The Evolution of the Control System for the Electromagnetic Calorimeter of the Compact Muon Solenoid Experiment at the Large Hadron Collider

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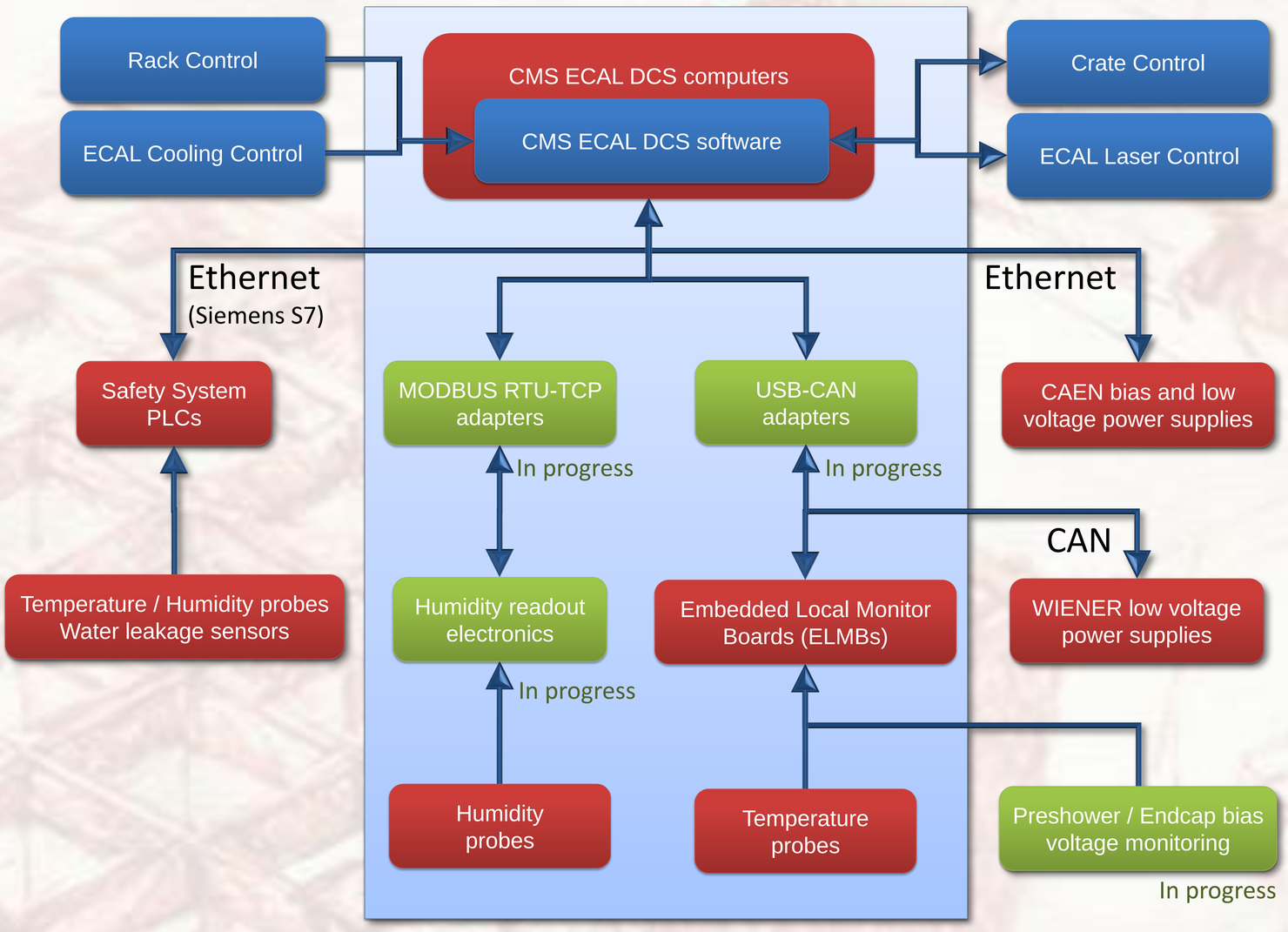
On behalf of the CMS ECAL group

Compact Muon Solenoid (CMS) Electromagnetic Calorimeter (ECAL) Detector Control System (DCS)

