Experiment Control System

SCADA and Framework demo

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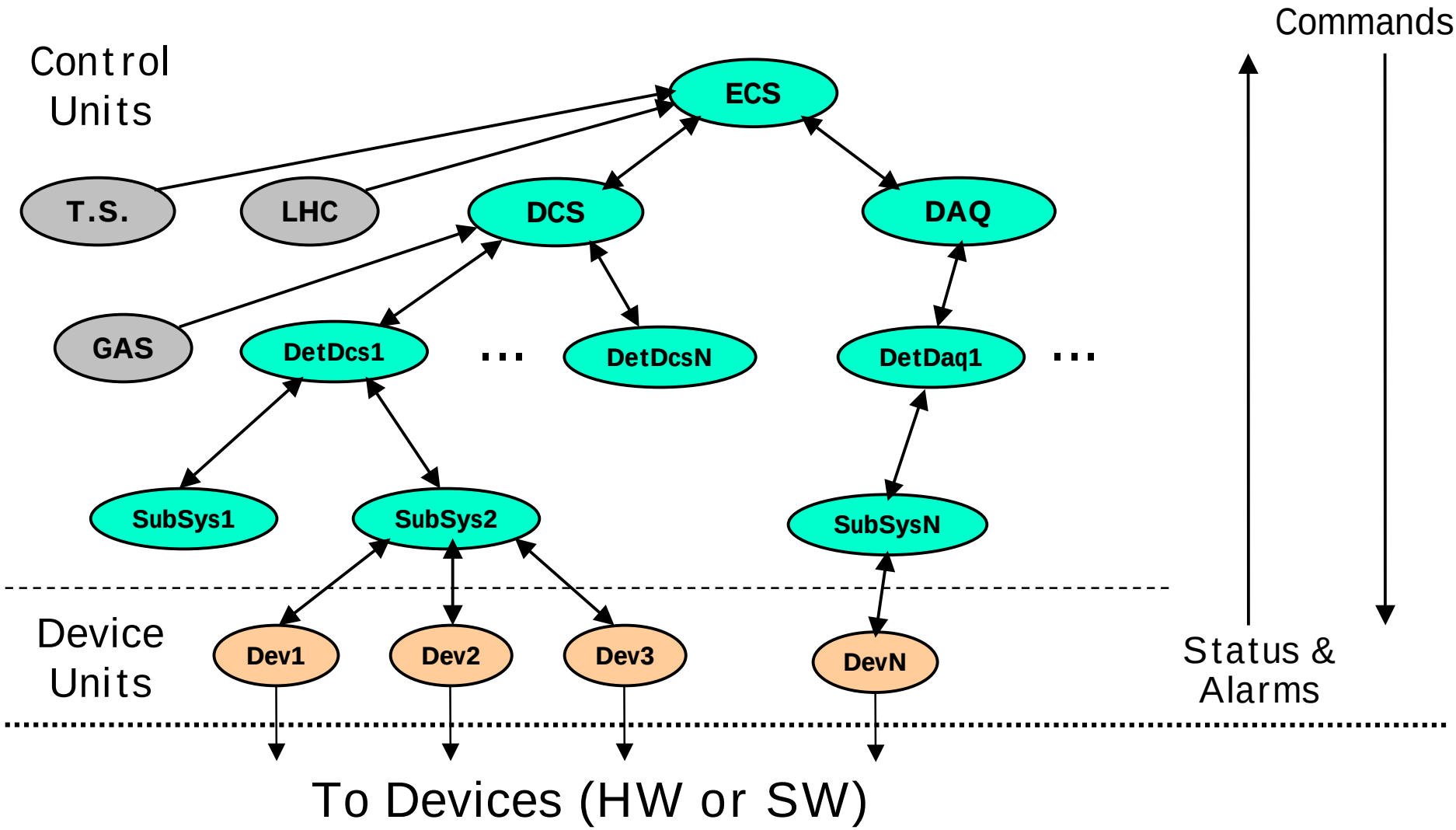
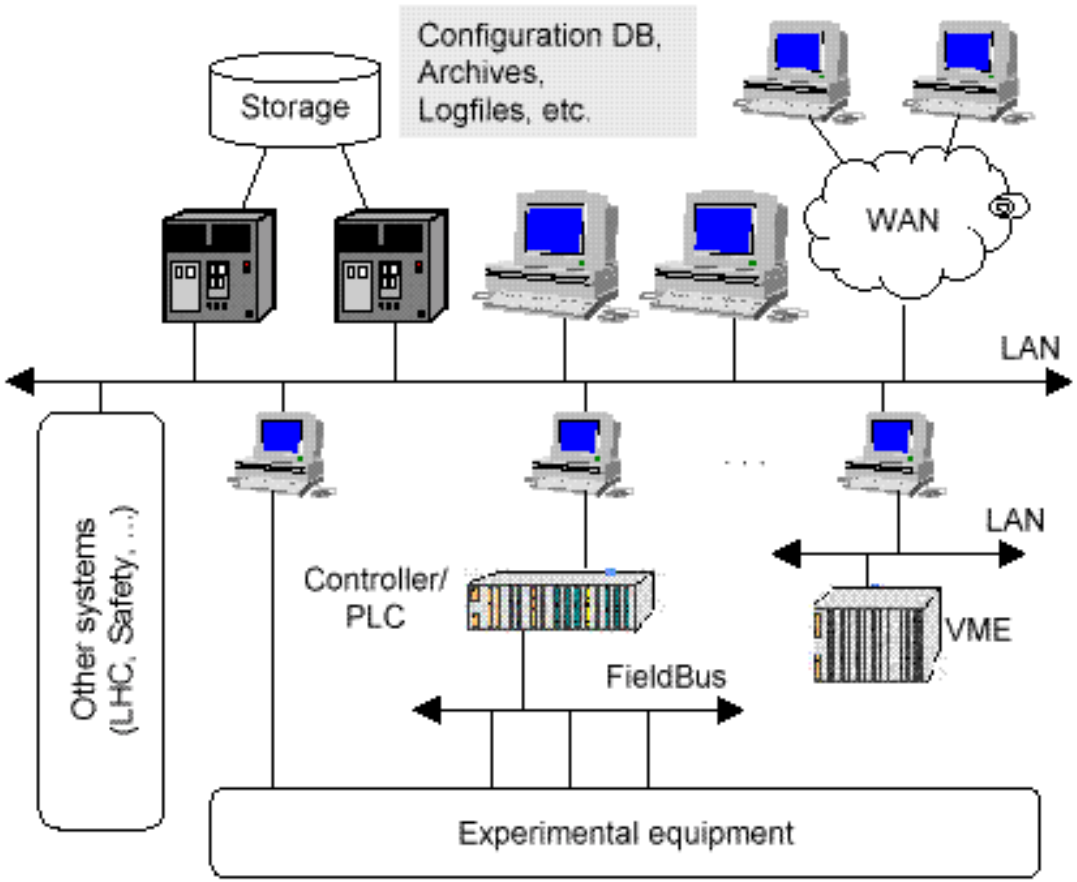
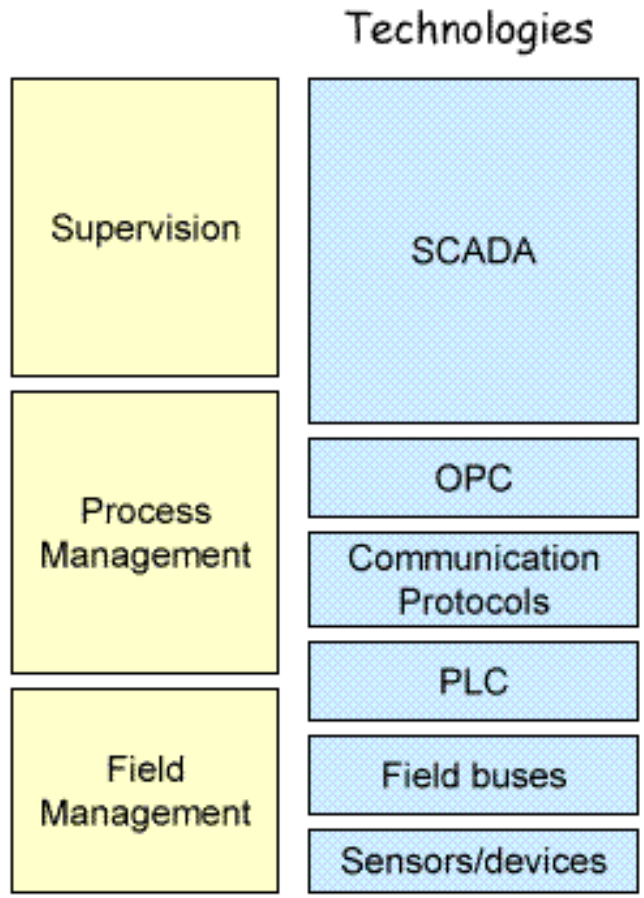
November 2000

