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

Subj: PEO C4I ANNUAL ACQUISITION GAPS FOR SCIENCE & TECHNOLOGY

Ref: (a) S&T Alignment and Transition CONOPS of 6 Dec 09
(b) SPAWAR S&T Forecasting, Investment, and Transition CONOPS (SPAWAR Instruction 5238.2) of 18 Dec 12
(c) PEO C4I Masterplan of 7 Aug 12

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

1. Purpose. The purpose of this memorandum is to provide PEO C4I's annual acquisition gaps 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 and an associated timeframe when the capability is needed (near-term (0-3 years), mid- term (3-8 years), or far term (9+ years)). 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 Interference(EMI) mitigation and electromagnetic resistance to jamming

(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) Improve data rate throughput and/or effective bandwidth through improvements in the antenna, terminal, waveform, or Quality of Service (QoS)

(6) Improve time-sensitive, reliable undersea 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

(8) Provide integration and synchronization capabilities among manned and unmanned systems and unattended sensors, across all communication domains

b. NETWORKS

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

(2) Techniques for Tactical Edge IP networks to adapt to highly mobile users and integrate mobile ad-hoc networks

(3) Networking over multi-tiered communications architectures to provide an Aerial Layer Network

(4) Develop disruption tolerant network technologies to maintain enterprise networking in degraded environments

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

(6) Provide predictive network modeling with tools to support mission planning and information sharing

(7) Develop technologies for networks to identify and act intuitively to solve network problems

c. COMMON COMPUTING ENVIRONMENT / COMMON SERVICES (CCE/CS)

(1) Develop improved capabilities for large-volume data exfiltration, management, and intelligent dissemination in a cloud environment ashore and afloat

(2) Develop scalable and modular enterprise-wide services in cloud environments including information sharing and security/Information Assurance (IA)

(3) Provide robust, modular, scalable, and self-adapting Computer Network Defense (CND) capabilities for network security across multiple security domains

(4) 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

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

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

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

e. APPLICATION SERVICES

(1) Develop ISR, IO, METOC, MDA, Cyber, and C2 applications and network services aware of and compatible with a DIL environment

(2) Develop automated capability to exploit audio signals in the absence of linguists

(3) Provide technologies for Countering Emerging Signals and ISR Exploitation

(4) Provide workflow analysis within the IO domain and between the IO, ISR, and METOC domains

(5) Provide real time fusion of sensor data with historical data and automatic detection/prediction of anomalous behavior at multiple classifications

(6) Develop capability enhancements to exchange data between Ship Combat Systems (SCS) and Command, Control, Communications, Computers and Intelligence (C4I) Systems

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

(8) 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

(9) Provide full spectrum dominance across all battlespace domains

(10) Provide Electronic Attack and Electronic Protection via networking and robust sensors

(11) Characterize environmental effects on communications and sensors

f. CROSS CUTTING SERVICES

(1) Provide distributed Information Assurance technologies across consolidated networks

(2) Provide Computer Adaptive Network Defense in Depth

(3) Detect and eradicate advanced persistent threats (APTs)

(4) Provide Cross Domain/Multi-Level Security Solutions for data and services

(5) Provide multi domain and multi-level secure information exchange with need-to-know

(6) Provide technologies for computer network attack and computer network exploitation

(7) Provide dynamic and granular Quality of Service (QoS) that can be tailored based on mission, AOR, and operational need

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

(9) Provide innovative training solutions

g. POWER & ENERGY

(1) Provide safe, reliable, and high efficiency energy generation/harvesting for off board systems and undersea environments

(2) Provide power management including technologies to manage waste heat in confined spaces

(3) Provide scalable power and energy to reduce total ownership cost

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 memo should be addressed to Dr. Robert Parker, APEO for S&T, at (619)524-7599 or robert.parker@navy.mil.

