Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification											DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602783A: *COMPUTER AND SOFTWARE TECHNOLOGY*							
COST ($ in Millions)	**FY 2009 Actual**	**FY 2010 Estimate**	**Base FY 2011 Estimate**	**OCO FY 2011 Estimate**	**Total FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	7.786	5.609	6.768	0.000	6.768	5.960	6.134	6.251	6.369	0	51.645
Y10: *COMPUTER/INFO SCI TECH*	5.394	5.609	6.768	0.000	6.768	5.960	6.134	6.251	6.369	Continuing	Continuing
Y11: *COMPUTER & INFORMATION SCIENCE APPLIED RES CA*	2.392	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

The objective of this program element (PE) is to conduct applied research that would enable enhanced understanding and accelerate the decision cycle time for commanders and leaders operating in a mobile, dispersed, highly networked environment. This PE supports research on information and communications technology (project Y10). Project Y11 funds congressional special interest items.Work in this PE is related to and fully coordinated with efforts in PE 0602782A (Command, Control, Communications Technology), PE 0603772A (Advanced Tactical Computer Science and Sensor Technology), and PE 0603008A (Command, Control, Communications Advanced Technology). The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.Work in this project is performed by the Army Research Laboratory (ARL), Adelphi and Aberdeen Proving Ground, MD locations.

B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	6.274	5.639	5.756	0.000	5.756
Current President's Budget	7.786	5.609	6.768	0.000	6.768
Total Adjustments	1.512	-0.030	1.012	0.000	1.012
• Congressional General Reductions		-0.030			
• Congressional Directed Reductions					
• Congressional Rescissions		0.000			
• Congressional Adds		0.000			
• Congressional Directed Transfers					
• Reprogrammings	1.617	0.000			
• SBIR/STTR Transfer	-0.105	0.000			
• Adjustments to Budget Years	0.000	0.000	1.012	0.000	1.012

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Change Summary Explanation

FY09 funding increase due to reprogramming of congressional special interest item.FY11 funding increase for Materials Force Protection technology efforts.

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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
Y10: *COMPUTER/INFO SCI TECH*	5.394	5.609	6.768	0.000	6.768	5.960	6.134	6.251	6.369	Continuing	Continuing

A. Mission Description and Budget Item Justification

The objective of this project is to conduct applied research of information and communications technology with the goal of developing information processing technologies to automate the delivery of local/global information for decision making (planning, rehearsal, and execution) so that it is synchronized, parallel and real-time; and devising communication/network technologies that will enable the synchronization of secure data/information from humans to humans, humans to computers, computers to humans, as well as reducing dependence on mouse and keyboard versus other modes of computer interaction. This is key to enabling enhanced understanding and accelerating the decision cycle time for commanders and leaders operating in the mobile, dispersed, highly networked environment envisioned for the future force.The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan. Work in this project is performed by the Army Research Laboratory (ARL), Adelphi and Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	1.090	1.100	1.160	0.000	1.160
Information Processing: Enhance information processing techniques in order to inform and protect the force from imminent threats. User directed fusion techniques that, when combined with methods developed at the Communications-Electronics Research, Development, and Engineering Center (CERDEC), enables semi-automated fusion to improve the completeness and timeliness of decision-making in command and control (C2) operations. The integrated technology will be matured for Distributed Common Ground Station-Army (DCGS-A) and future force assessment. In FY09, developed and transitioned fusion (relationship discovery) services to CERDEC for integration into DCGS-A. In FY10, investigate measures of interest to mine relevant information from social network information sources and augment that information with data from local (sensor) assets for improved understanding of the human/terrain battlefield interactions. In FY11, will investigate the concept of social network exploitation and its relationship to communication and information network domains in collaboration with the Network Sciences International Technology Alliance (ITA); investigations will lead to improved social network analysis tools, interfaces, and visualization routines for Army intelligence.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Information Assurance: Conduct applied research on tactical information protection technologies for agent-based vulnerability assessment over wireless bandwidth constrained links and security infrastructures for sensor networks. The future force will operate in a complex wireless environment where survivability must be maintained in spite of inherent vulnerabilities of standardized protocols and commercial technologies. In FY09, evaluated the scalability of the distributed wireless intrusion detection system (IDS) system in large networks and determined the expected bounds of performance (e.g. overhead, missed detection probability, and false alarm probability). In FY10, evaluate the wireless IDS system performance in terms of network overhead (i.e., bandwidth, energy and latency). In FY11, will evaluate secure information flow techniques in mobile tactical networks via simulation/emulation to enhance the reliable delivery of information to the Soldier. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	1.040	1.113	1.089	0.000	1.089

