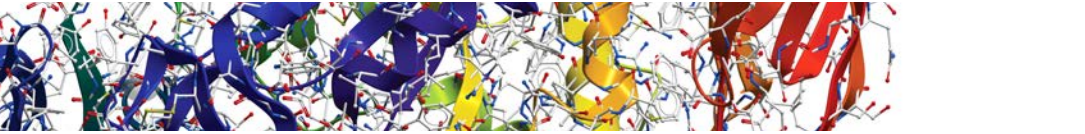
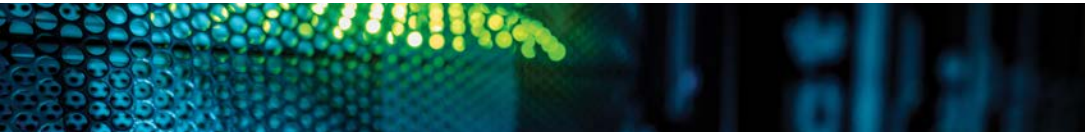


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# Jetstream Overview: A national research and education cloud

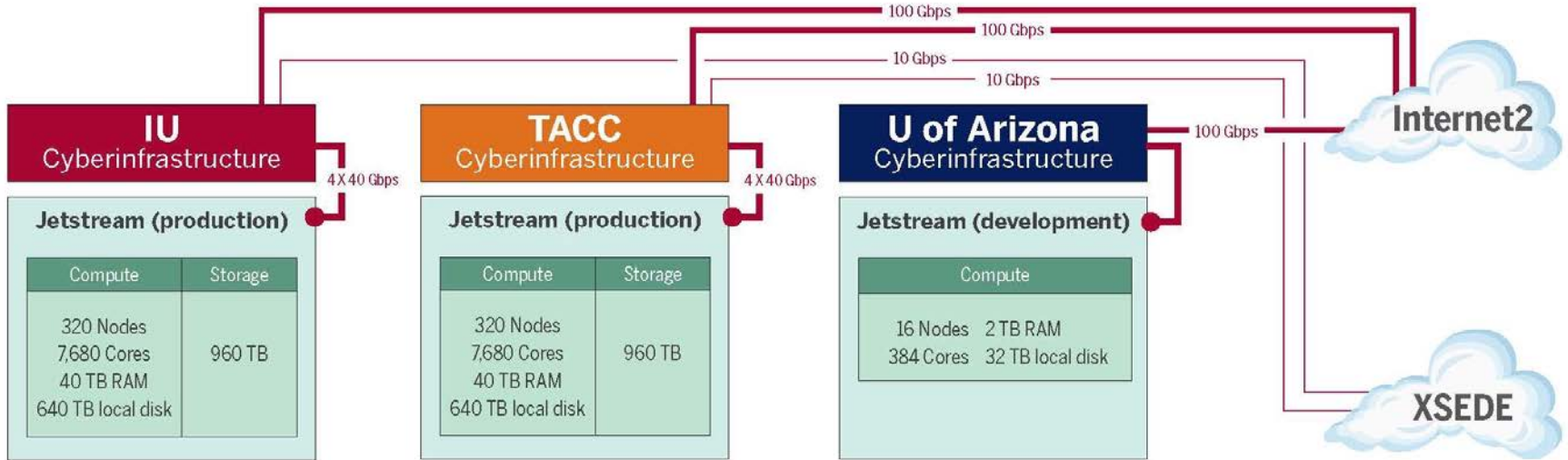
**SC21 Reproducibility Infrastructure Webinar**  
**June 11, 2021 – Bloomington, IN.**

Jeremy Fischer – [Jeremy@iu.edu](mailto:Jeremy@iu.edu) - Indiana University

Manager, Jetstream Cloud, UITS Research Technologies

Fischer, J. (2021). Jetstream Overview: A national research and education cloud. Bloomington, IN. Retrieved from <https://jetstream-cloud.org/research/publications.php>