J. K. BURROUGHS

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2013 PEO C4I S&T CAPABILITY GAPS					
Domain (Ref PEO C4I Masterplan)		PMW	S&T Focus Area General Description	Desired Capability Synopsis	Need Date (years)
NTRM Level 0	NTRM Level 1				
COMMUNICATIONS	SATCOM	170	**Standard Interfaces**	Develop standard phased array/directional antenna interfaces for both RF and control signals. Provide options for RF/IF and digital (IP-based) signal transmission	**Mid (3-8)**
				Dynamic modem-router interface	
		750, 760	**Improved Apertures**	Multiband SATCOM Apertures	**Mid (3-8)**
		170	**Improve data rate throughput and/or improve effective bandwidth through improvements in the antenna and terminal**	Develop adaptive coding technologies to dynamically change the link coding rate when improved link conditions exist and develop shared bandwidth technologies	**Mid (3-8)**
				SATCOM antenna reflector technologies to increase antenna gain, and reduce antenna sidelobes, reduce RCS and reduce EMI and susceptibility to interference and jamming	**Mid (3-8)**
				Improve satellite terminal receive performance by decreasing systems noise temperature (increased G/T) via a cooled low noise amplifier at the front end	**Near (0-3)**
				Develop architecture that supports seamless JIPM migration into navy wideband SATCOM systems other than GBS	**Mid (3-8)**
				Investigate techniques to reduce or limit latency impacts to existing and future communications architectures	**Near (0-3)**
		750, 760	**SATCOM Denial Mitigation**	Dynamic Reprogramming of Satcom Terminals to Surrogate Satellite	**Near (0-3)**
		770	**Improve submarine communications antennas to enable high bandwidth, communications at periscope depth**	Advanced materials for submarine antenna radomes	**Mid (3-8)**
				Miniaturization, development and demonstration of phased array components for submarine antenna applications	**Mid (3-8)**
				Mitigation of EMI for submarine communications	**Mid (3-8)**
				Multifunction phased array apertures to combine communications and ESM functions	**Far (9+)**
				Technologies to improve (better performance and reliability) submarine antenna systems (OE-538/SubHDR type)	**Mid (3-8)**
	Non-SATCOM (Wireless)	150	**Tactical Data Links**	Parsing of OPTASK Link Messaging. Ability to parse an OPTASK Link Message into a form appropriate for input to a C2P, with minimal human interaction	**Near (0-3)**
				Enhanced Built-In Test (BIT) Functionality for Link 16 Command & Control Processor (C2P) to locate hardware faults more precisely and estimating time to failure where possible	**Mid (3-8)**
				Routine uploads of performance and prognostic data to shore support activities	**Mid (3-8)**
		170	**Improve data rate throughput &/or effective bandwidth through improvements in the antenna & terminal**	Improve transmit performance by increasing the efficiency of sold state power amplifiers enabling the radio to operate at higher transmit data rates with reduced heating	**Mid (3-8)**
			Cost effective phased array	Develop multi function (LNA, ADC and receiver) monolithic solutions that enable reduced phased array size, weight, power and fabrication cost	**Mid (3-8)**
			Waveform Capability and RF networking	RF Networking (gateways and bridging)	**Mid (3-8)**
				HF Wideband	
				HF GEN II ALE	
				Balanced ALE in network environment	
			Improve HF Communication antennas and terminals	Electrically short, high efficiency, HF broadband transmit antenna for low RCS shipboard applications	**Mid (3-8)**
				Anti-Jam HF Modems	
			Reductions of EMI and other RF source interference effects	Broadband multicoupler capable of transferring multiple simultaneous RF signals to and from a single antenna while reducing interference between signals	**Mid (3-8)**
				Develop cost effective technologies to mitigate strong interfering signals in the presence of weak desired signals	**Mid (3-8)**
				Reduced impact of jammers and EMI/Co-site interference through digital and analog filtering techniques	**Mid (3-8)**
				General RF and link situational awareness to include a comprehensive software based frequency management solution to identify probable sources of interference	**Near (0-3)**
		750	**TDL interoperability**	LINK 16 interoperability with JADOCS	**Near (0-3)**
		760	**RF Distribution and Switching**	Automated RF Distribution and Switching	**Near (0-3)**
		750, 760	**Improved Apertures**	Integrated Modular LOS/BLOS Planar and Conformal Arrays	**Mid (3-8)**
			LOS/BLOS Networked	High BW Ship-Ship LOS/BLOS Networked Communications	**Near (0-3)**
			RF Management and Control	RF Propagation model to be used in littoral areas to generate realigned RF Plan for ongoing operations, a HERF/HERO/HERP plan, and/or EMCON posture for Naval platforms	**Near (0-3)**
		760	**HF Ground Wave Radio**	HF Propagation near the ground/surface for short distances, independent of antenna height	**Near (0-3)**

