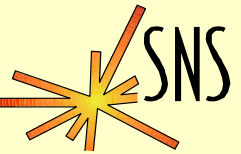


Conventional Facilities From a Vendor for SNS

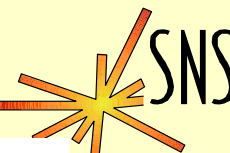
John K. Munro, Jr.
EPICS Collaboration Meeting
San Jose, CA
3-4 December 2001

New Features

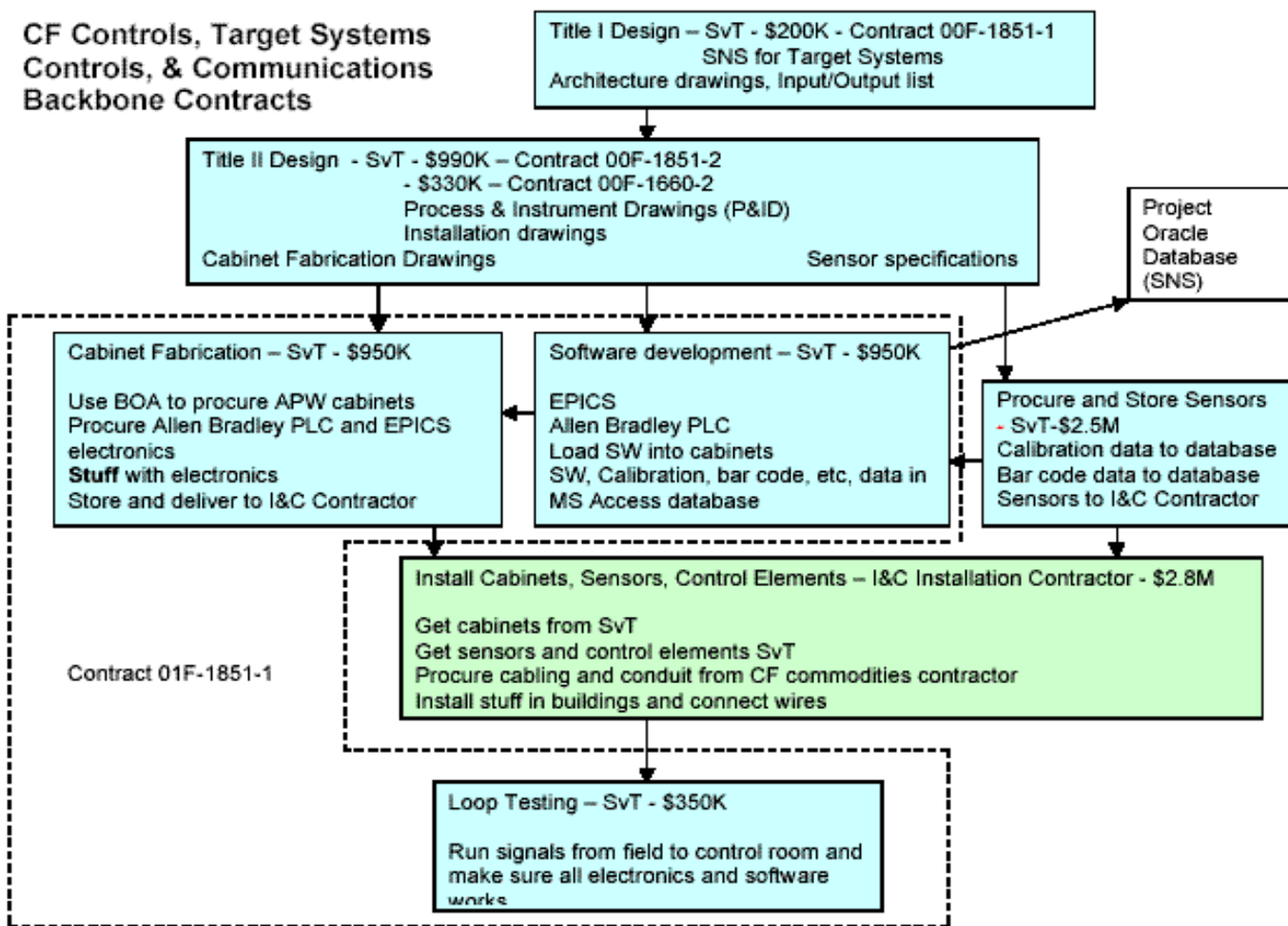


- **First time all CF control systems for a large accelerator facility are being integrated “up front” into the EPICS control system for the accelerator.**
- **Use of Linux to support all EPICS functions and development tools on a major project.**
- **Use of Motorola MVME2101 PowerPC processor board for the I/O controllers (IOCs).**

Business Arrangement

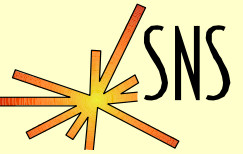


CF Controls, Target Systems
Controls, & Communications
Backbone Contracts



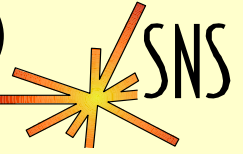
Note: \$ values include expected small increases for remaining target systems and communications backbone work

