



# Introduction to the DAQ

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DAQ Shifter Tutorials  
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# Control Room Shifters

- There are five shifters that are required to be on shift during data taking.
  - Captain – In charge of making decisions that could effect data taking.
    - GM – Watches data for irregularities
  - Three Detector Shifters
    - CFT
    - SMT
    - CALMUO
  - DAQ
- In addition, the OPs shifter looks after general operations



# DAQ Shifter

- The DAQ shifter is the key to D0's ability to record quality data.
- It is his job to make sure that the DAQ system keeps data flowing.
  - If data flow stops, the DAQ shifter analyzes the problem and solves it directly or directs it to the appropriate detector shifter.



# Shifts

- 3 shifts per day
  - Owl (0:00 – 8:00)
    - A Monday owl shift begins before the Monday day shift.
  - Day (8:00 – 16:00)
  - Eve (16:00 – 24:00)
- You should arrive 15 minutes early to your shift to find out issues of the previous shifts.
- It is best to have read the run plan and the log book before arriving to your shift.



# DAQ Schedule

- There are three training (buddy) shifts
  - If you are not ready after training, more can be scheduled.
  - Additional training is available from shifter tutorials.
- DAQ shifts are a total of six weeks.
  - One week on then two weeks off
  - Rotate through DAY, EVE and OWL



