UNICOS* Principles and History

*UNified Industrial COntrol System

Outline

- History
- Objectives
- Scope of Supply
- Specification
  - Hardware Architecture
  - Software Architecture
- Implementation
  - Hardware & Software Implementation
- Present state & next steps
- Conclusions

History

- Project start-up for LHC cryogenics (Machine+Experiments) May 99
- Technical Specification emitted December 99
- Contract Awarded to GTD-Cegelec consortium in June 2000
- Framework prototyped March 2001
- First applications June 2001

UNICOS Initial Objectives

- Collaborative project between equipment groups LHC/ACR, LHC/ECR, EP/TA3 and LHC/IAS, for a single control system for all LHC cryogenics equipments: Machine, Experiment cryo+magnet
- Based on generic software architecture evolved from LEP cryogenics experience
- Outsourced contract for software realization & hardware delivery, with maintenance options
- Integrate the cryogenic control system within the LHC operational environment

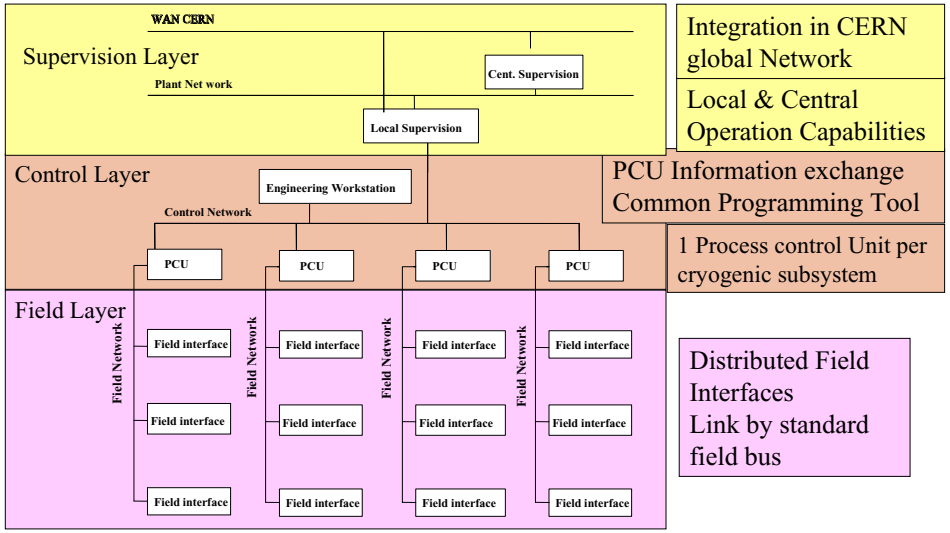
Scope of supply for external contract

- Supply,install & test all hardware components
- Production of the UNICOS Framework
  - PLC object library
  - Complete SCADA environment
  - PLC/PLC & PLC-SCADA Communication Protocol
  - Configuration Tools
- Production of user applications
- Basic & advanced training
- Hardware & Software Maintenance Options

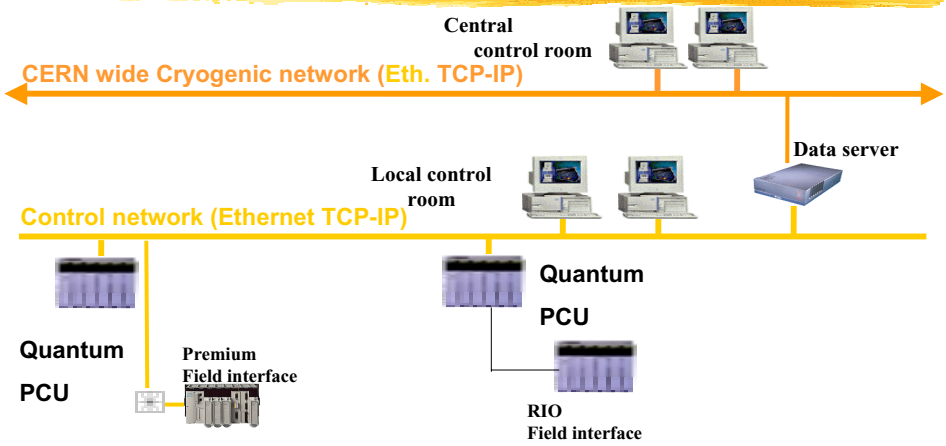
Project Organisation (CERN level)

- Collaborative writing of technical specs
- IAS responsible for contract follow-up
- IAS responsible for Framework support
  - Collaborative decision on Framework evolutions
  - Validate framework developments by firm
  - Ensure conformity with CERN standards
- Eq.group responsible of specific subsystem
  - Environment (powering, connection to equipment)
  - Process specs, planning, documentation
  - System commissioning
- IAS organises Maintenance Support

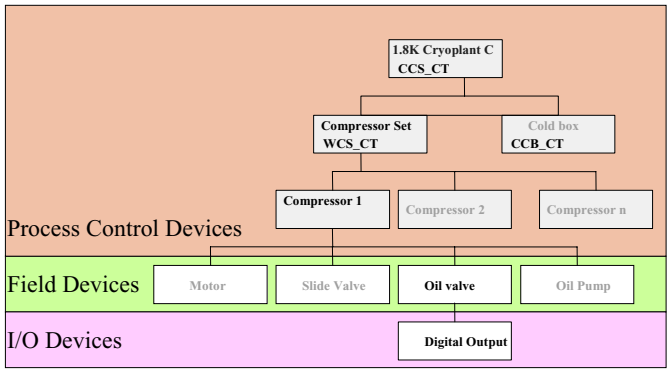
Hardware architecture (specified)



Implemented Hardware Architecture



Object hierarchy



For each object type an adapted user interface is created & implemented in the supervision to allow monitoring & control

Framework content

SCADA

- Display types
  - Synoptics
  - Trends(Predefined/Configurable)
  - Lists(Alarm, Event, Object)
  - Diagnostics, info
- Basic background design
- Display navigation facility
- Object presentation
  - Display element (color codes)
  - Faceplate
  - Online / History trend
  - Diagnostic screen
- Object selection mechanism

PLC

- Mode management
  - Manual, Auto, Forced, Local
- Activity state
  - On/Open. Off/ close, position
- Interlock,Warning status
  - Full stop, Temp stop, Start interlock, acknowledged
  - IO-error, auto/manual
- Output setting
- Ramp & bumpless evolution
- Specific logic block
- Timestamping
  - 10ms / event, 50ms/status

What's done

- First applications based on PCVue32 SCADA
- Software production rules:
  - Specification Document & PLC source code Templates
  - Rules apply to all development teams (CERN, GTD, Collaboration) to allow a common maintenance policy
- Unique database & code generation tool (in devt)
- Port SCADA layer to PVSS-II
  - Pre-study autumn 2001
  - Started Compatibility study with JCOP Framework

What's next

- Evolution of Schneider PLC
  - Unique development platform for Premium & Quantum PLC end 2002, allows same time-stamping
- Port SCADA layer to PVSSII
  - Framework "port" Q3-2002
- Unicos for gas control in Experiment
  - Collaboration with IT-CO
- Study possible extension to other LHC domains
  - Specific Requirements (VAC,..?)
- Communication protocol with Schneider PLCs
  - Collaboration with IT-CO, ST-MA(?)

Conclusions

- Unicos not dedicated to Cryogenics controls, could apply to other:
  - slow controls systems
  - loosely coupled with accelerator or experiment DCS
  - Needing fast-developed expert user application
- Follow same collaborative model with equipment group
- Maybe less fashionable technical challenges and sense of ownership, but optimises development costs and maintenance in the long term