



Controls for the QPS hardware commissioning

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- QPS is already running in String 2
 - Learn about the operation
 - Learn about important signals for the protection
 - Collaboration between SL/CO, LHC/IAS and LHC/ICP
 - Learn about installation, commissioning
 - Learn about the behavior of such system
- Today this is a collaboration between AB/CO and AT/MEL
- QPS control is not an active control
 - No feedback control
 - Just monitoring
 - Evaluate the power permit
 - Do the test mode



Outline

- Hardware component list
- Hardware architecture
- Software architecture
- Commissioning phase
 - Surface test
 - Tunnel installation and commissioning



Hardware component: Controller

- Rack composed of:
 - WorldFIP agent:
 - DQAMC, DQAMG, DQAMS, about 12 different types of configuration
 - CPU with a MicroFIP chip
 - reading data
 - Power permit, quench status evaluation
 - Test mode: simulation a quench and checking of the sequence
 - Radiation tolerant (compulsory for the DQAMC)
 - No hardware security action
 - Synchronized with LHC time via WorldFIP
 - Time stamp the data
 - Quench detector: ADC/DAC/I2C interface
 - Located
 - Under the magnets
 - UAs, RRs, etc.

Hardware component: Gateway

- LynxOS kernel with WorldFIP
 - PC or VME platform (under discussion)
 - AB/CO platform
 - Diskless with secure remote disk server
 - Receive LHC Timing: 1msec synchronization
 - Maximum 2 WorldFIP fieldbus, 200msec macrocycle, 60 agents/bus
- Located in SR
- Based on the AB/CO (PS/CO) development framework
 - Data driven
 - Configurable executable from database
 - Same software for all the possible configurations
- Interfaced
 - To the upper layers:
 - Supervision, access to all the data, etc.
 - Handle commands, test mode, etc.
 - To Interlock: 1 DQGTW ↔ PIC
 - One signal per DQGTW:
 - AND of the power permit of all the DQAMC, DQAMS, DQAMS

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Hardware component: others

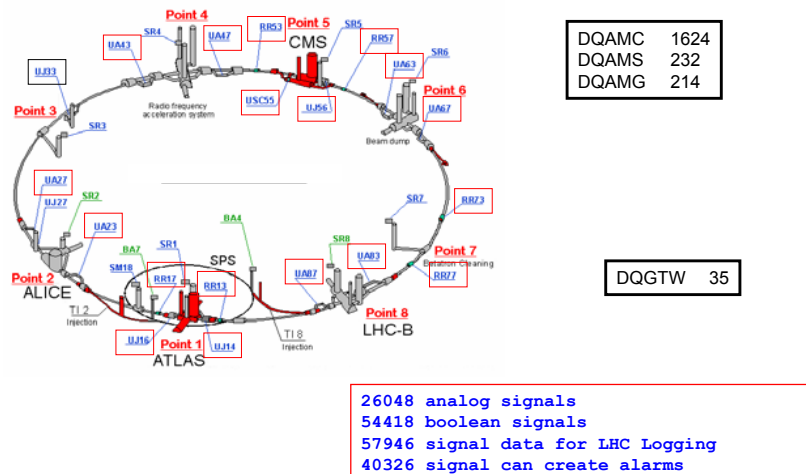
- Supervision
 - Expert tool
 - Graphical interface used to validate, debug and monitor the system
 - Check the integrity of the QPS control software:
 - Correct functioning of the underlying layers
 - Local archive for fast retrieval
 - Alarms handled and displayed
 - Under study: 2 options
 - ABC/CO business: 3 tier JAVA
 - PVSS
- Interface to LHC Alarms, Logging, Post-Mortem
 - Under study, either
 - In the supervision layer
 - Or in the DQGTW layer
 - Or a mixture

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Hardware architecture

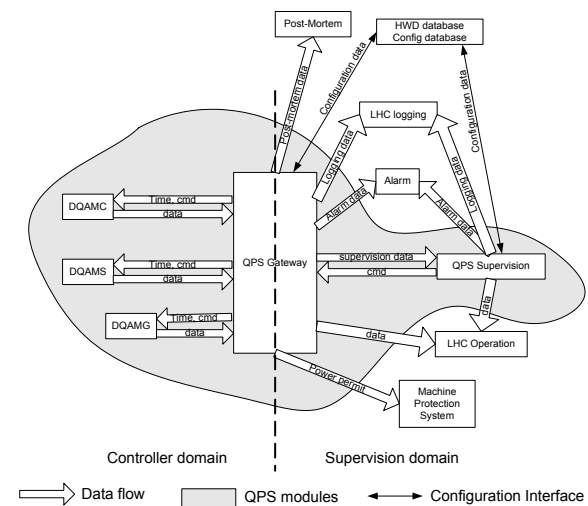


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Software architecture: functional diagram



