



# **Open OnDemand**

**Supercomputing. Seamlessly. Interactive computing  
with GPUs via Open OnDemand. Everywhere.**

Alan Chalker, Ph.D.

Director of Strategic Programs, OSC

Douglas Holt

Solutions Architect, NVIDIA

# GTC Presentation Agenda



Ohio Supercomputer Center



1. **About Open OnDemand**
2. Open OnDemand Walkthrough
3. GPU Specific Developments
4. Live Demo on a DGX Cluster

**OPEN**  **nDemand**

# Supercomputing. Seamlessly.

## Open OnDemand: Open, Interactive HPC Via the Web

Provides an easy to install and use, web-based access to supercomputers, resulting in intuitive, innovative support for interactive supercomputing.

Features include:

- Fully open-sourced and audited
- Plugin-free web experience
- Easy file management
- Command-line shell access
- Job management and monitoring
- Graphical desktop environments and applications

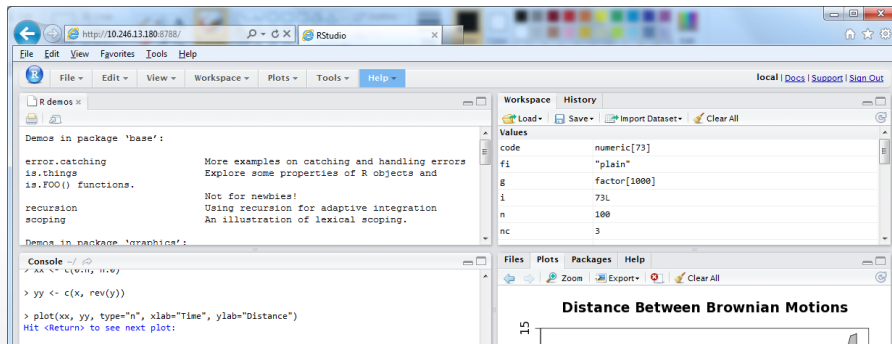


# Interactive Apps

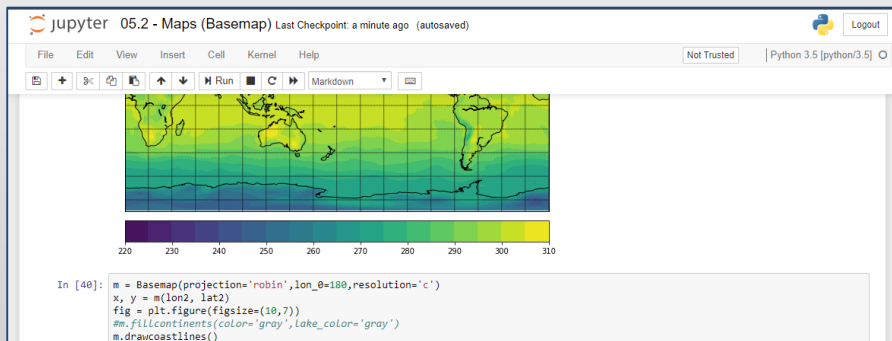
&

# Cluster Access

## RStudio Server – R IDE

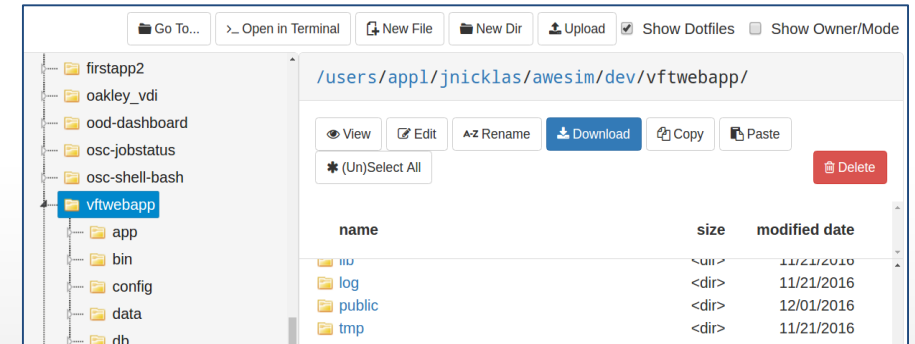


## Jupyter Notebook – Python IDE



And many more, such as ANSYS Workbench, Abaqus/CAE, MATLAB, Paraview, COMSOL Multiphysics

