Open OnDemand

HPC for everyone

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Ohio Supercomputer Center

University at Buffalo
Center for Computational Research

VIRGINIA TECH

Goals and Objectives

Showcase Open OnDemand for HPC

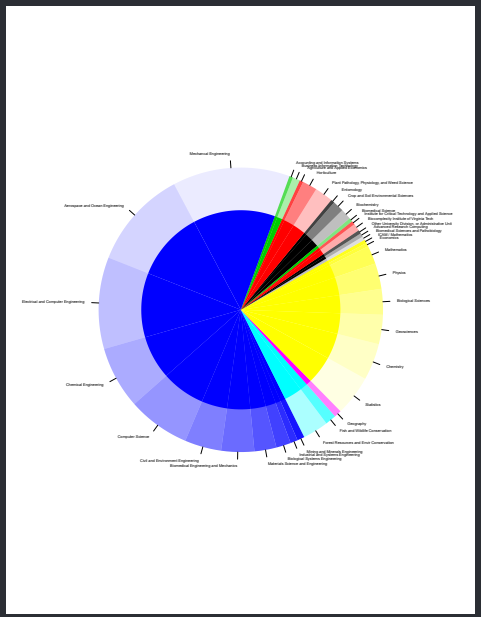
- Introduce ARC at VT
- Discuss HPC barriers
- Introduce OOD
  - features
  - adoption
  - successes
  - roadmap

Advanced Research Computing
Virginia Tech

Unit within the Office of the Vice President of Information Technology.

Goal: Further research by lowering barriers to the use of HPC and Viz

- Centralize resource acquisition, maintenance, and support for research community
- Provide support to facilitate usage of resources and minimize barriers to use
- Enable and participate in research collaborations between departments



Advanced Research Computing

Resources

Heterogeneous clusters supporting many different compute profiles.

934 x86 + 14 Power8 + misc. 7.5 PB BeeGFS, 3 PB GPFS, 275 TB Qumulo

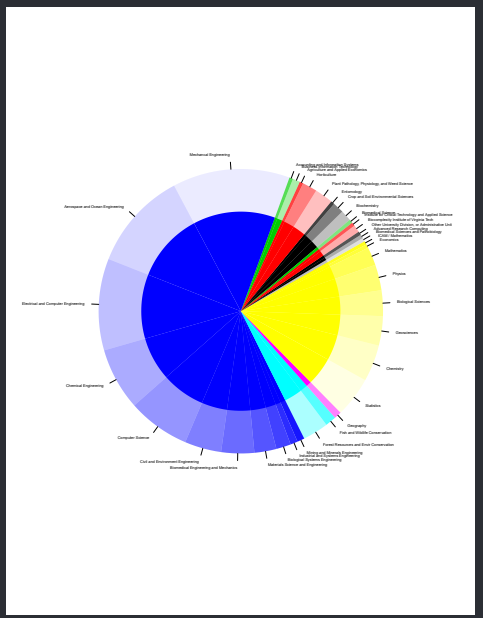
- Ca. 1000 compute nodes split by acquisition generation in 5 clusters
- General X86 compute, x86 + GPU (V100, P100, K80), large mem (3 TB), big data (3 TB local disk + 768 GB RAM), PowerAI (Power8 + 4 P100)
- Visualization resources including 10’ 3D cube, high res wall, more

High Performance Computing
Barriers

Availability of hardware is not an (immediate) issue.

Access and use barriers are largely self-imposed.

- System access: ssh
- Software: no root access, modules
- Data (in/out): ftp, scp, rsync, etc
- Compute configuration, script writing: vi, emacs, etc
- Compute execution: job scheduling



Open OnDemand

Features | Overview

Open, Interactive HPC Via the Web.

Provides easy to use and extend, web-based access to HPC.