Generic Architecture



HW Architecture





SCADA = supervisory control and data acquisition
OPC = OLE for process control
PLC = Programmable logic controller
Field buses = CAN, ProfiBus, WorldFip, ...

The Control Framework

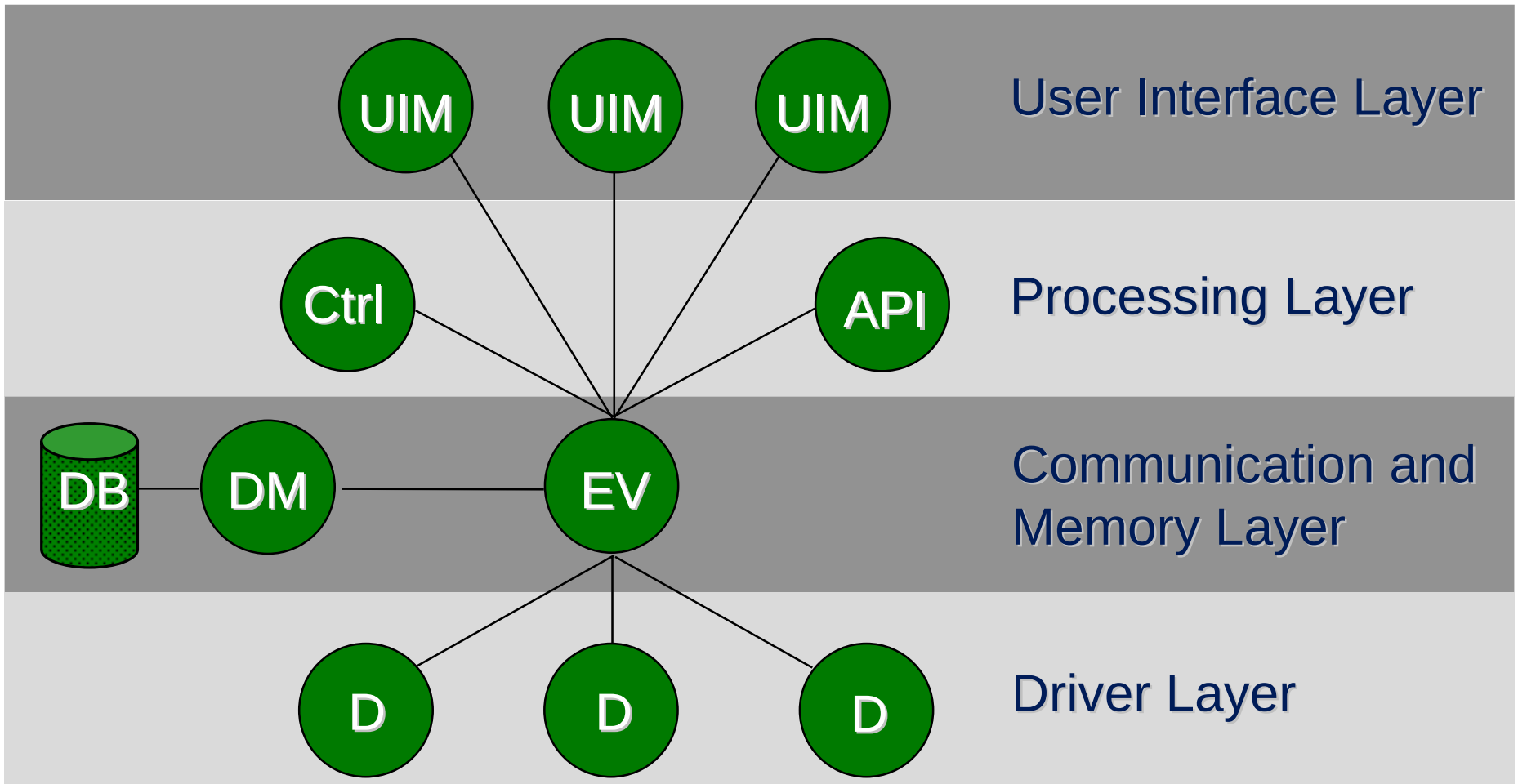
- **Will provide guidelines and tools for the implementation of all components in the tree.**
- **Based on:**
  - A Commercial SCADA Tool - PVSSII
  - +Additions (home made or commercial)
    - Finite State Machine Toolkit
    - Specific drivers
    - etc.