## File Access (browse, edit, etc)



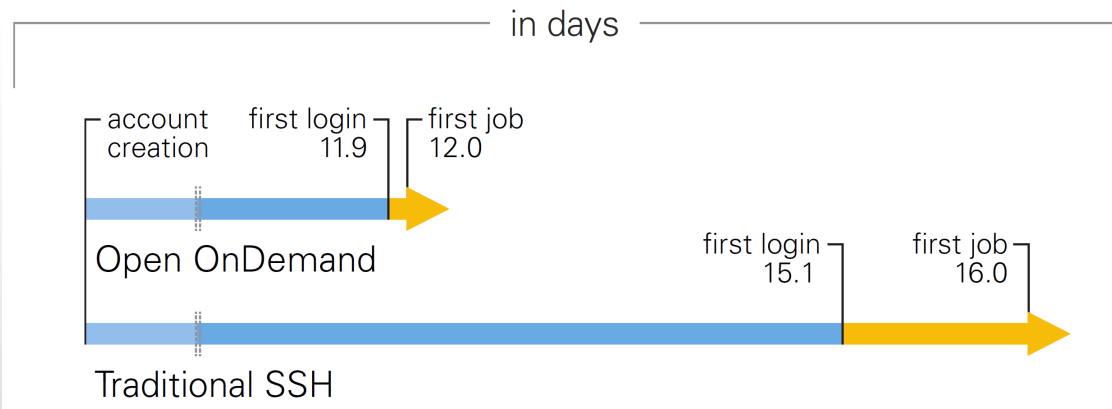
## Manage Jobs (view, submit, etc)

Active Jobs									
ID	Name	User	Account	Time Used	Queue	Status	Cluster		
> 3057900	owe... high_yp_PIV_N_80_PR_1_2_w_tm	osu9725	PAS1136		parallel	Hold	Owens		
> 3130444	owe... RASPA_convert	osu1842	PA40026	140:50:24	serial	Running	Owens		
> 3130446	owe... RASPA_convert	osu1842	PA40026	138:30:25	serial	Running	Owens		
> 3130447	owe... RASPA_convert	osu1842	PA40026	138:09:22	serial	Running	Owens		
> 3133547	owe... high_yp_PIV_N_80_choke_wa_tm	osu9725	PAS1136	17:36:02	parallel	Running	Owens		
> 3137260	owe... Case42	osu8290	PA40008	96:36:34	longserial	Running	Owens		
> 3137285	owe... Case195	osu8290	PA40008	163:01:58	longserial	Running	Owens		
> 3137292	owe... Case261	osu8290	PA40008	165:44:57	longserial	Running	Owens		

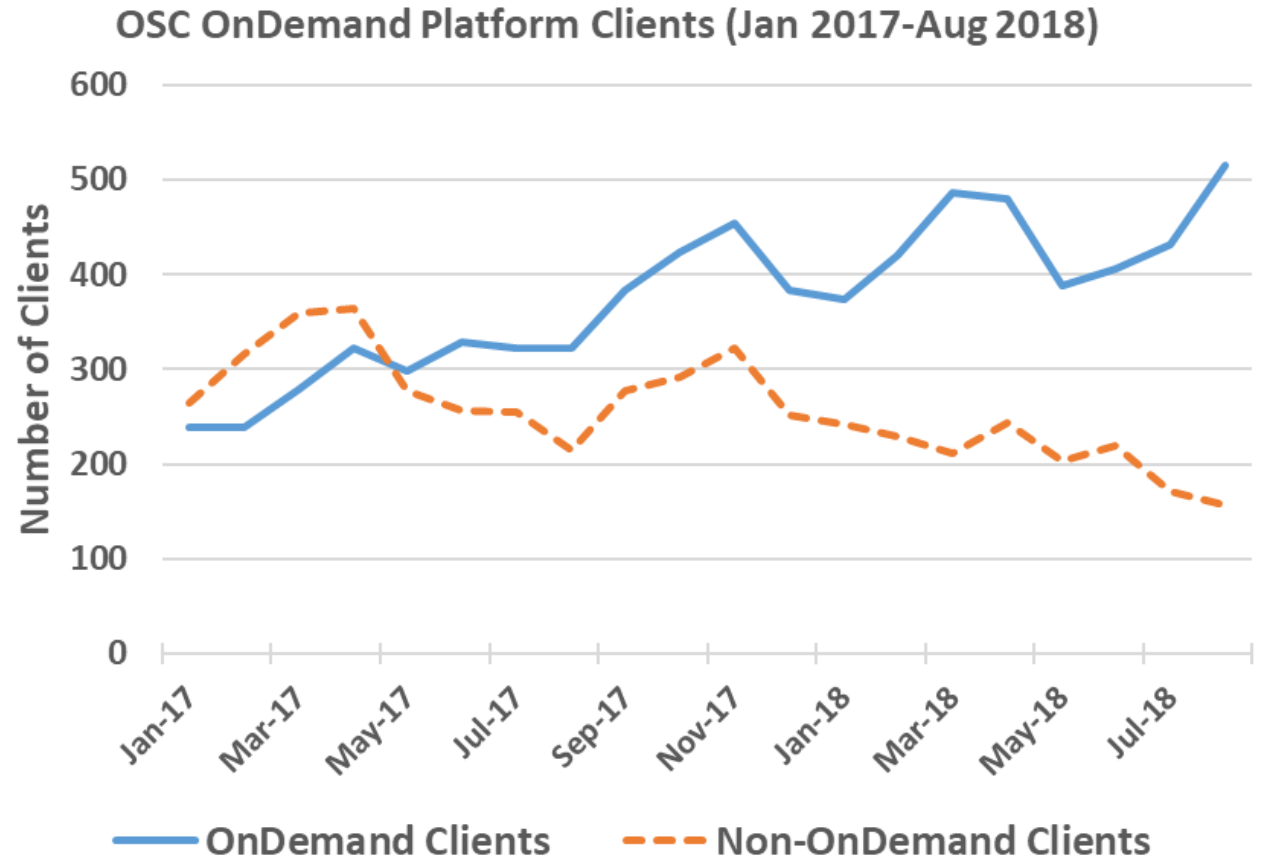
And many more, such as in-browser SSH terminal, job constructors, VNC desktops