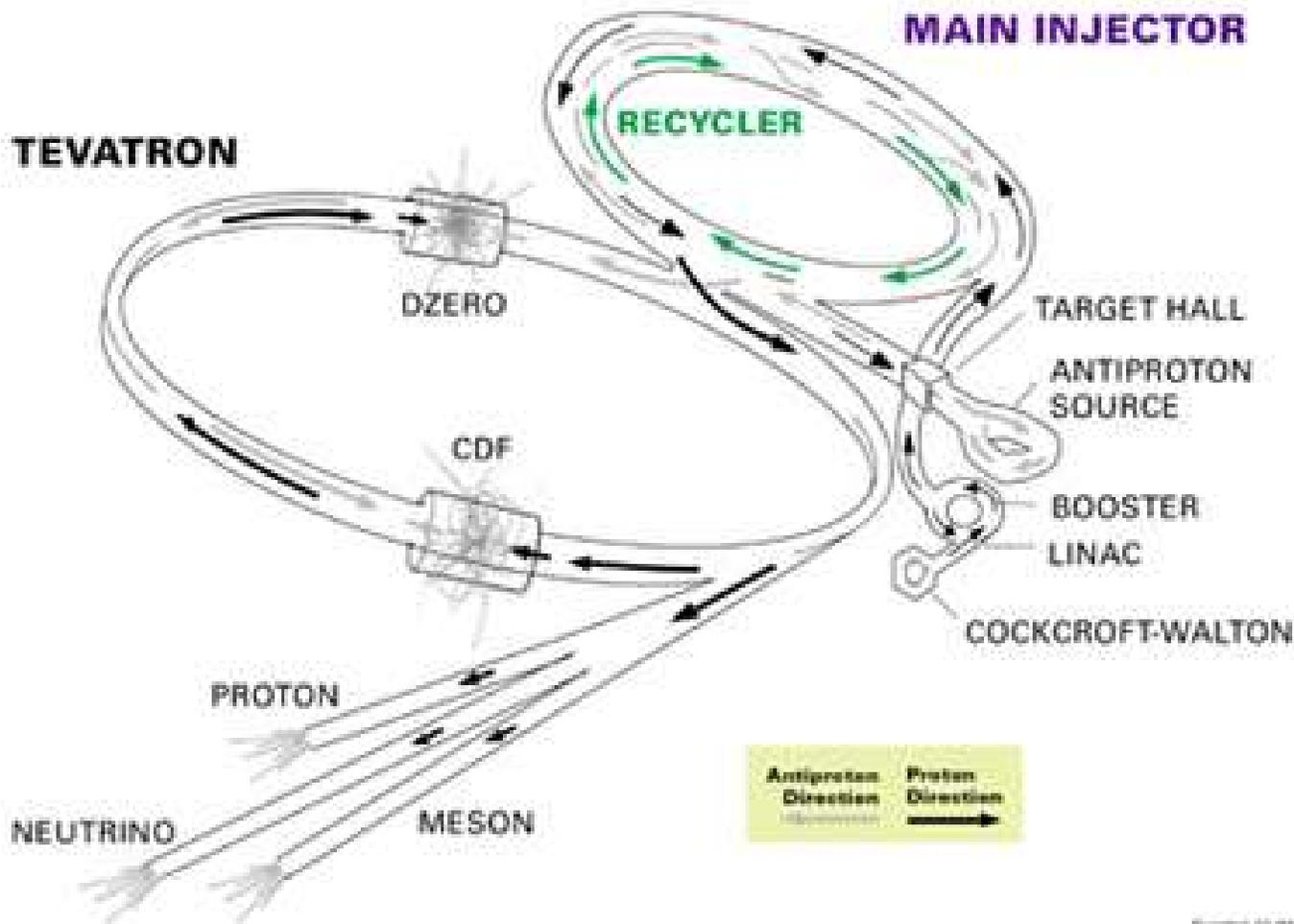
# Safety Training

- The DAQ shifter and the OPs shifter are required to be around 24 hours per day, so they need to be trained to make a controlled access. This requires:
  - D0 Hazard Awareness
    - You should already have this.
  - LOTO Level 1