Control Framework

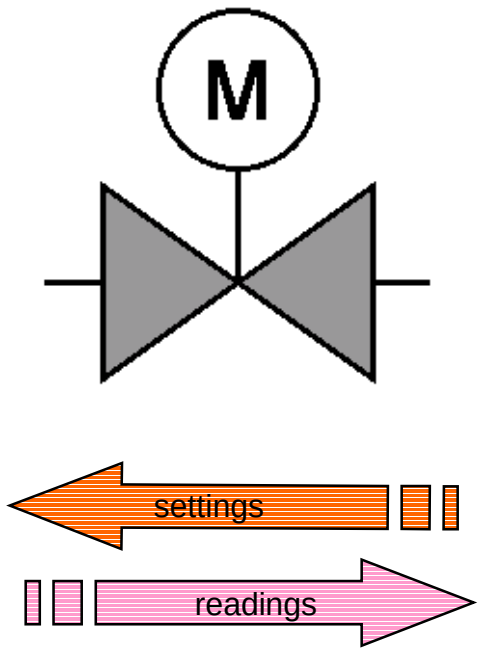
Dev

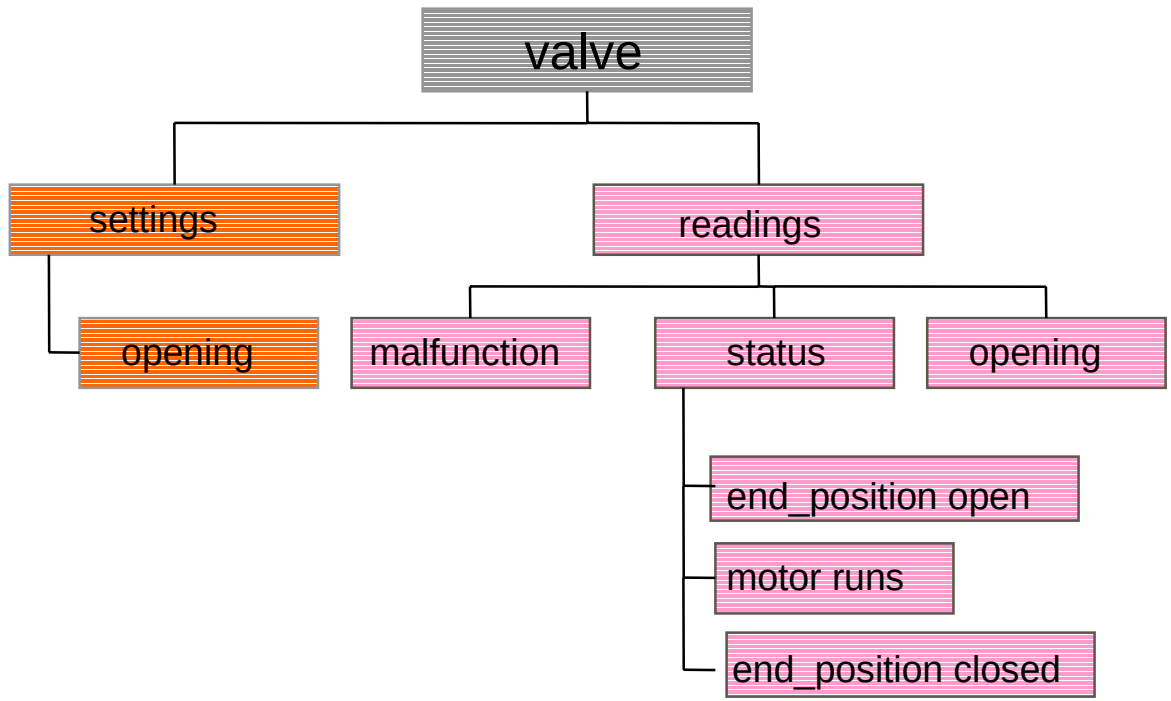
- Tools for the implementation of Device Units
  - PVSSII Tools for:
    - Device Description
    - Several Access Protocols
    - Alarm Generation Configuration
    - User Interface Editor
    - and also Alarm Display, Archiving, Logging, etc.
  - Additional FSM tool for:
    - Device Behaviour and Integration in Hierarchy