What Makes It Work: Requirements



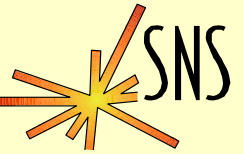
- **Define/document them early; Do only what is needed.**
- **Minimize the number of drivers used (power monitoring, BacNet, EtherNet/IP).**
- **Perform all logic and nearly all calculations in PLCs and commercially provided, skid mounted controls equipment.**

What Makes It Work: Requirements (Cont'd)



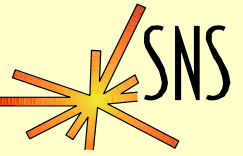
- **Need requirements for**
 - » **Process and instrument diagrams (P&ID)**
 - » **I/O wiring interfaces**
 - » **Device naming convention/rules**
 - » **Signal naming convention/rules**
 - » **Task allocation (logic in PLCs vs. Logic in IOCs)**
 - » **Alarm handling rules**
 - » **Operator display screens**
 - » **Standards to be followed**

What Makes It Work: FSD Documents



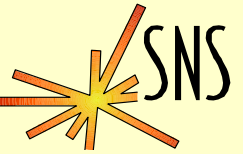
- **Generate functional system design (FSD) documents from P&IDs.**
- **Document tag names, signal names and setpoints, EPICS record parameters, and logic functions in a form to allow testing completed software.**
- **Have contractor generate documents before coding starts (helps to insure software developers understand what must be done).**

What Makes It Work: Standards



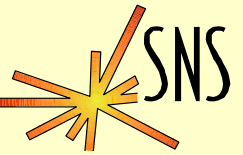
- Document standards in a Design Criteria or similar document.
- Make standards encompass all aspects of the work.
- Use standards in early test examples to make sure they work as desired/expected.
- Generate a standard example that uses nearly all software features and includes all symbols to be used.
- Use standard example as a reference to test new/modified tools and procedures throughout the development effort.

What Makes It Work: Standards (Cont'd)



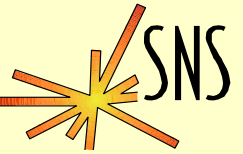
- **Standards should include as a minimum:**
 - » **Screen layout and color schemes**
 - » **Application development environment (ADE)**
 - **PLCs and IOCs (EPICS)**
 - » **Tools used**
 - » **Application development process**
 - » **PLC logic programming features**
 - » **Data transfer arrays used to communicate between PLCs and IOCs**

What Makes It Work: Training



- Train only on what parts of the EPICS environment are used.
- Train on the integrated (PLC/IOC) environment.
- Train at the contractor site using the development environment set up for the job.
- Build use of project standards and procedures into the training to provide a smoother transition to work on the production software.
- Build training examples and laboratory exercises into the ADE.

What Makes It Work: ADE

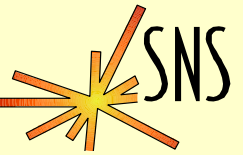


- **ADE used by the contractor should be the same as what is intended for use in the field.**
- **Use database and other development tools contractor is familiar with as much as possible.**
- **Software tools must be stable, thoroughly tested, and changed only after testing with the reference standard example.**
- **Development hardware must operate reliably and must remain stable throughout the development effort.**

What Makes It Work: Configuration Control

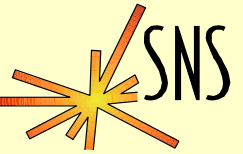
- Use the reference standard example to test all new versions of tools, changes to development procedures, and all new features.
- Use contractor procedures and methods for configuration control as much as possible.

What Makes It Work: Technical Support



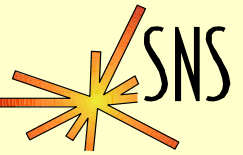
- **Maintain a duplicate software development system and environment at the home office.**
- **Establish a reliable, high-speed communications link between the home office and the contractor.**
- **Identify qualified and available personnel at the home office who will be on call at the home office to provide technical assistance when needed.**

What Makes It Work: Qualified Contractor



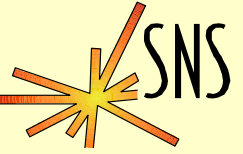
- Has experience in technical integration tasks.
- Has qualified software development staff.
- Flexible and easy to work with.

Conclusions



- **Organization and results of training have been much more successful than expected.**
- **Minimal technical support has been required so far and most of that occurred in the first months following training.**
- **Materials developed for CF training are being used as references and examples for development of control systems for other parts of the SNS project.**
- **Preparation for the CF control systems development effort required making choices that have served to set standards for the rest of the SNS project.**

CF Training/Development Teams



- **SNS Team**
 - » John Cleaves
 - » John Munro
 - » Ernest Williams
 - » Kay Kasemir
 - » Delphy Nypaver
 - » Ron Battle
- **Sverdrup Technologies Team**
 - » Tim Brewer
 - » Tony Tenison
 - » Randall Steadmon
 - » Dave Meyer