

High Performance Computing Modernization Program



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Unclassified

The Agenda

- Our Mission and Resources
- CREATE
- PET and Available Training
- Workforce Development
- Additional Resources and Strategic Vector
- Q&A

High Performance Computing Modernization Program



- The High Performance Computing Modernization Program (HPCMP) initiated in 1993 in response to Congressional mandate
 - ***Mandate: Advance the supercomputing capability for the DoD, provide a national research network, provide software and computational science expertise and support to better enable DoD RDT&E activities***
- Department-wide program administered by U.S. Army Engineering Research & Development Center (Vicksburg, MS) on behalf of Army ASLT
 - Joint Service execution
 - Substantial “in kind” funding from services



HPC Modernization Program Supports Air Force, Army, Navy, and Department Agencies



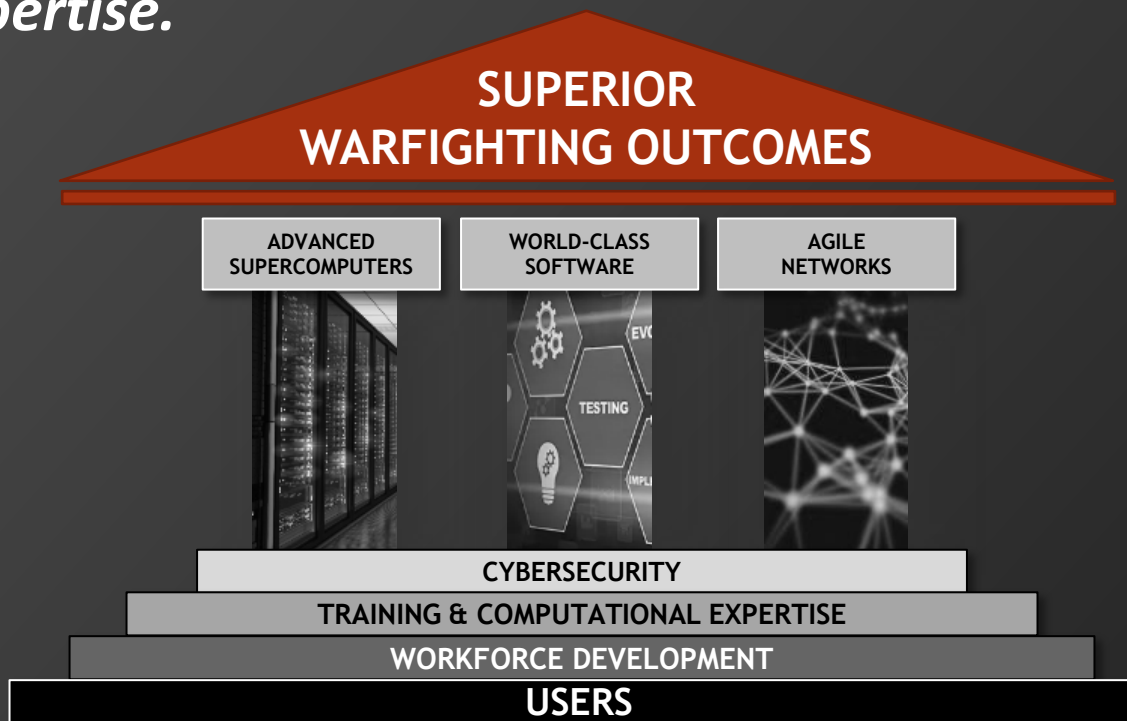
What is the Mission?

To accelerate the development and transition of warfighting capabilities through the application of advanced computing, networking, software, security, and computational expertise.

Accelerating technology development

Enabling new warfighting capabilities

Supporting the Department's 33,000 scientists and engineers



A program and national asset providing high-performance computing capabilities and expertise to solve our most critical mission challenges

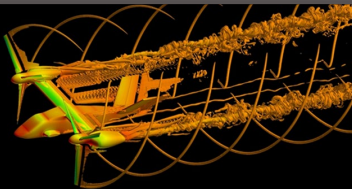


Services & Agencies

Army
Navy
Air Force
DTRA
MDA
DARPA

Major Functions

Science and Technology



Test and Evaluation



Acquisition Engineering



Hardware

+

Network

+

Software

DoD Supercomputing Resource Centers (DSRCs)