PVSS II Overview



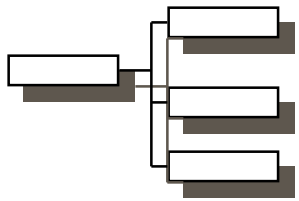
Data Point Concept



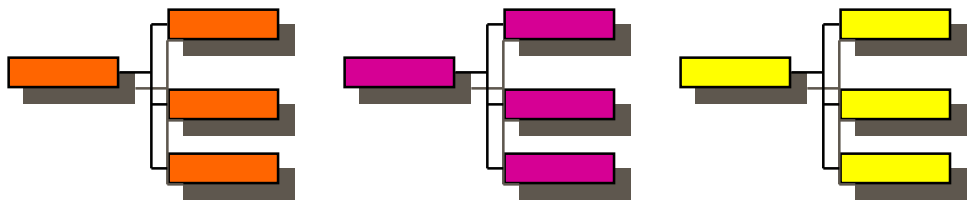


Data Point Modelling

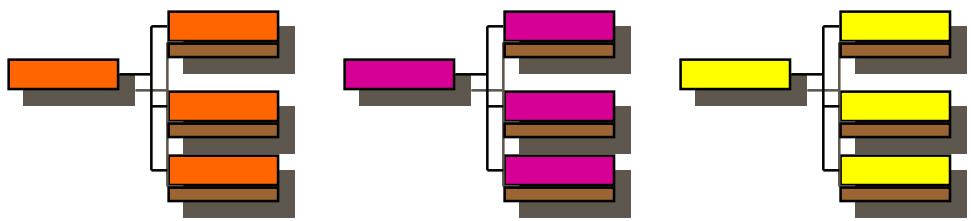
- **Define type of Data Point**



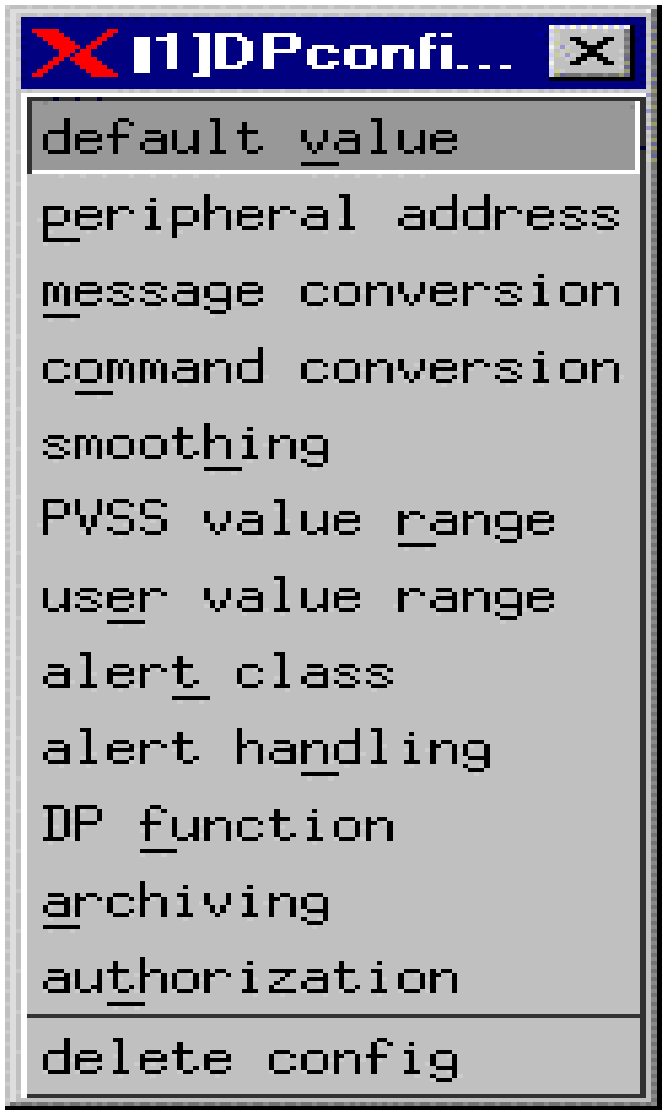
- **Create Data Points**



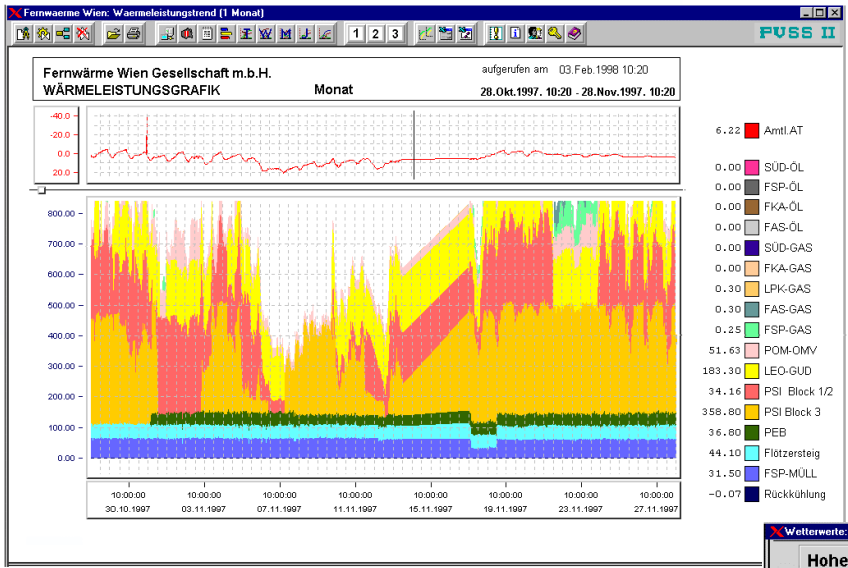
- **Set Configuration Parameters**

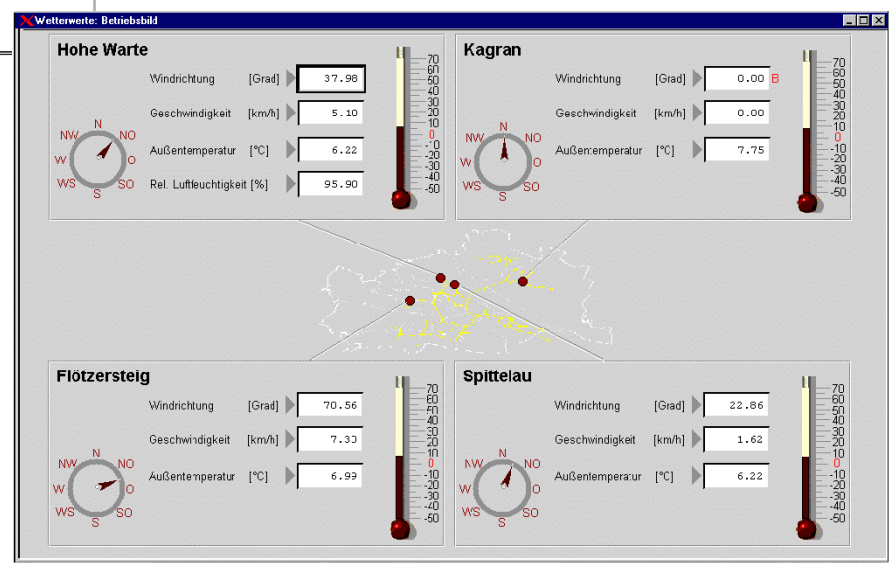


DP Configuration

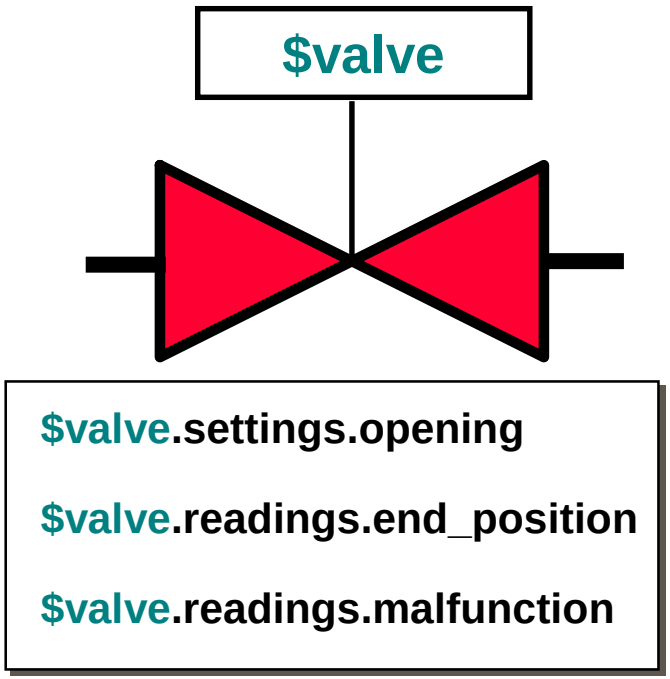


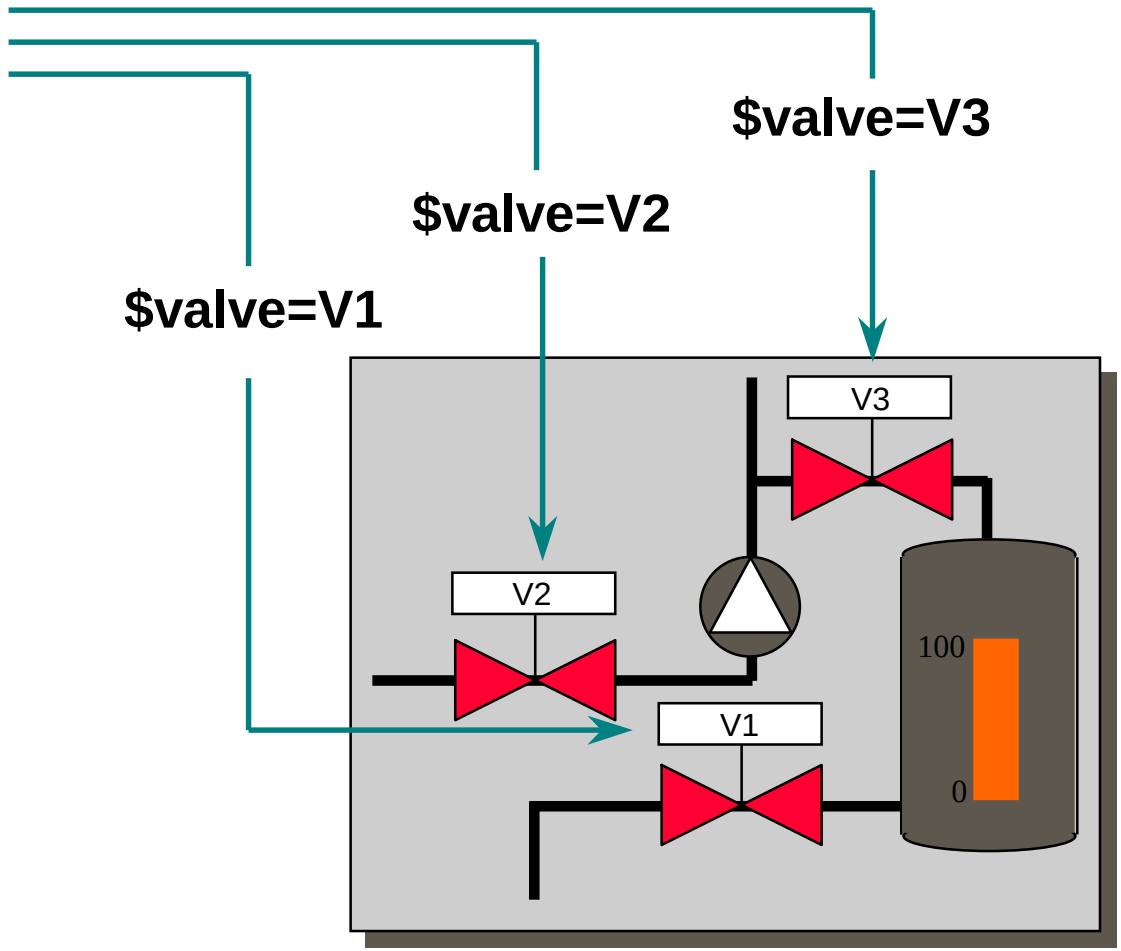
User Interface Editor





Graphic Objects





PVSSII Tools Demo

- **Example:**
  - The Control and Monitoring of a Power Supply
    - Define the Structure of a Crate
    - Define the Access Protocol
    - Define Alarm Generation
    - Create a panel to visualize and act on the crate
    - Define the interface to the above hierarchy:
      - States it can have
      - Actions it can receive
  - Already done: CAEN SY127 HV Power Supply

Controls Framework

- **Will Contain:**
  - Predefined (Configurable) Components, like:
    - Power supplies (CAEN, Lecroy, …)
    - Electronics ECS Interfaces: CC-PC, SPAC, CCU ?
    - Any other common items
  - User Defined Components:

    (in order of integration facility)
    - Devices Accessible via OPC (Industry Standard)
    - CERN recommended Fieldbus nodes: CAN, Profibus
    - Other Devices

Control Framework (cont.)

