

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Army **Date:** March 2024

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603461A / <i>High Performance Computing Modernization Program</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	293.043	255.772	239.597	-	239.597	245.350	258.877	261.701	264.317	0.000	1,818.657
<i>DS7: High Performance Computing Modernization Program</i>	-	243.043	255.772	239.597	-	239.597	245.350	258.877	261.701	264.317	0.000	1,768.657
<i>DW5: HIGH PERF COMP MODERN (HPCM) (CA)</i>	-	50.000	-	-	-	-	-	-	-	-	0.000	50.000

A. Mission Description and Budget Item Justification

The High Performance Computing Modernization Program (HPCMP) addresses the supercomputing requirements of Department of Defense (DoD) scientists and engineers by: (1) demonstrating and maturing the most advanced, leading-edge computational architectures while exploiting the resulting systems by employing complementary specialized expertise; (2) demonstrating and maturing the Defense Research and Engineering Network (DREN), which investigates, demonstrates, and matures leading-edge digital networking and security technologies to securely deliver computational capabilities to the distributed DoD Research, Development, Test, and Evaluation (RDTE) community; and (3) leveraging specialized expertise from DoD, other federal departments and agencies, industry, and academia to demonstrate and mature leading-edge software application codes. DoD Supercomputing Resource Centers (DSRCs) provide extensive computational capabilities to demonstrate and mature emerging technologies that address the supercomputing requirements of the DoD RDTE community in the areas of hardware, software, and programming environments. All HPCMP sites are interconnected to each other, the DoD High Performance Computing (HPC) RDTE community, and other major defense sites via the DREN, a research network which investigates, demonstrates, and matures (a) state-of-the-art digital networking technologies to ensure a robust distributed environment and (b) the most advanced digital security capabilities to protect the intellectual property of the DoD and its contract entities as they employ HPCMP capabilities. The HPCMP's software application effort (a) optimizes, enhances, demonstrates, and matures critical DoD physics-based and engineering software to allow scientists and engineers to execute calculations with precision and efficiency on leading-edge supercomputers, (b) demonstrates and matures immersive collaborative programming environments to improve science and engineering workflows, and (c) demonstrates and matures leading-edge computational technology from academia and industry. These synergistic activities collectively demonstrate and mature horizontal technologies that are exploited across the DoD RDTE community, ensuring the DoD maintains the most advanced research and development ecosystem in computationally-intensive modeling and design.

The research cited is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Army **Date:** March 2024

Appropriation/Budget Activity 2040: <i>Research, Development, Test & Evaluation, Army / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603461A / <i>High Performance Computing Modernization Program</i>
---	---

B. Program Change Summary (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	301.964	255.772	259.736	-	259.736
Current President's Budget	293.043	255.772	239.597	-	239.597
Total Adjustments	-8.921	0.000	-20.139	-	-20.139
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-8.921	-			
• Adjustments to Budget Years	-	-	-20.139	-	-20.139

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: DW5: *HIGH PERF COMP MODERN (HPCM) (CA)*

Congressional Add: *Program increase*

	FY 2023	FY 2024
Congressional Add Subtotals for Project: DW5	50.000	-
Congressional Add Totals for all Projects	50.000	-

Change Summary Explanation

Decrease funding reflect planned lifecycle for this effort.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army										Date: March 2024		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603461A / High Performance Computing Modernization Program				Project (Number/Name) DS7 / High Performance Computing Modernization Program			
COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
DS7: High Performance Computing Modernization Program	-	243.043	255.772	239.597	-	239.597	245.350	258.877	261.701	264.317	0.000	1,768.657
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The High Performance Computing Modernization Program (HPCMP) addresses the supercomputing requirements of Department of Defense (DoD) scientists and engineers by (1) demonstrating and maturing the most advanced, leading-edge computational architectures and exploiting the resulting systems by employing complementary specialized expertise; (2) demonstrating and maturing the Defense Research and Engineering Network (DREN) which investigates, demonstrates, and matures leading-edge digital networking and security technologies to securely deliver computational capabilities to the distributed DoD Research, Development, Test, and Evaluation (RDTE) and acquisition engineering communities; and (3) leveraging specialized expertise from DoD, other federal departments/agencies, industry, and academia to demonstrate and mature leading-edge software application codes. DoD Supercomputing Resource Centers (DSRCs) provide extensive computational capabilities and demonstrate and mature emerging technologies that address the supercomputing requirements of the DoD RDTE and acquisition engineering communities in the areas of hardware, software, and programming environments. HPCMP sites are interconnected to each other, the DoD High Performance Computing (HPC) RDTE community, and other major defense sites via DREN, a research network which investigates, demonstrates, and matures (a) state-of-the-art digital networking technologies to ensure a robust distributed environment and (b) the most advanced digital security capabilities to effectively protect the intellectual property of the DoD and its contract entities as they employ HPCMP advanced capabilities. The HPCMP's software application effort (a) optimizes, enhances, demonstrates, and matures critical DoD physics-based and engineering software to allow scientists and engineers to execute calculations with precision and efficiency on leading-edge supercomputers, (b) demonstrates and matures immersive collaborative programming environments to improve science and engineering workflows, and (c) demonstrates and matures leading-edge computational technology from academia and industry. These synergistic activities collectively demonstrate and mature horizontal technologies that are exploited throughout the DoD RDTE and acquisition engineering communities, ensuring the DoD maintains the most advanced research ecosystem in the areas of computationally-intensive modeling and design.

