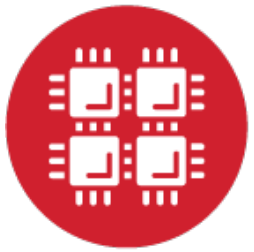


Ohio Supercomputer Center

An OH·TECH Consortium Member

# Open OnDemand:
# 1.0, Jupyter, App Development, & Authentication

Basil Mohamed Gohar

Web and Interface Applications Manager

This work is supported by the National Science Foundation of the United States under the award NSF SI2-SSE-1534949.

# Open OnDemand Overview

- ✓About Open OnDemand
- Open OnDemand 1.0 release
- Open OnDemand 1.1 features
  - Integrating Jupyter
  - Application Development
  - Keycloak and two-factor authentication
- Upcoming and Future

# About Open OnDemand

- Open source software project
- Installable for an HPC cluster (or clusters)
  - Standalone system, Lab, Department, University or National Resources
- More than just an “out of the box” solution
  - OnDemand is a platform that can be extended through additional and custom apps

# Open OnDemand Features

- Single point of entry for HPC Center's services
- User needs three things
  - URL:  ood.osc.edu
  - Username
  - Password
- Zero install (Completely browser based)
- Single sign-on
- Firewall friendly (Keep traffic on https port)

# Open OnDemand Timeline

- 2016Q4
  - OSC OnDemand 3.0 released
    - First usage of Open OnDemand
  - Beta testing at external sites begins
- 2017Q1
  - First public, fully installable release
  - First webinar
- 2017Q2
  - Second webinar
- 2017Q3
  - Open OnDemand 1.0 Release
  - Third webinar

# Open OnDemand Overview

- ✓About Open OnDemand
- ✓Open OnDemand 1.0 release
- Open OnDemand 1.1 features
  - Integrating Jupyter
  - Application Development
  - Keycloak and two-factor authentication
- Upcoming and Future

# Open OnDemand 1.0 – Main Features

- Apps
  - Cluster Access
  - Gateway
  - Interactive HPC (iHPC)
- Authentication

# Open OnDemand – Let's talk about apps

- Open OnDemand functionality is presented through apps
  - Files browser, My Jobs, Desktop, Jupyter, and others all exist as apps within Open OnDemand
  - Open OnDemand supports different types of apps
    - Cluster Access
    - Gateway
    - iHPC

# Open OnDemand Apps – Cluster Access

- They grant access to cluster services as would be available on a login node
  - e.g., shell, file access, job status
- Run on OnDemand server
- They do not typically submit jobs

# Open OnDemand Apps – Gateway

- These are apps that provide some more advanced functionality, typically while also interacting with the batch system
  - My Jobs
- They handle workflows
- They submit jobs and provide some basic job management functionality for their own jobs

# Open OnDemand Apps – iHPC

- iHPC apps are interactive apps that typically execute fully within a job
- They allow a client to interact with a running job and perform their work on the compute hardware directly
- Examples
  - Desktop, Jupyter

# Open OnDemand 1.0 – Apps

- Cluster Access
  - Dashboard, Files, Editor, Terminal, Active Jobs
- Gateway
  - My Jobs
- iHPC
  - Desktop

# Open OnDemand 1.0 – Authentication

- HTTP Basic Auth
- Community solutions
  - Shibboleth
  - Open ID Connect
    - CILogon
    - Keycloak

# Open OnDemand Overview

- ✓About Open OnDemand
- ✓Open OnDemand 1.0 release
- Open OnDemand 1.1 features
  - ✓Jupyter Integration
  - – Application Development
  - – Keycloak and two-factor authentication
- Upcoming and Future

# Open OnDemand 1.1 Features

- Next planned release of Open OnDemand
- Should be released this month (September 2017)
- Features discussed today
  - Jupyter app example install
  - Application development
  - Keycloak & two-factor authentication

