Argonne NATIONAL LABORATORY

NOvA DAQ Software

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NOvA DAQ Control and Monitoring (Jon)

-> Run Control

-> Online Database

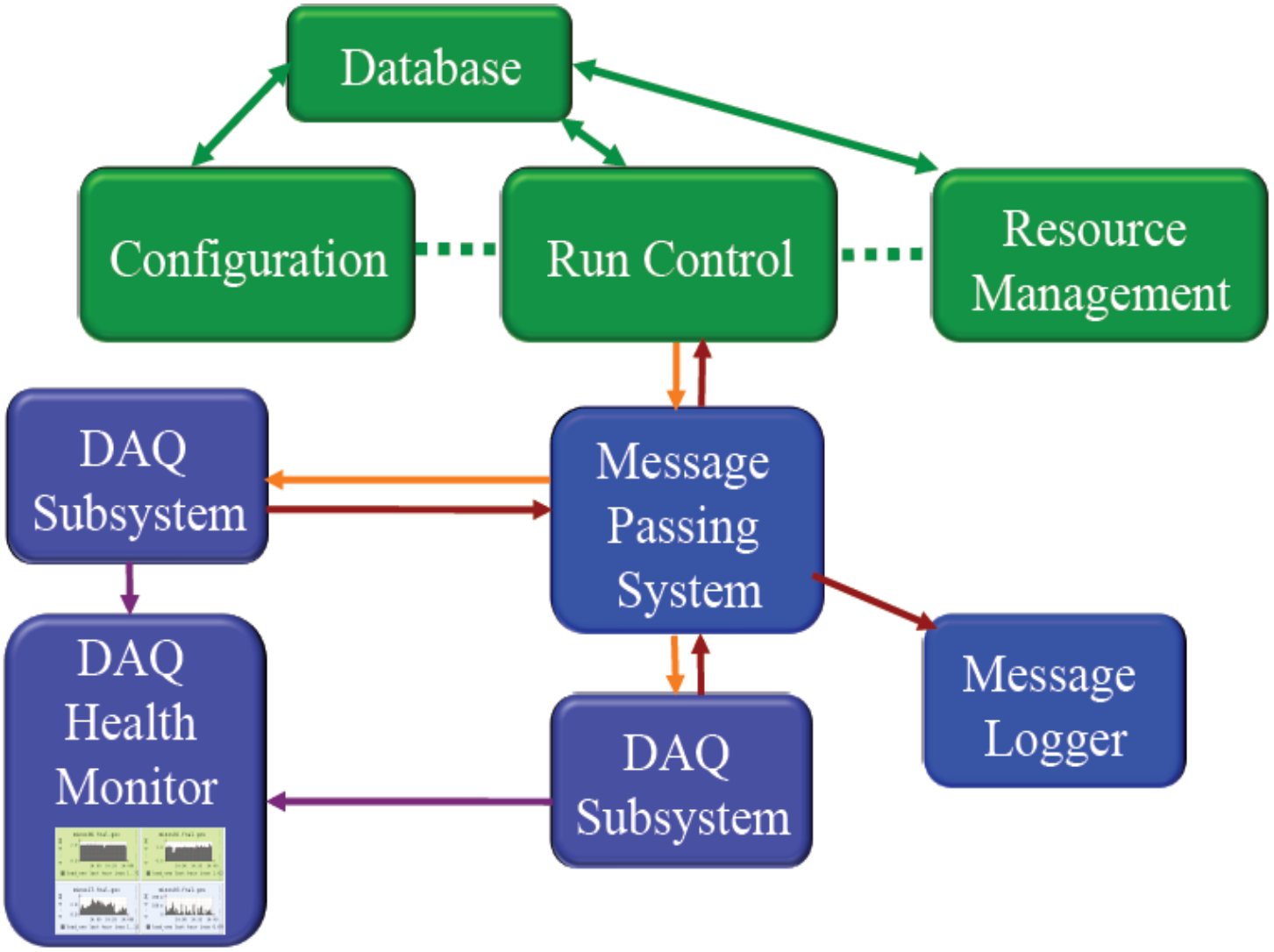
-> Resource Management

NOvA DAQ Software Subsystems (Steve)