U.S. Air Force Research Laboratory DSRC



U.S. Army Research Laboratory DSRC



U.S. Army Engineer Research and Development Center DSRC



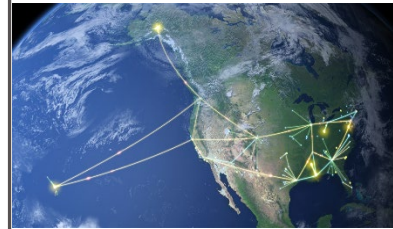
Maui High Performance Computing Center DSRC



U.S. Navy DSRC

Networking and Security

Defense Research & Engineering Network (DREN)



Computer Network Defense, Security R&D, and Security Integration

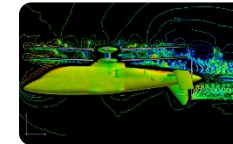


Software Applications



Core Software

Computational Environments



Education and Training

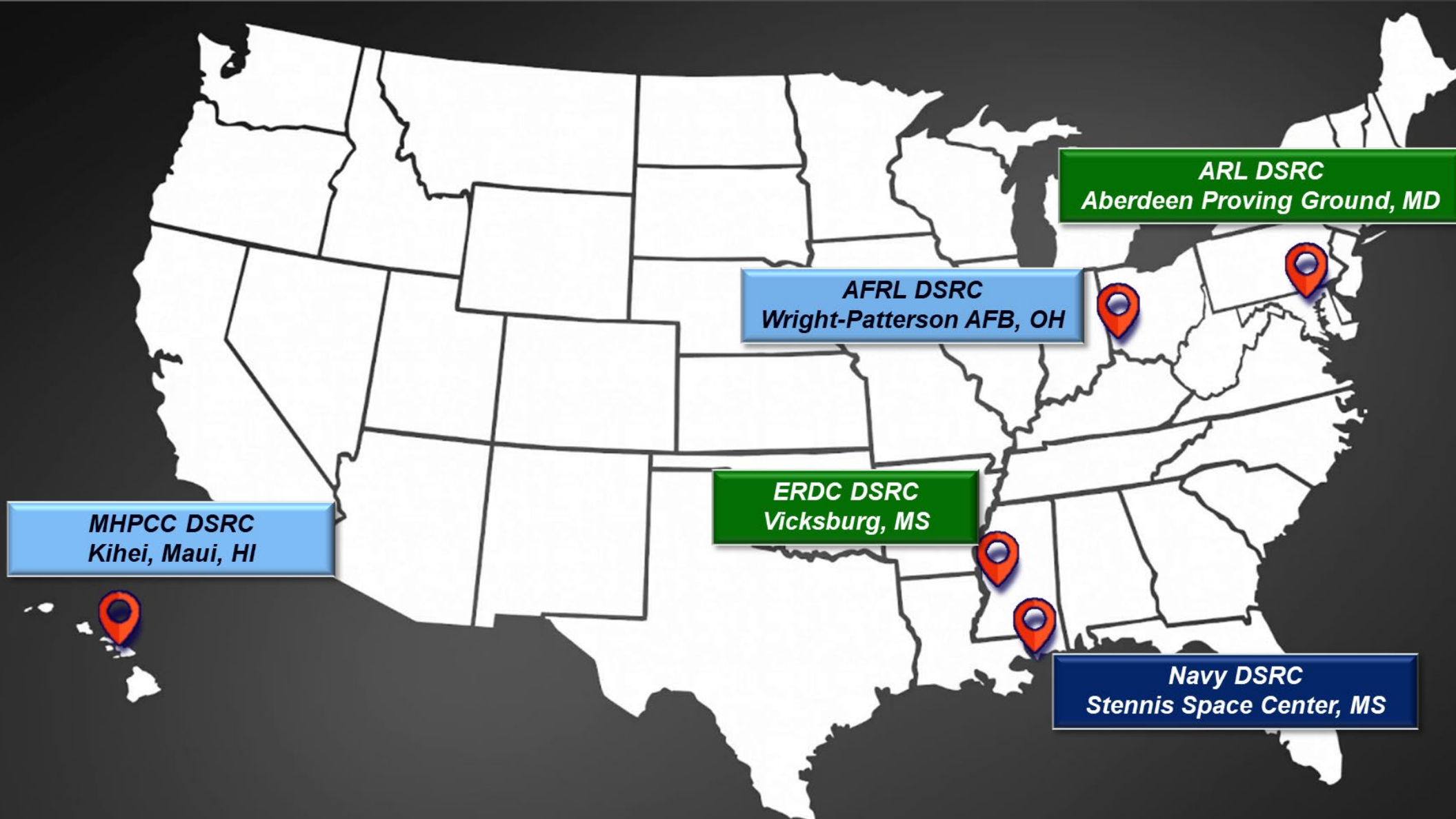
HPC User Support



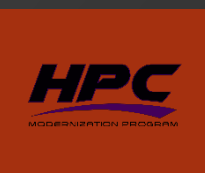
Partners

Federal Agencies + PEO's/PM's + Academia + Industry

DoD Supercomputing Resource Centers (DSRCs)



Large Scale Systems, Breadth of Capabilities



HPE Cray EX4000 system
1,092 standard compute nodes
4 large-memory nodes
12 1-GPU visualization nodes
Total of 212,736 compute cores
382 TB of usable memory; Rated at 8.2 peak PFLOPS



HPE Cray EX4000 system
1,280 standard compute nodes
16 large-memory nodes
32 AI/ML nodes
24 visualization nodes
Total of 256,512 compute cores



HPE Cray EX4000
1,632 standard compute nodes
4 large-memory nodes
8 GPU nodes
Total of 313,344 compute cores
585 TB of useable memory; Rated at 17.65 peak PFLOPS



