INL/CON-22-68640-Revision-0

2022 INL Site Report

August 2022

C. Nathan Woods

Changing the World's Energy Future

Idaho National Laboratory

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DOE Computer Graphics Forum

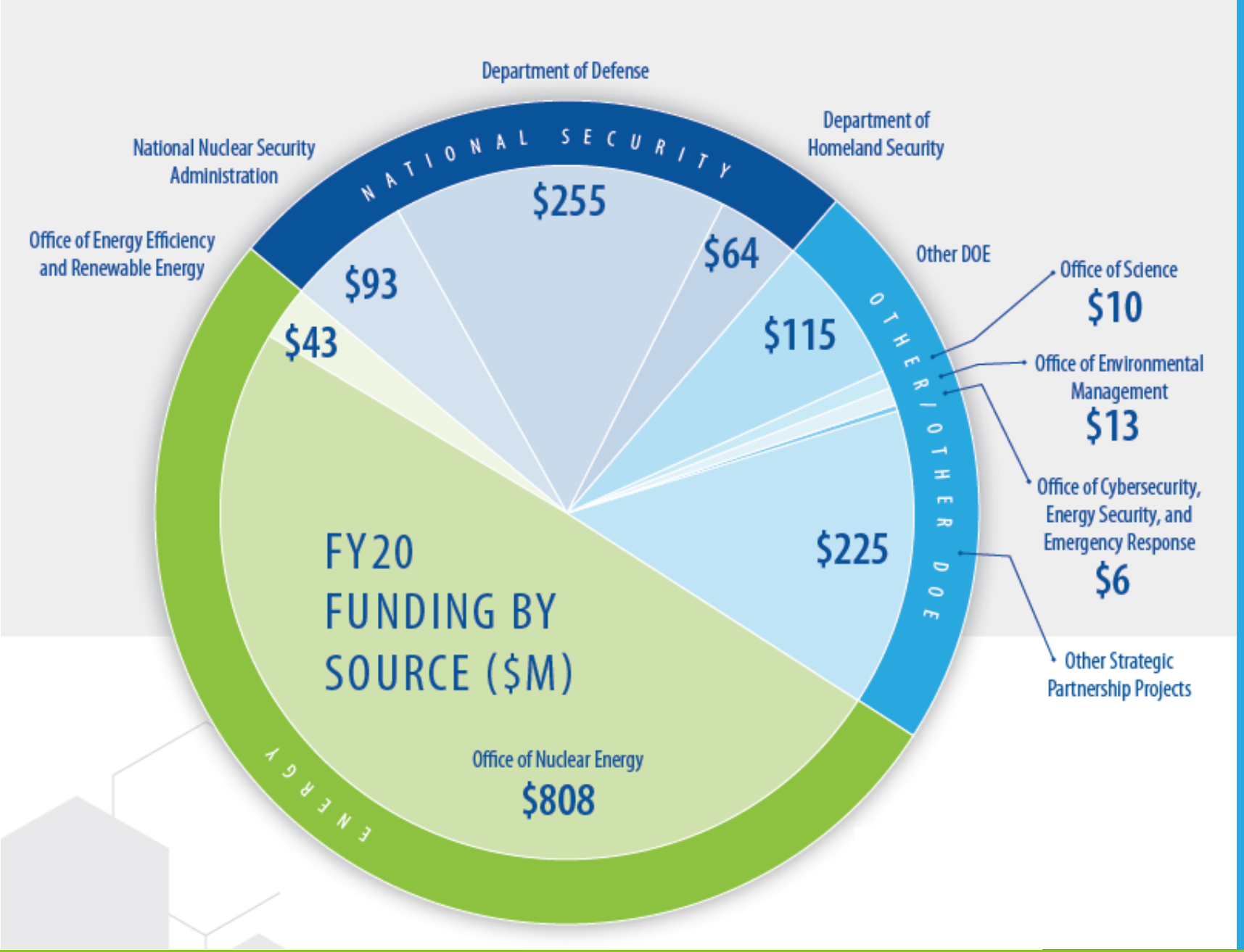
Idaho National Laboratory

Abstract

Visualization is key to the work we do at Idaho National Laboratory (INL). We support research computing, nuclear science, and educational outreach using both traditional and emerging visualization tools and technologies. In this presentation, we will introduce and summarize INL and its mission, describe some of the visualization resources INL provides, and present example applications from recent years.

