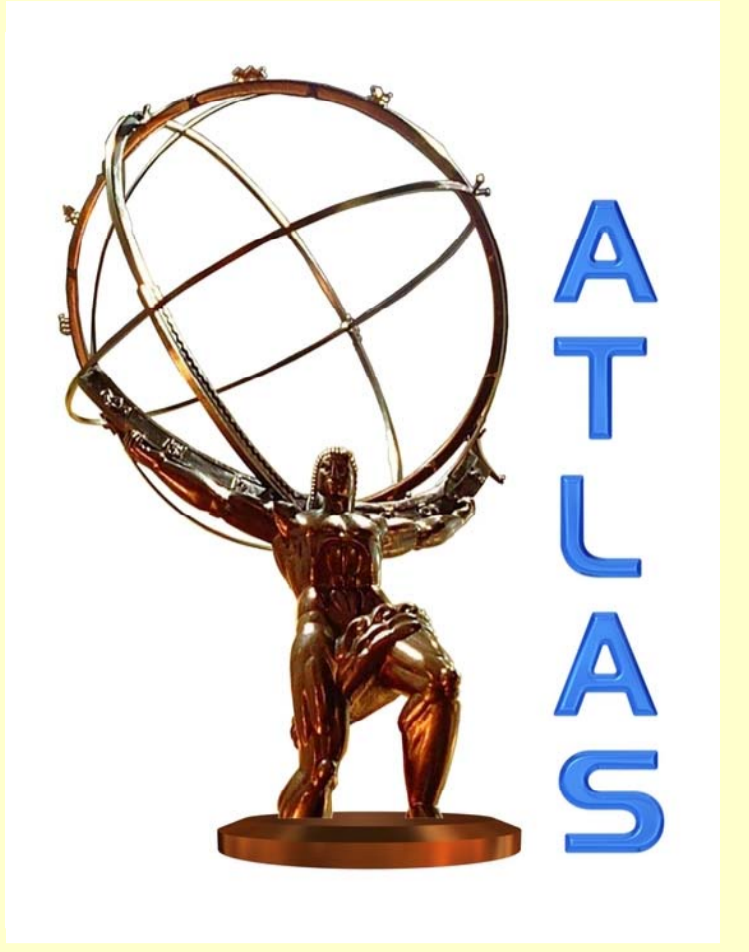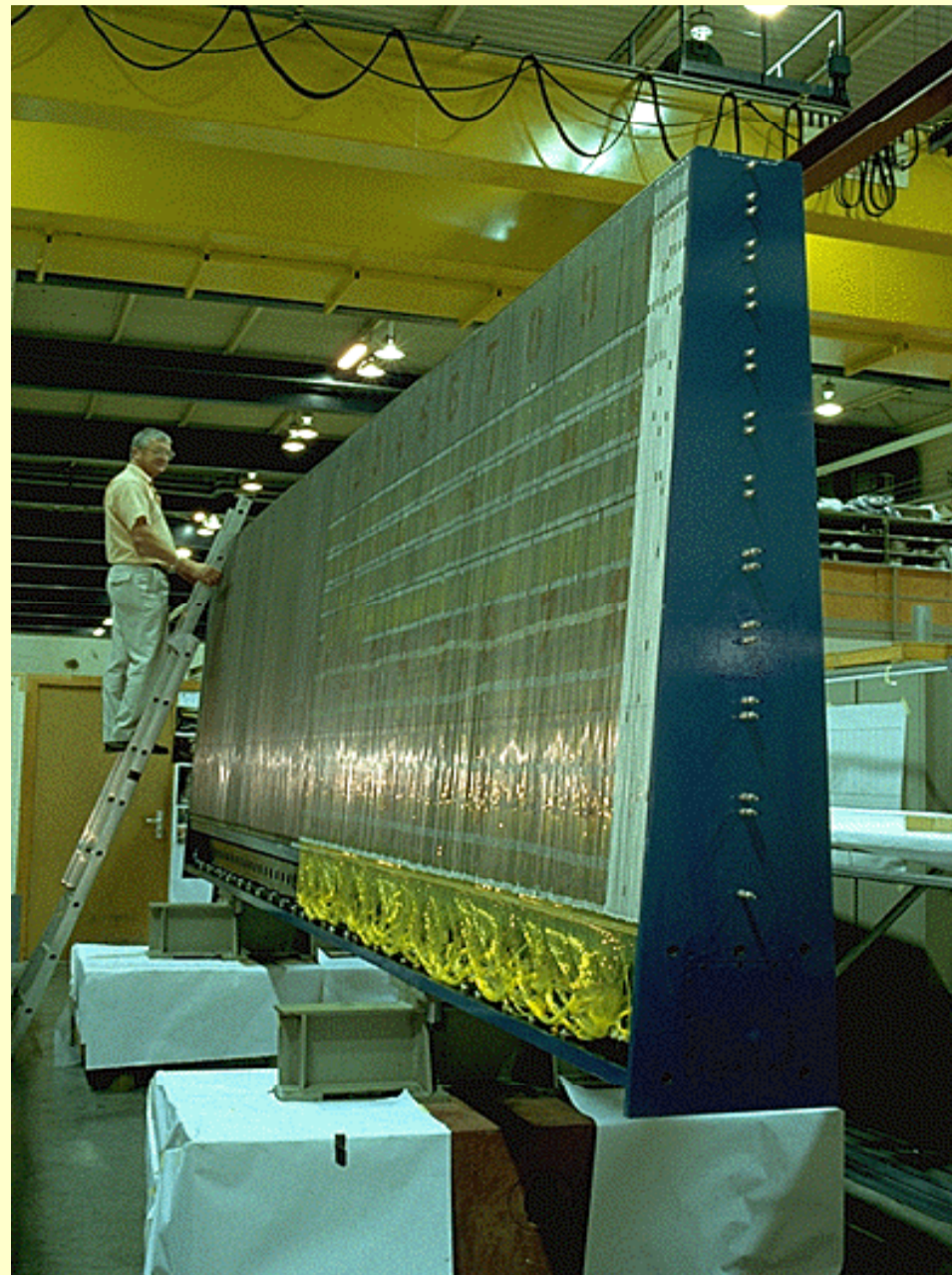