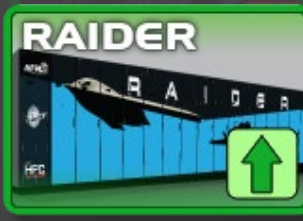
Liquid system
494 standard compute nodes
24 large-memory nodes
36 AI/ML nodes
24 visualization nodes.



HPE Cray EX system
2,304 standard compute nodes; 26 large-memory nodes
16 visualization accelerated nodes
32 Single-GPU MLA accelerated nodes
32 Dual-GPU MLA accelerated nodes
2,410 compute nodes
308,480 compute cores
640 TB of memory; Rated at 13.5 peak PFLOPS.



Penguin Computing TrueHPC system
1,384 standard compute nodes, 16 large-memory nodes
16 visualization accelerated nodes, 32 AI/ML nodes
32 High Core Performance nodes
Total of 1,480 compute nodes or 186,368 compute cores
386 TB of memory; Rated at 8.5 peak PFLOPS



Penguin Computing TrueHPC
1,480 standard compute nodes, 8 large-memory nodes
24 Visualization nodes, 32 MLA nodes
64 High Clock nodes
Total of 199,680 compute cores
447 TB of memory and is rated at 9 peak PFLOPS



HPE Cray EX system
640 standard compute nodes
4 large-memory nodes
16 AI/ML nodes
24 visualization nodes



HPE Cray EX system
1,024 standard compute nodes
4 large-memory nodes
24 1-GPU visualization nodes, 40 2-GPU Machine-Learning nodes
Total of 1,092 compute nodes or 139,776 compute cores
564 TB of memory; Rated at 6.86 peak PFLOPS