# Jupyter Integration

- Why Jupyter?
  - A well-known web application frequently used in scientific computing
  - Allows users to create & share live examples including code, equations, and more
- Example of a class of “full web apps” managed by Open OnDemand
  - Other examples include RStudio, COMSOL Server
- Open OnDemand handles authentication and per-user environment and session management
- See Dr. David Hudak’s presentation on Open OnDemand for more Jupyter examples
  - https://youtu.be/UCmzwV37Ta4?t=2521

# Jupyter Example (Integration Plotting)

Goals:

- Launching and connecting to Jupyter Notebook Server on a compute node
- Uploading an iPython notebook file (`example-integrate.ipynb`) to your home directory
- Opening and running the notebook file

# Open OnDemand Overview

- ✓About Open OnDemand
- ✓Open OnDemand 1.0 release
- Open OnDemand 1.1 features
  - ✓Integrating Jupyter
  - ✓Application Development
  - – Keycloak and two-factor authentication
- Upcoming and Future

# Why care about apps?

- We would never be able to write all the apps everyone will ever need.
- The vision of Open OnDemand is to provide a platform on which further apps can be developed beyond what we ourselves can do
- Each center knows best what their clients needs, we can only anticipate in the most general terms
  - Custom apps can greatly extend the utility and usefulness of Open OnDemand

# Application Development

- Extend Open OnDemand with your own custom applications
- New toggleable development menu
  - Restart apps
  - Access documentation (configurable)
  - Clone, edit, & test your own apps in the new sandbox development environment

# Application Development

- Interactive demo
  - ps example app converted to quota app

# Open OnDemand Overview

- ✓About Open OnDemand
- ✓Open OnDemand 1.0 release
- ✓Open OnDemand 1.1 features
  - ✓Integrating Jupyter
  - ✓Application Development
  - ✓Keycloak and two-factor authentication
- Upcoming and Future

# Authentication in OnDemand

- Apache is the entry point
- For each authentication mechanism you must:
  1. configure apache to protect resources via authentication
  2. configure apache to map authenticated user to system user
- Any method of configuring Apache for authentication can potentially be used for Open OnDemand

# Authentication: 2 currently supported options

- Basic auth via mod_authnz_ldap
- Federated authentication
  - Two popular kinds
    - Shibboleth via mod_shib
    - OpenID Connect via mod_auth_oidc
  - Available via
    - Campus wide authentication (Shibboleth or OpenID Connect or CILogon)
    - Local identity provider (run your own IDP server configured against LDAP)