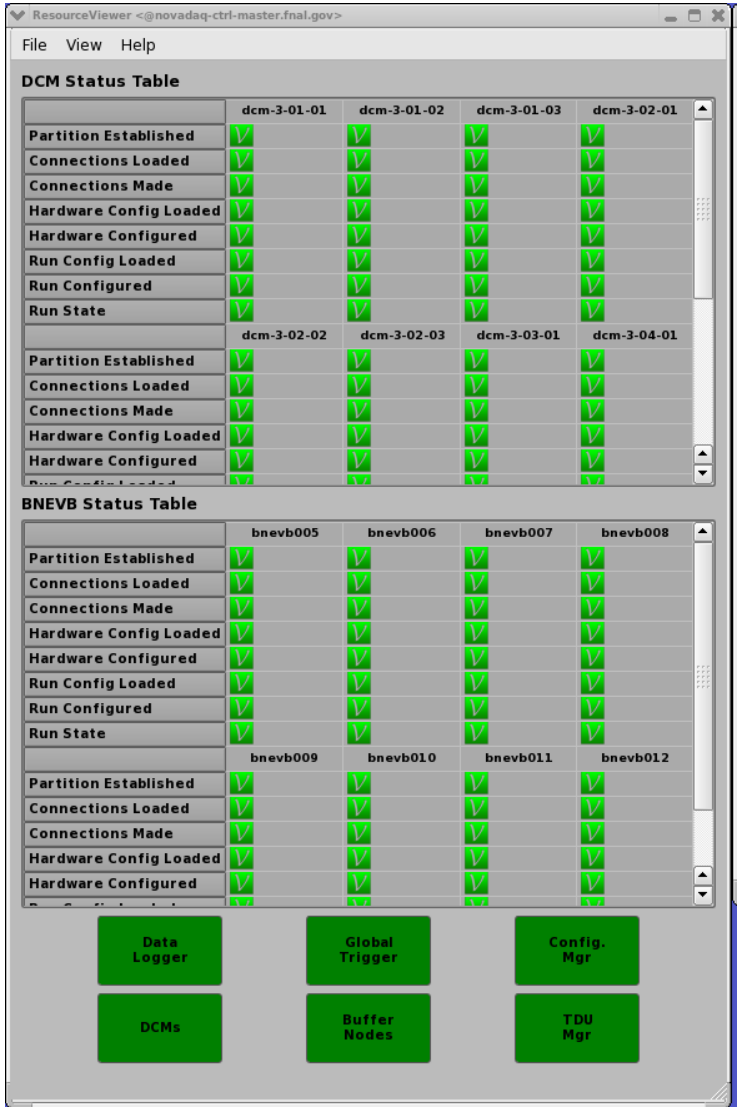
-> Data Logger

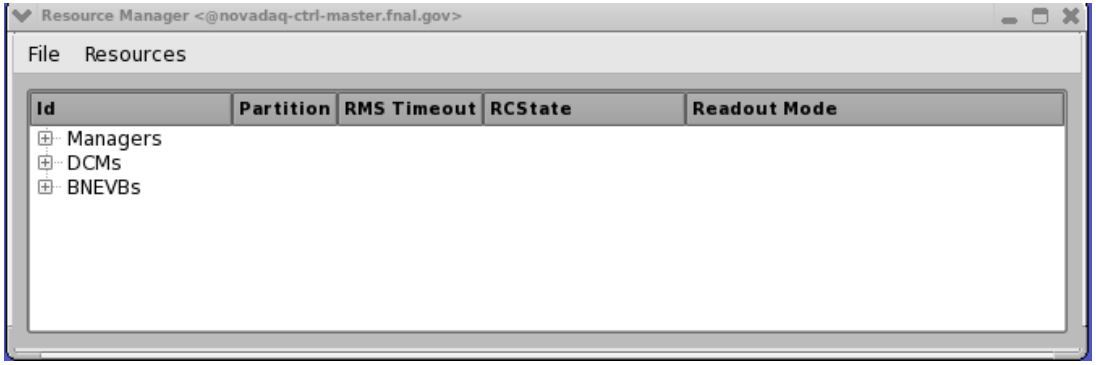
Summary and Plans for Ash River

NOvA DAQ Control and Monitoring Systems



Resource Manager