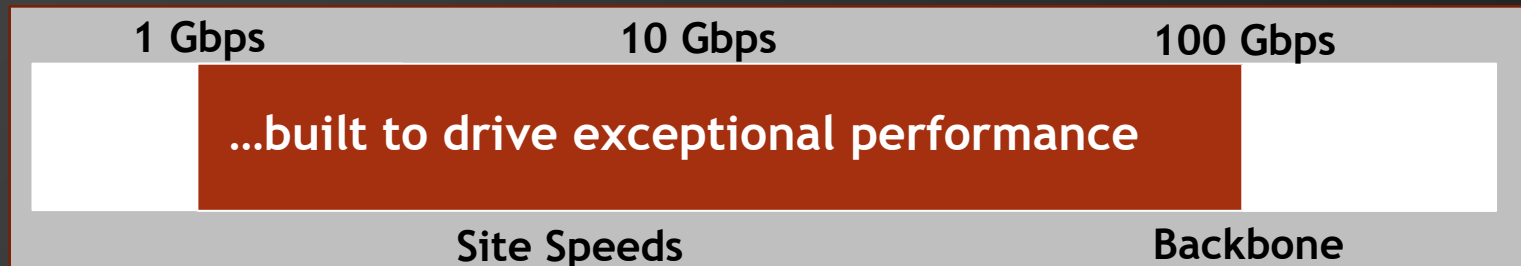
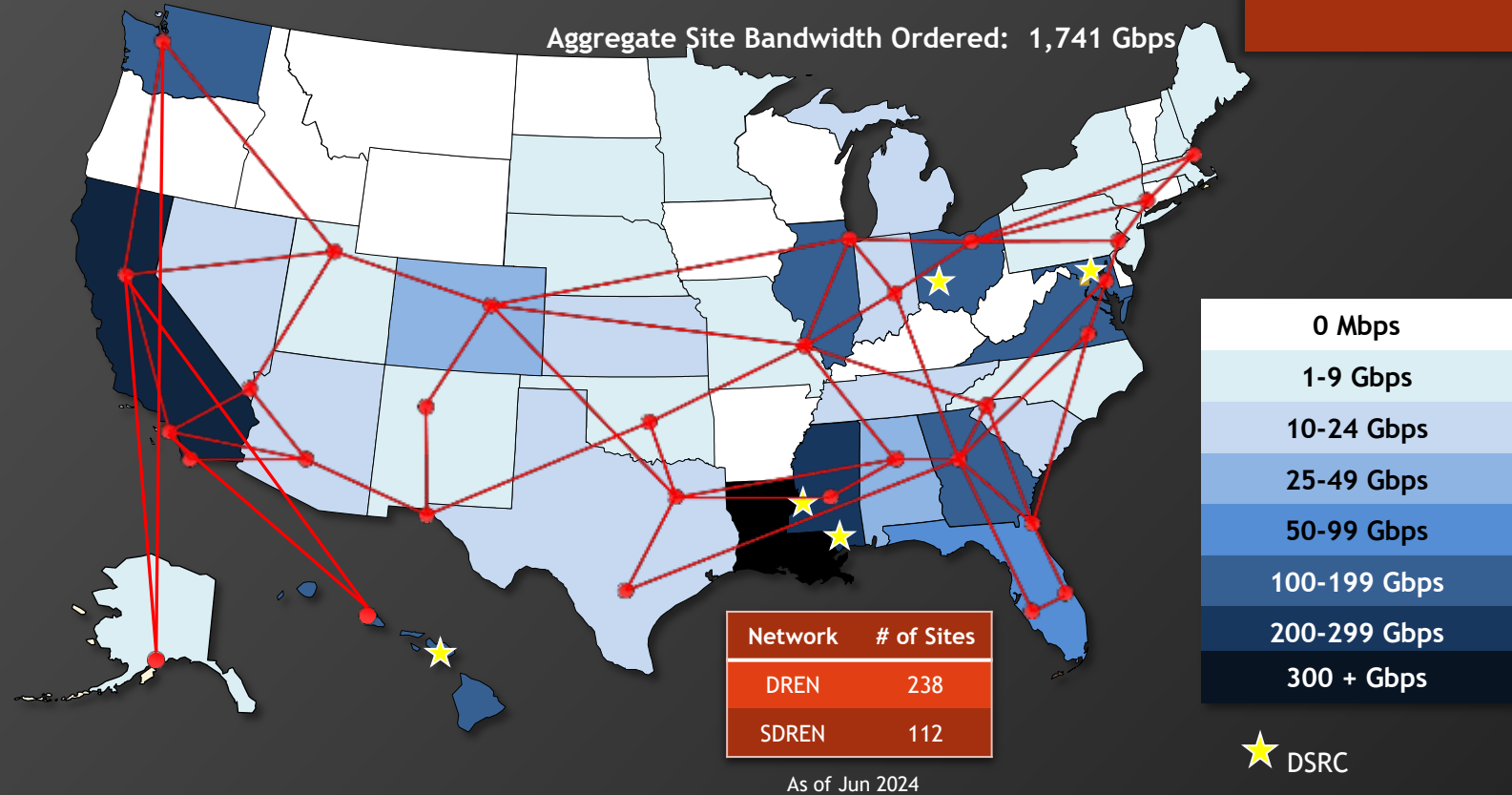


