Bringing Your Own Capacity
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“Bringing your own capacity” is a description of something we see happening in high-throughput computing.

Researchers increasingly want to use compute capacity to which their HTCondor administrator does not have access.

… from their usual access points, for their usual jobs.
First Phase:
  • condor_annex (self-service cloud bursting tool)
Second Phase:
  • split-starter/lumberjack (HPC systems w/o outbound networking)
  • XD-SUBMIT (HPC systems with outbound networking)
Third Phase:
  • HPC Annex (self-service HPC system tool)
Bringing Your Own Capacity to the Open Science Pool - Initial Experiments
Open Science Pool ("OSPool") Quick Overview
(very simplified)

› HTCondor pool composed of federated compute resources from ~100 member sites
› Sites have full autonomy, donate spare resources from their own pools
› Powered by:
  • GlideinWMS (managed by OSG/PATh staff)
    • Submits “pilot jobs” – jobs that are Execution Points (EPs) that join the OSPool
    • Is triggered by user demand
  • HTCondor-CE (sometimes managed by OSG/PATh staff)
    • Accepts pilot jobs and runs them on the site’s batch system
Exploratory work: “what will it take to do this?”

Hook up HPC centers to the Open Science Pool using the same infrastructure that we use for every other site

Steps for OSG/PATh staff:

• Obtain one user account from the HPC center for automated logins (SSH keypair, no 2FA)
• Ask the user to add the new account to their allocation
• Set up HTCondor-CE in front of the HPC site to accept pilot submissions and run them on the HPC site
• Add GlideinWMS “factory” configuration so pilots with the correct parameters get submitted
• Add GlideinWMS “frontend” configuration so the user's jobs can trigger pilot submission
• Test!
Considerations for Allocation-Based Submission

› Only one project's jobs should result in pilot submission -- and only when desired
  • OSG/PATh staff need to keep track of user allocations and modify configs as needed
› Only jobs from that project should run on that pilot
  • Pilot needs to know what project "asked for it"
› Conversely: pilot should always be able to run jobs from that project
  • Idle pilots still consume allocations (SUs)
› Pilots should be shaped to fit the user's workflow
  • Affects queue choice, requested resources, environment (e.g., loaded modules)
Drawback: Poor User Isolation

- One account per site, all pilots use that account
- Users use separate allocations, but they all have the same file system permissions -- especially a problem with a shared file system
- Users can interfere with each other's files, or use up the account's disk quota
Drawback: Staff Effort Needed

- User has no control over the mechanisms for launching pilots
  - nor the number of pilots
  - nor the size of a pilot
  - nor the features
- User has no "panic button"
- User depends on OSG/PATh staff for changes
- Therefore OSG/PATh staff need to monitor closely to avoid wastage, and be quickly available to take care of user requests
Results and Lessons Learned

- ~1.5 million core-hours for Chemistry and Grav. Wave Astronomy jobs
- Learned how to run on several HPC sites
  - Each HPC site is unique -- queues, sbatch parameters, proxies, environment, filesystems, etc.
  - Tooling was written to adapt site environments to run our users' jobs (which has been reused elsewhere on the Open Science Pool)
- Experienced need for a "self-service" model
  - For proper isolation, users must be able to use their own identities, not just their allocations
  - Straightforward changes shouldn't require contacting staff
A Self-Service Tool

› Use what we learned about running pilots on these HPC systems, but start them as the researcher.
› Not hard to do interactively, so let’s automate it.
› What about 2FA?
› Write a command-line tool that gives us the opportunity to prompt the researcher to log in.
HPC Annex

- Pilots are user-specific (and totally unshared).
- No staff involvement.
- Direct user control over allocation use and pilot “shape”; user can shut pilots off remotely.
- Pilots shut themselves off if idle.

- Requires users to (re-)authenticate each time they add their own capacity.
A Demonstration

› I’ll mostly be following one of the recipes.
https://htcondor.com/web-preview/preview-ospool-byor/ospool/byor/stampede2
Status

› Deployed at the OSG Connect access points. 😊
  • Stampede 2, Bridges 2, Expanse, and Anvil supported.

› Deployed. 😞
  • Work is in progress to make enabling the tool turning a single knob, ideally one that’s on by default.

› Targets a single use case.
Future Work

› Cover additional use-cases:
   • DAGMan
   • Sharing an annex with coworkers

› Eliminate external infrastructure and admin involvement.
   • Maybe no “home pool” required.
   • Could we offer user-specific access points as a service?
Questions?
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