Features:

- Plugin-free web experience
- Easy file management
- Command-line shell environment
- Job Management and monitoring
- Graphical desktop environments and applications

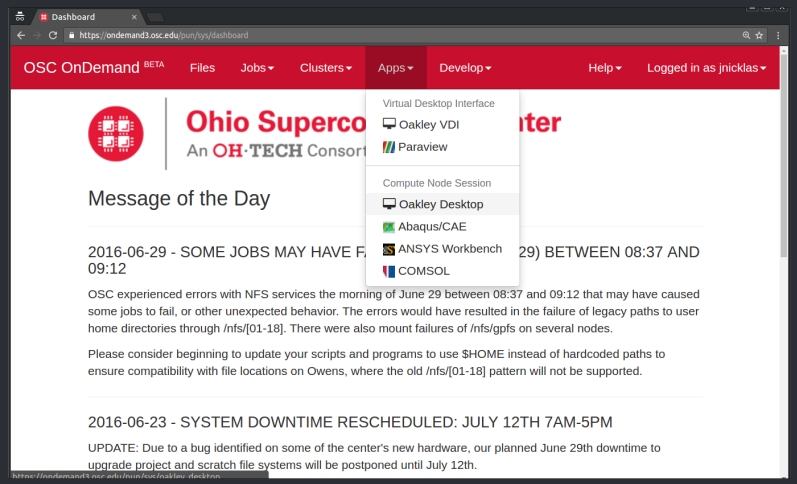
Open OnDemand

Features | Out of the Box

Users come with a modern web browser and HPC credentials.

Open OnDemand provides zero-install and single sign-on solution.

- Landing page
- Files App
- Job Composer App
- Job Monitor



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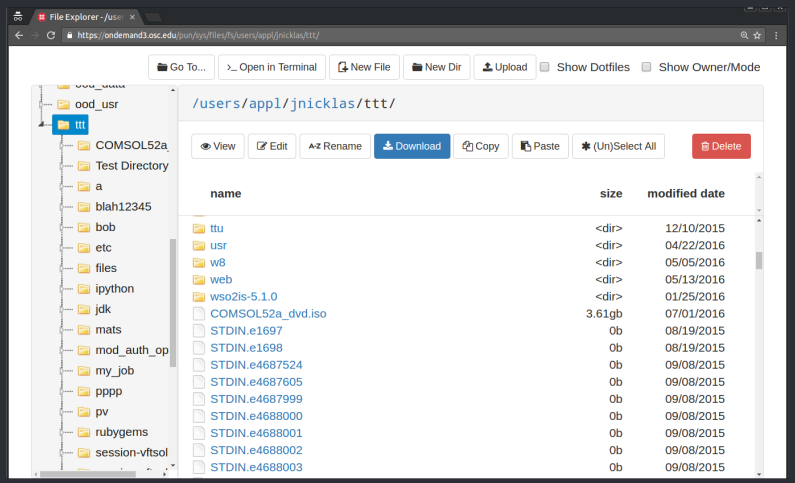
Files App

Command line file management is a formidable barrier.

Open OnDemand gives users a familiar tree based file management tool.

- Tree view
- Drag/Drop transfers
- Web viewer
- Web editor



Combined, this reduces inadvertent file errors.

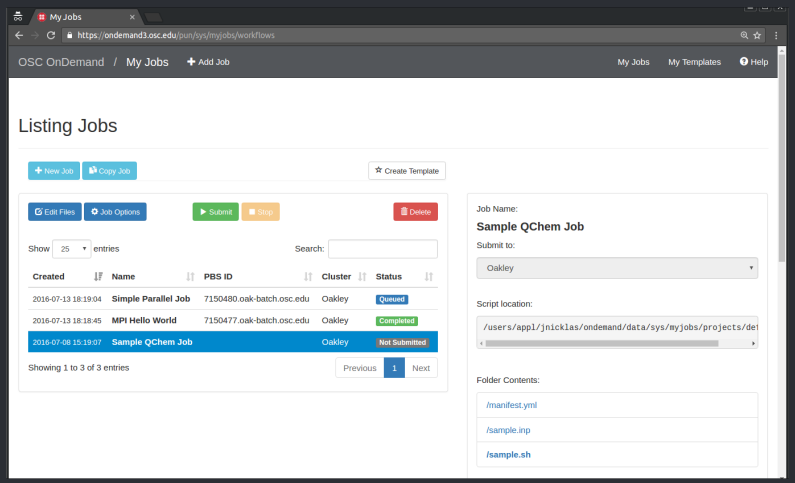
Open OnDemand

Job Composer App

Interaction with schedulers can be both confusing and daunting.

Open OnDemand makes editing and submitting jobs visual.

