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From: Program Executive Officer, Command, Control, Communications, Computers and Intelligence
To: Distribution

Subj: PEO C4I ANNUAL ACQUISITION REQUIREMENTS FOR SCIENCE & TECHNOLOGY

Ref: (a) S&T Alignment and Transition CONOPS of 6 Dec 09
(b) PEO C4I Masterplan of 7 Aug 11

Encl: (1) PEO C4I Acquisition Gaps for Science & Technology

1. Purpose. The purpose of this memorandum is to provide PEO C4I's annual acquisition requirements for Science & Technology in accordance with reference (a).

2. Background. PEO C4I has compiled S&T capability gaps for associated Programs of Record based on current and projected needs. These consolidated S&T gaps have been aligned to the Tier 0 and Tier 1 categories of the Navy Technical Reference Model (NTRM) as defined in reference (b) and are summarized below:

a. COMMUNICATIONS

(1) Provide technologies for electromagnetic survivability resistance to jamming and Electromagnetic Interference (EMI)

(2) Improve SATCOM denial mitigation technologies

(3) Provide technologies for high volume data transmission for Line of Sight (LOS) and Beyond Line of Sight (BLOS) links

(4) Improve mobile platform coverage through steerable multiband antenna systems

(5) Develop antenna systems with adaptive coding and modulation for broad-band communications

(6) Improve time-sensitive, reliable communications across the full range of tactically relevant speeds and depths

(7) Provide technologies to reduce the size of components used in undersea broadcast systems

b. NETWORKS

(1) Provide dynamic ad-hoc network technologies capable of supporting standardized secure video/voice over dynamic IP routing protocols

(2) Enhance tactical edge networks supporting highly mobile and disadvantaged users

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(3) Develop disruptive tolerant network technologies to maintain enterprise networking in degraded environments

(4) Provide innovative technologies to migrate the Fleet Operating Centers to a cloud infrastructure

(5) Improve platform integration technologies for cross domain network environments with assured QoS for real-time data services

(6) Develop improved capabilities for large-volume data exfiltration, management, and intelligent dissemination

(7) Provide predictive network modeling tools with mission planning capabilities

c. COMMON COMPUTING ENVIRONMENT

(1) Develop cryptographic capabilities for large data (to include modifications and updates) in a cloud environment ashore and afloat

(2) Provide storage and analysis capabilities for afloat cloud systems with secure, reliable, scalable, and low latency content

(3) Provide enhancements of Infrastructure as a Service (IaaS) including virtualization of servers, elastic computing networks, storage, and system software to augment/replace functions of current data centers

(4) Support infrastructure consolidation and reduction in size, weight, and power (SWAP)

(5) Develop application and network services aware of and compatible with a Disconnected, Intermittent, Low-bandwidth (DIL) environment

d. COMMON SERVICES

(1) Provide interoperable high accuracy timing technologies to distribute assured Position, Navigation and Timing (PNT) data

(2) Provide information services that enhance messaging performance for cross domain solutions supporting multiple enclaves

(3) Provide core services at the tactical edge that support dynamic C2/ISR capabilities including messaging, service-discovery, notification, collaboration, orchestration, and mediation in DIL environments

(4) Provide Platform as a Service (PaaS) technologies in support of cloud functions for the tactical environment

e. APPLICATION SERVICES

(1) Provide ISR, IO, METOC, MDA, Cyber, and C2 applications suitable for operations in DIL environments

(2) Develop capability enhancements to exchange data between Ship Combat Systems (SCS) and Command, Control, Communications, Computers and

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Intelligence (C4I) Systems

(3) Provide reach back capabilities from UxV/Maritime Patrol systems to MOCs

(4) Support automatic target recognition from Full Motion Video (FMV) with technologies that provide symbology, descriptions, and content tagging in real-time

(5) Provide Common Operational Picture (COP) capabilities for mission planning in support of commander's intent, course of action analysis, time to decision, and dynamic tasking of C4ISR assets

f. CROSS-CUTTING SERVICES

(1) Provide robust, modular, scalable, and self-adapting Computer Network Defense (CND) capabilities for network security

(2) Provide distributed Information Assurance (IA) technologies across consolidated networks

(3) Provide QoS for real-time streaming for ISR video, voice, and messaging in Cross Domain environments.

g. ENERGY & POWER MANAGEMENT

(1) Provide power and energy efficient technologies for scalable electronic warfare systems

