



DoD High Performance Computing Modernization Program Update

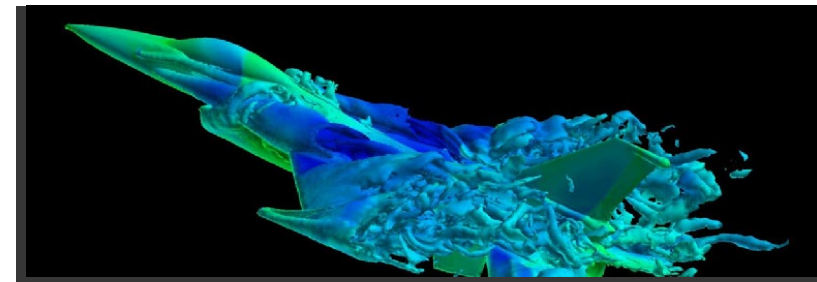
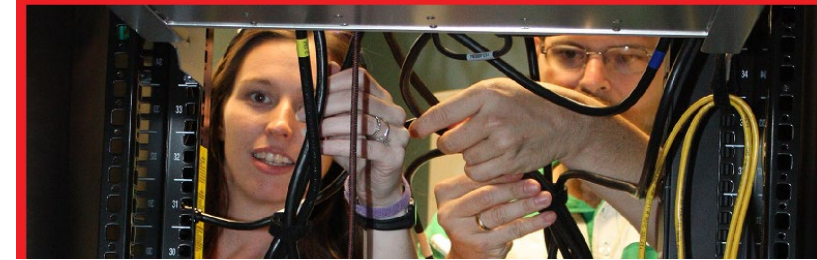
HPC User Forum 4 Sep 2024



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HPCMP Strategic Decisions

- The DoD HPCMP provides science and technology (S&T), test and evaluation (T&E), and acquisition engineering (AE) community customers with a full ecosystem to address their most challenging problems.
- The HPCMP amplifies the creativity, productivity, and impact of the DoD RDT&E and AE communities by providing a virtual environment for design, analysis, and testing. The insights gained by HPC capabilities are often too costly, too dangerous, and/or too time-consuming to obtain through observation and experimentation in the physical world alone.
- HPCMP personnel provide supercomputing technology delivered with a portfolio of services and capabilities that the Department's scientists and engineers use every day to develop, test, and field the new technologies that keep America strong.



HPCMP Ecosystem

- The HPCMP ecosystem enables the development and use of physics-based modeling and simulation, and high-performance data analytics to optimize the development, acquisition, and sustainment of innovative weapons systems. The HPCMP ecosystem consists of:
 - EXPERTISE
 - HPC CENTERS
 - NETWORKING
 - SOFTWARE APPLICATIONS



Executive Priorities

The Commitment to support the Warfighter and protect our nation drives the High Performance Computing Modernization Program (HPCMP) mission. To accomplish this mission, the HPCMP focuses on five goals:

- Maintain Leadership
- Expand the Base
- Increase Customer Productivity
- Exploit Next-Generation Technologies
- Develop the Workforce

Exploiting Next-Generation Technologies

- **HPCMP Systems Support for AI/ML Workloads**
 - Supporting Accelerated Workloads since 2010 with Technology Insertion (TI) Awards
 - “Scout” System Acquired in 2018 – “HPC in a Container”
 - Fully AI/ML Dedicated for Training and Inference Machine Learning Workload
 - TI Awards focusing on ~15% of System configured with AI/ML Nodes
- **HPCMP User Support for AI/ML**
 - Yearly HPCMP AI/ML Workshop
 - Dedicated Training
 - Providing Support to GPT Efforts
- **Goal: Making AI/ML Fully Useful**

Advanced User Support

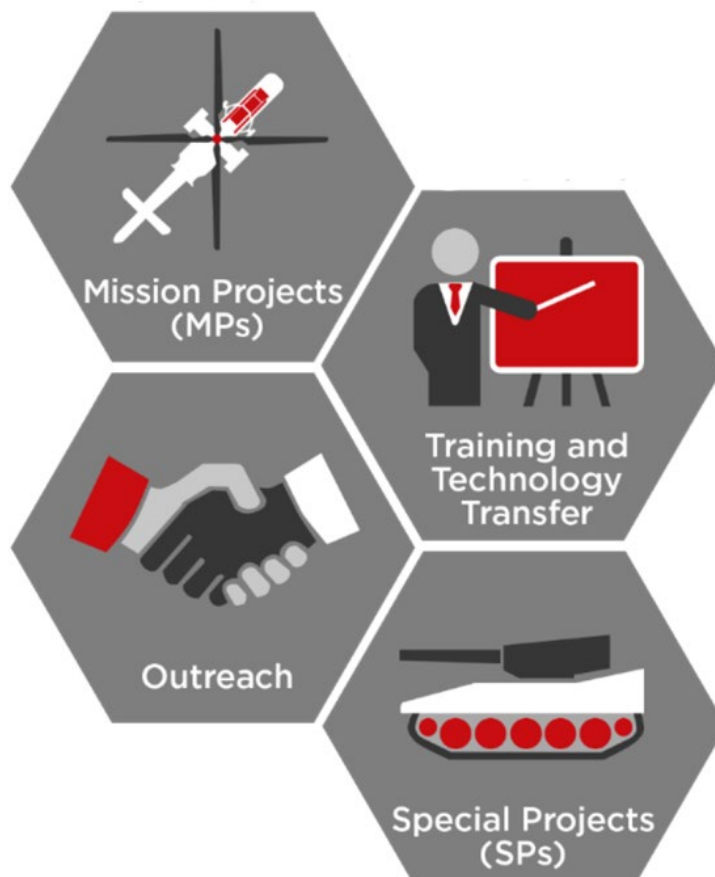
PhD level assistance is provided through the Productivity Enhancement and Training Element of the DoD HPC Program

