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Jetstream Overview: A national research and education cloud

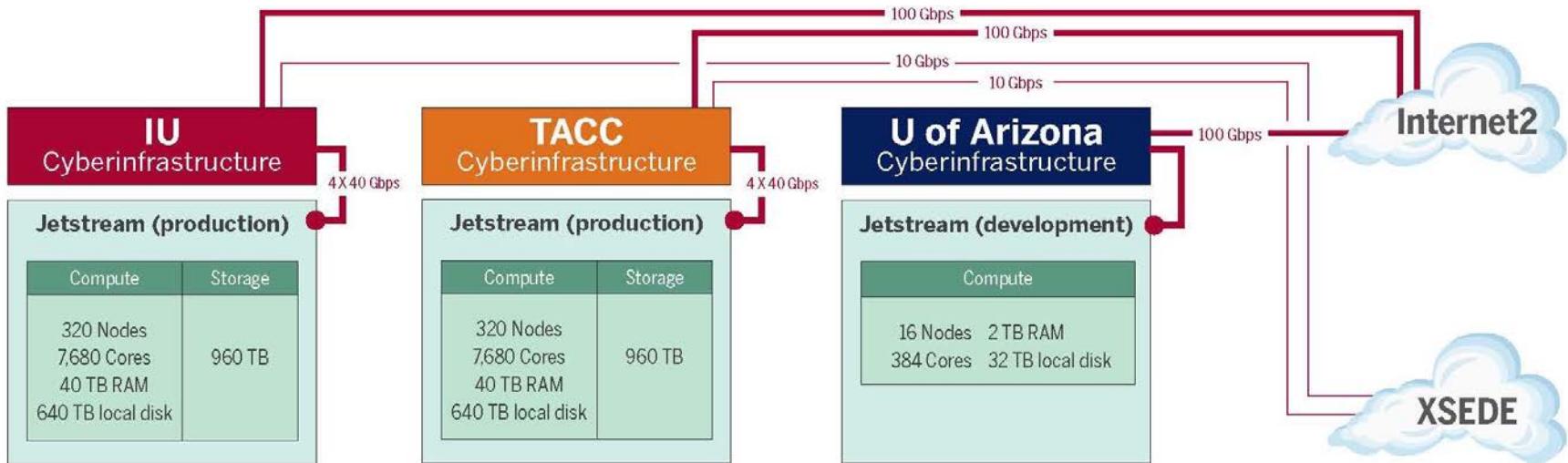
SC21 Reproducibility Infrastructure Webinar
June 11, 2021 – Bloomington, IN.

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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