DCS

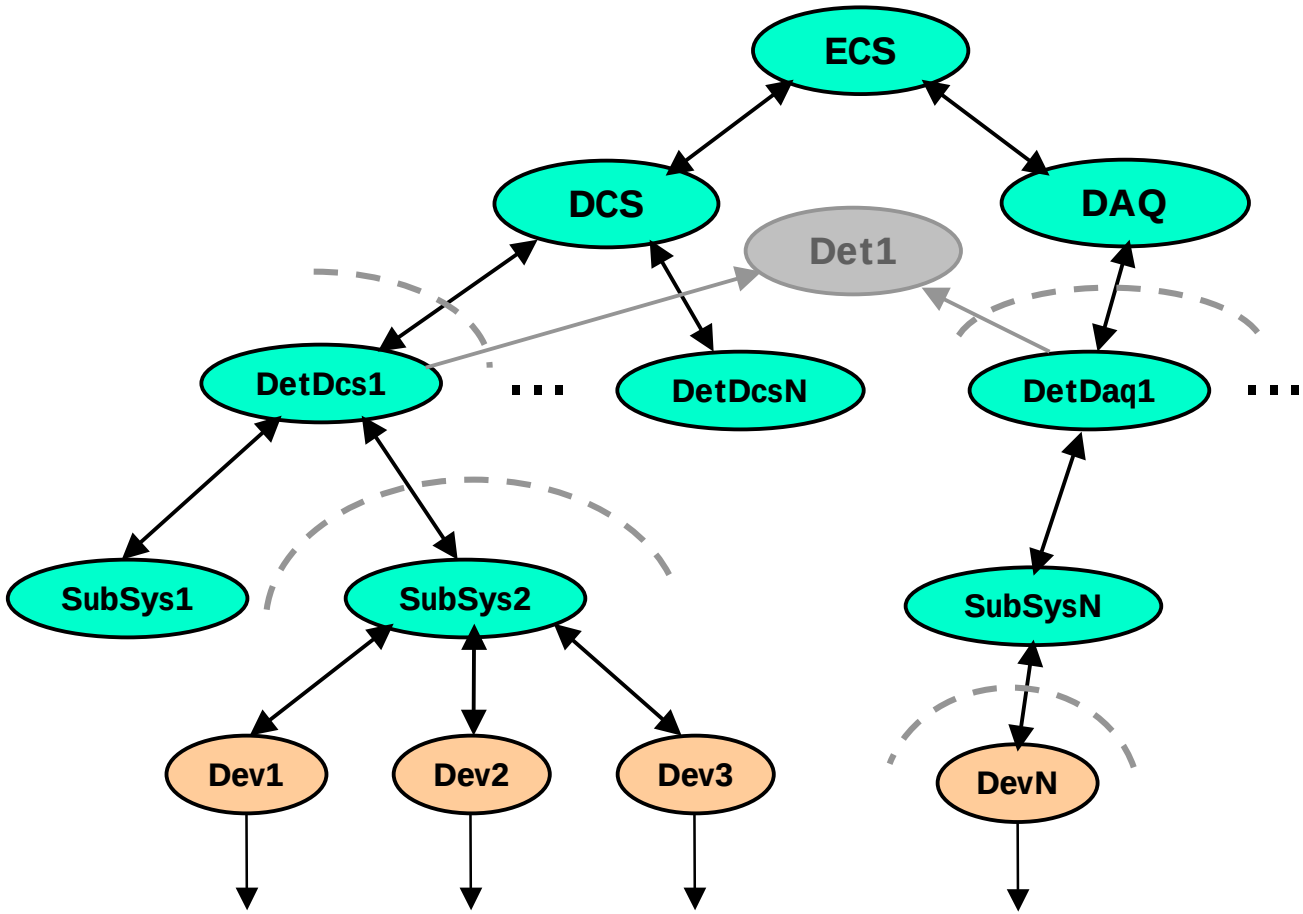
- Tools for Developing the Control Units:
  - PVSSII Tools for:
    - Control Unit Description
      - Its Components: Devices and/or other Control Units
    - Alarm Handling
      - Filtering, Summarising, Displaying, Masking, etc
    - User Interface Generation
    - and also Alarm Display, Archiving, Logging, etc.

Control Framework (cont.)

DCS

- Tools for Developing the Control Units:
  - Additional FSM tool for:
    - CU Behaviour and Integration in Hierarchy
      - Model the dependencies between components
      - Automate Operations & Error Recovery
    - CU Partitioning Rules