# Jetstream1 System Overview



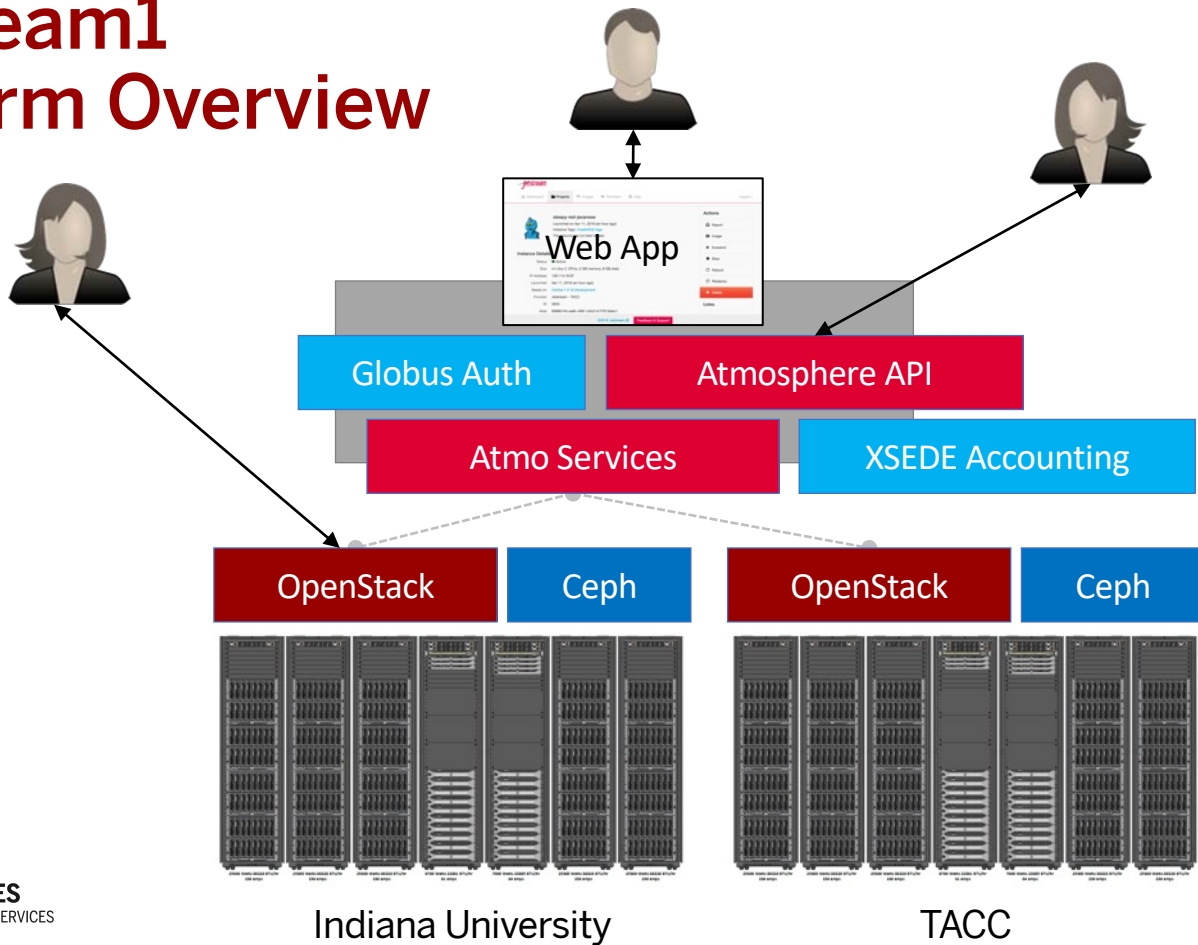
<http://wiki.jetstream-cloud.org/Network+configuration+and+policies>

# Quick Jetstream1 Facts

- vCPU ranges from 1 core to 44 cores
- Ram on flavors ranges from 2gb to 120gb
- Atmosphere gives 100gb of block storage per user by default (may request more)
- API side allows 1TB per allocation by default (shared between all allocation users – may request more)
- GPUs (NVIDIA V100) available on a limited basis as  $\frac{1}{4}$  vGPU,  $\frac{1}{2}$  vGPU, or 1 vGPU



# Jetstream1 Platform Overview





# The Jetstream1 Atmosphere web interface

The screenshot shows the Jetstream1 Atmosphere web interface dashboard. At the top, there is a navigation bar with the Jetstream logo, a 'Dashboard' menu item, and links for 'Projects', 'Images', 'Help', and 'Admin'. The user's name 'jfischer' is visible in the top right corner.