- Common job workflow:
  - copy previous job
  - edit
  - submit
- Monitor status



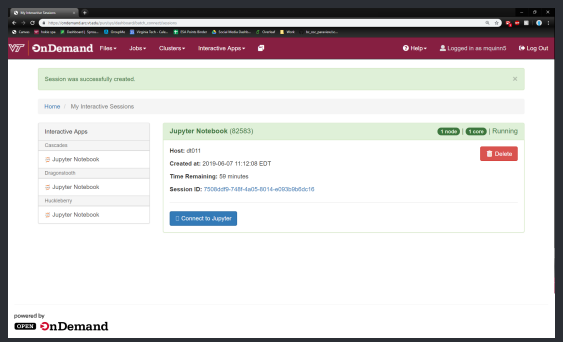
Open OnDemand

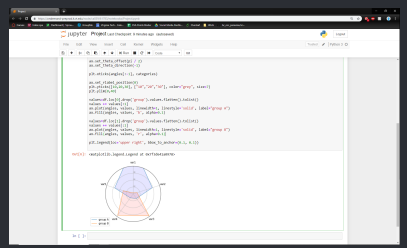
Features | Extensibility I

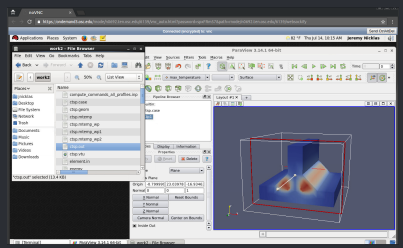
OnDemand uses a plug-in style wrapper to facilitate app development.

Users and sites can develop and share custom apps.

- Jupyter Notebooks
- Matlab
- Rstudio
- ParaView, Comsol, etc





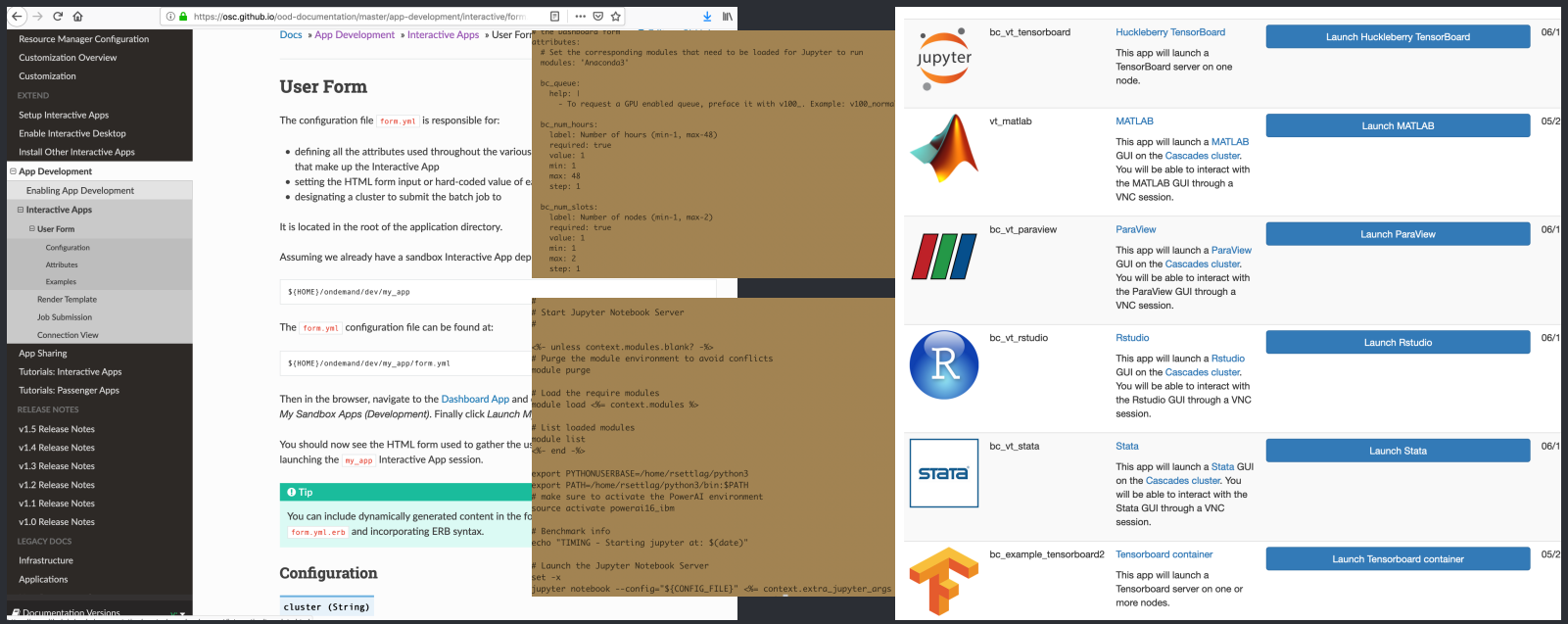


Open OnDemand

Features | Extensibility II

OnDemand has rich documentation.