2013 PEO C4I S&T CAPABILITY GAPS					
Domain (Ref PEO C4I Masterplan)		PMW	S&T Focus Area General Description	Desired Capability Synopsis	Need Date (years)
NTRM Level 0	NTRM Level 1				
COMMUNICATIONS	Non-SATCOM (Wireless)	770	**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	**Far (9+)**
				Improve reliability and performance of offboard antenna systems (i.e. buoyant cable antenna, towed bouy, pop-up buoy)	**Near (0-3)**
			Command and control communications links for unmanned systems	Improvements of magnetic/RF communications for submarines & UUVs	**Mid (3-8)**
				Multimodal, LPI/LPD communications techniques for submarines, UUVs, & offboard sensors	**Far (9+)**
		770	**Enhance performance, improve reliability, and reduce size of components in Fixed Submarine Broadcast System (FSBS)**	Application of dynamic tuning technology and new materials to increase ability of shore VLF to operate at lower frequencies (greater seawater penetration)	**Mid (3-8)**
				Advance present theory of electrically small antennas to enable optimization of the bandwidth, shape, size and configuration of VLF/LF systems	**Mid (3-8)**
				Application of new materials to decrease VLF/LF Helix house size, also materials to improve the aging and corrosion resistance.	**Mid (3-8)**
				Reduce or eliminate application of hazardous waste materials	**Near (0-3)**
		790	**Enhance Joint (UHF) MILSATCOM Network Integrated systems to reduce total ownership cost (TOC)**	Virtual environment to enable development and testing of JMINI software for software assurance / Information Assurance (IA) compliance and facilitate remote software push	**Near (0-3)**
				Robust JMINI monitoring and management capability (RF hardware/software status, configuration, alerts, warnings) to enhance remote operation and improve Cyber SA	**Near (0-3)**
NETWORKS	Wide Area Networks	160	**Improved High Data Rate Throughput/Increased Effective Bandwidth for disadvantaged users**	Technology and techniques for WAN Optimization	**Near (0-3)**
				Content Distribution Management	
			Dynamic Ad-hoc Networking	Capability to enhance the Tactical Edge Networks (TEN)	**Near (0-3)**
				Techniques for Tactical Edge IP networks to adapt to highly mobile users and integrate mobile adhoc networks	
			Dynamic Modem to Router Interface	Capability to allow information exchange and feedback between modems and routers to maximize bandwidth in dynamic bandwidth environments	**Near (0-3)**
			Asymmetric Communication	Capability to enable asymmetric networking over various RF paths	**Near (0-3)**
			Network architectures and solutions to support multi-tiered networking	Networking over multi-tiered communications architectures to provide an Aerial Layer Network	**Near (0-3)**
			Dynamic and Granular Quality of Service	QoS that can be tailored based on Mission, AoR and Operational Need	**Near (0-3)**
			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 GIG entry point	**Far (9+)**
			Disruption Tolerant Networking	Technology to support networks ability to sense and mitigate impairments effectively	**Near (0-3)**
			Alternate Routing Protocols to enable Next Generation Dynamic Networking	Networking which will use diverse routing protocols to defend against Cyber attacks	**Far (9+)**
				Capability to impair an adversary's ability to determine effects network attack their actions	**Far (9+)**
		790	**Improve/accelerate terrestrial transport/backhaul and IP capabilities to reduce total ownership cost**	FLT NOC as data node to support tactical cloud and provide enhanced content management service to expedite reach-back to regional and global data nodes/centers	**Mid (3-8)**
				Explore and define collaborative network information exchange requirements and services between Navy and DISA to support NetOps	**Mid (3-8)**
	Local Area Networks	160	**Tools to support information sharing and predictive failures**	Tools that enable technicians to anticipate equipment failures, track trends and forecast sparing requirements	**Mid (3-8)**
				Techniques to dynamically manage & provision resources to hosted applications	
				More seamless application/OS software updating (including server applications) that significantly reduces the need for manual intervention to install software updates	
				Techniques to seamlessly update software	
			Capability for networks to automatically respond to change, act intuitively to solve problems, and identify potential problems before they occur	Technology for networks to identify and act intuitively to solve problems	**Far (9+)**