# Impact at OSC



OnDemand users start work faster than traditional users, both in terms of first login and job submission



Launched Sep. 2016, % users has steadily increased since launch

# Client Example: HPC aids search for neutrinos

The field of ultra-high energy (UHE) cosmic neutrino experiments has entered an exciting phase of research. They utilize GPUs on OSC systems to analyze large data sets to perform leading searches for UHE neutrinos, run sophisticated simulations to design future experiments with optimal neutrino sensitivity and perform theoretical calculations to interpret the implications of their results.

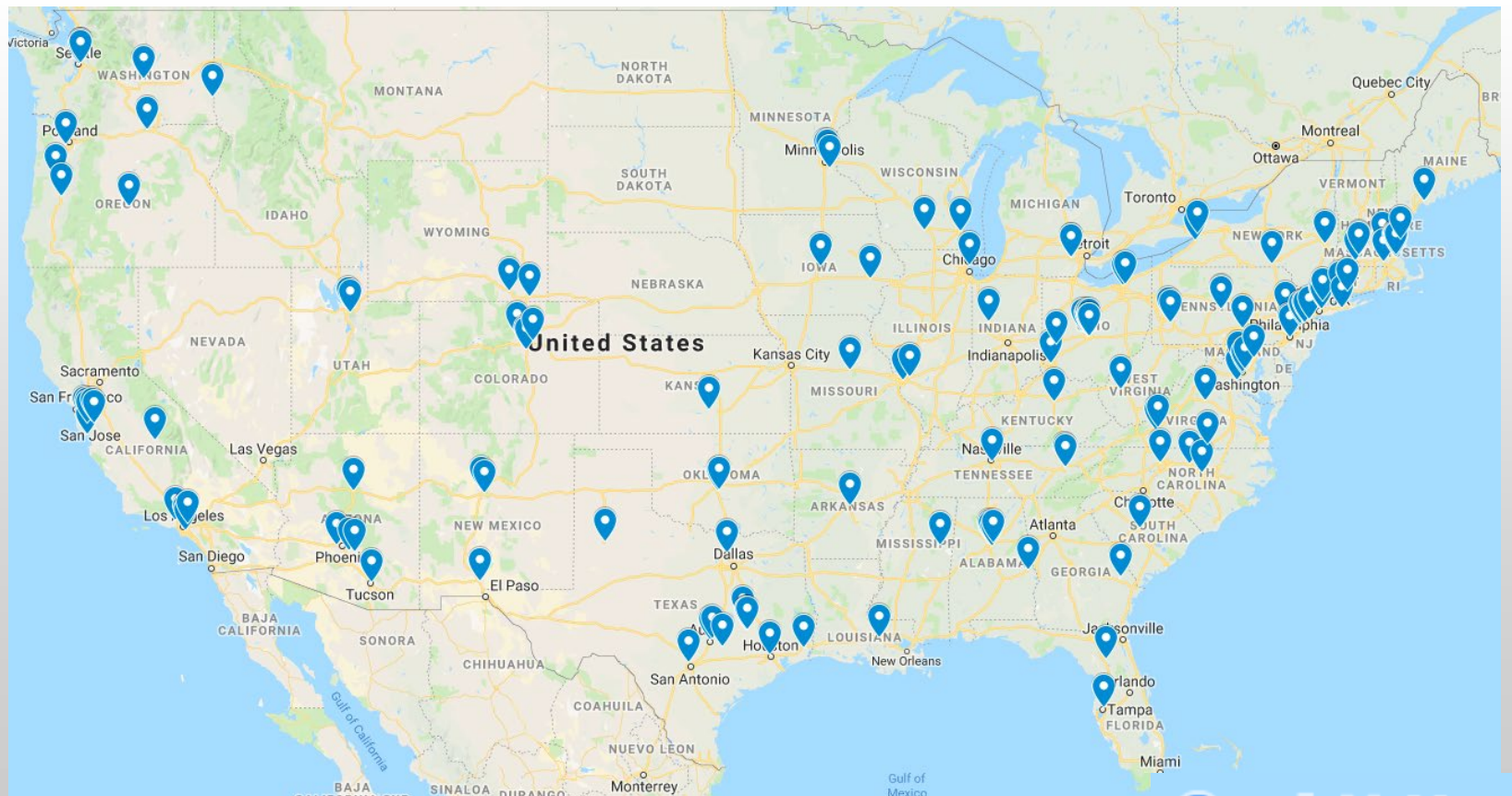


Amy Connolly, Ph.D.  
*The Ohio State University*



# Approx Number of Institutions based on RPM logs

- 136 unique US locations
- 70 unique international locations



- Map data @2019 Google, INEGI, ORION-ME

# Example Current Engagements and Deployments

## Production Deployments



## In Process of Installing

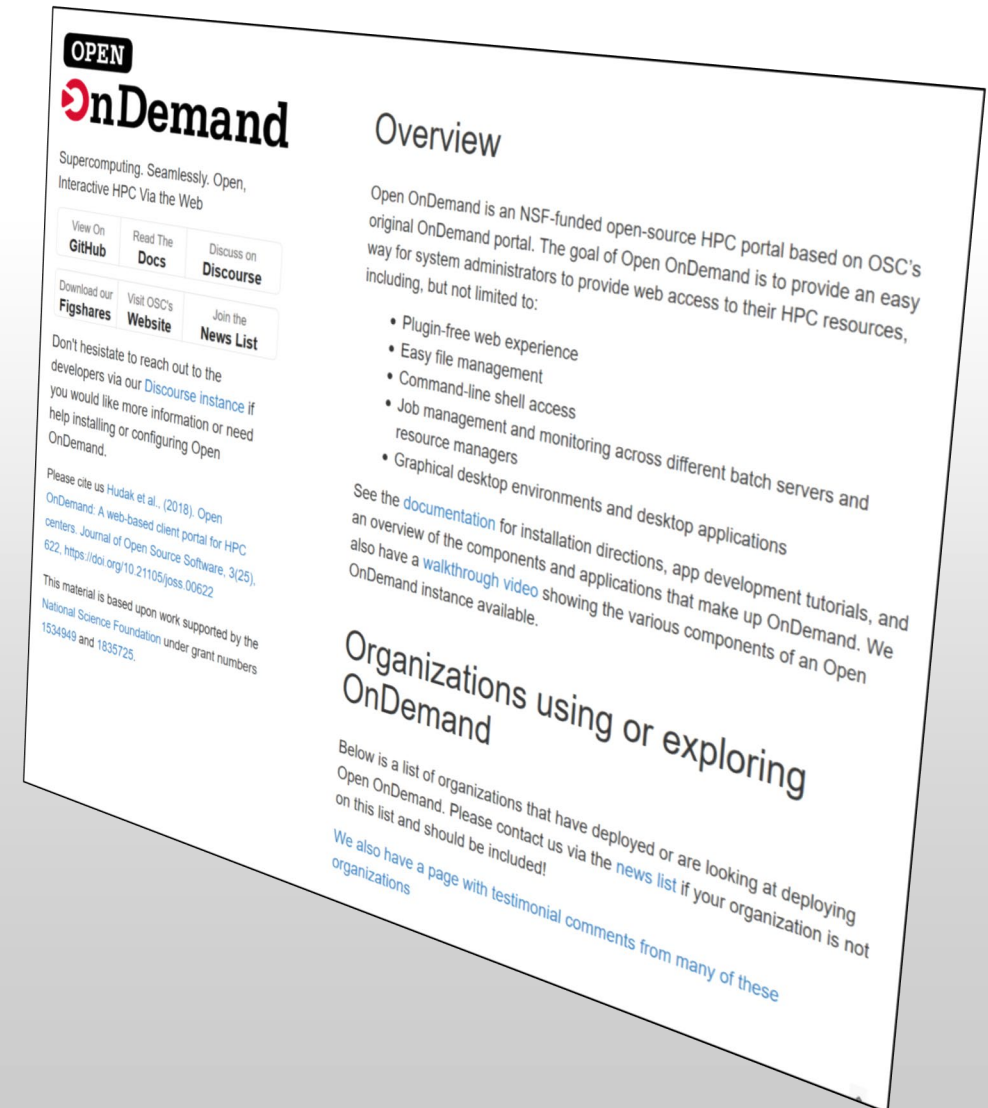




# Find Out More!

## [openondemand.org](https://openondemand.org)

- Use our Discourse instance for help
- Join our mailing list for updates
- Our webinars are roughly quarterly



