Calibration/ Alignment for Run II

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Online Calibration Subgroup

- **People**
  - J. Simmons, V. Sirotenko, D. Zhang, H. Wang, H. Fox, J. Warchol, S. Chopra, M. Bhattacharjee, D. Chakraborty, J. Huang, S. Doulas, T. Yasuda (leader)

- **Web**
  - [http://d0server1.fnal.gov/www/online_computing/projects/online_projects.html](http://d0server1.fnal.gov/www/online_computing/projects/online_projects.html)

- **Mailing list**
  - d0_online_calibration@fnal.gov
Offline Calibration/ Alignment Subgroup

- People

- Web
  - http://d0server1.fnal.gov/projects/OfflineCalibAlign/home.html

- Mailing list
  - d0_offcal2@fnal.gov
Calibration

- Every sub-detector needs periodic calibration.
  - Pedestal for sparse readout, energy offset
  - Gain for uniform response and to check if channels are in working order
  - etc
- Luminosity dependence needs to be studied
  - Calibration in between bunch crossings
Calibration Procedure

- 1. Take a calibration run using the standard D0 DAQ system. Constants are calculated online on FE processors or on L3 nodes and shipped to CalibManager.
- 2. Constants are inserted into the D0 Online calibration database.
- 3. Constants are shipped to the D0 Offline calibration database.
- 4. Constants are accessed from D0reco via a CORBA database server.
Databases

- **Oracle version 8 (Relational Database)
- Two sets of database**
  - Online and offline
  - With periodic transfer of data from online to offline
  - Integrated with other D0 databases (e.g. Run)
Online Calibration

- **Online calibration: Collecting constants**
  - Collect and analyze data, insert constants into database, and ship them to the offline database
  - Three different methods to acquire constants
    - FE processor, L3 filter, and offline analysis
  - Constants used for download to the FE electronics
  - Only the latest sets kept due to disk space limitation
Online Calibration System

Taker
- Configure
- Request start run

COOR
- Start run
- End Run
- Request download

COMICS
- Download
- Start run

Crates
- Data

Calibration Manager
- Pedestals Gains
- Comparison Results

Validator
- Database Interface
- Status
- Commit, Abort, etc

Database
- Access

Calib Manager GUI

Calib. Data Processor
Infrastructure for Online Calibration

- COOR/Taker (S. Snyder)
- SDAQ (D. Zhang, F. Bartlett)
  - Data processing in the FE node
  - Calibration code can be used for monitoring during data run
- L3 (J. Hays, M. Souza, G. Watts, M. Bhattacharjee)
  - Calibration data analysis code as a filter for CAL
- Calib Manager (T. Yasuda)
  - Overall manager of the calibration processes
Infrastructure (cont’d)

• Database Interface (J. Simmons)
  - Uniform database interface for all sub-detectors

• Online - Offline transfer (J. Simmons)
  - Uniform database transfer for all sub-detectors

• Database flattening for L3 (J. Guglielmo)
  - To avoid time consuming database access on L3
SMT Online Calibration

- People
  - H. Fox, H. Wang, D. Mendoza, T. Yasuda (X. Fang, I. Bertram)
- Approximately 800,000 channels in 12 crates
- Data collected and analyzed in the FE processors and the results shipped to CalibManager
- Version 1 in operation since last Fall
  - Measured pedestal values are used to set zero suppression threshold for sparse readout
- Version 2 with TFW ready for use
CFT/ CPS/ FPS Online Calibration

- People
  - S. Chopra, J. Warchol, G. Savage
- Approximately 125,000 channels
- Electronics and optical calibration methods
  - Electronics calibration identical to SMT
  - Optical calibration (by illuminating fibers with LEDs) requires offline data analysis (peak fitting)
- Luminosity dependence
- Electronics Calibration works
Calorimeter Online Calibration

- People
  - M. Bhattacharjee, D. Chakraborty, M. Thioye

- Approximately 50,000 channels

- Charge injection controlled by Pulser Controller Boards (an improvement from Run I)

- Data analysis performed as a L3 filter and the results shipped to CalibManager via C/R

- Single node mode in operation since last Dec
  - Pedestals used to download zero supp. thresholds

- Multi-node mode in preparation
Muon Online Calibration

- People
  - S. Doulas, D. Wood, J. Huang, A. Zieminski
- Running standalone calibration programs on the FE and on the host
- Migrate to SDAQ framework
- Three systems
  - PDT (7,000 channels, T0, pad gain, Drift t-to-d)
  - MDT (50,000 channels, T0, Drift t-to-d)
  - MSC (6,000 channels, T0, pedestal, gain)
Offline Calibration

- **Offline Calibration: Using constants**
  - Access constants from D0reco
    - Highly sophisticated infrastructure to overcome cost and administrative burden of ORACLE using d0om and CORBA
    - CORBA server and d0omCORBA clients
  - Keeps all constants
  - Calibration using real particles
Infrastructure of Offline Calibration

- Overall design
  - V. White, H. Greenlee, E. Barberis, S. White, M.Vranicar, J. Hobbs

- CORBA server
  - Automatic server code and c++ header generation from database table definition

- d0omCORBA, d0omORACLE
  - Access from c++ code using d0om persistency mechanism and deferred I/ O

- Calibration Management
Subsystem Offline Calibration

- SMT: E. Barberis
  - due to a large number of channels, only channels with significant changes are retained.
- CFT: A. Mayorov
- CPS/ FPS: Z. Wang
- Calorimeter: U. Bassler
- Muon: J. Huang, U. Rao, A. Zieminski
<table>
<thead>
<tr>
<th></th>
<th>Online table design</th>
<th>Online data collection</th>
<th>Online - Offline transfer</th>
<th>Offline table design</th>
<th>Offline data access</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMT</td>
<td>Done</td>
<td>Done</td>
<td>Transfer done to the staging tables</td>
<td>In progress (Almost done, needs modifications)</td>
<td>In progress</td>
</tr>
<tr>
<td>CFT</td>
<td>Done</td>
<td>In progress (Following the SMT example)</td>
<td>Done</td>
<td>Done</td>
<td>Done</td>
</tr>
<tr>
<td>CPS/ FPS</td>
<td>Done</td>
<td>In progress (Uses the same system as CFT)</td>
<td>Not done</td>
<td>Done</td>
<td>In progress</td>
</tr>
<tr>
<td>Calorimeter</td>
<td>Done</td>
<td>In progress (Done for one crate with pedestals only)</td>
<td>Transfer done to the staging tables</td>
<td>Done</td>
<td>In progress</td>
</tr>
<tr>
<td>Muon</td>
<td>Done</td>
<td>In preparation</td>
<td>Transfer done to the staging tables</td>
<td>Done</td>
<td>Done</td>
</tr>
</tbody>
</table>
Status on March 1

- SMT
  - 1 full VRB crate + 1 more crate with some VRBs
  - 50,000 - 80,000 channels, similar to 10% test
  - Will run SDAQ calibration with TFW
  - Non-zero suppressed run for cross check

- CFT
  - A few stereo AFE boards available for calib
  - Will run a SMT-like calibration program on the FE
Status on March 1 (cont’d)

- Calorimeter
  - a few crates will be available for calib
  - Will run a multi-node calibration on L3

- Muon
  - All of the crates will be available for calib
  - Will run a standalone calibration program on the FE and host
  - Will migrate to SDAQ calibration framework
Summary

- All of the system components for the online and offline calibration exist and work.
- Some sub-detector systems lack implementation of some of the components.
- We are in the process of integrating all the components into one large system that functions smoothly.
- Development databases are being migrated to production databases.
- Performance test are being carried out for offline access.