2013 PEO C4I S&T CAPABILITY GAPS					
Domain (Ref PEO C4I Masterplan)		PMW	S&T Focus Area General Description	Desired Capability Synopsis	Need Date (years)
NTRM Level 0	NTRM Level 1				
NETWORKS	Local Area Networks	160	**Theater Network Modeling: Capability to conduct predictive network modeling**	Tools to conduct mission planning of the network prior to conducting operations	Far (9+)
				Ability to model adversaries' actions and impacts to friendly forces	
				Capability for war fighters to conduct realistic modeling of potential scenarios and weigh risks against mission success	
		750, 760	**Transition to all IP while maintaining legacy capability with reduced cost and footprint**	Multi-media Bi-Directional Baseband (for legacy PTT, Serial, and Crypto, and new IP with AES TRANSEC Encryption) for use with Narrowband and Wideband Comms	Near (0-3)
				Platform Integrated Common Computing and Network Environment with Assured QoS and Network Management for real-time data and non real-time data services	Near (0-3)
				Cross-Domain Information Sharing	Mid (3-8)
				Modular and Scalable, Self-Adapting CND and IA Solutions	Mid (3-8)
		790		Assured Service Session Initiation Protocol (AS-SIP) modeling and simulation over Naval Enterprise Network (e.g. NMCI & ONENET)	Near (0-3)
				Develop Telecomm Situational Awareness Management System (TSAMS) prototype: integrated Unified Capabilities FCAPS mgmt in a COP for NEN Network Ops	
				Upgrade ADNS to support SCIP-IWF technology for AS-SIP ship-shore traffic, enabling call access control & QOS over SATCOM for voice & video over IP	
				Multi-Level Secure (MLS) Video Teleconference System (VTC) equivalent to Defense Red Switch Network (DRSN) that is end point agnostic & supports AS-SIP	
	Network/ Circuit Management	750, 760	**Automated Management and Control**	Automated Management and Control	Near (0-3)
			Cross-Domain Solutions	Cross Domain Solution for Automated Management and Control	Near (0-3)
			RF Management and Control	Automated RF Control, Monitoring, and Reporting	Near (0-3)
		770	**Undersea Connectivity**	Mission model design capabilities for Undersea Networks	Far (9+)
				Technologies for Undersea Network Management	Far (9+)
COMMON COMPUTING ENVIRONMENT	Hosting Environment (Computing Infrastructure)	130	**Proactive & preventative computer network defense (CND)**	Apply analytical, conceptual & behavior driven approach/techniques for CND (e.g. anomaly detection) that span network, device, & user/human realms	Near (0-3)
			Validate continued effectiveness of deployed CND	Validate that deployed computer network defense (CND) products and technologies continue to meet current requirements and perform as expected	Near (0-3)
			Predictive computer network defense (CND) techniques	Use short-term observations & adversarial knowledge for predictive CND to discover anomalies & increase understanding of adversary's operational tactics	Mid (3-8)
		160	**Infrastructure as a Service: IaaS**	Provide grids or clusters or virtualized servers, elastic computing networks, storage, & systems software to augment/replace functions of entire data centers	Near (0-3)
			Combat Systems/Command and Control Information Gateway	Secure information exchange	Near (0-3)
				Common language	
				Secure bi-directional gateway	
			Tactical Data Cloud	Data cloud technologies for a tactical afloat environment	Mid (3-8)
			Tactical Storage Cloud Technologies	Storage Cloud technologies for a tactical afloat environment	Mid (3-8)
			High-Availability Core	Technology to support the implementation of a High-Availability Core	Far (9+)
			Cloud computing in a Tactical Environment	Hybrid Cloud computing: Technology to migrate services, connect public and private clouds, and provide flexibility on where services originate	Far (9+)
				Microclimates: Cloud computing framework for disadvantaged users	
			Management of Cloud	Technologies that enable systems management across clouds and provide for capability such as elasticity across clouds	Mid (3-8)
			Data Centric Cloud Computing in a Tactical Environment	Intelligent data delivery in the cloud	Mid (3-8)
				Autonomous cloud synchronization and optimization	
		750	**Common and Scalable Computing Environment**	Scalable, Modular and Open CCE with Cloud Computing Capabilities for Unit, Group, Force, Shore, and Sub Platforms	Mid (3-8)
			Cloud Computing	Afloat / Ashore Cloud Computing w/ Replication	Near (0-3)

