

# Ohio Supercomputer Center

An **OH·TECH** Consortium Member

## Open OnDemand: A Unified Platform for Developing and Serving Gateway Apps

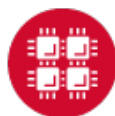
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Eric Franz, Brian McMichael, Basil Gohar,  
Troy Baer, Trey Dockendorf, Katherine Cahill

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



## Outline

- Open OnDemand Project
- Open OnDemand Apps
- Science Gateway App Examples



# Open OnDemand Review

- The Open OnDemand software project
  - Goals, status
- OnDemand Functionality
  - File Browser and Editor
  - Job Control
  - Terminal Access
  - Desktop Access
- OnDemand usage at OSC



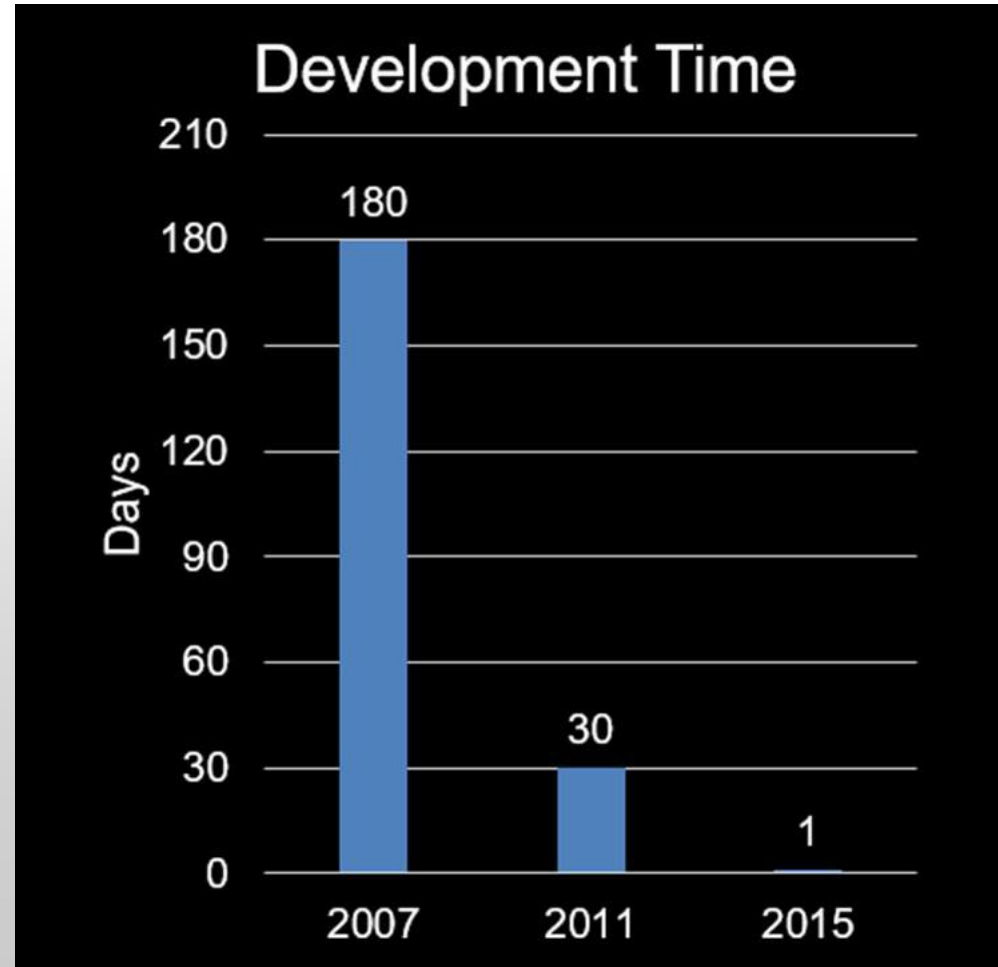
# Open OnDemand Apps

- OnDemand Apps encapsulate workflow and expertise
- OnDemand users create and share apps
  - Similar in spirit to HubZero Tools and Galaxy Workflows
- OnDemand App Tools
  - App Kit: Development tools including libraries and templates
  - App Sharing: Peer-to-peer app distribution



