High-Performance Computing in the Accelerator Systems Division at APS

- APS has a cluster of over 200 Sun workstations, with a common server and operating system.
- Use Distributed Queueing System (DQS) to manage 24 of ASD's fastest workstations.
- When combined with ASD-developed software tools, this provides a powerful *concurrent* computing environment.

Concurrent Computing at APS —Problems and Solutions—

How to use resources that are distributed around a building or lab?

- DQS (http://www.scri.fsu.edu/~pasko/dqs.html) provides load-based queueing of jobs to heterogeneous networked workstations.
- It incorporates features that reduce the impact on interactive users.
- It supports both concurrent and parallel computing

Concurrent Computing at APS —Problems and Solutions—

How to prepare 100's or 1000's of input files?

- Use scripts (simple programs) to prepare specific simulation input files from templates.
  Each input file might have, e.g., a different value for a parameter or a different seed.
- Typically this is a simple matter of text substitution.
- Decide on a method for making locally unique root filenames for simulations. (You can't call them *all* FOR006.DAT.)

Concurrent Computing at APS —Problems and Solutions—

How to process 100's or 1000's of output files?

- Trival but vital point: Use the same root filename for all input and output for a run.
- Use codes that are compatible with an automated postprocessing system. We use APS-developed SDDS (Self-Describing Data Sets), a group of ~70 generic programs using a common data protocol.
- Use scripts to combine the SDDS modules into data processing algorithms.
- The number of simulations in a set is arbitrary when this approach is used.

Computing Activities Depending on the Concurrent Approach

- Top-up safety simulations.
  "Proves" the safety of a proposed new APS operating mode by simulating ~3000 fault scenarios and configurations.
- Simulation of collective effects (impedance, IBS) in storage rings.
  - Understanding SURF sawtooth instability.
  - Testing 4th generation concepts.
  - Finding APS impedance model.
- Light source design validation.
  Able to simulate large numbers of randomly perturbed machines for dynamic apertures, etc.

Other Intensive Computing Activities and Interests at APS

- Automated optimization of a new rf gun design using a PIC code. (Presently done using PARMELA.)
- SASE FEL simulations.
- Lattice calibration of the APS ring.