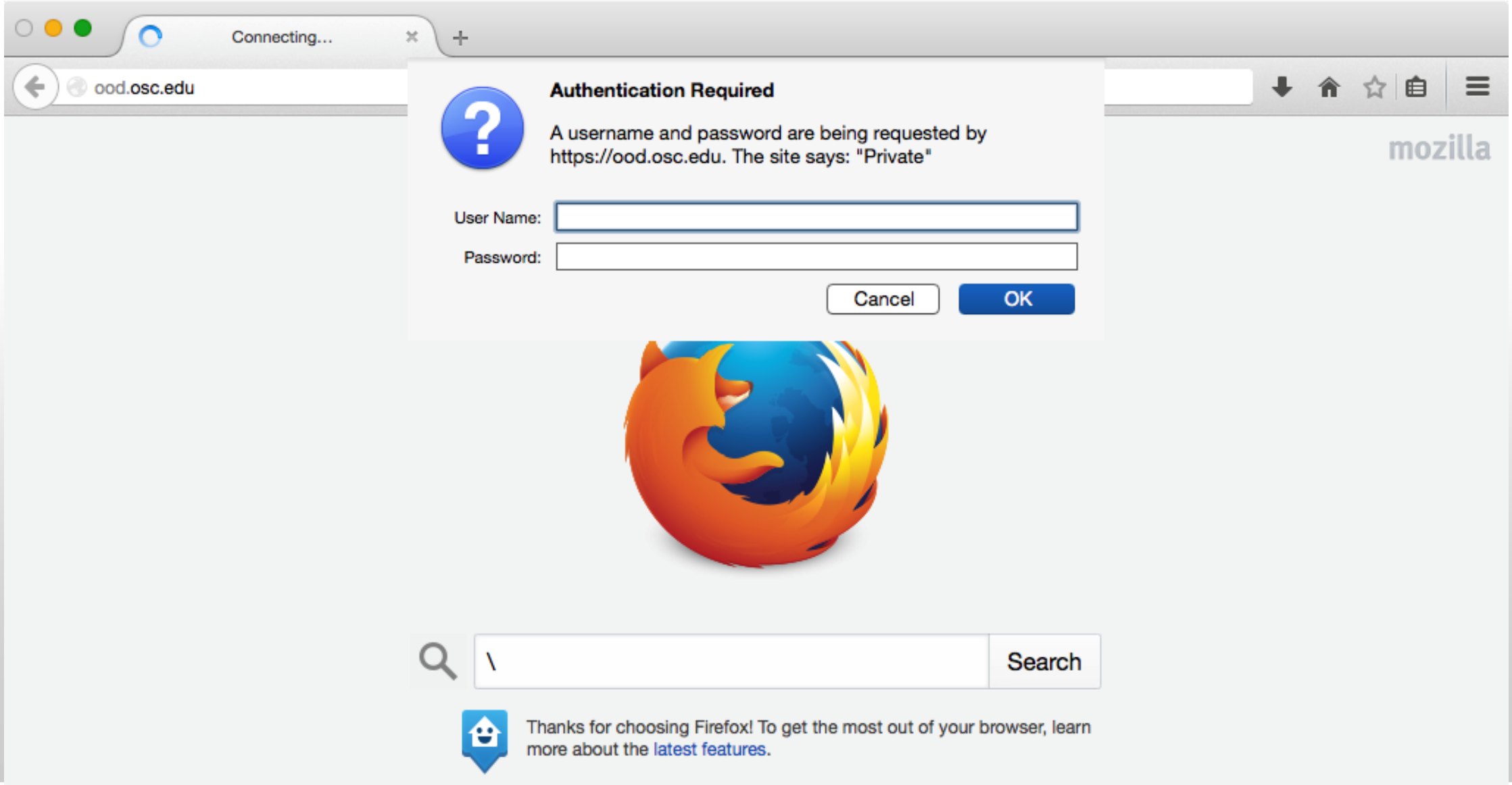
# Federated Authentication: example deployments

- Two outside institutions are working with Open OnDemand and have configured it with pre-existing federated authentication systems
- OSC previously used a local Shibboleth IDP for our AweSim Open OnDemand portal
- OSC also uses CILogon to make use of OSU's Campus wide authentication
- OSC now uses OpenID Connect for both AweSim and OSC OnDemand via a locally installed KeyCloak server
- We plan to provide basic documentation on these options in the future
- We will provide detailed documentation on setting up a KeyCloak server as a local IDP in Open OnDemand 1.1