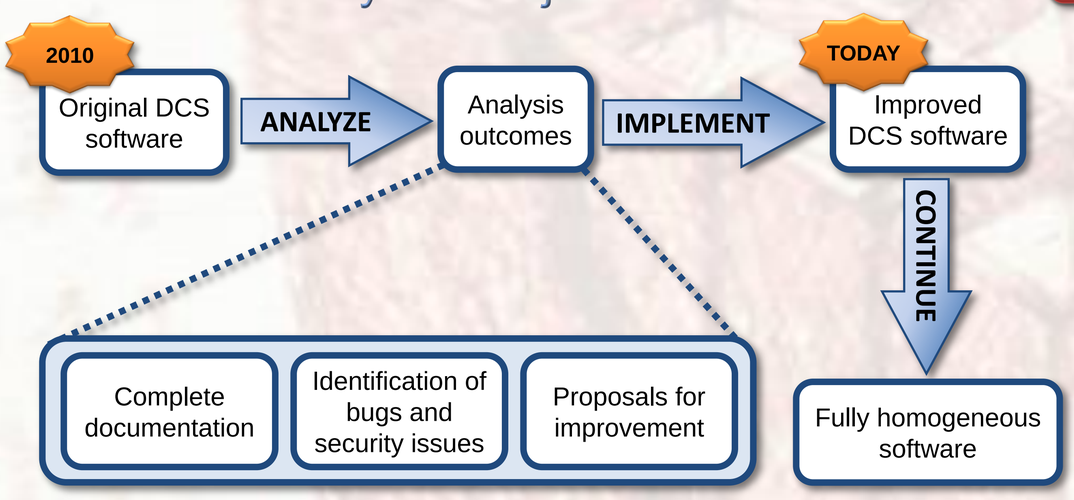
- Based on WinCC Open Architecture (formerly PVSS)
- Uses Joint COntrols Project (JCOP) Framework
- 24/7 two-level on-call service (operations / expert)
- Almost no ECAL down time associated with DCS

DCS computers	14
Low voltage channels	>1000
Bias voltage channels	>1400
Temperature sensors	972
Humidity sensors	180
Water leakage detection sensors	40

Modified architecture and interfaces to external systems



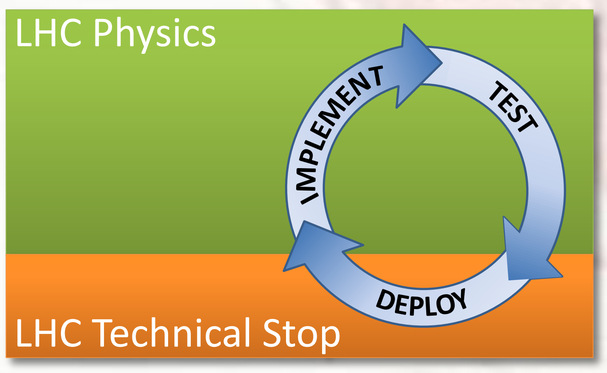
Software Analysis Project



- Reduction of long term maintenance effort
- Removal of duplicated feature implementation
- 20% reduction of control and data processing code

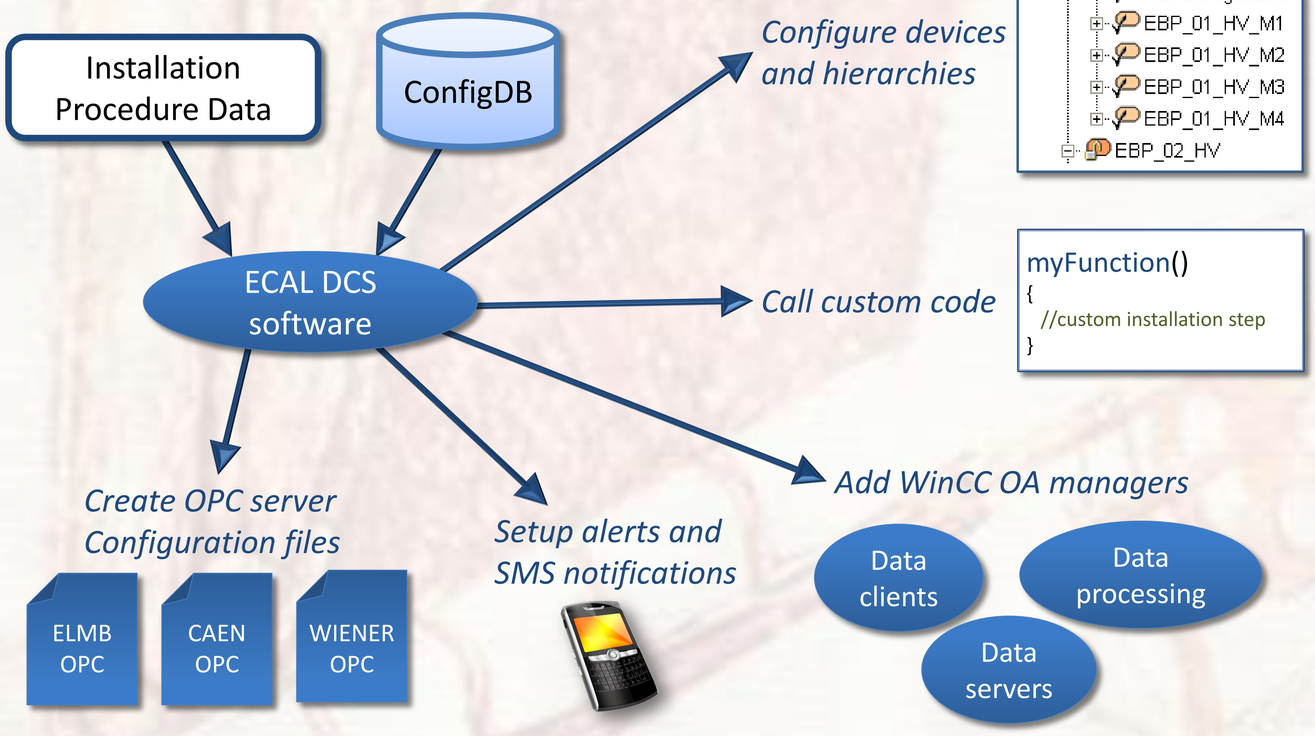
Software Re-Development Approach

- Create generic reusable components
- Piece-by-piece implementation minimizes risk of change
- Matching of development cycle to LHC technical stops