The main content area is titled 'Getting Started' and contains three cards:

- Launch New Instance:** Includes a rocket icon and text: 'Browse Atmosphere's list of available images and select one to launch a new instance.'
- Browse Help Resources:** Includes a question mark icon and text: 'View a video tutorial, read the how-to guides, or email the Atmosphere support team.'
- Change Your Settings:** Includes a gear icon and text: 'Modify your account settings, view your resource quota, or request more resources.'

Below this is the 'Resources Used' section, which includes a 'Need more?' button. It features an 'Allocation Source' horizontal bar chart and two donut charts for '10 Instances' and '4 Volumes'.

**Allocation Source Data:**

Allocation Source	Percent of Allocation Used
TG-STA1100245	5.06%
TG-ASC160018	32.23%
TG-CDA160007	23.15%
TG-TRA160003	17.61%
TG-TRA160027	0%

**10 Instances:** A donut chart showing the distribution of 10 instances, with a legend for 'active' (blue) and 'shutoff' (grey).

**4 Volumes:** A donut chart showing the distribution of 4 volumes, with a legend for 'available' (blue).

The 'Provider Resources' section at the bottom shows a bar chart for CPU usage:

Provider	CPU Usage
Jetstream - Indiana University	9.09%
Jetstream - TACC	0%

# JS1 Atmosphere Image Catalog

The screenshot displays the Jetstream Atmosphere Image Catalog interface. At the top, there is a navigation bar with the Jetstream logo and links for Dashboard, Projects, Images, Help, and Admin. The user 'jfischer' is logged in. Below the navigation bar, there are search and navigation options: SEARCH, FAVORITES (2), MY IMAGES (42), MY IMAGE REQUESTS, and TAGS. The main section is titled 'Image Search' and features a search input field containing 'ubuntu'. Below the search bar, it indicates 'Showing 100 results for 'ubuntu'' and a 'Show End Dated' toggle switch. The results are listed under the heading 'All Images'. Each result entry includes a small icon, the image name, the date and creator, a brief description, and a list of tags. The results shown are:

- cacr camp-1 2021 Ubuntu 20\_04**: Private. This is the primary CACR cybersecurity camp image for student desktop use. It's b ...  
Jun 8th 21 08:35 by mkrenz  
Tags: base, CACR, desktop, development, Ubuntu
- Stata and Rstudio Desktop**: This image contains RStudio and a licensed copy of Stata-mp (16th ed).  
Jun 4th 21 06:16 by bewolfe  
Tags: base, desktop, development, docker, docker-compose, m1\_small, Rstudio, ShinyServer, stata, Ubuntu
- Ubuntu 20.04 Devel and Docker**: Ubuntu 20.04 LTS Development + GUI support + Docker  
May 17th 21 04:55 by jfischer  
Based on Ubuntu cloud image for 20.04 ...  
Tags: base, desktop, development, docker, docker-compose, Featured, Ubuntu
- RStudio Desktop - Shiny Server**: RStudio Desktop 1.3.1073 and R 4.0.3 and Shiny Server v1.5.16.958  
May 17th 21 04:29 by jfischer  
built on Ubuntu 20.04 ...  
Tags: base, desktop, development, docker, docker-compose, Featured, m1\_small, Rstudio, ShinyServer, Ubuntu
- Ubuntu 18.04 Devel and Docker**: Ubuntu 18.04 LTS Development + GUI support + Docker  
May 17th 21 03:22 by jfischer  
Based on Ubuntu cloud image for 18.04 ...  
Tags: base, desktop, development, docker, docker-compose, Featured, Ubuntu, vnc
- Matlab Minimal**: Matlab R2018a with Update 6 built on Ubuntu 18.04 LTS Development + GUI support + Docker  
May 17th 21 03:06 by jfischer  
...  
Tags: docker, docker-compose, Featured, gui, m1\_small, Mathematics, MATLAB, Ubuntu

At the bottom of the page, there is a footer with the following text: 'Jetstream Homepage - Jetstream Partners - Citing Jetstream - Jetstream is supported by NSF ACI-1445604' and a 'FEEDBACK & SUPPORT' button.

