Design of the GERDA Slow Control

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GERDA Slow Control Do's

The GERDA Slow Control should provide

- High Voltage and Low Voltage monitoring
- Electronic Crates monitoring
- acquisition of relevant detector parameters (temperature, pressure, detector currents, etc.)
- data storage in a centralized database
- alarm handling
- online histograms
- a GUI for detector experts
- a WEB based interface

$\rightarrow$ a reliable remote monitoring of the whole experiment

GERDA Slow Control Don’ts

But we think it should NOT

1. take decisions to START or STOP a physics run
2. handle interactions between different components (for instance DAQ/Clean Room)
3. perform detector calibration procedures

These tasks
should be handled by some other independent system,
for example a RUN Control

Design steps

- a questionnaire was sent to all group leaders $\Rightarrow$ collect requirements from sub-components
- details of the survey in a new GERDA internal note `GSTR-08-011`
- a discussion will take place in the “GERDA construction and integration” session

- we have analyzed some possible commercial packages (PVSS, iFix, etc) all appealing solutions, but . . . we cannot afford it
  the Italian Commissione II (F. Ronga et. al) rejected all our funding requests

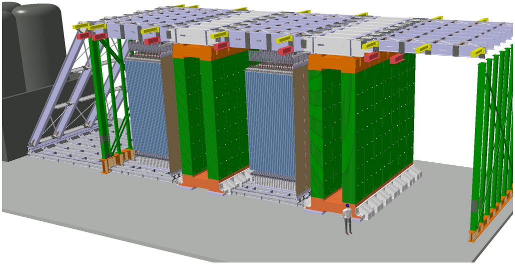
- we wanted to consider an *home made* solution, following what we developed for OPERA

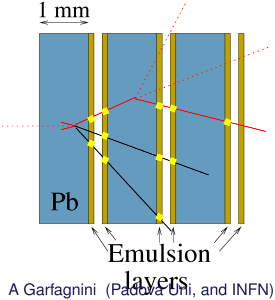
Oscillation Project with Emulsion-tRacking Apparatus

Designed for $\nu_\mu \leftrightarrow \nu_\tau$ oscillation studies through direct τ appearance in a pure ν_μ beam shot from CERN.

Modular structure:

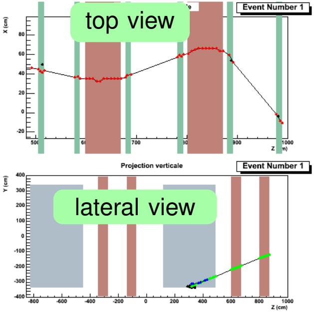
- target
- magnetic spectrometer



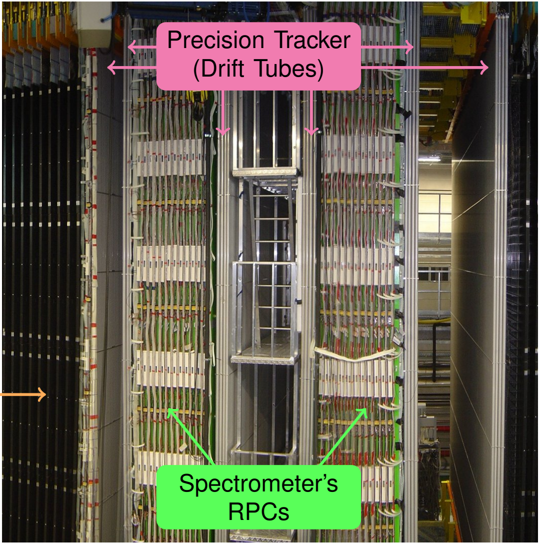


Target: Pb + nuclear emulsion bricks alternated to plastic scintillator strips
Spectrometer: drift tubes for momentum measurement and magnet inner walls instrumented with 22 RPC planes for muon charge identification

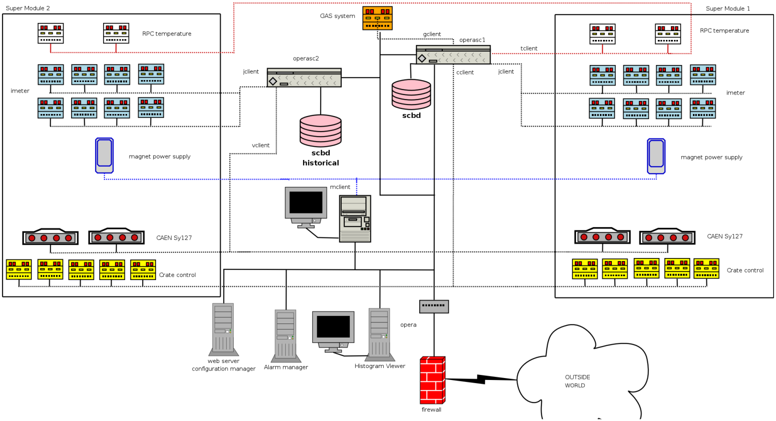
The OPERA magnetic spectrometer



Target section



The OPERA spectrometer Slow Control



Simple structure

- one central database
- several distributed clients

Monitored systems

- RPC (HV, temperature, timing boards)
- Magnet Power Supply
- GAS system
- FEB crates

