Observatory Control System & Electronics

Simon Radford &
Tom Sebring

Control System Scope

- All software and hardware
- Timing and communications
- Architecture includes embedded systems
  - Controls for major subsystems supplied by vendors
- Safety systems autonomous
  - Only monitored by observatory system
- Common instrument interface
- Support data reduction packages

Control Functions

- Telescope Control
- Enclosure Control
- Environmental Monitoring
- Instrument Control
- Observation Control
- Data Management
- Communications

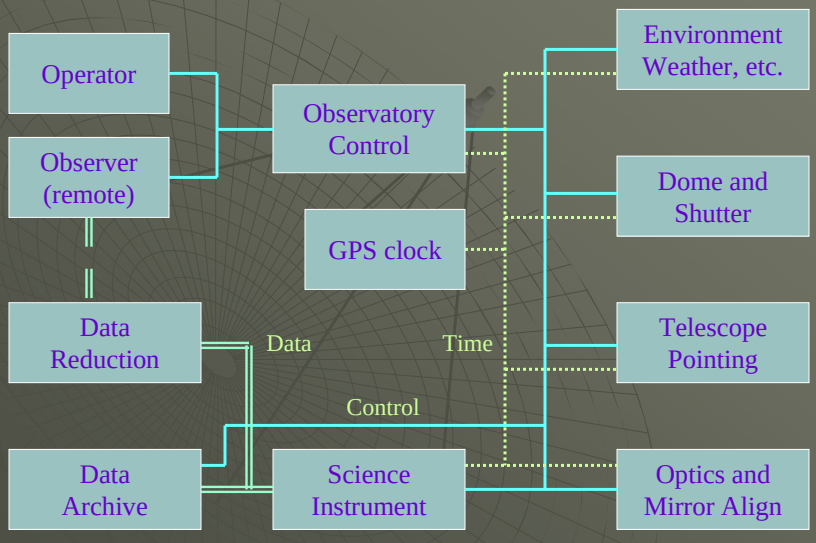
Controls/Software Design Guidelines

- Existing solutions when practical
- Transparent support for remote operations
- Efficient user interfaces - direct and scripted
- Include instrument and subsystem developers
- Mostly homogenous, but not draconian
- Commodity hardware and OS
- Well supported applications environments
- Adequate communications bandwidth

Strawman Control System

- As available subsystems from existing telescopes (CSO, Arecibo, etc.)
- Pointing kernel from P. Wallace
- PC hardware with Linux (mostly)
- LabVIEW applications environment supports legacy code
- Ethernet, separate control and data
- Separate timing bus (IRIG-B)

Control System Conceptual Design



Control System Design Approach

- Hire experienced software engineer
- Define use cases and requirements
- Detailed functional specifications
- Interface identification and spec.
- Choose development tools and stds
- Identify hardware capacities

Electronics Scope

- Power Sources, Distribution and Protection Strategy
- Lighting and Emergency Lights
- Safety and Security Equipment
- Communications Network
- Control System Implementation
- System Specific Equipment
- Computer System Approach
- Dome and Shutter Controls
- Optical Systems Electronics
- Instrument Interface Electronics
- Coating Plant Controls

Electronics for Major Subsystems Included in Contractor's Scope of Work

We Will Need Electric Power Budget
Preliminary Estimate by M3

Load		Power [kVA]					Classification		
Item	Description	Total	RAW	Total	ATS	UPS	SHR	OBS	SDN

