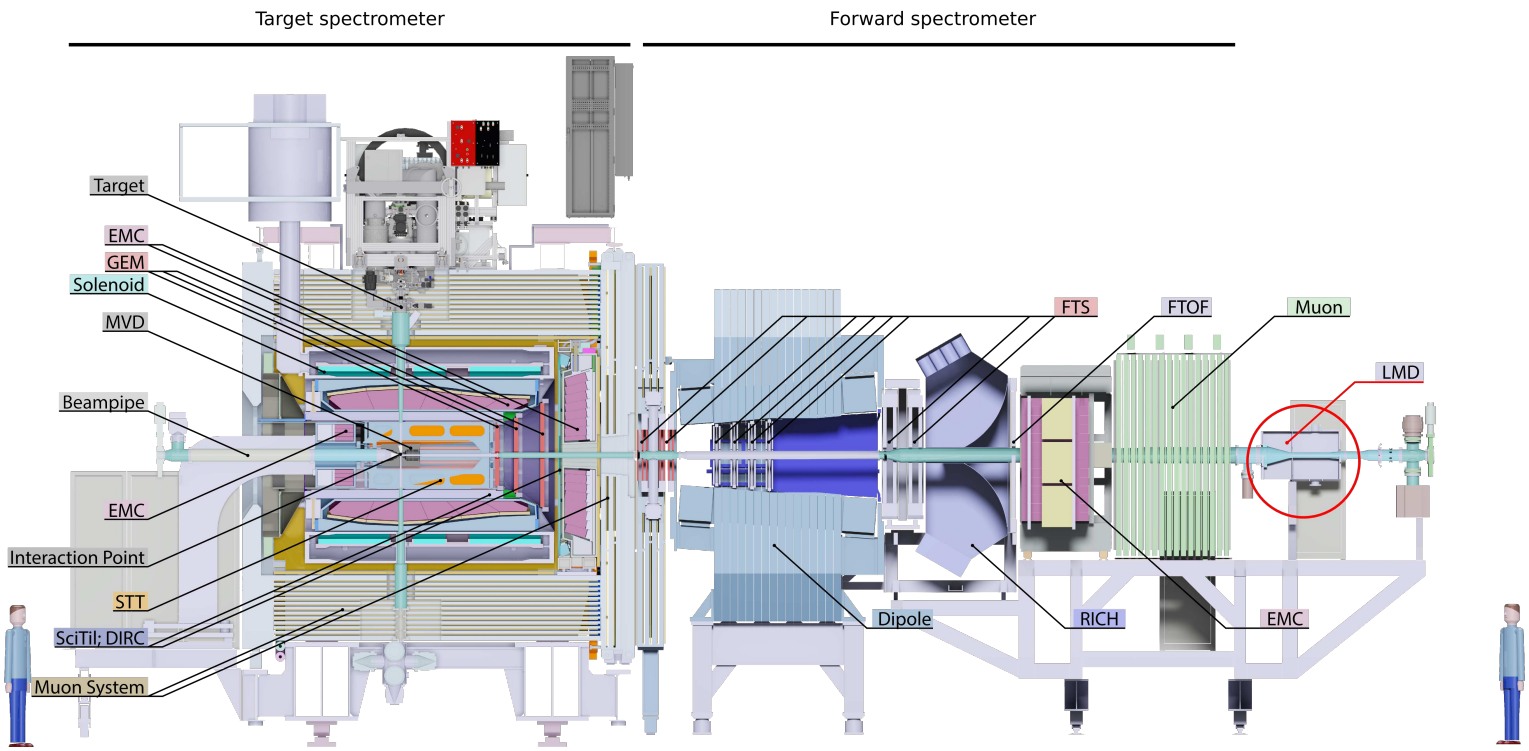
PANDA Detector Control System

Joint CBM/PANDA DCS Workshop

Florian Feldbauer

Ruhr-Universität Bochum - Experimentalphysik I AG

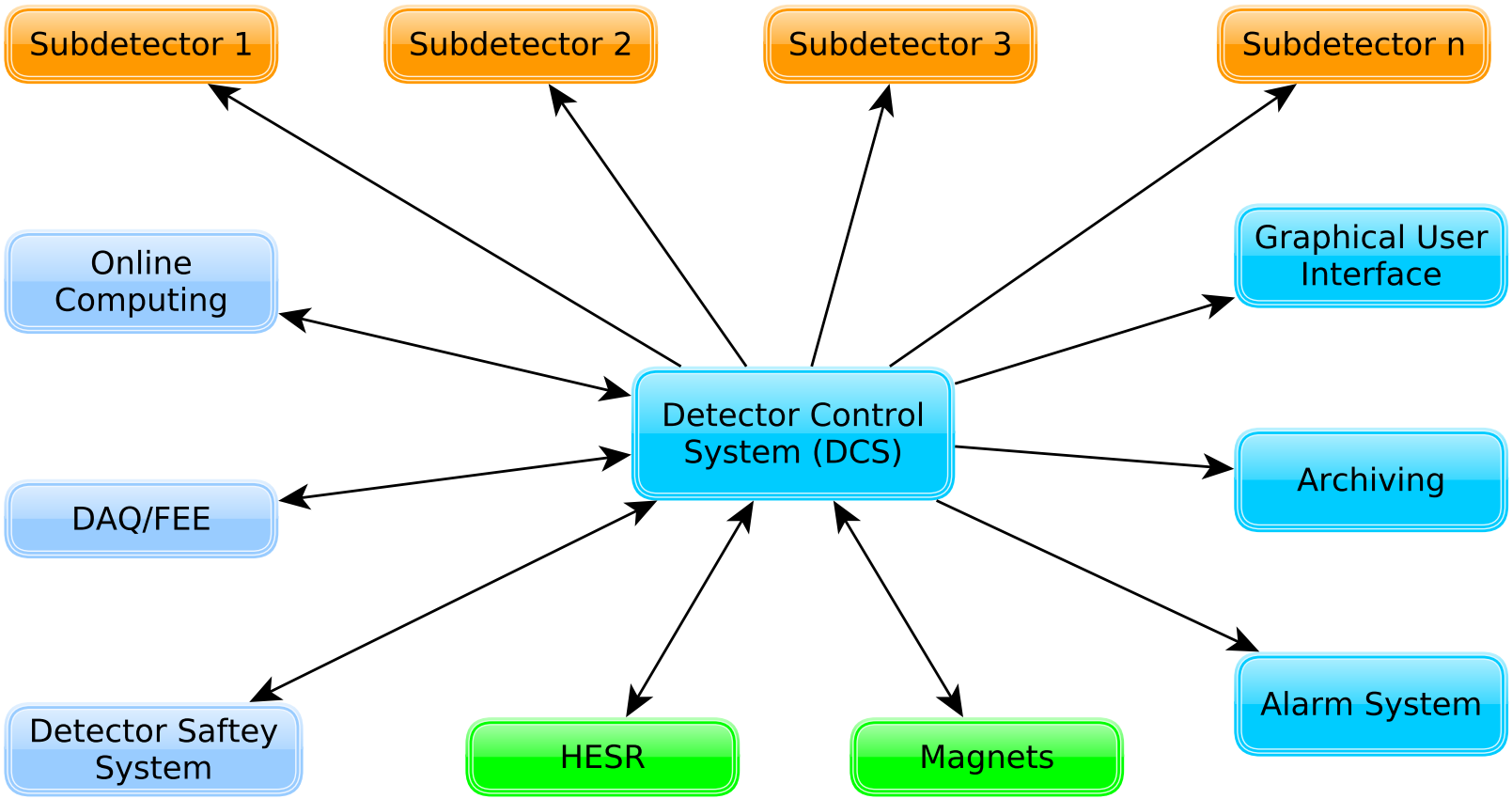
The $\bar{P}$ANDA Detector