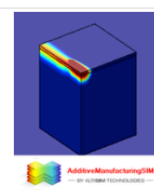
# Build Gateways with Open OnDemand

- Build Gateways fast
  - App Kit libraries and templates
  - No need for additional web deployment
  - No new user accounts
    - Uses existing HPC system accounts
- Build Gateways different
  - “Plug in” existing tools from the platform
    - File Browser, Editor, Terminal, VNC



# Proven Development Platform

- Five developer teams have built over 30 apps in the last 18 months



This application simulates the transient thermal history of the Powder Bed Fusion Additive Manufacturing process for a range of geometries, materials and laser beam parameters.

Details



Automotive App provides drag prediction capability for external vehicle simulations of automotive applications.

Details



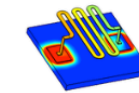
Axial Fan App generates high-fidelity performance predictions for uploaded fan designs across the entire fan curve.

Details



Leverage the processing power of HPC to render single or multi-frame blender scenes.

Details



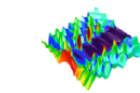
BolometerSIM solves the thermo-electric problem of an infra-red bolometer device. Incident radiation causes a temperature rise in a thermally insulated conducting absorber mounted on an insulating dielectric heat sink.

Details



Datacenter Cooling App provides easy-to-use thermal analysis for any datacenter layout and configuration.

Details



EMMirrorSIM calculates the reflectance of a dielectric mirror consisting of a number of identical dielectric bi-layers with high and low refractive indices.

Details



FillSIM applies OpenFOAM® computational fluid dynamics (CFD) to simulate the filling of a container with a fluid using a simple web portal user interface hosted at the Ohio Supercomputer Center (OSC).

Details



Fixed-Wing UAV app provides flow-field prediction capability for fixed-wing UAV designs of any scale and configuration.

Details



Flow Bench App allows users to run their geometry through a "virtual flow bench" and measure the flow rate or pressure drop through the device.

Details



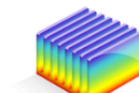
The FSAE Sim App gives students designing Formula SAE cars the ability to easily perform Aerodynamic analysis on their designs using Computational Fluid Dynamics (CFD) simulations in a "Virtual Wind Tunnel".

Details



FSAE Structure Optimizer gives students designing Formula SAE cars the ability to easily perform topology optimization on their designs.