Idaho National Laboratory

- Established in 1949 near Idaho Falls
- U.S. leader for nuclear energy R&D
  - Fuel development and fabrication
  - Steady-state and transient irradiation
  - Multiscale post-irradiation examination
- 890 Square Miles
- 4 operating reactors
- 12 hazard category 2 & 3 facilities
- 5,200+ employees



INL Mission

To discover, demonstrate, and secure innovative nuclear energy solutions, other clean energy options, and critical infrastructure

Research and Education Campus

Collaborative Computing Center (C3)

- Opened October 2019
- Financed and owned by State of Idaho, leased to INL
- Scalable data center:
  - 7,000 sq. ft, up to 197 racks
  - Up to 8 MW power
  - Water-cooled
- Office space for 200

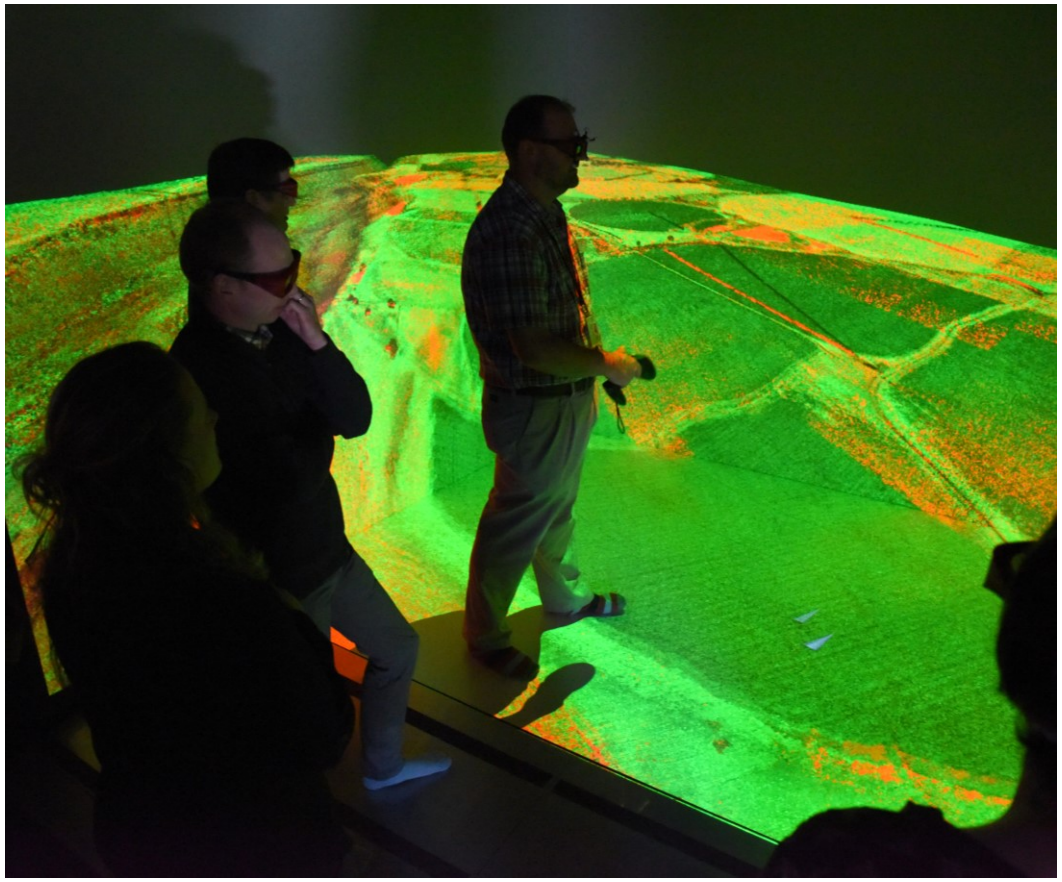
Installed HPC Systems

System Name Year	Core Count (Memory)	Processor	Network	GPUs	Performance (TOP 500 rank)
Falcon (State of Idaho) 2014 (2017 refresh)	34,992 (121TB)	Intel Broadwell	Mellanox Infiniband FDR	NA	1.1 PFLOPS (#92 2014)
Lemhi 2018	20,160 (94TB)	Intel Skylake	Omnipath	NA	1.0 PFLOPS (#427 2018)
Sawtooth 2019	99,792 (394TB)	Intel Cascade Lake	Mellanox Infiniband EDR	108 NVIDIA V100	5.6 PFLOPS (#37 2019)
Hoodoo 2021	352 (5.6TB)	AMD EPYC 7302	Mellanox Infiniband HDR	44 NVIDIA A100	0.858 PFLOPS (Never on TOP500 list)