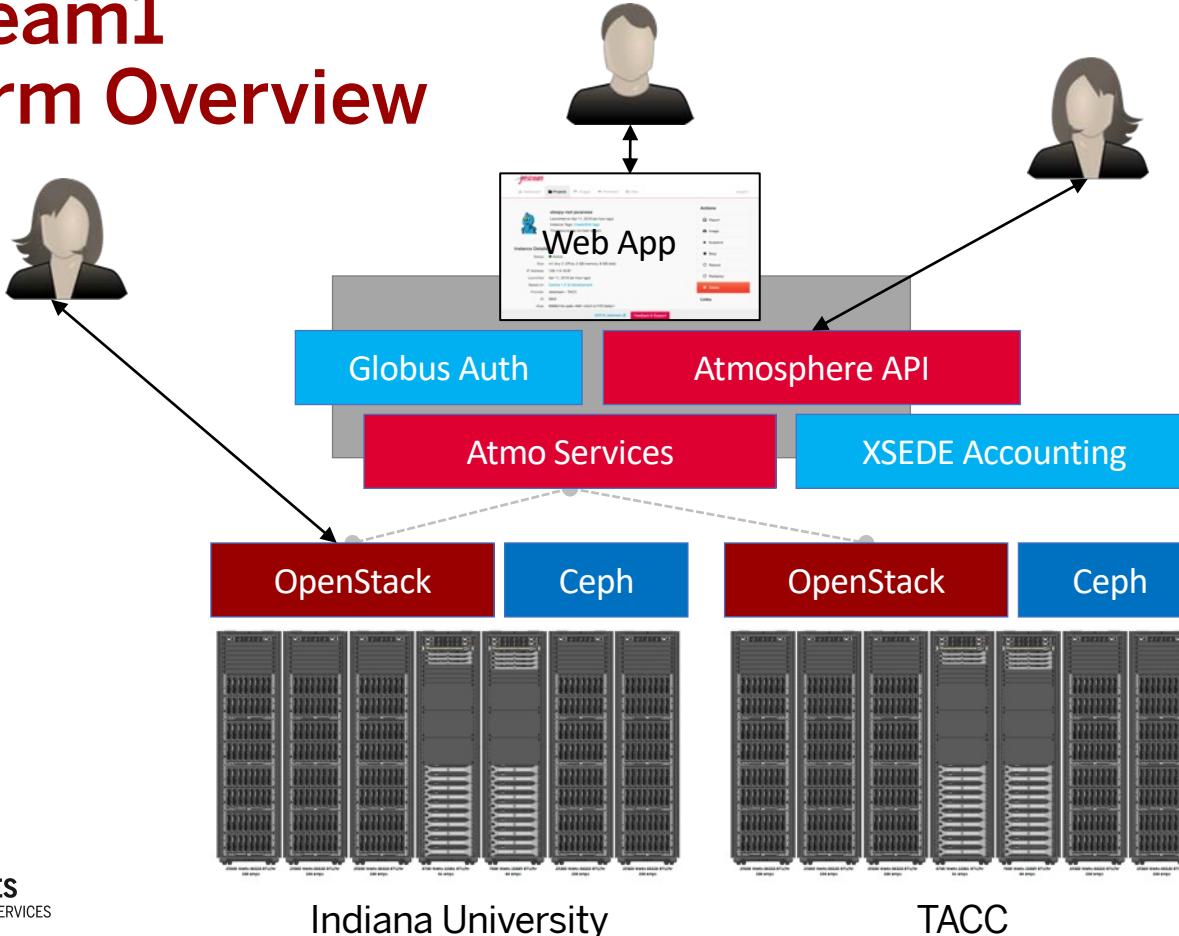
<http://wiki.jetstream-cloud.org/Network+configuration+and+policies>

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 links for Dashboard, Projects, Images, Help, Admin, and a user account (jfischer). Below the navigation bar, there are three main sections under the heading "Getting Started":

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

Below these sections, there is a summary of "Resources Used" and "10 Instances".

Resources Used (Allocation Source):

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

10 Instances (Allocation Status):

Status	Count
active	8
shutoff	2

4 Volumes (Status):

Status	Count
available	4

Provider Resources (CPU Usage):

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

At the bottom of the dashboard, there is a footer with copyright information and a feedback link.

JS1 Atmosphere Image Catalog

jetstream Dashboard Projects Images Help Admin jfischer ▾

SEARCH FAVORITES (2) MY IMAGES (42) MY IMAGE REQUESTS TAGS

Image Search

ubuntu

Showing 100 results for 'ubuntu'

All Images Show End Date

Image	Description	Tags
	cacr camp-1 2021 Ubuntu 20_04 Jun 8th 21 08:35 by mkrenz Private. This is the primary CACR cybersecurity camp image for student desktop use. It's b ...	base CACR desktop development Ubuntu
	Stata and RStudio Desktop Jun 4th 21 06:16 by bawolfe This image contains RStudio and a licensed copy of Stata-mp (16th ed).	base desktop development docker docker-compose m1_small RStudio ShinyServer stata Ubuntu
	Ubuntu 20.04 Dev and Docker May 17th 21 04:55 by jfischer Ubuntu 20.04 LTS Development + GUI support + Docker Based on Ubuntu cloud image for 20.04 ...	base desktop development docker docker-compose Featured Ubuntu
	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 ...	base desktop development docker docker-compose Featured m1_small RStudio ShinyServer Ubuntu
	Ubuntu 18.04 LTS Development + GUI support + Docker May 17th 21 03:22 by jfischer Based on Ubuntu cloud image for 18.04 ...	base desktop development docker docker-compose Featured Ubuntu vnc
	Matlab R2018a with Update 6 built on Ubuntu 18.04 LTS Development + GUI support + Docker May 17th 21 03:06 by jfischer ... base docker docker-compose Featured gu m1_small Mathematics MATLAB Ubuntu	

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Atmosphere - Launch

Jetstream

Dashboard Projects Images Help Admin jfischer

RESOURCES

JLF Test

NEW Instances Volumes

Name: BUILD NewShiny... Centos 7 (7.8) Docker JLF Temp Admin MATLAB U20... OLD - FOR REFER... OLD - FOR REFER... TACC Ubuntu 20...