Details



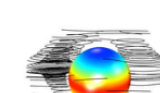
HEATSINKSIM BY ALTRISIM TECHNOLOGIES



HVAC BY: TOTALSIM US



MARINE BY: TOTALSIM US



MieSIM BY ALTRISIM TECHNOLOGIES

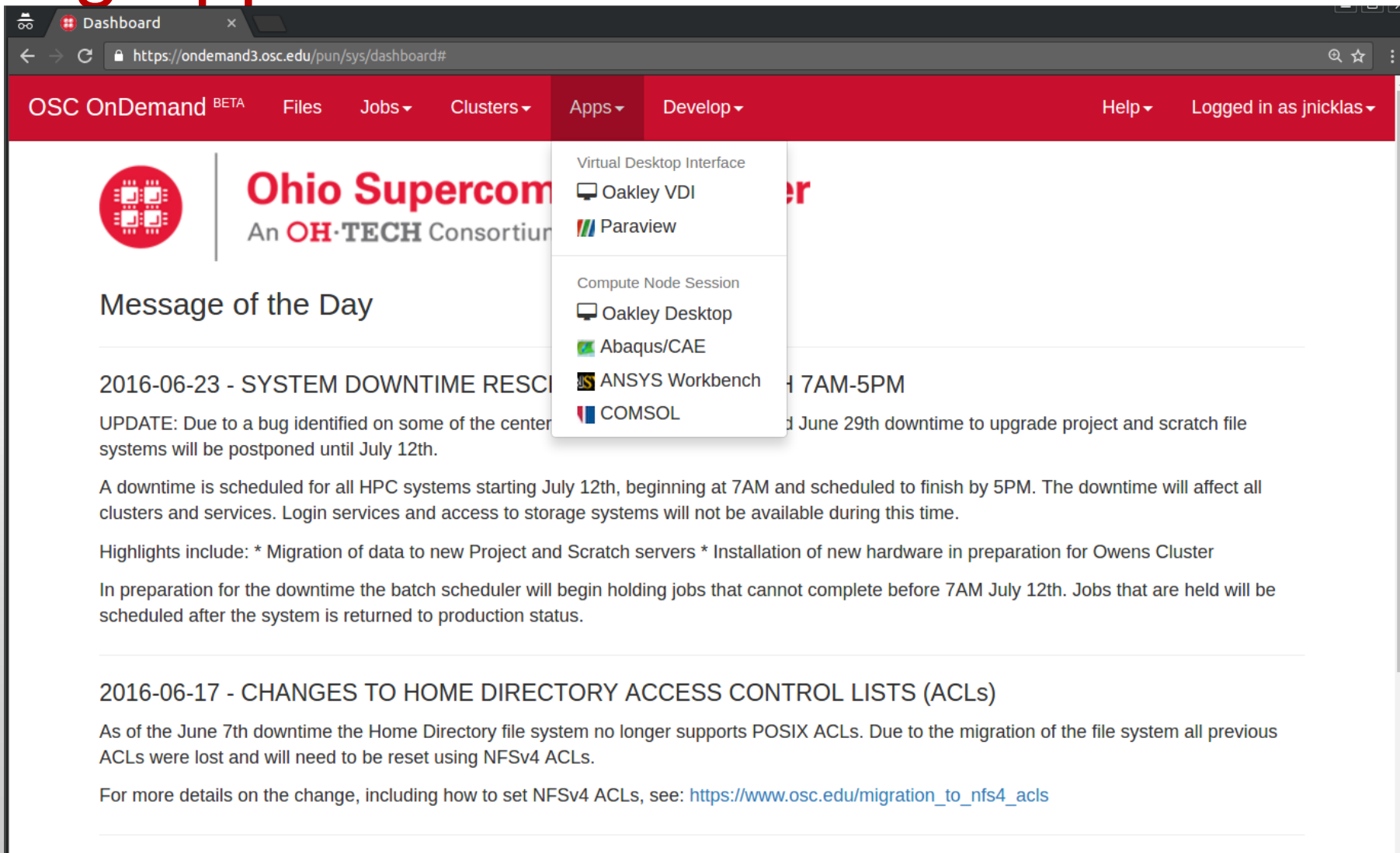


# OOD Science Gateway Examples

- Job submission apps (Abaqus, Ansys, Blender, )
- Web workflow apps (Cantilever Beam, FSAE, WeldPredictor, VFT, TruckSim, FillSim, FanSim)
  - <https://www.awesim.org/en/products/>
- COMSOL Server apps