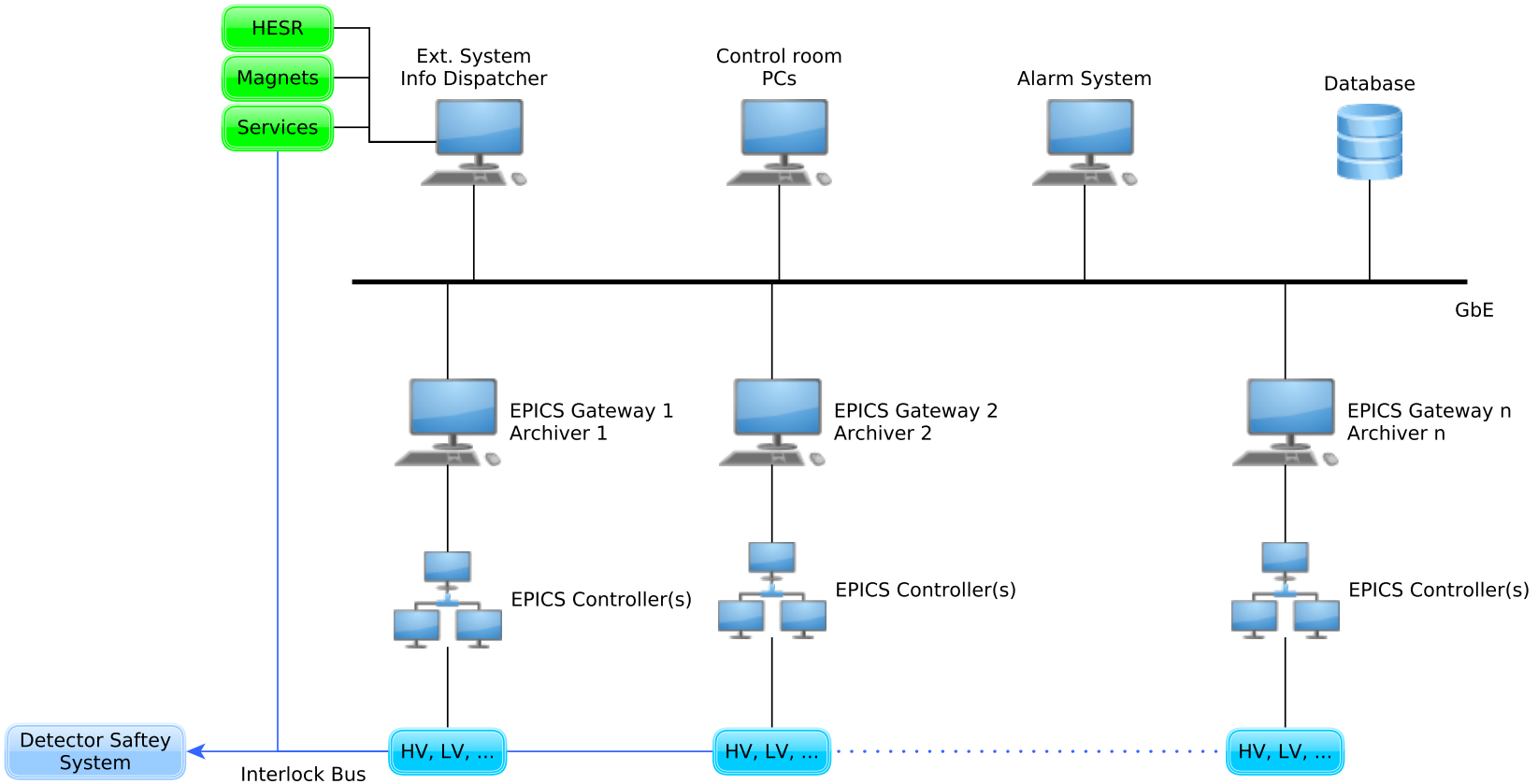
$\bar{P}$ANDA physics program:

- Hadron spectroscopy
- Hadron structure
- Hadrons in medium
- Hypernuclear physics

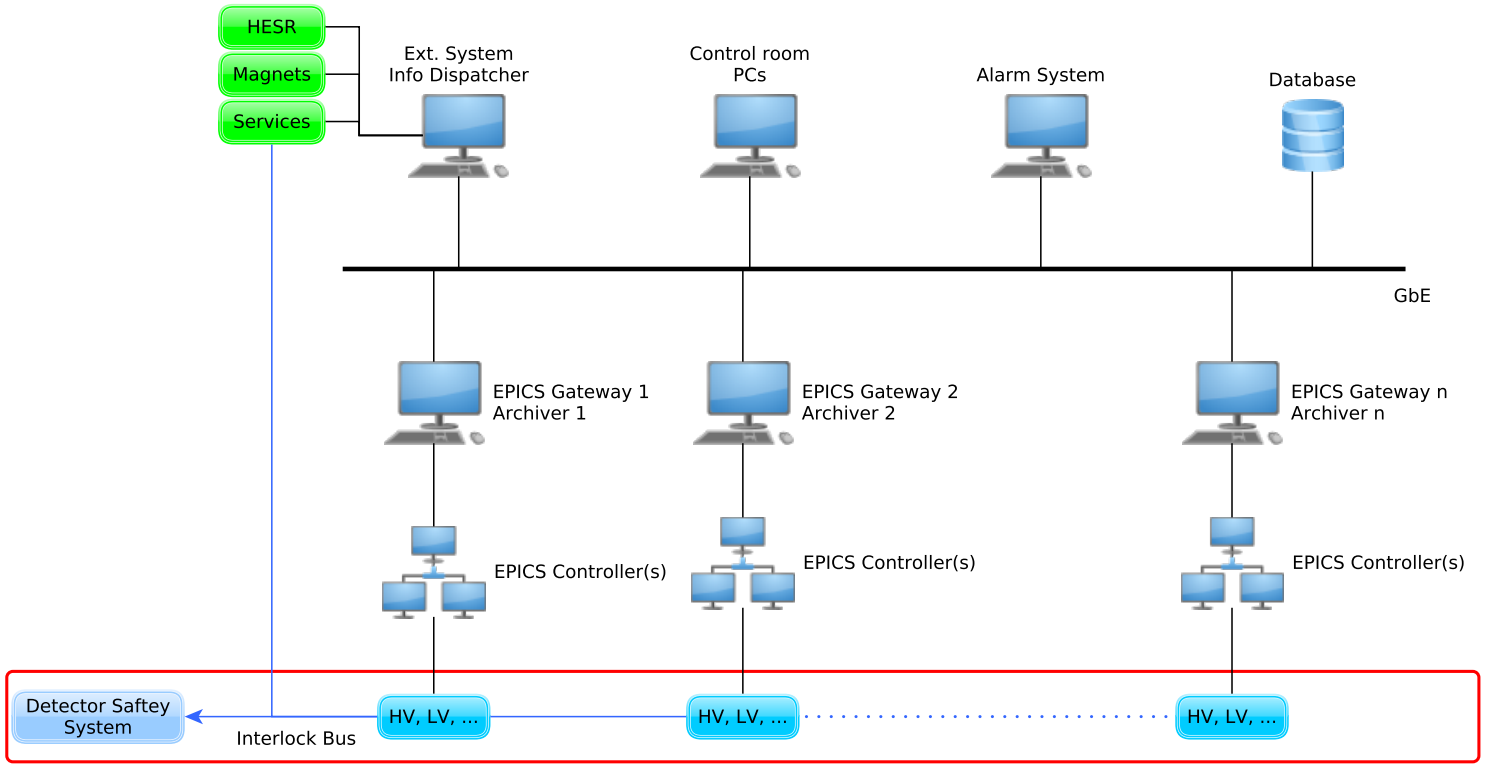
Detector Control System Centralized View