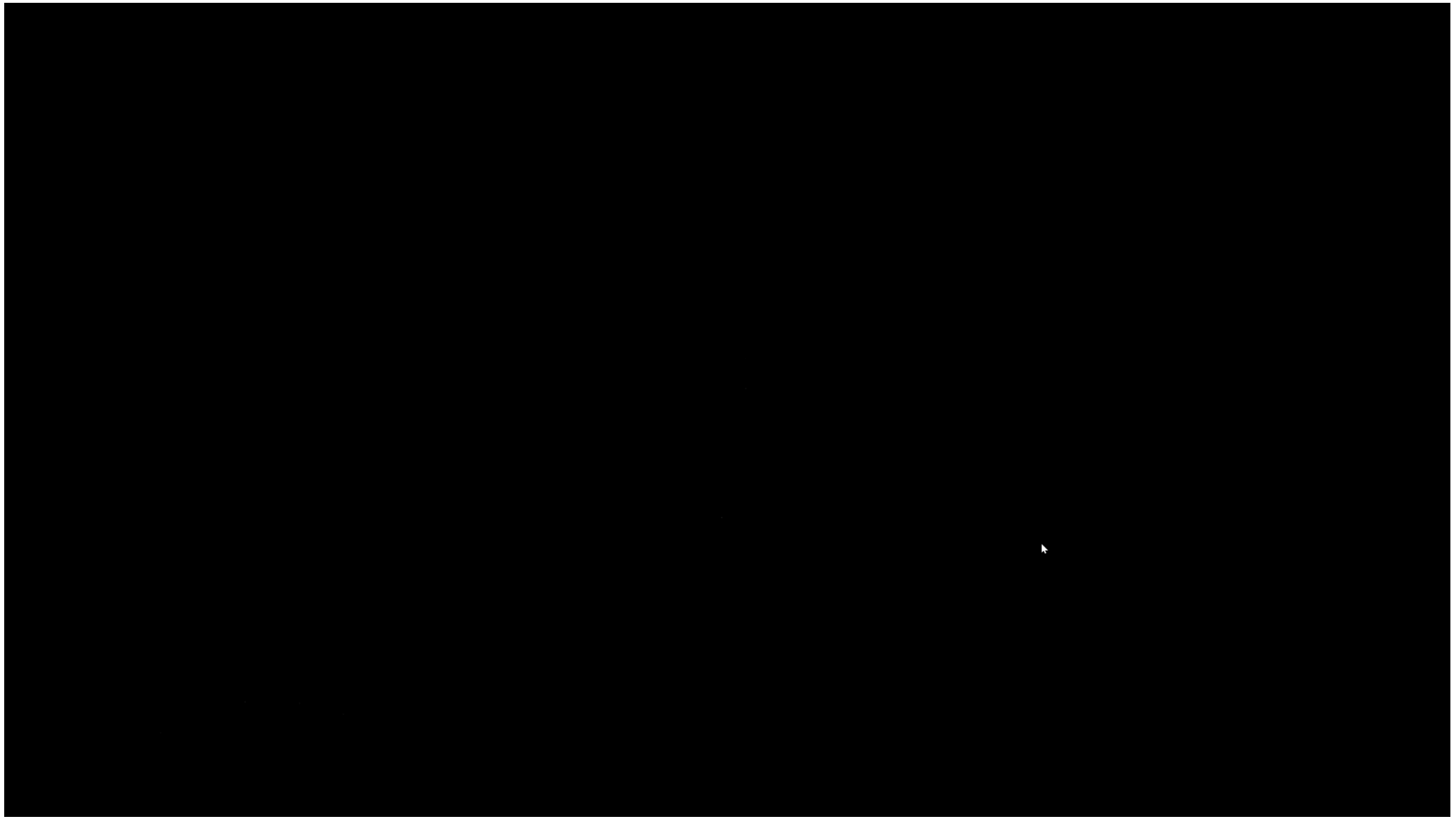
Visualization Resources

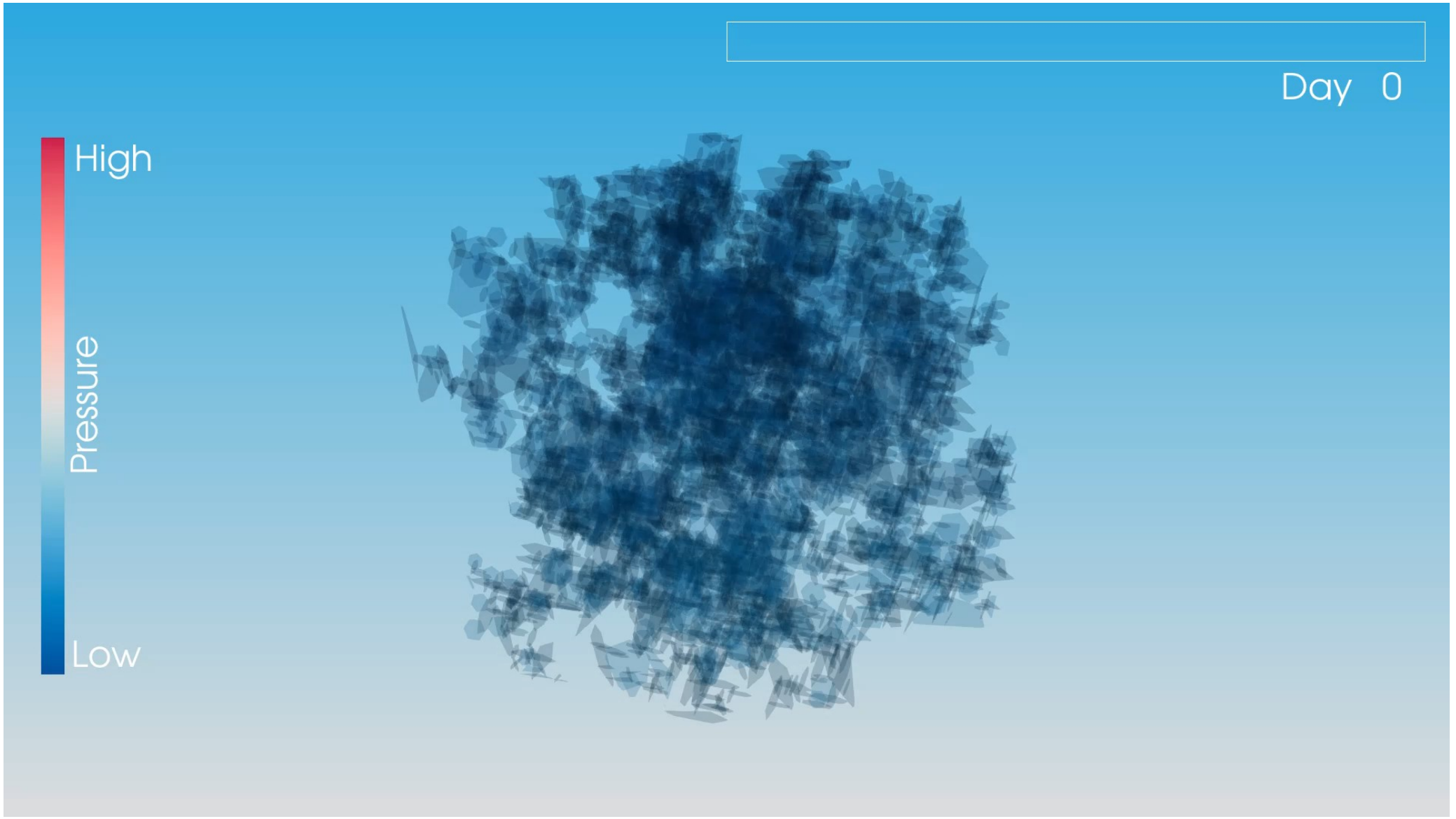
- Applied Visualization Laboratory
- Viz cluster
- FalconViz
- SawtoothViz