Mission Projects

DoD HPCMP PhD support staff funded by DoD HPCMP to work with users to solve mission-critical problems of interest across the DoD

Outreach

Increase awareness of DoD Supercomputing Resources and support available to the DoD RDT&E community



PET

**USER PRODUCTIVITY
ENHANCEMENT AND TRAINING**

Training

Provide recurring live and recorded training for new and advanced supercomputing users as well as training/reference material

Special Projects

DoD HPCMP PhD support staff funded by user's organization to help the user's organization solve unique mission-critical problems

Expertise

- **HPC Helpdesk**

- Dedicated support to all DoD Centers
- Provides Direct Tier 1 support

- **Workforce Development**

- A key challenge for the Department of Defense is identifying, developing, and retaining leaders, engineers, and scientists with HPC skills. The HPCMP provides funding for HPC conference attendance and summer internships with DoD laboratories, providing funding to DoD laboratories for undergraduates and graduates to work with the Department's top researchers on projects to maintain US military superiority.



HPC Centers and Supercomputing Resources

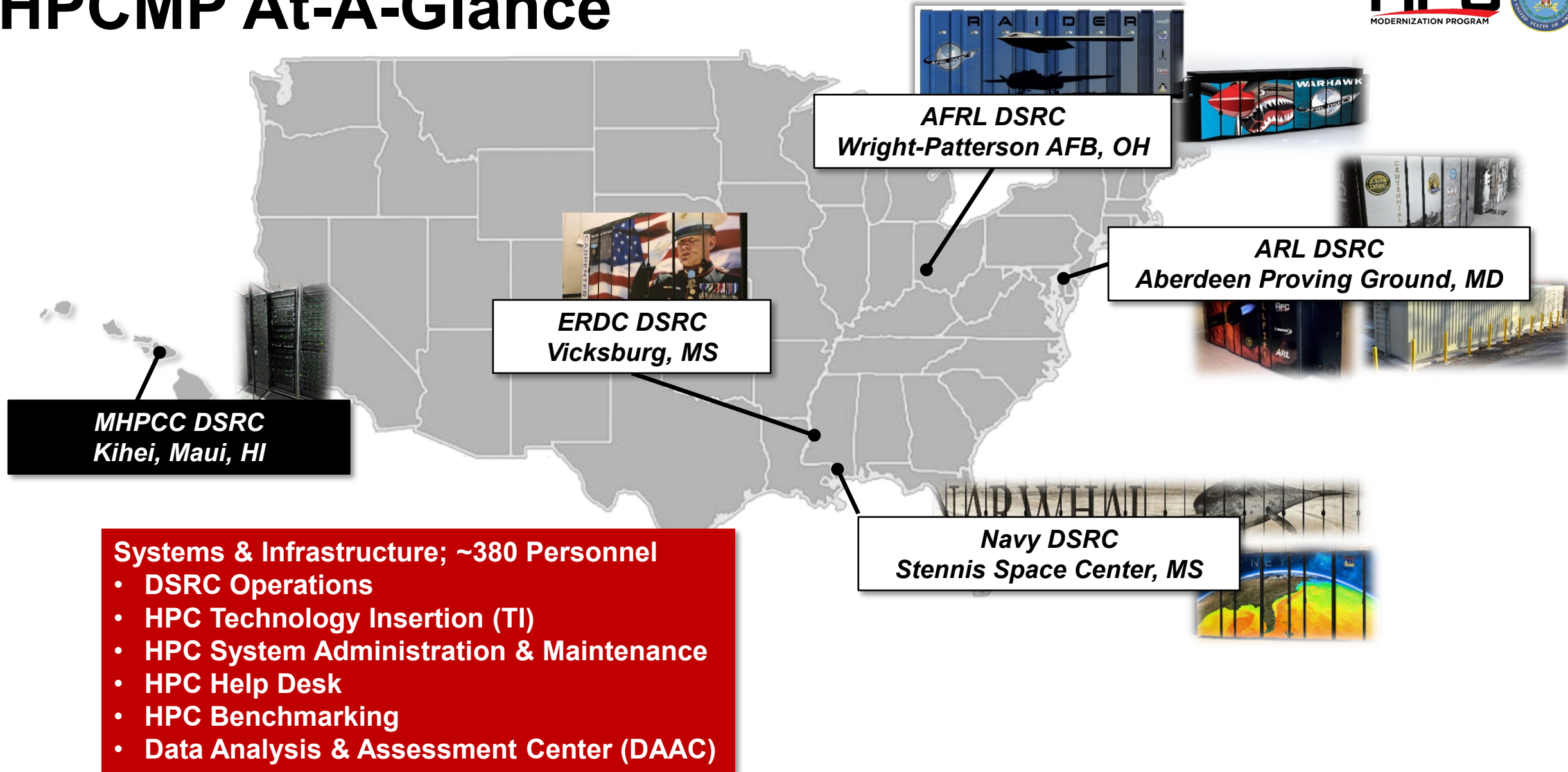


The mission of HPC Centers is the delivery of world-class high-performance computational capabilities to the DoD science and technology (S&T) and test and evaluation (T&E) communities. Located at five DoD Supercomputing Resource Centers (DSRCs), these capabilities provide DoD scientists and engineers with the resources necessary to efficiently solve the most demanding computational problems. The HPC Centers are a part of the DoD High Performance Computing Modernization Program (HPCMP).

Each center hosts a robust complement of HPC capabilities that include large-scale HPC systems, high-speed networks, multi-petabyte archival mass storage systems, and computational expertise. These centers are supported by counterpart data analysis and customer assistance services to maximize the HPCMP user's experience on those resources.

DoD Supercomputing Resource Centers (DSRCs)				
AFRL DSRC	ARL DSRC	ERDC DSRC	Navy DSRC	MHPCC DSRC
Air Force Research Laboratory WPAFB, OH	Army Research Laboratory Aberdeen Proving Ground, MD	Army Engineer Research and Development Center Vicksburg, MS	Navy DoD Supercomputing Resource Center Stennis Space Center, MS	Maui High Performance Computing Center Kihei, Maui, HI

HPCMP At-A-Glance



Available DoD HPCMP Supercomputing Resources