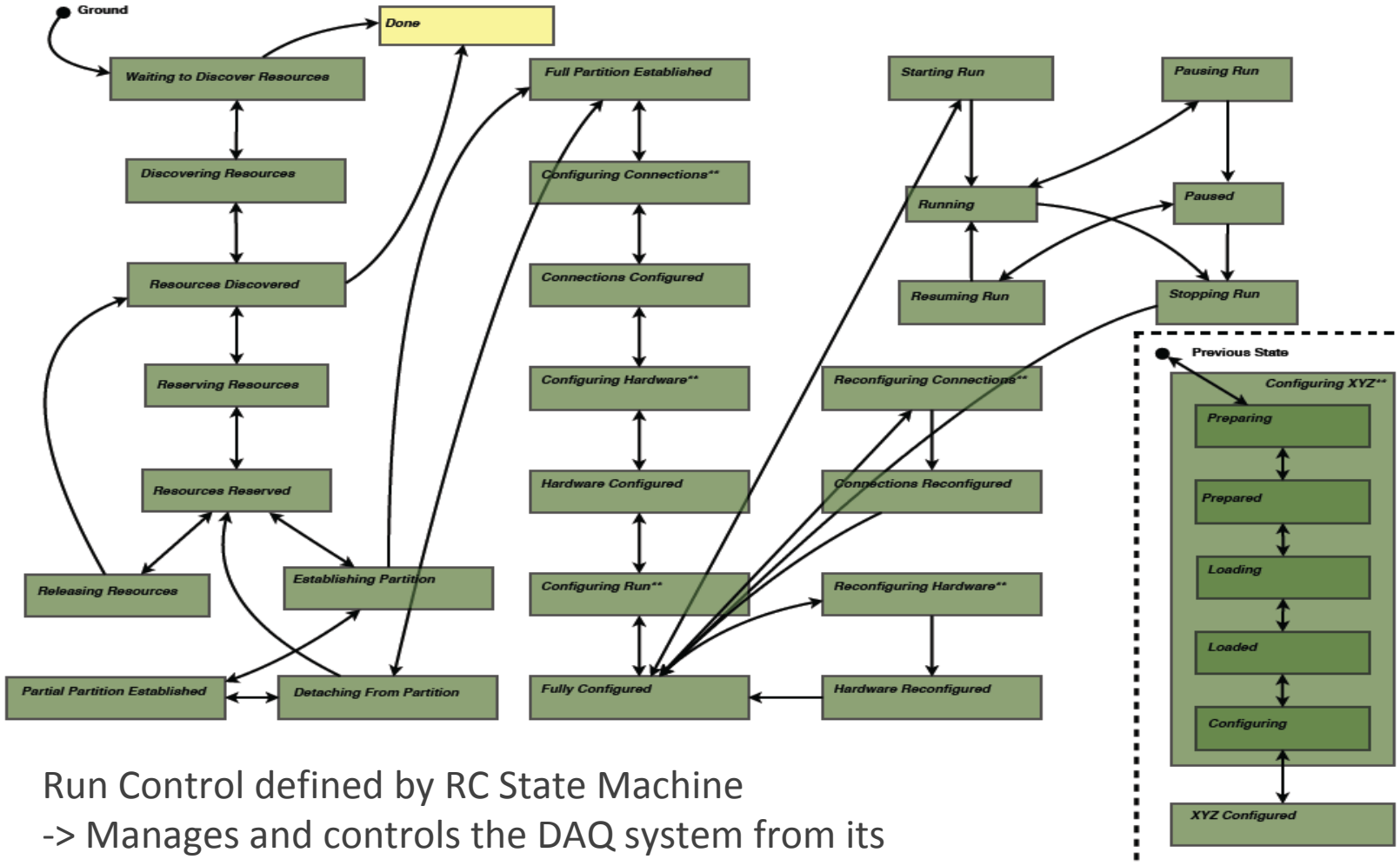


Resource Manager

-> defines resources needed for data-taking
-> interactive window for shift crew
-> displayed on Resource Viewer showing status of selected resources for the run

