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Online Data Challenge 2014

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1 Introduction

The second Online Data Challenge (ODC2014) is planned for May 2014. This will be approximately 6 months prior to the scheduled first beam in Hall-D during the engineering run in October 2014. It also corresponds to the beginning of some 12GeV Project activities scheduled to begin around that time[1]. The verification and debugging of the L1 trigger should also be finishing up around then[2] . The overall goal of ODC2014 will be to test the couplings of all systems in the L1-trigger to tape archive chain at once, as will be required for data taking. It is assumed that each individual system will have been tested and declared working (at least at some level) by then.

The ODC2014 exercise will directly serve in part or in whole to satisfy the following 12GeV activities from the project schedule:

Activity ID	**Description**
2531125	Check-out Trigger Electronic's (DAQ)
2531385	Check-out DAQ Hardware (DAQ)
2531370	Check-out Online Computers (DAQ)
2532060	Debug DAQ software
2532085	Archiving and Retrieval of Histogram Files

The formal goals of ODC2014 are given in the following section.

[1] activities 2531125, 2531385, 2531370, 2532060, and 2532085

[2] activity 2543165 : Level-1 Verification and Debugging

2 Goals

The main goals of ODC2104 are:

1. Test system integration from L1 trigger to tape using low rate, cosmic trigger
2. Test system integration from ROC to tape using M.C. data at high rate
3. Test calibration event tagging[3]

   secondary goal: Test multiple output streams

2.1 Prerequisites

These require that several prerequisites are satisfied as shown in the following table.

Prerequisite	**Goals**
L1 trigger (BCAL, FCAL crates)	1
Farm Manager (monitoring and data chain)	1,2,3
HV, LV controls (on/off mode only)	1
Working CODA system (including EB, and ER)	1,2,3
Fiber network	2
Trigger Distribution	1,2,3

More detailed descriptions of what is needed for each of these prerequisites follows:

L1 trigger: The L1-trigger needs to be working at a level where it can trigger off of at least one detector system in the hall. This can be as little as 1 crate from the FCAL or the BCAL. Triggering off of the Start Counter could even be used and would have the advantage that most triggers should also have signals in opposing modules of the BCAL. The calibration of the trigger is not critical so long as a cosmic trigger rate ¿ 1Hz is achieved and the timing calibrated so that signals correlated with the L1 trigger are within the readout window. The readout window of the fADC modules may be set larger than anticipated for production running in order to relax the timing calibration constraint.

Farm Manager: Multiple compute farms will be needed for normal data taking. The data flow plan[1] calls for using L3 farm nodes to connect the EB and ER, even when L3 rejection is not being performed. In addition to eh L3 farm, at least one monitoring farm will be needed. Two monitoring farms will be used when L3 rejection is enabled

[3] as suggested by 2013 Software Review Committee

in order to monitor the pre-L3 and post-L3 data. For this Data Challenge, we will run with both the one monitoring farm and two monitoring farm configurations. This means the we will need at least two or three Farm Managers running simultaneously.

HV, LV controls The HV, LV controls will need to be functioning at a level where the detectors can be turned on and off easily. There will be no gain matching or similar exercises during the Data Challenge that will require fine control over individual channels. All channels do not necessarily need to be on (i.e. if a few are tripped or are not yet functional, that is acceptable.) A GUI is not required and a simple command line program would be adequate. There does need to be a mechanism by which to verify that at least some channels are on.

Working CODA system A working CODA system is required that can read out at least one crate from the FCAL and one from the BCAL. The more crates that are available, the better. CODA must be configured to use a farm manager to transport data from the EB to the ER and the ER configured to write files to the RAID disk. Control of the DAQ system will be through the standard CODA GUI.

Fiber Network *< is this just needed for high/fast data volumes ?? >*

Trigger Distribution The fibers that distribute the trigger to those crates involved in the CODA readout must be in place and working. Timing calibrations do not need to be in place for all channels, but will need to be done for at least a few that can initiate a L1 trigger so that the signals can be seen in the recorded data.

2.2 Milestones

The following is a list of milestones that should be reached in order to ensure the prerequisites are satisfied prior to ODC2014.

- develop system to manage and compile ROL's using svn and scons build system
- install coda 3.0 release, place under Hall D control
- test coda 3.0 release
- implement farm manager agent
- test farm processes connected to farm manager
- set up COOL_HOME, develop and implement code management strategy
- test COOL runscripts and configscripts
- implement program to prepare mc2coda data for injection into data stream in a ROC

- inject MC information into ROC for arbitrary block level
- implement program to re-entangle mc2coda data for arbitrary block level
- develop DAQ start/stop scripts
- test single full-crate readout at various block levels
- test multi-crate readout
- test L3 in pass-through and with rejection
- test monitoring of all detectors pre- and post-L3
- implement L3 event monitoring
- implement L3 event marking
- test new RootSpy features: archiving, etc.
- measure, histogram and display ROL times and other front-end information
- use mini-HBook/RootSpy system to collect and transmit histograms
- test multi-stage event building
- test secondary ROLs
- test multiple output streams using varied criteria
- test multi-crate readout with full TI/TS system using TS pulser
- test multi-crate readout using trigger generated by CTP/SSP/GTP system
- test various detector-generated triggers
- test crate readout using front-end board playback mode
- similar tests as above but at full rate
- get monitoring histograms from detector groups
- test DAQ with network connection to CC disabled
- test ROL archive/recovery strategy using svn (or git)
- test disentangling
- test compression

- test scaler readout
- create prototype scripts including DB bookkeeping and auto elog entries
- integrate slow controls into run control- hv,lv,etc.