    - Offered occasionally, takes 15 min, contact Eric McHugh.
  - Radiological Worker
    - Through ES&H, 5 hours, offered ~weekly
  - Controlled Access
    - Through ES&H, 2 hours, offered ~weekly



# The Tevatron

## FERMILAB'S ACCELERATOR CHAIN



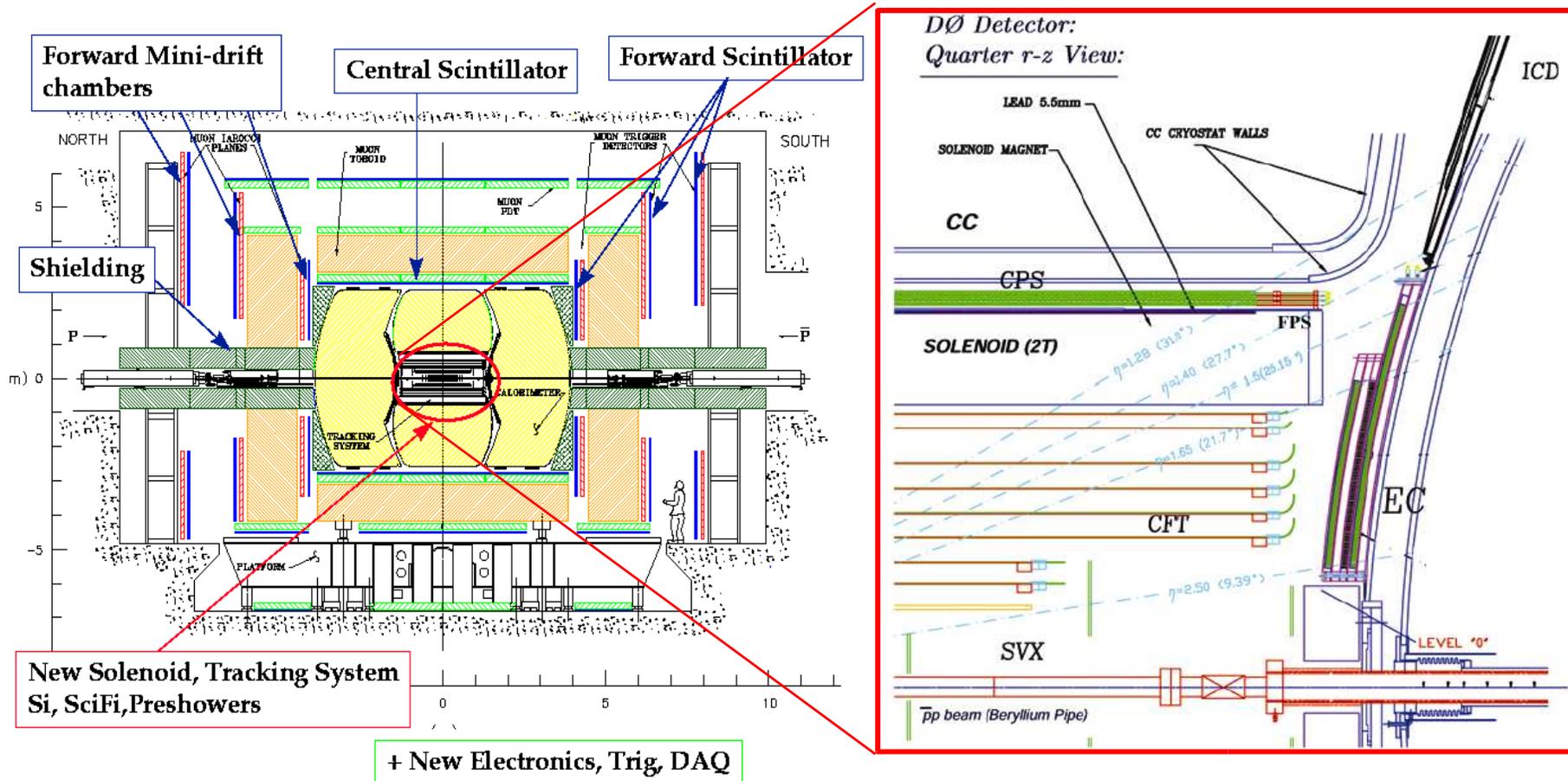
Terms to know:

- Stack
- Accumulator
- Stash
- Recycler
- Store
- Luminosity





# The D0 Run II detector



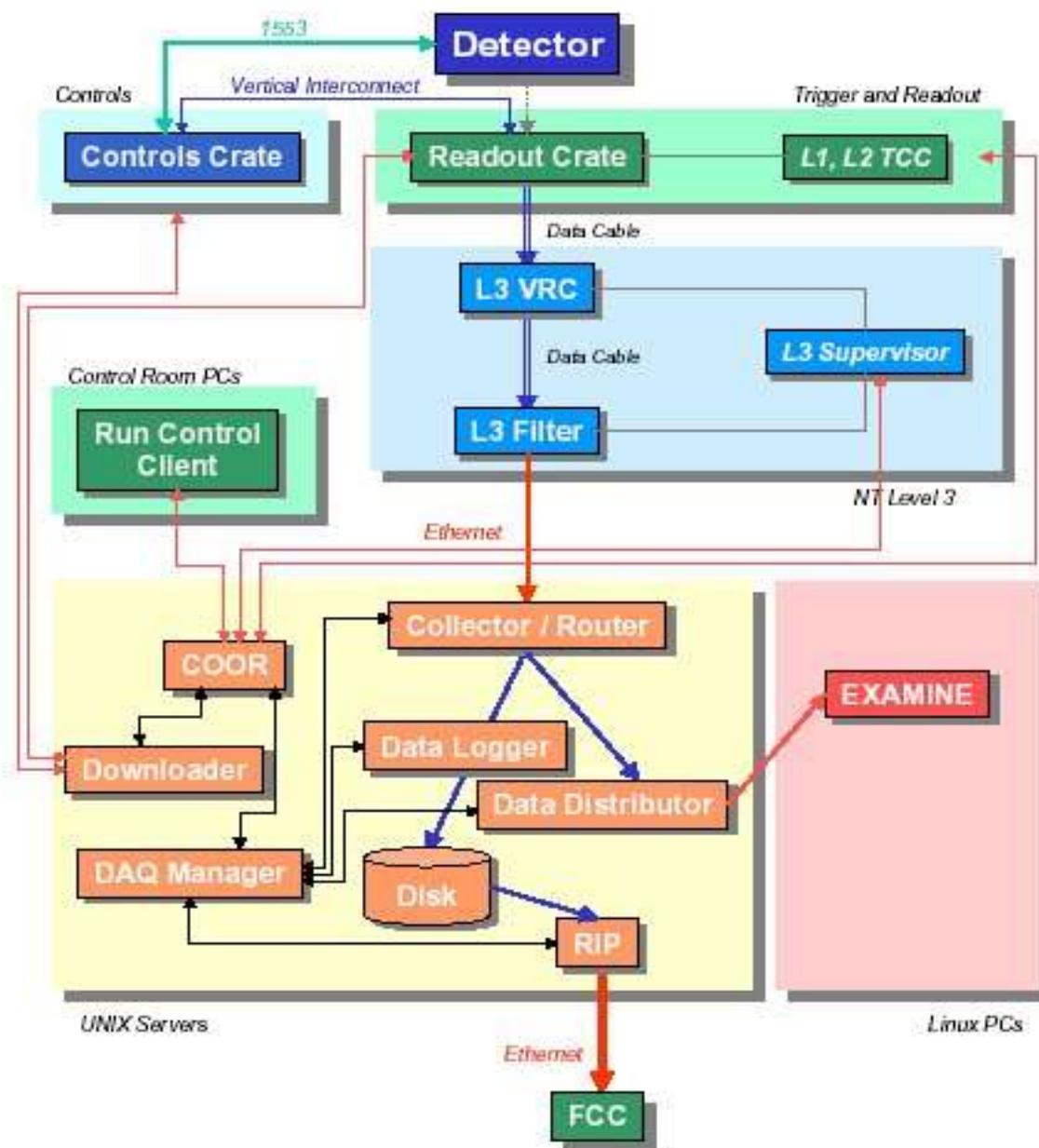


# DAQ

- Many parts
  - Controls
  - Triggering
  - Readout
- It all has to work together.