# NVIDIA Presentation Agenda



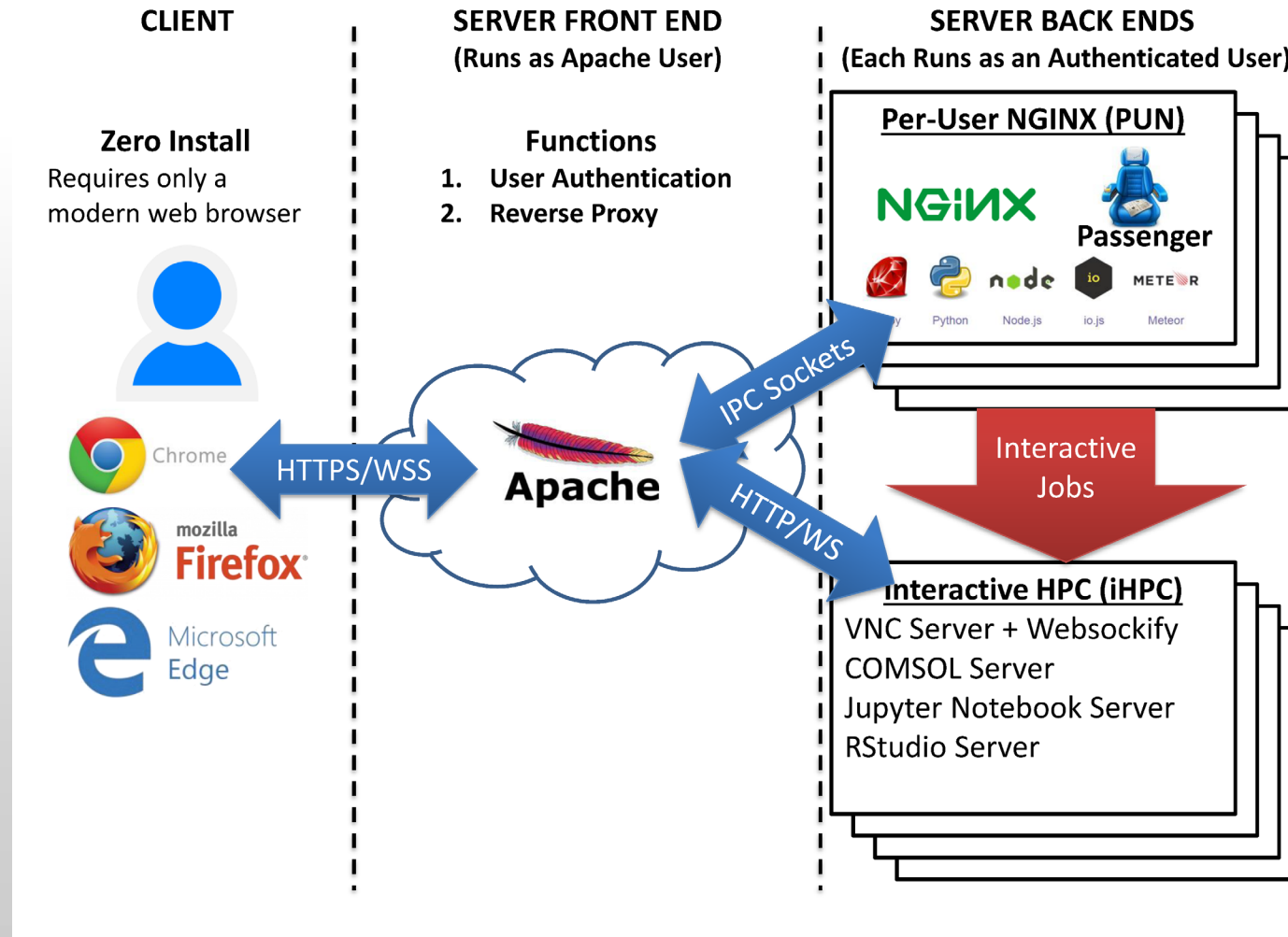
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# Architecture



# Walkthrough – File Explorer

[OSC OnDemand](#)[Files ▾](#)[Jobs ▾](#)[Clusters ▾](#)[Interactive Apps ▾](#)[My Interactive Sessions](#)[Home Directory](#)[/fs/project/PZS0712](#)[/fs/scratch/PZS0712](#)

## Ohio Supercomputer Cen

An **OH-TECH** Consortium Member

### File Explorer

[Go To...](#)[\\_ Open in Terminal](#)[New File](#)[New Dir](#)[Upload](#)☐ Show Dotfiles☒ Show Owner/Mode

#### Home Directory

- 7479989.oak-batch.osc.edu
- 7482682.oak-batch.osc.edu
- 7482705.oak-batch.osc.edu
- Amber\_GPU
- Amber\_test
- Desktop
- Documents
- Downloads
- July17-Bigdata
- Mar0917-Bigdata
- Music