Liquid system
770 standard compute nodes
7 large-memory nodes
16 1-GPU visualization nodes, 68 4-GPU MLA nodes
28 6-GPU MLA nodes (a total of 81,502 compute cores). It has
376 TB of useable memory and is rated at 4.2 PFLOP

Defense Research and Engineering Network (DREN)



- Department's premier wide area network - for S&T, T&E and Acquisition Engineering - with separation from Warfighting networks
- High-bandwidth, low-latency, low-jitter, full-service network fully supporting IPv6
- Connects high performance computing (HPC) centers and users
- Secret-level network overlay on DREN backbone (SDREN)
- DREN 4 provides 1 Gbps to 100 Gbps service to DoD sites; across a 100 Gbps dedicated backbone



Robust, Scalable, Reliable

Powerful Software Tools Built for a Purpose



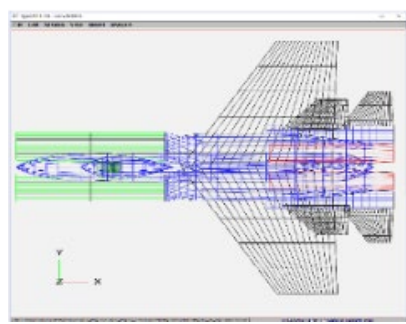
Stakeholder Requirements



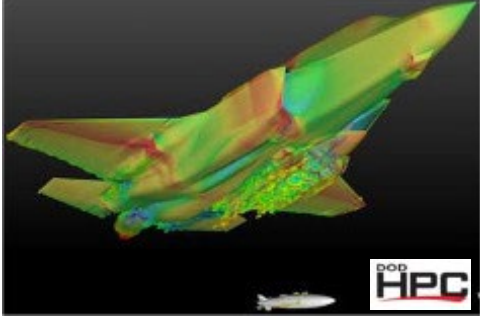
CREATE
Computational Research and Engineering
Acquisition Tools and Environments