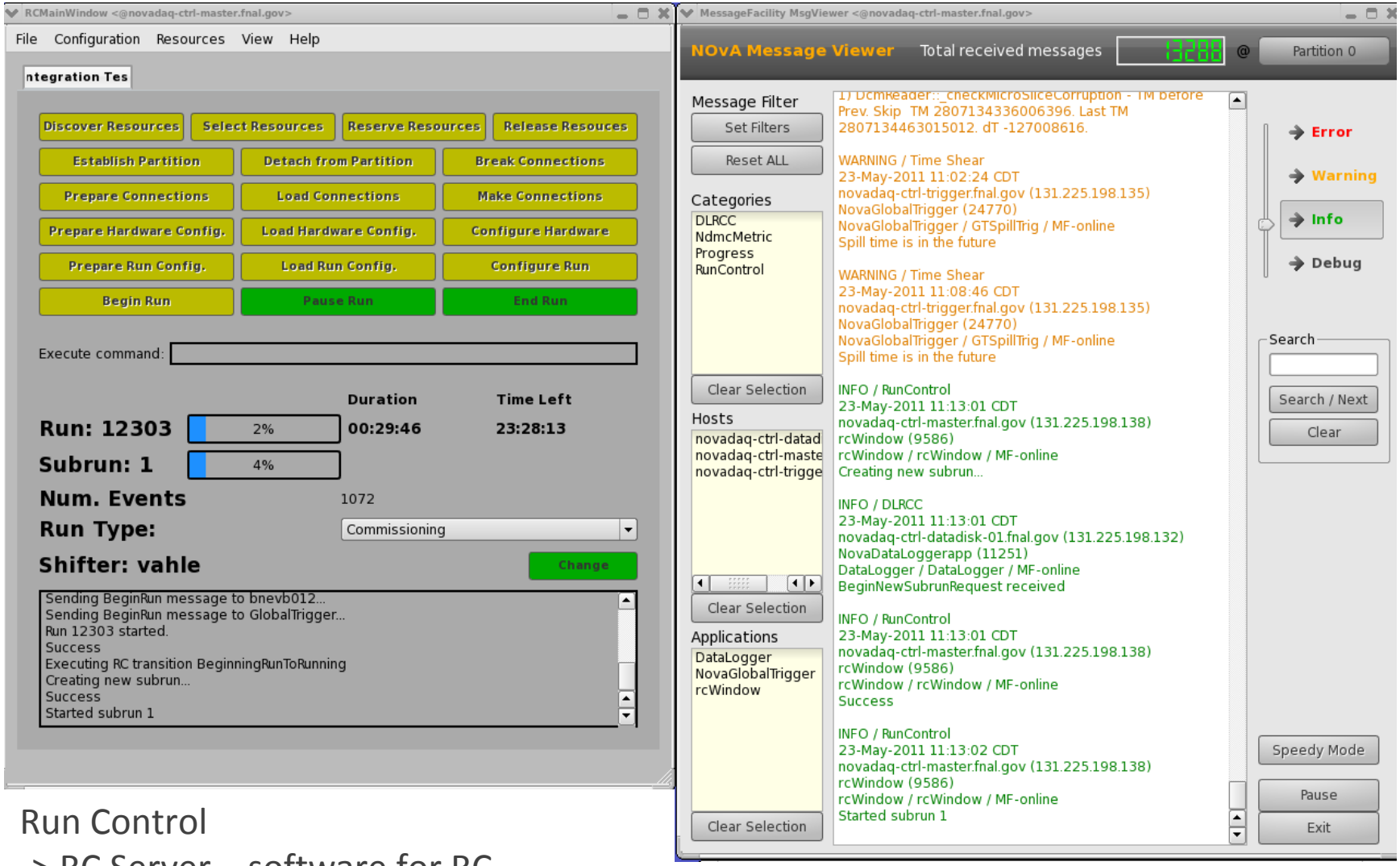
Online Database
-> contains run history including configuration state of the run, resources used in data-taking and Detector Control System (DCS) information

Run Control State Machine



Run Control defined by RC State Machine
-> Manages and controls the DAQ system from its ground state through various configured states to the fully-configured data-taking mode

