Jetstream Overview: A national research and education cloud – Lightning Edition

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What is Jetstream and why does it exist?

- NSF’s first production cloud facility
- Focus on ease-of-use, broad accessibility
- User-selectable library of preconfigured virtual machines
- Provides on-demand interactive computing and analysis or persistent services such as gateways
- Enables configurable environments; programmable cyberinfrastructure
Who uses Jetstream?

- The researcher needing a handful of cores (1 to 44/vCPU)
- Software creators and researchers needing to create their own VMs and workflows
- Science gateway creators using Jetstream as either the frontend or processor for scientific jobs
- STEM Educators teaching on a variety of subjects
What Jetstream isn’t…

• It’s not traditional HPC
• There’s no shared filesystem (think cloudy!)
• There’s no high-end interconnect fabric (keep thinking cloudy!)
• There aren’t GPUs widely available
• It isn’t Amazon, Azure, or GCE (similar, but...)
Jetstream System Overview

http://wiki.jetstream-cloud.org/Network+configuration+and+policies
Platform Overview

- Globus Auth
- Atmosphere API
- Atmo Services
- XSEDE Accounting
- OpenStack
- Ceph

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What is Jetstream – a closer look

• **Software layers**
  - **Atmosphere** web interface
    - library of images, generic, domain specific
    - simplify VM administration
  - **OpenStack**: software tools for building and managing cloud computing platforms for public and private clouds.
  - **KVM** hypervisor: what the VMs run on
  - **Ceph**: storage platform that stores data on a single distributed computer cluster, and provides interfaces for **object-**, **block-** and **file-level** storage.
  - **Operating systems**: CentOS, Ubuntu, Windows(?)
  - **Applications**: e.g. software developed by the domain specialist, gateways, etc.
The Jetstream Atmosphere web interface
API Access to Jetstream

- What was unexpected
  - Demand for programmable cyberinfrastructure
  - Great platform for learning system administration skills
  - Great platform for teaching & learning cloudy technologies

- Command line clients
- Horizon dashboard very popular; but, incomplete
- Programmatic control; python is popular
  (https://docs.openstack.org/openstacksdk/latest/)
- Slack channel for collaboration API users of Jetstream
Jetstream usage highlights – 1 July 2020

- 406 XSEDE projects covering 78 fields of science and over 2100 active users representing 206 institutions
- 80% of Jetstream users have not used any other XSEDE system
- >337M CPU hours allocated to XSEDE projects since June 2016
- 38 active science gateways
- 43 education/teaching allocations serving over 700 students presently and over 4900 through July 2020
- 1189 mean active VMs in previous qtr, 1632 peak active VM count
- Highest user satisfaction in most recent XSEDE survey
Jetstream2 Capabilities

- Enhancing IaaS model of Jetstream:
  - Improved orchestration support
  - Elastic virtual clusters
  - Federated JupyterHubs
  - Commitment to >99% uptime
  - Critical for science gateway hosting
  - Hybrid-cloud support
  - Revamped User Interface
  - Unified instance management
  - Multi-instance launch

- >57K cores of next-gen AMD EPYC processors
- >360 NVIDIA A100 GPUs will provide vGPUs via NVIDIA’s MIG feature
- >18PB of storage (NVMe and disk hybrid)
- 100GbE Mellanox network
Timeline

- Jetstream now in 5th year of operations
- Jetstream extension requested through November 2021
- Jetstream2
  - Early operations planned for August 2021
  - Production operations by October 2021
Where can I get help?

- API CLI Tutorial: https://github.com/jlf599/JetstreamAPITutorial
- User guides: https://portal.xsede.org/user-guides
- XSEDE KB: https://portal.xsede.org/knowledge-base
- Email: help@xsede.org
Jetstream2 partners

[Logos of Arizona State University, The University of Arizona, Cornell University, University of Hawaii, Johns Hopkins University, TACC, UCAR]
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