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

ACNN Lightning Talks
September 4, 2020 – Bloomington, IN. (Webinar)

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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
# Jetstream System Overview

## IU Cyberinfrastructure

### Jetstream (production)

<table>
<thead>
<tr>
<th>Compute</th>
<th>Storage</th>
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</thead>
<tbody>
<tr>
<td>320 Nodes</td>
<td>960 TB</td>
</tr>
<tr>
<td>7,680 Cores</td>
<td></td>
</tr>
<tr>
<td>40 TB RAM</td>
<td></td>
</tr>
<tr>
<td>640 TB local disk</td>
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</tbody>
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## TACC Cyberinfrastructure

### Jetstream (production)

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## U of Arizona Cyberinfrastructure

### Jetstream (development)

<table>
<thead>
<tr>
<th>Compute</th>
<th>Additional Storage</th>
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</thead>
<tbody>
<tr>
<td>16 Nodes</td>
<td>2 TB RAM</td>
</tr>
<tr>
<td>384 Cores</td>
<td>32 TB local disk</td>
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</table>
Platform Overview

Atmosphere API

Globus Auth

Atmo Services

XSEDE Accounting

Web App

OpenStack

Ceph

OpenStack

Ceph

Indiana University

TACC
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.
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
Jetstream Partners

funded by the National Science Foundation
Award #ACI-1445604

http://jetstream-cloud.org/
Acknowledgements

NSF Awards 1053575 & 1548562 (XSEDE), 1445604 (Jetstream) and 2005506 (Jetstream2)

This document was developed with support from the National Science Foundation. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the NSF.

Special thanks to contributors & Jetstream2 partners
- David Y. Hancock, J. Michael Lowe, Therese Miller, Maria Morris, Winona Snapp-Childs, and George Turner