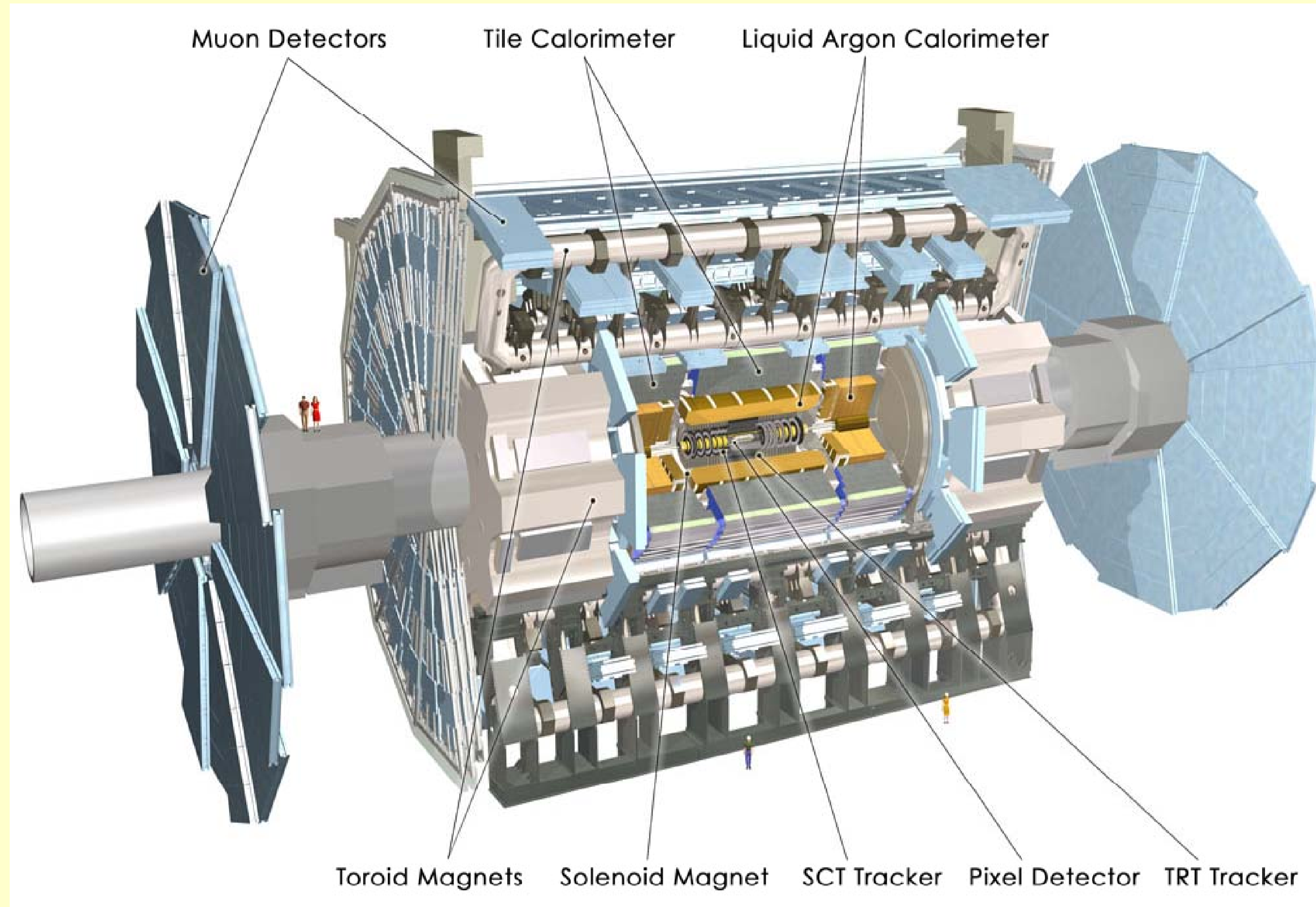# The ATLAS/TILECAL Detector Control System