`http://openondemand.org/`



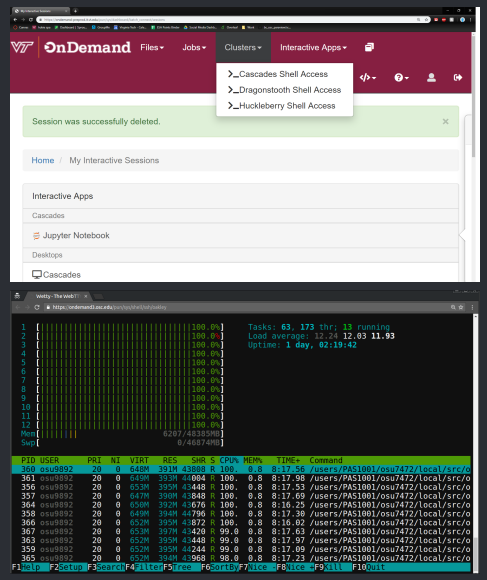
Open OnDemand

Successes | Teaching

Many class settings benefit from HPC as a computing platform.

Simplifying access helps students and instructors alike.

- Platform variability reduced
- Unified view of clusters
- Shell App
- Reduced time to compute
  - pre-OOD full class introduction
  - post-OOD less than 15 min



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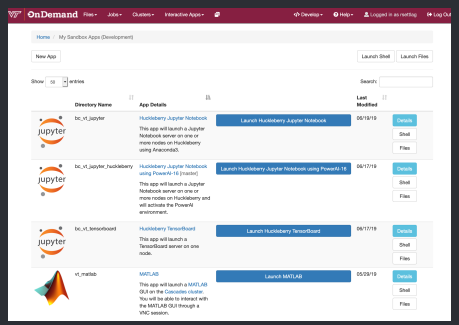
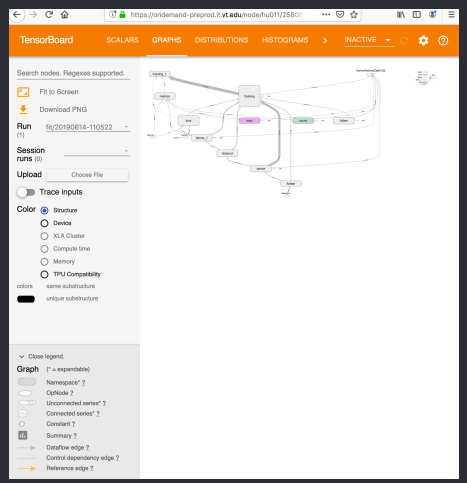
Successes | Hackathon

VT-OpenPOWER Hackathon Spring 2019.

Goal: bring a model and accelerate using PowerAI.

- >50 participants, 2 week
- Many had zero HPC experience
- OOD
  - Shell App
  - Jupyter Notebook with PowerAI
  - TensorBoard via Jupyter





Winning teams showed acceleration and scaling in diverse applications from GANs for CFD, RNNs in game AI, Siamese NN in cell type classification.

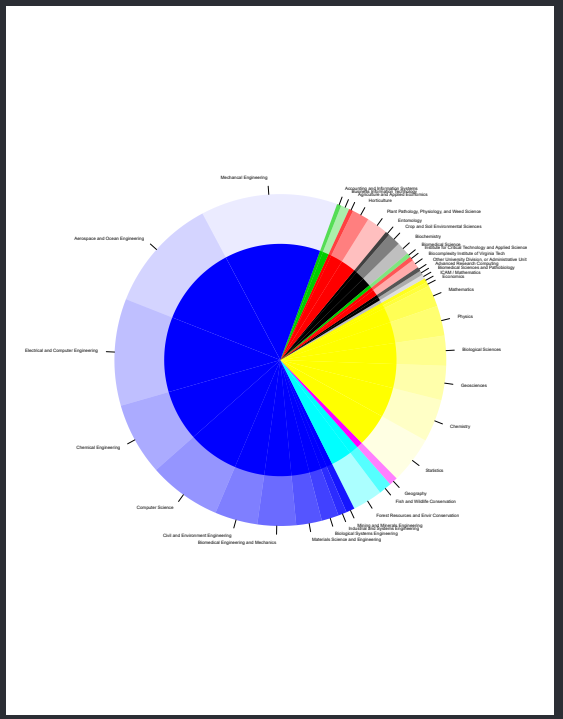
Open OnDemand

Successes | Research

Open OnDemand: HPC for everyone.