Base Image Version: 1.5 Project: JLF Test Instance Count: 1

Launch an Instance / Basic Options

Basic Info Resources

Instance Name: Ubuntu 20_04 Devel and Docker Allocation Source: TG-TRA160003

Provider: Jetstream - Indiana University Instance Size: m1.tiny (CPU: 1, Mem: 2 GB, Disk: 8 GB)

Allocation Used: 5% of 6000000 SU's from TG-TRA160003

Resources Instance will Use:

- A total 18 of 440 allotted CPUs
- A total 44 of 1200 allotted GBs of Memory

Advanced Options CANCEL LAUNCH INSTANCE

Name	Status	Size	Provider
IntelCompiler-v18	Unattached	20 GB	Jetstream - Indiana University
IntelCompilerVol	Unattached	10 GB	Jetstream - Indiana University
IntelCompilerVol-v3	Unattached	10 GB	Jetstream - Indiana University
MatlabScratch	Unattached	50 GB	Jetstream - Indiana University
Windows Images	Unattached	100 GB	Jetstream - Indiana University

Sort By: Name

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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?

Checking 'New Image' will create a brand new image. Or un-check to create a new version for the same image.

New Image?

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

***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.

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.,

Actions

- Report
- Image
- Suspend
- Shelve
- Stop
- Reboot
- Redeploy
- Delete**

Links

- Open Web Shell
- Open Web Desktop



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 3rd 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 | staff-wiki | ACTIVE | cvmfs-api-net=10.0.0.8, | JS-API-Featured- | m1.small |
| -10c8127733d2          |             |         | 149.165.172.192    | Ubuntu20-Latest  |
+-----+-----+-----+-----+-----+
(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

The screenshot shows the OpenStack Horizon interface for the 'tacc' project. The left sidebar navigation includes 'Project', 'API Access', 'Compute' (selected), '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 is titled 'Instances' and displays a table of 20 items. The table columns are: Instance Name, Image Name, IP Address, Flavor, Key Pair, Status, Availability Zone, Task, Power State, Time since created, and Actions. The table lists several instances, including 'manilate_st02', 'auto_allocated_network', 'manila_testing', 'globus_t_est', and 'ssudarsh-api-net'. Each instance row includes a 'Create Snapshot' button.

Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
manilate_st02		10.0.8.26 2001:18e8:c02:100:400::4	m1.quad	Frady	Active	az1 zone-r7	None	Running	1 day, 3 hours	Create Snapshot
		Floating IPs: 149.165.172.132								
		auto_allocated_network								
		10.0.8.14 2001:18e8:c02:100:400::17								
manilate_st01		Floating IPs: 149.165.171.159	m1.quad	Frady	Active	az1 zone-r3	None	Running	1 day, 3 hours	Create Snapshot
		manila_testing								
		10.255.0.53								
globus_t_est	JS-AP I-Feat ured-CentO S7-La test	10.0.0.6 Floating IPs: 149.165.171.251	m1.small	id_rsa_sudarshan	Active	az1 zone-r2	None	Running	6 days, 8 hours	Create Snapshot
jed-dd-compute-persistent-t-0	JS-AP I-Feat ured-CentO S8-La test	10.0.0.18 Floating IPs: 149.165.171.251	m1.small	StevesMacKey	Active	az1 zone-r2	None	Running	2 weeks	Create Snapshot
Manila_t_119unit	JS-AP I-Feat ured-	10.0.0.16 Floating IPs:	m1.small	id_rsa_eularchan	Active	az1 zone-r2	None	Running	3 weeks	Create Snapshot



Horizon, cont...