Run Control GUI

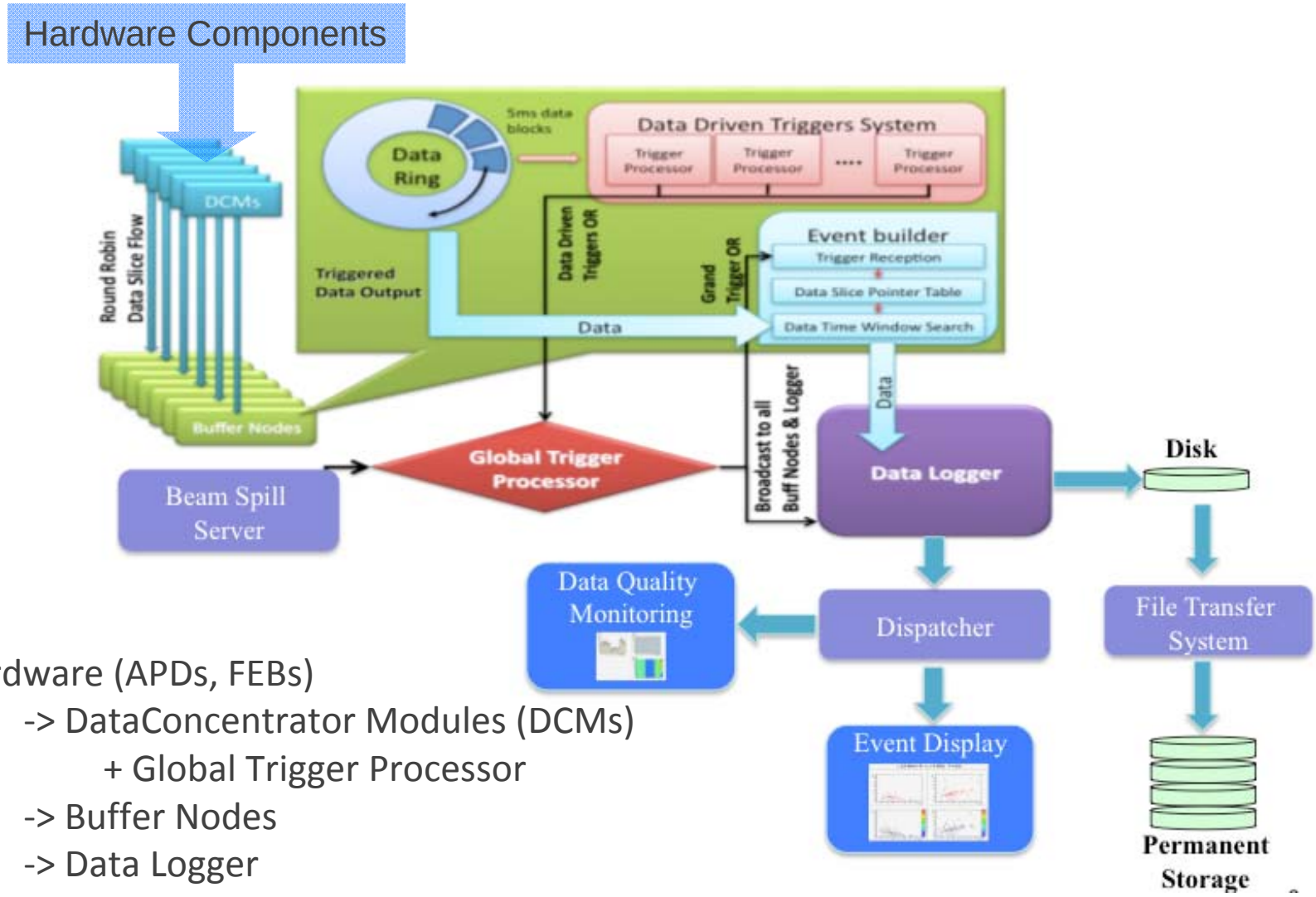


Run Control

-> RC Server – software for RC

-> RC GUI – interface to RC Server, shift crew interaction with experiment

NOvA DAQ Software Subsystems



Hardware (APDs, FEBs)

-> DataConcentrator Modules (DCMs)

