

DATA ACQUISITION & ONLINE COMPUTING

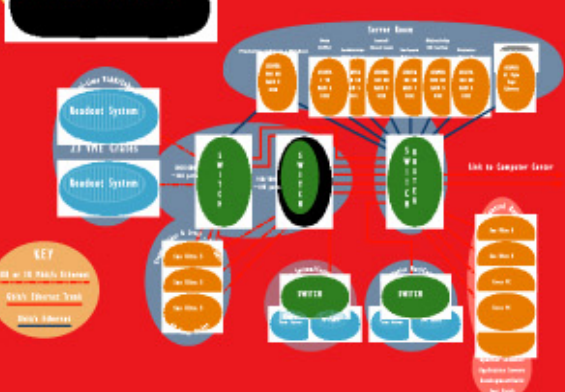
Seeking rare events with specific characteristics in a sea of data, in real-time, requires a highly integrated system of detector control, data readout, selection triggers, and online computing.

Detector Control Systems

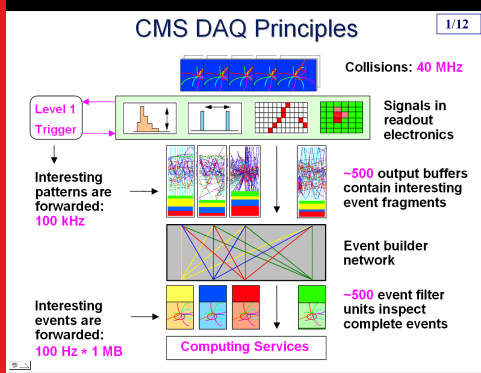
Often thousands of settings need to be monitored and recorded: voltages and currents, temperatures, fan speeds, pressures, gas flows, mechanical movements, safety interlock status, and radiation levels. Operators can change settings and are alerted if limits are exceeded.

Detector control systems allow monitoring and controlling the detector, and recording the status of subdetectors and systems, via commercial and custom hardware and software.

BaBar Online Computing Infrastructure



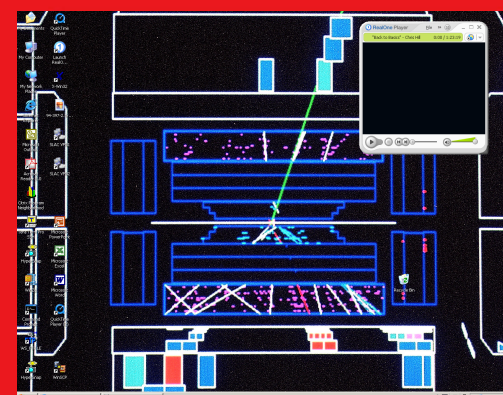
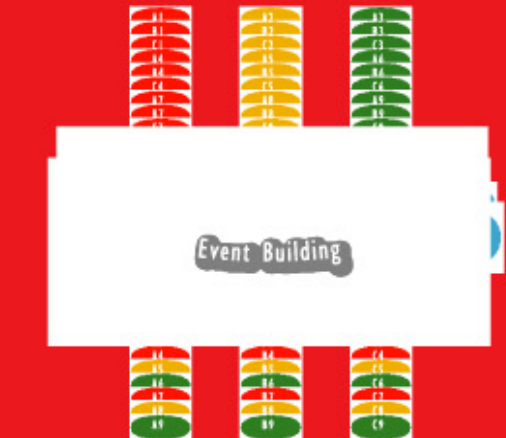
MONITOR
11.875" X 14.75"



Readout Systems & Triggers

Readout systems feed data from the detector at extremely high rates into triggering systems. Triggers intelligently select the rare and interesting data for future analysis, via "filters" of successive levels of finer granularity.

Triggers must minimize the loss of interesting data while rejecting uninteresting "background" events. Custom-designed hardware triggers usually process data from components of the detector to select a subset of events in microseconds. Software filters on computing farms make a further selection of the surviving events, taking more time and using the full detector data.



Online Computing Centers

Online systems handle many activities including:

- controlling the detector
- routing data
- monitoring, analyzing, and selecting data
- recording selected data for future offline analysis

Large experiments may have:

- detector with a million readout channels, each channel with data at high rate
- high performance network switches supporting networks of varying throughput and security
- hundreds of embedded and single board computers, often with specialized electronics
- large number of computers for processing, display & monitoring
- hundreds of specialized software applications
- large arrays of disks and multiple databases

Online systems must have high reliability and quick error detection and response 24x7.