System	TI	Compute Nodes/Cores	GPUs/ MLAs	Peak TFLOPS	EOS Date
SCOUT (ARL)	18	150/6,000	644	1409	Dec 2024
Narwhal (Navy)	19	2,410/308,840	112	13600	Mar 2029
Warhawk (AFRL)	19	1,092/139,776	104	6863	Aug 2028
Jean (ARL)	20	577/55,392	294	9810	2030*
Wheat (ERDC)	20	778/88,512	528	16584	Apr 2028*
Nautilus (Navy)	21	1,400/176,128	144	8467	Apr 2028
Raider (AFRL)	21	1,528/189,440	152	9072	Dec 2030
Ruth (ARL)	22	768/133,632	88	7593	Aug 2031
Carpenter (ERDC)	22	1,644/315,340	8	17650	Dec 2028
Blueback (Navy)	23	1,352/256,512	128	17700	Oct 2024**
Flyer (AFRL)	23	864/172,800	16	8700	Dec 2024**
Fran (ARL)	24	902/173,184	88	8321	July 2025**
TBD (ERDC)	24	1,108/212,736	12	8401	July 2025**
Makau (MHPCC)	24	26/3,328	84	1246	July 2025**



- **Compute time is allocated:**
 - Air Force 30%
 - Navy 30%
 - Army 30%
 - Agencies 10%
- **No charge for computational hours on the supercomputers!**

* Accepted but not yet in Production
 **Acceptance dates are current projections

Defense Research and Engineering Network (DREN)

- Robust, high-capacity, low-latency network
- Connects DoD Supercomputing Resource Centers and user sites
- Supports the DoD Research, Development, and Test & Evaluation missions
- DREN IV provides 1 Gbps to 400 Gbps service to DoD sites
- Supports Multicast, IPv6, and IPv4
- Complies with all DoD Security Regulations and provides secure transport for data between Service Delivery Points (SDPs) at each connected location
- Secret-level network overlay (SDREN)



Computational Research and Engineering Acquisition Tools and Environments (CREATE)



CREATE-AV

KESTREL

Air Vehicle (AV) Design Tools

CREATE-SHIPS

Ship Design Tools

CREATE-RF

Radio Frequency (RF) Antenna Design and Integration Tools

CREATE-GV

Ground Vehicle Design Tools

CREATE-MG

Meshing and Geometry (MG) Support

- **Aircraft (AV) Design Tools:** Fixed-wing aircraft, rotorcraft, conceptual design, trade-space exploration and operational testing and transition
- **Ship Design Tools:** Shock/damage, hydrodynamics, early-stage design & trade-space exploration, and operational testing and transition
- **Radio Frequency (RF) Antenna Design and Integration Tools:** Conceptual design and detailed analysis tools relevant to virtually all DOD platforms
- **Ground Vehicles (GV) Tools:** End-to-end mobility solver, provide rapid, physics-based data for design and trade-space analysis
- **Meshing and Geometry (MG) Support:** CAD-neutral digital representations/product models of weapons systems & platforms and terrain/environments

QUESTIONS?