UNICOS: an open framework

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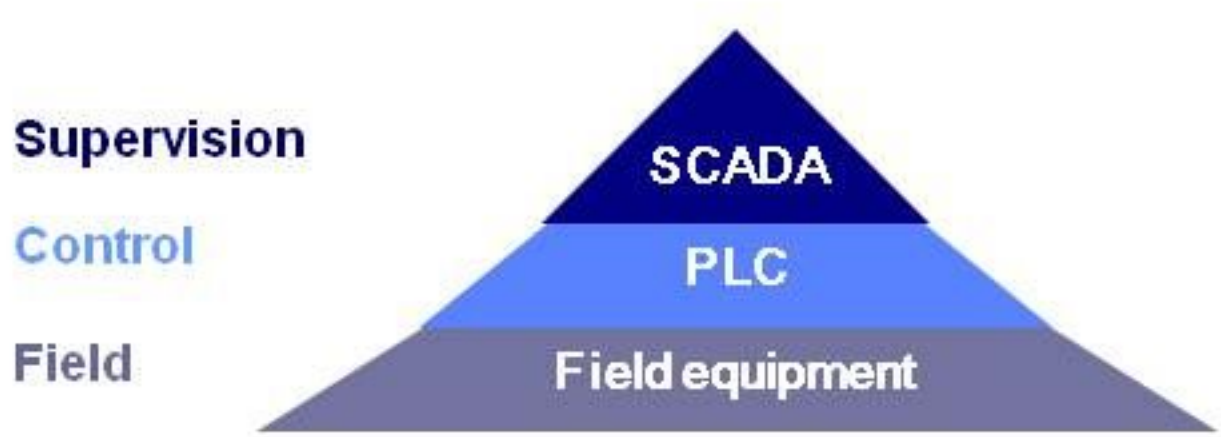
Outline

1. **Introduction and origins**
2. **UNICOS framework**
   - Package vs. application
   - UNICORE
   - UNICOS CPC
3. **Use case:**
   - SURVEY
   - QPS
   - PIC
4. **Conclusions**

- **UNICOS** (UNified Industrial COntrol System) was born at CERN
- Development of the LHC Cryogenics control system
- To create an **industrial control system** covering the three layers



- With automatic data driven generation tools
  - For a rapid startup
  - Easy intervention on the program logic and HMI