Total Raw Power

Raw Power

Total Automatic Transfer Switch Power

Automatic Transfer Switch Power

Uninterruptible Power Supply Power

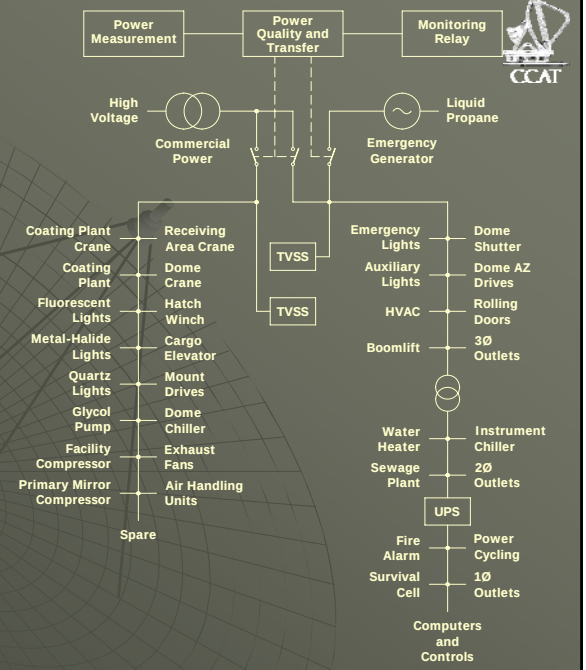
Shared Loads

Observation Loads

Shut Down Loads

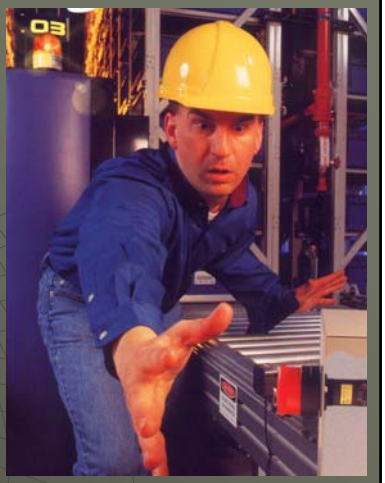
Electric Power Distribution

- Provides Appropriate Power to Subsystems
- Compatible with Emergency Switchover
- Central UPS for All 110 VAC Power (Computers & Network Equipment)



Emergency Stop System

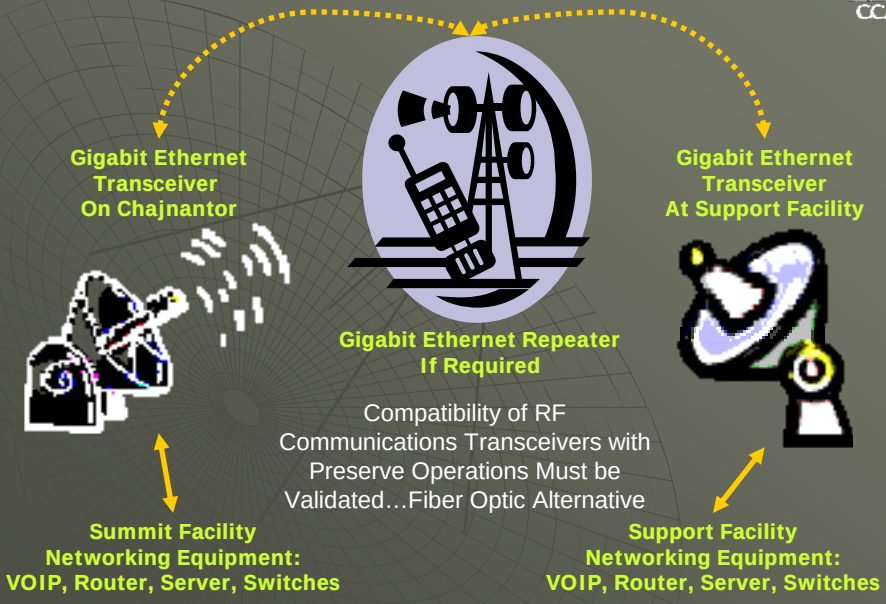
- Normally Closed Double Loop Around the Facility and Mount
- Any Switch Interrupts the Loop and Stops all Dome, Shutter and Telescope Motion
- "Intelligence" always Remains Alive
- Large Illuminated Mushroom Switches, Lockout as Reqd.
- Electrical Panel in Control Room Shows E-stop Status
- Integrated with Contractors' and Third Party Subsystems



Telescope Surveillance System

- Automatic Iris Low Light Video Cameras w Ethernet Interface
- Coverage Angles Throughout Facility Required for Remote Operations
- Microphone and Two-way Intercom Incorporated on Each Camera
- Provides Remote Monitoring of Personnel for Safety
- Integrated with TCS

Data Transfer & Communications



Summary of Electronics

- Electronics as Defined are Not Technically Challenging
- Cost of Electronics is Not an Issue
- Appropriate Engineering Practice and Implementation Important
- Next Phase of Work Will Include Further Definition and Specification of Electronics Subsystems