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Technical choices milestones

- DQGTW:
 - VME/PC LynxOS platform
 - Will be tested in String 2
 - Development of the production version from 08/2003
 - PS/CO development framework, possibly FECOMSA in the future
 - Version for surface test ready by 01/2004
 - Full version ready for tunnel installation [06/2004]
- Supervision
 - Decision on the architecture: PVSS vs 3 tier JAVA [end 07/2003]
 - Basic supervision for surface test [01/2004]
 - Full software ready [end of 2004]



Test and installation: summary

- 3 main steps
 - Surface tests
 - Installation in tunnel
 - Continuous integration, and validation tests
 - Hardware commissioning



Surface test

- Starting early 2004
- 1 Gateway operational
 - No timing, no LHC Services
 - Connection to database:
 - AB/CO equipment database (PS/CO front-end database)
 - MTF
 - Result data saved by QPS experts
- Interface to validate the DQAMx software and hardware
 - WorldFIP: assign Id and name to the DQAMx
 - Readout data: pre-defined pattern based on WorldFIP number
 - All possible modes
 - Automatic sequence of test
 - Simulation of quenches and other events
 - All results stored by QPS
- Done by QPS operators and experts



DQAMC-DQAMG-DQAMS

- During surface tests:
 - Quench detectors validation
 - Discharge of the heater power supply
 - WorldFIP tests
 - Communication validation with the GTW
 - All modes: readout, test mode, etc.
- At the end of the surface test of a DQAMx
 - The name is set into the DQAMx,
 - DQAMx configured for tunnel installation and no modification in the software and hardware afterwards.
 - Data saved in the MTF database

Tunnel installation

- As soon as a group of magnets is installed (batches to be defined)
 - From June 2004
- Connection of the QPS rack to WorldFIP
- DQGTW:
 - Configured from database
 - Basic tests with DQAMC, DQAMS and DQAMG:
 - WorldFIP communication
 - Response to commands
 - Perform all the possible tests except discharge of the heater power supply
 - Read value: predefined pattern and correct value
 - Pre-defined pattern: to check mapping between DQAMx, DQGTW and Supervision
 - Get and check the DQAMx name
- Integration within supervision
 - Continuous integration
 - Modification of view
 - Tests

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Hardware commissioning

- Test of the whole system
 - Supervision, DQGTW and DQAMx
 - Same as during installation
 - All possible modes
 - Readout value: pre-defined pattern
 - Automatic procedure with result: preferable
 - All DQAMx checked in test mode
 - Simulate a quench and check the sequence: quench detection, fire heaters, etc.
 - On QPS expert request: particular condition, no current

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14

QPS needs: hardware commissioning-1

- WorldFIP [06/2004]:
 - QPS needs already given to WorldFIP support
- Ethernet [06/2004]: in SRs
- Computers [06/2004]:
 - DQGTW SRs
 - Supervision computers
 - PVSS or 3 tier JAVA
 - Graphical Console for QPS experts in a place to be defined
 - Eg: SR, Tunnel
 - UPS:
 - WorldFIP, repeaters, DQAMx
 - Tunnel, UJs-Uas (WorldFIP repeaters) and SRs
- LHC Timing [06/2004]: 1ms in SRs
- Voice communication [06/2004]

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QPS needs: hardware commissioning-2

- LHC Alarm
 - Interface [01/2004]: for the software development
 - Operational [06/2004]: commissioning
- LHC Logging:
 - Interface [01/2004]: for the software development
 - Operational [06/2004]: commissioning
- LHC Post-Mortem:
 - Interface [01/2004]: for the software development
 - Operational [06/2004]: commissioning
 - Send data and view them

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QPS needs: hardware commissioning-3

- DQGTW:
 - Ready for surface tests [01/2004]
 - Installation, cabling, hardware tests
 - Corresponding to 80% of full functionalities
 - Full functionalities ready for tunnel installation [06/2004]
- Supervision:
 - Basic applications for hardware tests on surface and tunnel pre-commissioning [01/2004]
- QPS controls ready for commissioning 7-8 [03/2005]
 - Commissioning of the whole QPS control chain
 - All functionalities available: DQGTW and supervision
 - Alarm, Logging, Post-Mortem analysis tools
- Deployment for the other sector tests:
 - Creation of the configurations by QPS experts
 - Download of the configurations
 - Development/configuration of the graphical interface of the QPS for the other sectors.

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Conclusions

- Design of on-the-field controllers has been completed
- Design of the architecture layout has been done
- Milestones are defined and known by AB/CO through the TC

- No major showstoppers but time/resources are limited
- Project still on-time but not a lot of “marge de manœuvre”

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18