2.3 Additional Systems

In addition, there are some additional systems that could be included in the ODC2014 exercise if they are available. These include:

- EPICS archiving
- EPICS alarms
- L3 algorithm(s)
- Blocked events

3 Schedule

Figures 1-3 show the activity schedule for the Trigger, DAQ, Online Computing, systems. Several of these actives are relevant to the ODC2014 exercise.

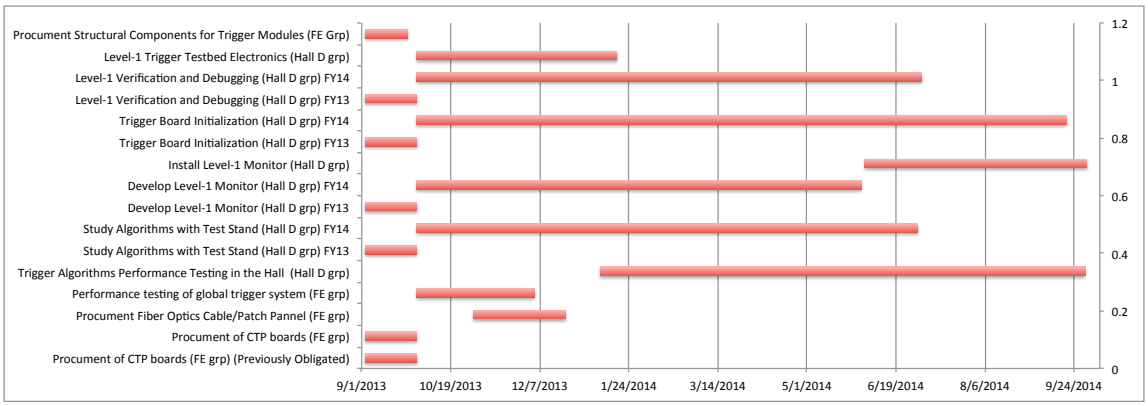

Figure 1: 12GeV Activity Schedule for Trigger (from Nov. 2013 spreadsheet)

Figure 2: 12GeV Activity Schedule for DAQ (from Nov. 2013 spreadsheet)