DCS Overview



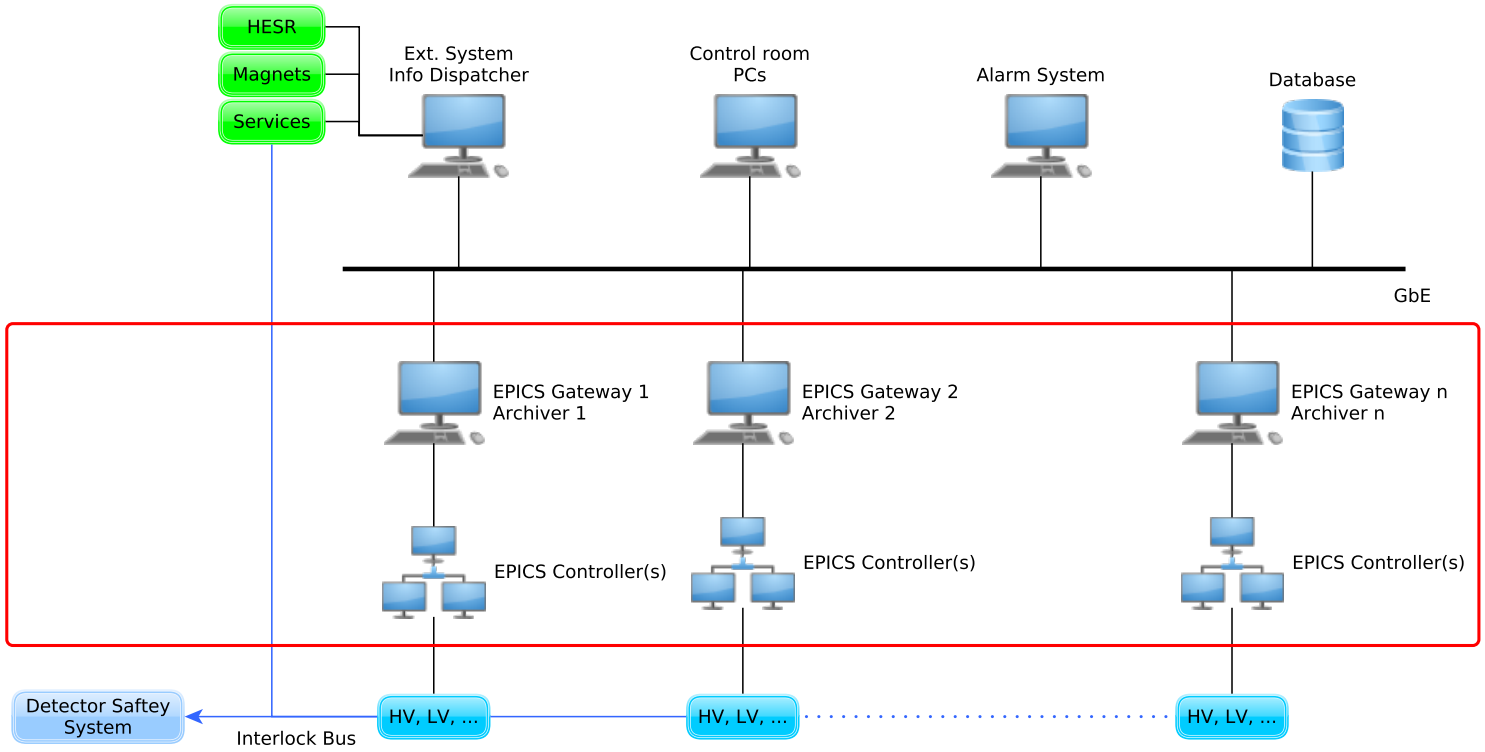
DCS Overview



Field Layer (FL):

- Temperature monitoring, power supplies, valves,...
- Every device that is monitored or controlled
- Detector Safety System (e.g. Interlocks)

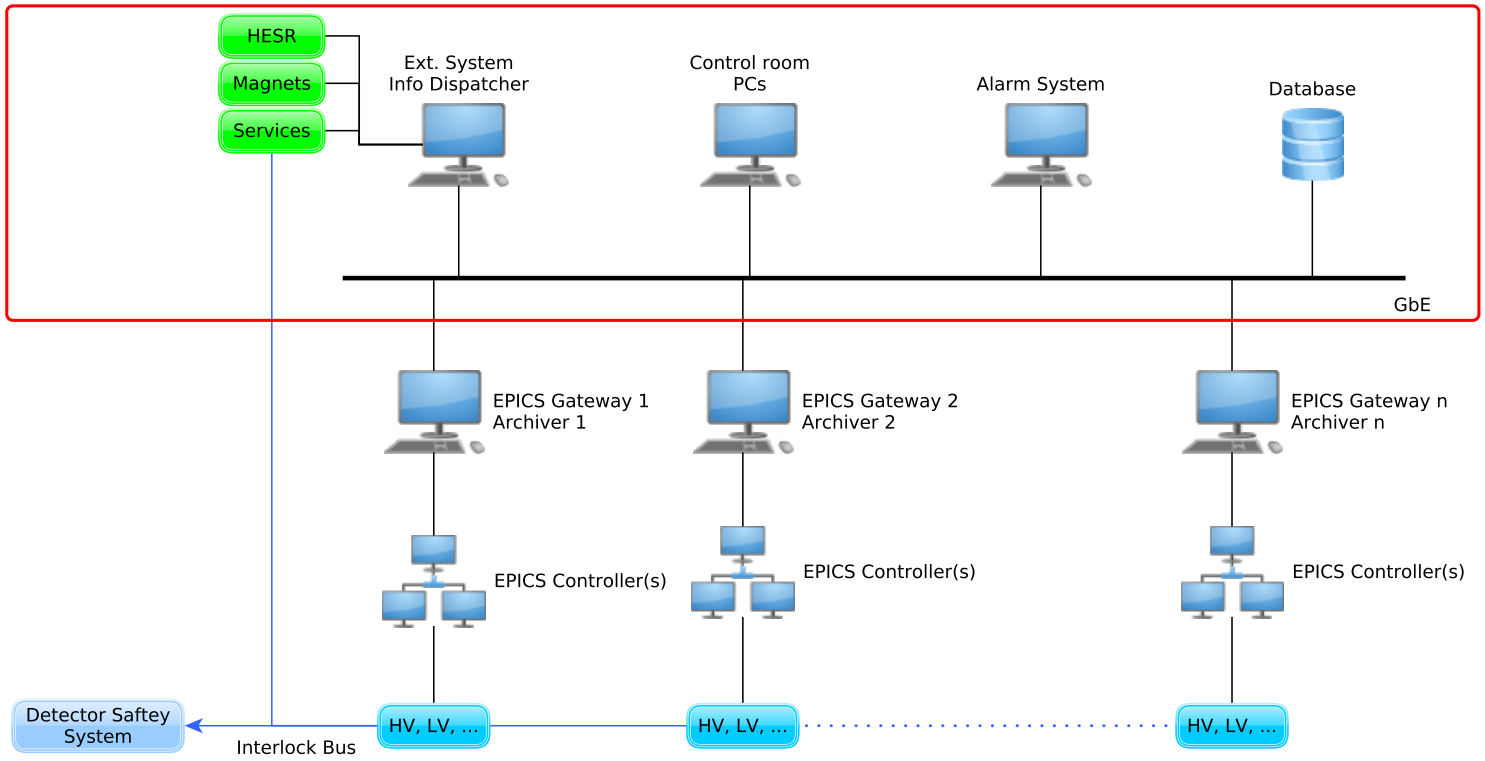
DCS Overview



Control Layer (CL):

- Input/Output controller communicating with devices in FL
- Archiver for data collection
- Gateway to Supervisory Layer