+ Global Trigger Processor

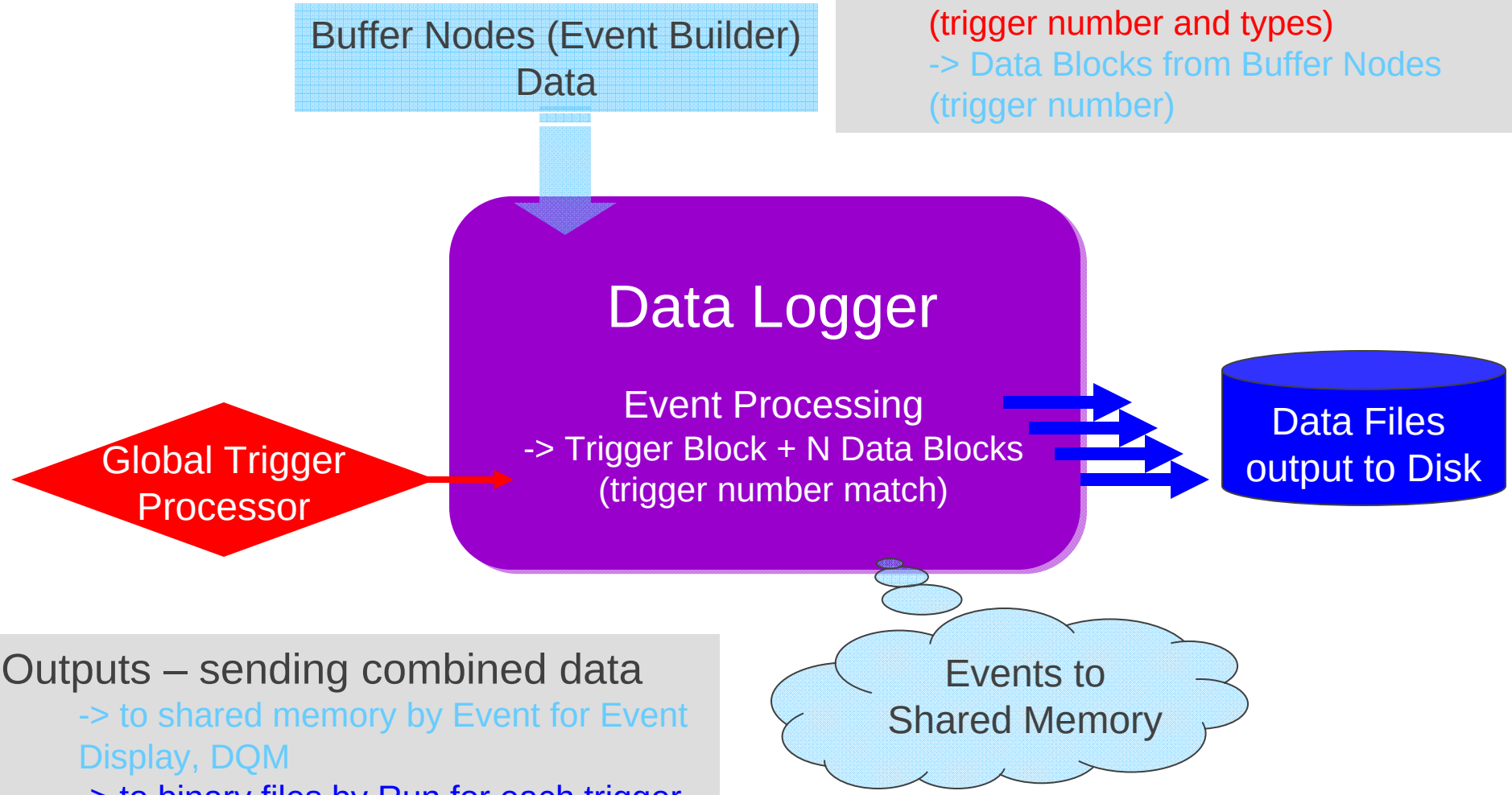
-> Buffer Nodes

-> Data Logger

-> Disk and permanent storage

NOvA Data Logger

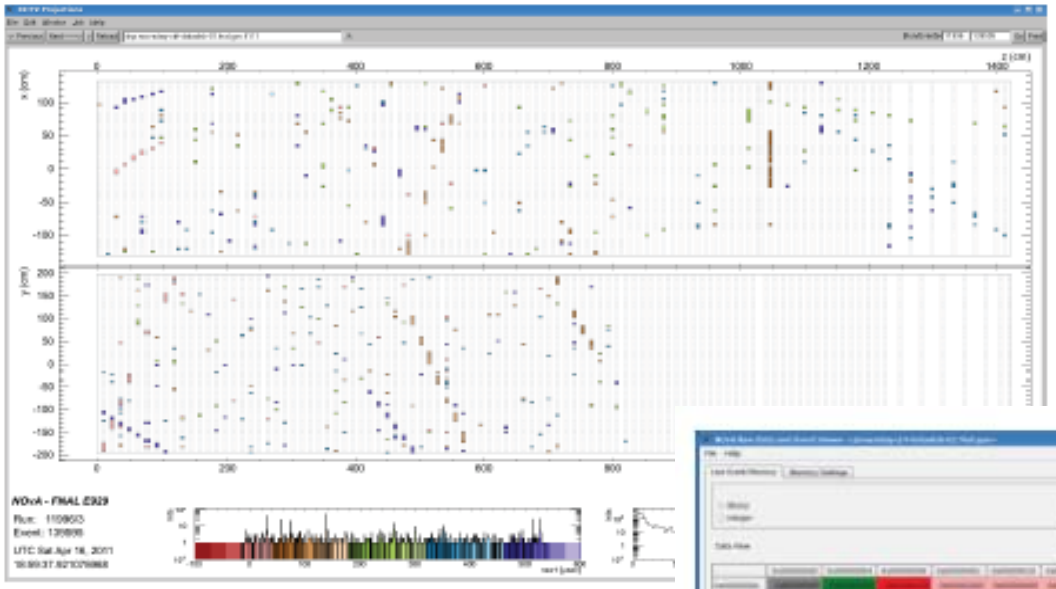
Inputs – managing connections
-> Trigger Blocks from Global Trigger (trigger number and types)
-> Data Blocks from Buffer Nodes (trigger number)