(2) Provide safe, reliable, and high efficiency energy generation for undersea environments

(3) Provide high power efficient sources for UxV systems

(4) Provide technologies to manage waste heat in confined spaces

(5) Provide technologies to improve power chain efficiency of shore-based Submarine Broadcast System equipment.

h. LOGISTICS

(1) Improve capabilities for system prognostics to assist with prediction of capability failures

(2) Provide advanced power amplifier technologies to improve mean time between failures (MTBF)

(3) Provide focused and highly interactive computer based training (CBT)

(4) Use of mobile device technology to provide user aids and training

3. Enclosure (1) provides additional fidelity for the PEO C4I S&T gaps. The gaps are presented in a non-prioritized manner, along with the associated program offices, to facilitate their resolution by the DoD/DoN Science and Technology Enterprise. Recommendations, questions or comments regarding this

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J. K. BURROUGHS

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2012 PEO C4I S&T CAPABILITY GAPS

NTRM-TIER 0	NTRM-TIER 1	PMW	S&T FOCUS AREA	SPECIFIC GAP/ NEED
COMMS	Satcom	PMW170	Reduction of Electromagnetic Interference (EMI) and other RF source of interference effects	Broadband multicoupler capable of transferring multiple simultaneous RF signals to and from a single antenna while reducing interference between signals
			Improve data rate throughput and/or improve effective bandwidth through improvements in the antenna and terminal	Adaptive coding technologies to dynamically change the link coding rate to pass more data when improved link conditions exist
				Technologies that can be employed in SATCOM antenna reflectors to increase antenna gain, reduce antenna sidelobes, reduce RCS, reduce EMI and susceptibility to interference and jamming
		PMW750/760	Satcom Denial Mitigation	Technologies for the dynamic reprogramming of satcom terminals to surrogate satellites
			Aperture Improvement	Multiband SATCOM apertures. Integrated Modular LOS/BLOS Planar and Conformal Arrays
		PMW770	Improve submarine communications antennas to enable high bandwidth, communications at periscope depth	Technologies for miniaturization and development of phased array components for submarine antenna applications
				EMI mitigation technologies for submarine communications
				Advanced materials for submarine antenna radomes
				Technologies to improve (better performance and reliability) submarine antenna systems (OE-538/SubHDR type)
		PMW790	Control System Improvements	Innovative technologies to enhance SATCOM capacity to include Integrated Waveform (IW)
				Improvement technologies for the User Objective System (MOUS) capable of enhancing user capacity, quality of service, and accommodate SCDMA waveforms
				Technlogies to help accelerate the JMINI Control System transition to JTRS and other systems
	Non-Satcom	PMW750/760	RF Distribution and Switching	Automated RF Distribution and Switching
		PMW770	Time-sensitive, reliable communications with other fleet platforms & systems within full range of tactically relevant speed and depths	Air-water interface technologies to support this focus area
			Command and control communications links for unmanned systems	Submarine communication technologies with organic and non-organically launched UAVs
				Technologies to improve magnetic/RF communications for submarines & UUVs
				Laser communications technologies for submarines, UUVs, & offboard sensors
			Enhance performance and reduce size of components used in Fixed Submarine Broadcast System	Dynamic tuning technologies and new materials to increase ability of shore VLF to operate at lower frequencies
				New materials and technologies to decrease VLF/LF Helix house size
				Advance present theory of electrically small antennas to enable optimization of the bandwidth, shape, size and configuration of VLF/LF systems
				Technologies to reduce or eliminate application of hazardous waste materials
		PMW790	Communications Link Monitoring and Management	Capability to provide the routing and filtering to allow Joint Interface Control Officer (JICO) and afloat staffs to selectively send and receive TDL tracks in order to optimize the usage of bandwidth
NETWORKS	Wide Area Networks	PMW160	Dynamic Ad-hoc Networks	Capabilities to enhance the Tactical Edge Networks (TEN) with technology to support networking with highly mobile and disadvantaged users and to integrate the mobile adhoc networks.
			Non-satcom/Non-shore based connectivity and reachback	Capability to maintain network connectivity in support of operational needs in a SATCOM denied environment and reachback to the GIG via a mobile entry point
			Network architectures and technologies for multi-tiered networking	Network technologies over multi-tiered communications architectures to provide an Aerial Layer Network
			Disruptive Tolerant Networking	Disruption Tolerant Networking (DTN). Technologies to sense network impairment and to mitigate the effect of these impairments
			Alternate Routing Protocols to enable Next Generation Dynamic Networking	Network technologies with diverse routing protocols to defend against Cyber attacks
			Asymmetric Communication Networking	Capability to enable asymmetric networking over various RF paths
		PMW750/760	Cloud Computing	Afloat / Ashore Cloud Computing technologies w/ Replication
		PMW790	Improve/Accelerate Terrestrial Transport/Backhaul Capabilities	Accelerate to Defense Information System Network (DISN) Core by developing dynamic routing protocol technologies
				Innovative technologies to migrate FLTNOC services to the "Cloud"
	LANs	PMW160	Tools to support real-time collaboration, data/information sharing and predictive failures	Technology to manage servers and dynamically manage and provision resources to hosted applications
		PMW760	Transition to all IP while maintaining legacy capability with reduced cost and footprint	Multi-media Bi-Directional Baseband technologies for use with Narrowband and Wideband Comms
			Multi-functional, Cross-Domain Networks	Platform Integrated Common Computing and Network Environments (technologies) with assured QoS and network management capabilities for real-time data and non real-time data services
				Cross-Domain information sharing capabilities
		PMW790	Enhance C2 Networks Ashore	Automated Information Assurance Vulnerability (IAV) verification and reporting system technologies
				Network data capability to move from reactive to proactive to predictive modes for better analysis, assessments, and plans for their AOR.
				ENMS data foundation technologies supporting NetOps and CyberOps in various mission areas including BMD Cyber Core, COMSPOT, and CPF
				Tools to buils dashboards to assist maritime operators in understand activities in communications, networks,and SA in support of commander's decision tree
			Enhacement and Moderization of Shore Telephony	Innovative technologies to effectively leverage existing IP networks to host Assured Services Session Initiation Protocol (AS-SIP) based Unified Capabilities that would provide enhanced voice and video
				Integrated capability to provide the network operator both situational awareness and configuration management of the Unified Capability (UC) domain within the enterprise including telecommunications management (fault tolerance, configuration, accounting, performance profiling & security), as well as telecommunications expense management (TEM)
				M&S tools and develop an (AS-SIP module) that supports IPv6 simulations.
		PMW760	RF Management and Control	Automated RF control, monitoring, and reporting technologies
		PMW770	Undersea Connectivity	Technologies for Undersea Network Management
				Data Management capabilities: data to knowledge algorithms, data strategies, and data exfiltration capabilities
				Mission model design capabilities for Undersea Networks