# Accessing Apps in OnDemand Dashboard

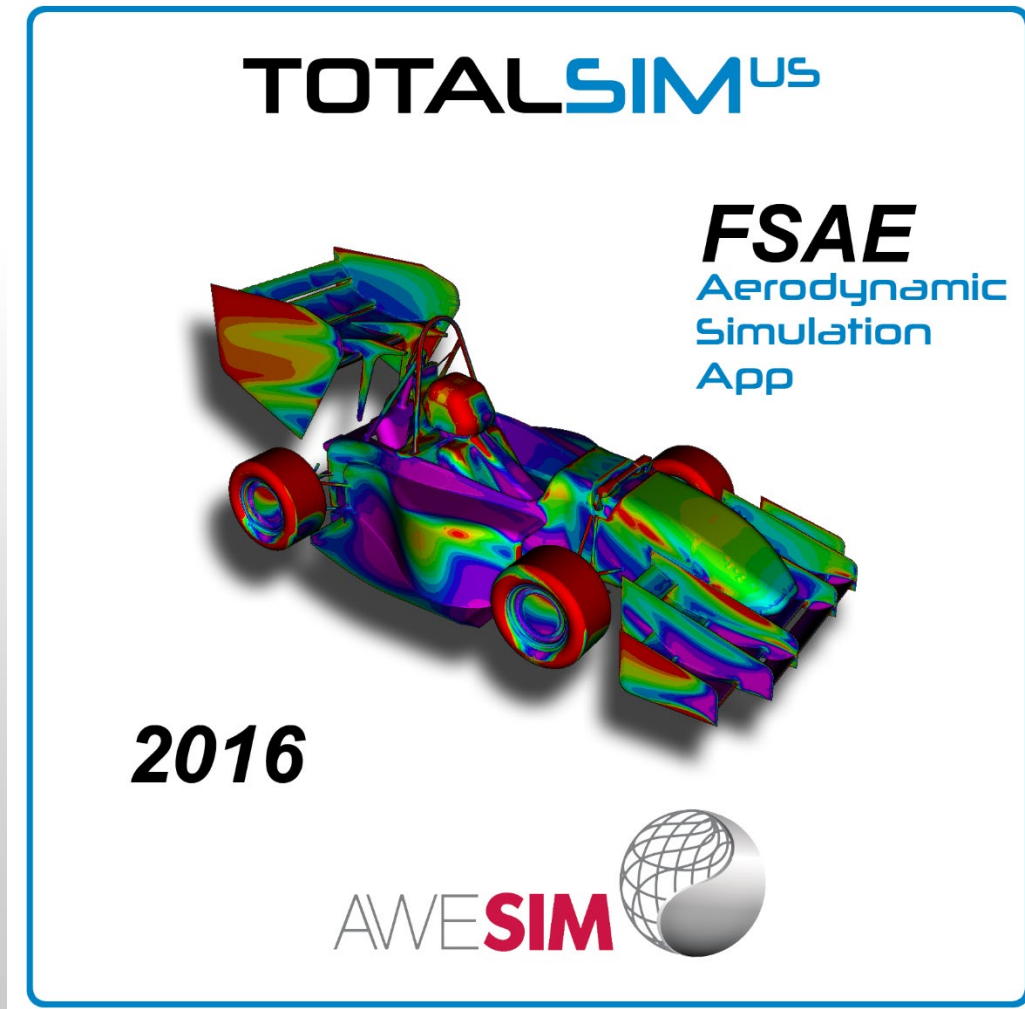


The screenshot shows a web browser window with the URL <https://ondemand3.osc.edu/pun/sys/dashboard#>. The page header includes the OSC OnDemand logo, navigation tabs for Files, Jobs, Clusters, Apps, and Develop, and a user login status for 'jnicklas'. The 'Apps' dropdown menu is open, listing the following options: Virtual Desktop Interface, Oakley VDI, Paraview, Compute Node Session, Oakley Desktop, Abaqus/CAE, ANSYS Workbench, and COMSOL. The main content area features a 'Message of the Day' section with a system downtime notice for June 23rd and a change in directory ACLs for June 17th.