The research cited is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Work in this Project is performed by the United States Army Engineer Research and Development Center.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2023	FY 2024	FY 2025
Title: Department of Defense Supercomputing Resource Centers	139.101	146.387	141.847
Description: The effort investigates, demonstrates, and matures general and special-purpose supercomputing environments that incorporate the most advanced, leading-edge computational architectures, distributed mass storage technologies, and data analysis methodologies; employs complementary specialized expertise to mature and exploit these environments; enables the			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603461A / <i>High Performance Computing Modernization Program</i>	Project (Number/Name) DS7 / <i>High Performance Computing Modernization Program</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2023	FY 2024	FY 2025
DoD RDTE and acquisition engineering communities to effectively and efficiently investigate, demonstrate, and mature a broad range of technologies through advanced computational methods.				
<p>FY 2024 Plans: Will mature and demonstrate over 20 high-end computers across a full range of classifications at five geographically distributed DoD supercomputing resource centers to collectively provide between 110 and 115 quadrillion floating-point operations per second of capability. Will continue to conduct complex, tightly-coupled, large-scale, scientific and engineering simulations and analyses that mature and demonstrate capabilities for important DoD research, test, and development priorities. Will mature and demonstrate emerging data-intensive computing and persistent data services for DoD use cases. Will continue to mature new technologies for accelerating computations, storing/retrieving large volumes of data (over 200 quadrillion bytes in total), and providing on-demand and secure access to high-end computers. Will mature appropriate, approved solutions for sharing highly classified high-end computers among multiple special programs. Will mature and demonstrate seamless sharing of resources across DSRCs and transparent interfaces with cloud computing services for those DoD entities that demand a hybrid compute capability.</p> <p>FY 2025 Plans: Will mature and demonstrate 24 or more high-end computers across a full range of classifications at five geographically distributed DoD supercomputing resource centers to collectively provide over 120 quadrillion floating-point operations/calculations per second of capability. Will continue to conduct complex, highly-coupled, large-scale, scientific and engineering simulations and analyses that mature and demonstrate capabilities for important DoD research, development, and test priorities. Will continue to mature and demonstrate data-intensive computing, persistent data services, and data archiving/retrieval for artificial intelligence/machine learning and other DoD use cases employing large volumes of data (over 250 quadrillion bytes in total). Will continue to mature new technologies for accelerating computations and sharing of highly classified high-end computers among multiple special programs. Will continue to mature and demonstrate seamless access to resources across DSRCs and transparent interfaces with cloud computing services for those DoD entities that demand a hybrid compute capability. Will implement new high-end computing capabilities to support technology transition efforts in acquisition engineering and international collaboration.</p> <p>FY 2024 to FY 2025 Increase/Decrease Statement: Funding decrease reflects the adjusted scope to reduce the level of resources provided by HPCMP to stakeholder organizations.</p>				
Title: Defense Research and Engineering Network (DREN)		52.740	55.501	56.361
Description: The DREN effort investigates, demonstrates, and matures state-of-the-art digital networking technologies to ensure a robust distributed environment among HPCMP sites, the DoD HPC RDTE and acquisition engineering communities, and other major defense sites; investigates, demonstrates, and matures the most advanced digital security capabilities to effectively				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603461A / <i>High Performance Computing Modernization Program</i>	Project (Number/Name) DS7 / <i>High Performance Computing Modernization Program</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2023	FY 2024	FY 2025
<p>protect the intellectual property of the DoD and its contract entities as they employ HPCMP advanced capabilities; employs complementary specialized expertise to mature and exploit this environment.</p> <p>FY 2024 Plans: Will mature and demonstrate secure, advanced networking across a full range of classifications to provide over 1500 Gigabits per second of aggregate bandwidth to more than 215 CONUS and 12 OCONUS sites to implement computational workflows that employ various combinations of high-end computing resources, research assets, test center devices, weapon/platform prototypes, and live participants to mature and demonstrate capabilities for important DoD research, test, and engineering priorities. Will expand DREN installation in the Pacific and other regions of interest to meet test requirements in response to emerging threats. Will continue to mature and enhance the secure protection of DREN from external and internal threats to effectively protect the intellectual property of the DoD and its contract entities engaged in research, test, and engineering missions.</p> <p>FY 2025 Plans: Will mature and demonstrate secure, advanced networking across a full range of classifications to provide over 1600 Gigabits per second of aggregate bandwidth to more than 230 CONUS and 18 OCONUS sites to implement computational workflows that employ various combinations of high-end computing resources, research assets, test center devices, weapon/platform prototypes, and live participants to mature and demonstrate capabilities for important DoD research, test, and engineering priorities. Will continue to expand DREN installation in the Pacific and other regions of interest to meet test requirements in response to emerging threats. Will continue to mature and enhance the secure protection of DREN from external and internal threats to effectively protect the intellectual property of the DoD and its contract entities engaged in research, test, and engineering missions.</p> <p>FY 2024 to FY 2025 Increase/Decrease Statement: Funding increase reflects the adjusted scope planned lifecycle of this effort.</p>				
<p>Title: Software Applications</p> <p>Description: This effort optimizes, enhances, demonstrates, and matures software applications to provide for the adaptation of widely used applications and algorithms to address RDTE and acquisition engineering communities requirements. The Computational Research Engineering Acquisition Tools and Environments (CREATE) initiative demonstrates and matures advanced application codes to allow scientists and engineers to use supercomputers to design and analyze virtual prototypes of DoD ships, fixed-wing aircraft, rotorcraft, ground vehicles, and radio frequency (RF) antennas; HPCMP Institutes demonstrate and mature advanced supercomputing application codes to address critical high-impact DoD challenges (e.g. blast protection for platforms and personnel, high-power microwaves and lasers, munition sensitivities, and mobile network designs/prototypes); High Performance Computing Applications Software Initiative (HASI) projects address the need to mature and refine critical DoD software that can take advantage of new and emerging hardware advances; the Frontier initiative represents and supports</p>		51.202	53.884	41.389