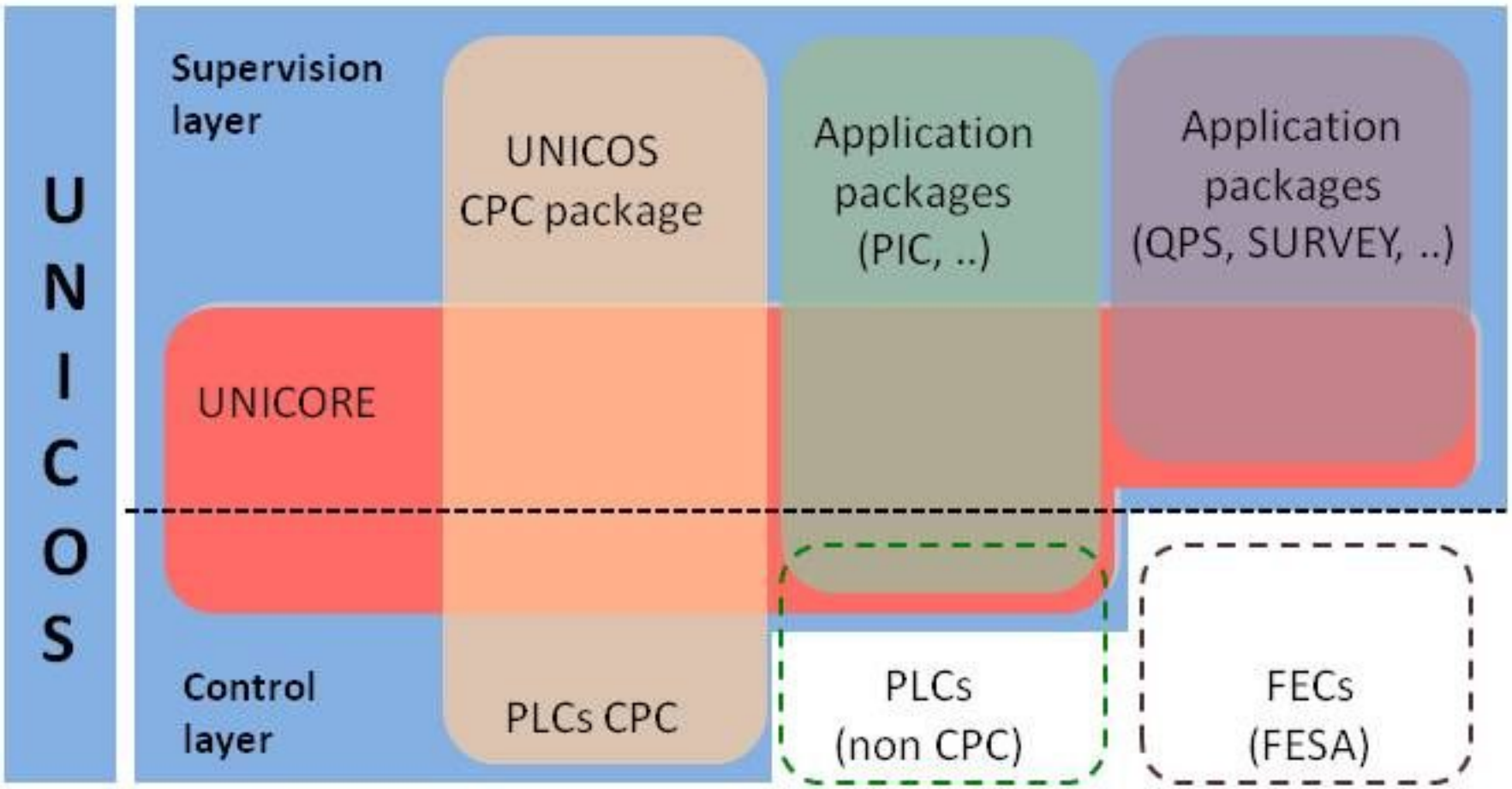
2. UNICOS framework

- To produce control application for two/three layers control systems
- Means to rapidly develop full control/monitoring applications
- Provides operators with ways to access all the device data with little effort
- Tools:
  - To diagnose problems (control system, process alarm, …)
  - To access devices
  - To operate the devices
  - Without specific developments

2.1. Package vs. Application

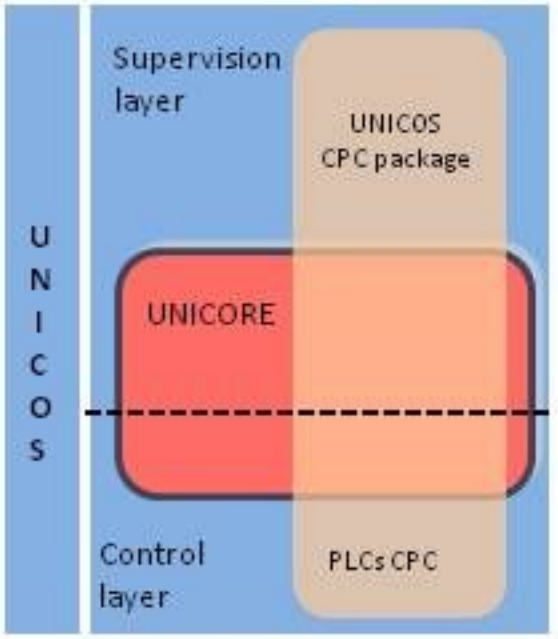
- Set of components
- For the supervision and control layer (front-end)
- Package:
  - A package extends UNICORE to specific domain
  - Set of components combined and configured together

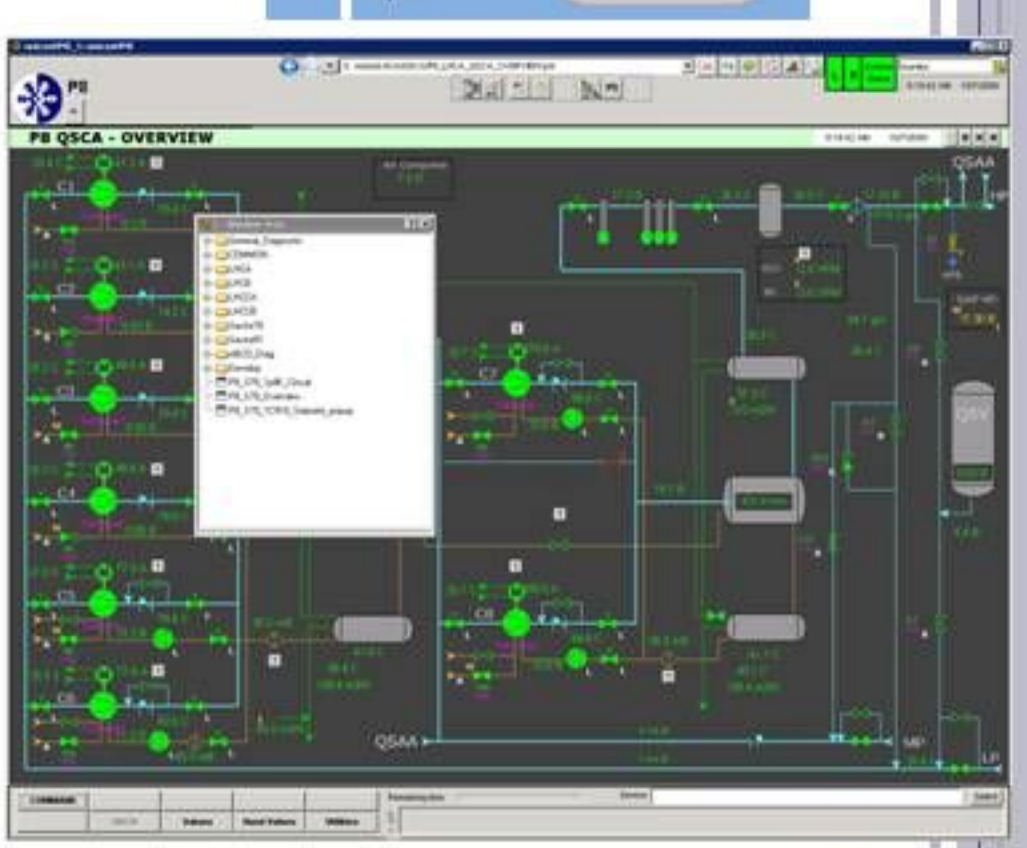
to produce control/monitoring applications



