Project Manager Joint Tactical Networks NEWSLETTER

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From the PM

CAPT Kevin Peterson, USN
PM JTN

As Project Manager for Joint Tactical Networks (PM JTN), I am very pleased to introduce our first newsletter. This newsletter is designed to provide you with relevant and timely updates on the status and utility of the products within the JTN portfolio which provide and enhance tactical networking. We have designed the newsletter to provide informative articles focused towards our customers – articles on operational utility for our warfighting users, technical details to our developers and field service representatives, potential and planned enhancements and engineering interfaces for our cross-services program office mission partners, and some limited programmatic information to our principal stakeholders and resource sponsors.

In this issue, my Product Managers (PdM) and Assistant PdMs have contributed articles with topics that highlight examples of our recent trends and issues. LTC Mat Guerrieri provides an overview of the family of JTRS waveforms, MAJ William Brickner describes waveforms within the ground domain, CPT Thomas Eddy discusses work being performed in the airborne domain, and CDR Enrique Molina highlights conclusion of the MUOS Formal Qualification Test, Dave Fusco outlines our way-ahead for integration of JTRS Enterprise Network Manager (JENM) into the Services' computing architectures, Tim Rastok updates JENM development, and MAJ Rachel Hoagland teaches the basics behind JENM training.

During the course of 2012, we have done a significant amount of work through our transition from the former Joint Tactical Radio System (JTRS) Network Enterprise Domain (NED) Program office to reshape ourselves as PM JTN, under the leadership of the Army's PEO C3T. Highlights from the year include:

- Army Network Integration Event (NIE) 12.1 – Operational Testing (OT) of Soldier Radio Waveform Network Manager (SRWNM) with the Handheld, Manpack, Small Form Fit (HMS) Program Office Rifleman Radio (RR). SRWNM was found operationally effective and operationally suitable by Commander Operational Test and Evaluation Force (COMOPTEVFOR), with recommendations for follow-on testing provided by Director Operational Test and Evaluation (DOT&E). Development testing was also conducted on several types of other vendors' (commercial) radios running the Soldier Radio Waveform (SRW).
- NIE 12.2 – Operational Testing (OT) of the JTRS Enterprise Network Manager (JENM v1.2) with both the HMS Manpack (MP) and HMS Rifleman Radio (RR). JENM 1.2 was found to be operationally effective and operationally suitable by both COMOPTEVFOR and DOT&E. Development testing was also conducted on several hundred other commercial radios running SRW.

Soldiers from 2nd Brigade, 1st Armor Division utilize JENM to monitor the network during NIE 12.2. (U.S. Army Photo / Released)

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- Wideband Networking Waveform (WNW) Interoperability Quicklooks (WIQ) WIQ-1, WIQ-2 and WIQ-3, to develop, test, and demonstrate interoperability among multiple different vendor WNW radios in both a laboratory environment as well as an operational environment.

Test Engineers demonstrating the use of tactical SA applications such as FBCB2, Life Ring, and live video streaming over a WNW network (U.S. Army Photo by Barkley Galloway / Released)

- NIE 13.1 – Demonstration of different vendor WNW radios achieving the Battalion Objective Architecture via a Battalion WNW backbone connecting disparate platoons on four different SRW subnets with a Warfighter Information Network-Tactical (WIN-T) satellite link between Electronic Proving Grounds (EPG, Ft. Huachuca, AZ) and White Sands Missile Range (WSMR, NM).

LTC Mat Guerrieri explains the value of WNW during the NIE 13.1 Distinguished Visitor Days at White Sands Missile Range, New Mexico (U.S. Army Photo / Released)

Vehicle-mounted radio running WNW as a mid-tier backbone network at a recent field test designed to demonstrate the utility of WNW in highly mobile environments with significant terrain impediments (U.S. Army Photo by Craig Steinkamp / Released)

- Programmatic review of JTRS NED conducted by the Overarching Integrated Product Team (OIPT) Chairman, Deputy Assistant Secretary of Defense (DASD) Communications, Command and Control, and Cyber (C3&Cyber).