# M&S APP EXAMPLE



**TOTALSIM<sup>US</sup>**

**FSAE**  
Aerodynamic  
Simulation  
App

**2016**

AWE**SIM** 

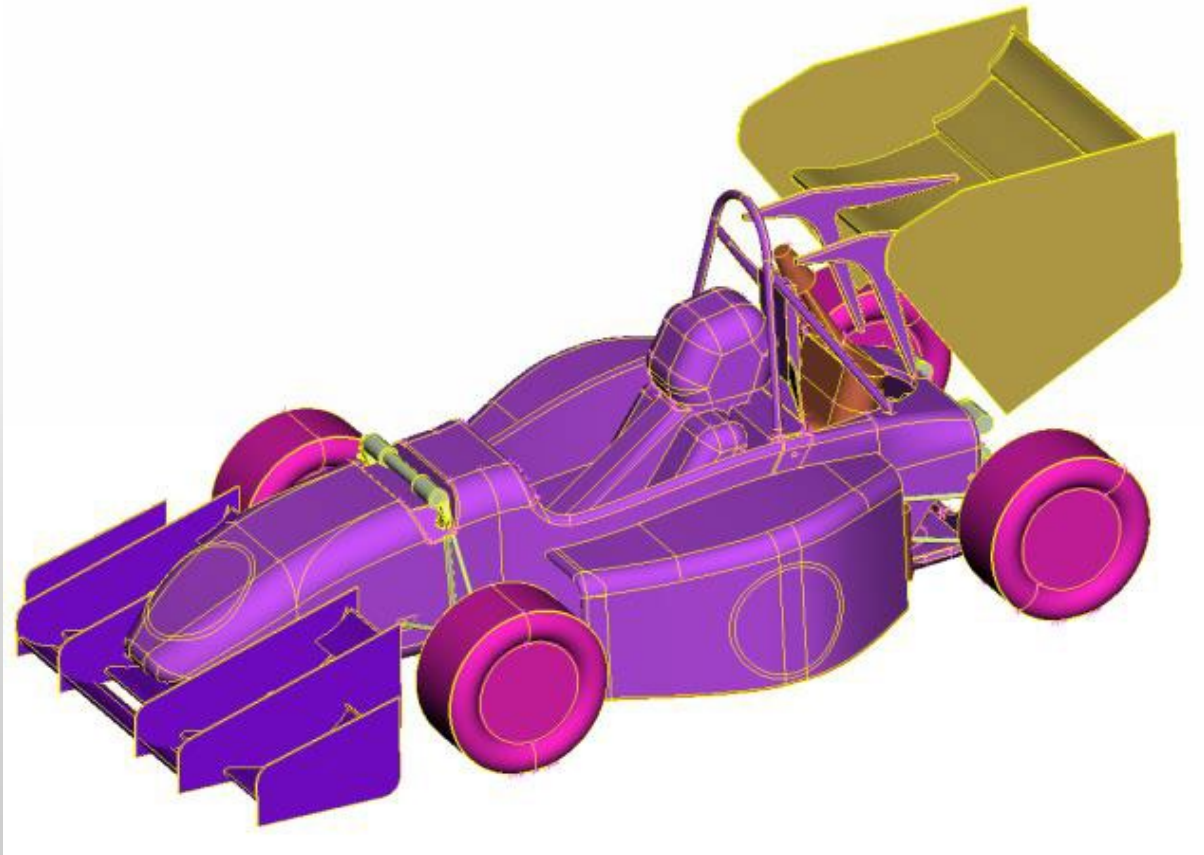
The image shows a promotional graphic for the TOTALSIM<sup>US</sup> FSAE Aerodynamic Simulation App. It features a 3D model of a Formula SAE race car with a colorful aerodynamic simulation overlay. The car is shown from a side-rear perspective. The text 'TOTALSIM<sup>US</sup>' is at the top, 'FSAE Aerodynamic Simulation App' is to the right of the car, '2016' is below the car, and 'AWE SIM' with a globe icon is at the bottom.