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Domain (Ref PEO C4I Masterplan)		PMW	S&T Focus Area General Description	Desired Capability Synopsis	Need Date (years)
NTRM Level 0	NTRM Level 1				
COMMON COMPUTING ENVIRONMENT	Computing Hardware	130	**Upgrade legacy crypto to support ONTK**	Incorporate protocols & security services into fielded crypto devices to support Over-The-Network-Keying (OTNK) technologies, for transition from EKMS to KMI	**Near (0-3)**
			Common remote management for encryptors	Provide a centralized solution to remotely configure interfaces and manage devices for all Navy encryptors	**Near (0-3)**
			Innovations for size, weight, and power reduction	Technology/Techniques for the consolidation of naval platform computing infrastructure	**Mid (3-8)**
COMMON SERVICES	Basic Information Services	130	**Stronger audit capability**	Strengthen current audit mechanisms to capture more information, improve data protection, provide synchronization across NOCs, & increase resiliency	**Near (0-3)**
			Automated application of IC-ISM security metadata to non-common data assets	Automatically apply IC-ISM security metadata tags to both common and non-common data file assets.	**Mid (3-8)**
			Retrieval, correlation, & analysis of defensive cyber data	Provide a robust means of intelligent retrieval (avoiding proprietary issues) & understanding of applicable operational data for cyber situational awareness	**Near (0-3)**
		170	**Assured precise positioning, navigation and timing (PNT) service to support combat, weapon, sensor, network and C4I systems**	High accuracy timing source through comparison of multiple independent, high accuracy timing sources	**Near (0-3)**
				Real time SOA for PNT systems	
				Miniature atomic clocks	
				Micro-Electro-Mechanical Systems Inertial Measurement Unit	
				GPS spoofer detection, location and resistance	
				Celestial Navigation	
				Miniature optical gyroscope	
	Core Services (Tactical Edge)	160	**"Serverless" Chat services**	Establish agreed membership knowledge at all participants & deterministically elected leader while withstanding partitions, merges, crashes & recoveries	**Near (0-3)**
				Queuing mechanism to provide "first update wins" semantics	
			Tactical Platform as a Service (PaaS)	Open source solutions that enable cloud functions such as computing and storage clouds and orchestration of clouds	
			Dynamic C2ISR capabilities for operations in disadvantaged, intermittent, latent (DIL) environments	Technology to better support & maintain applications or services in degraded network environments	**Mid (3-8)**
				Techniques to support common services deployed to the tactical edge and disadvantaged user	
				Applications to support publishing to a network aware infrastructure	
			Widget-based Framework	Technology to develop tools and examine the power of widget based framework incorporation in DON SOA DIL environment	**Mid (3-8)**
				Widget based framework for the rapid deployment of applications	
			Improved Messaging Performance	Federated Messaging, technologies to improve messaging performance when mediation is involved and there are added layers of security	**Near (0-3)**
		790	**Agile Radio Frequency (RF) routing and communications capability**	Technology to provide protected and enhanced mobile GIG access to ensure mission critical C2 communications in an A2AD/DIL environment	**Mid (3-8)**
				Technology to ID available spectrum & provide RF QoS, dynamic routing & control, & enhanced support for multiple signals & frequency bands (L-Ku)	
			Enhance Expeditionary Core Services technology to accommodate the Navy/DoD/Joint network architecture requirements	Tactical network interface (TNI) between Cypher Text (CT) Core & Common Mission Network Transport (CMNT) to provide access to any network worldwide	**Near (0-3)**
				Develop common standards within ECS to accommodate Navy/Joint Agile Core Services (ACS) that provides flexibility to the DJC2 forward deployed ops	
				Use NSA-approved commercial encryption devices in multiple configurations in a virtual desktop infrastructure (VDI) to reduce HW & SW footprint	
APPLICATION SERVICES	Support Systems	120	**Automatic Trip Wires for System Readiness**	A capability to automatically compile and review system readiness and performance data to queue APMs on potential readiness issues	**Near (0-3)**
		790	**Enterprise application integration (EAI) of Navy shore messaging systems to reduce total ownership cost (TOC)**	Enhance CUDIXS to replace Fleet Broadcast, retire end-of-life components, & increase throughput & reliability for IP-denied & EMCON shore-ship messaging	
				Transition from legacy applications to a cohesive EAI approach to provide simple, agile, and cost effective Navy shore & afloat messaging systems	
	Battle Space Awareness	120	**Real Time Fusion of Historical and Real Time Sensor Data**	Automatically fuse historical data with real time sensor data from multiple classifications to increase understanding of maritime entities of interest	
			All Source Predictive Analysis	Automatically predict anomalous behavior in a maritime environment from all source data to improve detection of potential entities & activities of interest	
			Automated Target Recognition From FMV	Capability to automatically detect vessels and other targets from full motion video	
			FMV Annotation and Search	Annotate FMV in NRT; auto & manual search of historical FMV for entities/activities of interest; improve merchant vs. combatant classif from past behavior	