2.2. UNICORE

- Deployed in two layers
  - **Control layer (Front-end)**
    - Time stamping communication protocol: TSPP
    - Event publishing
  - **Supervision layer**
    - Distribution in many Data Servers (DS)
    - Handling of connection state
    - Interface to LHC software suite
    - Client/Server CMW interface
    - Uses JCOP components
    - Interface for new packages
    - Device & file access control
      - 4 privileges, many domains, LDAP
    - Device hierarchy
      - *Front-end device* containing *process device*
      - Time stamping in front-end
    - Customizable and configurable HMI
      - Navigation facilities
      - process alarm & event list
      - Direct access to the device

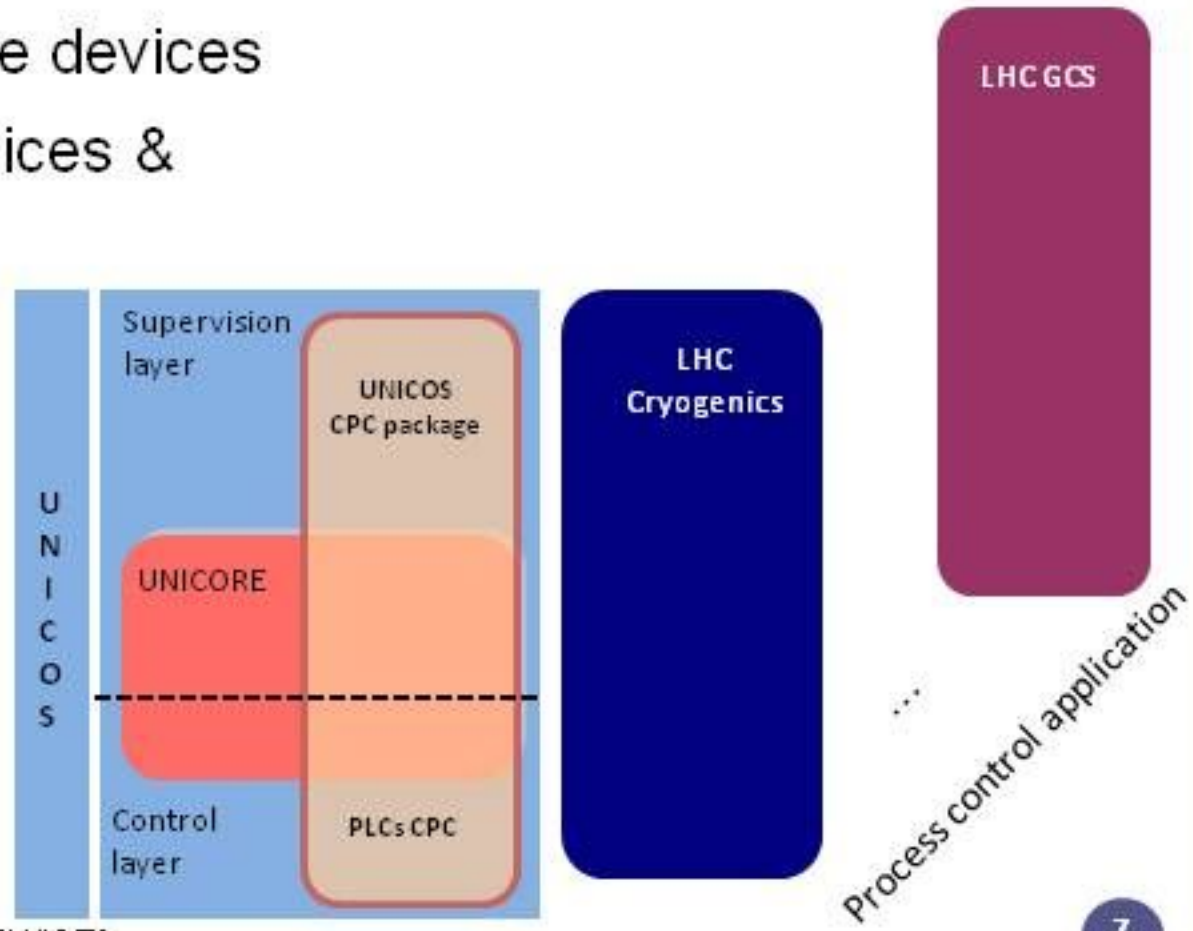




2.3. UNICOS CPC

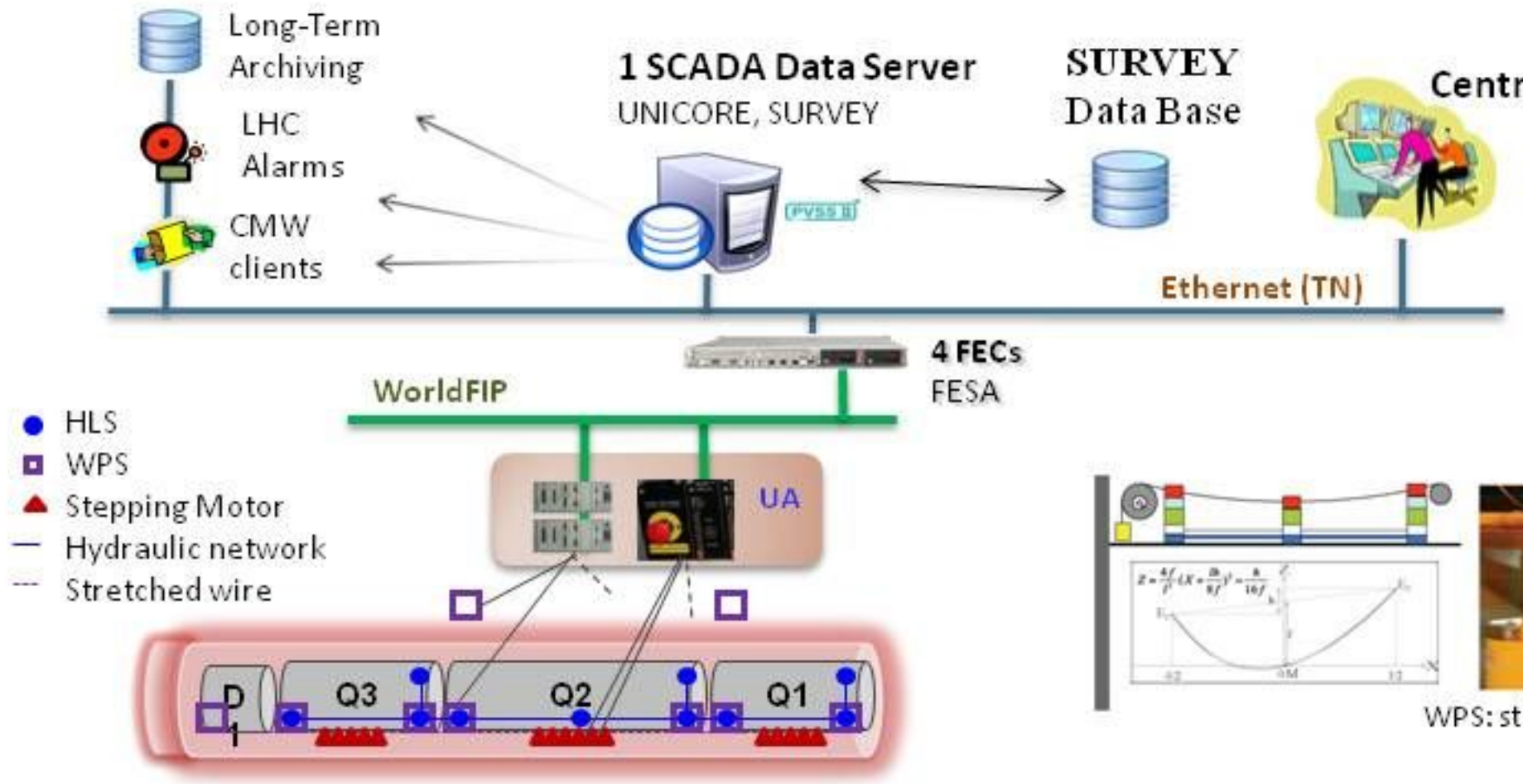
UNICOS CPC (Continuous Process Control) Package

- Method to design and develop process control applications
- Modeling the process in hierarchy of devices
  - I/Os, field device, abstract control devices
  - Common language between process engineers and programmers to define the functional analysis
- Deployed in the Supervision & Control layer (Siemens & Schneider PLCs)
- In the supervision: tools to create the devices
- In the PLCs: tools to create the devices & skeleton or PLC program
- Custom devices can be added