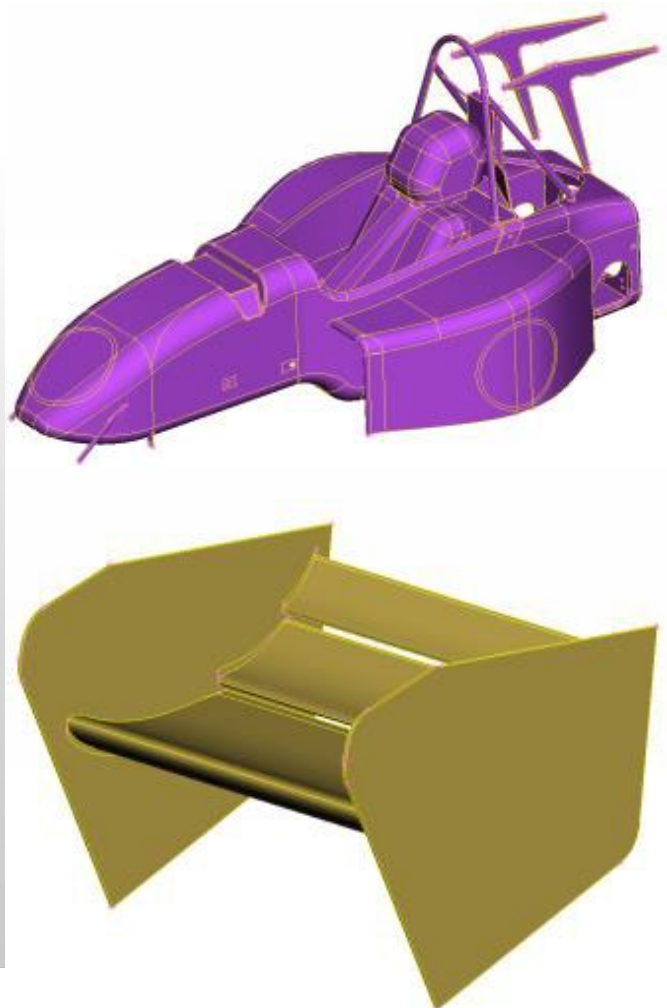


This app automatically:

- meshes geometry
- configures solver settings
- generates output visualizations
- organizes the results

so that university students can focus on designing and improving their formula SAE cars and not setting up complex CFD simulations





fsae 2016 FSAE Car USERNAME

Geometries Simulations Results

Search Simulations...

**My New Geometry** Not Submitted

Simulation Details  Done

My New Description

Created: Nov 2, 2015 8:57:11 AM  
Edited: Nov 2, 2015 8:57:11 AM

Assigned Geometries

New Geometry Assignment

Bodies:

Name  [Add Geometry](#)

Engines:

Name  [Add Geometry](#)

Front Wings:

Name  [Add Geometry](#)

Radiators:

Name  [Add Geometry](#)

Parameters

Speed:

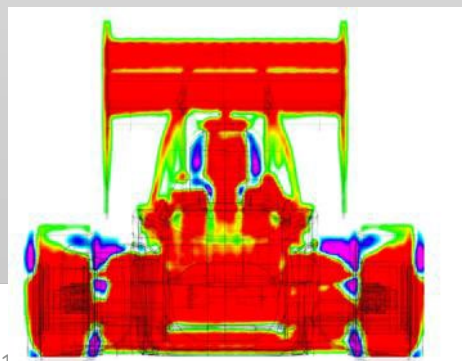
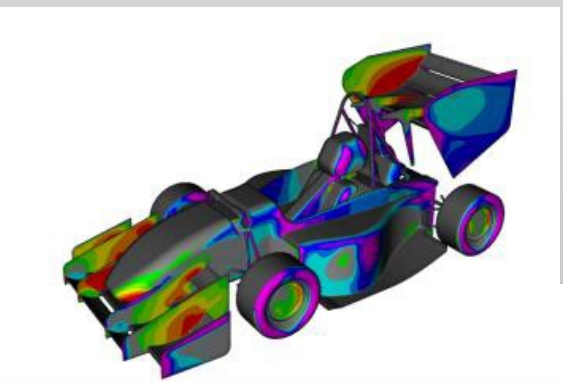
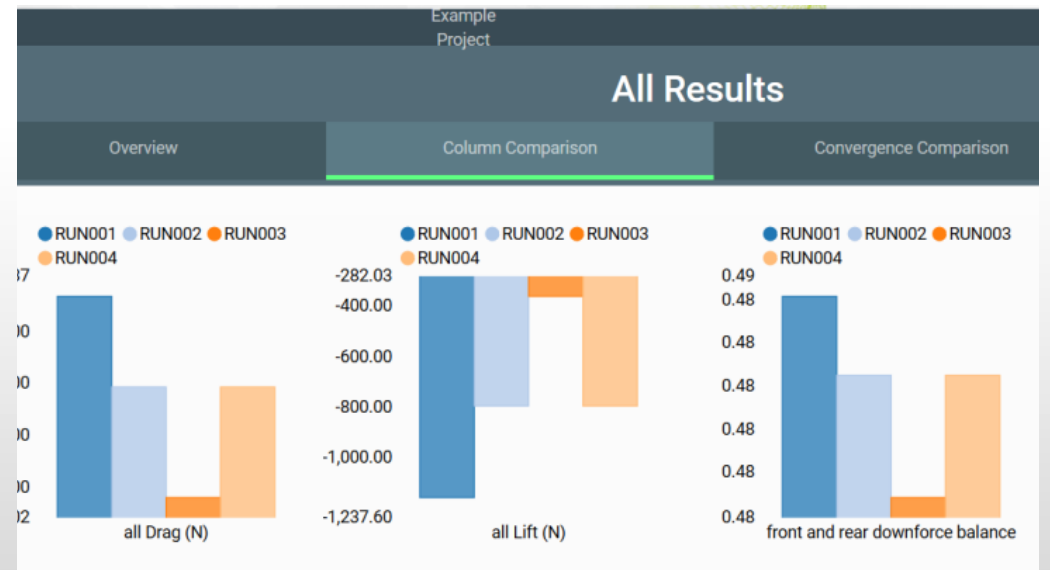
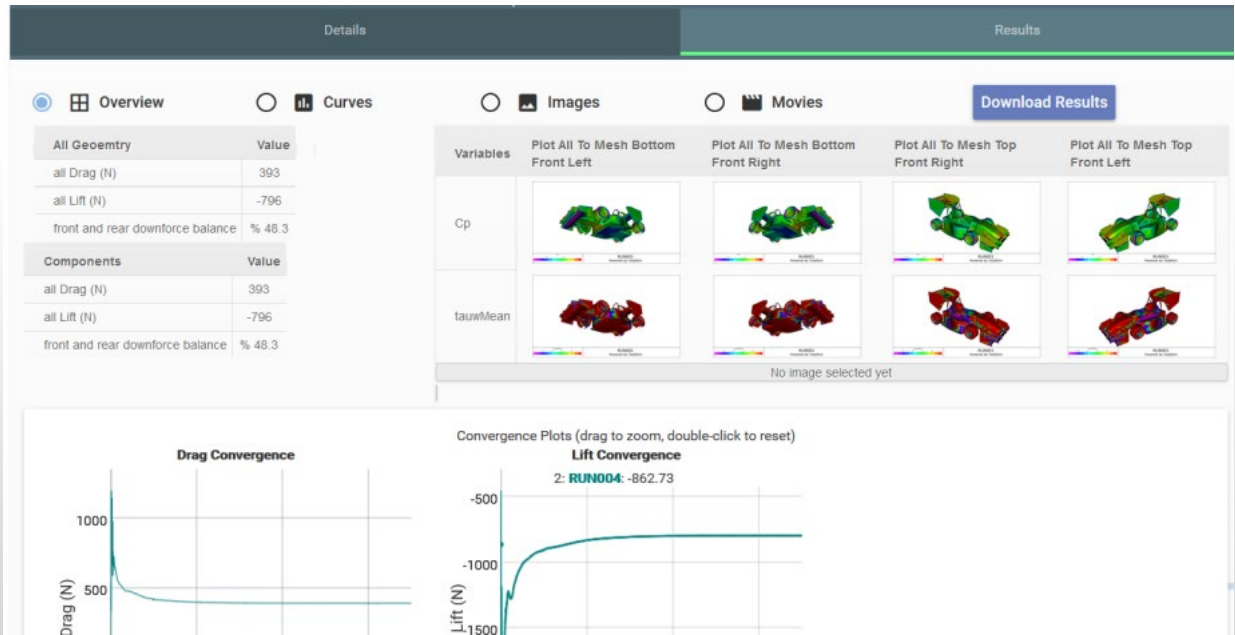
Yaw:

The yaw angle is relative to the forward direction of the car, and the positive yaw direction is to the right of the vehicle

[US](#)

[+ New Simulation](#)