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #3 Information Exchange: Investigate techniques to enable automated integration of global and local information, allowing tactical assets to cooperatively share sensed events within a wireless distributed fusion environment in order to inform the force of relevant events. In FY09, integrated cross-security-level information exchange algorithms to ensure tactically relevant information is presented to the user in a minimally intrusive manner. In FY10, investigate data structures for policy-based information exchange (administrative approach used to simplify network management by establishing rules/guidelines to deal with situations that are likely to occur) and integrate information assurance modules to support the evaluation in tactically relevant environments. In FY11, will design network service interfaces, refine policy-based information exchange structures, and conduct assessments on policy-based exchange software in an operational (command, control, communications, computer, intelligence, surveillance and reconnaissance (C4ISR) On-the-Move) environment. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base	1.104	1.145	1.185	0.000	1.185

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Program #4 Language Translation: Conduct research into techniques for developing the underlying computational multilingual software framework to enable commanders and troops to bridge language barriers in order to counter adversaries and collaborate with allies. In FY09, evaluated the use of document image processing tools operating through web service on noisy and handwritten foreign language documents. In FY10, assess the impact of pre-processing tools on downstream processes like named entity extraction, machine translation, and summarization that are critical to the Intelligence Community. In FY11, will integrate new optical character recognition/machine translation (OCR/MT) evaluation tools and expand the testbed to accommodate select Net Centric Enterprise Services (NCES). Will jointly evaluate/modify/transition best-of-breed language processing tools with PM-Sequoyah for the Army and Intelligence Communities. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.545	0.551	0.580	0.000	0.580
Program #5	1.615	1.625	1.742	0.000	1.742

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Network Theory: Statistical based methods for studying networks supports theory development in network science. Provide a basis to validate or invalidate theoretical results, identify gaps between theory prediction and field performance, provide verification of mobility, channel, and topology models, and of convergence of adaptive protocols; guide development of the theoretical effort by providing a basis for refining models and assumptions. All of this leads to the right levels of robust abstraction to understand network behavior, resulting in a tight coupling between theoretical developments, simulation, emulation, and over-the-air testing in lab and field environments. The long-term goal is to develop a real-time adaptive statistical analysis system that is coupled to a monitoring system that can infer/learn global network behavior and to a control system that controls local behavior so as to predictively improve performance, while ensuring the stability of the overall system. In FY09, refined and expanded the scope of the effort (size of the network, complexity of the deployed algorithms and protocols, heterogeneity of the nodes, harshness of the radio frequency (RF) channel conditions and sophistication of the adaptation). Validated theoretical work against the acquired data. In FY10, create models that incorporate network characteristics and human information processing, and communication and decision making capabilities for enhanced system performance. In FY11, will investigate bio-inspired approaches for robust resilient networking and assess the trade-offs between simplicity, resilience, overhead and performance for heterogeneous tactical networks (work in this area will build on technology transitioned from the Institute for Collaborative Biotechnologies, PE 0601104A/project H05). *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
OCO FY 2011 Plans: FY 2011 OCO					
Program #6 Heterogeneous Computing and Computational Sciences: In FY11, will investigate scalable interface algorithms for implementing heterogeneous computing systems on battlefield applications of robotics information decision aids and biometric applications. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	0.000	1.012	0.000	1.012
Program #7 Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	0.000	0.075	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	5.394	5.609	6.768	0.000	6.768

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
Y11: *COMPUTER & INFORMATION SCIENCE APPLIED RES CA*	2.392	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Computer and Software Technology applied research.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1 Lightweight Soldier Sensor Computing. In FY09, this Congressional Interest Item investigated new techniques to provide sensor networks and sensors increased computing power. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.797	0.000	0.000	0.000	0.000
Program #2 Integrated Information Technology Policy Analyses Research. This is a Congressional Interest Item.	1.595	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Accomplishments/Planned Programs Subtotals	2.392	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.