Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Office of Secretary Of Defense										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 3: *Advanced Technology Development (ATD)*				R-1 ITEM NOMENCLATURE PE 0603755D8Z: *High Performance Computing Modernization Program*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	231.735	200.986	-	-	-	-	-	-	-	Continuing	Continuing
P507: *High Performance Computing Modernization Program*	231.735	200.986	-	-	-	-	-	-	-	Continuing	Continuing

Note

The High Performance Computing Modernization Program transfers from the Office Secretary of Defense to the Department of the Army in FY2012.

A. Mission Description and Budget Item Justification

Today, the Department of Defense (DoD) faces many challenges. The High Performance Computing Modernization Program (HPCMP) provides cost effective tools the Department needs to address the most difficult defense problems. These tools include modern high performance computing hardware, parallel software, wide area networking services and the expertise to use them. The HPCMP helps enables DoD personnel to:

- Conduct basic research into areas such as materials, fuels, turbulence, proteins, electromagnetic fields, signal image relationships, structural response, blast effects, and combustion;
- Conduct applied research into areas such as aerodynamics applied to fighter and transport manned and unmanned aircraft, automated target recognition; hydrodynamics applied to new hull forms, structural performance of new armor and penetrator concepts, and explosives performance;
- Design elements of weapon systems such as the Hellfire missile, F-35, MRAP, C-17, the Javelin missile, and directed energy weapons systems;
- Test and evaluate weapons system performance on systems such as F-16, F-22, F-35, C-17, FCS, AIM-9X, GBU-39 and Striker;
- Immediately support urgent operations for efforts such as counter IED, hurricane Katrina related flood modeling, and the 2010 gulf oil spill migration modeling.

High Performance Computing has been identified as a key enabling technology essential to achieving the DoD's research development, test and evaluation (RDT&E) objectives. Validated requirements collected across the DoD reflect the needs of 4,400 scientists and engineers located at hundreds of locations (DoD Laboratories, Test Centers, academic institutions and commercial businesses). The integrated HPCMP consists of DoD Supercomputing Resource Centers (DSRCs), the Defense Research and Engineering Network (DREN), and Software Application Support. DSRCs are responsible for as large a part of DoD`s RDT&E computational workload as feasible. DSRCs provide extensive capabilities to address user requirements for hardware, software, and programming environments. Dedicated HPC project investments (DHPIs) augment the DSRCs to form the total HPCMP computational capability. DHPIs address critical HPC requirements that cannot be met at DSRCs, such as real-time, and near real-time computing requirements, and leverage significant HPC and mission expertise located at these remote sites. All elements of the HPCMP are interconnected with all S&T and T&E user sites via the Defense Research and Engineering Network. DREN provides the flexible wide area network fabric needed by the RDT&E community to support technology demonstrations and distributed test and evaluation events in addition to providing access to the supercomputing centers. The Software Application Support component develops critical common DoD applications programs that run efficiently on advanced HPC systems, supports technology transition activities with academic and commercial institutions, trains users, and builds collaborative programming environments. The Computational Research and Engineering Acquisition Tools and Environments (CREATE) produces supercomputer-based engineering design and test tools, improving the acquisition process for major weapons systems.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Office of Secretary Of Defense	DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603755D8Z: *High Performance Computing Modernization Program*

The High Performance Computing Modernization Program transfers from the Office Secretary of Defense to the Department of the Army in FY2012

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	221.286	200.986	210.217	-	210.217
Current President's Budget	231.735	200.986	-	-	-
Total Adjustments	10.449	-	-210.217	-	-210.217
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-5.259	-			
• Other Program Adjustments	15.708	-	-210.217	-	-210.217

Change Summary Explanation

The High Performance Computing Modernization Program transfers from the Office Secretary of Defense to the Army in FY2012.

Exhibit R-2A, RDT&E Project Justification: PB 2012 Office of Secretary Of Defense			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 0400: *Research, Development, Test & Evaluation, Defense-Wide* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603755D8Z: *High Performance Computing Modernization Program*	PROJECT P507: *High Performance Computing Modernization Program*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
P507: *High Performance Computing Modernization Program*	231.735	200.986	-	-	-	-	-	-	-	Continuing	Continuing

Note

The High Performance Computing Modernization Program transfers from the Office Secretary of Defense to the Department of the Army in FY2012.

A. Mission Description and Budget Item Justification

The Department of Defense (DoD) High Performance Computing (HPC) Modernization Program supports the needs of the warfighter for technological superiority and military dominance on the battlefield by providing advanced computational services to U.S. weapons system scientists and engineers. By exploiting continuous advances in HPC technology, the defense research, development, test and evaluation (RDT&E) community is able to resolve critical scientific and engineering problems more quickly and with more precision. The results of these efforts feed directly into the acquisition process by improving weapons system designs through an increased fundamental understanding of materials, aerodynamics, chemistry, fuels, acoustics, signal image recognition, electromagnetics, and other areas of basic and applied research. As such, HPC has been identified as a key enabling technology essential to achieving the objectives of the DoD's RDT&E.