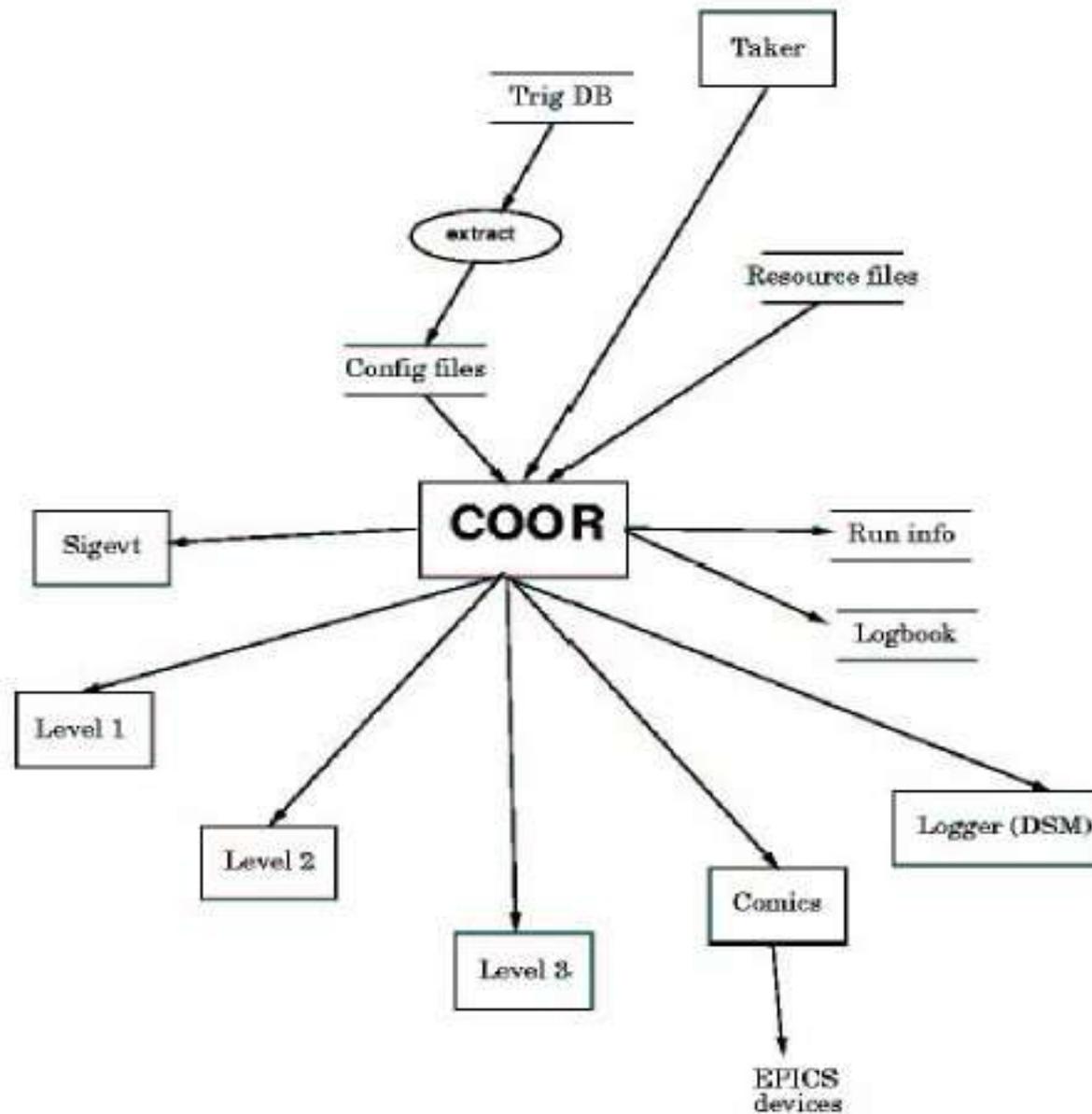


# Run Control and Configuration





# COOR Information Flow





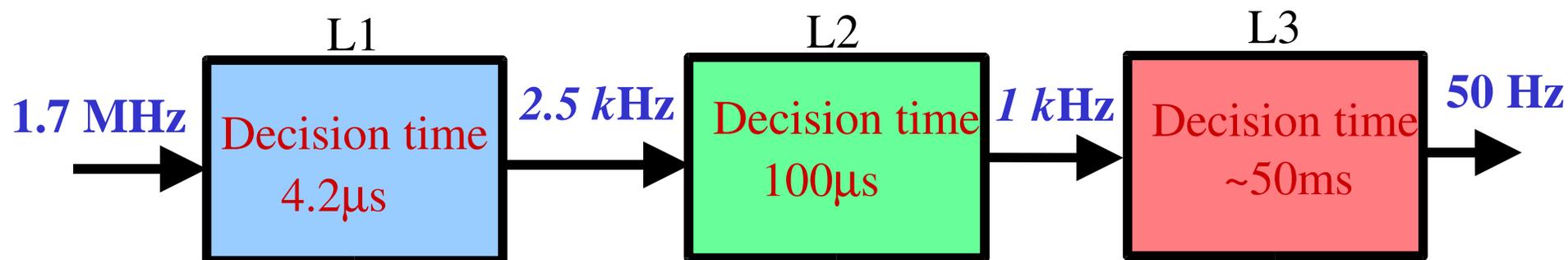


