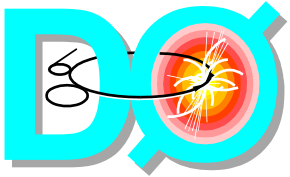
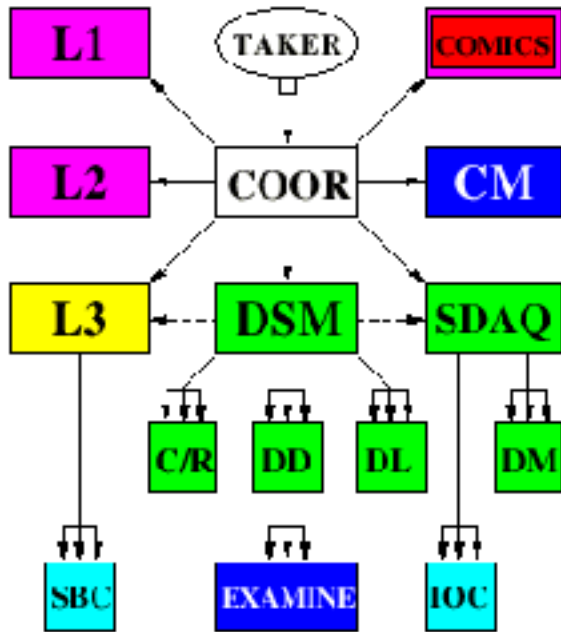


# DAQ Back End Tutorial

- **The players**
  - Control and data flow diagrams
  - Brief description of each application
- **Configuration and log files**
- **Starting and stopping applications**
- **Monitoring**
  - Status web page
- **How to reach the experts**
- **Summary**



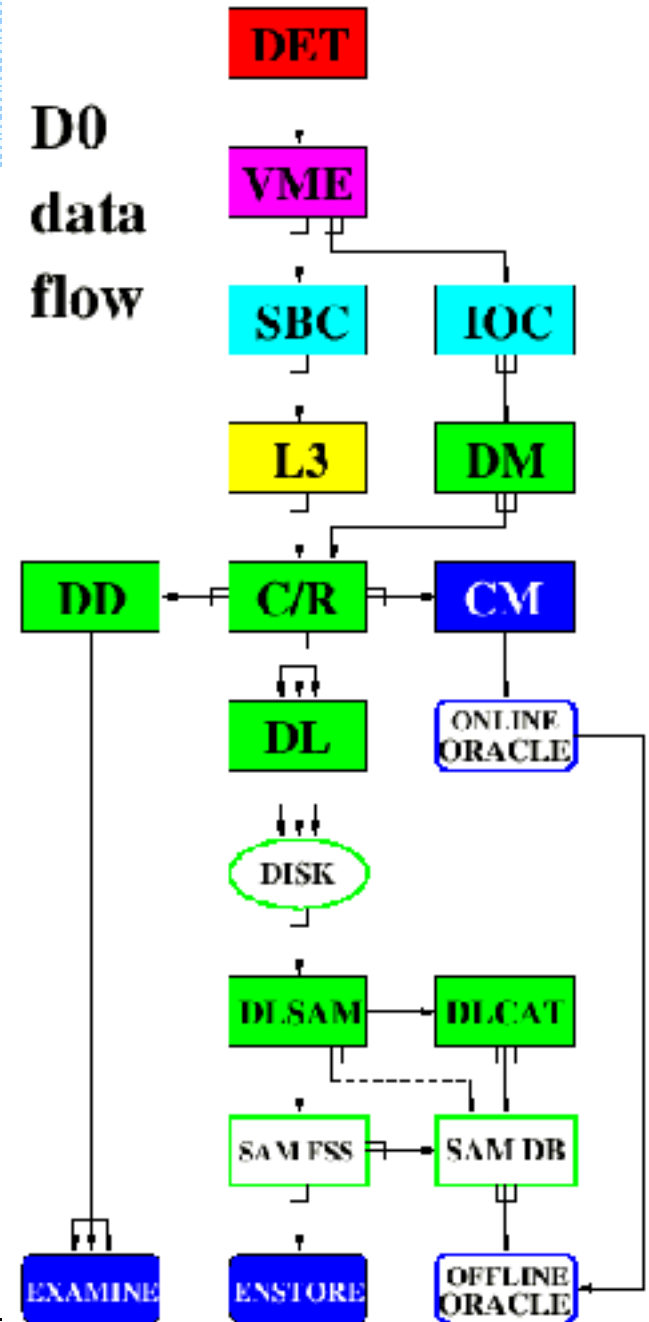
# The Players

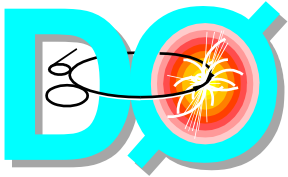


D0 control flow

This tutorial is about the green guys

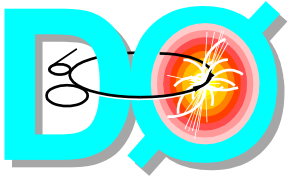
D0 data flow





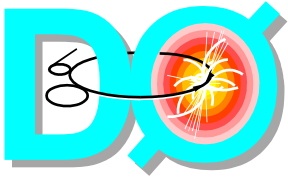
# C/R and DD

- **C/R = Collector/Router**
  - Receives events from L3 nodes and SDAQ DMs
  - Routes an event according to the event's stream(s):
    - Forwards calibration events to the CM
    - Forwards normal events to their DL(s) and as many as possible to the DD as well
    - Events w/o valid streams are dropped (with a warning)
      - Log file contains their event header dumps
      - Recently observed probability  $O(10^{-4})$ , clustered in a few spikes
- **DD = (Data) Distributor**
  - Receives events from the C/R(s)
  - Serves them to connected Examines according to each Examine's stream and trigger wish lists