# Atmosphere - Launch

**Launch an Instance / Basic Options**

**Basic Info**

Instance Name:

Base Image Version:

Project:

Instance Count:

**Resources**

Allocation Source:

Provider:

Instance Size:

Allocation Used: 5% of 6000000 SUs from TG-TRA160003

Resources Instance will Use: A total 18 of 440 alloted CPUs

A total 44 of 1200 alloted GBs of Memory

[← Back](#) [Advanced Options](#)

**RESOURCES**

## JLF Test

NEW

Instances

Name
<input type="checkbox"/> BUILD-NewShiny
<input type="checkbox"/> CentOS 7 (7_8) Docker
<input type="checkbox"/> DockerIT-Ubuntu 18
<input type="checkbox"/> JLF-Temp Admin
<input type="checkbox"/> MATLAB-U20-Ubuntu
<input type="checkbox"/> OLD - FOR REFERENCE
<input type="checkbox"/> OLD - FOR REFERENCE
<input type="checkbox"/> TACC-Ubuntu 20.04

Volumes

Name	Status	Size	Provider
<input type="checkbox"/> IntelCompiler-v18	● Unattached	20 GB	Jetstream - Indiana University
<input type="checkbox"/> IntelCompilerVol	● Unattached	10 GB	Jetstream - Indiana University
<input type="checkbox"/> IntelCompilerVol-v3	● Unattached	10 GB	Jetstream - Indiana University
<input type="checkbox"/> MatlabScratch	● Unattached	50 GB	Jetstream - Indiana University
<input type="checkbox"/> Windows Images	● Unattached	100 GB	Jetstream - Indiana University

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# Atmosphere – Custom Images

**Image Request - Image Info**

Step1 Step2 Step3 Step4 Step5 Step6

Note: All volumes must be detached from an instance before it can be imaged.

Please read the [wiki page about requesting an image of your instance](#) before completing the form below.

Please provide some information to help others discover this image. The information you provide here will be the primary means for others to discover this image.

Fields marked with \* are required.

Create or Update?

New Image?

**\*New Image Name**  
Something meaningful to help users find this image. Please limit name to 30 characters.

Ubuntu 18.04 Devel and Docker

**\*Description of the Image**  
Concisely describe the tools installed and their purpose. Please include key words that will help users search for this image and decide whether it will suit their needs.

Ubuntu 18.04 LTS Development + GUI support + Docker  
Based on Ubuntu cloud image for 18.04 LTS with basic dev tools, GUI/Xfce added

**Image Tags**  
Please include tags that will help users decide whether this image will suit their needs. You can include the operating system, installed software, or configuration information. E.g.

Jetstream Home

Dashboard

RESOURCES DETAILS

## JLF Test

Resources > DockIT Ubuntu 18\_04 Devel an

DockIT Ubuntu

Allocation Source

TG-TRA160003

Allocation Used

5% of 6000000 SUs from TG-TRA160003

Instance Details

Status	Active
Activity	N/A
Size	m1.tiny (CPU: 1, M
IP Address	149.165.156.203
Launched	Feb 11, 2021 (4 m
Based on	Ubuntu 18.04 De
Provider	Jetstream - India
ID	42818

Options

Report

Image

Suspend

Shelve

Stop

Reboot

Redeploy

Delete

Links

Open Web Shell

Open Web Desktop

Feedback & Support



# 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
- Paved the way for 3<sup>rd</sup> party interfaces like Exosphere



# CLI / API Interface

```
Openstack Admin - TACC -- -bash -- 114x36

(openstack4) [Entropy] jeremy ~-->openstack server list
+-----+-----+-----+-----+-----+-----+
| ID              | Name      | Status | Networks              | Image              | Flavor            |
+-----+-----+-----+-----+-----+-----+
| f1cb3b0f-0a8b-478f-a63e-10c8127733d2 | staff-wiki | ACTIVE | cvmfs-api-net=10.0.0.8,149.165.172.192 | JS-API-Featured-Ubuntu20-Latest | m1.small          |
+-----+-----+-----+-----+-----+-----+

(openstack4) [Entropy] jeremy ~-->openstack flavor list
+-----+-----+-----+-----+-----+-----+
| ID | Name      | RAM  | Disk | Ephemeral | VCPUs | Is Public |
+-----+-----+-----+-----+-----+-----+
| 1  | m1.tiny   | 2048 | 8    | 0         | 1     | True      |
| 10 | m1.quad   | 10240 | 20   | 0         | 4     | True      |
| 2  | m1.small  | 4096  | 20   | 0         | 2     | True      |
| 3  | m1.medium | 16384 | 60   | 0         | 6     | True      |
| 4  | m1.large  | 30720 | 60   | 0         | 10    | True      |
| 5  | m1.xlarge | 61440 | 60   | 0         | 24    | True      |
| 6  | m1.xxlarge | 122880 | 60   | 0         | 44    | True      |
+-----+-----+-----+-----+-----+-----+

(openstack4) [Entropy] jeremy ~-->
```