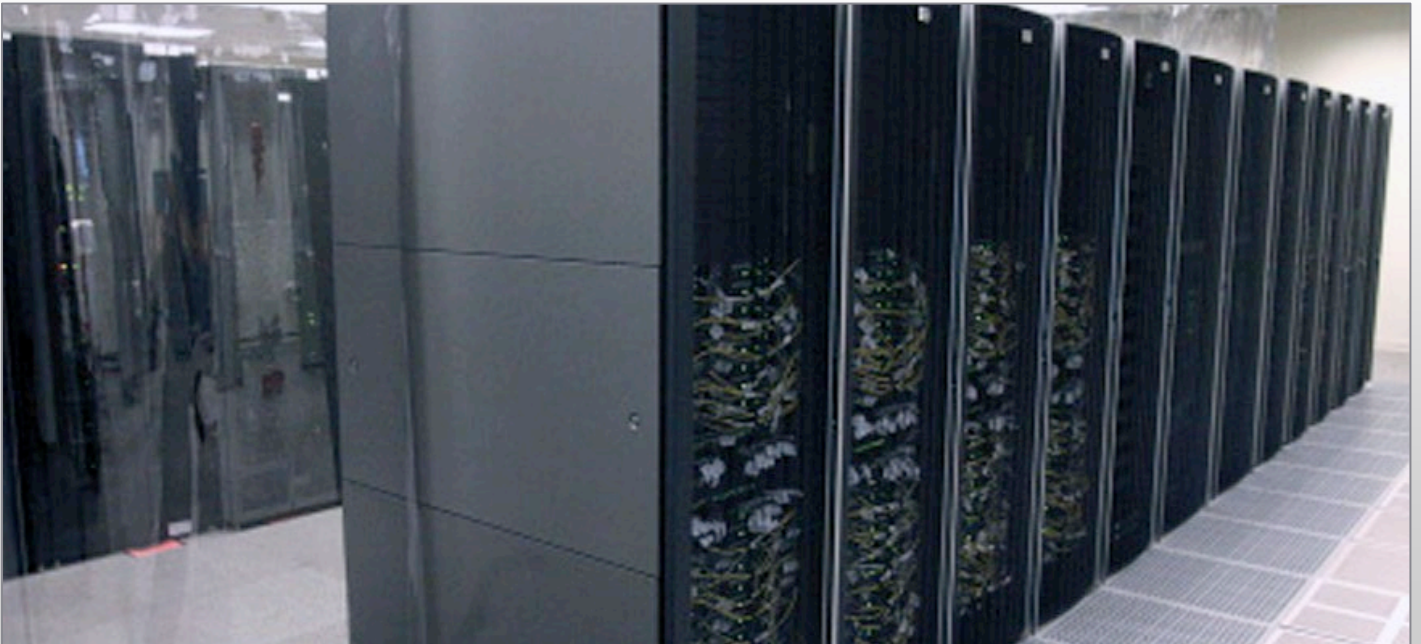




## Personal Laptop

2	Processors Used	48
14	Time (days)	1/2

## OSC's Oakley Supercomputer



Developed over the course of several weeks in late 2015 by TotalSim, LLC

In active use by FSAE teams at:



THE OHIO STATE  
UNIVERSITY

The  
University  
of Akron



INDIANA UNIVERSITY  
PURDUE UNIVERSITY  
INDIANAPOLIS



UNC CHARLOTTE

USC



Ohio Supercomputer Center

Slide 14

OH·TECH

Ohio Technology Consortium  
A Division of the Ohio Department of Higher Education

# Science Gateway Challenges Addressed by Open OnDemand

- **Challenge:** User administration
  - Creating managing user accounts
  - Enforcing user separation in the app
    - Making sure users can only see their data
    - Making sure users are charged for jobs submitted
- **OOD Solution:** system level user separation
  - Use existing system-level accounts
  - User separation enforced by PUN model
- **Challenge:** Web infrastructure deployment
  - Getting your HPC Center to install a publicly-accessible LAMPS stack
  - Getting your HPC Center to give you admin access to it
  - Getting a public DNS entry, maybe other things...
- **OOD Solution:** Single web infrastructure serves all apps
  - Any Open OnDemand user at the HPC Center can create and share apps
  - Similar goal for HubZero and Galaxy



# Project Status

Further documentation as well as source code can be found at:

<https://github.com/OSC/Open-OnDemand>

or by visiting:

<http://go.osu.edu/ood>