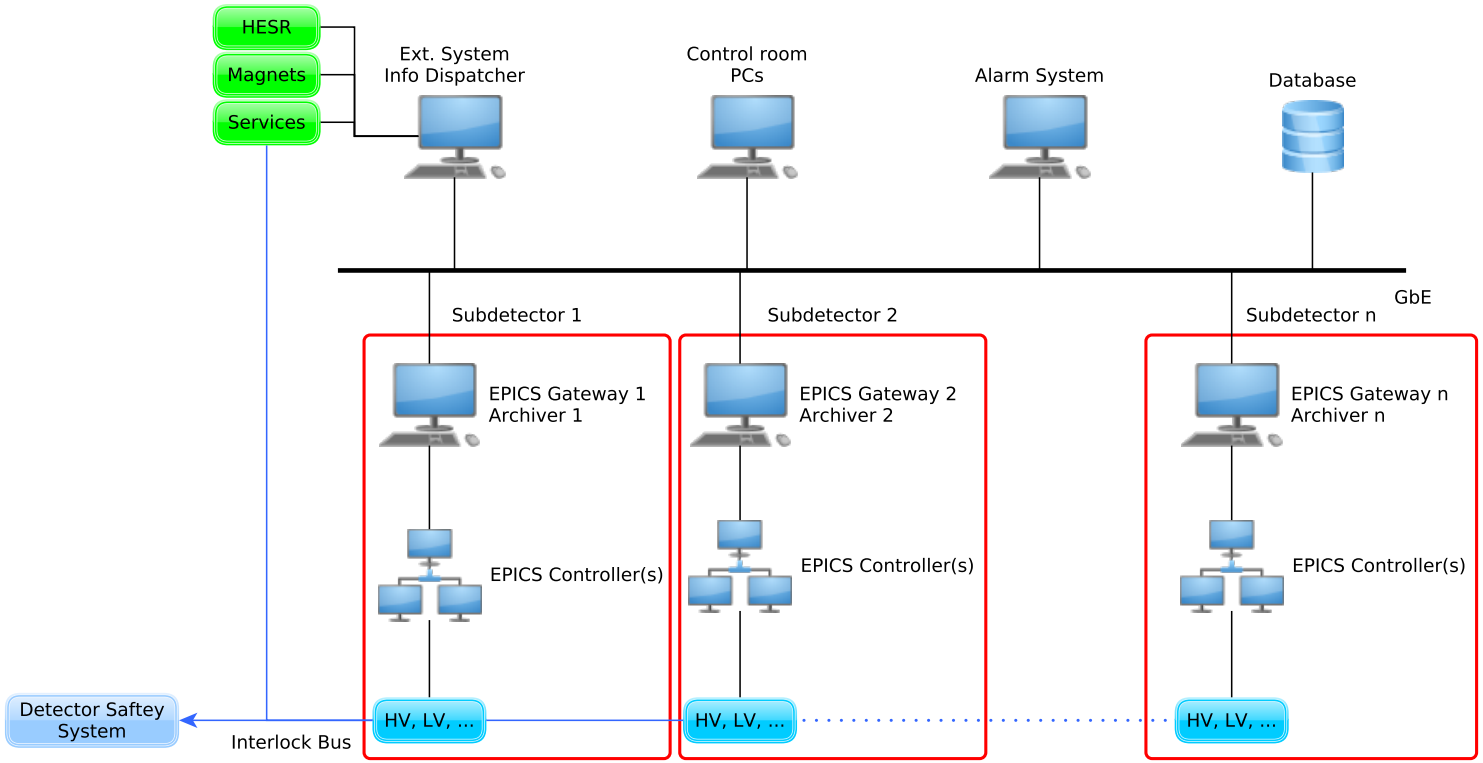
DCS Overview



Supervisory Layer (SL):

- Databases for data storage
- Graphical user interfaces
- Interface to "external" systems and experiment control