3.1. Use case: SURVEY, architecture

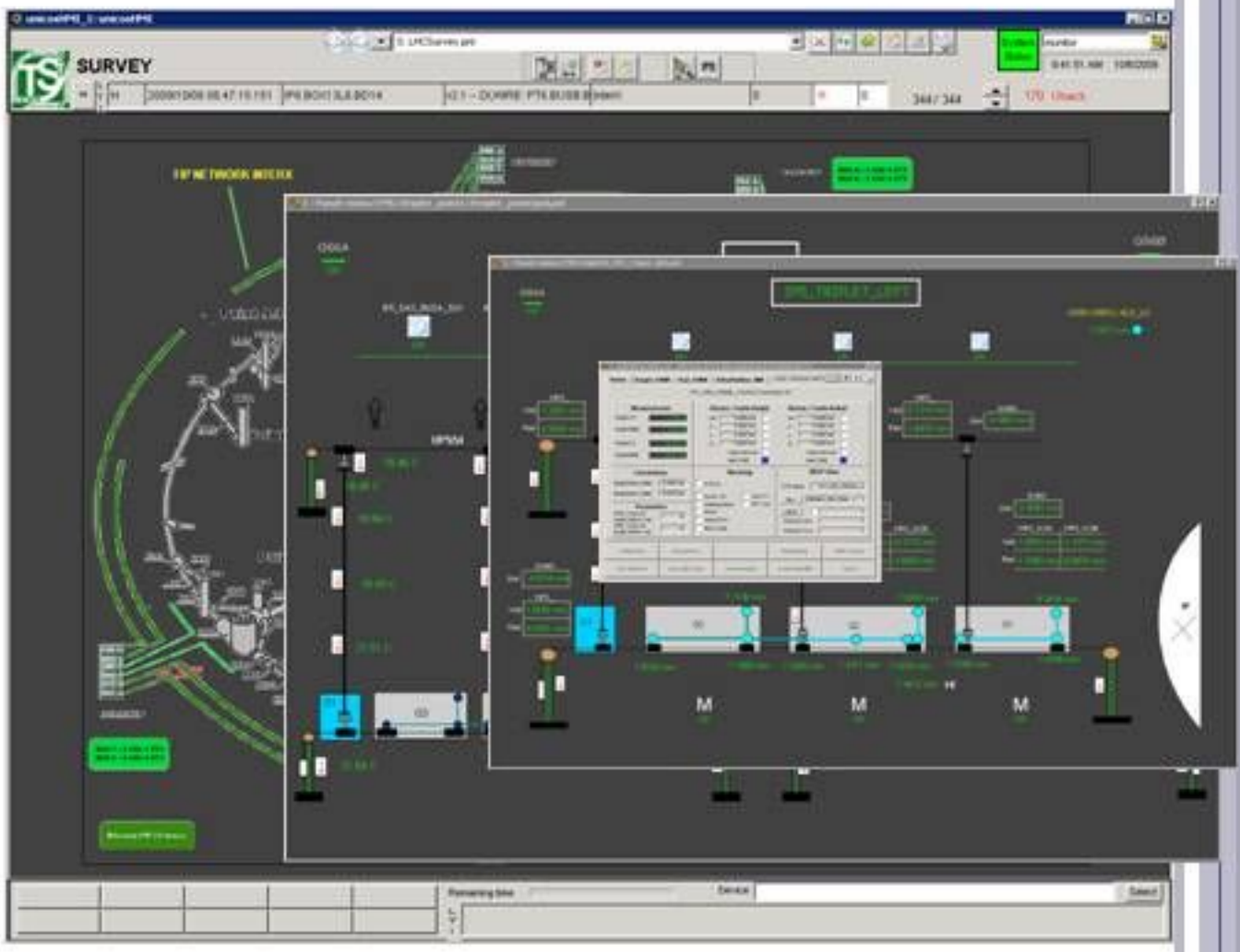
- Align the focusing magnets of the LHC on both sides of the experiments
- Control layer: FESA front-end with devices
  - 448 I/Os