# CLI / API Interface, cont

## Upsides

- Most complete interface to using OpenStack
- CLI and SDK allow for programmatic use of OpenStack
- Generally very fast (though still dependent on busy-ness of cloud)

## Downsides:

- Not all functionality is present in python-openstackclient
- There are still some inconsistencies in client
- Not very novice friendly



# Horizon Interface

Project / Compute / Instances

## Instances

Instance ID =  Filter [Launch Instance](#) [Delete Instances](#)

Displaying 20 items | [Next](#)

Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
<input type="checkbox"/> manilate-st02	-	10.0.8.26 2001:18e8:c02:100:400::4 Floating IPs: 149.165.172.132	m1.quad	Frady	Active	us-east-1 zone-r7	None	Running	1 day, 3 hours	<a href="#">Create Snapshot</a>
auto_allocated_network										
<input type="checkbox"/> manilate-st01	-	10.0.8.14 2001:18e8:c02:100:400::17 Floating IPs: 149.165.171.159	m1.quad	Frady	Active	us-east-1 zone-r3	None	Running	1 day, 3 hours	<a href="#">Create Snapshot</a>
manila_testing										
<input type="checkbox"/> globus-test	JS-AP I-Feat-ured-CentOS7-La test	10.0.0.6 Floating IPs: 149.165.171.251	m1.small	id_rsa_sudarshan	Active	us-east-1 zone-r2	None	Running	6 days, 8 hours	<a href="#">Create Snapshot</a>
<input type="checkbox"/> jed-dd-compute-persistent-1-0	JS-AP I-Feat-ured-CentOS8-La test	10.0.0.18	m1.small	StevesMacKey	Active	us-east-1 zone-r2	None	Running	2 weeks	<a href="#">Create Snapshot</a>
<input type="checkbox"/> Manila-1	JS-AP I-Feat-ured-	10.0.0.16 Floating IPs:	m1.small	id_rsa_sudarshan	Active	us-east-1 zone-r2	None	Running	3 weeks	<a href="#">Create Snapshot</a>





# Horizon, cont...

The screenshot shows the OpenStack Horizon interface for a project named 'tacc' with ID 'TG-TRA160003'. The user is logged in as 'jif599'. The navigation menu on the left includes Project, API Access, Compute, Overview, Instances (selected), Images, Key Pairs, Server Groups, Volumes, Container Infra, Network, Orchestration, Database, Data Processing, Object Store, Share, Identity, and Workflow. The main content area displays the details for an instance named 'wiki5'. The instance is active, located in the 'zone-3' availability zone, and was created on May 10, 2021, at 2:48 p.m. It has been running for 4 weeks and 1 day. The instance uses the 'm1.quad' flavor, which has 10 GB of RAM, 4 vCPUs, and a 20 GB disk. It has two IP addresses: 10.0.0.9 and 149.165.172.177. The instance is associated with the 'exosphere' security group, which allows ICMP, SSH, and TCP connections from 0.0.0.0/0. The instance also has metadata including a key name 'UniversalRSA', an image ID 'JS-API-Featured-Ubuntu20-Feb-25-2021', and an exoCreatorUsername 'jif599'.

Instance Details	
<b>Name</b>	wiki5
<b>Description</b>	hugely_crack_jennet
<b>ID</b>	30d329d7-032c-4c32-b47f-04f8c8c9fd5c
<b>Status</b>	Active
<b>Locked</b>	False
<b>Availability Zone</b>	zone-3
<b>Created</b>	May 10, 2021, 2:48 p.m.
<b>Time Since Created</b>	4 weeks, 1 day

Specs	
<b>Flavor Name</b>	m1.quad
<b>Flavor ID</b>	10
<b>RAM</b>	10GB
<b>VCPUs</b>	4 VCPU
<b>Disk</b>	20GB