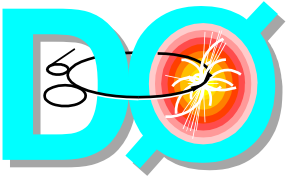
# The DL

- **DL = DataLogger**
  - Receives events from C/R(s)
  - Saves them in files based on stream, run and partition (“{stream}\_{run}\_{partition}.raw”):
    - Each covers an integral number of luminosity blocks
    - Each has an associated event catalog file
    - Late events go to partition 000
    - Events that arrive after their run has ended are dropped (with a warning)
      - Log file contains their event header dumps
      - Recently observed probability  $O(10^{-6})$ , clustered in a few spikes
  - Is told by DLSAM when to move to the next disk



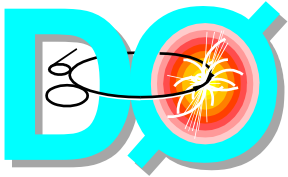
# DLSAM and DLCAT

- **DLSAM = DL-SAM interface**
  - Tells DL when to move to the next buffer disk
    - When occupancy or time limit is reached
    - Currently 2 TB available (30 disks)
      - Enough for 2 days of continuous (!) data taking at 12.5 MB/s
  - Uses SAM FSS to transfer completed files to Enstore
    - Checks PNFS before deleting any file
    - Lets DLCAT fix meta-data missing in the SAM DB
      - When the FSS lost its connection to the DB server
- **DLCAT = DL (event) Cataloguer**
  - Checks and fixes meta-data missing in SAM DB
  - Stores and checks event catalogs in SAM DB
  - SAM DB (Oracle) will detect duplicate events, if any



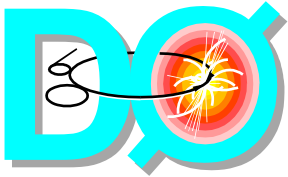
# The DSM

- **DSM = Data** (Flow) **State Manager**
  - **Controls all CR, DD and DL instances (“slaves”) on behalf of COOR**
    - DD is non-vital → its replies are ignored
    - Puts any restarted “slave” into current DAQ state
  - **Instructs CRs to which DL or CM to route a stream**
  - **Balances load over DLs**
    - Currently there is only 1 DL
  - **Supplies L3 and SDAQ Supervisors with weighted list of CRs**
    - 3 CRs are being used for ~80 L3 nodes



# SDAQ and DM

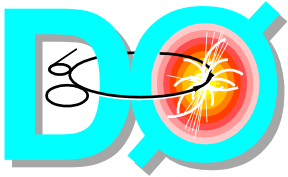
- **SDAQ = Secondary DAQ Supervisor**
  - Controls IOC processes (“crates”) participating in SDAQ runs (calibration, monitoring, tests)
  - Starts and controls corresponding DM processes
- **DM = DataMerger**
  - Receives SDAQ event fragments from IOC processes, merges them into complete events and sends those to a CR
  - Receives calibration and/or monitoring summaries from IOC processes and sends them to a CR, which will forward them to the CM
    - Currently this is the main use of the SDAQ



# Configuration and Logs

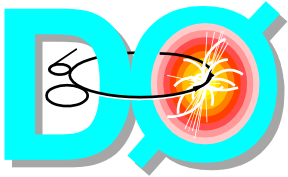
- **/online/data/d0online/d0online\_names.py**
  - Shows on which host(s) an application runs
- **/online/data/datapath/\$host/\$app.setup**
  - Configuration file for application \$app on \$host
    - \$app can be collector, datalogger, distributor, dlcats, dlsam, dsm, sdaq
- **/online/log/\$app/\$year/\$month**
  - Holds formatted logfiles
- **/online/log/\$app**
  - Holds stdout/stderr files (**out.\*** and **stop.\***)





# Starting and Stopping

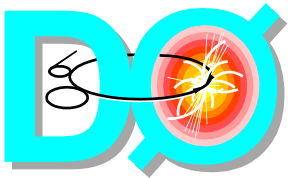
- **Start an application**
  - setup d0online
  - start\_daq \$app
- **Stop an application**
  - **First stop all ongoing runs!**
    - Not needed for DLCAT (nor DLSAM, but see below)
  - setup d0online
  - stop\_daq \$app
- **DLSAM must run when the DL is recording a run**
  - It instructs the DL when to move to the next disk