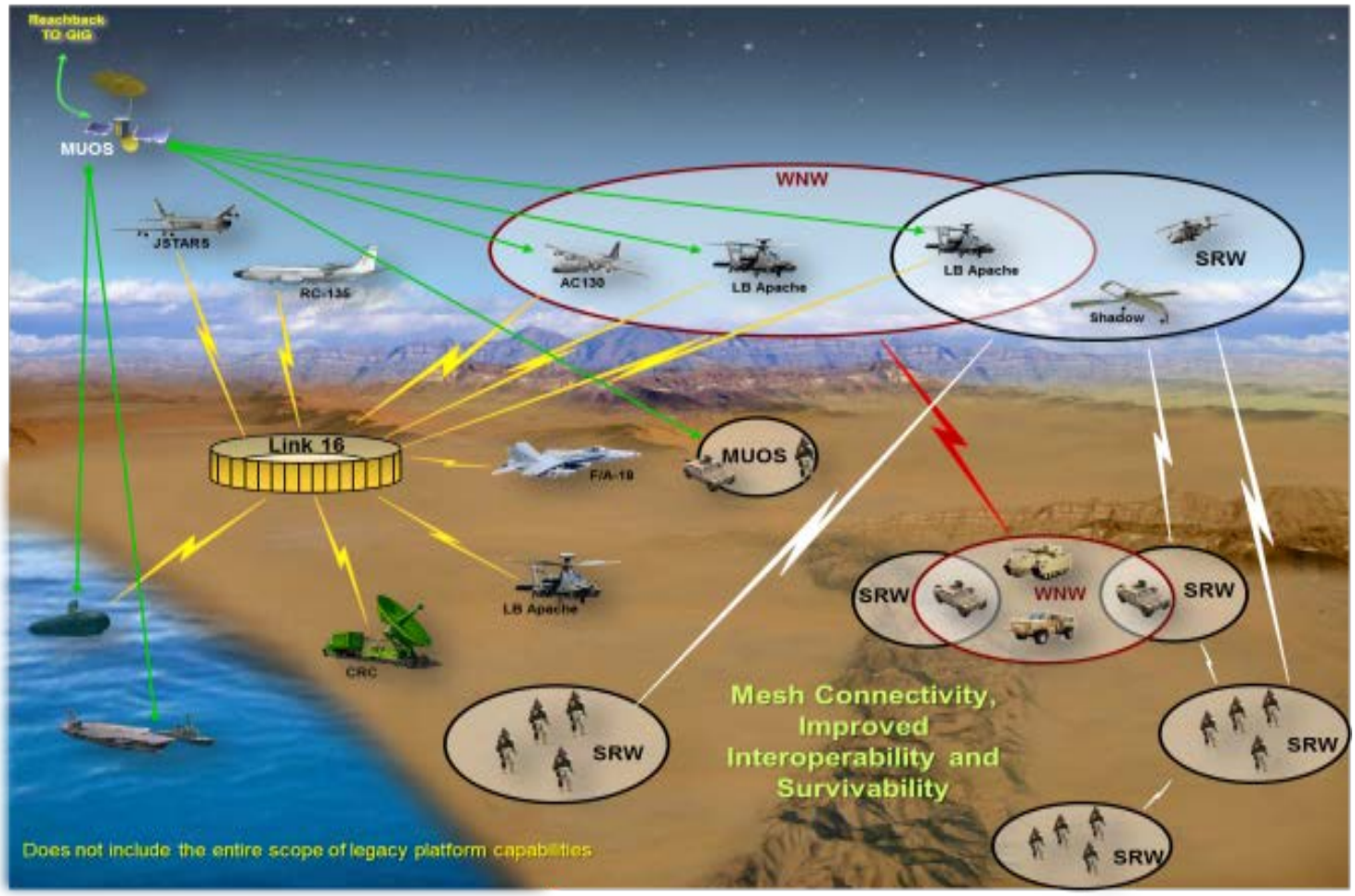
- Mobile User Objective System (MUOS) Red Team Results briefed to Under Secretary of Defense for Acquisition, Technology, and Logistics (USD (AT&L)) with remediation actions developed and implemented jointly by three program offices.

- MUOS waveform 3.1 software Formal Qualification Test (FQT).

- Conducted two JTRS Reference Implementation Laboratory (JRIL) Technical Exchange Meetings (TEMS) to facilitate interaction between operational user representatives, government technical representatives and testers, and commercial developers.

- JENM v2.5 software FQT.

Indeed, 2012 has realized the ability for multiple defense program offices to develop, integrate, test and field software defined radios – the vision of the former Joint Program Executive Office for the Joint Tactical Radio System. The JTRS vision for software defined radios is shown in the operational view (OV-1) graphic that follows.



Vision of a Mission-Centric JTRS Tactical Battlefield

- SRW, Soldier Radio Waveform, for dismounted Soldiers, sensors and smartweapons
- WNW, Wideband Networking Waveform , for ground mobile vehicles and airborne platforms
- MUOS, Mobile User Objective System, for ground, maritime and air platforms via satellite
- Link-16: Existing waveform for airborne platforms.