Applied Visualization Laboratory

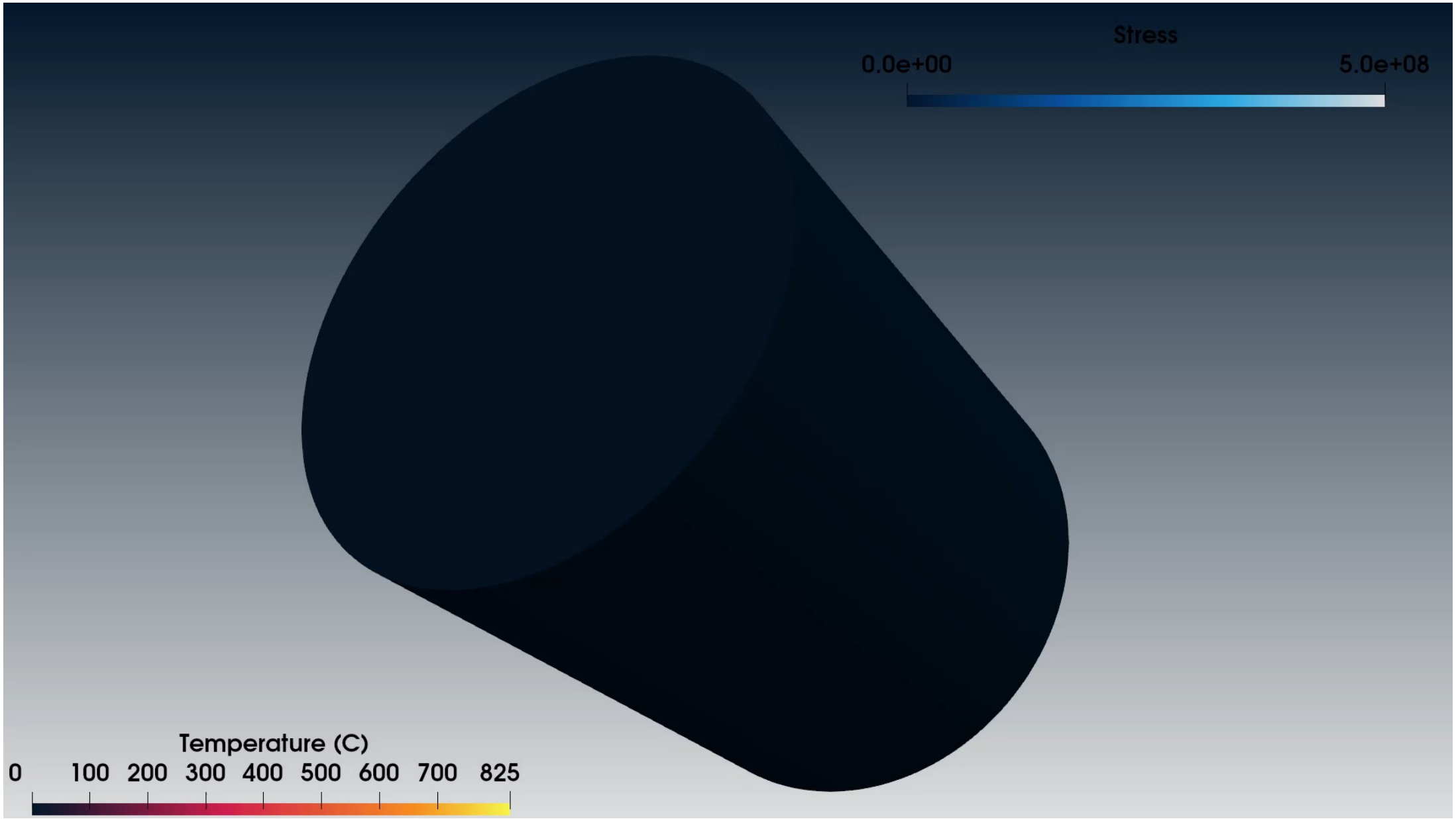


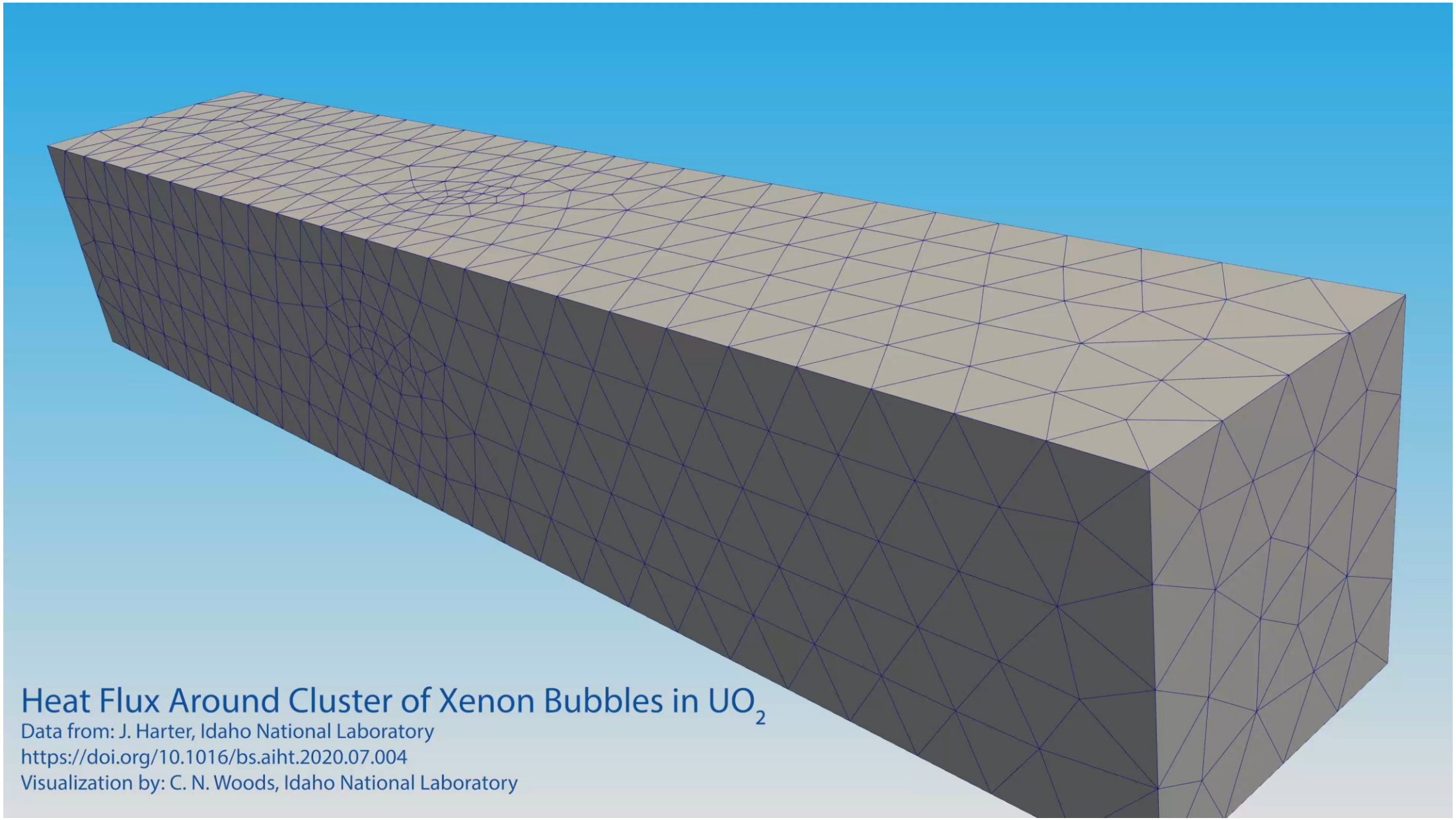
- 1,900 sq. ft.
- Mechdyne 4-panel CAVE
- DTrack (Mechdyne) 8-camera tracking system (CAVE)
- Optitrack tracking system (room)
- VR Base Station 2.0 (HTC)
- VR (HTC Vive Pro – Wireless, Oculus Quest) & AR (Microsoft Hololens II)
- OmniTreadmill
- IQ-Stations
- Haptic Gloves
- Kinect Xbox
- Samsung Tablets