# Monitoring

- **Back end status web page**
  - <http://www-d0online.fnal.gov/www/daq/operations/status/onlstatus-auto.html>
  - Updated every minute
  - Frequently checked by the experts
  - Usually sufficient to verify the status or to discover problems





# Example Status Page Bottom

Here DLCAT is busy storing 1 event catalog, 3 others are waiting to be checked against the DB, and 2 have just arrived:

```

Last known transfers: (DLCAT: 2 in stage, 0 in meta-check, 1 in store, 3 in cat-check, 0 in cleanup)

25/15 16:35:20 all_000178785_006.raw -- /pata/sas/dzere/db2/datalogger/anal175002/datalogger/all/all
25/15 16:35:20 all_000178785_007.raw -- /pata/sas/dzere/db2/datalogger/anal175002/datalogger/all/all
25/15 16:35:40 all_000178785_005.raw -- /pata/sas/dzere/db2/datalogger/anal175002/datalogger/all/all
25/15 16:35:40 all_000178785_006.raw -- /pata/sas/dzere/db2/datalogger/anal175002/datalogger/all/all
25/15 16:35:40 all_000178785_007.raw -- /pata/sas/dzere/db2/datalogger/anal175002/datalogger/all/all
25/15 16:35:40 all_000178785_008.raw -- /pata/sas/dzere/db2/datalogger/anal175002/datalogger/all/all
25/15 16:35:40 all_000178785_009.raw -- /pata/sas/dzere/db2/datalogger/anal175002/datalogger/all/all
25/15 16:35:40 all_000178785_010.raw -- /pata/sas/dzere/db2/datalogger/anal175002/datalogger/all/all
25/15 16:35:40 all_000178785_011.raw -- /pata/sas/dzere/db2/datalogger/anal175002/datalogger/all/all

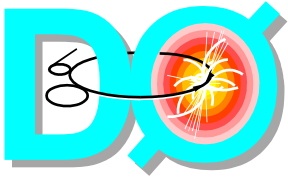
Last N files to Restore + SAM: 10 100 1k 2k
Sorted on run, stream, partition: 10 100 1k 2k

Application: CR DD DL DLCAI DL&AM DM D&M SDAQ
Snapshot: rDolr rDolr rDolr rDolr rDolr rDolr rDolr rDolr rDolr
Options: rDolr rDolr rDolr rDolr rDolr rDolr rDolr rDolr rDolr

Enable shooting instructions Report: LMF
    
```

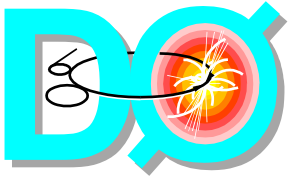


Statistics for the last N files transferred.  
 The last **100** and **1000+** lines of an application's log file.  
 Trouble shooting hints.



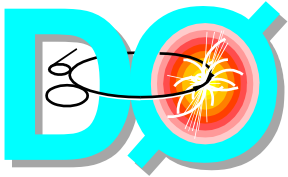
# DSM Status Snapshot

- Usually shows messages pertaining to the most recent COOR commands
  - Click on the DSM log file snapshot or episode link to see more details
- Shows if the DSM is “ok” or “bad”
  - DSM is “ok” when all its required “slaves” are “ok”
    - The DD is not required
  - Click on the DSM status dump link to see more details
    - Compare the lists of required and connected slaves
    - Absent/misbehaving slaves can be (stopped and) restarted
- First stop all ongoing runs



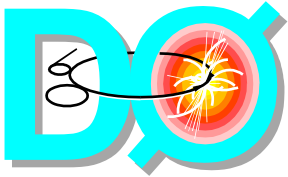
# DLSAM Status Snapshot

- Shows status of buffer disks and files to be transferred
  - “timeout” → DL should move to another disk
- Symptoms of SAM or Enstore problems:
  - Files staying “Queued” or “Submitted” > 1 hour
    - DLSAM may recover automatically
    - Stopping and restarting DLSAM rarely helps
      - The same applies to DLCAT
  - Files in “Alarm” state
    - Expert intervention needed



# How to reach the experts

- **The ODS D0 Online Support group has a primary:**
  - Send e-mail to [helpdesk@fnal.gov](mailto:helpdesk@fnal.gov)
  - Call the HelpDesk at x2345, or the Computing Services Operators at x2746 after hours, when the problem is urgent
  - **In all cases mention the application that has problems (e.g. “dsm”) and its host (“d0olc” will do)**
    - The HelpDesk/Operator needs that information to figure out whom to contact/page
- **Questions and comments about the DAQ Back End can be sent to:**
  - [d0online-support@fnal.gov](mailto:d0online-support@fnal.gov)



# Summary

- **The D0 DAQ back end is an integrated system comprising:**
  - **CR, DD, DL, DLCAT, DLSAM, DM, DSM, SDAQ**
    - Their interactions/dependencies are not trivial
    - Contact the experts for configuration changes
- **DAQ shifters can stop and (re)start the applications**
  - Following guidelines e.g. found in this tutorial
  - Please inform the experts of any problems
- **The status web page is handy for monitoring and trouble shooting**