The program primarily provides supercomputing services through DoD Supercomputing Resource Centers (DSRCs). Additionally, support for specialized programs is provided through dedicated HPC project investments (DHPIs). DHPIs support a one-time need and have no support tail within the HPC Modernization Program. Centers and DHPIs directly support the DoD RDT&E laboratories and test centers and are accessible to local and remote scientists and engineers via high-speed network access. An integral part of the program is providing for the adaptation of broadband, widely used applications and algorithms to address RDT&E requirements, along with continued training of users as new system designs and concepts evolve. The program pursues continuous interaction with the national HPC infrastructure, including academia, industry, and other government agencies to facilitate the sharing of knowledge, tools, and expertise.

Annually validated requirements, collected across the DoD reflect the needs of 4,400 scientists and engineers located at hundreds of locations (DoD Laboratories, Test Centers, academic institutions and commercial businesses), and to drive program decisions. The integrated HPC program consists of DoD Supercomputing Resource Centers; the Defense Research and Engineering Network (DREN); and Software Application Support. DSRCs are responsible for as large a fraction of DoD`s S&T and T&E computational workload as feasible. DSRCs provide extensive capabilities to address user requirements for hardware, software, and programming environments. DHPIs augment the DSRCs to form the total HPC Modernization Program computational capability. DHPIs address critical HPC requirements that cannot be met at DSRCs, such as real-time, and near real-time computing requirements, and leverage significant HPC and mission expertise located at these remote sites. All elements of the HPC Modernization Program are interconnected with all S&T and T&E user sites via the DREN. Additionally, the Software Application Support component develops critical common DoD applications programs that run efficiently on advanced HPC systems, supports technology transition activities with academic and commercial institutions, trains users, and builds collaborative programming environments.

True modernization of DoD`s HPC capability and fulfillment of the program's vision and goals requires an on-going program strategy that addresses all aspects of HPC. While advancing the level of hardware performance is critical to success, the higher objective is to enable better scientific research, T&E environments, and

Exhibit R-2A, RDT&E Project Justification: PB 2012 Office of Secretary Of Defense		DATE: February 2011
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technology development for superior weapons, warfighting, and related support systems. The Program goals are to (1) acquire, deploy, operate and maintain best-value supercomputers; (2) acquire, develop, deploy and support software applications and computational work environments that enable critical DoD research, development and test challenges to be analyzed and solved; (3) acquire, deploy, operate and maintain a communications network that enables effective access to supercomputers and to distributed S&T/T&E computing environments; (4) continuously educate the RDT&E workforce with the knowledge needed to employ computational modeling effectively and efficiently; and (5) promote collaborative relationships among the DoD computational science community, the national computational science community and minority serving institutes.

The DREN provides wide area network (WAN) connectivity among the Department's S&T and T&E communities. The DREN is implemented through an Intersite Services Contract awarded to MCI (WORLDCOM) during FY 2002. A new DREN network services contract is planned to be awarded in FY 2011. DREN currently provides services to sites throughout the continental United States, Alaska, Hawaii, and can be extended overseas where necessary. A Secret DREN using common Secret systems high key with NSA certified Type-1 encryptors that can transport classified traffic at OC-3 (155 Mbps) has also been deployed. The HPC Modernization Program employs state-of-the-art WAN security and strong host and user security creating a defense-in-depth security architecture.