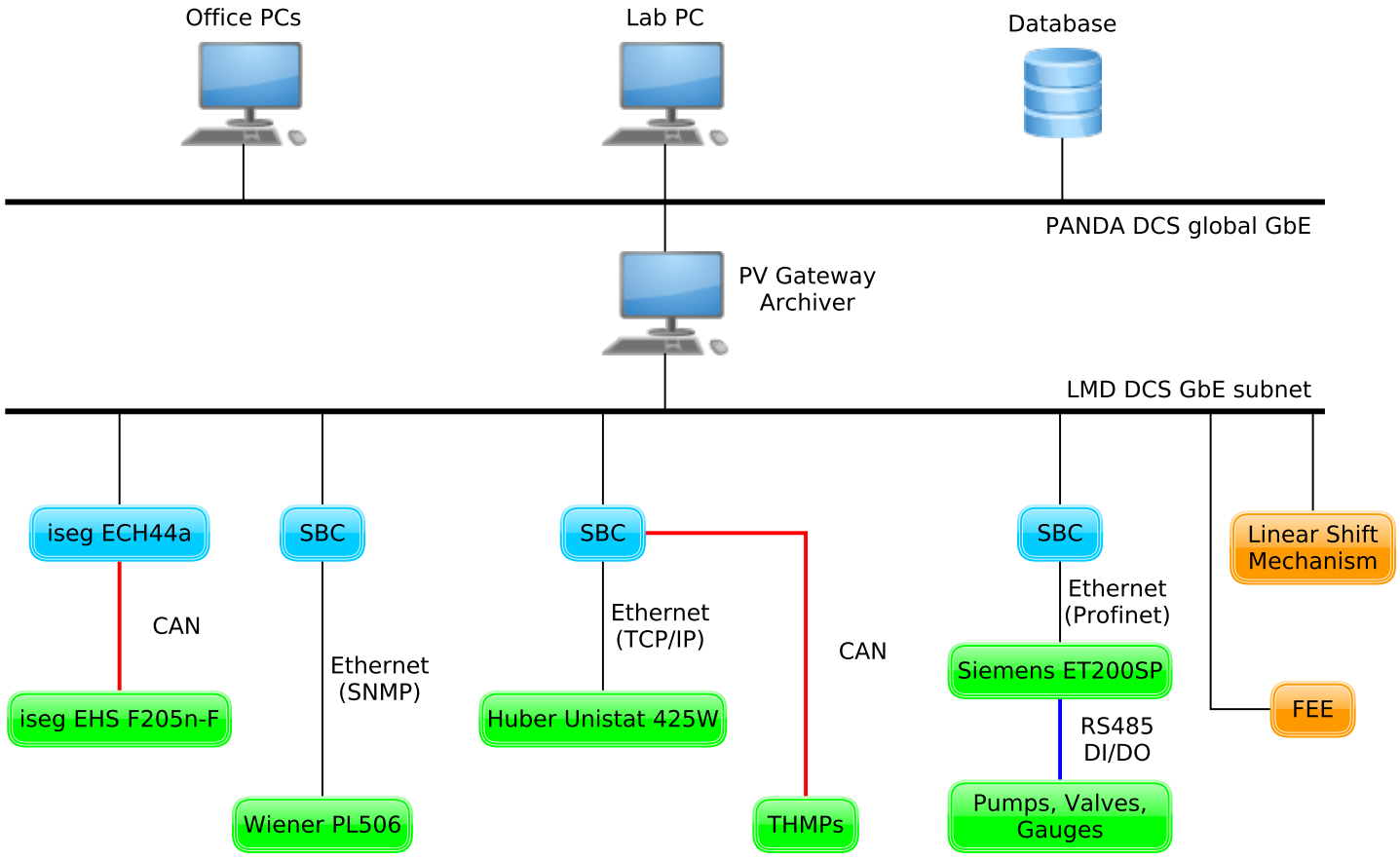
DCS Overview



EPICS - **E**xperimental **P**hysics and **I**ndustrial **C**ontrol **S**ystem

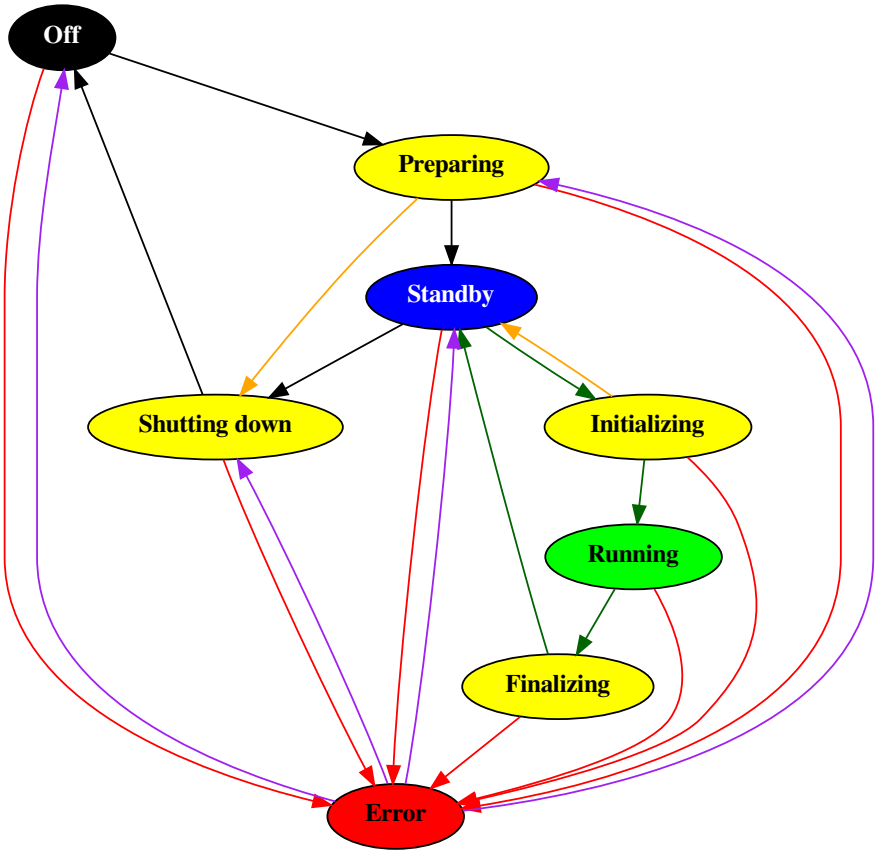
- Decentralized architecture
- Freely scalable
- Allows "partitioning" ⇒ each subdetector has its own DCS

Example: Luminosity Detector DCS partition



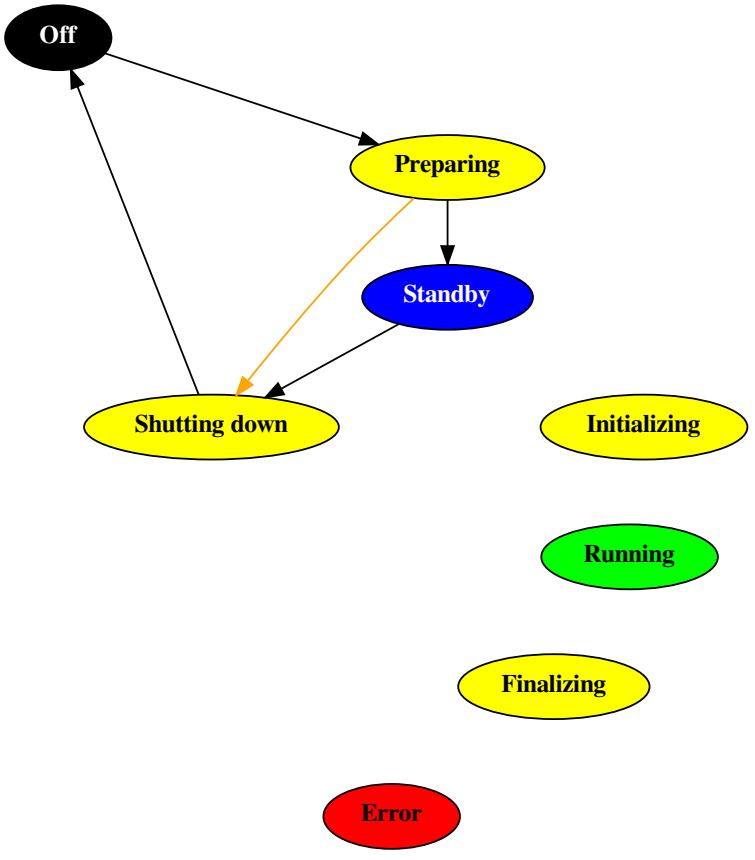
- IOCs running on Single Board Computer (SBC)
- Linear Shift Mechanism and FEE not yet implemented

Finite State Machine



Each subdetector needs to perfom defined actions
One state machine for global DCS (SL) and one for each subdetector (CL)