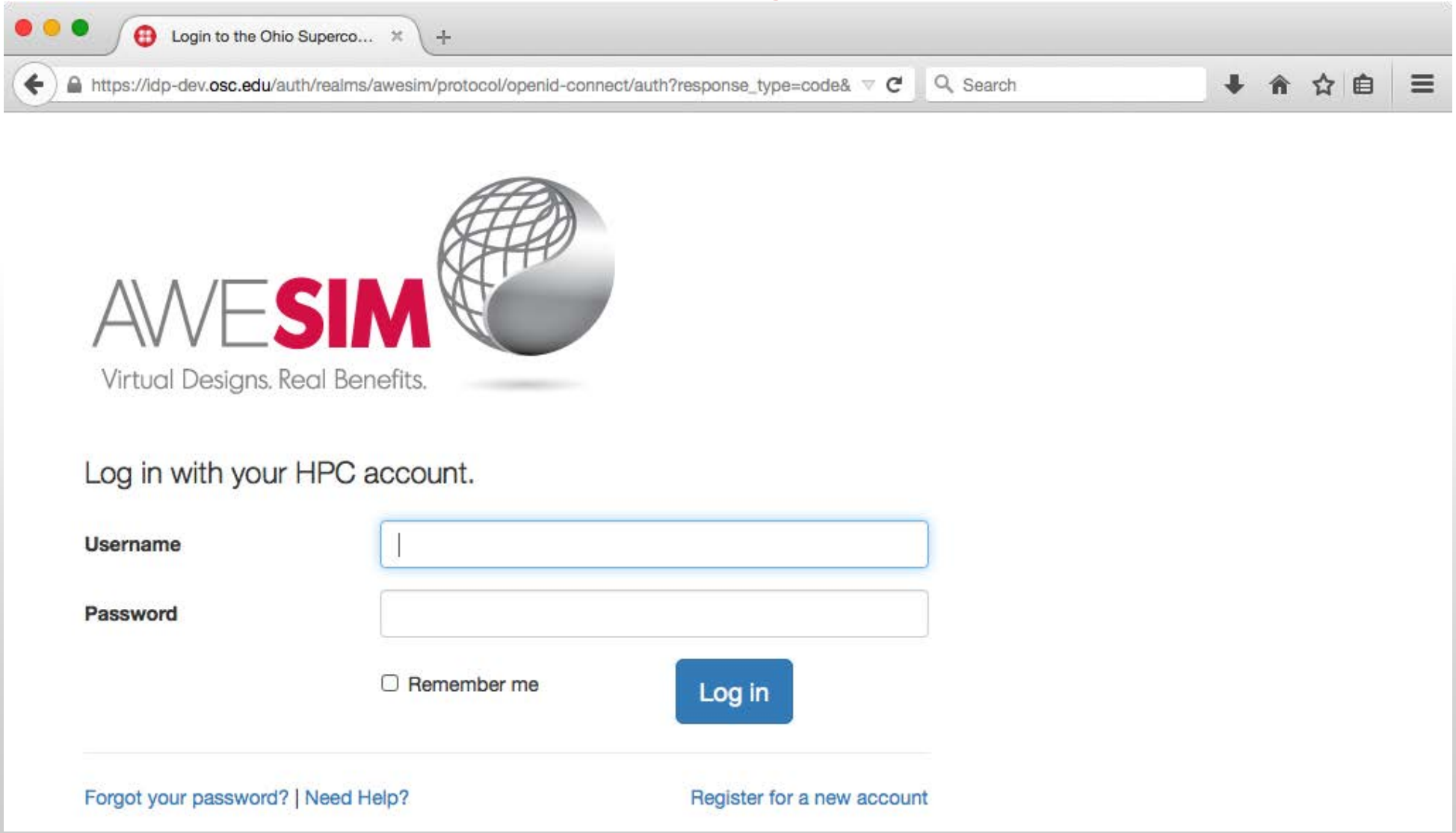
# Federated Authentication via KeyCloak vs Basic Auth

- Basic Auth drawbacks
  - Each request includes username and password
  - Slow: each request makes request to LDAP server
  - Logout only possible client side by closing browser
  - Safari bug preventing web socket connections (breaks OOD Terminal app)
- Keycloak benefits
  - Session based authentication (via OpenID connect)
  - Branded login
  - 2 Factor Authentication support out of the box with Google Authenticator and Redhat's FreeOTP
  - 2FA can be per user or enforced for every user