Outputs – sending combined data
-> to shared memory by Event for Event Display, DQM
-> to binary files by Run for each trigger type

NOvA Data Logger – Shared Memory

Online Event Display



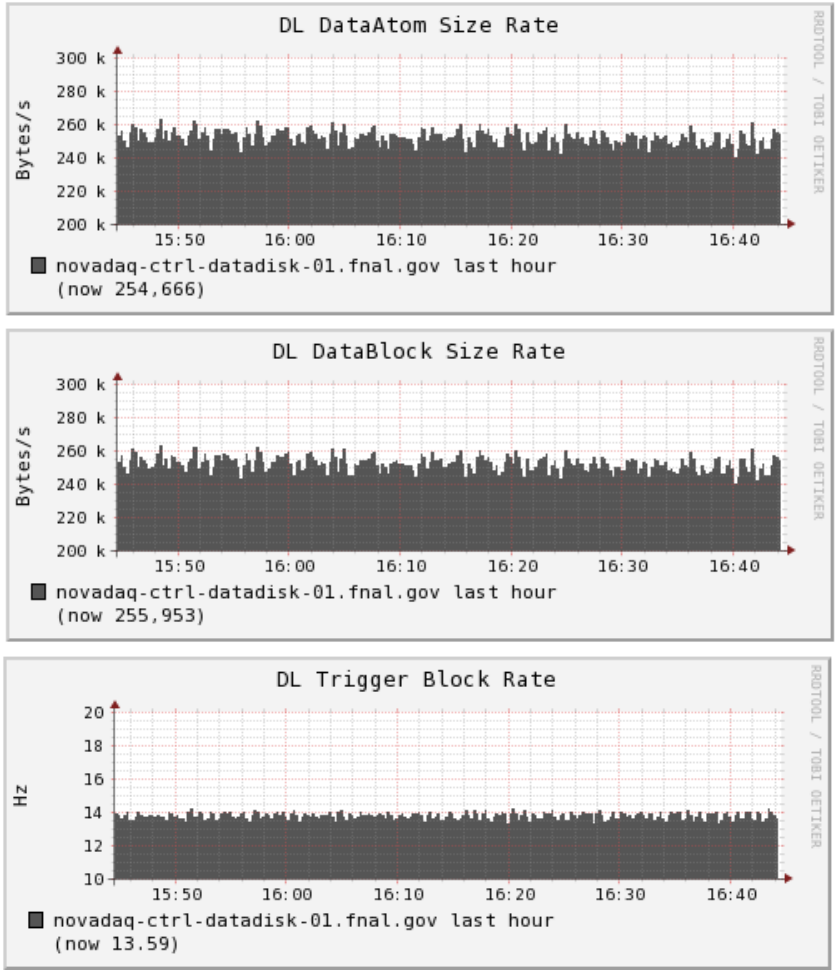
NOvA Data Logger writes events into a shared memory segment