IP Addresses	
<b>Jif-Network</b>	10.0.0.9, 149.165.172.177

Security Groups	
<b>exosphere</b>	ALLOW IPv4 icmp from 0.0.0.0/0 ALLOW IPv6 to ::/0 ALLOW IPv4 to 0.0.0.0/0 ALLOW IPv4 tcp from 0.0.0.0/0 ALLOW IPv4 9090/tcp from 0.0.0.0/0 ALLOW IPv4 22/tcp from 0.0.0.0/0

Metadata	
<b>Key Name</b>	UniversalRSA
<b>Image Name</b>	JS-API-Featured-Ubuntu20-Feb-25-2021
<b>Image ID</b>	8bc9412c-e666-40fa-8254-f8481e344a49
<b>exoCreatorUsername</b>	jif599
<b>exoServerVersion</b>	4
<b>exoClientUid</b>	d47028a1-948d-4f92-9e58-d23968b2062
<b>exoGuac</b>	{"v":1,"ssh":true,"vnc":false}
<b>exoSetup</b>	complete

# Horizon GUI interface

- Allows most things you can do from the CLI
- Nice for some tasks
  - Network visualizer is something we tend to use as a troubleshooting tool
  - Easier to look at security groups on Horizon (IMHO)
- Downsides:
  - Considerably slower than using CLI
  - Not all features are present that are in CLI
  - Can't do things programmatically
  - Not very novice friendly nor intuitive




The screenshot shows the OpenStack Dashboard login page. At the top, there is the OpenStack logo (a red cube) and the text "openstack" in a sans-serif font, with "DASHBOARD" in a smaller font below it. Below the logo is the heading "Log In". There are three input fields: "Domain" with the value "TACC", "User Name" (empty), and "Password" (empty). Each input field has a small icon on the right side. At the bottom right of the form is a blue button labeled "Connect".



# Exosphere

The screenshot displays the Jetstream Cloud management interface. At the top, the header includes the Jetstream logo, navigation links for Messages, Settings, Get Support, and About, and the user's email address (iu). The main content area is titled "iu.jetstream-cloud.org - TG-TRA160003" and includes a "REMOVE ALLOCATION" link and a "CREATE" dropdown menu. Below this, the "Instances" section shows usage statistics: 26 of 200 total instances used, 72 of 664 total cores used, and 183296 of 1480000 MB RAM used. A "Select All" checkbox and a "DELETE" button are present. Three instances are listed: "VideoTest", "tutorial-ip-holder", and "wiki5", each with a delete icon. A note indicates that 23 instances created by other users are hidden, with a "SHOW" link. The "Volumes" section shows 37 of 200 total volumes used and 1830 of 4000 GB storage used. A list of volumes is shown, including "manilatest02" (100 GB), "manilatest01" (100 GB), "This is a Demo volume" (10 GB), "gpu-vc-jec-vol" (100 GB), "40percentmoretrail" (50 GB), and "js\_docker\_vol" (10 GB).




Jetstream Cloud  Messages Settings Get Support About

iu **iu.jetstream-cloud.org - TG-TRA160003** REMOVE ALLOCATION CREATE

tacc Instances

Add Allocation Instances used: 26 of 200 total Cores used: 72 of 664 total RAM used: 183296 of 1480000 MB

Select All DELETE

- VideoTest 
- tutorial-ip-holder 
- wiki5 

Hiding 23 instances created by other users [SHOW](#)

Volumes

Volumes used: 37 of 200 total Storage used: 1830 of 4000 GB

- > manilatest02 100 GB
- > manilatest01 100 GB
- > This is a Demo volume 10 GB
- > gpu-vc-jec-vol 100 GB
- > 40percentmoretrail 50 GB
- > js\_docker\_vol 10 GB



# Exosphere GUI interface

- 3rd party GUI interface for OpenStack clouds
- Developers have a past connection to Jetstream but are working with multiple cloud providers
- Attempting to fill the gap between interfaces built for system administrators like OpenStack Horizon, and intuitive-but-proprietary services like DigitalOcean
- More about Exosphere:
  - <https://gitlab.com/exosphere/exosphere>



