Condor at the RACF

SUCCESSES, FAILURES, NEW FEATURES, AND PLANS FOR THE FUTURE.

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Upgrade to 7.6.x

- Move to 7.6.4 done in October time-frame for RHIC experiments
  - Everything went better than expected
- 7.6.6 for ATLAS done in February, also went smoothly
- Small experiments done with RHIC upgrade
  - A few hiccups—caused LSST (ASTRO) to abandon Condor in favor of a homegrown batch system

Repackage

- Why? Easy upgrades, configuration management
- One pitfall—CMake silently failing to find globus-libs at build time and building without support
- Requires: globus-callout globus-common globus-ftp-client globus-ftp-control globus-gass-transfer globus-gram-client globus-gram-protocol globus-gsi-callback globus-gsi-cert-utils globus-gsi-credential globus-gsi-openssl-error globus-gsi-proxy-core globus-gsi-proxy-ssl globus-gsi-sysconfig globus-gssapi-error globus-gssapi-gsi globus-gss-assist globus-io globus-libtool globus-openssl globus-openssl-module globus-rsl globus-xio globus-xio-gsi-driver globus-xio-popen-driver
- Most have one library and a README
  - Instead build new condor-libs package
  - Out of standard library search paths & set RPATH

Repackage

- Move away from old way:
  - (tarball + path-twiddling) = new RPM
- New package buildable from any git snapshot of Condor repository—verified in SL5 & 6.
- CMake works (almost) perfectly—would not have been possible with previous build system
- Dynamic linking a huge plus
  - Size reduced from 177Mb→44Mb compressed!

ASTRO (LSST) Condor Move

- Two problems—eventually caused a move away from Condor to home-grown batch system (for now).
- First, wanted parallel universe with dynamic slots. Broken in 7.4.2 [#968]
  - Considered special whole-machine slot queue
    - $(DETECTED_CORES) + 1 Slots, one weighted differently
  - Drawbacks incl. complexity and resource starvation in on relatively small farm (34 nodes)

ASTRO (LSST) Condor Move

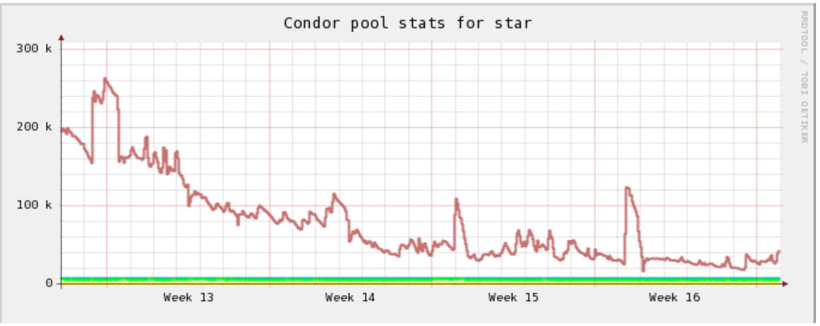
- Move to 7.6 brought promised change with dynamic slots and the parallel universe.
- In 7.6.3—chirp bug, missing leading "/" in path names, caused MPI jobs to fail [#2630]
  - Found workaround involving different MPI setup script and some software changes
  - Fixed in 7.6.4(5?)—too late for them:
    - Eventually gave up and wrote own system…

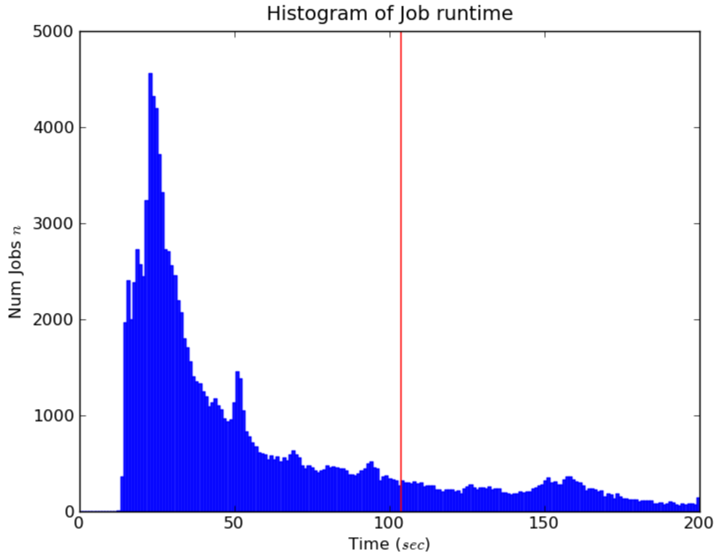
New Scales

- Single largest pool is ATLAS farm, ~13.5k slots!
- Negotiation cycle only 1 or 2 minutes
- condor_status takes a whole second!
- Group quotas help with negotiation cycle speed
- More small experiments in common pool:
  - DAYABAY, LBNE, BRAHMS, PHOBOS, EIC, (formerly) ASTRO—totals a few hundred CPUs.
  - WISC machines and dedicated OSG slots are still in the ATLAS pool