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ATLAS

Muon Detectors — Tile Calorimeter — Liquid Argon Calorimeter

Toroid Magnets — Solenoid Magnet — SCT Tracker — Pixel Detector — TRT Tracker

TILECAL module

TILECAL is composed of 3 cylinders, one central barrel and two extended barrels with each cylinder composed of 64 modules.

Back-end (Software):
- Distributed **S**upervisory **C**ontrol **A**nd **D**ata **A**cquisition system (**SCADA**) running on PCs
- SCADA system **PVSSII** commercial program from Austrian company **ETM**

Front-end (electronics):
- **PLC's** (**P**rogrammable **L**ogical **C**ontroller)
- ▶ HV micro boards and HV opto boards
- **ELMB** (**E**mbedded **L**ocal **M**onitor **B**oard)

Field bus
- CANbus (**C**ontroller **A**rea **N**etwork)
- ▶ MODbus

Communication Protocols
- ▶ DIM (Distributed Information Management)
- ▶ OPC (OLE for Process Control)

CUSTOM-MADE COMPONENTS FOR THE DCS

- ▶ a new firmware for the ELMB (non-ATLAS standard)
- ▶ Several PVSS scripts for control of the low voltage power supplies (examples: majority for temperatures probes; automatic retrieving of data for off-line analysis)
- ▶ All control and security of low voltages power supplies (software interlocks)
- ▶ All High Voltage Control system (photomultiplier's voltage control) implementation of a DIM server
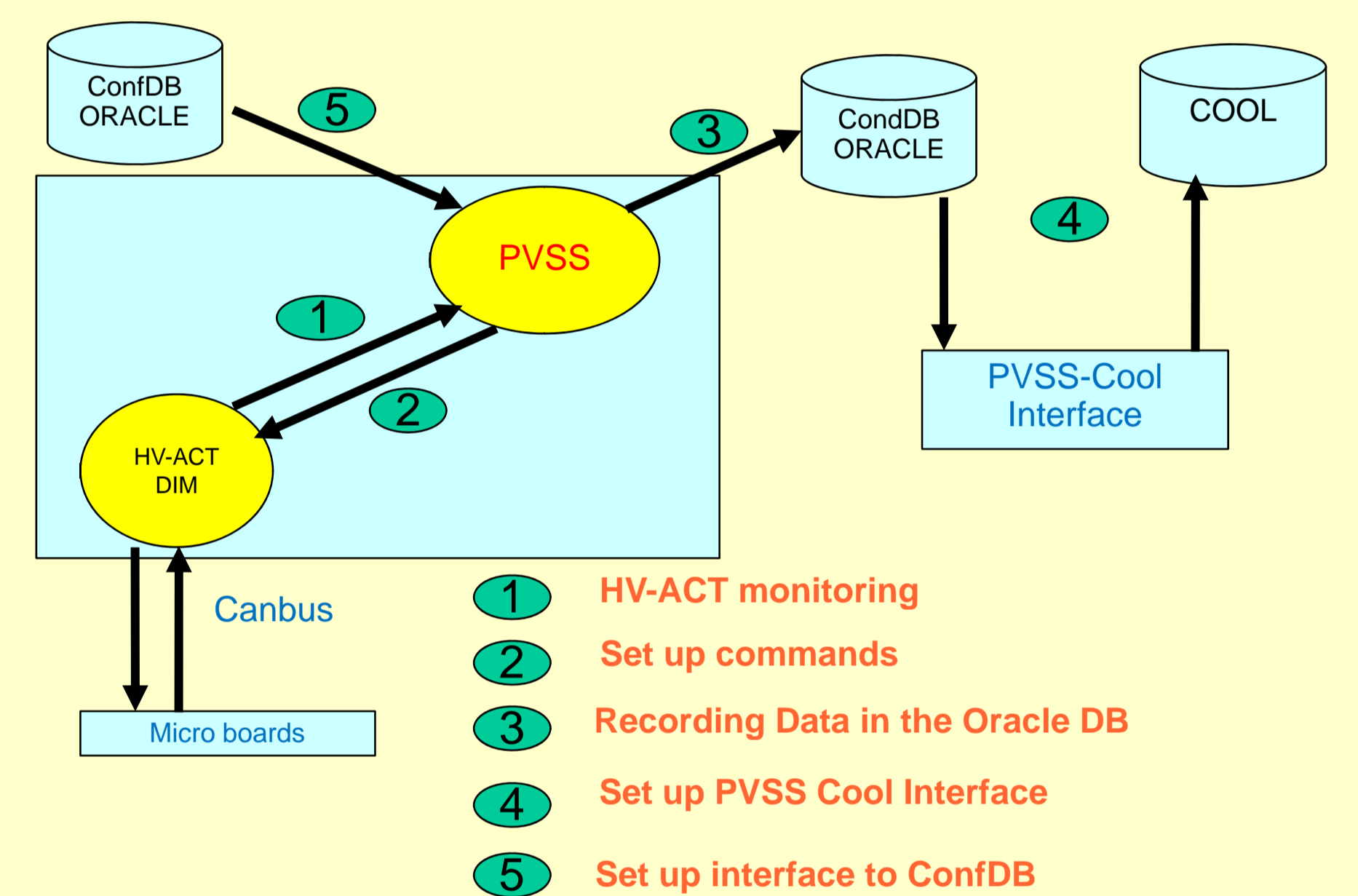
LOW VOLTAGE CONTROL