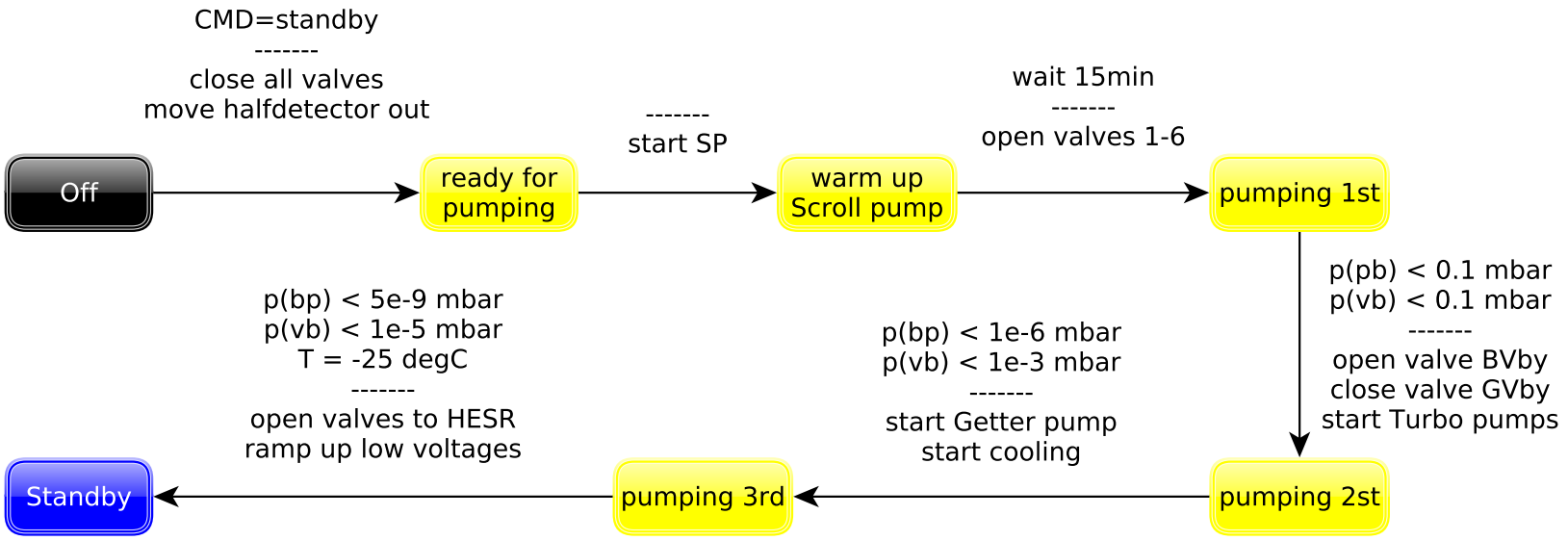
Finite State Machine



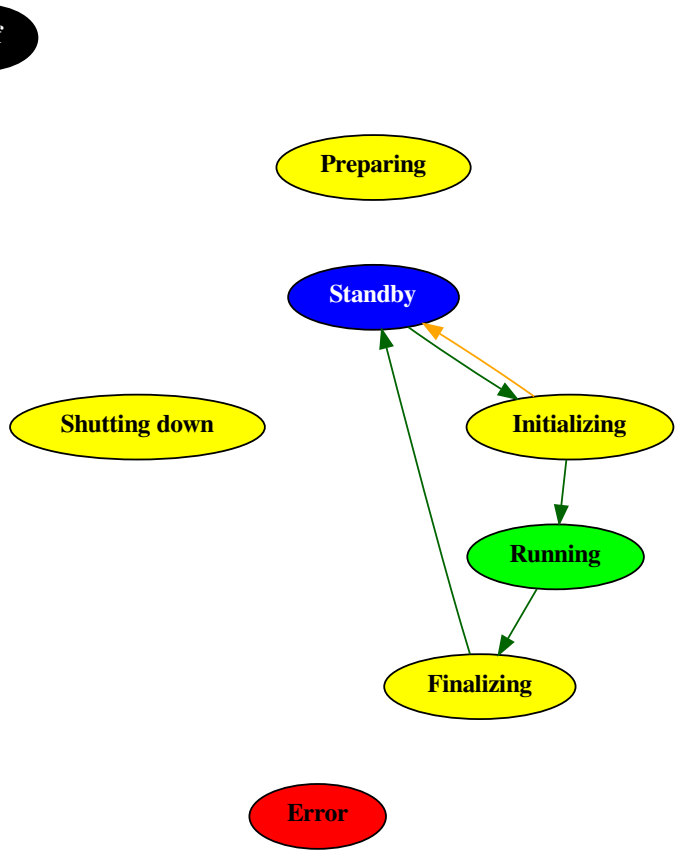
Start/End a run period (e.g. after maintainance)
Off $\rightarrow$ Preparing $\rightarrow$ Standby
Standby $\rightarrow$ Shutting down $\rightarrow$ Off

Finite State Machine

Example: Starting procedure of the Luminosity Detector

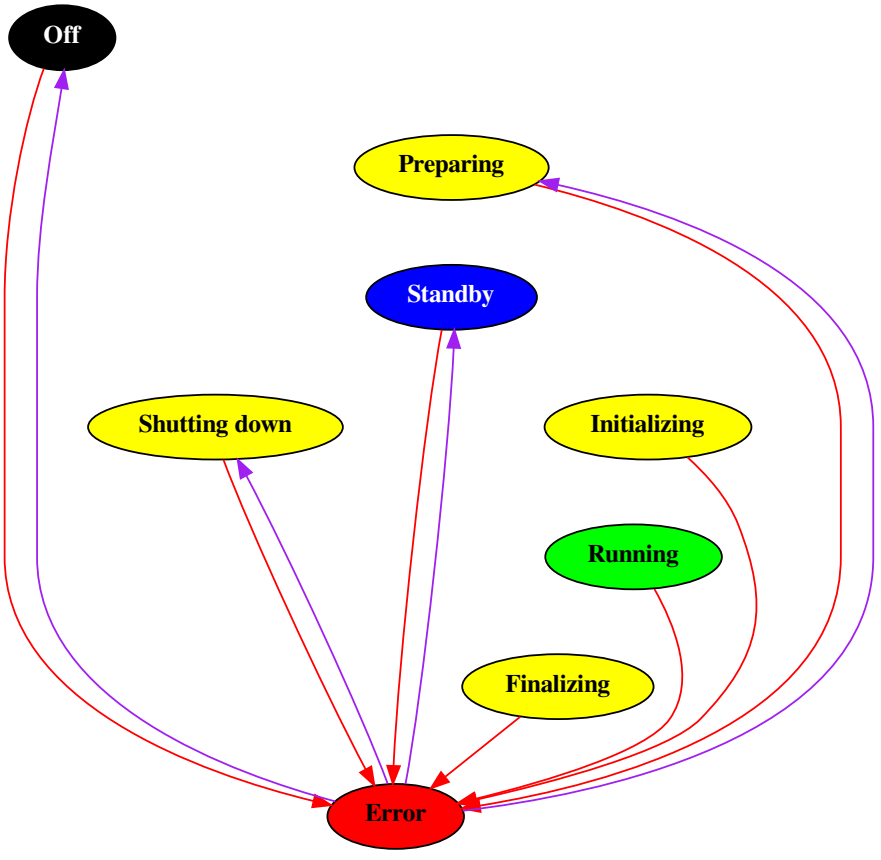


Finite State Machine



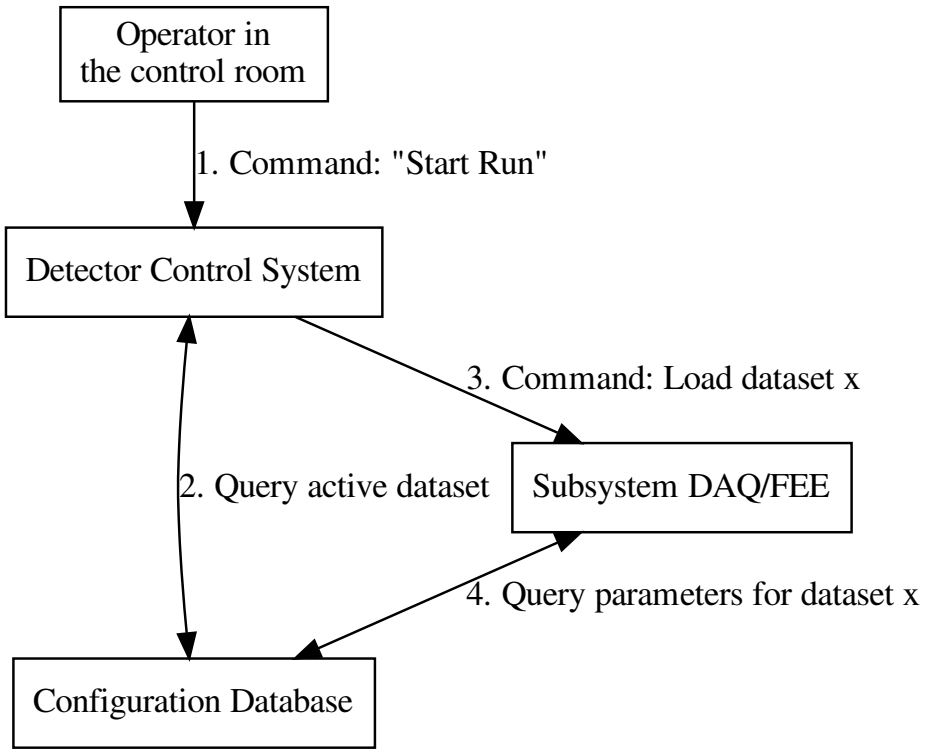
Typical procedure for data taking
Standby $\rightarrow$ Initializing $\rightarrow$ Running $\rightarrow$ Finalizing $\rightarrow$ Standby

