DOD HPC DEPARTMENT OF DEFENSE HIGH PERFORMANCE COMPUTING PORTAL

High Performance Computing Portal
Lowering Barriers / Modern HPC Ecosystems

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DOD HPC MODERNIZATION PROGRAM

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HPC Portal

- **Secure, Web-based Access to DoD HPC Assets**
  - End-to-End, Full-Featured, Web-Based Workflow
  - Highly Productive User Experience
  - **Enabling Non-Traditional Users & Users with Constrained Desktops**
- **Transformative, Successful, Growing, Agile**
- **Enables 3rd Party Developers & Innovative Applications**
  - **A Simple Services API Abstracts the HPC Workflow**

Easy, Secure, & Powerful: Demolishes entry and access barriers to DOD HPC Services

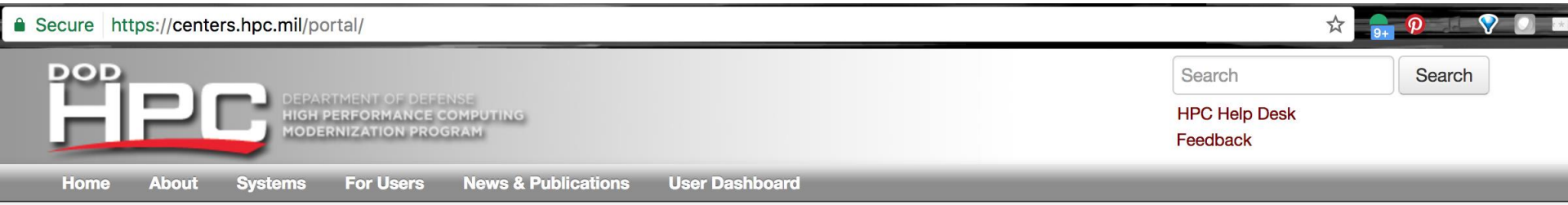
Access: Game Changer for DOD HPC

Secure Sign On
DoD-Hosted OpenID 2-Factor Logon
No User Signups

"Zero Footprint" Browser Access
No Client Installs / Configurations
No Kerberos Kit Required

Software as a Service (SaaS)
Instant Updates to Users
Manage Access through Accounts
Enforces Access Controls
Access from Any Network