- LVPS 8 Output voltages
- Auxiliary Boards control the LVPS
- Equipment:
  - 256 LVPS
  - 64 Auxiliary Boards
    - ~2000 canais AO
    - ~16000 canais AI
    - 10 between readings

200 V PS
Auxiliary ELMB
MODbus
LVPS ELMB
Front End electronics
PC — CANBus

TILECAL DCS MAIN SYSTEMS

HIGH VOLTAGE (HV) – power supplies the Photomultiplier's (400 to 1000 V) - monitoring of the voltages and temperatures

LOW VOLTAGE (LV) – supplies power to HV distributor, Digitizers and Motherboard (eight voltages from 3 to 15V) – DCS monitors voltages, currents and temperatures using Embed Local Monitor Board (ELMB). DCS also provides control of the system.

COOLING – cooling for both Low voltage and High Voltage systems - DCS monitors temperatures and pressures in cooling sectors. Also provides monitoring of temperatures inside LV and HV system.

CESIUM
LASER
} Calibration systems with their own control

HIGH VOLTAGE CONTROL

ConfDB ORACLE — PVSS — CondDB ORACLE — COOL
HV-ACT DIM
Canbus
Micro boards
PVSS-Cool Interface

1 HV-ACT monitoring
2 Set up commands
3 Recording Data in the Oracle DB
4 Set up PVSS Cool Interface
5 Set up interface to ConfDB

DAQ DCS COMMUNICATION (DDC)