WPS: streched-wire pos. system

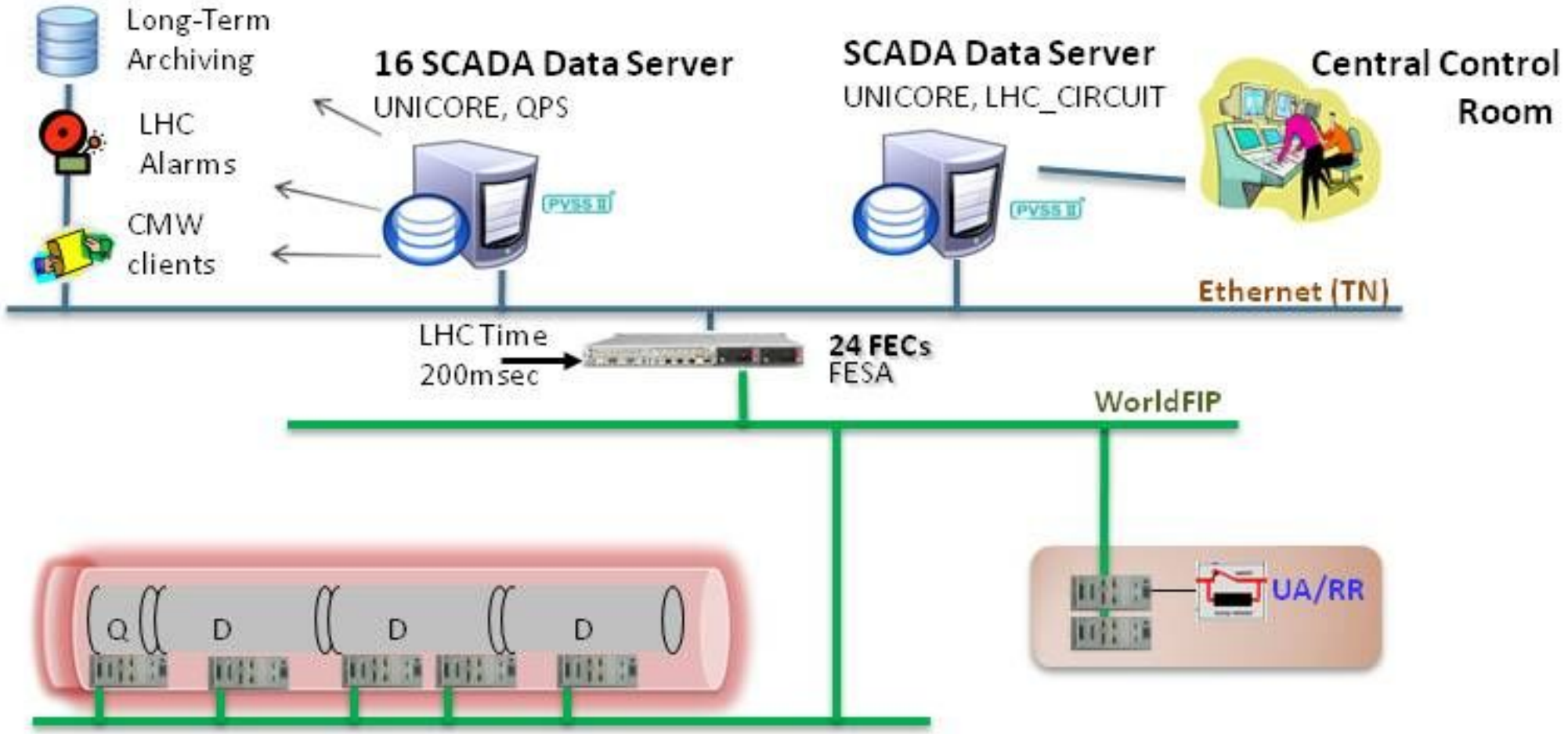
3.1. Use case: SURVEY, UNICORE features

- CMW interface
  - Mapped PVSS devices and FESA front-end devices
  - Published data
- Basic HMI
  - Navigation facility
  - Tree device overview
  - Process alarm/event list
- External interface:
  - ORACLE DB
- LHC Software suite
  - LASER
  - LHCLogging



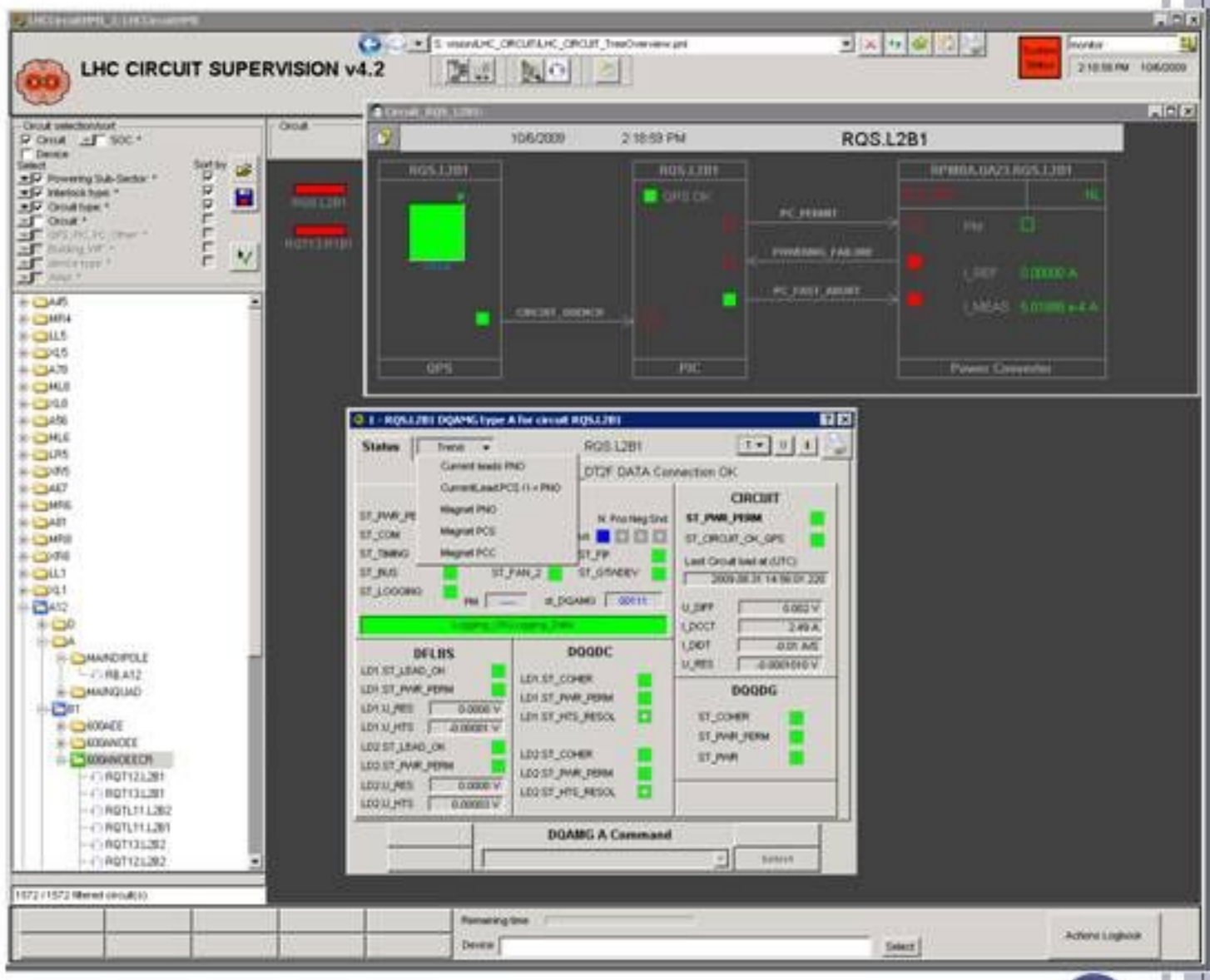
3.2. Use case: QPS, architecture

- Quench Protection System
- Control layer: FESA front-end with devices
  - 26000 I/Os
- Time stamp from field layer equipment