# The D0 Trigger System



But data acquisition rate is limited to 50 Hz

⇒ 3 Level Trigger System



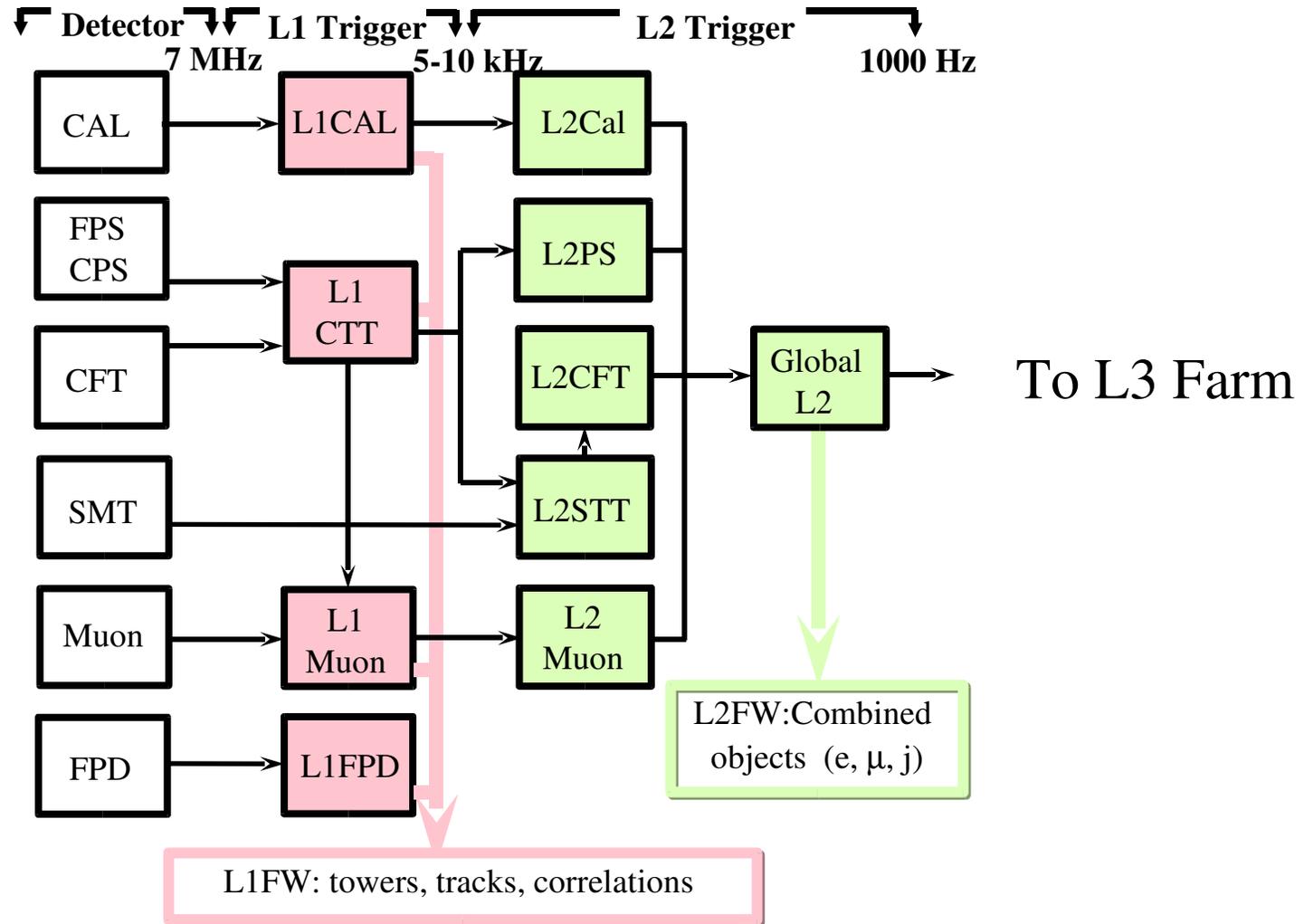
- Hardware based
- Simple Signatures in each Sub-Detector