Software defined radios can now go the next step – to achieve improvements and efficiencies through an open innovative and competitive marketplace of multiple vendors hosting the government-provided software waveforms, ensuring interoperability between various vendor devices; interoperability between platforms, units and individuals; and interoperability between the defense services. A snapshot of the current "marketplace" of software defined radios is included within the graphic on the following page.

As PM for the software, tactical networking waveforms, and network managers, I will continue to develop and improve the core products to extend to more devices, utilizing the hardware innovations that will continue to be provided throughout the decade as described by Moore's Law and enabling a cost-effective marketplace for tactical networking terminals to support the platforms and missions of our future military needs.

CAPT Kevin R. Peterson, USN

Project Manager,
Joint Tactical Networks

JTN Product Portfolio

			Program Of Record (POR)									Non-Developmental Initiative (NDI)*										
			HMS				MIDS	AMF	GMR	MNVR	PD COMSEC											
Platform										TBD											
			Rifleman Radio AN/PRC-154 (B250M)	SFF-B	SFF-D RT 1948/D	Manpack AN/PRC-155 (B025)	AN/USQ-190	AMF-SA AN/ZRC-2	AN/VRC-107	TBD	J-TNT	TBD	TBD	AN/PRC-117G (v1.0.2 & vMP4.3.02_20120301)	AN/PRC-152A	SSDL/ STT	Soldier Radio - Rifleman (SR-R)	Side Hat	AN/ARC-231	Freedom 350	AN/ARC-210 Gen5	Future
Channels			1	2	1	2	4	2	2/3/4	2	n/a	2	2/4	1	1	2	1	1	2	2	1	2+
Waveforms			SRW	SRW SINCGARS SATCOM[1] HF[1]	SRW	SRW SINC[1] MUOS SATCOM[1] HF[1]	L-16*** TTNT	WNW SRW, L-16*** MUOS	SRW WNW SINC[1] DAMA[1] HF[1]	SRW WNW**	SRW	SRW WNW**	SRW WNW	SRW MUOS ANW2*** WNW	SRW	SINC[1] SRW L-16***	SRW	SRW	SRW WNW MUOS	SRW WNW MUOS	SRW WNW MUOS	TBD
Network Manager	Version 1 (VM Integration)	JENM 1.1							WIQ-1 WIQ-2 WIQ-3 NIE 12.2	**		Lab**	Lab WIQ-3	Lab						Lab		
		JENM 1.2	GDT 2.3 SIQ-2 WIQ-3 NIE 12.2 NIE 13.1		Lab	GDT 2.3 SIQ-2 SVT NIE 12.2 NIE 13.1			NIE 12.2	**	CS-13	Lab**	Lab WIQ-3	SIQ-2 SVT NIE 12.2 NIE 13.1	NIE 12.2 NIE 13.1	Lab	Lab NIE 12.2	NIE 12.2 NIE 13.1		Lab	Lab	
	Version 2	JENM 2.5 (FQT DEC-12)							Lab	**		MOU	MOU	MOU**	MOU	MOU	MOU		MOU**	MOU**	MOU	

Legend	
	Supported
	Support Planned
	Not Supported
1	Passthru from ACES
2	WIN-T = NCW + HNW
3	Implemented but not to current spec

Legend	
* Initial development complete, upgrades under JENM	
** Supportability based on GMR RMDS Compatibility Only	
***WF Capability not currently planned in JENM	
Green WF	Currently Supported on Platform
Black WF	Future Capability for Platform

* This listing may not be all inclusive and does not constitute government endorsement

Farewell JPEO JTRS. Hello JTNC.

By CAPT Kevin Peterson, USN, PM JTN

Under Secretary of Defense for Acquisition, Technology, and Logistics (USD (AT&L)) Acquisition Decision Memorandum, dated 11 July 2012, subject: Joint Program Executive Office (JPEO) Joint Tactical Radio System (JTRS) Reorganization, directed JPEO JTRS to transition to become the Joint Tactical Networking Center (JTNC). That decision memorandum also assigned the Army Acquisition Executive as the Lead Acquisition Executive for the JTNC and renamed Network Enterprise Domain (NED) as Joint Tactical Networks (JTN) program. JPEO JTRS was formally disestablished 30 September 2012. The five JPEO JTRS program offices were realigned under existing program executive offices (PEOs). The Multifunctional Information Distribution System (MIDS) Program was assigned to Navy Program Executive Office for Tactical Aircraft Programs (PEO T). The JTRS Handheld, Manpack, and Small form-factor (HMS) Program was renamed Project Manager for Tactical Radios (PM TR) and assigned to U.S. Army Program Executive Office for Command, Control and Communications-Tactical (PEO C3T). PM Airborne, Maritime, and Fixed station (AMF) and PM Mobile Networking Vehicular Radio (MNVR) were both assigned to PEO C3T. NED was renamed PM JTN, assigned to PEO C3T, and also identified as a supporting component of the JTNC. Although JTNC was placed administratively under the U.S. Army, the ADM expressed a desire that all Service branches leverage the JTNC's waveforms. With this new focus, JTNC has become the gearbox that drives the execution of the military's acquisition of advanced tactical networks for modern warfare. The latest PEO C3T Organizational Chart follows.

