Jetstream2 as part of the NSF Ecosystem

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PEARC21 Panel – July 22, 2021
The NSF Computing Ecosystem: Category 1 and 2 Resources for Accelerating Research for the Community
What is Jetstream2 and why does it exist?

• Significant evolution of the Jetstream cloud resource

• Under 10% NSF investment → support for 24% of institutions, 23% of active PIs, and 32% of users*

• Jetstream has provided 6x more SUs than any other XSEDE resource for Education

• Emphasis on ease-of-use, broad accessibility, *Al for Everyone*

• Will provide on-demand interactive computing and persistent services for science gateways

• Enables configurable environments; programmable cyberinfrastructure

*Based on XDMoD data at Workload Analysis Report: http://arxiv.org/abs/1801.04306
Are we there yet?
What worked?

- Allowing API access and full control (root privileges)
- “Indefinite workflows” – allowing instances to run continuously – providing PIs renew their allocations
- Development of trial allocations

What didn’t work?

- Forcing small allocations into the research allocation process
- Lack of multi-year allocations
- Lack of shared data set storage
Jetstream2 Capabilities

Enhancing IaaS model of Jetstream:
• Improved orchestration support
• Elastic virtual clusters
• Federated JupyterHubs
• Ease storage sharing (CephFS w/Manilla)

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
>17PB of storage (NVMe and disk hybrid)
100GbE Mellanox network
XSEDEnet
Advanced Layer 2 Services (AL2S) platform

INDIANA UNIVERSITY
CYBERINFRASTRUCTURE

PRIMARY
- Compute
  - 416 Nodes
  - 53,248 Cores
  - 224 TB RAM
- Storage
  - 96 Nodes
  - 14 PB
- Accelerators
  - 90 Nodes
  - 45 TB RAM
  - 360 GPUs

JETSTREAM2

TACC CYBERINFRASTRUCTURE

- Compute
  - 8 Nodes
  - 1,024 Cores
  - 4 TB RAM
- Storage
  - 768 TB
- Accelerators
  - 2 Nodes
  - 1 TB RAM
  - 8 GPUs

Arizona State University
CYBERINFRASTRUCTURE

- Regional
  - Compute
    - 8 Nodes
    - 1,024 Cores
    - 4 TB RAM
  - Storage
    - 768 TB
- Accelerators
  - 2 Nodes
  - 1 TB RAM
  - 8 GPUs

UNIVERSITY OF HAWAII
CYBERINFRASTRUCTURE

- Regional
  - Compute
    - 8 Nodes
    - 1,024 Cores
    - 4 TB RAM
  - Storage
    - 768 TB
- Accelerators
  - 2 Nodes
  - 1 TB RAM
  - 8 GPUs

CORNELL UNIVERSITY
CYBERINFRASTRUCTURE

- Regional
  - Compute
    - 8 Nodes
    - 1,024 Cores
    - 4 TB RAM
  - Storage
    - 768 TB
Conceptual Jetstream2 Architecture

Users/Gateways
- Atmosphere (CACA0) User Interface
- Horizon web dashboard
- Atmosphere & OpenStack command line interfaces
- Third party applications
- Language binding

OpenStack
- PRIMARY
  - Compute Service
  - Storage Service (CEPH) Block | Object | POSIX | Image
  - Network Service
- SECONDARY
  - Orchestration
  - Containers
  - Databases
  - Bare metal
  - Data processing

AUTHORIZATION

Jetstream2
Timeline

- Jetstream now in 5th year of operations
- Jetstream extension granted by the NSF through November 2021
- Extension through March 2022 in process
- Jetstream2
  - Early operations planned for December 2021
  - Production operations by January 2022
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
• Jeremy Fischer, J. Michael Lowe, Therese Miller, Maria Morris, Winona Snapp-Childs, and George Turner