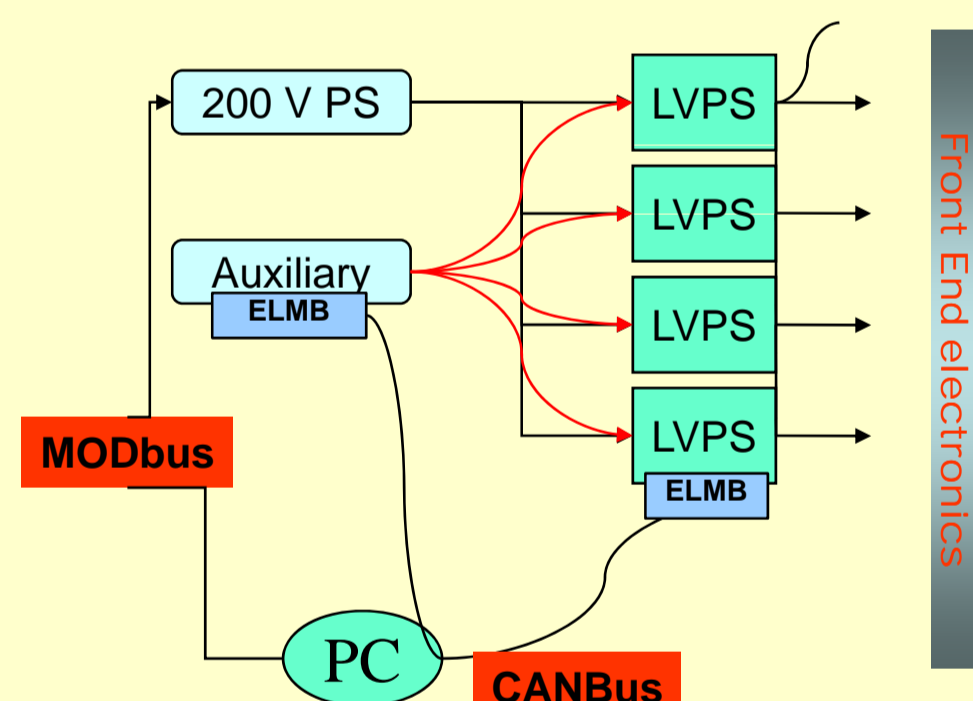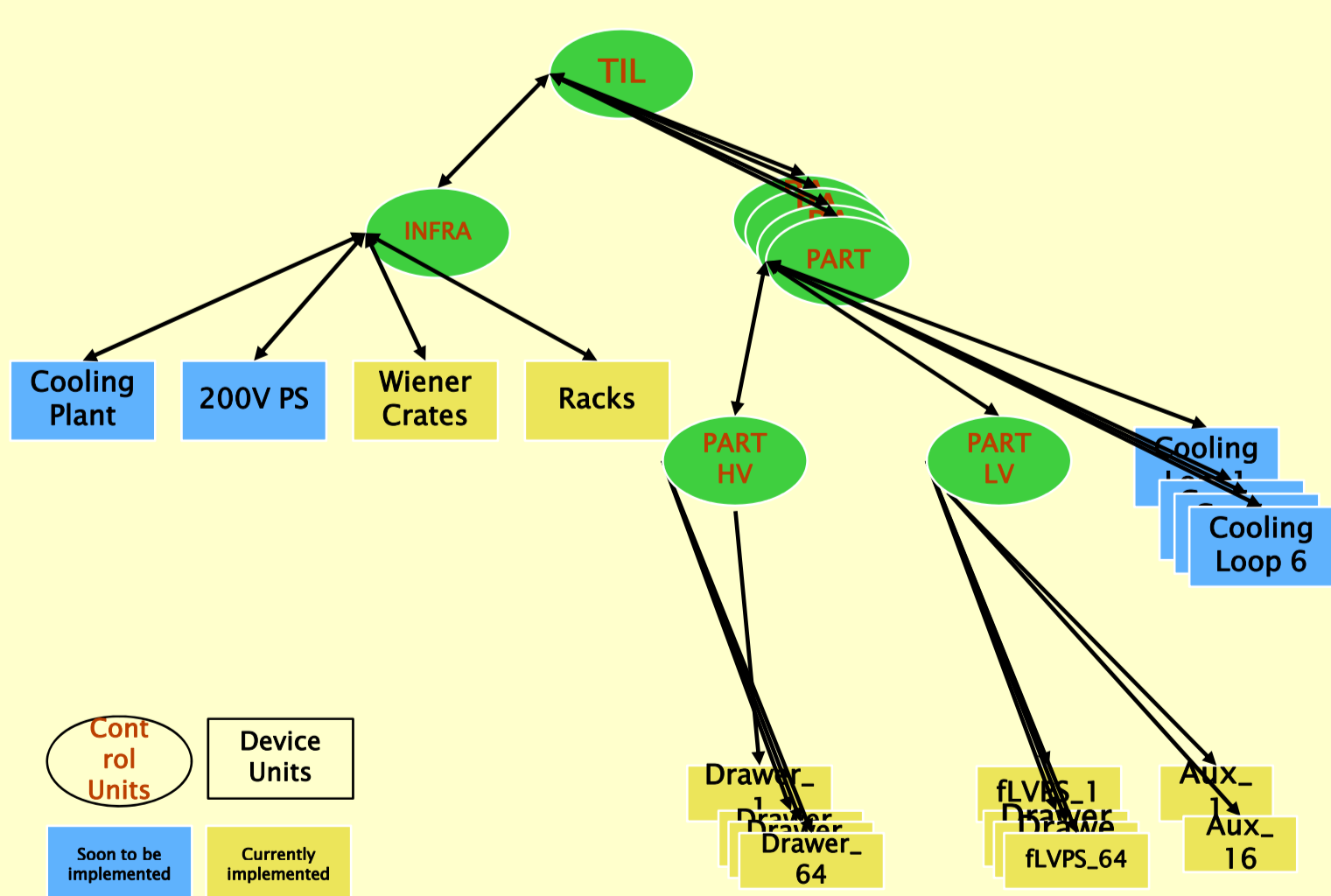Mechanism to exchange information between TDAQ and DCS based on DIM across Windows and Linux