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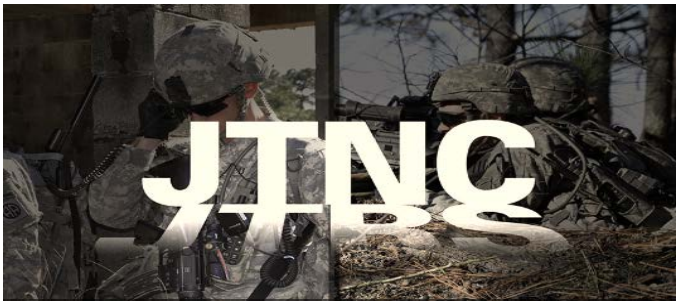
Refocused Portfolio of JTN Products

The USD (AT&L) decision memorandum directed the JTNC to "provide secure networking waveforms (for example, Soldier Radio Waveform (SRW), Wideband Networking Waveform (WNW), Mobile User Objective System (MUOS), and Link-16 waveforms), capable of operating in a variety of hardware transport solutions, for both program of record systems and commercial radios in support of Combatant Commander, Service, and Coalition interoperable network mission requirements. The JTNC is the Information Repository (IR) for these waveforms and will rely on testing performed through established test centers and agencies to ensure the supportability of all previously developed NED software products. PM JTN has the capability to call upon government and contractor subject matter experts from the Reference Implementation Laboratories (RILs) as well as commercial developers via existing Software In-Service Support (SwISS) contracts. Sustainment support for all NED developed products can be performed per a reimbursable basis. Reimbursable support is ongoing today for the Very High Frequency (VHF)/ Ultra High Frequency (UHF) Line-of-Sight (VULOS) and HAVEQUICK II waveforms (in support of U.S. Air Force needs), Tactical Targeting Networking Technology (TTNT) waveform v7 development (in support of the MIDS program), and for Single Channel Ground and Airborne Radio System (SINCGARS) enhancements (in support of PM AMF).



Graphic Courtesy of Defense Systems Magazine

In addition to the NED developed software products available on the IR, there are also other applications available (downloadable) via the IR but are not supported by PM JTN. Thus, product support by PM JTN is defined per the following categories:

Fully Supported – This category pertains to products PM JTN ensures mission funding is applied to sustain, enhance, and develop. These products are considered "core" Joint Tactical Networking applications and will be designated as requirements specifically via acquisition decision memoranda, directed requirements, or similar written tasking (e.g. international project agreements) by appointed Defense Acquisition Executive. These products will form the basis for program objective memorandum (POM) submissions within the PM JTN product portfolio.

Products within this category are: Wideband Networking Waveform (WNW), Soldier Radio Waveform (SRW), Mobile User Objective System (MUOS), Link-16, and JTRS Enterprise Network manager (JENM).

Reimbursable Support – This category pertains to products previously developed by JTRS NED. Active requirement for sustainment is not specifically designated or assumed for mission funding. PM JTN will stand ready to support these products on a reimbursable basis. Support for reimbursable products will be conducted per the needs of the funding sponsor.

Products within this category: Very High Frequency (VHF)/ Ultra High Frequency (UHF) Line-of-Sight (VULOS) and HAVEQUICK II, Tactical Targeting Networking Technology (TTNT), Single Channel Ground and Airborne Radio System (SINCGARS) Demand Assigned Multiple Access (DAMA), High Frequency (HF), Enterprise Network Services Software Internet Controller (ENS SOFTINC), Enterprise Network Services Tactical Data Controller (ENS TDC), and JTRS Bowman Waveform (JBW (Bowman)).

Available via IR, but not supported – This category pertains to products delivered to the JTRS IR, however are not complete or do not have existing requirements to support sustainment or development efforts. These products are available for access and use by developers that assume ownership for their use.