Each DoD Supercomputing Resource Center has a Portal

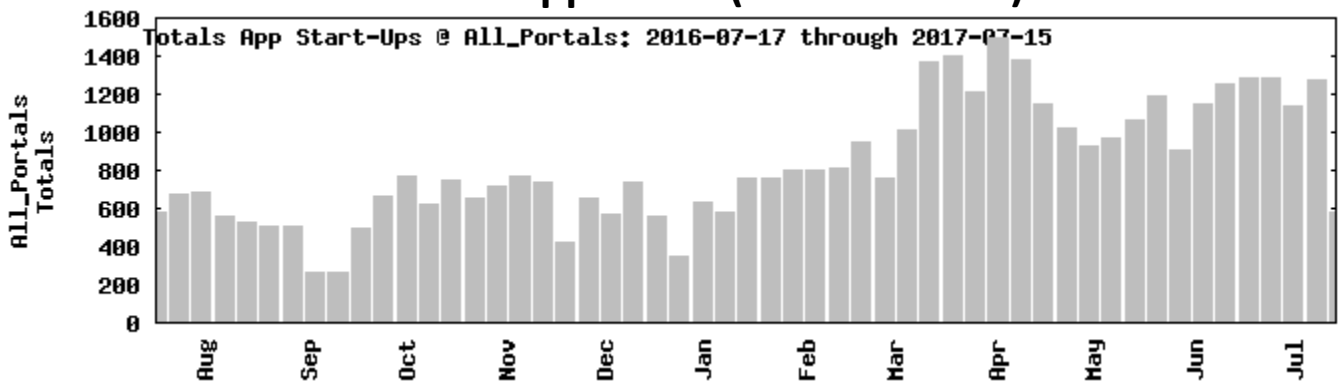


https://portal.hpc.mil*

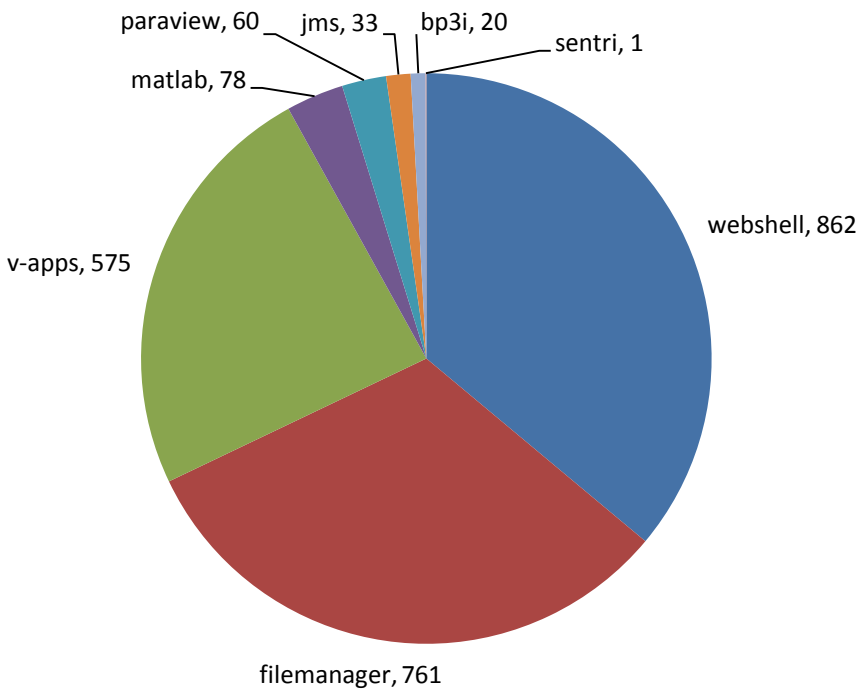
* Note: DoD issues their own certificates, you may get an “unsafe error”

HPC Portal Adoption: APPLICATIONS

Total Webapp Starts (last 52 weeks)



Webapp Starts (7/2 – 7/16)

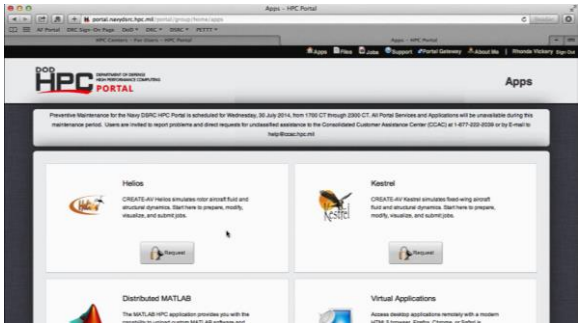


HPC Portal Application Startups ~ 1200/week (also doubled)

Portal for Users

- **Job Creation, Submission, Monitoring, Termination, Visualization**
  - ***Virtual Applications***
    - Pre/Post-Processing & Visualization
    - Access any X-Based Application
    - Quickly automate repetitive workflows
  - ***Native Web Applications***
    - Customized User Interfaces for data entry, control and analysis
- **Utilities**
  - **Command Line Interface**
  - **File Management**
  - **User Account Information**
  - **Help & Forums**