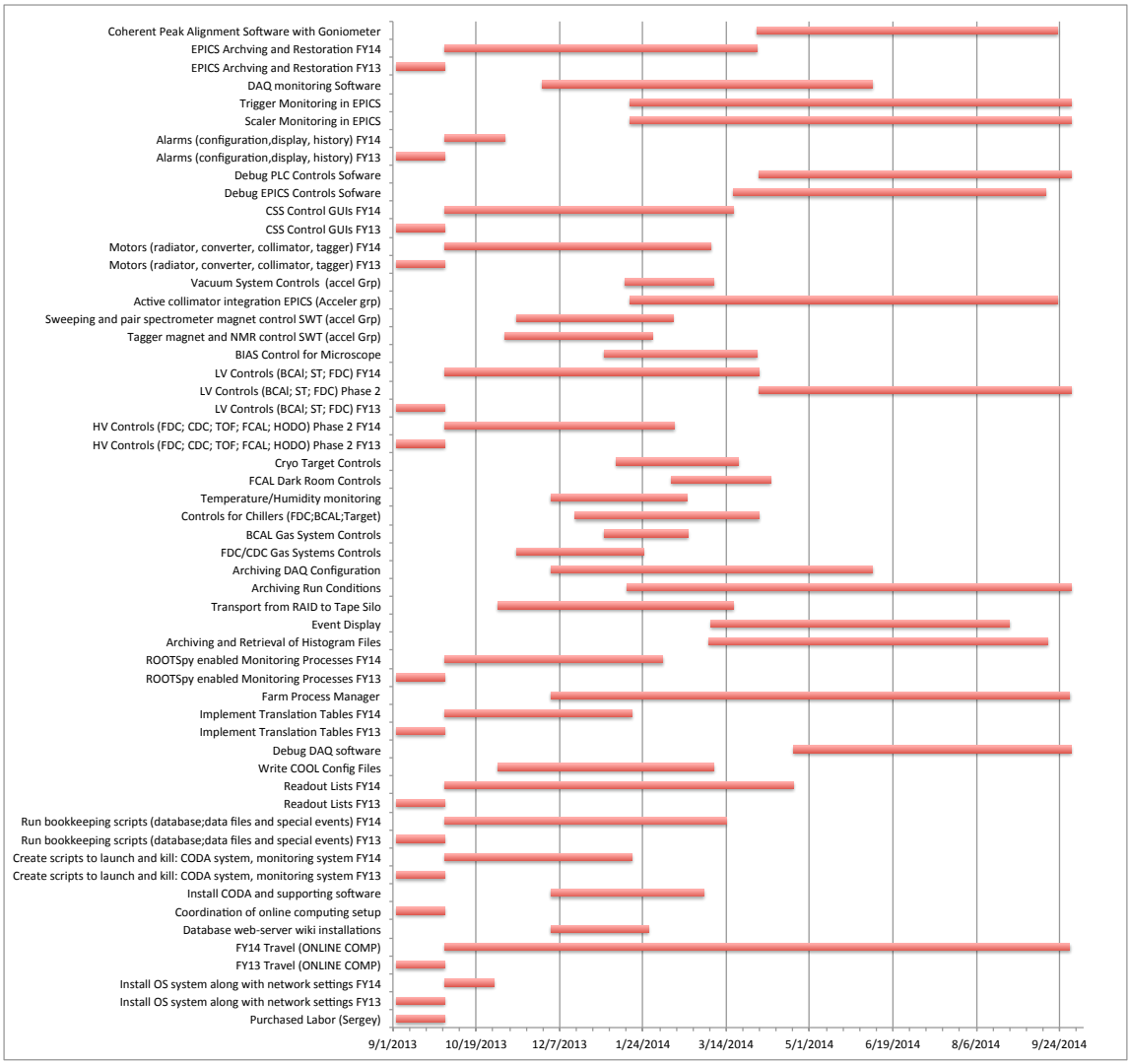

Figure 3: 12GeV Activity Schedule for Online Computing (from Nov. 2013 spreadsheet)

4 Run Plan

4.1 Low Rate (Cosmics)

1. Power on BCAL, FCAL and L1 trigger crates
2. Start CODA system
   - verify all ET systems active
   - verify cMsg server(s) are active
   - verify EMUs are running (Event Builders)
   - verify Event Recorder is running
3. Start L3 and monitoring farm managers
   - verify L3 (data chain) farm processes are active
   - verify monitoring farm processes are active
4. Start DAQ run
   - verify L1 trigger system is active
   - verify data flow through ER to raid disk
5. Check monitoring
   - verify histograms are filling
6. Check Farm Management
   - Kill single farm processes and verify that it is restarted by farm manager and data flow is not disrupted
   - Kill all farm processes and verify that Farm Manager stops the run
7. End DAQ run
   - verify that run ends cleanly and no DAQ processes die unexpectedly
   - verify that output data file is closed cleanly and is complete with total number events equal to what CODA reported
   - verify that monitoring farm completed cleanly and archive file was closed cleanly after receiving last event
8. Start second DAQ run
   - Allow to run for 1 hour. Verify all systems run. Note any crashes.

4.2 High Rate (M.C. data)

1. Power on BCAL, FCAL and L1 trigger crates
2. Start CODA system
   - Configure for MC Data System Test
   - verify all ET systems active
   - verify cMsg server(s) are active
   - verify EMUs are running (Event Builders)
   - verify Event Recorder is running
3. Start L3 and monitoring farm managers
   - verify L3 (data chain) farm processes are active
   - verify monitoring farm processes are active
4. Start DAQ run
   - verify data flow through ER to raid disk
5. Check monitoring
   - verify histograms are filling
6. Check Farm Management
   - Kill single farm processes and verify that it is restarted by farm manager and data flow is not disrupted
   - Kill all farm processes and verify that Farm Manager stops the run
7. End DAQ run
   - verify that run ends cleanly and no DAQ processes die unexpectedly
   - verify that output data file is closed cleanly and is complete with total number events equal to what CODA reported
   - verify that monitoring farm completed cleanly and archive file was closed cleanly after receiving last event
8. Start second DAQ run
   - Allow to run for 1 hour. Verify all systems run. Note any crashes.

4.3 Calibration Event Tagging

This will use the same configuration as the High Rate test using Monte Carlo data.

1. Power on BCAL, FCAL and L1 trigger crates
2. Start CODA system
   - Configure for MC Data System Test
   - verify all ET systems active
   - verify cMsg server(s) are active
   - verify EMUs are running (Event Builders)
   - verify Event Recorder is running
3. Start L3 and monitoring farm managers
   - configure L3 farm to include calibration event tagging plugin(s)
   - verify L3 (data chain) farm processes are active
   - verify monitoring farm processes are active
4. Start DAQ run
   - verify data flow through ER to raid disk
5. Check monitoring
   - verify histograms are filling
6. End DAQ run
   - verify that run ends cleanly and no DAQ processes die unexpectedly
   - verify that output data file is closed cleanly and is complete with total number events equal to what CODA reported
   - verify that monitoring farm completed cleanly and archive file was closed cleanly after receiving last event
7. Check Event Tags are in output file
   - verify that tags are in the output data file and appear correct
8. Start second DAQ run
   - Allow to run for 1 hour. Verify all systems run. Note any crashes.

References

[1] David Lawrence, Elliott Wolin, and Sean Dobbs. Hall-d online data challenge 2013 report. Technical Report GlueX-doc-2287, Jefferson Lab ands Northwestern Univ., 2013.