The High Performance Computing Modernization Program transfers from the Office Secretary of Defense to the Department of the Army in FY2012.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Department of Defense Supercomputing Resource Centers	117.221	100.493	-
Description: The program supports DoD Supercomputing Resource Centers that are responsible for as large a fraction of DoD's S&T and T&E computational workload as feasible. Dedicated HPC project investments (DHPIs) support a one-time need and have no legacy within the HPC Modernization Program. ***FY 2010 Accomplishments:*** Since 1994, the program has sustained and regularly modernized HPC systems, storage, and scientific data analysis and visualization capabilities to fulfill a significant portion of the science and technology (S&T) and test and evaluation (T&E) community HPC requirements. Six DSRCs were supported in FY 2010 and two DHPIs were competitively awarded at the Air Force Research Laboratory, Rome, NY and the Air Force Electronics Systems Command, Hanscom AFB, MA. Computational services were provided to over 4,000 scientists and engineers located at over 200 DoD Laboratories, Test Centers, academic institutions and commercial businesses. These services enabled basic research, applied research, design elements of weapon systems, test and evaluation of weapons system performance, and immediate support for urgent operations efforts (counter IED, hurricane Katrina, and the 2010 gulf oil spill). Also in FY 2010, the program made significant investments in mass data storage systems to replace systems that had reached the end of their life cycle. Status of FY 2010 Congressional adjustments: $3,120 Naval Research Lab prototype – Funds obligated			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
$13,000 HPC Program Adjustments – Funds obligated ***FY 2011 Plans:*** Since 1994, the program has sustained and regularly modernized HPC systems, storage, and scientific data analysis and visualization capabilities to fulfill a significant portion of the science and technology (S&T) and test and evaluation (T&E) community HPC requirements. Six DSRCs are initially programmed for support in FY 2011 and two to five competitively awarded DHPIs are planned. The program will begin steps to streamline DSRC structure and will end the year with five DSRCs. ***FY 2012 Plans:*** The High Performance Computing Modernization Program transfers from the Office Secretary of Defense to the Department of the Army in FY2012.			
Title: Networking ***Description:*** The Defense Research and Engineering Network (DREN) provides wide area network (WAN) connectivity among the Department's S&T and T&E communities and provides the computer and network security for the HPCMP. ***FY 2010 Accomplishments:*** Network services to link all elements of the program will be provided by the DREN as well as operation of security systems and enhancements. The DREN network services contract re-competition was initiated in FY 2010. DREN provided a flexible wide area network fabric allowing the DoD RDT&E community to support technology demonstrations and distributed test and evaluation events as well as providing this community access to the six supercomputing centers. Collaborative work with the federal networking community and standards associations assured that the DREN remained compatible with technology changes. ***FY 2011 Plans:*** Network services to link all elements of the program will be provided by the DREN as well as operation of security systems and enhancements. Collaborative work with the federal networking community and standards associations will continue to assure that the DREN will remain compatible with future technology change. ***FY 2012 Plans:*** The High Performance Computing Modernization Program transfers from the Office Secretary of Defense to the Department of the Army in FY2012.	29.964	31.735	-
Title: Software Applications ***Description:*** Software Applications provide for the adaptation of broadband, widely used applications and algorithms to address RDT&E requirements, continued training of users as new system designs and concepts evolve, and continuous interaction	84.550	68.758	-

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
with the national HPC infrastructure, including academia, industry, and other government agencies to facilitate the sharing of knowledge, tools, and expertise. ***FY 2010 Accomplishments:*** Computational Research and Engineering Acquisition Tools and Environments (CREATE) continued development of supercomputer-based engineering design and test tools to improve the acquisition process for major weapons systems across the Department. Development efforts in software programs continued to mature as other projects were completed, and others begun with a greater emphasis on engineering applications. Software Institutes and portfolios developed shared scalable applications to exploit scalable HPC assets. Final software portfolio projects were completed. The Academic Outreach Program encouraged and supported computational science in universities across the U.S. The Programming Environments and Training (PETTT) effort provided computational and computer science support to the DoD HPC user community through interaction and collaborative projects with academic and industrial partners. A new contract providing for PETTT services was awarded in FY2010. Technologies and methodologies were developed to protect and limit end-use of high performance computing applications software while minimizing the burden on authorized end-users. ***FY 2011 Plans:*** Computational Research and Engineering Acquisition Tools and Environments (CREATE) will continue development of supercomputer-based engineering design and test tools to improve the acquisition process for major weapons systems across the Department. Development efforts in software programs will continue to mature as other projects are completed, and others begun with a greater emphasis on engineering applications. Software Institutes will continue to develop shared scalable applications to exploit scalable HPC assets. However, the number of institutes will be adjusted as the program is re-focused. An Academic Outreach Program will continue be supported to encourage and support computational science in universities across the United States. The Programming Environments and Training effort will provide computational and computer science support to the DoD HPC user community through interaction and collaborative projects with academic and industrial partners. Efforts to develop technologies and methodologies to protect and limit end-use of high performance computing applications software will be completed. ***FY 2012 Plans:*** The High Performance Computing Modernization Program transfers from the Office Secretary of Defense to the Department of the Army in FY2012.			
Accomplishments/Planned Programs Subtotals	231.735	200.986	-

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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
• 0902198D8Z: *Major Equipment OSD*	52.936	53.489	0.000		0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

Not applicable for this item.

E. Performance Metrics

Strategic Goals supported are as follows:

Defense Supercomputing Resource Centers - Method of Measurement: Habus (HPCMP standard measurement of computational performance)

FY2010: Existing Baseline – 2024.0/ Planned Performance Improvement - Requirement Goal – 2000.0/ Actual Performance Improvement – 2251.0
FY2011: Existing Baseline – 4275.0/ Planned Performance Improvement - Requirement Goal – 1575.0
Networking - Method of Measurement: Gigabits per second

FY2010: Existing Baseline – 30.6/ Planned Performance Improvement - Requirement Goal – 1.0/ Actual Performance Improvement – 2.1
FY2011: Existing Baseline – 32.7/ Planned Performance Improvement - Requirement Goal – 1.0

Software Applications - Methods of Measurement: Customer Satisfaction on a 0-5 scale

FY2010: Existing Baseline – 4.2/ Planned Performance Improvement - Requirement Goal – 4.2/ Actual Performance Improvement – 4.2
FY2011: Existing Baseline – 4.2/ Planned Performance Improvement - Requirement Goal – 4.2

Comment: All FY2010 actual performance metrics met or exceeded those planned.