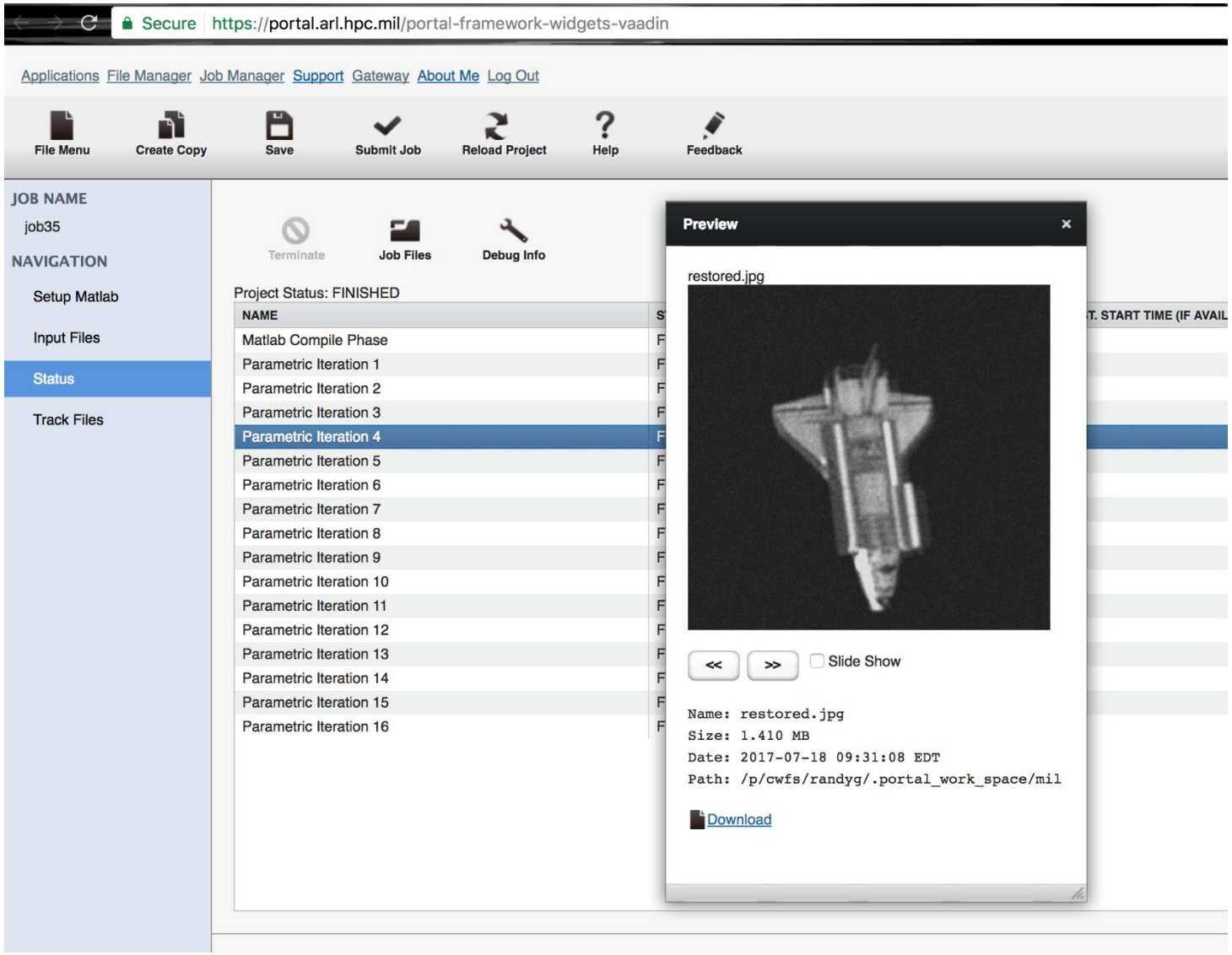
HPC Portal-Hosted Web Applications



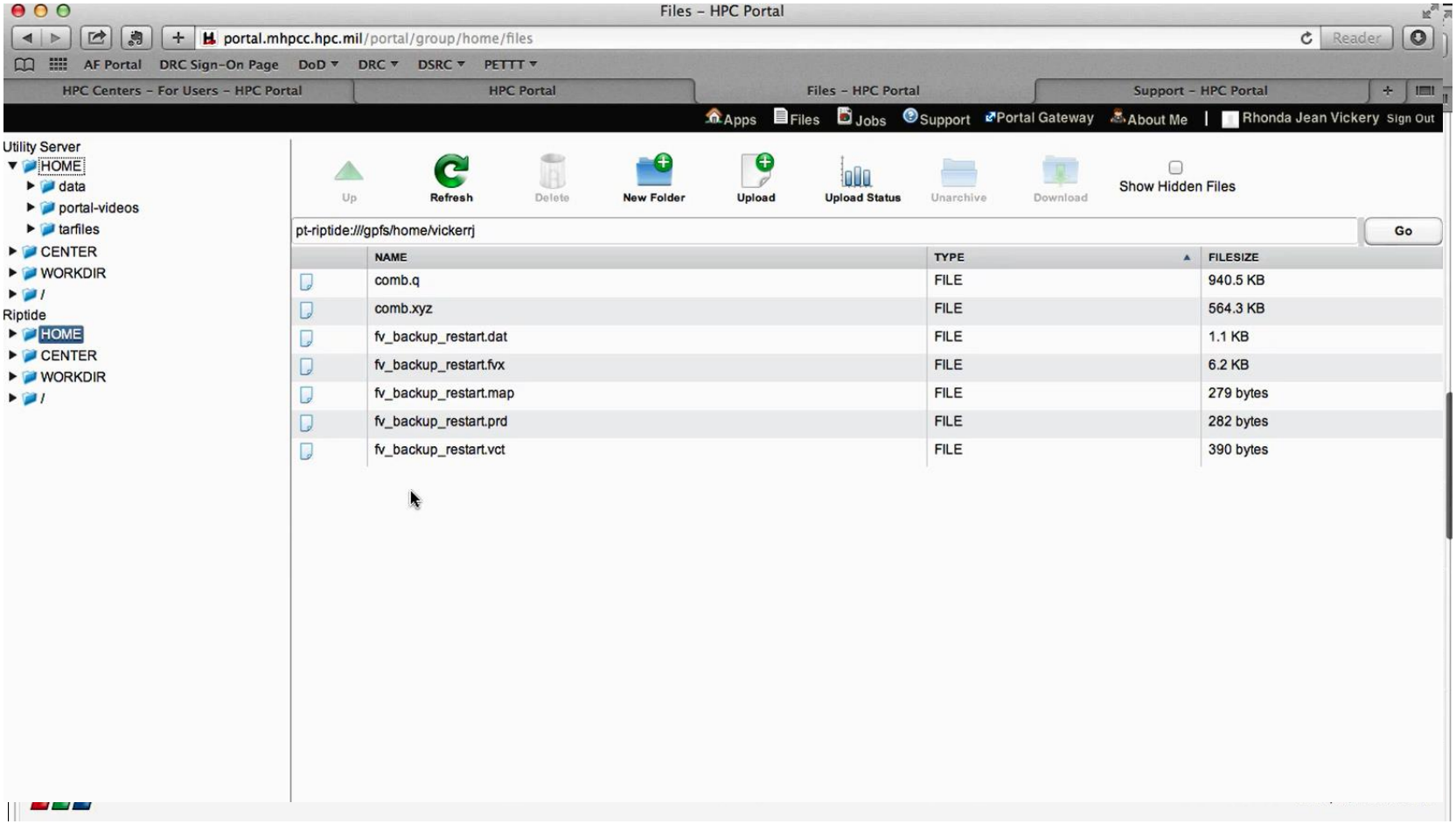
- CREATE-AV Web Kestrel
- CREATE-RF WebSENTRi
- CREATE-MG WebCapstone
- CREATE-GV Mercury/MAT
- JMS/ARCADE (Space Situational Awareness)
- BP3I (Blast Protection Institute)
- ParaView Web (3D Visualizations on Utility Servers)
- Jupyter Notebooks (on HPC Resources)
- Distributed Matlab
- Collaboration / Repository Management—in work

50,000+ application starts and growing!