New Scales

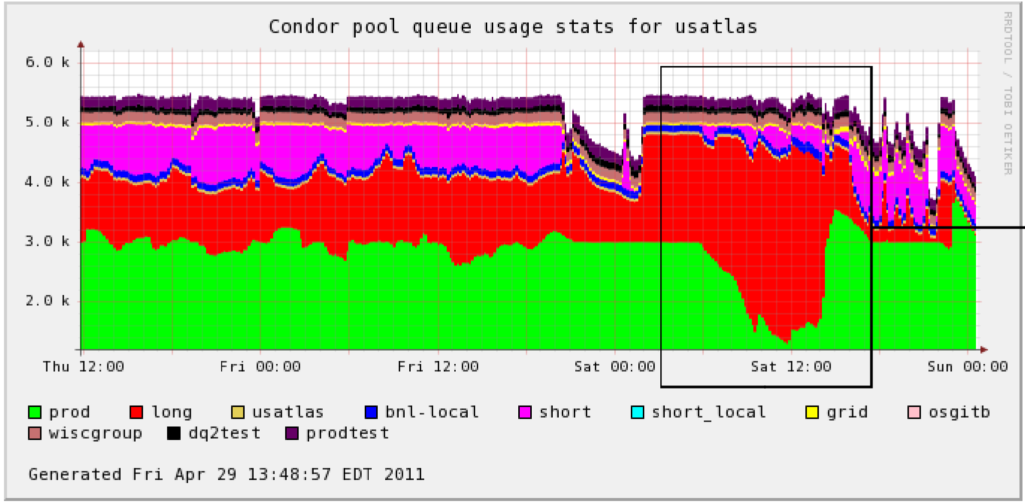
- STAR pool has most user diversity, ~40 active users with lots of short running jobs
  - Negotiation cycle still only O(5min) without any limiting time per-user
  - Worst case many different Requirements
- PHENIX pool mostly runs with a few special users (reconstruction, simulation, and analysis-train).
- Wish for FIFO/Deadline option for reconstruction jobs





Hierarchical Group Quotas

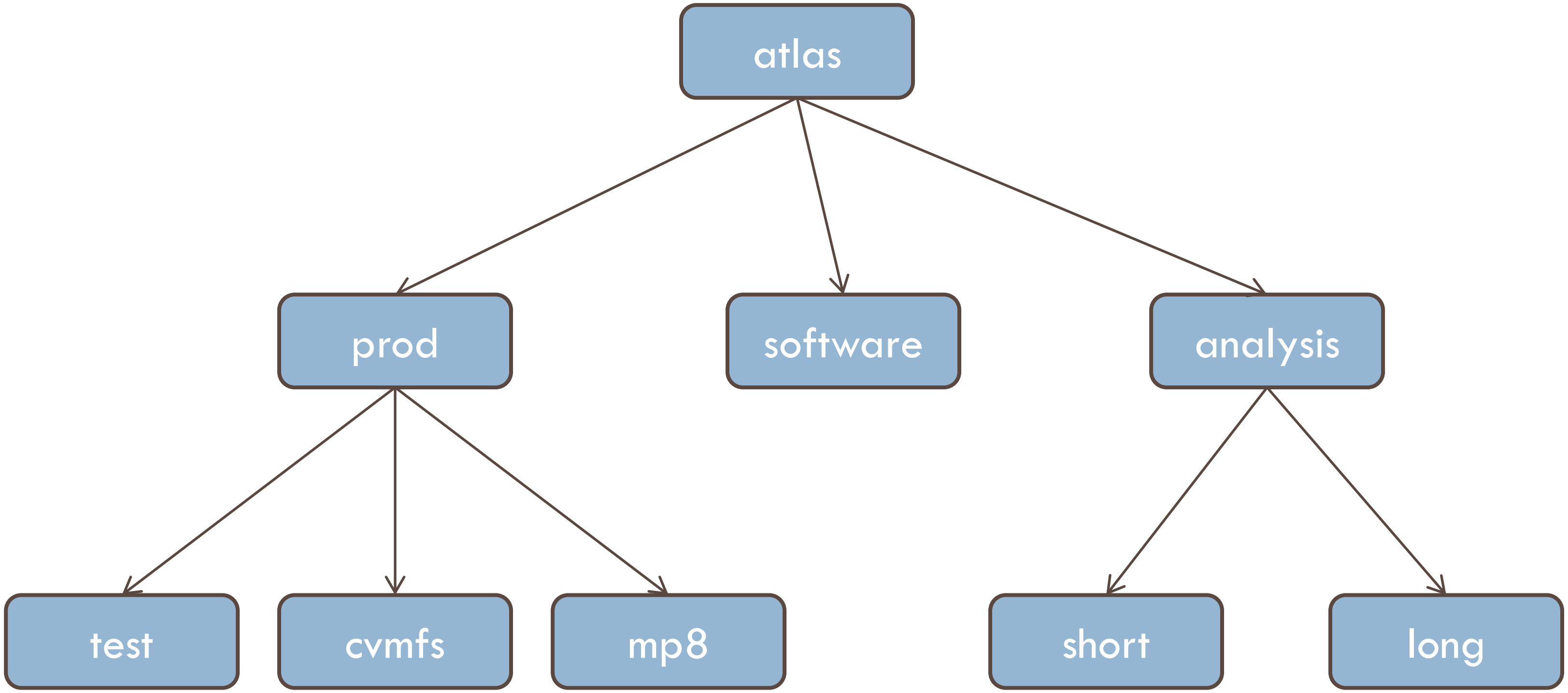
- After upgrade to 7.6.6 moved ATLAS to HGQ
- More success had using ACCEPT_SURPLUS flag than was had with AUTO_REGROUP
- Behavior more stable, no unexplained jumps:



Even with queues supplied with ample Idle jobs, this sometimes happened with AUTO_REGROUP.

Hierarchical Group Quotas

- Nice organization and viewing of totals of each sub-group running; groups structured thus:



ATLAS Multicore

- New queue (mp8) has hard-coded 8-core slots
- Just in testing, but some new requirements
    - Overhaul of monitoring scripts needed
        - Number of jobs running becomes weighted sum
        - Tested interplay with group quotas—some hiccups
- Will likely move to use dynamic slots if someday more than just 8-core jobs are desired
    - Interested in anyone’s experience with this

Configuration Management

- Done with a combination of Puppet, git, and homegrown scripts
  - Problems encountered on compute farm:
    - Certificate management
    - Node classification
    - Puppet master load
    - QA process
- Ultimate goal: use exported resources to configure location of each experiment's central manager
  - Config files, monitoring all updated automatically
  - Bring up a new pool with push-button ease

Poor Man's Cloud

- Problem
  - We want users to be able to run old OS's after entire farm goes to SL6
  - Not to have to support one or two real machines of each old OS as legacy.
- Keep It Simple (Stupid)
  - With current hardware, nothing extra
  - Avoid using Open* etc...
  - Not an official cloud investigation, just a way to use virtualization to ease maintenance of legacy OS's

Poor Man's Cloud—Requirements

- Users cannot run images they provide in a NAT environment that does not map ports < 1024 to high ports—could edit our NFS(v3)!
  - Anything that uses UID-based authentication is at risk if users can bring up their own VM's
- Need access to NFS for data, user home directories, and AFS for software releases, etc…
- Cannot handle network traffic of transferring images without extra hardware (SAN, etc...)

Poor Man's Cloud—Distribution

- Distribution done through a simple script that fetches/decompresses from webserver
- Allowed images listed in checksum file on webserver
  - Automatically downloads new images if out of date and re-computes the checksums.
  - QCOW2 image created for each job with read-only backing store of local image copy
    - Diffs get written in condor's scratch area (or we setup read-only-root in our images)

Poor Man's Cloud—Instantiation

- Instantiation done by same setuid-wrapper after potential image-refresh.
- Wrapper execs program that uses libvirt/qemu to boot an image
  - First guest-fish writes a file with the user to become and a path to execute
    - Information comes from job description
    - Wrapper has rc.local that becomes user and executes the script as passed into the job

Poor Man's Cloud—Getting Output

- Most likely place is NFS—users can run the same code and write to the same areas as the would in a non-virtual job
- Wrapper can optionally mount a data-disk (in scratch area) that is declared as condor job output
  - Future extension to untrusted VM's would require port-redirection and only allow output this way
    - Input provided in similar manner or via file-transfer-hooks and guest-fs injection

Poor Man's Cloud—VM Universe

- With addition of LIBVIRT_XML_SCRIPT option using the VM universe for instantiation becomes possible
- Use of guest-fs to inject user code and actual instantiation can be done by Condor now
  - Restrictions on which VM's are trusted can be managed in this script
- Still need setuid wrapper to do image-refresh
  - Use a pre-job-wrapper or just require it of the users

End

Thanks!