Partitioning

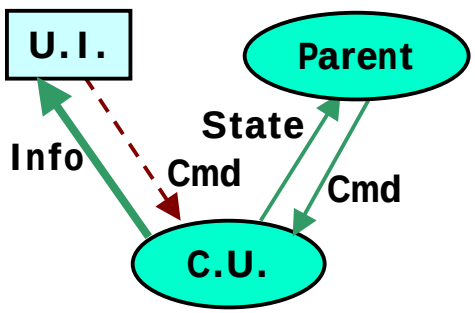


Clara Gaspar, November 2000

Control Unit Operation Modes

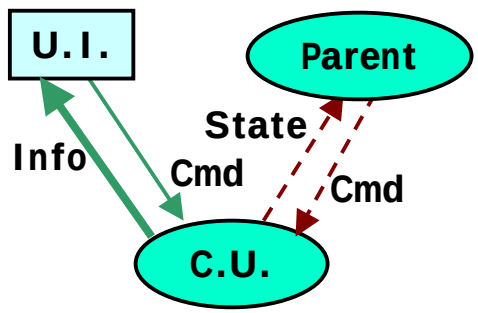
Normal Operation

- Hierarchical control only

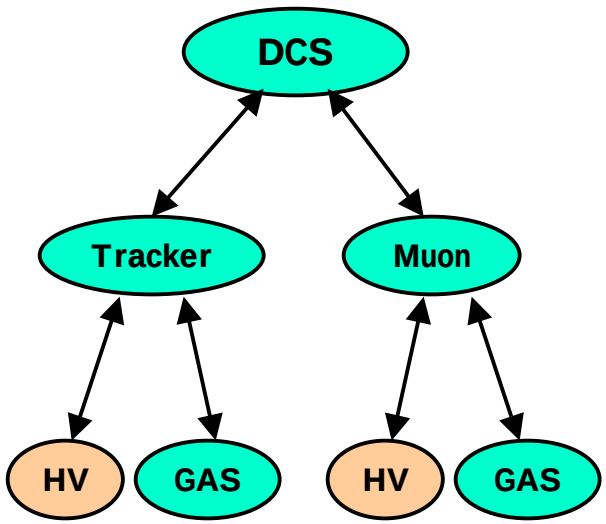


Partitioned

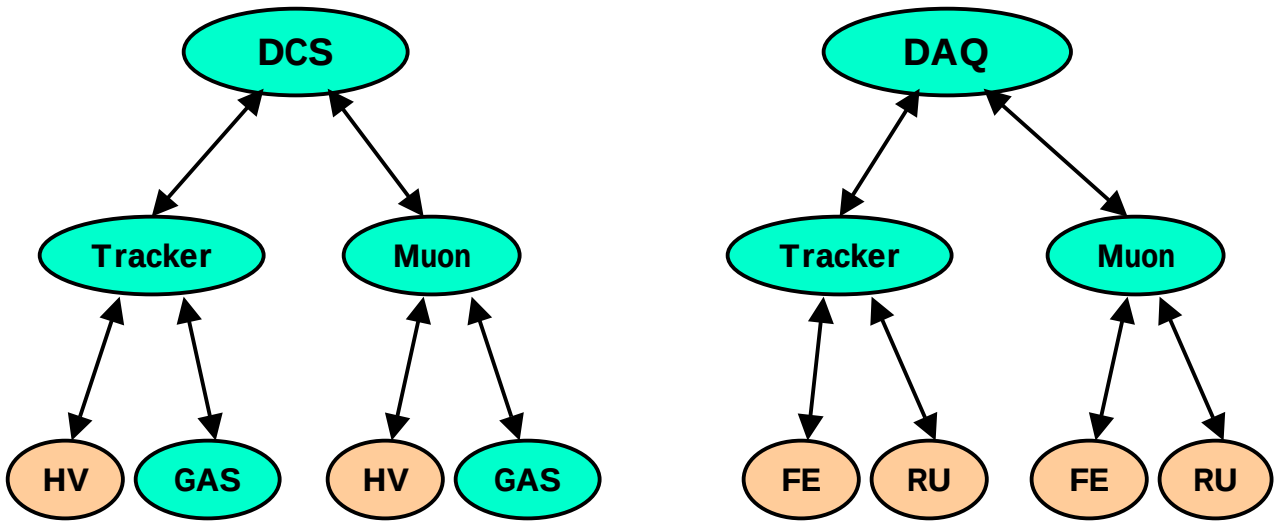
- No Hierarchical control
- Control from a “local” U.I.