Native Web Applications: Matlab

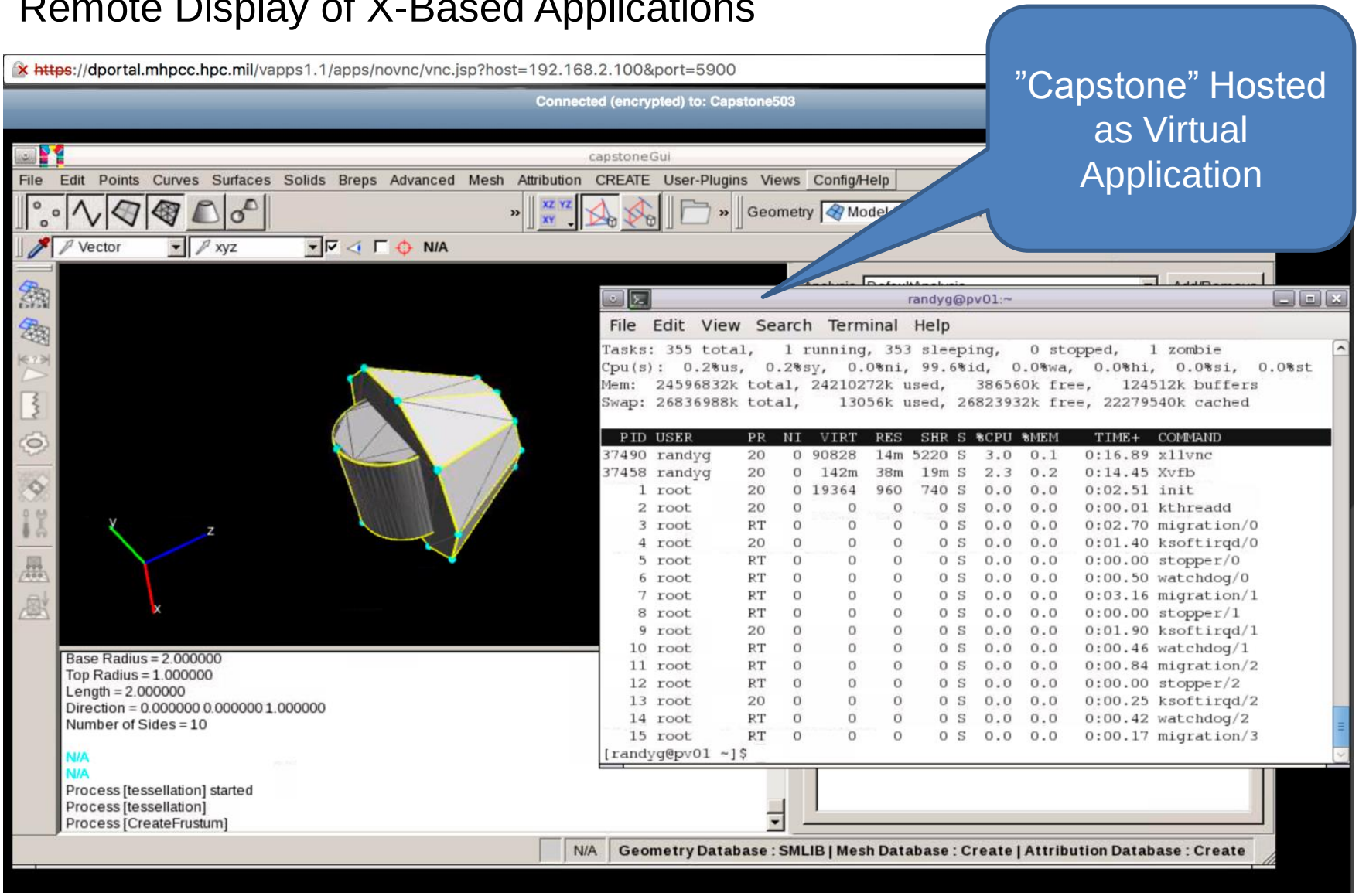


Native Web Apps: File Manager

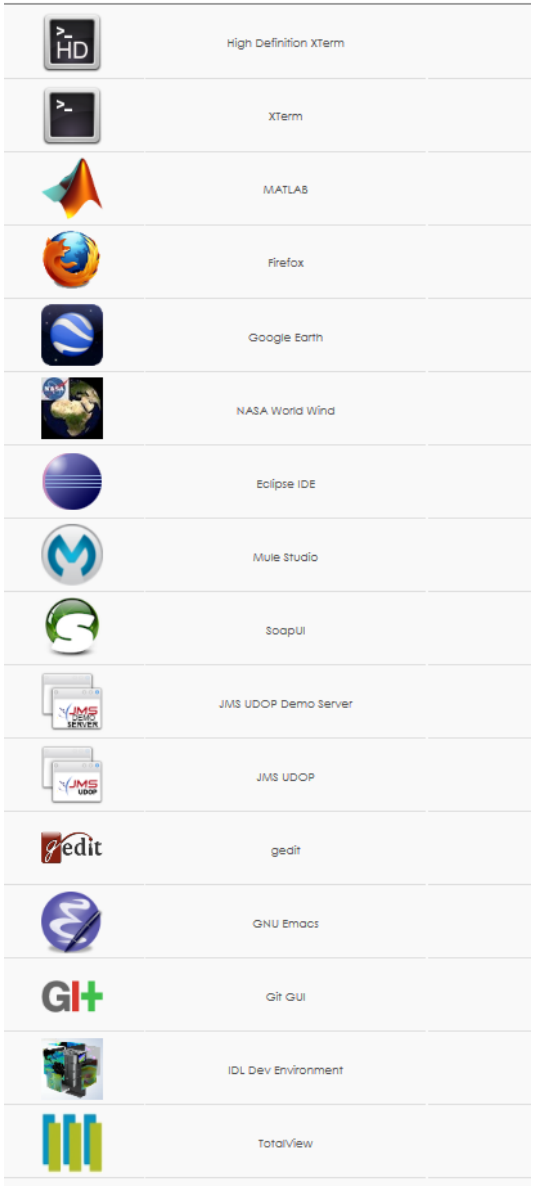


Virtual Applications

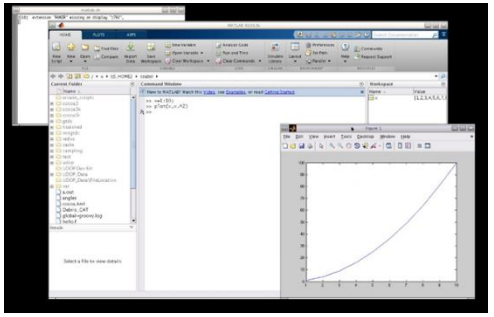
Remote Display of X-Based Applications



Portal for HPC Developers



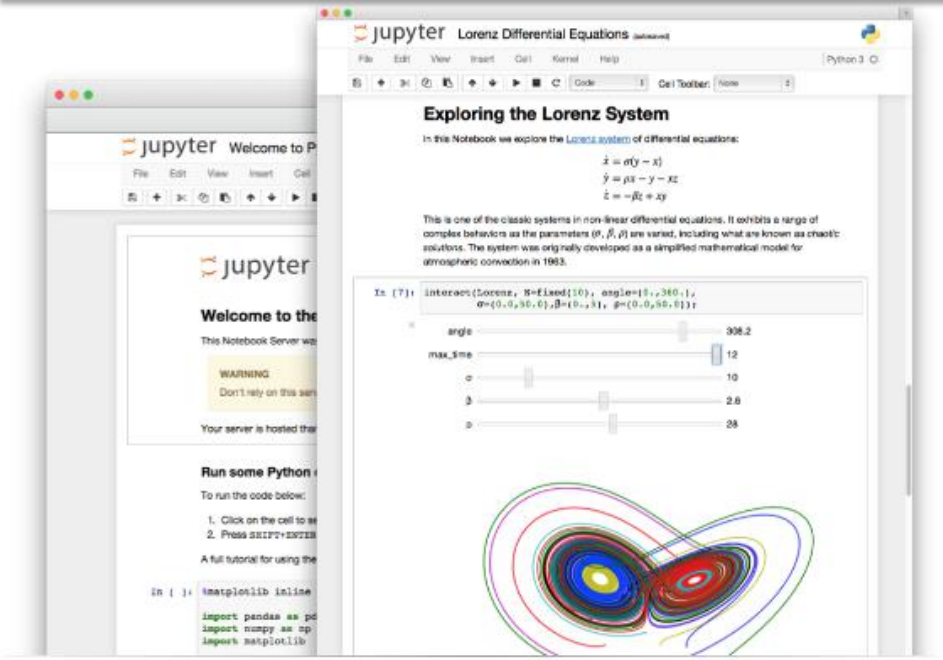
- **Integrated Development Environments**
- **Editors**
- **Debuggers**
- **Configuration management**
- **File manager**
  - Transfers to/from client machine
  - Permission editing
- **Command line**
- **Specialized HPC Workflows**
- **Visualization**



Matlab running through browser

Jupyter Notebooks on HPC Portal

Open source, interactive data science and scientific computing platform (web-based) supporting over 40 programming languages



The Jupyter Notebook

The Jupyter Notebook is a web application that allows you to create and share documents that contain live code, equations, visualizations and explanatory text. Uses include: data cleaning and transformation, numerical simulation, statistical modeling, machine learning and much more.