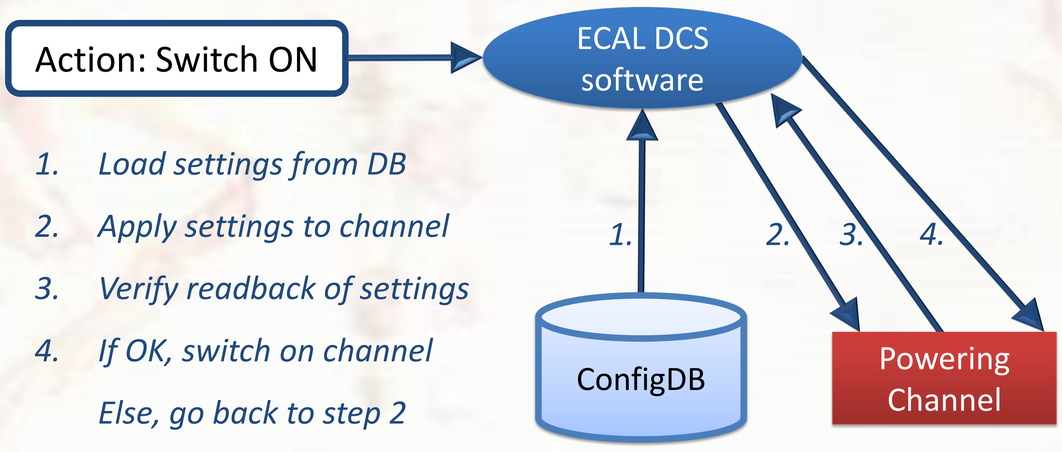
Unified CMS ECAL DCS Installation Mechanism

- Replaces individual mechanism for each DCS application
- Fully automated installation and upgrades
- Data-driven method

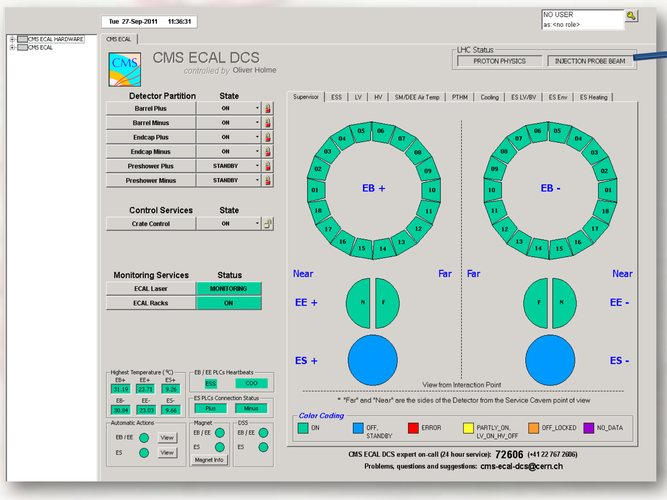


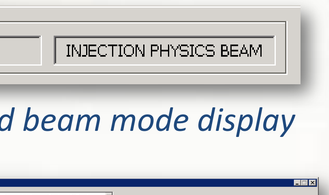
Use of Configuration Database (ConfigDB)

- Storing CMS ECAL DCS hardware and software configuration
- Storing bias and low voltage channel settings
- Channel settings applied and verified before switching on
- Periodic verification of hardware setting consistency

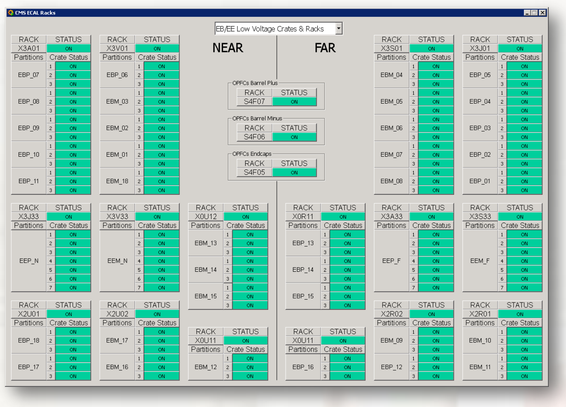


New Features Improve On-Call Efficiency





LHC status and beam mode display



Extended alert and SMS notifications → *Faster problem detection*

Combined rack and crate monitoring → *Faster problem resolution*

Acknowledgements

Swiss National Science Foundation, Switzerland

1) ETH Zurich, Switzerland

2) University of Wisconsin-Madison, U.S.A.