Maintenance and Sustainment



Design

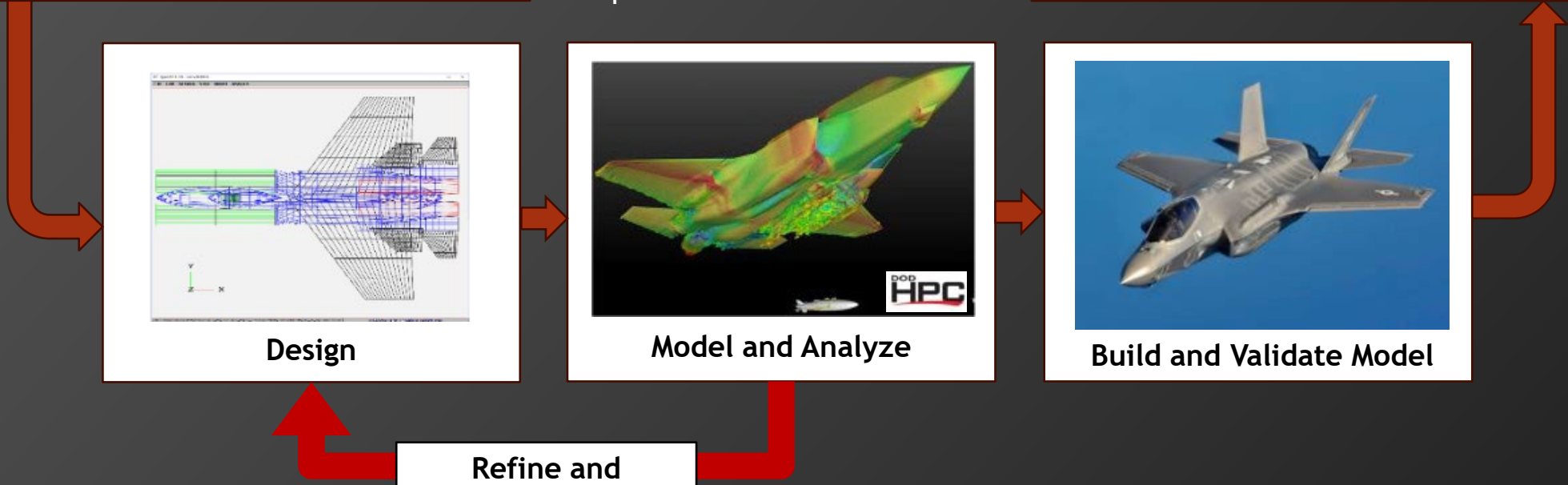


Model and Analyze



Build and Validate Model

Refine and Optimize





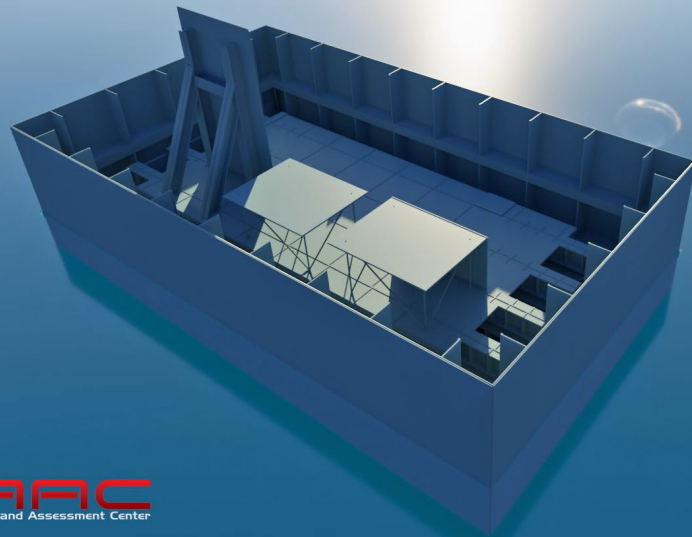
Computational
Research &
Engineering
Acquisition
Tools and
Environments
(CREATE)



CREATE Simulation: NavyFOAM

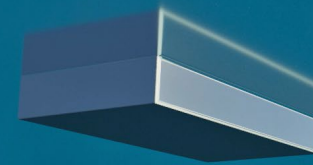


CREATE Simulation: Explosive Modeling



Time: 0.0065 seconds

Above Surface



Time: 0.0065 seconds

Below Surface

Productivity Enhancement and Training (PET)

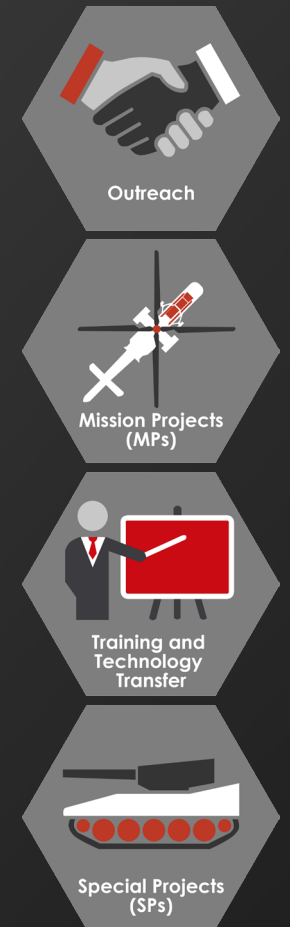


PET Resources

- Provide** Provide access to computational Subject Matter Experts
- Enable** Enable HPCMP users to become more productive by effectively employing HPCMP resources
- Improve** Improve the scaling, portability, accuracy and functionality of application software on a variety of hardware platforms
- Build** Build awareness of and promote transfer of scientific and technical HPC capabilities to reduce cost and schedule of DoD priorities

Four Elements of Support

- Training** Provides access to HPC training resources and events in applicable tools/technologies using the latest collaboration, distance learning, and training technologies
- Mission Projects (MPs)** Designed to assist users with solving complex issues in mission-critical areas
- Outreach** Cultivates and maintains collaborative relationships with enterprise-wide stakeholders to improve HPCMP productivity enhancement
- Special Projects (SPs)** Enables collaboration between to solve HPCMP and mission-related problems



How to Access HPCMP Resources



Department researchers and
engineers



Department contractors



University staff working on a
Department research grant



Non-US Citizens may have
access to HPCMP resources

HPCMP is Critical to DoW



- Enabling improvements to > 50 Major Defense Acquisition Programs and existing weapons platforms
- Supporting the development of next-generation platforms and capabilities for multi-domain operations
- Complementing iterative developmental and operational testing