- Software and Firmware based
- Physics Objects  $e, \mu, \text{jets, tracks}$

- Software based
- Simple versions of reconstruction algorithms



# The D0 Trigger - L1/L2





# A Typical Readout Crate

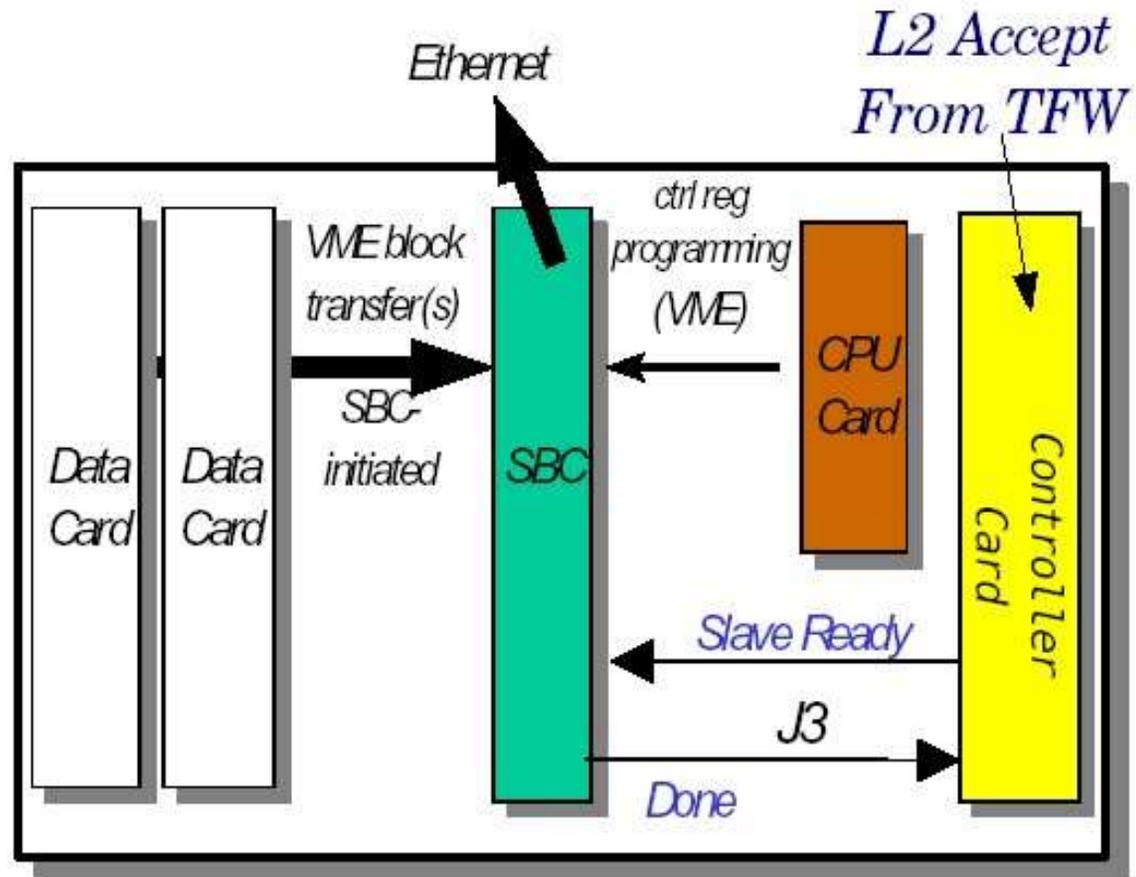
After a L1 accept the data is stored in the Input Buffers of the crate.

Input buffers full -> L1 Busy

On a L2 Accept the data is moved to the Output buffers and the SBC is told the data is ready to be moved to L3.

Output buffers full -> L2 Busy

On a L2 reject, the data is discarded.