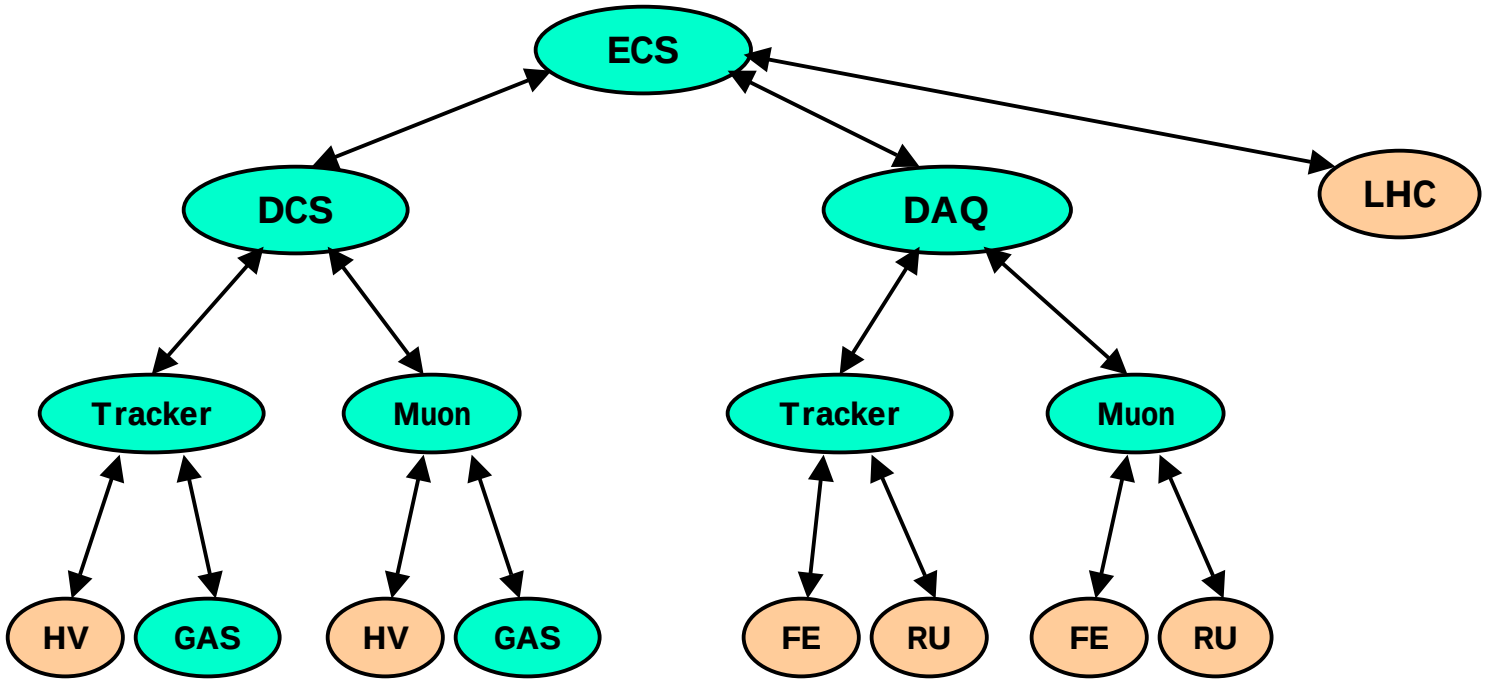
Demo Architecture - DCS



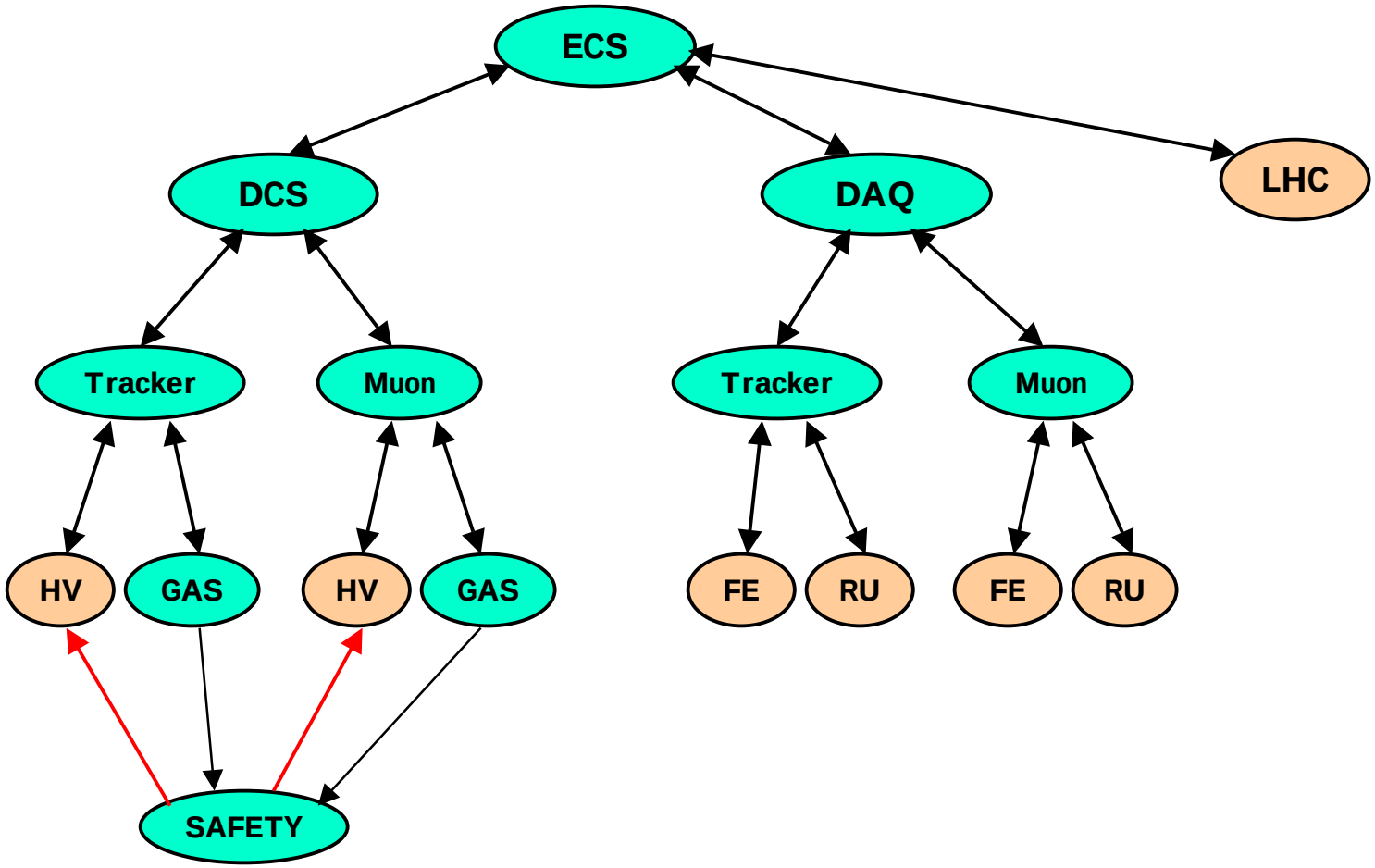
Demo Architecture - DAQ



Demo Architecture-Run Control



Demo Architecture - Safety



Control Framework

- **Other Items that will be integrated:**
  - Experiment Infrastructure
    - Rack and Crate Control
    - GAS Systems (GAS WG)
    - Cooling (?)
  - CERN Infrastructure (Data Interchange WG)
    - Technical Services
    - LHC machine
    - LHCb Magnet(?)

Status & Information

- **The SCADA Contract has been signed**
  - It can be downloaded and used by all members of LHC experiments either at CERN or in their own laboratories.
    - http://itcowww.cern.ch/pvss2/index.htm
  - PVSSII courses are available
    - Please contact me

Conclusions

- The best way to achieve an homogeneous and maintainable control system (and to save manpower) is:
  - To do the maximum in common
    - The Controls Framework is being developed and will be used by the 4 LHC experiments (Joint Controls Project)
    - New “Devices” should be developed in a re-usable way and included in the Framework
  - To Standardize on HW choices as much as possible
    - So that common SW can be used
- Please contact us for HW choices

(of potentially common items)

  - like: power supplies, Temperature Sensors, etc