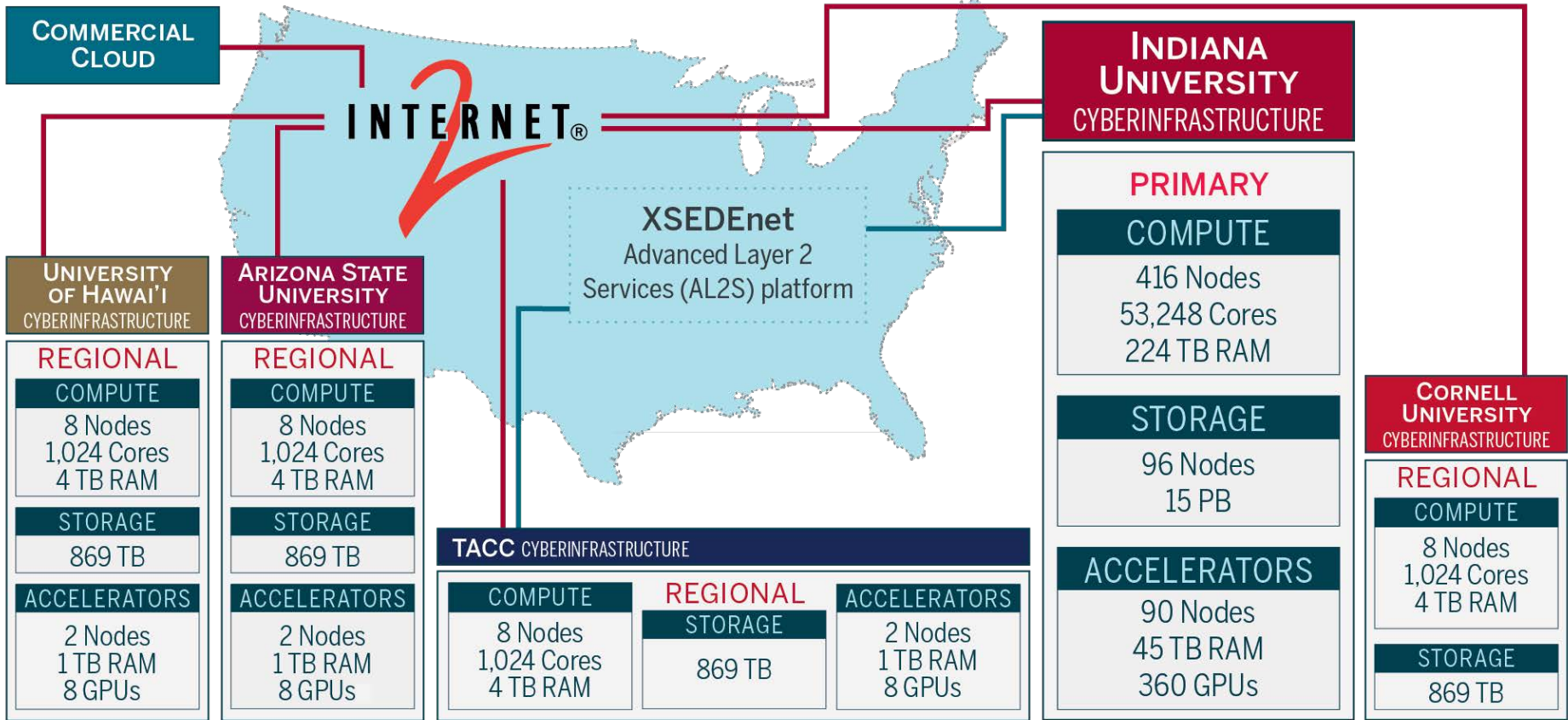
*And introducing...*

# *Jetstream2*



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# Where can I get help?

- Wiki / Documentation: <http://wiki.jetstream-cloud.org>
- API CLI Tutorial: <https://github.com/jlf599/JetstreamAPITutorial>
- User guides: <https://portal.xsede.org/user-guides>
- Email: [help@xsede.org](mailto:help@xsede.org)



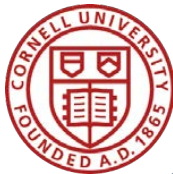
# Acknowledgements

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.



# Jetstream Partners

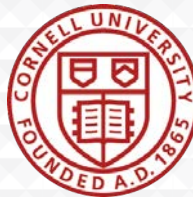


funded by the National Science Foundation  
Award #ACI-1445604



# Jetstream2 partners

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JOHNS HOPKINS  
UNIVERSITY



UCAR

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<http://jetstream-cloud.org/>  
National Science Foundation  
Award #ACI-2005506