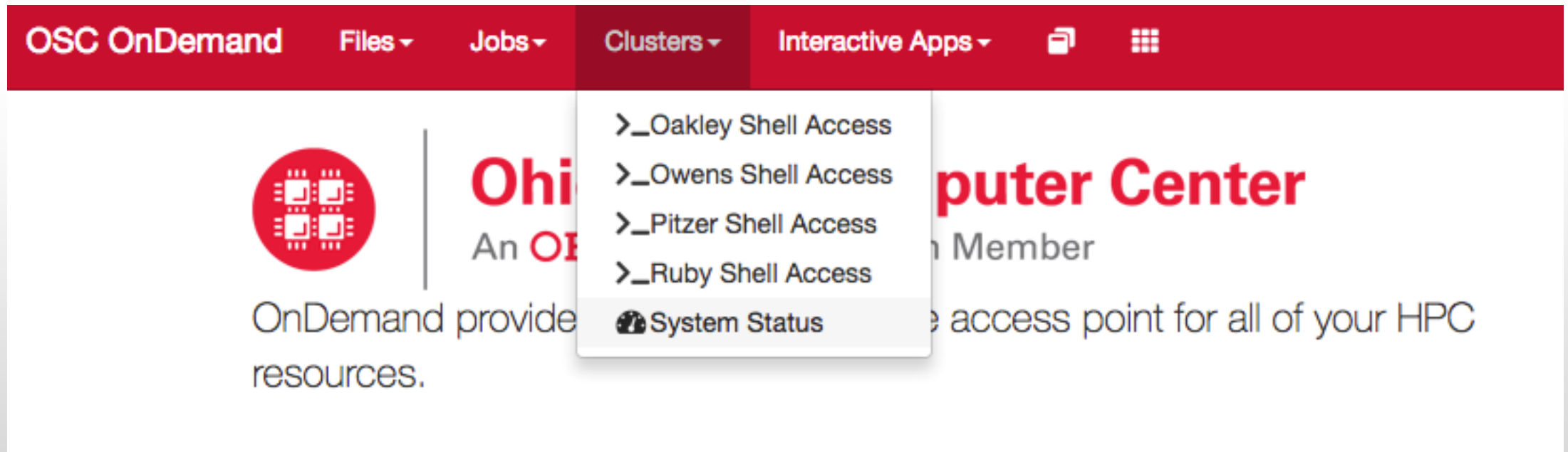
/users/appl/kcahill/

[View](#)[Edit](#)[A-Z Rename](#)[Download](#)[Copy](#)[Paste](#)[\\* \(Un\)Select All](#)[Delete](#)

name	size	modified date	owner	mode
..	<dir>	.	---	---
7479989.oak-batch.osc.edu	<dir>	09/12/2016	20238	rwX r-X r-X
7482682.oak-batch.osc.edu	<dir>	09/12/2016	20238	rwX r-X r-X
7482705.oak-batch.osc.edu	<dir>	09/12/2016	20238	rwX r-X r-X
Amber_GPU	<dir>	05/22/2017	20238	rwX r-X r-X
Amber_test	<dir>	02/06/2017	20238	rwX r-X r-X



# Walkthrough – Clusters



The screenshot shows the OSC OnDemand web interface. The top navigation bar is red with white text for 'OSC OnDemand', 'Files', 'Jobs', 'Clusters', and 'Interactive Apps'. The 'Clusters' menu is open, showing a list of shell access options and a system status link. The main content area features the Ohio State University logo and text about OnDemand resources, with a 'Computer Center' section partially visible.

OSC OnDemand Files Jobs Clusters Interactive Apps

- >\_Oakley Shell Access
- >\_Owens Shell Access
- >\_Pitzer Shell Access
- >\_Ruby Shell Access
- System Status

**Ohio State University**  
An OnDemand provider  
resources.

**Computer Center**  
Member  
access point for all of your HPC


# Walkthrough – Apps

[Home](#) / [My Interactive Sessions](#) / ParaView


## Interactive Apps

### Desktops


 Oakley Desktop

 Owens Desktop

 Ruby Desktop


 Oakley VDI


 Owens VDI

 Ruby VDI

### GUIs

 ANSYS Workbench

 Abaqus/CAE

 COMSOL Multiphysics

 MATLAB

 **ParaView**

## ParaView

This app will launch a [ParaView](#) GUI on the [Owens Cluster](#) using a **shared node**. You will be able to interact with the ParaView GUI through a VNC session.

### Project

You can leave this blank if **not** in multiple projects.

### Number of hours

### Resolution

width	<input type="text" value="1536"/>	px	height	<input type="text" value="864"/>	px
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[Reset Resolution](#)

[Launch](#)

\* All ParaView session data is generated and stored under the user's home directory in the corresponding [data root directory](#).

# Walkthrough – Jobs


OSC OnDemand

Files

Jobs

Clusters

Interactive Apps



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🕒 Active Jobs

⌵ Job Composer

OnDemand provides an integrated, single access point for all of your HPC resources.

## Jobs

+ New Job

From Default Template

From Template

From Specified Path

From Selected Job

☆ Create Template

Open Terminal

Submit

Stop

Delete

Search:

Created

Name

ID

Cluster

Status

September 26, 2018 10:45am

MPI Hello World

Owens

Not Submitted

Job Details

Job Name:

MPI Hello World

Submit to:

Owens

Account:

Not specified

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# System Status with GPUs

## Ruby Cluster Status

163 of 230 Nodes Active (67 Nodes Free)

70.87%

3240 of 4584 Processors Active (1344 Processors Free)

70.68%

8 of 20 GPU Nodes Active (12 Node(s) Free)

40.0%

### 72 Running or Queued Jobs

(and 10 blocked jobs)

Running		66
Queued		6 (0 requesting GPU)

## Pitzer Cluster Status

246 of 259 Nodes Active (13 Nodes Free)

94.98%

8360 of 10520 Processors Active (2160 Processors Free)