2013 PEO C4I S&T CAPABILITY GAPS					
Domain (Ref PEO C4I Masterplan)		PMW	S&T Focus Area General Description	Desired Capability Synopsis	Need Date (years)
NTRM Level 0	NTRM Level 1				
APPLICATION SERVICES	Battle Space Awareness	120	Storing, Accessing and Archiving Large Data Sets	New database management system (DBMS) solutions; improved HW & data management (SW) systems for effective storage & retrieval of battlespace info	Near (0-3)
			Assimilation and Prioritization of Data	Decentralized, semi-autonomous agents/engines to help gather and triage raw intel data to filter 'noise' and alert to significant changes/areas of interest	Near (0-3)
			Analysis of distributed data across multiple clouds	Capability to fuse and analyze data residing on multiple clouds	Mid (3-8)
			Tagging and Labeling Maritime Big Data	Cloud data storage solutions require effective tagging and labeling of the data to be of value to maritime analytics, searches, and user interfaces Improved storage systems (HW) and improved data management systems (SW) also are needed	Mid (3-8)
		750, 760	ISR Applications	Scalable ISR / IO Applications for Force Level / Unit or Group Platforms	Near (0-3)
			Battlespace Awareness	Low-Cost, Modular and Scalable ESM/EW Systems	Near (0-3)
		120	Countering Emerging Signals	The rapid pace of signal proliferation requires a new software/hardware approach to countering emerging signals of interest (SOIs)	Near (0-3)
			Exchange of Data Between Combat System and SSES	Capability to exchange data between the ship's Combat System and the Ship's Signal Exploitation Space (SSES) located on the SCI networks	Mid (3-8)
			Workflow Analysis (between IO and ISR and METOC)	Need automated capabilities to analyze workflow and dynamically compose new workflow paths and actions as missions change	Near (0-3)
			Data Fusion and Analysis	Data fusion and analysis does not occur across the entire metadata level. Need improved meta data fusion & analysis to gain intel, knowledge, wisdom	Mid (3-8)
			Counter ISR	Command & control functions to coordinate counter ISR sensors & non-kinetic responses to optimize employment, enable re-tasking, & prevent fratricide	Near (0-3)
			Improve Identification of Speaker, Platform & Emitter	Need capability to automate the identification of individual foreign language speakers, platforms and specific emitters in the absence of Navy linguists	Near (0-3)
			Automated Audio to Text	Lack of foreign language specialists is limiting the ability to exploit signals: need automated transcription of foreign language audio into text for transmission to upper echelons	Mid (3-8)
			Electromagnetic Interference (EMI) Mitigation	Dynamic shipboard EMI mitigation: software apps; mechanical means; ops procedure mods; cryogenics; electronics (e.g. filters); or other novel mechanisms	Near (0-3)