Day 0
High
Pressure
Low

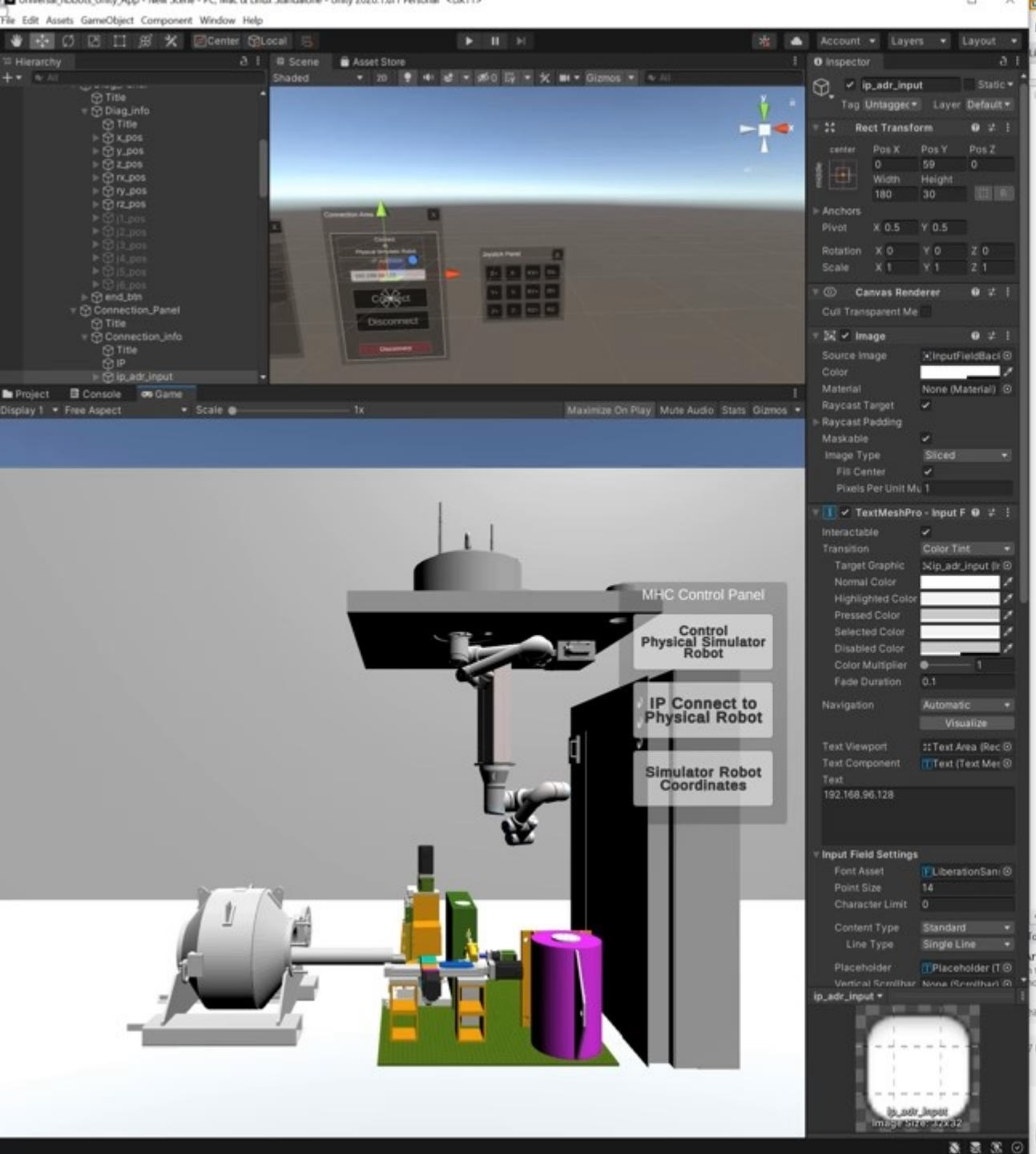

Waste Storage Cask

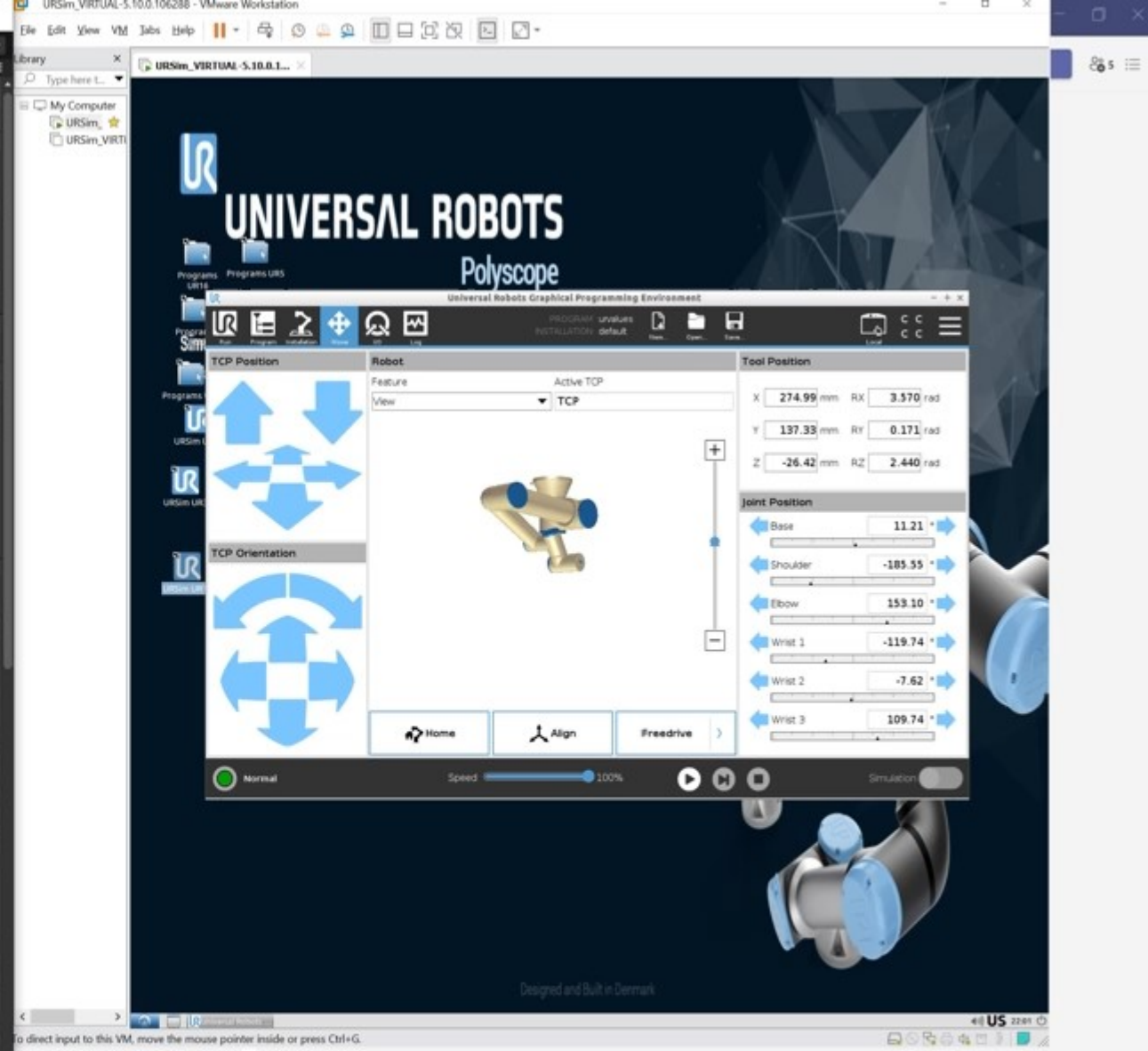

Stress
0.0e+00
5.0e+08
Temperature (C)
0 100 200 300 400 500 600 700 825


Heat Flux Around Cluster of Xenon Bubbles in UO_2
Data from: J. Harter, Idaho National Laboratory
https://doi.org/10.1016/bs.aiht.2020.07.004
Visualization by: C. N. Woods, Idaho National Laboratory


Mobile Hot Cell
Virtual Prototyping
Please wait...


RCBLD 603 Lab B-12
Identify hazards from replacing current benchtop with