The screenshot shows the OpenStack Horizon dashboard for the 'tg-tacc' project. The main navigation bar includes 'Project', 'API Access', 'Compute' (selected), 'Storage', 'Network', 'Identity', and 'Workflow'. Under 'Compute', the 'Instances' tab is selected, showing a single instance named 'wiki5'. The 'Overview' tab is active, displaying the following details:

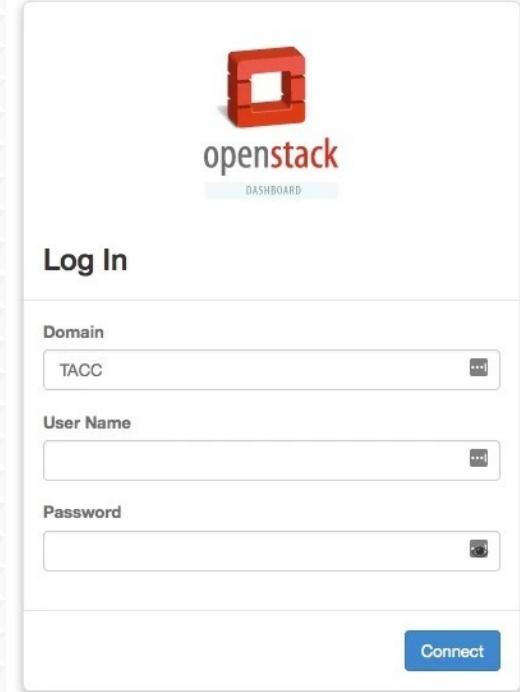
Name	wiki5
Description	hugely_crack_jennet
ID	30d329d7-032c-4c32-b47f-04f8c8c9fd5c
Status	Active
Locked	False
Availability Zone	zone-3
Created	May 10, 2021, 2:48 p.m.
Time Since Created	4 weeks, 1 day

Below the instance details, there are sections for 'Specs' (Flavor Name: m1.quad, Flavor ID: 10, RAM: 10GB, vCPUs: 4 VCPU, Disk: 20GB) and 'IP Addresses' (Jif-Network: 10.0.0.9, 149.165.172.177). Further down, the 'Security Groups' section lists a single rule for the 'exosphere' group: ALLOW IPv4 icmp from 0.0.0.0/0. The 'Metadata' section contains key-value pairs for various configuration parameters.

Key Name	Value
Image Name	JS-API-Featured-Ubuntu20-Feb-25-2021
Image ID	8bc9412c-e666-40fa-8254-f8481e344a49
exoCreatorUsername	jlf599
exoServerVersion	4
exoClientUuid	d47028a1-948d-4f92-9e58-d23968bf2062
exoGuc	{"v":1,"ssh":true,"vnc":false}
exoSetup	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



Exosphere

The screenshot shows the Jetstream Cloud web interface. At the top, there's a navigation bar with links for Messages, Settings, Get Support, and About. Below the header, the main content area displays an allocation for `iu.jetstream-cloud.org - TG-TRA160003`. The allocation summary shows 26 instances used out of 200 total, 72 cores used out of 664 total, and 183296 MB of RAM used out of 1480000 MB. There are buttons for REMOVE ALLOCATION and CREATE.

Instances

Instance Name	Action
VideoTest	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="button" value="DELETE"/>
tutorial-ip-holder	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="button" value="DELETE"/>
wiki5	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="button" value="DELETE"/>

Hiding 23 instances created by other users

Volumes

Volume Name	Storage Used
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...

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CYBERINFRASTRUCTURE

REGIONAL

COMPUTE
8 Nodes
1,024 Cores
4 TB RAM

STORAGE
869 TB

ACCELERATORS
2 Nodes
1 TB RAM
8 GPUs

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REGIONAL

COMPUTE
8 Nodes
1,024 Cores
4 TB RAM

STORAGE
869 TB

ACCELERATORS
2 Nodes
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8 GPUs

XSEDEnet
Advanced Layer 2
Services (AL2S) platform

TACC CYBERINFRASTRUCTURE

COMPUTE
8 Nodes
1,024 Cores
4 TB RAM

REGIONAL
STORAGE
869 TB

ACCELERATORS
2 Nodes
1 TB RAM
8 GPUs

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PRIMARY

COMPUTE
416 Nodes
53,248 Cores
224 TB RAM

STORAGE

96 Nodes
15 PB

ACCELERATORS

90 Nodes
45 TB RAM
360 GPUs

CORNELL
UNIVERSITY
CYBERINFRASTRUCTURE

REGIONAL

COMPUTE
8 Nodes
1,024 Cores
4 TB RAM

STORAGE
869 TB

Jetstream2 Proposed
Architecture



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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

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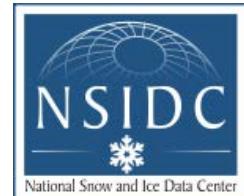
TACC



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