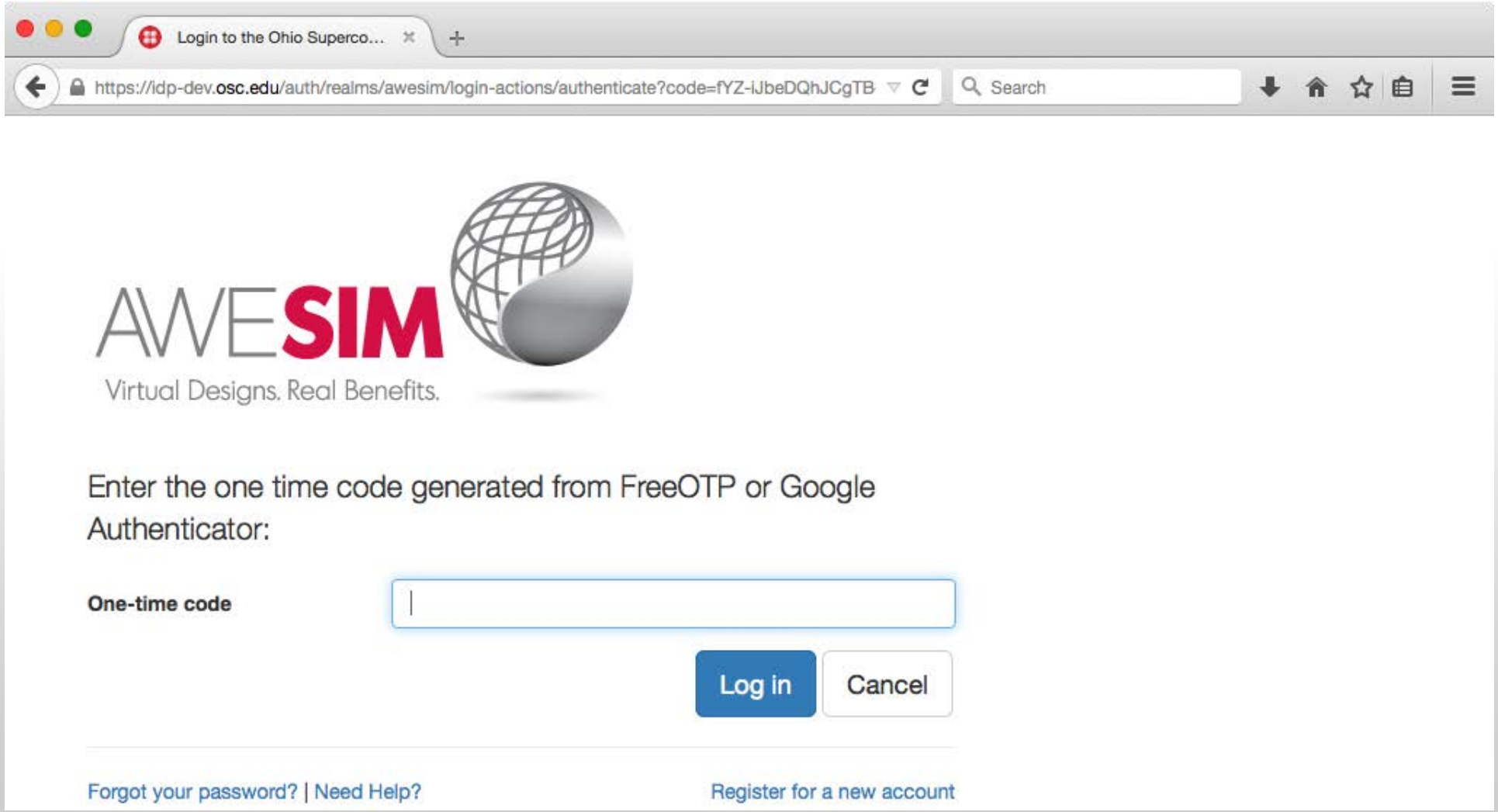
# Basic Auth Screenshot



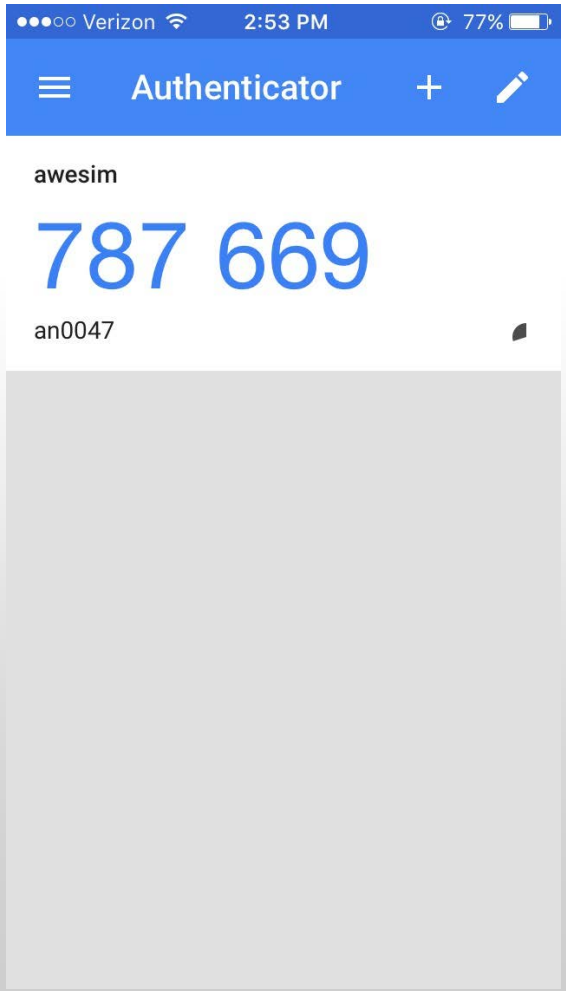
# KeyCloak Screenshot 1: branded login



# KeyCloak Screenshot 2: 2FA/OTP



# KeyCloak Screenshot 3: 2FA/OTP iOS apps




# KeyCloak considerations

- Drawbacks with the complexity of installation and branding
  - Requires separate host, Apache reverse-proxy configuration, SSL certificate
  - May require a separate database and system user/group
  - mod_auth_openidc needs to be compiled against httpd24
  - Keycloak theme added and modified
  - No duo support for 2FA built in
- Are these actually drawbacks? Feedback would be helpful.
- Solutions we are investigating include
  - Simplifying KeyCloak installation by automating or workaround some of these steps
  - Build a custom duo plugin to KeyCloak
  - Build a custom Apache authentication module for a simpler non-federated option

# Open OnDemand Overview

- ✓About Open OnDemand
- ✓Open OnDemand 1.0 release
- ✓Open OnDemand 1.1 features
  - ✓Integrating Jupyter
  - ✓Application Development
  - ✓Keycloak and two-factor authentication
- ✓Upcoming and Future

# Upcoming and Future

- Gateways 2017 Demo – Come meet us!
  - Demo: Developing Apps to Extend Open OnDemand
  - Tuesday, October 24 • 12:55pm - 2:20pm
  - http://sched.co/Bl3h
- Upcoming & planned features
  - Globus Online integration
  - Open XDMoD integration
  - Packaging and simpler installation
- Suggestions?

# Get Engaged and get Open OnDemand!

- Open OnDemand is installed or being explored at more than half a dozen external sites
- We are happy to work with you getting Open OnDemand installed at your site too

# Next Webinar/Staying in Touch

- Our webinars are planned roughly quarterly
  - Let us know what you'd like to learn about next
- Visit our website
  - https://osc.github.io/Open-OnDemand/
- Join our mailing list
  - https://lists.osu.edu/mailman/listinfo/ood-users
- Get Open OnDemand!
  - https://github.com/OSC/Open-OnDemand

# Thank you!  Any questions?

Basil Mohamed Gohar

Web and Interface Applications Manager

Ohio Supercomputer Center

bgohar@osc.edu

https://osc.github.io/Open-OnDemand/  go.osu.edu/ood