Hall D DAQ Software Run Control

Elliott Wolin and David Lawrence

10-May-2012

GlueX Doc #2027 covering 12GEV line 1532030c

The CODA DAQ system includes a run-control facility consisting of a back-end run control supervisor and a front-end graphical operator display that connects to the supervisor and controls its operation. The supervisor in turn controls operation of the many CODA components that participate in the run. The latter are defined in run configuration files that the operator chooses at startup. The gui presents the operator with a choice of possible actions that depend on the current state of the run. The supervisor translates the operator choice into appropriate commands to the individual components. Alternatively, limited communication with the supervisor can be performed via command-line scripts.

The supervisor in addition monitors the health and operation of the CODA components and warns the operator or pauses the run if problems are detected.

Users can customize run control operation in a number of ways. The configuration file can specify user-written scripts or processes that get invoked or started at specific points in the run control state machine. These can be as simple as a script that makes an entry in a database at particular transition point, or as sophisticated as a complete state machine for a detector component that responds to run control state transitions and communicates with the run control supervisor (e.g. a HV control state machine).

Finally, a run scheduler component can automate a series of runs with user-specified scripts run between them that change detector parameters, ideal for automating calibration runs.

CODA run control has developed significantly over the past year or two, and has been successfully used by many experiments at JLab. It is a relatively mature product that has been proven in production use. Many of its features were developed with Hall D in mind. We expect it will develop further as new needs arise.

Hall D Strategy

Hall D needs fall into the following categories:

1. Detector and trigger configuration.
2. Integration of other state machines into the run control state machine.

3. Bookkeeping and databases.
4. Integration with alarm system.

Many detector and trigger configuration parameters vary with run type. Rather than having operators follow a manual checklist to prepare the detector for a particular type, instead experts will prepare scripts specific to a each run type that get invoked at the appropriate point in the run control state machine. Our goal is to automate as much detector configuration as is possible to minimize the burden on operators.

State machines for other control systems need to be integrated with the run control state machine when close coordination with run control is required. This can easily be achieved by specifying processes in the run configuration file that understand run control states and transitions and perform their tasks at appropriate transition points.

We plan to automate almost all the required run bookkeeping via scripts invoked at appropriate transition points. These scripts will gather information about the detector configuration and state and record the information in databases.

When detector components fail or are in a fault state the run needs to be stopped or paused, and operators must be alerted and be required to take appropriate action. These actions could be to abort the run, end the run gracefully, fix the problem and continue, or ignore the problem and continue. This integration should easily be accomplished via processes specified in the run configuration file or via command-line based communication with the supervisor. In particular, integration with the slow controls alarm system should not be difficult.

In summary, the comprehensive and flexible customization abilities of the CODA run control system seem more than adequate for use in Hall D.

Remote Access

Security concerns at JLab severely restrict communication between computers in the counting house and the rest of the world. Read-only access to run information will be provided via web pages on special servers configured for this purpose. Control of online systems by experts will only be possible via a two-factor authentication procedure and configuration of SSH tunnels.

Manpower Estimates

The 12GeV schedule allocates 5 man-weeks for planning and 8 man-weeks for writing DAQ software run control. It further allocates 11 man-weeks for checkout of all DAQ software. Due to the sophistication of the CODA run control system 5 man-weeks is more than adequate for the planning stage, perhaps 2 man-weeks is required. 8 man-weeks seems inadequate for the writing stage, probably another 4 man-

weeks is required. 11 man-weeks for checkout of this and other DAQ software components seems adequate.

Note that this report completes the 12 GeV schedule item Plan DAQ Software Run Control.