**Tracker DCS Architecture**

**Introduction:**
The CMS Tracker Detector is the largest (200 m²) silicon detector in the world. It has been operational for the last 12 years in harsh radiation environment 100 meters underground. It has 124 million pixel and 9 million strip channels. The CMS Tracker Detector Control System (TCS), a fully self-contained sub-system of the CMS Detector Control System (DCS), is the distributed control software that operates the Silicon Strip and Pixel Tracker. It is implemented using the commercial WinCC-OA SCADA software. The main purpose of the TCS is to ensure that the detector, operational at low temperature (-20°C to -22°C), is at all times in a safe state, based on the information coming from the environmental sensors, safety system and control units of the detector and the LHC beam state.

**In numbers:**
- 4 distributed WinCC-OA projects running on a redundant HW and SW architecture
- 9 power supply Mainframes handling:
  - 4’412 Low voltage channels
  - 4’412 High voltage channels
  - 1’000 environmental sensors
  - ~17’000 detector control units (DCU)

**Features:**
- 13 Tracker components built on top of the JCOP and CMS framework (FW) components used to build the Full Tracker Control Software
- Tracker DCS Operation panels
- Tracker Finite State Machine (FSM)
- Users access control
- Archiving mechanism
- Alerts configurations (email/SMS)
- Generic plotters
- CAEN power supply & PLC Heartbeats
- Generic components used by other sub-systems
- One component can be used to setup multiple projects

**Challenges:**
- Components refactoring for a clean architecture
- Remove cyclic inter-dependencies
- Improve re-usability of components
- Remove legacy and duplicate code
- Objective: Reduce software maintenance load for TCS (and other sub-systems)

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**Present (Long Shutdown) Activities**

1. **CMS Central DCS HW&W Upgrade**
   - Central DCS Server HW upgrade:
     - State of the art Blade servers
     - Migration to Windows Server 2016
     - JCP FW Upgrade followed by a CMS FW Upgrade
     - Migration from SVN to Gitlab

2. **CAEN Power Supply Migration**
   - Migration from OPC DA to OPC UA
   - Aim to achieve an homogeneous power system:
     - Older Mainframe models will be replaced by SY5527
     - Firmware upgrade to the latest version

3. **DCS Software Upgrade**
   - WinCC-OA Migration from 3.15 to 3.16
     - Object Oriented Programming paradigm
     - Panel format conversion to XML
     - Text encoding changed from ISO-8859-1 (Latin1) to UTF-8
     - Unit Test definition (tibs and scripts)
     - Automated Continuous development

4. **CMS Pixel Detector Test Setup**
   - Due to its irradiation over years of operations, the Pixel detector, to be replaced during the long shutdown, was extracted and placed into 2 separate clean rooms to perform test measurements
   - 2 additional independent DCS projects
   - WinCC-OA Components that ensure clean installation