Jetstream Overview:
A national research and education cloud

ESIP Cloud Computing Cluster Monthly Call
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UITS Research Technologies

NSF Funding Areas in HPC

Traditionally concentrated on enabling petascale capability
- Blue Waters – 13.3 petaflops, 2012 (Frontera awarded late 2018, coming in 2019)
- Stampede – 9.6 petaflops, 2013 (extended to Stampede2 in 2017 – 18 petaflops)
- Comet – ~2.0 petaflops, 2014

Has funded research into building clouds and computer science
- CloudLab (renewed for 2nd phase)
- Chameleon (renewed for 2nd phase)

Now funding clouds to do research
- Bridges (Hybrid system)
- Jetstream
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)**
  - Compute: 320 Nodes, 7680 Cores, 40 TB RAM, 640 TB local disk
  - Storage: 960 TB

**TACC Cyberinfrastructure**
- **Jetstream (production)**
  - Compute: 320 Nodes, 7680 Cores, 40 TB RAM, 640 TB local disk
  - Storage: 960 TB

**U of Arizona Cyberinfrastructure**
- **Jetstream (development)**
  - Compute: 16 Nodes, 2 TB RAM, 384 Cores, 32 TB local disk

Connections:
- 4 x 40 Gbps to Internet2
- 100 Gbps, 100 Gbps, 10 Gbps, 10 Gbps
- XSEDE
Platform Overview

Globus Auth
Atmosphere API
Atmo Services
XSEDE Accounting
OpenStack
Ceph

Web App

Indiana University
TACC
The Jetstream Atmosphere web interface
<table>
<thead>
<tr>
<th>Discipline or area of interest</th>
<th># of Jetstream allocations</th>
<th>SUs allocated on Jetstream</th>
<th>SU Increase/Decrease on Jetstream over previous year</th>
<th>% of SUs allocated on Jetstream</th>
<th>% of all SUs allocated on other XSEDE-supported systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Sciences</td>
<td>6</td>
<td>3,465,516</td>
<td>100% Increase</td>
<td>4.24%</td>
<td>0.61%</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>89</td>
<td>15,041,928</td>
<td>72.18% Increase</td>
<td>18.40%</td>
<td>3.59%</td>
</tr>
<tr>
<td>Biophysics</td>
<td>86</td>
<td>3,627,026</td>
<td>44.15% Decrease</td>
<td>4.44%</td>
<td>13.56%</td>
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<tr>
<td>Computer Science</td>
<td>72</td>
<td>6,883,269</td>
<td>33.28% Increase</td>
<td>8.42%</td>
<td>2.98%</td>
</tr>
<tr>
<td>Earth Sciences</td>
<td>37</td>
<td>5,476,250</td>
<td>37.06% Increase</td>
<td>6.70%</td>
<td>4.60%</td>
</tr>
<tr>
<td>Education and Training</td>
<td>128</td>
<td>16,599,512</td>
<td>2.62% Increase</td>
<td>20.31%</td>
<td>4.66%</td>
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<tr>
<td>Engineering</td>
<td>13</td>
<td>520,690</td>
<td>71.21% Increase</td>
<td>0.64%</td>
<td>1.75%</td>
</tr>
<tr>
<td>Materials Science</td>
<td>6</td>
<td>1,035,508</td>
<td>100% Increase</td>
<td>1.27%</td>
<td>13.89%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>13</td>
<td>688,505</td>
<td>150.37% Increase</td>
<td>0.84%</td>
<td>0.90%</td>
</tr>
<tr>
<td>Molecular Science/Biochemistry</td>
<td>21</td>
<td>4,254,643</td>
<td>10.15% Decrease</td>
<td>5.20%</td>
<td>5.83%</td>
</tr>
<tr>
<td>Neuroscience</td>
<td>19</td>
<td>4,708,180</td>
<td>327.87% Increase</td>
<td>5.76%</td>
<td>1.98%</td>
</tr>
<tr>
<td>Physics</td>
<td>10</td>
<td>2,440,581</td>
<td>15.58% Decrease</td>
<td>2.99%</td>
<td>8.65%</td>
</tr>
<tr>
<td>Social Sciences and Humanities</td>
<td>28</td>
<td>2,409,633</td>
<td>192.27% Increase</td>
<td>2.95%</td>
<td>0.81%</td>
</tr>
</tbody>
</table>
Jetstream for engineering researchers (and others)

- Matlab and SimuLink and additional toolkits are installed on Jetstream
- You do NOT need to have a local license to use MATLAB on Jetstream
- If you are a researcher, and MATLAB or SimuLink... you’re ready to go!
- If you are an engineering researcher, and you need other tools... let us know!
Jetstream for Education

Jetstream has been used in multiple graduate and undergraduate courses

- Management, Access, and Use of Big and Complex Data
- Multiple informatics and general bioinformatics courses
- Business Intelligence (big data and analysis)

- Research Topics in Music
- Multiple genetics and sequencing courses
- Multiple information security and assurance courses

Research Data Alliance workshops, Galaxy workshops, data analysis in finance using R, security and intrusion detection, and principles in cloud computing...
Jetstream usage highlights – 1 April 2019

- 414 active XSEDE projects covering 73 fields of science and over 2300 active users representing 207 institutions
- 80% of Jetstream users have not used any other XSEDE system
- >190M CPU hours allocated to XSEDE projects since June 2016
- 24 active science gateways
- 54 education/teaching allocations serving over 1000 students
- 1458 mean active VMs in previous qtr, 1590 peak active VM count
- Highest user satisfaction in most recent XSEDE survey
Requesting access to Jetstream

- Trial allocations available TODAY
- You can request startup allocations anytime. (Startups are simple!)
- You can request allocations for educational use anytime.
- Next submission period for large allocations is 15 Jun 2019 – 15 Jul 2019
- Research allocation: Project desc (<10 pages) and Scaling doc (<5 pages)
  - We can help!
Where can I get help?

- User guides: [https://portal.xsede.org/user-guides](https://portal.xsede.org/user-guides)
- XSEDE KB: [https://portal.xsede.org/knowledge-base](https://portal.xsede.org/knowledge-base)
- Email: help@xsede.org
- Campus Champions: [https://www.xsede.org/campus-champions](https://www.xsede.org/campus-champions)
- Introduction to Jetstream Virtual Workshop: [https://cvw.cac.cornell.edu/jetstream/](https://cvw.cac.cornell.edu/jetstream/)
- Jetstream Allocations Virtual Workshop: [https://cvw.cac.cornell.edu/JetstreamReq/](https://cvw.cac.cornell.edu/JetstreamReq/)
Questions?

- Project website: http://jetstream-cloud.org/
- Project email: help@jetstream-cloud.org Direct email: jeremy@iu.edu

License Terms

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