- Data card, CPU, and Controller cards specific to crate type

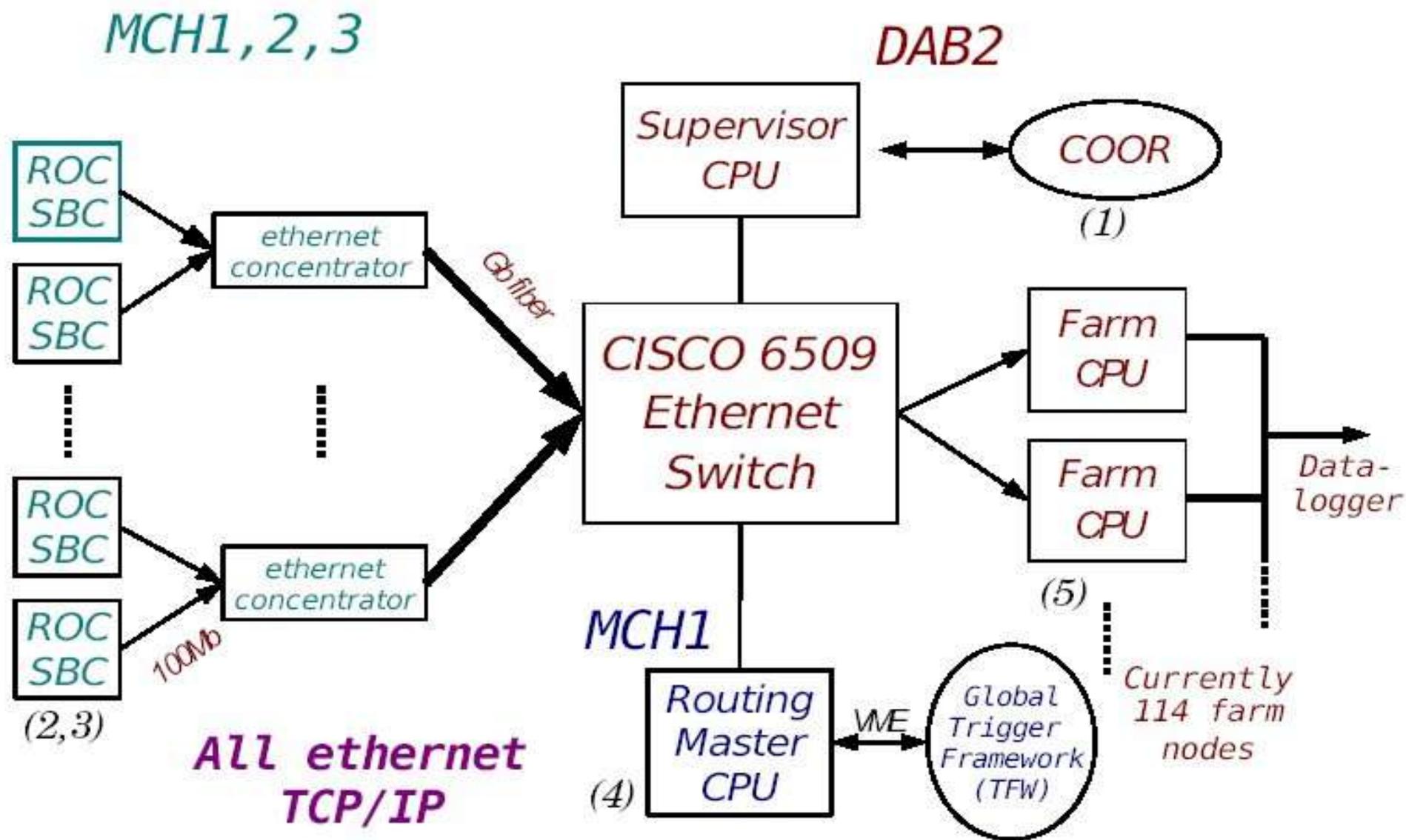


# SCLInit

- SCLInit – What is that?
  - An SCLInit is the command from the trigger Framework through the Serial Command Link to all crates and modules to get them in sync.
    - This command stops data flow.
    - All crates on the SCL need to clear out their buffers and signal that they are ready.
    - Once all crates have responded, data flow is resumed.
    - The next event will now be in sync for all crates.
  - This command is automatically issued at the start of every run.
  - It can also be issued by hand or after a pause.
    - This is our first tool if something goes wrong.



# L3 DAQ





# More information

- The DAQ shifter page has a lot on information:  
[http://wwwd0online.fnal.gov/www/groups/daq/daq\\_main.html](http://wwwd0online.fnal.gov/www/groups/daq/daq_main.html)
  - Buddy Guide
  - Run Plan
- Feel free to contact me <bill1@fnal.gov> if you have any questions.
- I will try to keep the DAQ shifter page up to date but let me know if there are any errors.