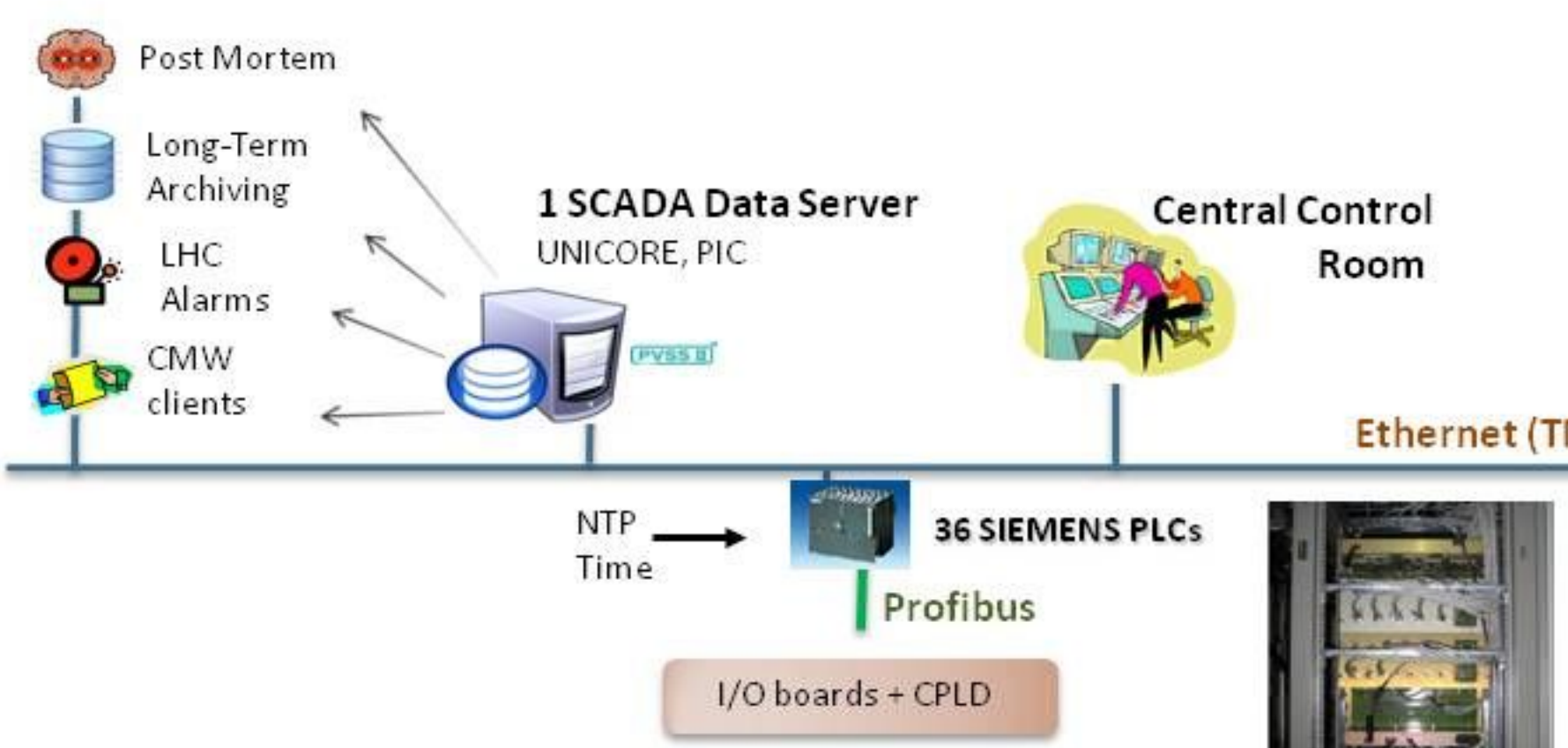
3.2. Use case: QPS, UNICORE features

- CMW interface
  - Mapped PVSS devices and FESA front-end devices
  - Published data: PIC, splice monitoring, etc.
- Grouping mechanism
- Distribution (16 DS)
- Remote access
- LHC Software suite
  - LASER
  - LHCLogging