ByteStream MetaData — TDAQ — DCS — Oracle DB
TDAQ state
LVPS and HV states
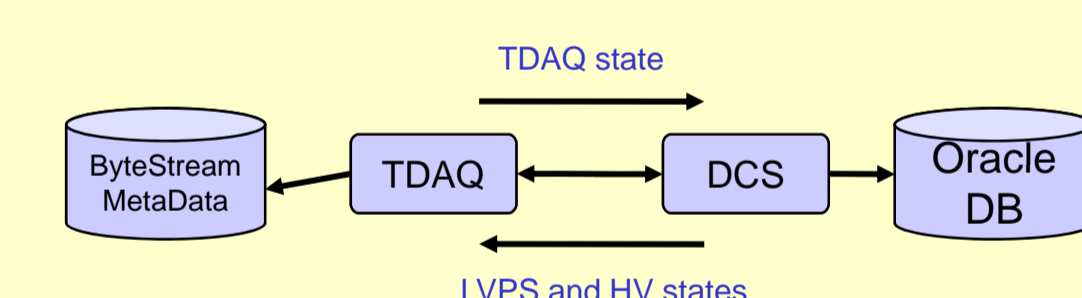
DAQ - DCS Data Flow
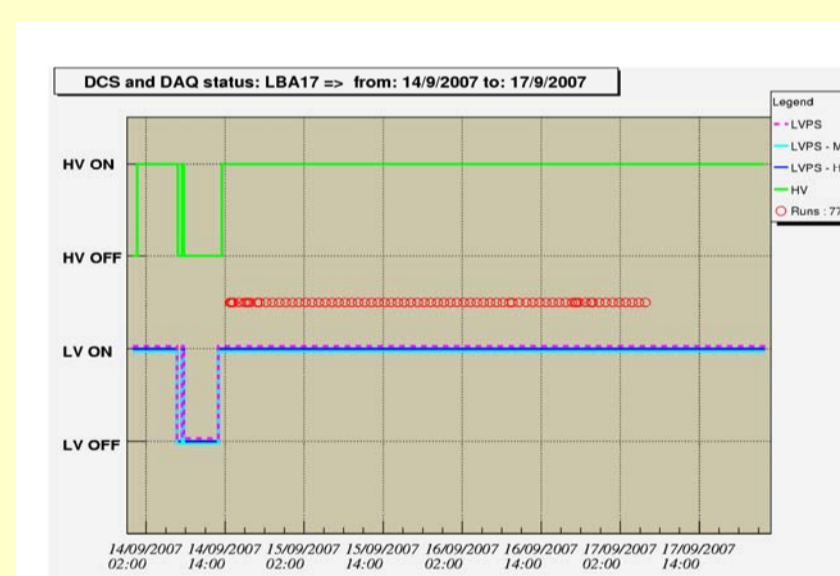