Products within this category are: Enhanced Position Location Reporting System (EPLRS), Collection of Broadcasts from Remote Assets (COBRA), Air Traffic Control (ATC), Integrated Waveform (IW), Mobile Ad hoc Interoperability Network GATEway (MNW (Maingate)), Common Interactive Broadcast (CIB), Digital Data Link (DDL), Multi Role Tactical Common Data Link (MR-TCDL), Future Multiband Multimode Modular Tactical Radio (FM3TR).

Fully Supported	Reimbursable – Active	Reimbursable – Inactive	Available on IR, but not supported
WNW (Wideband Networking Waveform) **SRW** (Soldier Radio Waveform) **MUOS** (Mobile User Objective System) **Link-16** **JENM** (JTRS Enterprise Network Manager)	**TTNT** **VULOS** **HAVEQUICK II** **SINCGARS**	DAMA HF ENS TDC ENS SOFTINC JBW (US/UK) EPLRS	COBRA ATC MNW (code only, no docs) IW CIB DDL MR-TCDL FM3TR

Product plans

Each of the fully supported products are complimented with a government Reference Implementation Laboratory (RIL) as well as a SwISS contract. A product manager is assigned to manage each individual software product, develops a fully-resourced plan to develop and sustain the product, and directs execution of sustainment activities. The Product Manager is also assigned as the contracting officer's representative (COR) of the product's SwISS contract. The RILs are the government in-service engineering activity for their respective software products. The WNW RIL is located at Space and Naval Warfare (SPAWAR) Systems Center Atlantic (SSC LANT) located in Charleston S.C. The SRW RIL is located at Army's Communications and Electronics Research Development Engineering Center (CERDEC) located at Aberdeen Proving Ground, Md. The MUOS RIL, Link-16 RIL, and JENM RIL are all located at SPAWAR Systems Center Pacific (SSC PAC) located in San Diego, Calif. The RILs support integration and interoperability testing of both hardware program of record systems and commercial terminals.

Project Manager's Goals

PM JTN goals are listed within the following table. Measures of Effectiveness (MOE) to track progress towards each goal are in the process of being defined and collected.

PM JTN Goal	MOE Attributes
1. Sustain, enhance, and develop JTN applications (i.e. waveforms and network management software products).	• Supportability • Reliability • Availability • Maintainability
2. Assure interoperable and secure software products for software defined radios.	• Functionality • Interoperability
3. Drive down costs.	• Affordability • Efficiency • Reusability • Portability
4. Responsive to Warfighters' needs to address urgent capability gaps.	• Usability • Extensibility
5. Implement software process improvements to advance JTN applications more efficiently and effectively.	• Agile Software Development • Test Driven Design • Code as Design Documentation

Moore's Law is the observation that over the history of computing hardware, the number of transistors on integrated circuits doubles approximately every two years [1].

The law is named after Intel co-founder Gordon E. Moore, who described the trend in his 1965 paper. The paper noted that the number of components in integrated circuits had doubled every other year from the invention of the integrated circuit in 1958 until 1965 and predicted that the trend would continue "for at least ten years". His prediction has proven to be uncannily accurate, in part because the law is now used in the semiconductor industry to guide long-term planning and to set targets for research and development. Intel executive David House predicted 18 months as the iterative cycle for microprocessor chip performance to double per the combination of more transistors and processing speed.

The capabilities of many digital electronic devices are strongly linked to Moore's law: processing speed, memory capacity, sensors and even the number and size of pixels in digital cameras. All of these are improving at (roughly) exponential rates as well. This exponential improvement has dramatically enhanced the impact of digital electronics in nearly every segment of the world economy. Moore's law describes a driving force of technological and social change in the late 20th and early 21st centuries. This trend has continued for more than half a century. Industry and academic sources in 2010 expect it to continue until through 2020.

"***The hardware will come. We need to define and build our software to smartly leverage the hardware advancements.***"

CAPT Kevin Peterson, USN
PM JTN

[1] www.mooreslaw.org/

Objectives for FY13

I have set the following top-level objectives for completion during FY13. This "punch list" will be tracked and assessed for reviews throughout the year. This list of objectives constitutes the major externally facing activities that the PM JTN team will be driving to complete. There are many supporting internally facing activities for the program office as well that are necessary to support these objectives.

