LLRF (4)**
 - **Original approach: Operator interface in Tcl/tk writes
parameter files, puts file name into stringin record, IOC
(MVME2100, VME) reads file & programs LLRF hardware.**

EPICS Issues...

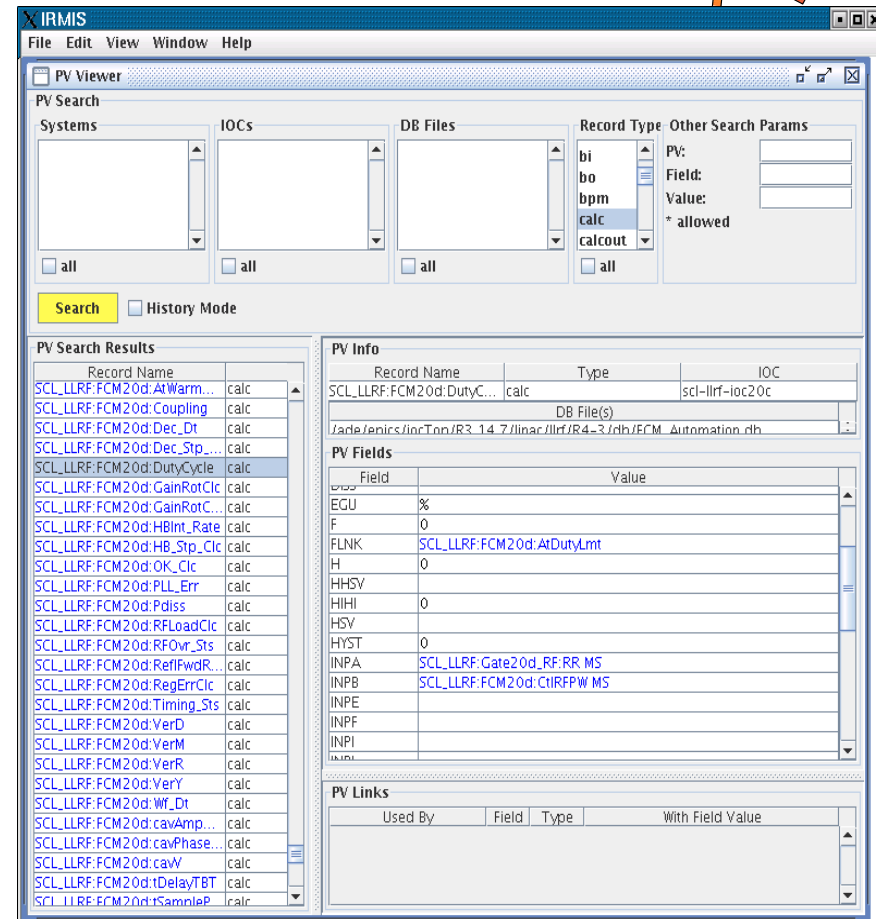


- **Timing System Support**
 - » EPICS base allows *either* NTP & custom inter-IOC synchronization *or* site-specific code
 - » SNS “GeneralTime” picks time from multiple, prioritized sources
 - 1) Hardware timing system - if available
 - 2) Fall back to NTP - if available
 - 3) Fall back to IOC clock... and assures monotonic time while switching time sources.
 - » Suggest to include this or similar handling of multiple, prior’ed sources in EPICS base.
- **Getting Synchronized data**
 - » Channel access subscriptions do not allow specification of e.g. “update at about 1Hz, but only beam pulses”.
 - » Therefore “Correlator” library is used to monitor data from RF and SNS event/timing system, selecting datasets based on matching time stamps.

Database Collaboration with APS has grown (SNS, APS, SLAC, TRIUMF, BESSY, FNAL, Diamond, PSI)



- **IRMIS:** Integrated Relational Model for Installed Systems
- Agreed “Core Schema” describes control system with three hierarchies:
 - Signal
 - Housing
 - Power
- Uses the SNS Physics XAL “Framework”
 - Pelaia et al.
- RDB synchronized using “crawlers”
- 106 SNS IOCs successfully “crawled”
 - EPICS versions 3.13.9, 3.14.6, 3.14.7
 - 228,270 PVs found
 - SCL 112141
 - DTL 33607
 - CCL 27443
 - MEBT 10918
 - HEBT 8074
- “Crawlers” in development for all EPICS clients, IOCs, edm, Archiver, Alarms, etc.



Summary



So far so good