Example graph from DCS web interface showing activities of DCS and TDAQ
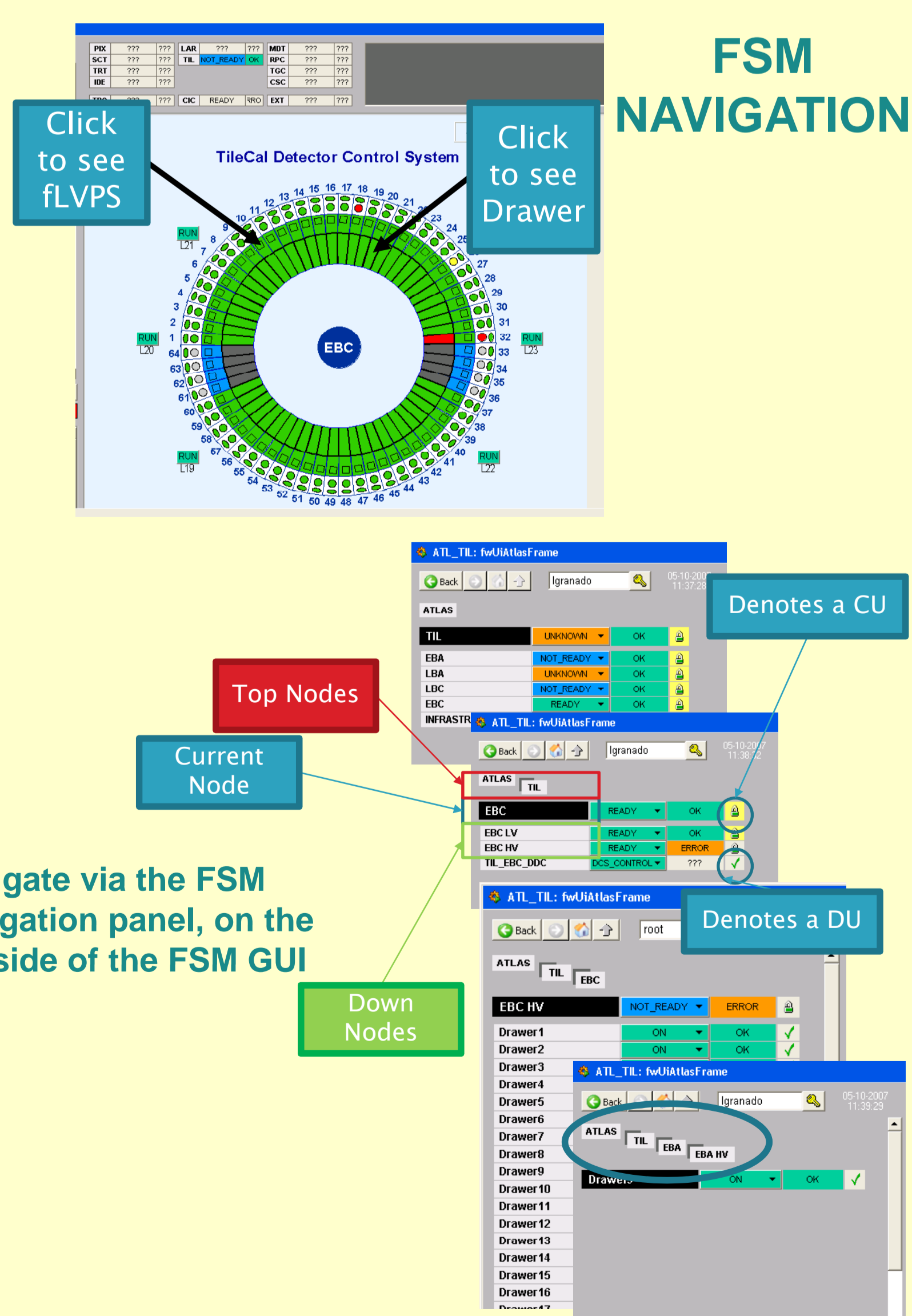
Finite State Machine (FSM)