a new chemical resistant benctop


MHC Control Panel
Control Physical Simulator Robot
IP Connect to Physical Robot
Simulator Robot Coordinates


UNIVERSAL ROBOTS
Polyscope
Universal Robots Graphical Programming Environment
TCP Position
Robot
Tool Position
TCP Orientation
Joint Position
Home
Align
Freedrive

Human-in-the-loop machine learning malware analysis with immersive visualization

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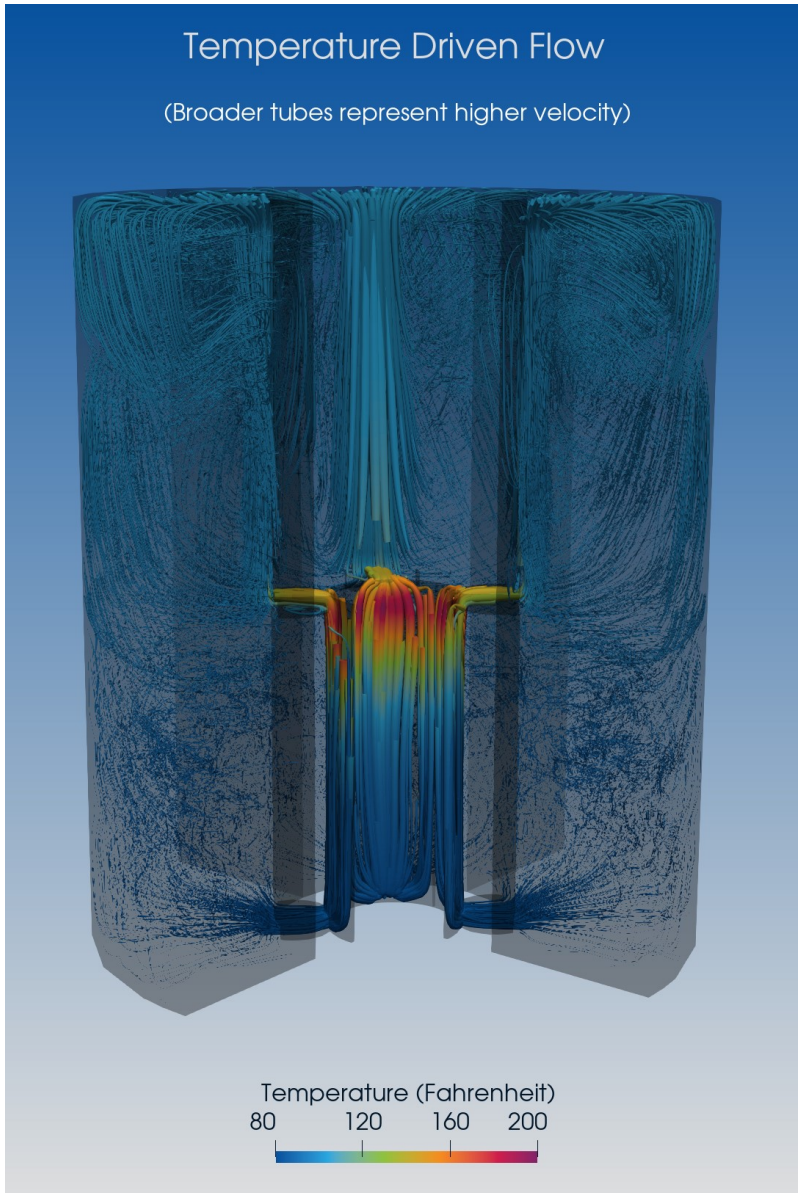

Questions?

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