2012 PEO C4I S&T CAPABILITY GAPS

NTRM-TIER 0	NTRM-TIER 1	PMW	S&T FOCUS AREA	SPECIFIC GAP/ NEED
	Network/Circuit Mgmt	PMW790	Moderization of Shore Network Management	Enhance operator utility of Navy's network management system through automation; develop user definable and tailorable data views and access, providing QoS
				Capabilities and tools for Intelligent analysis, presentation, and dissemination of QoS on an individual's or group's performance
				Technology to enhance computer network security alerts and warnings for planning and monitoring of the network
		PMW160	Management of SOA/Cloud	Technologies that link (machine to machine) predictive maintenance forecasting capabilities for logistic support services.
			Theater Network Modeling	Capabilities to conduct predictive network modeling. Tools to conduct mission planning of the network prior to conducting operations. Ability to model adversaries'
COMMON COMPUTING ENVIRONMENT	Hosting Environment (Computing Infrastructure)	PMW130	Cloud computing security	Cryptographic capabilities for data modifications/updates to data stored in a cloud environment
		PMW160	Voice and Video over Secure IP	Technologies for ADNS
			Combat Systems/Command and Control Information Gateway	Capability to securely exchange information between C4I networks and Combat Systems
			High-Availability Core	Technology to support the implementation of a High-Availability Core supporting membership and the ability to receive communications from any other core group.
			Information Sharing and Predictive Failures	Capabilities to enhance management of servers and provision resources to hosted applications including databases, applications, environmental requirements, performance, SNMP, VoIP, Web, etc.
			Infrastructure as a Service (IaaS)	Provide grids or clusters of virtualized servers, elastic computing networks, storage and systems software designed to augment or replace the functions of entire data centers
			Cloud Computing	Technology that minimizes computing at the workstation allowing for reduction in deployed and supported H/W, ease of s/w maintenance and improved scalability
		PMW750/ 760	Data Management technologies	Data storage and manipulation technologies; High Performance Computing on ships.
	Computing Hardware	PMW160	Tactical Storage Cloud Technologies	Technologies that will enable the implementation of a tactical storage cloud afloat providing secure, reliable, scalable, low latency content storage for tactical applications
			Tactical Data Cloud	Technologies to enable the implementation of a tactical data cloud afloat to provide a highly parallel analytic engine used to store, analyze search petabyte scale data sets
			Innovations for size, weight, and power reduction	Technology for consolidation of naval platforms computing infrastructure and the reduction of weight, space and power.
COMMON SERVICES	Basic Info Services	PMW170	Assured precise Positioning, Navigation, and Timing (PNT) service to support combat, weapon, sensor, network and C4I systems	High accuracy timing technologies through comparison of multiple independent, high accuracy timing sources.
				Real Time SOA for PNT Systems
				Miniature Atomic Clocks
		PMW130		Robust network time protocol security through the delivery of cryptographic and keying technologies for all C4I users
				Technologies to provide new low power, hardware cryptographic products that support IEEE 1588 precision time security for both master and slave agents
		PMW130	Integration and synchronization capabilities	Low cost, disposable Suite B-type hardware cryptographic solution for unmanned vehicles, unattended sensors, and tactical networks
		PMW160	Improved Messaging Performance	Technologies to improve messaging performance when mediation is involved and there are added layers of security
		PMW790	Organizational Messaging	Technologies that enhance C2 messaging capability while consolidating physical infrastructure required to support
				Technologies to support JTRS transition for surface ships, ISO EMCON, and two way non-SHF systems
				Nuclear Command, Control, and Communications (NC3) - Hybrid System - Nova, Modernization to enhance performance