Finite State Machine



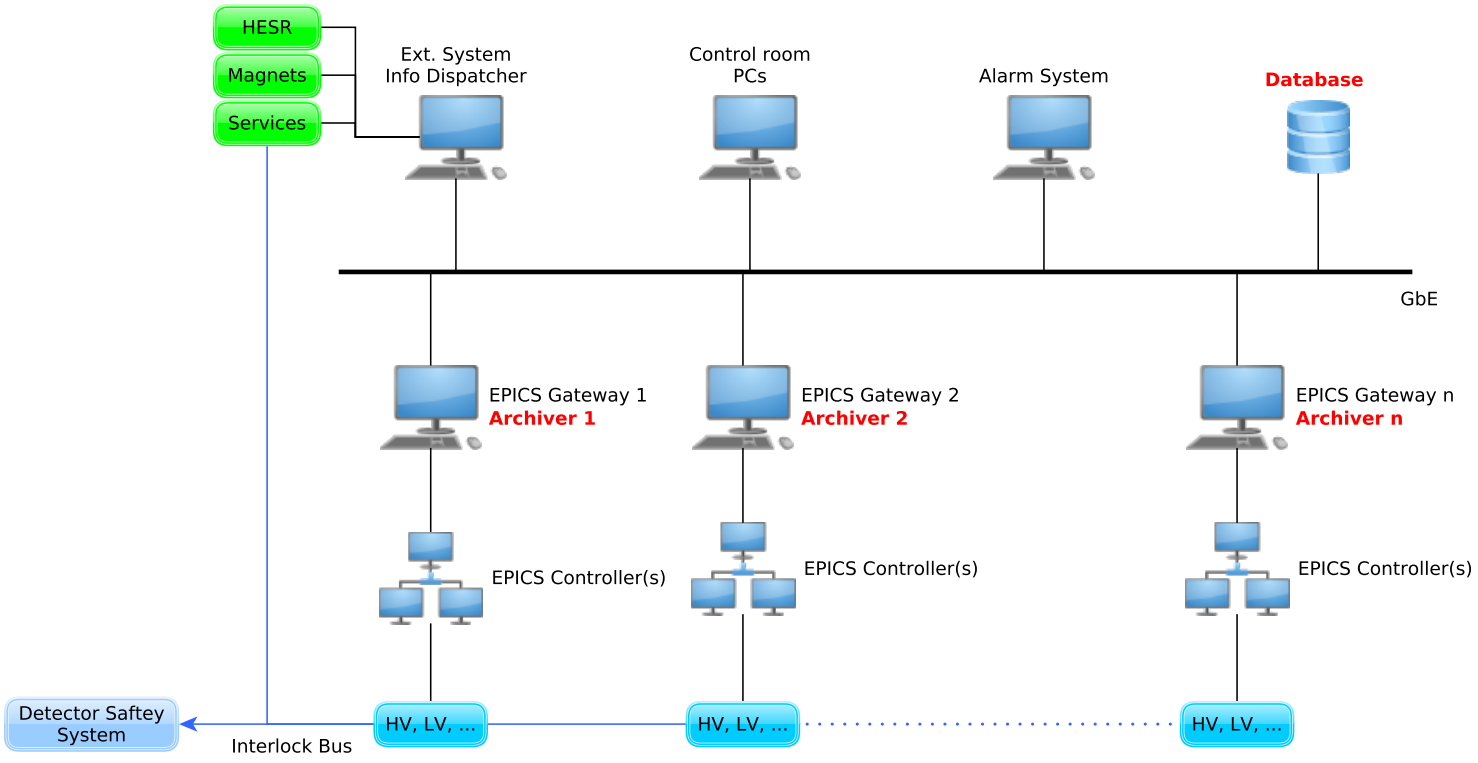
In case of a problem Error state can be entered from any other state
After solving problem return to non-data-taking states

DCS-DAQ/FEE Interface



- DCS and DAQ/FEE configuration parameters stored in central database
- Configuration datasets get unique ID
- FEE configuration via SODAnet (not through EPICS)
- Shared responsibility between FEE and DCS groups

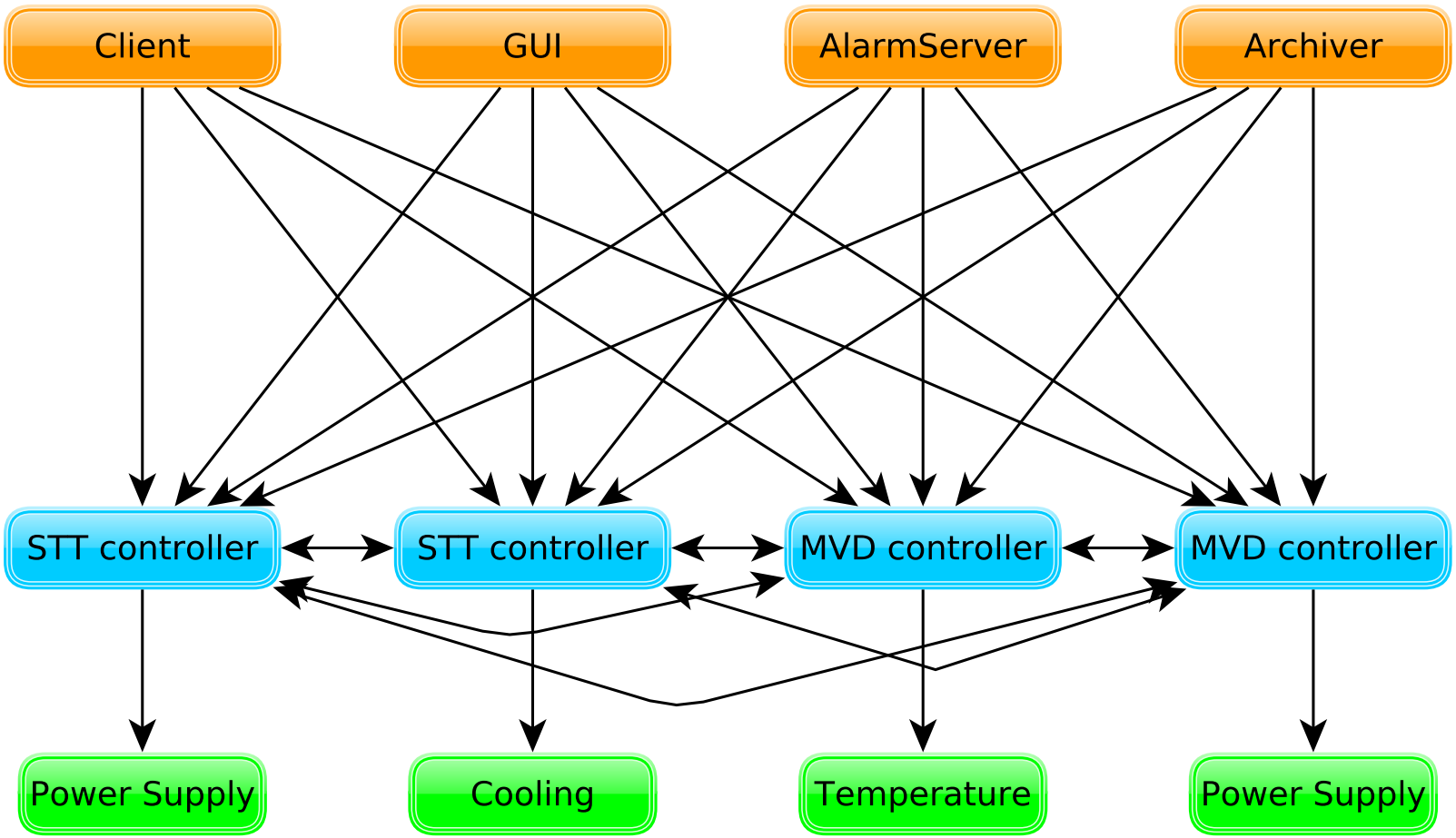
Archiving Slow Control Data



- Each subdetector has its own archiver engine (in CL)
- One common database as storage (in SL)