FSM will be extensively used in ATLAS DCS. It allows, among other, automatic detector operations, single subsystem operations and integration of the control in the ATLAS DCS.

TIL
INFRA — PART
Cooling Plant — 200V PS — Wiener Crates — Racks
PART HV — PART LV — Cooling
Cooling Loop 6
Control Units — Device Units
Soon to be implemented — Currently implemented
Drawer_1 Drawer_64 — fLVPS_1 fLVPS_64 — Aux_1 Aux_16

The TILECAL FSM hierarchy

The basic FSM elements are Device Unit (DU) and Control Unit (CU). The DU provides the interface with the hardware, the CU (with a complex control program) integrates the DUs in the hierarchy.
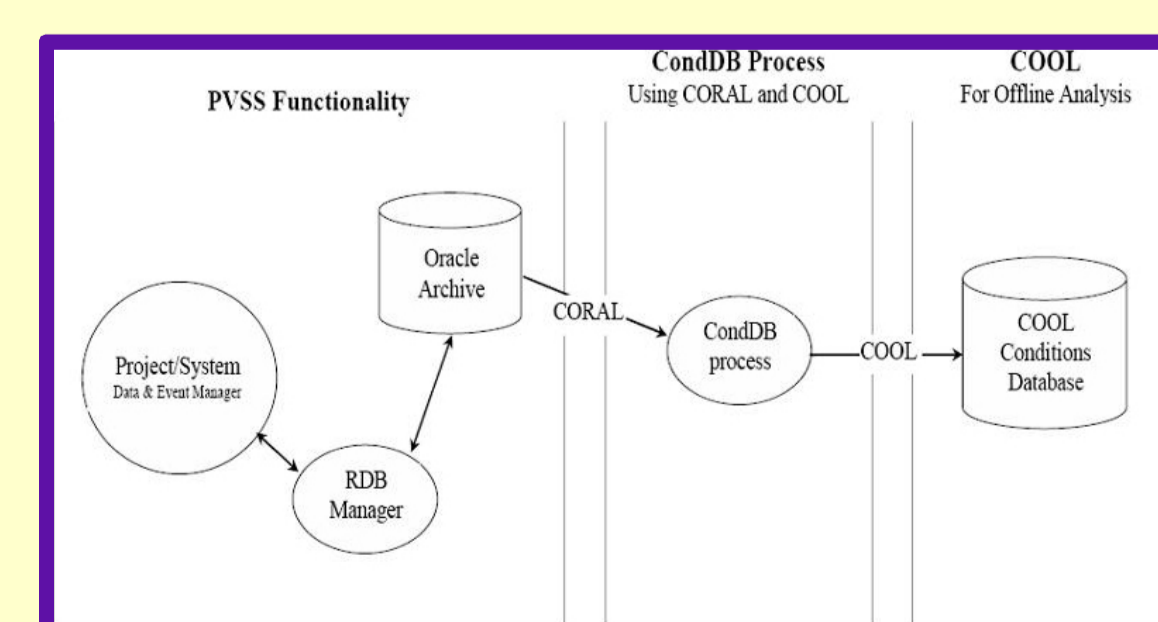
FSM NAVIGATION

Click to see fLVPS
Click to see Drawer
TileCal Detector Control System
EBC

Denotes a CU
Top Nodes
Current Node
Denotes a DU
Down Nodes

▶ Navigate via the FSM navigation panel, on the left side of the FSM GUI

Data Storing

The TILECAL DCS will use three types of databases:

CONDITIONS DATABASE: PVSS ORACLE DATABASE - database to store data that is relevant for understanding detector behaviour
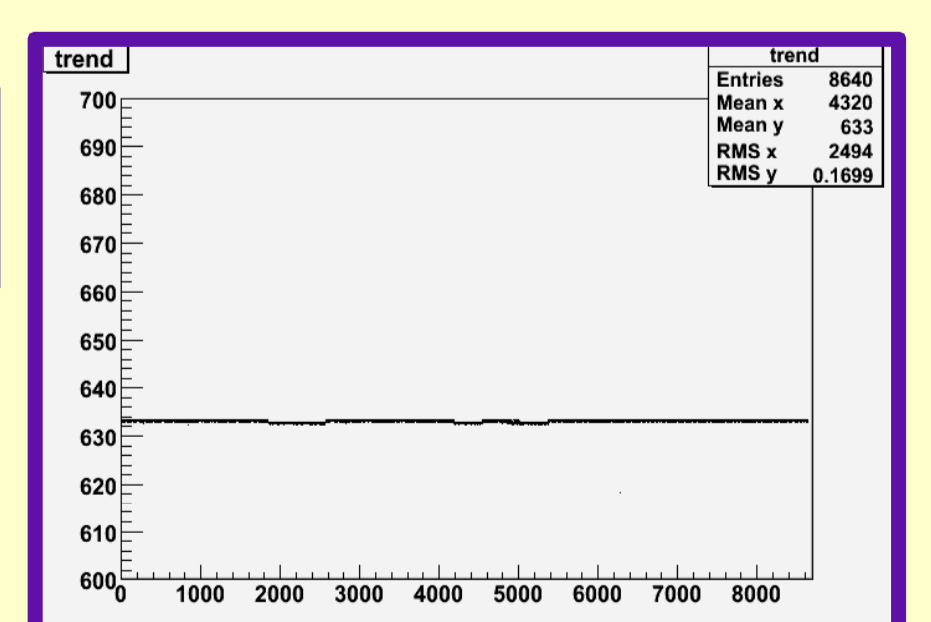
COOL DATABASE: database that will store data that is relevant for off-line physics analysis

CONFIGURATION DATABASE: ORACLE database to store settings (like output values, alert limits), system structure (lists and hierarchies of devices), device properties (like configuration of archiving, smoothing, etc.)

Shift on LBC11 HV pmt 38 June 15th 2007

PVSS Functionality — CondDB Process Using CORAL and COOL — COOL For Offline Analysis
Project System Data & Event Manager — Oracle Archive — CORAL — CondDB process — COOL — COOL Conditions Database
RDB Manager

PVSS to COOL Data Flow

LBC11 HV pmt 38
Δ max = 0.6 V
r.m.s = 0.20 V