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army		Date: March 2024		
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603461A / <i>High Performance Computing Modernization Program</i>	Project (Number/Name) DS7 / <i>High Performance Computing Modernization Program</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2023	FY 2024	FY 2025
<p>the DoD's highest-priority, highest-impact, most demanding computational work, both from a technical and mission-relevance standpoint; the Productivity, Enhancement, Technology Transfer, and Training (PETTT) initiative (1) optimizes and enhances critical DoD physics based and engineering software to allow scientists and engineers to execute scientific calculations with precision and efficiency on leading-edge supercomputers, (2) demonstrates and matures immersive collaborative programming environments to improve science and engineering workflows, and (3) demonstrates and matures leading-edge computational technology from academia and industry.</p> <p>FY 2024 Plans: Will mature and demonstrate 12 software applications for high-end computers to be used by over 150 DoD stakeholder organizations in air, land, and sea programs of record (PORs) as well as future concept development for DoD's highest priorities. Will mature and demonstrate software tools and environments for high-end computers and provide training to over 3000 users to improve resource effectiveness and impact. Will mature software applications for the operation of DSRC high-end computers in support of over 2000 users and operational staff.</p> <p>FY 2025 Plans: Will continue to mature and demonstrate 12 software applications for high-end computers to be used by over 150 DoD stakeholder organizations in air, land, and sea programs of record (PORs) as well as future concept development for DoD's highest priorities. Will continue to mature and demonstrate software tools and environments for high-end computers and provide training to over 3000 users to improve resource effectiveness and impact. Will continue to mature software applications for the operation of DSRC high-end computers in support of over 2000 users and staff. Will demonstrate new HPC tools for acquisition engineering.</p> <p>FY 2024 to FY 2025 Increase/Decrease Statement: Funding decrease reflects the adjusted scope to reduce the level of resources provided by HPCMP to stakeholder organizations.</p>				
Accomplishments/Planned Programs Subtotals		243.043	255.772	239.597
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
N/A				
D. Acquisition Strategy				
N/A				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Army										Date: March 2024		
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603461A / High Performance Computing Modernization Program					Project (Number/Name) DW5 / HIGH PERF COMP MODERN (HPCM) (CA)		
COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
DW5: HIGH PERF COMP MODERN (HPCM) (CA)	-	50.000	-	-	-	-	-	-	-	-	0.000	50.000
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project enables the Defense Research, Development, Test and Evaluation (RDT&E) community to resolve critical scientific and engineering problems more quickly, and with more precision, using advanced, physics-based computer simulation supported by high performance computing (HPC) technology. The computational expertise and resources enable Department of Defense (DoD) personnel to analyze phenomena that are often impossible, not cost effective, too time-consuming, or too dangerous to study any other way. The High Performance Computing Modernization Program (HPCMP) supports the requirements of the DoD's scientists and engineers in three major areas of effort: supercomputing resource centers, the Defense Research and Engineering Network (DREN), and software applications. DoD Supercomputing Resource Centers (DSRCs) provide extensive capabilities and demonstrate new technologies that address user requirements for hardware, software, and programming environments. Efforts of the DSRCs are augmented by dedicated HPC project investments (DHPs) that address near real-time and real-time HPC requirements. All sites in the HPC Modernization Program are interconnected to one another, the user community, and major defense sites via the DREN, a research network which matures and demonstrates state-of-the-art computer network technologies. The Software Application effort optimizes and improves the performance of critical common DoD applications programs to run efficiently on advanced HPC systems, matures and demonstrates leading-edge computational technology from academic and commercial partners, and provides collaborative programming environments.

The work cited is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2023	FY 2024
Congressional Add: Program increase	50.000	-
FY 2023 Accomplishments: Congressional Interest Item funding provided for High Performance Computing Modernization Program		
Congressional Adds Subtotals	50.000	-

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A