79.47%

31 of 32 GPU Nodes Active (1 Node(s) Free)

96.88%

### 1061 Running or Queued Jobs

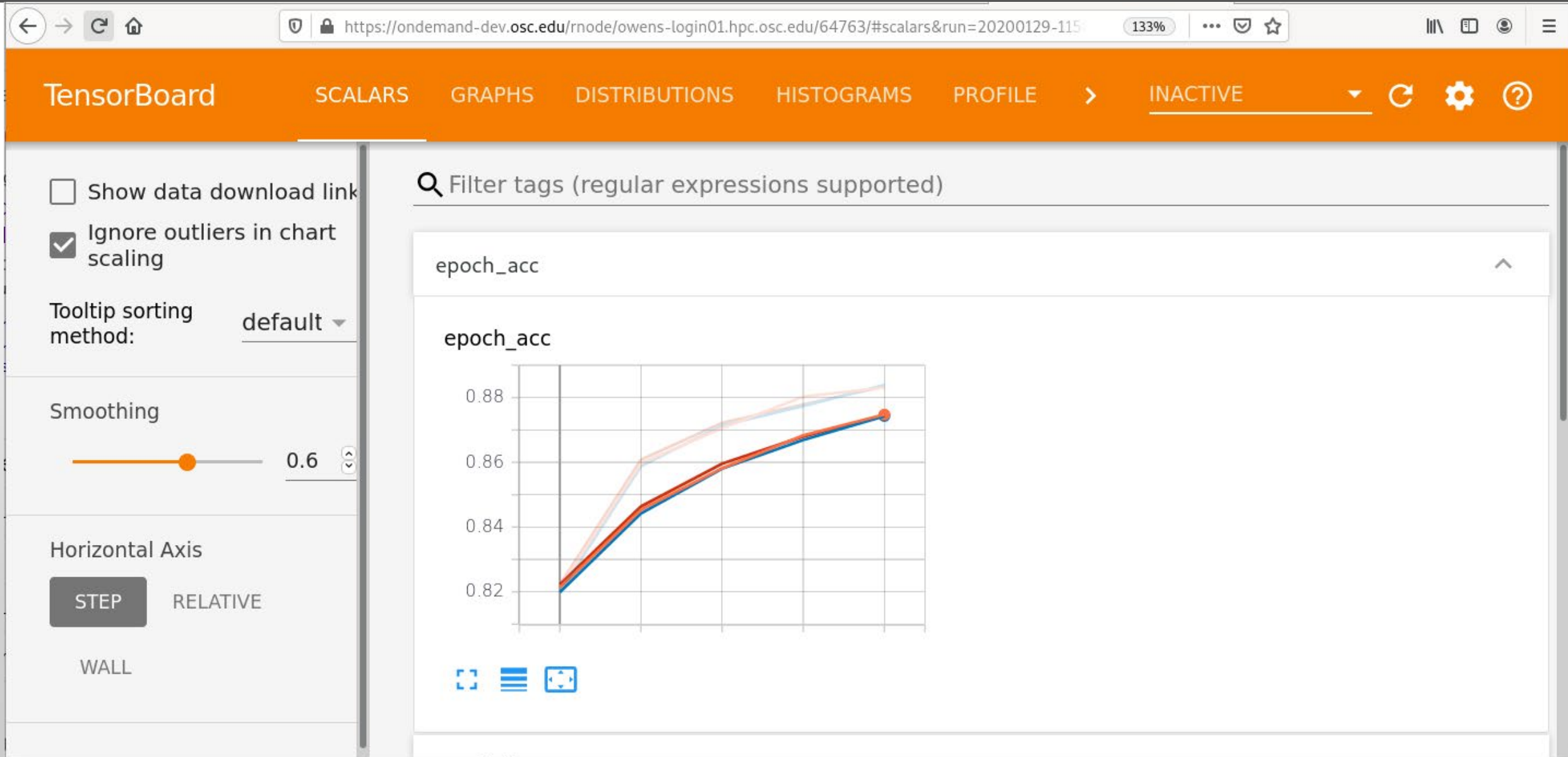
(and 189 blocked jobs)

Running		535
Queued		526 (38 requesting GPU)