Language of choice

Share notebooks

Interactive widgets

Big data integration

Focus is On Data Analytics & Reproducible Workflows for R&D

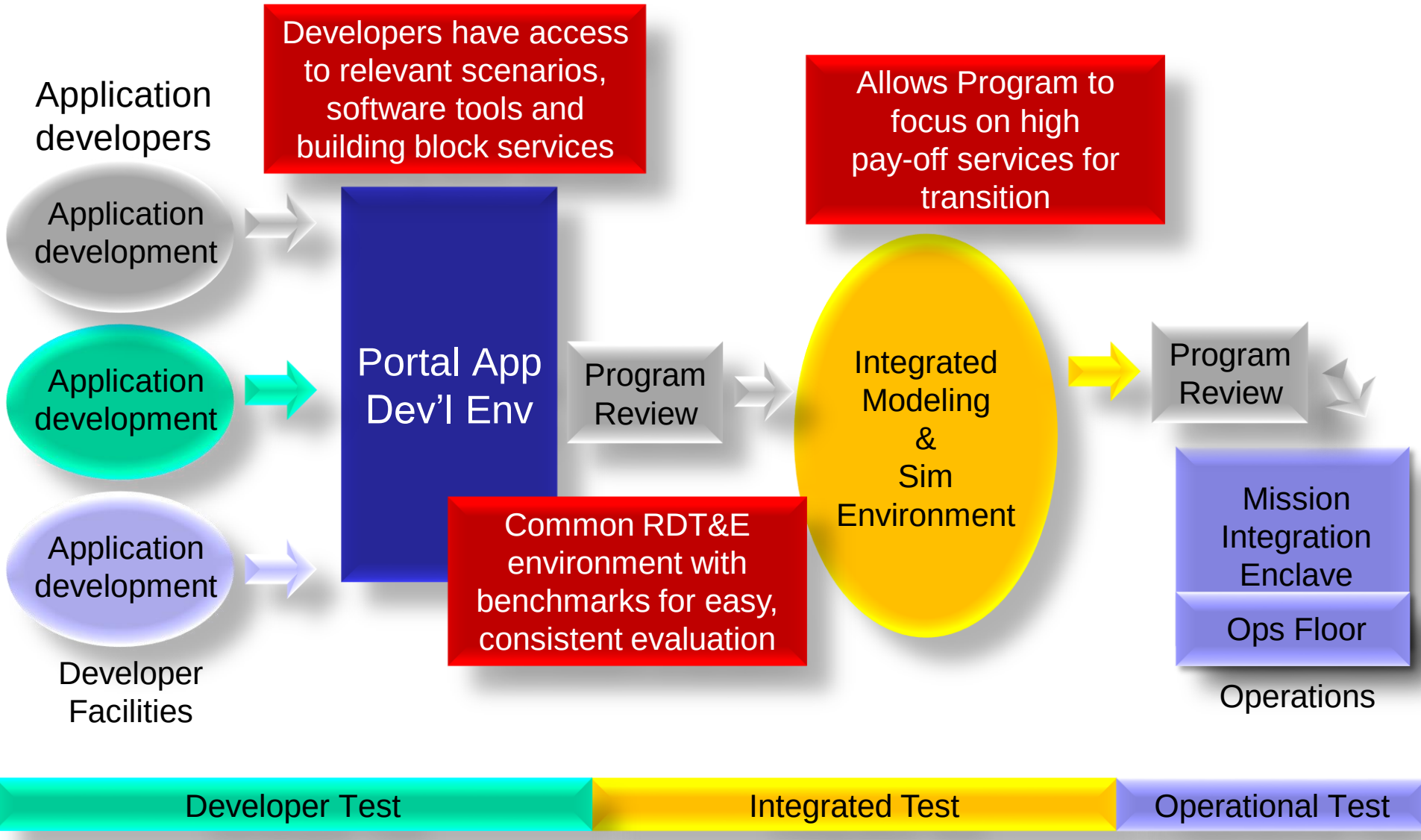
Portal Platform Enables Integrated M&S

Automated web-service generation from executables

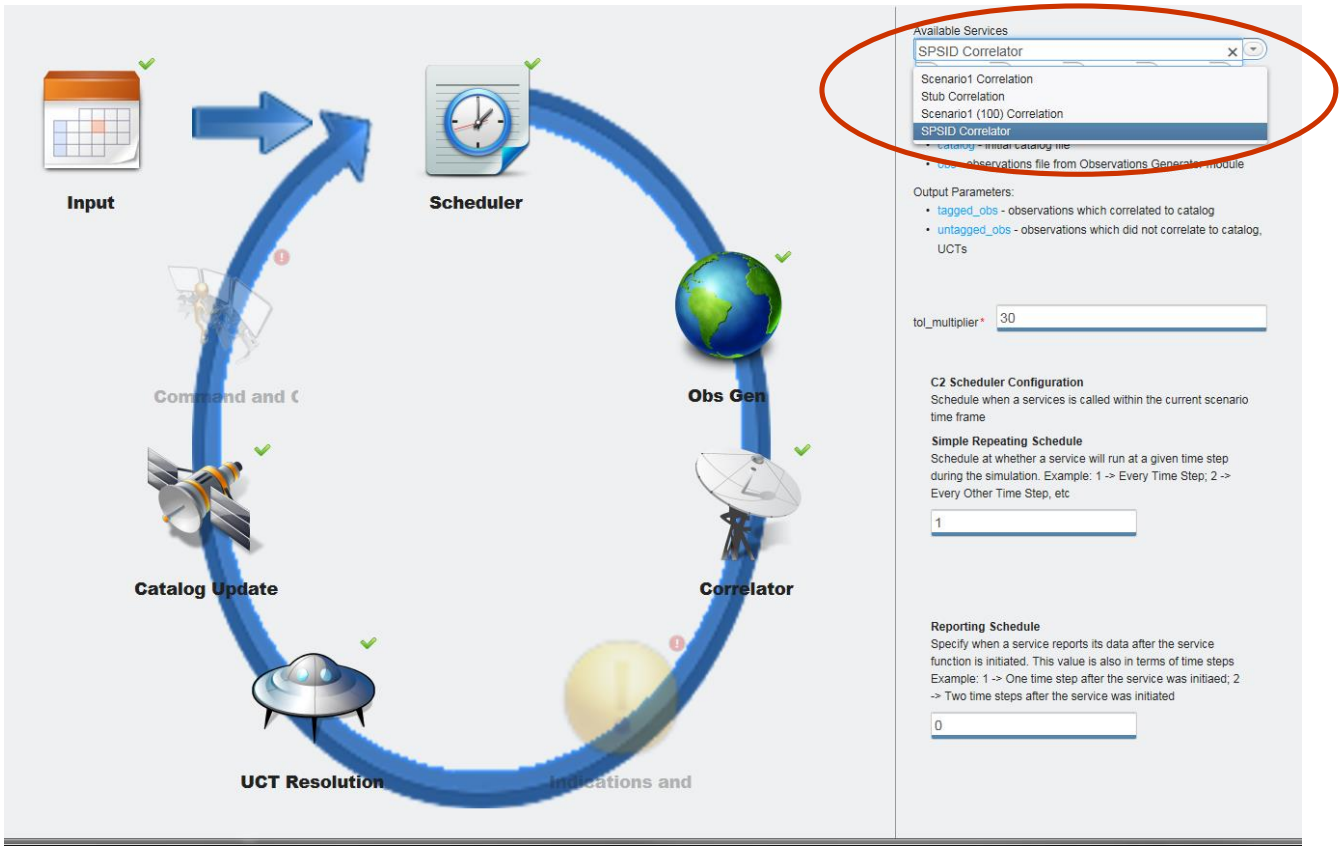
End-to-end performance testing in user sandbox

Collaboration and market survey tools and resources

Portal Supports Technology Integration into Acquisition: e.g., ARCADE



Example: Custom Workflow Tool for Trade-Space Exploration and Analysis



- **User can select services based upon group permissions**
  - Group permissions also used to protect intellectual property
- **Different combinations of capabilities can be tested to determine best approach**

Key “Take Aways”… HPC Portal:

- Provides Modern/Productive Web-Based Workflow
- Demolishes Entry Barriers to DOD Supercomputing
- Enables 3rd Party Developers & Innovative Applications
- Supports a Modern HPC Ecosystem: *Portal as Platform for Innovative Solutions*
- Enables Collaboration, Advanced Work Flows & Acquisition Engineering

Questions?