				Technologies to integrate cross domain solution in support of multiple enclaves (TS, Secret, and Unclassified)
	Core Services (Tactical Edge)	PMW160	Dynamic C2ISR capabilities for operations in disadvantaged, intermittent, latent (DIL)	Technology to support and maintain access to applications or services in differing levels of degradation or in a degraded network environment
			"Serveless" Chat services	Capabilities to establish agreed membership knowledge at all participant subscribers while withstanding partitions, merges, crashes, and recoveries. Queing mechanisms to provide "first update wins" semantics
			Widget-based Framework	Technologies to address security, performance, standards and reliability in the widget world. Technologies to develop tools to examine the power of widget-based framework incorporation in DIL environments
			Data Centric Cloud Computing	Intelligent data delivery in the cloud, Autonomous cloud synchronization and optimization
			Tactical Platform as a Service (PaaS)	PaaS technologies to provide cloud functions in the tactical environment. Open source solutions that ensable cloud functions (cloud computing, storage, orchestration)
APPLICATION SERVICES	Support Systems	PMW160	Core Services	Employ Chat capability that meets or exceeds current user experience while incorporating required security policies
		PMW120	Evaporative ducts	Automated capability to measure continuosly the height of the evaporative duct aboard ship
	Battlespace Awareness	PMW120	Automatic target recognition from FMV	Automated capability for detection of specified targets from large volumes of raw video data for analysis and identification.
			Countering Emerging Signals	Technologies for countering the rapid pace of signal proliferation
			Annotation of FMV in near real time	Full motion video (FVM) annotation technology with appropriate symbology, descriptions, and content in near real time
			Storing, accessing and archiving large data sets	New database management system (DBMS) for the effective storage and retrieval of battlespace information; both HW and SW
			Workflow analysis within IO and between IO, ISR, and METOC	Capability to analyze workflow and compose new workflow paths and actions and mission change.
				Automated capability to dynamically compose Community Of Interest (COI) services in order to optimize mission specific work flows
			Exchange of data between combat systems	Provide a capability to exchange data between the Ship's Combat System (SCS) and the Ship's Signal Exploitation Space (SSES)
		PMW790	Technologies for ISR Exploitation	Provide reachback capability to share ISR data from UxV/Maritime Patrol systems to MOC
	Command & Control	PMW130	Metadata Security - Intelligence Community Information Security Markings (IC-ISM)	Provide automated application of IC-ISM security matadata to common documents (Office, PDF, JPG, HTML, email)
		PMW130	Information Operations	Capability to provide cyber situational awareness through the real-time collection, analysis, and fusion of telecommunications, network, and maritime information
		PMW150	Common Operational picture (COP)	Automated Course of Action (COA) development capability that enables the user to set ownership/read/write permissions, and capable of comparing shared COAs with subordinate echelons
				Knowledge Manangement capabilities to archive and recall COAs .
				Capabilities for collaborative campaign planning & execution across components, missions, functions, and geographies
				Capabilities for the collaborative development and assessment of operational and tactical plans across the full range of military operations
				Next-generation COP technologies capable of both making associations between inter-related data sources as well as extending track management systems such as GCCS-M
				Capability to provide the Maritime Operation Centers (MOC) and combatant commanders with real-time visualization of multi-source information for decision making
				Visual capability that enables the synchronization of planned activities and key decision points in time, with messaging systems that alert during conflicts