Online Event Viewer

Event Dispatcher reads events from the shared memory segment -> displays in online Event Display and in Event Viewer

NOvA Data Logger – Monitoring and Testing

Ganglia Histograms of Input and Output to NDL



Integtests with Trigger/Data Simulation :

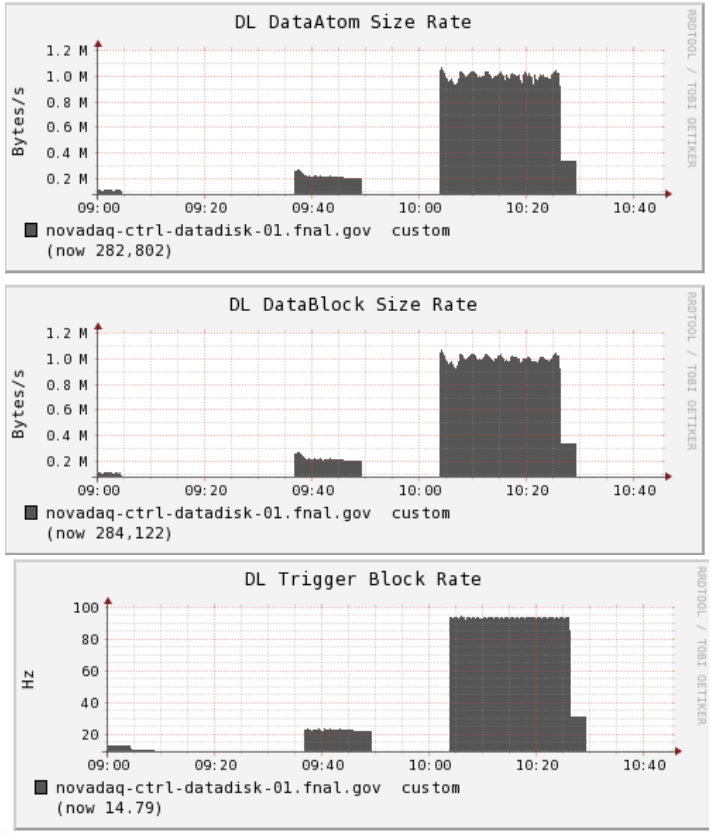
-> Tests integrated DAQ system including DataLogger

-> Can simulate and test many situations, e.g. loss of an input BN to NDL, increased trigger rates and widths

-> Validation of NDL performance

DAQ Stress Tests

Recent tests have been performed to force data-taking at higher trigger rates and larger trigger widths
-> understand/fix choke points in the DAQ Software chain
-> map 2-D space of successful DAQ performance in rate vs width



Using Data Logger monitoring histograms :

-> increased trigger rate from ~10 Hz to ~95 Hz

-> see corresponding increase in both input and output data rate (Bytes/sec)

-> Successful tests in this range of trigger rates

Summary

ANL HEP joined NOvA DAQ Software group in February 2010, filling 2 large holes :

-> Run Control of DAQ components

-> Logging of NOvA data

NOvA DAQ performs stably and reliably

-> Began data-taking with NDOS in November 2010

-> runs routinely last for > 8 hours without user intervention

-> RC GUI complete and easy to use by shift crews

-> *~NO events lost* due to software “features” since startup

-> Simulated development (Integtests) -> successful real DAQ operation

Future Plans for Run Control, Data Logger

-> Test implementation of partitioning for data-taking while commissioning
-> separate RC GUI (at Fermilab) from RC Server (at Ash River)
-> add more run history information to database

-> Test Data Logger's ability to handle more data (continued stress tests)