FY 13 Objective	Status as of December 2012
☑ MUOS FQT	Completed 30 November 2012
☐ NSA approval for MUOS (v3.1) along with delivery of final waveform	In progress, NSA report received January 2013
☐ TTNT Engineering Drops (2)	In progress, on track for delivery of 2 engineering drops by September 2013
☐ NSA approval for WNW (v4.0.7)	In progress, estimate complete May 2013
☐ Completion of Link-16 Upgrade	In progress, estimate complete September 2013
☐ Completion of VULOS Upgrade	In progress, estimate complete September 2013
☐ Completion of HAVEQUICK II Upgrade	In progress, estimate complete September 2013
☐ Stating COALWNW as funded requirement	In progress through continuation of coalition support
☐ Complete and close out JTRS ORD Increment 1 requirements	To be started
☐ Define relationship between MUOS RIL and PMW-146	In progress
☑ JENM v2.5 (implementation of JENM as an integrated SOA application) FQT	Completed 14 December 2012
☐ JENM support to MUOS Net Management capabilities and E2E testing	In progress
☐ Integration of JENM with ACES/JACS and RBSAM into Army NETOPS architecture	In progress via I-NETOPS processes
☐ Development of a common JENM ICD (common for all Services, common for all POR terminals, common for all NDI terminals, common for interaction with other communications networking software applications)	In progress
☑ Demonstration of JTN applications as the Battalion Level Operational Architecture at NIE 13.1	Completed 16 November 2012
☐ Demonstration of JTN applications supporting WIN-T at NIE 13.2	Planning commenced
☐ Conduct Independent Technical Assessment by Software Engineering Institute	Statement of work signed for placing on to existing USAF contract
☐ Certify (3) SRW NDI terminals	Certifications in progress
☐ Certify (3) WNW NDI terminals	Several NDI terminals recently developed
☐ Stretch Goal: Certify (4) MUOS NDI terminals	NDI developers have downloaded MUOS v3.1 code

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Product Manager Waveforms (JTN-W)

JTN-W OVERVIEW

By LTC Mat Guerrieri, U.S. Army, Product Manager

The Product Management Office for Joint Tactical Networks Waveforms (JTN-W) continues to develop, deliver, and sustain software that is revolutionizing communication for Joint Warfighters. The product office consists of three domains: 1) Ground, 2) Airborne, and 3) Maritime, Beyond Line of Sight, & Space. The product office collaborates with stakeholders to ensure Joint Warfighter requirements for agile, interoperable, cyber-hardened, and portable tactical networking waveforms are satisfied. Our vision for 2013 is "Value Today" and the team is dedicated to delivering real value to our stakeholders through everything we do.

Think of communication in terms of firepower. In the lower tier, SRW is like a soldier's personal weapon (M-16 or M-4, 5.56mm), data rate = 450-1000 Kbps (small caliber), light, easy to carry, every soldier has one, perfect for small arms contact.

In the middle tier, WNW is like the armament of the tank/Bradley (M1A1, 120mm), data rate = 2400-5000 Kbps (large caliber), mobile, necessary when engaging enemy vehicles.

WIN-T is like indirect fire (M109, or even naval gunfire), it is great when you have priority of fires (satellite availability).

WNW provides our Warfighters the firepower they need to effectively leverage the communication spectrum.

The Ground Domain is led by Major William Brickner and is responsible for current and future force common waveform software, delivering enhanced tactical edge networking to the full spectrum service members. The products within the Ground Domain include Single Channel Ground and Airborne Radio System (SINCGARS), Joint Tactical Radio System (JTRS) Bowman Waveform (JBW), Coalition Wideband Networking Waveform (COALWNW), Soldier Radio Waveform (SRW), and Wideband Networking Waveform (WNW). These software enabled networking waveform applications supports integration of waveforms into joint radio platforms and supports transmit, receive, and route/relay voice, data and video between unmanned/manned, air/ground vehicles and combat platforms. The Ground Domain plays a vital role in support of the U.S. Army's bridge and objective tactical network architectures at Network Integration Evaluations (NIEs) at Fort Bliss /White Sands Missile Range and in the Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Network Modernization event at Ft. Dix, N.J.

Captain Tom Eddy leads the Airborne Domain and has the responsibility for Link-16, Tactical Targeting Network Technology (TTNT), Very High Frequency (VHF) and Ultra High Frequency (UHF) Line-of-Sight (VULOS), and HAVE QUICK II. The Airborne Domain coordinates with industry and key stakeholders to provide agile, interoperable, secure, and cyber-hardened waveforms to Joint Service Members.

