Slurm 23.02, 23.11, and Beyond

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Release and Development Process
Release Cycle

● Major releases are currently made every nine months
● Version is the two digit year, two digit month:
  ○ 23.02, 23.11, 24.08
● Maintenance releases are made roughly monthly
  ○ For the most recent major release
● Releases are supported for 18 months
  ○ Currently: 22.05 and 23.02
Development Process

- Most larger work is handled through sponsored projects
  - SchedMD support only covers maintenance
- Some projects - those of wider community interest - may be handled internally on a best-effort basis
Slurm 23.02 Release
(February 2023)
New scrun command

- Directly launch OCI-compliant container images
- Slurm's version of crun / runc
- See separate presentation from SLUG'22 for further details
  - [https://slurm.schedmd.com/publications.html](https://slurm.schedmd.com/publications.html)
New --tres-per-task option

- Allow jobs to be modeled as a number of tasks, with all appropriate resource types scaled directly by the number of tasks requested
  - Task can request licenses, GRES, CPUs, memory
License Preemption

- When running with preemption, license usage is not currently considered, and jobs will not be preempted to free up licenses.
- This is an issue especially when using licenses to represent cluster-wide resources, as they won't be reclaimed to allow higher-priority work to preempt.
AllowAccounts - automatic recursion

- Update the "AllowAccounts" access control to automatically extend access to all child accounts
Cloud nodes enhancements

- Pass list of requested features to ResumeProgram
- Reset active features on CLOUD nodes
- Allow for Node Weight to be considered on CLOUD nodes
- New flag to automatically power down "Exclusive" nodes once jobs are completed
Reservation Enhancements

- Add a Comment field to reservations
- Show active reservations on each node in 'scontrol show node'
- Support node addition and removal from a reservation through scontrol with += and -= on the node list
Accounting Tweaks

- New FailedNode field
  - Set for jobs that have been terminated due to a node failure
  - Help triage hardware issues
New job completion plugin

- New jobcomp/kafka plugin
Performance Improvements

- **Halved** the number of MUNGE interactions by slurmctld
Flexible Node Counts

- In addition to min and max node counts, allows the user to specify acceptable node counts
  - E.g., --nodes=20,40,80,160
- Also allows for a step function specification
  - E.g., --nodes=10-30:5 is equivalent to --nodes=10,15,20,25,30
"Explicit" GRES Flag

- Currently, all GRES are allocated to a job when --exclusive is set
- New GRES Flag "Explicit" avoids allocating that GRES by default for --exclusive jobs
  - Will only allocate it when explicitly requested
Debug option handling

- New 'scontrol setdebug <level> nodes=node[1-10]' sub-command
  - Allows dynamic changes to debug level on specified nodes
- 'scontrol setdebugflags flag,flag2,flag3 nodes=node[1-10]' also added
JSON and YAML

- Greatly extended support for JSON and YAML output from user commands
- Now allows many command filtering options to be used as well
RPC Rate Limiting

- New optional per-user RPC rate limiting mechanism
  - Backs off client commands if they're being too chatty
  - Sends new dedicated response code telling the command to sleep for a second before retrying, rather than crashing the user command
  - Can avoid having 'while true; do squeue; done' overload slurmd
Developed by HPE
  - Subject to review and validation by SchedMD

... now works
  - 22.05 version was DOA due to libcxi library changes

Known outstanding issues...
  - No HetJobs support at present
Slurm 23.11 Roadmap
November 2023
Fixing 'scontrol reconfigure'

- Plans to ensure 'scontrol reconfigure', SIGHUP, and restarting slurmctld/slurmd processes all have equivalent semantics
- Currently, certain changes cannot take effect within the process through 'scontrol reconfigure', and require a process restart
  - Which these are is undocumented, and somewhat hard to intuit
- Work to simplify these paths, and allow for additional sanity checks
- Configuration check capability expected as well
The "right-left" tree data structure was used to represent the association hierarchy in a flat row-oriented fashion

- Unfortunately, insertion and deletion is $O(n)$
  - And can trigger $O(n)$ row updates in the database
  - And $O(n)$ updates to slurmctld
- New "lineage" approach significantly improves performance
  - Especially when heavily scripting against external accounting systems
  - Must move slurmctld to 23.11 alongside slurmdbd to see benefits
New auth/slurm and cred/slurm plugins

● New internal authentication and job credential plugins
  ○ Alternative to MUNGE

● Simple HMAC scheme (SHA-256) built off JWT
  ○ Separate from existing auth/jwt plugin though
  ○ Will require a shared secret be shared throughout the cluster
    ■ Similar security posture to MUNGE

● Will allow for future extension and flexibility…
LDAP-less control plane

- Using auth/slurm, will support running the slurmctld without LDAP
  - Username, uid, gid, groups will be provided by auth/slurm
Extended SElinux

- auth/slurm will allow for secure communication of the originating command's SElinux context
TRES Reservations

- Allow for TRES-oriented reservations
  - E.g., reserve 200 GPUs alongside 800 CPUs
Extensible Features

- Set of key=value pairs, with the values provided by site-specific scripts
  - Can be integers, floats, or string types
  - Values refreshed periodically (on node ping)
    - Flag can mark an extensible feature as unchanging after node boot
- Separate job submission syntax to select between these extensible features
Relative QOS limits

- Flag allows QOS to be specified as a percentage of the cluster's total resources
  - Or an individual partition, if used as a PartitionQOS
… and Beyond
macOS Support

- Stripped-down, but usable, Slurm install on macOS
  - Notable subsystems that macOS cannot support
    - cpu affinity
    - cgroup
    - containers
    - job_container/tmpfs
    - ...
  - Meant mainly for testing and training
Questions?
Next Events

- **SLUG'23**
  - Hosted by Brigham Young University, in Provo, Utah, USA
  - September 12-13th
  - Call for Papers is out now
    - Deadline is June 9th

- **SC'23**
  - Slurm Booth
  - BoF - waiting on acceptance
Audience Survey
Does anyone use the "Coordinator" setting on accounts?
- How long are sites planning to continue supporting Cray Aries platforms?
  - 2023?
  - 2024?
  - 2025?
  - … beyond?
● Container support…
  ○ Shifter
  ○ CharlieCloud
  ○ podman
  ○ Singularity / Apptainer
  ○ Docker
  ○ … other?