			Modeling & Simulation for sensor placement	Modeling and simulation of the battlespace to conduct mission planning and optimize SIGINT/IO sensor placement and employment (what-if analysis)	Near (0-3)
			Multifunction Antennas	Low RCS, multifunction antennas for IO Transmit, Receive, & Direction Finding at 3 MHz-100 GHz for current US Navy ships & future platforms	Mid (3-8)
			Automated Characterization of the Atmosphere	Capability for automatic temperature, barometric pressure, & relative humidity atmospheric measurements from ships, ground units, aircraft & UAVs	Near (0-3)
			Organic Capability to Measure Evaporative Duct	Need automated capability to continuously measure the height of the evaporative duct aboard ship	Near (0-3)
			Boundary Layer Atmospheric Acoustics & EM/EO	Boundary layer characteristics at sufficiently high vertical resolutions for accurate atmospheric acoustics, EM/EO performance prediction, & sensor capabilities assessment	Near (0-3)
			Optimize Spectrum Utilization	Need to acquire or measure key atmospheric characteristics and integrate with appropriate electromagnetic assessment tools for optimal sensing & use of battlespace spectrum	Near (0-3)
			Model Biological Impact on Sonar Performance	Need to accurately forecast the movement of bio-acoustic activity (i.e. fish schools) to better support Navy mid-frequency hull-mounted active sonar performance predictions	Mid (3-8)
			Visibility Prediction	Need automated capability that forecasts surface visibility in the maritime global environment	Mid (3-8)
	Command & Control	750, 760	C2 Applications	Core C2 Services Portals for Disadvantaged Users	Near (0-3)
				Prototype of Naval C2 Applications in an SOA environment	
		150	Common Operational Picture (COP)	Tactical Planning (COA Sketch): collaborative automated COA analysis and development tool with archive, briefing, collaboration, and other decision support capabilites	Near (0-3)
				Commander's Critical Information Requirement/Primary Intelligence Requirement (CCIR/PIR) Collection Management collaborative tool	
				Operations Synchronization tool to enhance execution and aid in avoiding fratricide and provides capability in a DIL environment	
				Collaborative Planning & Execution tool to support planning across components, missions, functions, and geographies with mission partners across the full range of military ops	
				Open Track Manager (OTM) to support transition of GCCS-M track management to next-generation COP architecture and leverage CANES / Afloat Core Services	
				Logistics Support Service to access existing logistics applications on current and wireless networks via hand held device, read bar codes and IUID, with future capability for RFID	