The Maritime, Beyond Line of Sight, & Space Domain's leader is Commander Hank Molina. The domain is responsible for the Mobile User Objective System (MUOS), Ultra High Frequency Satellite Communications (UHF SATCOM), and High Frequency (HF) waveforms. The APdM coordinates with industry and key stakeholders to provide agile, interoperable, secure, and cyber-hardened waveforms to Joint Service Members.

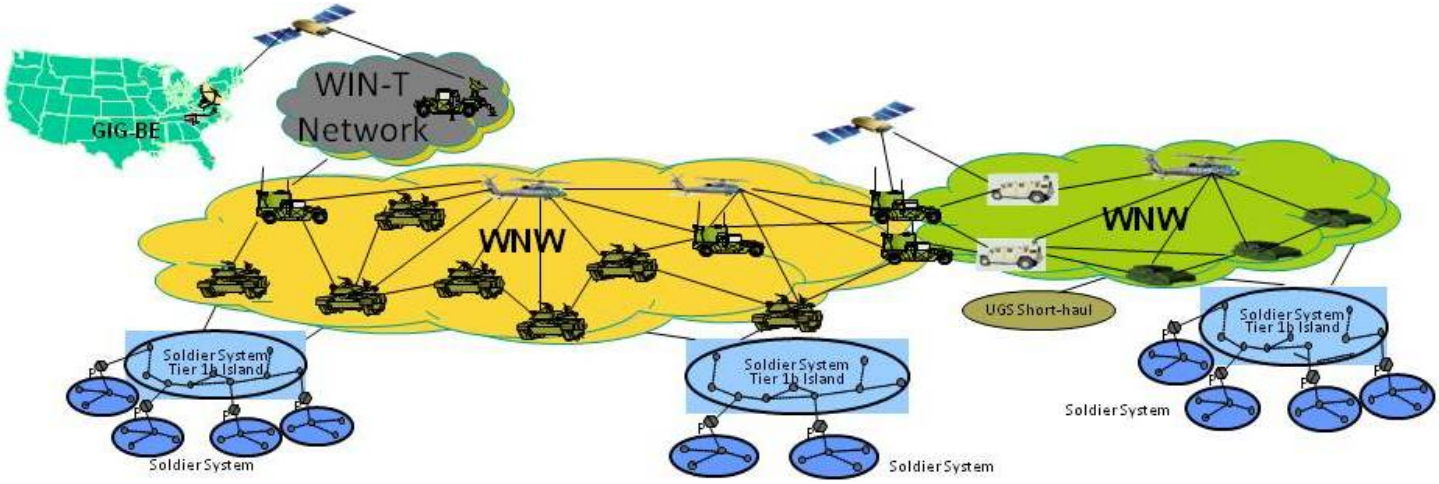
ABOUT THE GROUND DOMAIN

By MAJ William Brickner, U.S. Army, Assistant Product Manager

The Ground Domain is responsible for the development, sustainment, maintenance, and enhancement of several legacy and networking waveform applications that are primarily used to support Warfighters in the Last Tactical Mile (LTM). SRW and WNW are software Waveform Applications (WFA) integrated on software-defined radios (SDR) that support an open and secure system architecture framework. The radios that are developed by

Department of Defense (DoD) development programs and other industry vendors through their respective Internal Research and Development (IRAD) programs, have successfully ported these waveform applications and are being fielded to U.S. Army units and extensively tested during the semi-annual NIEs.

The U.S. Army's objective networking architecture will have three tiers. The lower tier is currently supported by SRW nodes, the mid-tier will be supported by a mid-tier networking waveform such as WNW, and the upper tier is supported by various Warfighter Information Network-Tactical (WIN-T) systems. Operationally, SRW and WNW are bringing revolutionary new capabilities to the Warfighter that were not available several years ago with SINCGARS or other legacy waveforms. With the vastly increased bandwidth, simultaneous support for voice, video, and data, and advanced networking ability of both waveforms, Soldiers, Marines, Sailors and Airmen at the tactical edge of the battlefield can receive and transmit operationally relevant information in a timely, reliable, and secure manner without the need for a satellite link. Communications between all SRW and WNW nodes are over terrestrial Radio Frequency (RF) links and supports on the move operations with or without the presence of Global Positioning System (GPS).



Notional Integrated WNW and SRW Ground Domain Network

WNW is a self-forming, self-healing, wireless network that allows the Joint Services to communicate securely with each other in the tactical battlefield and provide the mid-tier backbone for lower-tier nodes operating SRW. One of the most innovative capabilities is the Mobile Adhoc Network (MANET) function which allows nodes in the WNW network to have Internet Protocol (IP) connectivity and maintain a secure network without the need of a fixed external infrastructure. WNW waveform application enables high capacity voice, data, video, and chat exchange at the company level and above. WNW automatically forms a mobile mesh network for IP communications between geographically separated networks through the use of extension or relay nodes. WNW interoperates with upper-tier networks like WIN-T and the Global Information Grid (GIG).