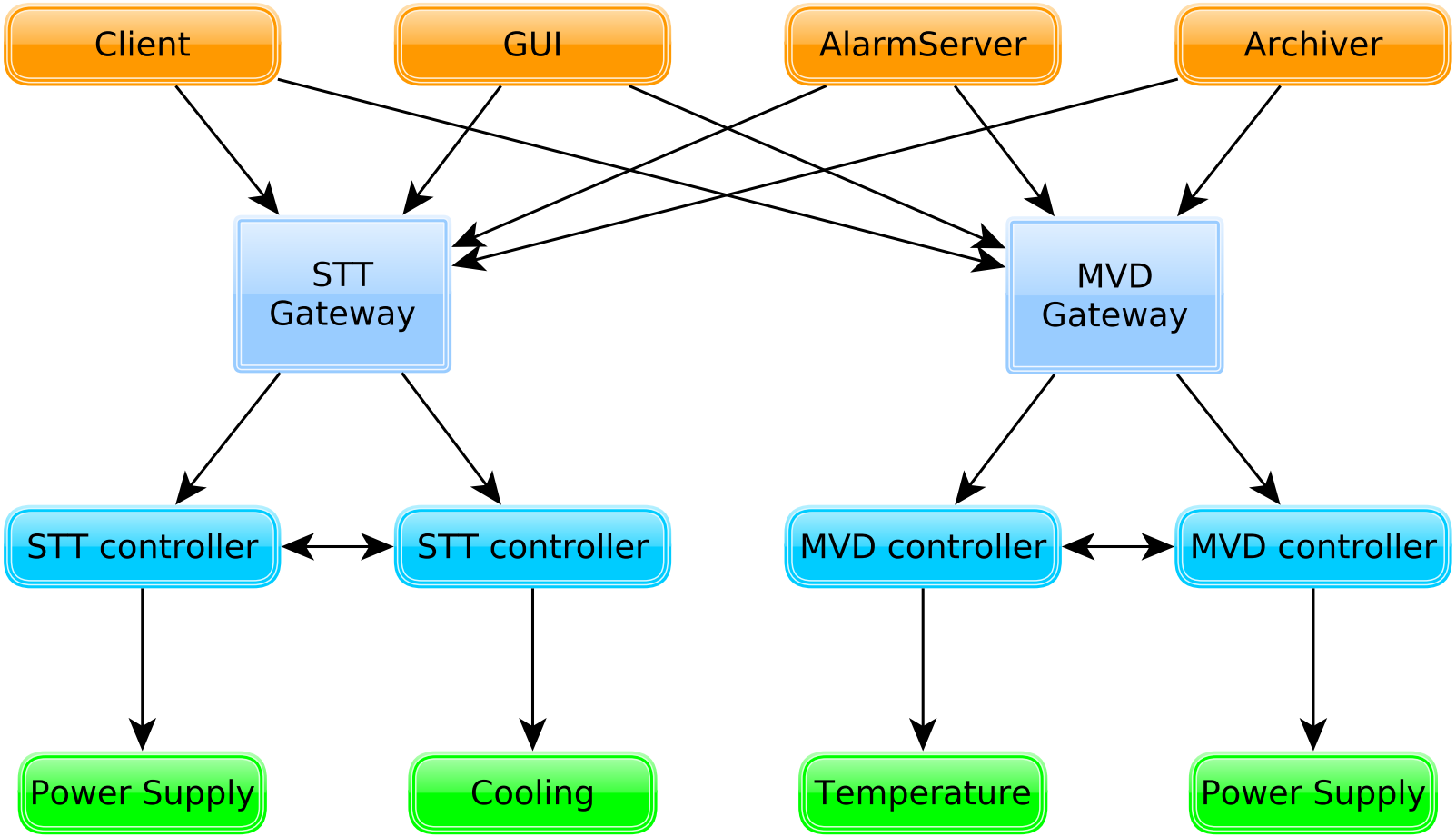
EPICS Communication Protocol

Each Client is connected to each Server
Arrows indicate direction of data queries



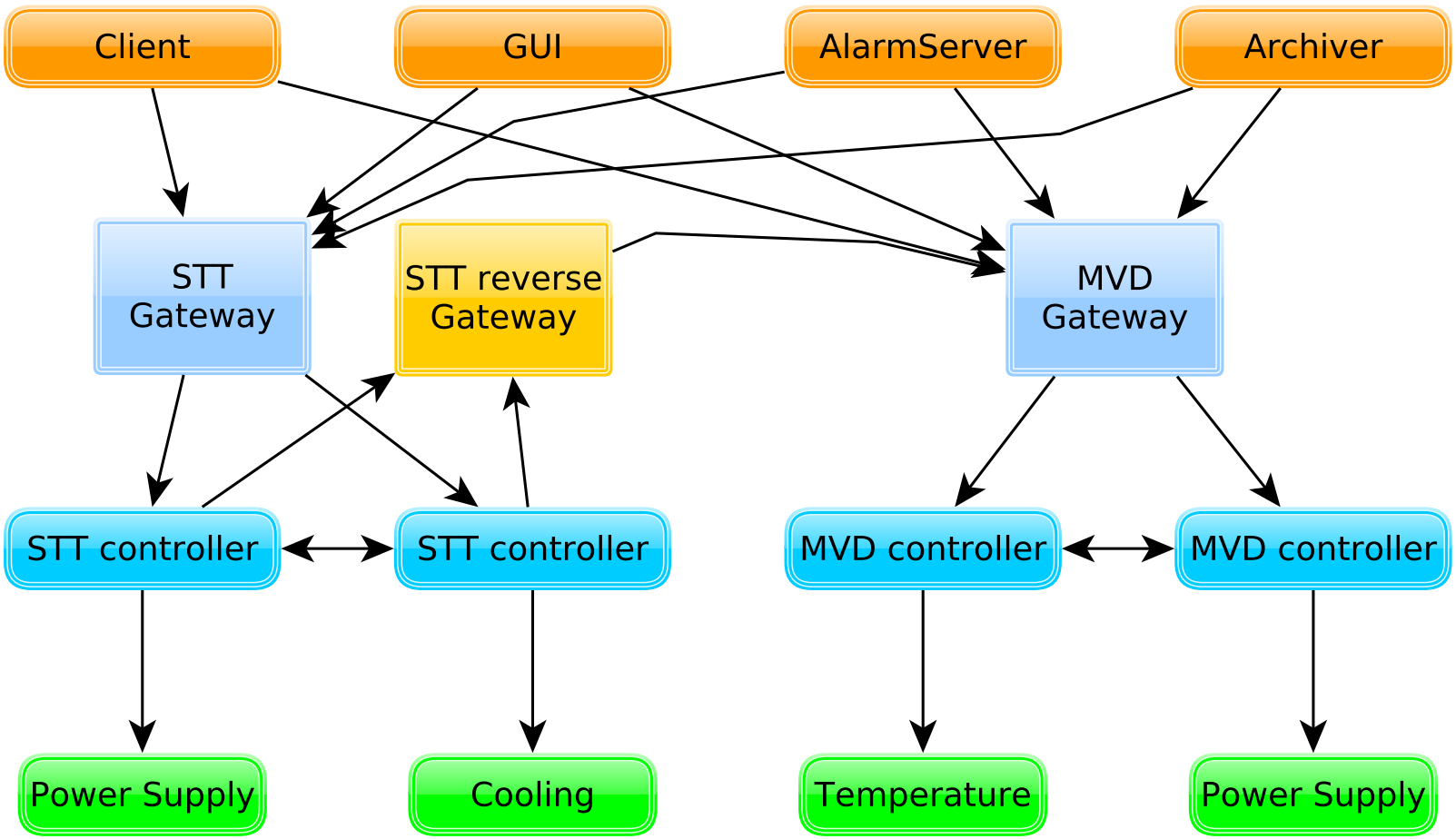
EPICS Communication Protocol

Using gateways to separate subdetectors from global DCS
Uni-directional connection!



EPICS Communication Protocol

What if subdetector A needs information from subdetector B?
$\Rightarrow$ reverse gateway



Organization of $\overline{\text{P}}$ANDA DCS

- $\overline{\text{P}}$ANDA DCS Group: Each subdetector and their controls managers
- $\overline{\text{P}}$ANDA DCS Core Group: F. Feldbauer, T. Triffterer, A. Belias
- Recently joined: P. Zumbruch, P. Robbe (external expert advisors)

- Each subdetector is responsible for its DCS partition
- DCS Core Group offers support (tutorials, lists of supported hardware, ...)