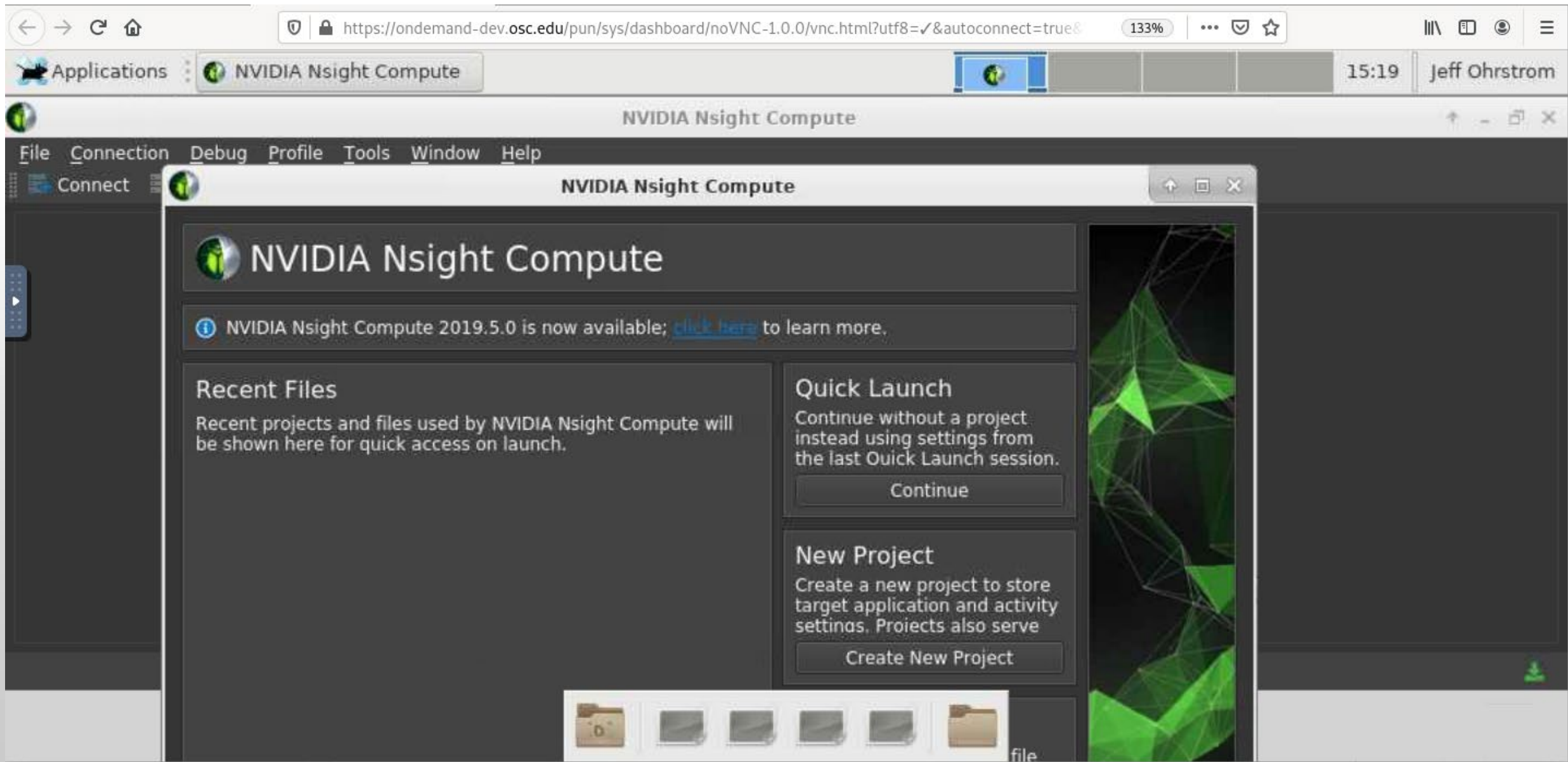
# Tensorboard App (Video)



# TensorBoard App (Screenshot)



# NVIDIA nsight App





# Jupyter with TensorFlow App

The screenshot shows a JupyterLab environment. The top bar includes navigation icons, a browser address bar with the URL `https://ondemand-dev.osc.edu/node/o0562.ten.osc.edu/63629/lab?`, and a zoom level of 133%. Below the top bar is a menu bar with options: File, Edit, View, Run, Kernel, Tabs, Settings, and Help. On the left side, there is a sidebar with tabs for Files, Running, Commands, Cell Tools, and Tabs. The main area displays a code cell with the following text:

```
copy with constraints is deprecated and will be removed in a future version.  
Instructions for updating:  
If using Keras pass *_constraint arguments to layers.  
Train on 60000 samples, validate on 10000 samples  
Epoch 1/5  
60000/60000 [=====] - 14s 239us/sample - loss: 0.4987 - acc: 0.8205 - val_loss: 0.4481 -  
val_acc: 0.8354  
Epoch 2/5  
60000/60000 [=====] - 14s 234us/sample - loss: 0.3829 - acc: 0.8608 - val_loss: 0.3959 -  
val_acc: 0.8596  
Epoch 3/5  
60000/60000 [=====] - 14s 237us/sample - loss: 0.3497 - acc: 0.8710 - val_loss: 0.3743 -  
val_acc: 0.8674  
Epoch 4/5  
60000/60000 [=====] - 14s 235us/sample - loss: 0.3293 - acc: 0.8792 - val_loss: 0.3416 -  
val_acc: 0.8744  
Epoch 5/5  
60000/60000 [=====] - 14s 236us/sample - loss: 0.3131 - acc: 0.8836 - val_loss: 0.3421 -  
val_acc: 0.8780
```

At the bottom of the code cell, there is an input prompt `In [ ]:` followed by a text area for entering new code.

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