2013 PEO C4I S&T CAPABILITY GAPS					
Domain (Ref PEO C4I Masterplan)		PMW	S&T Focus Area General Description	Desired Capability Synopsis	Need Date (years)
NTRM Level 0	NTRM Level 1				
CROSS CUTTING SERVICES	Information Assurance	130	Assured information sharing with need-to-know	Need a more granular approach to information that will limit access to classified information by individuals with security clearances but without need-to-know	Mid (3-8)
			Detect counterfeit HW & SW from cyber supply chain	Extend current supply chain security mechanisms to counter reverse engineering & detect when integrity of currently deployed systems (hw & embedded SW) is compromised	Mid (3-8)
			Resiliency mechanisms for use during cyber attack	Strengthen current INFOCON guidance & procedures to execute in specific events, & ensure some (if not all) tasks can be executed automatically during cyber security attack	Mid (3-8)
			Detect & eradicate advanced persistent threats (APTs)	Traditional means of "scanning & cleaning" for advanced malware is insufficient to counter attacks such as polymorphism, stealth, regeneration, and disabling of current defenses	Mid (3-8)
			Detection/prevention/reporting of data exfiltration	Detection and full inspection of encrypted traffic, embedded data, & compressed files to counter a determined insider. Also consider printers, scanners, etc. as data exfil mediums	Near (0-3)
			Processing encrypted data without decrypting	Need secure encryption schemes for data in transit and data at rest in cloud hosted environment as well as current databases that are unencrypted	Far (9+)
		160	Cross Domain Solutions for Data and Services	Capability for single point of access across domains	Mid (3-8)
				Techniques for single point access across domains and classifications	
				Development of robust C4I architecture that can counter cyber threats	
				Technology to enable single desk top and single login across all domains/enclaves	
				Multi-Level security solutions that allow for single display with no mixing of data	
			Distributed Information Assurance	Technologies to enhance Layered Network Security in distributed networks	Mid (3-8)
			Proactive network defense/Computer Network Defense and Info Assurance	Technologies and Techniques to react quickly to an adversary's or others' IO attack or intrusion	Mid (3-8)
				Technology/Techniques to protect networks and respond to cyber threats at the tactical edge	
			Advanced Information Assurance	Supply Chain Risk Management: Develop technologies that can identify anomalous behavior in h/w prior to install. Develop capability to trace h/w from production to delivery	Mid (3-8)
				Technology/Techniques to protect networks and respond to cyber threats at the tactical edge	
				System monitoring: Intelligent systems which are able to differ between naturally occurring network issues and malicious actions	
				Tactical Policy Enforcement Point/Policy Decision Point (PEP/PDP) for SOA Applications	
				Management and monitoring of SOA Applications within DoN (mid term) and DoD (far term)	
			Enterprise Services Oriented Architecture Security in an Afloat Tactical Environment	Policy Enforcement Point (PEP)	Near (0-3)
				Policy Decision Point (PDP)	
				Identity and Access Management (IDAM)	
			Computer Adaptive Network Defense in Depth	CND principles for the tactical edge	Mid (3-8)
				Ability to establish and maintain Secure Enclaves within existing networks	
				Limited access and increased monitoring for Virtually Secure Enclaves (VSE)	
				Advanced Sensing and System Monitoring	
		790	Multi domain and multi-level security information exchange	Multi-level thin client computing environment to reduce overall hardware footprint at MOC workstations to provide near-term response and operations/mission support	Near (0-3)
				Demonstrate Identity-Based Internet Protocol (IBIP) technology to provide additional robust security over SIPR for MOCs	
		770	Undersea Connectivity	Undersea Network Vulnerability	Far (9+)
	QoS	770	Undersea Connectivity	Reliable connection and transfer of data and energy	Far (9+)
	Data Services	750,	Data Management (Strategy)	Tradeoffs: Afloat vs Ashore Data Storage w/ Replication	Near (0-3)
		770	Data Management for Undersea Connectivity	Data Management capabilities: data to knowledge algorithms, data strategies, and data exfiltration capabilities	Far (9+)
POWER & ENERGY	Energy Security	770	Alternative energy & petroleum fuel consumption	Capabilities to reduce usage of on site generated diesel power for shore based submarine broadcast systems	Mid (3-8)
				Safe, reliable, & high efficiency energy generation/harvesting, storage, & certification for undersea environments; high power density/energy density sources for off board systems	Far (9+)
	Efficiency for power & energy systems	770	Power Management	Technologies to improve power chain efficiency of shore based Submarine Broadcast System equipment	Mid (3-8)
				System of systems level energy management for Undersea Connectivity	Far (9+)
				Manage waste heat in confined space to optimize the effieciency of power consumption, reduce wear and tear on rack mounted systems, and improve manning conditions	Far (9+)
		790	Scalable power and energy to reduce total ownership cost	Optimize power & energy usage & reduce SWAP by 25-30% using smart generators, sensor systems, control & management system, & intelligent micro-grid system	Near (0-3)
				Alternate power and energy sources that minimize threat signature	Mid (3-8)