Goal: find users with HPC use cases and enable using OnDemand.

- New users
- English
- History
- Statistics
- Biomedicine/Health Care
- Artists

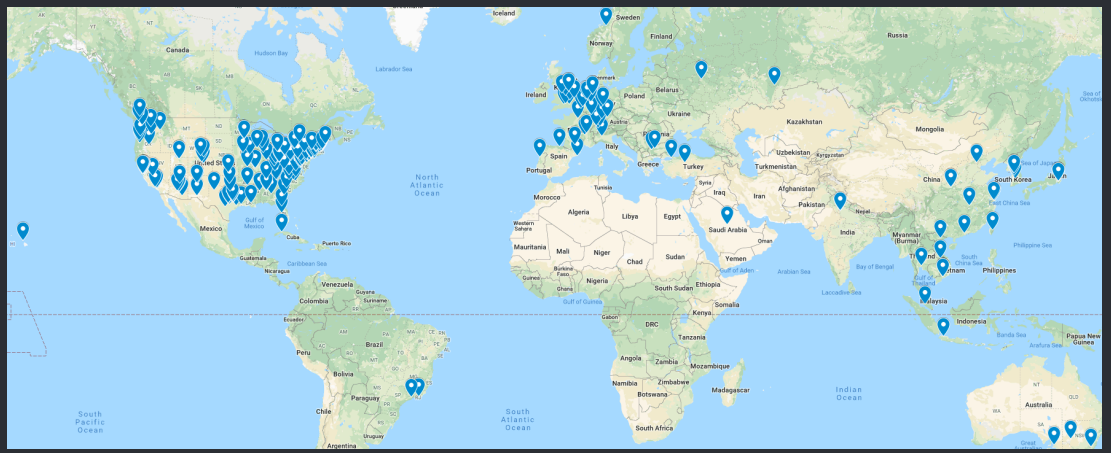


Open OnDemand
Adoption

Open OnDemand is a community driven open source project.

Our current user base is pretty broadly distributed. Unique installations:

- 136 US
- 70 International



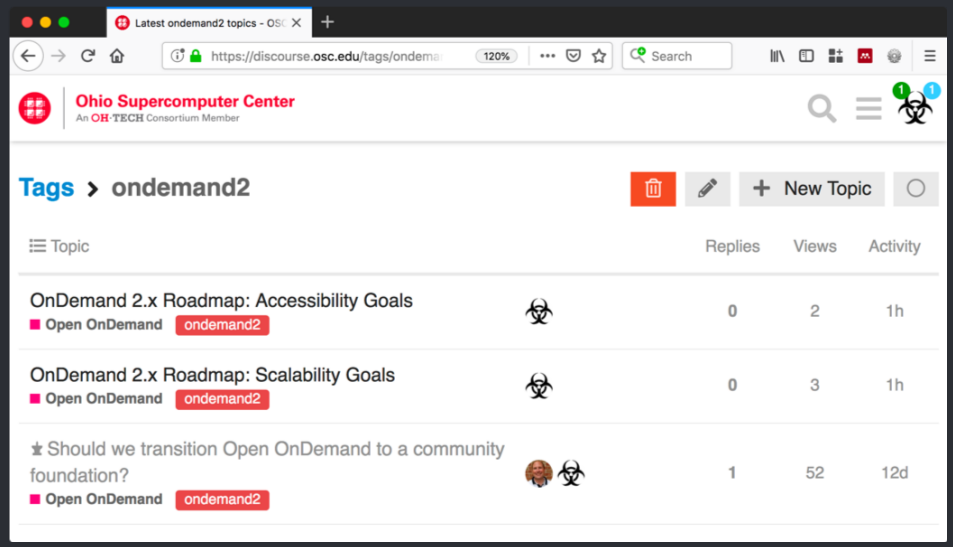
Open OnDemand2

Roadmap

Open OnDemand 2.x, NSF award #1835725

Four focus areas:

- Visibility
- Scalability
- Accessibility
- Engagement



Pinned topics on Discourse.