The Data Base

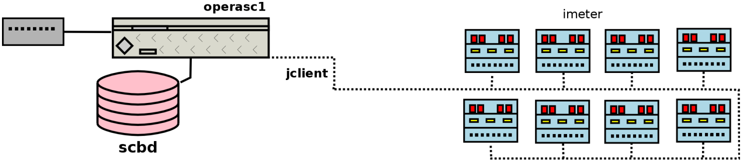
- The heart of the system is a Relational Database (SQL compliant)
    - gives persistence to the data

      allows correlations between different client and easy generation of alarms
    - stores all hardware configurations
    - used as a backbone for client synchronization (MAILBOXES)

- All read data split into two databases (for access optimization):
    - SCDB, stores 'current' data up to one week, no data reduction;
    - SCDBhist, stores all data older than 1 week

      Maintain an 'history' of all parameters for offline investigations
      data reduction is applied to limit storage size

The slow control clients



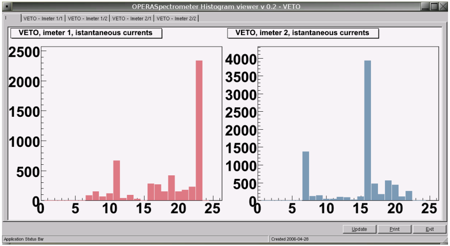
- electronics slow-control data read via CANbus connections
  industrial standard, widespread, robust and reliable
- all clients store data in the central database (TCP/IP connections)
- client administration done using System V like start up scripts

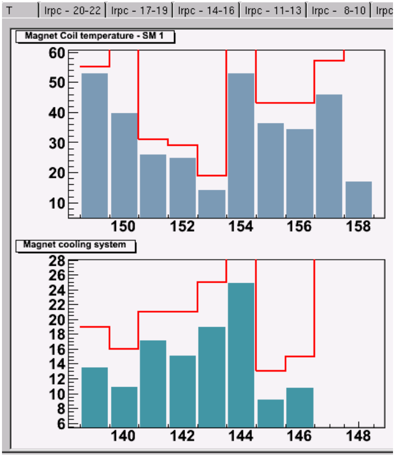
- hardware:
  - RPC HV system (SY127 Power Supply + custom imeters)
  - RPC timing boards
  - RPC and magnet temperatures
  - GAS system

Histogramming

- Ad hoc program developed in the ROOT framework to display relevant quantities for Detector Quality Monitoring

- driven by XML configuration files
- data retrieved from SCDB
- display simple 1D histograms (snapshots, strip histograms)





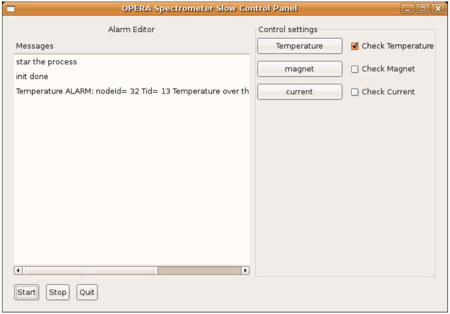
The Alarm manager (1)

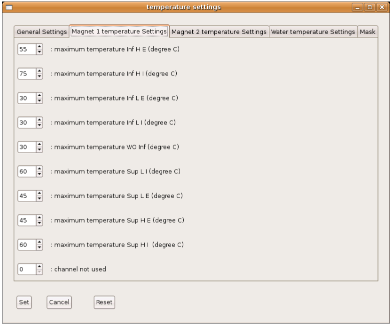
- Retrieve the last inserted data from the database
- Checks that all data is properly updated (client is not dead or isolated from network)
- Compare values against references
- Generate warnings/alarms when values exceed predefined thresholds
- Communicate to the central OPERA DAQ Manager via CORBA interface
- A Graphical User Interface (GUI) is available for shifter

In case of alarms an SMS is sent to the shifter

The Alarm manager (2)

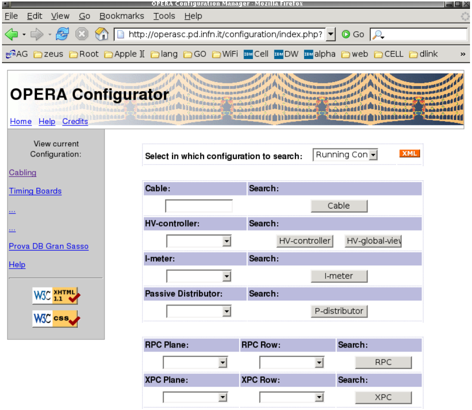
- Warnings/Alarms are
  1. logged (screen and separated log file)
  2. sent to the OPERA DAQ Manager via CORBA interface





The Configuration Manager

- All detector configuration parameters stored in the DB
- A WEB server (Apache) gives access:
  - user friendly editing of parameters
  - XML files for the clients



Conclusions

- We have started to collect all the requirements from the GERDA sub-components (new GERDA note `GSTR-08-011`)
- with feedback from sub-detector experts → aim to complete the specifications
- We need to clarify the responsibility of the GERDA Slow Control we feel some kind of "RUN-Control" is needed (independent of GERDA SC) → discussion in the "integration" session
- We decided to profit from the OPERA experience and go for an *home made* solution (due experience in our group and, unfortunately, to money cuts)
- It's time to start the development phase:
  1. with all specs in hand we can start designing the data structure
  2. we need hardware to build a test system to develop the SC