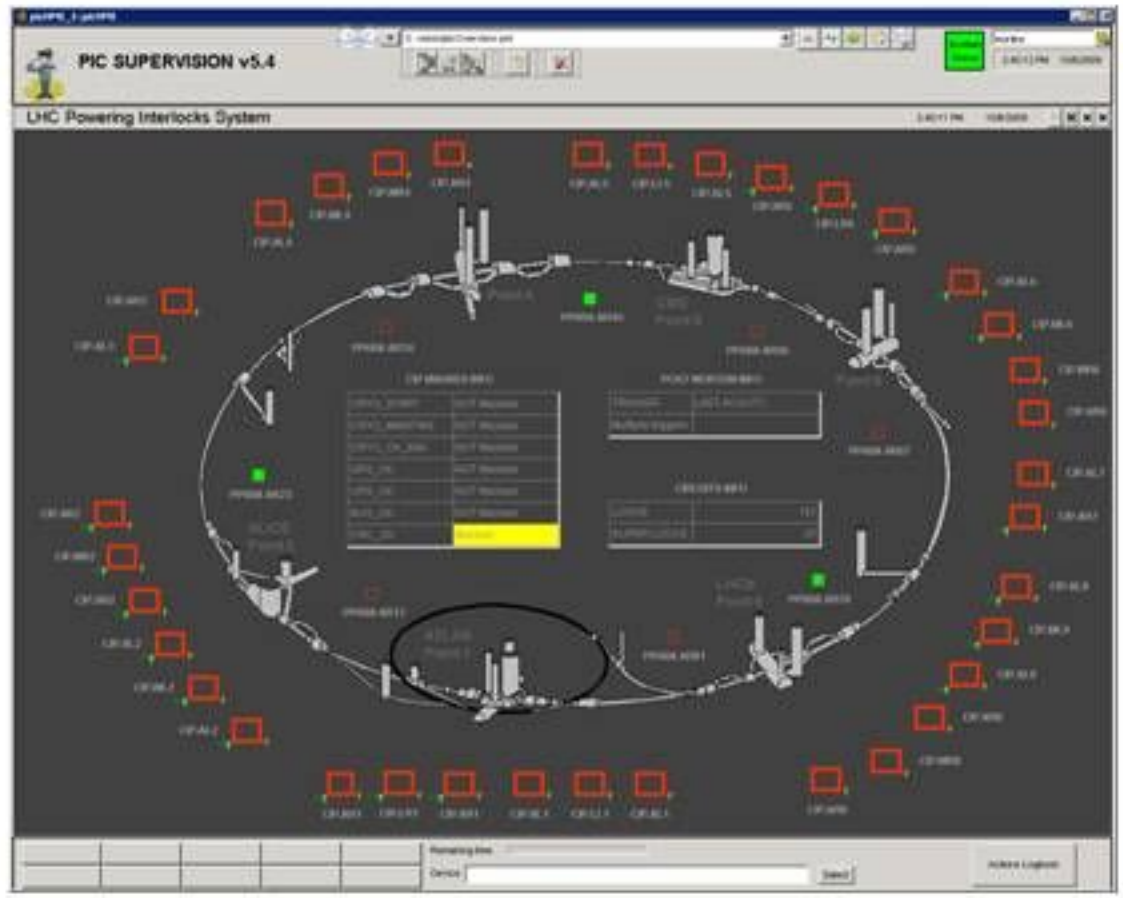
3.3. Use case: PIC, architecture

- Manage the powering permissions of the electrical circuits
- Control layer: Standard Siemens PLC
  - 10000 I/Os
- Supervision layer: 18000 CMW I/Os



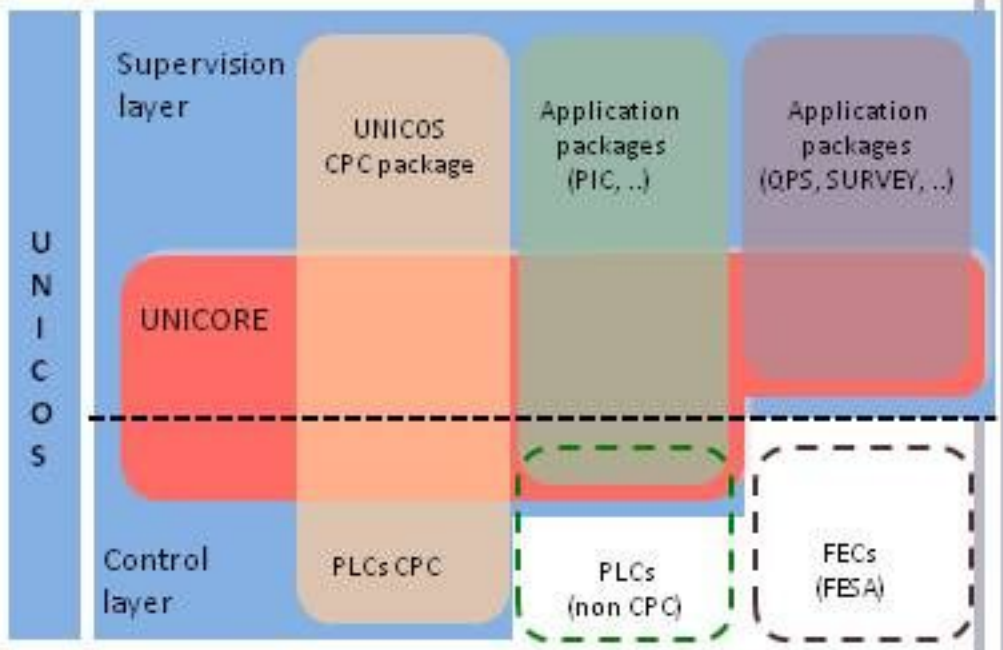
3.3. Use case: PIC, UNICORE features

- CMW interface
  - Mapped QPS, CRYO summary data
  - Published data
- Grouping mechanism
- Widget
- Device access control
- LHC Software suite
  - Post-Mortem
  - LASER
  - LHCLogging



4. Conclusions

- UNICOS framework used in many applications
  - Feedback control, monitoring systems, etc.
- Re-usability of UNICORE component
- Various front-end:
  - PLC, FESA FECs
  - ….



- Other packages
  - CIET: Cryogenics Instrumentation Expert Tool
  - WIC: Warm Interlock Controller
  - VPC: Vacuum Package Control (2010)
  - …

Thank you!