2012 PEO C4I S&T CAPABILITY GAPS

NTRM-TIER 0	NTRM-TIER 1		PMW	S&T FOCUS AREA	SPECIFIC GAP/ NEED
			PMW790	NetOps Support Tools / C2 of CS	Visualization and user-interface capabilities for operational impact assessments resulting from changes in networks, C2 applications, and communication systems
CROSS-CUTTING SERVICES	Information Assurance		PMW160P MW130	Computer Adaptive Network Defense in Depth	Technologies that enable CND principles for the tactical edge commander including detection of configuration changes, providing alerts of suspicious traffic on unauthorized accounts, detection of data leakage, detection of unauthorized devices, and the monitoring for remote access attempts.
				Distributed Information Assurance	Technologies and techniques to collapse both client and server sides for transformational Cross Domain Solutions (CDS) supporting distributed network identification and authentication, trusted recovery, security management, trusted path, access control, audit, availability, cryptography, data confidentiality, and data integrity
				Cross Domain Solutions for Data and Services (Improved Information Assurance)	Capabilities for single point of access across domains and classifications based on user authentication (access, privilege, need-to-know)
				Commander's Intent	Technology that enables the tactical edge commander to discern the information assurance
			PMW130	Information Assurance in SOA Environments; CND across networks and multiple security domains; Cross domain solutions for data	Provide dynamic pro-active CND defense technology solutions across all classified networks and unclassified networks
			PMW790	Multi-Level Domain and Muli-level Security Info Sharing	Secure capabilities for automated sharing of information across all security enclaves (JWICS-SECRET-SECREL-UNCLAS-NonClass)
			PMW750	Cross Domain Solutions for (Improved Information Assurance)	Automated releaseability of classified data within a cross domain environment
			PMW770	Undersea Connectivity	Technologies for reliable connection and transfer of data and energy
	QoS	WAN Optimization	PMW160	Improved High Data Rate Throughput/Increased Effective Bandwidth for disadvantaged users	Enhanced QoS technologies and techniques, WAN optimization or Performing Enhancement Proxies (PEP)
		WAN	PMW160	Dynamic and Granular Quality of Service	QoS enhancing technologies that can be tailored based on mission, AoR and/or operational need
Energy	Efficiency		PMW760	Efficiency for power and energy systems	Low cost, modular and scaleable ESM/EW Systems
			PMW770	Alternative energy & petroleum fuel consumption	Capabilities to reduce reliance on site generated diesel power for shore based submarine broadcast systems
					Capabilities for safe, reliable, and high efficiency energy generation/harvesting, storage, and certification for undersea environments; high power density and high energy density energy sources for off board systems
				Power Management	Technologies to Improve power chain efficiency of shore based Submarine Broadcast System equipment
					System level energy management capabilities for undersea connectivity
					Technologies to manage waste heat in confined spaces (e.g. Radio Room or Data Processing Center) to optimize the effieciency of power consumption, reduce wear and tear on rack mounted systems, and improve manning conditions

DOMAIN	FOCUS AREAS	GAPS & NEEDS
LOGISTICS	Prognostics	Capability to provide system or software users with embedded feedback signals to take actions that will improve system performance and availability
	Remoted ops and maintenance	Shore to ship distance support of installed systems or software to assist user with diagnosis and resolution of capability failures
	Power amp reliability	Power Amplifier engineering and advance technology that improves mean time between failure times
	Digital Tutors	Focused, highly interactive computer based training (CBT) that provides immediate feedback and numerous scenarios to ensure learner mastery of subject
	Portable tech doc delivery devices (IPAD like capability)	Use of "Tablet" device technology to provide electronic, point of maintenance user aids and training