`https://discourse.osc.edu/tags/ondemand2`

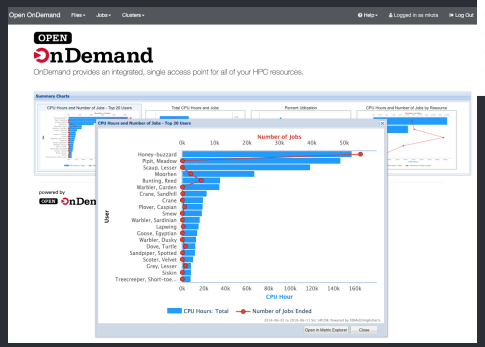
Open OnDemand2

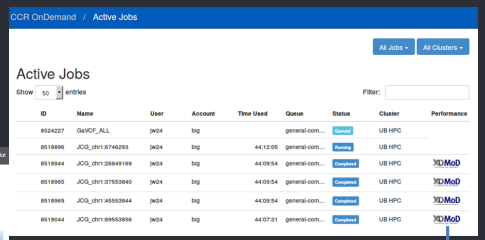
Visibility I

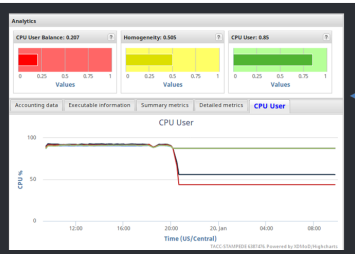
Enhance resource utilization visibility by integrating Open XDMoD.

Providing both novice and seasoned users with more resource utilization metrics will lead to more efficient computes.

- Overall cluster utilization metrics
- System performance
- Individual job performance
- Add GPU utilization







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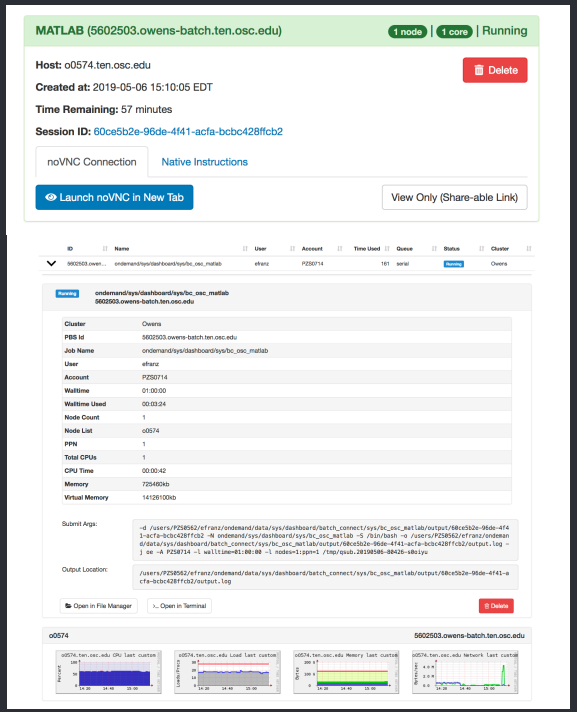
Visibility II

Enhance resource utilization visibility by integrating Open XDMoD.

Real time metrics should also be visible.

- Active job performance
- Add button to connect to job via shell



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Scalability

Support more types of computing resources and software.

Enable less sophisticated users and enhance the veteran power user.

- Enable Git
- Enable pipelines/parameter sweeps
- Extend Files App
- Support spawning VMs in Cloud
- Bring your use case …

Open OnDemand2

Accessibility

Present HPC in a way that makes the computing resources more accessible to more users.

Often this means provide a more familiar interface.

- Further simplification of the Job Composer
- Further increase power of the Job Composer
- Build out more domain specific apps
- Desktop metaphore – completely automate job submission from users desktop
- Can we simplify the app creation process?
- Can we automate software switch discovery?

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Engagement

Open OnDemand is a community project.

We will actively discover new HPC use cases, advocate for the novice user, and ensure the community is engaged.

- Establish community of HPC users
- Establish community of administrators
- Continuously poll the community for development direction
- Establish Science and Client Advisory Group

Questions?

Thank you.