Under the WNW Software In-Service Support (SwISS) contract which was awarded to General Dynamics C4 Systems (GDC4S) in September 2011, the government has conducted several efforts to increase the security posture of the WNW waveform application. GDC4S and the WNW Reference Implementation Laboratory (RIL) at Space and Naval Warfare (SPAWAR) Systems Center Atlantic (SSC LANT) are on schedule to deliver the next version of the WNW waveform application which enhances the Software Communications Architecture and security posture of the waveform. Version 4.0.7 delivery is in June 2013 after formal testing at the WNW RIL. Other efforts that will commence at the beginning of 2013 is the upgrade of the current High Assurance Internet Protocol Encryptor (HAIPE) module from version 1.3.5 to 4.1. This upgrade would allow WNW to be interoperable with other external HAIPE devices that may be used by in the network architecture. Along with the HAIPE upgrade, several MANET enhancements will be developed concurrently. Both efforts will be integrated, tested and delivered at the end of calendar year 2013.

SRW is a self-forming, self-healing, wireless networking waveform that enables converged voice, data, and video communications at the tactical edge for size, weight and power (SWAP) disadvantaged platforms and radio form factors, including mounted and dismounted Soldiers, sensors, and unmanned vehicles. SRW supports seamless IP connectivity and is interoperable with higher echelon networks via SRW gateways. SRW modular design supports multifunctional applications in the following Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) domains: Soldier System (SS), Unattended Ground Sensors (UGS)/Intelligent Munitions System (IMS), Non-Line-of-Sight-Launch System (NLOS-LS) and Tele-Operations (TO). SRW waveform application provides a seamless communications gateway function from each of these domains to the mid-tier networks comprised of WNW (or equivalent mid-tier networking waveforms) nodes which forms the backbone of the tactical communications system. Each SRW domain subnet acts as a lower tier sub-network to the mid-tier, and supports the unique C4ISR requirements of that domain. The SS domain in particular provides simultaneous wideband voice, Position Location Information (PLI), and other data capabilities over a multi-hoped, self-forming, self-healing networking infrastructure.

A Soldier from 2nd Brigade, 1st Armored Division uses a Handheld, Manpack, Small Form Fit (HMS) Manpack radio, running SRW, to communicate while conducting dismounted operations at the Army's Network Integration Evaluation (NIE) 13.1 on 9 November 2012. The Manpack allows small units in austere environments to exchange voice and data information with their higher headquarters, without having to rely on a fixed infrastructure. (U.S. Army Photo / Released)

Under the SRW SwISS contract which was awarded to Harris Corp. in March 2012, the government has conducted several technical studies to improve the functionality and performance of the SRW waveform application. In order to sustain and maintain the baseline waveform application, the government has transitioned the baseline version from the ITT/Exelis Waveform Development Environment (WDE) to a Harris developed WDE. This transition to the Harris baseline version will provide full Government Purpose Right (GPR) of all software modules of the WFA to include the high-speed data rate field-programmable gate array (FPGA) modem source code. The new baseline will be the equivalent of the current SRW version 1.1.1.1 plus all JTN-Configuration Control Board (CCB) approved fixes and enhancements and will be delivered as SRW version 1.2 in December 2013. Another effort currently underway is the development of a Combat Net Radio (CNR) voice pre-emption capability. This capability enables certain higher priority nodes (e.g. company commander, platoon leader, squad leader) to pre-empt other active voice calls within their respective call groups in order to get high priority voice calls to subordinate nodes. This function will enhance command and control (C2) capability at the company, platoon, squad and team levels. The subsequent version with the CNR voice pre-emption capability will be delivered in 2nd QTR FY 14.

SINCGARS is the only legacy waveform application in the Ground Domain and will see new capability being added in FY 13. SINCGARS is a non-networking, narrowband waveform application that has been used on JTRS HMS and GMR radios providing voice and limited data transport services. CNR voice communications over VHF frequencies will continue to be used in the U.S. Army with legacy SINCGARS capable radios while Basis of Issue Plans (BOIPs) for SRW and WNW radios are being developed and then fielded to all the units. Under the SINCGARS SwISS contract with ITT/Exelis, the government is determining the feasibility to improve the waveform application by adding Enhanced Operating Mode (EOM), Universal Networking Situational Awareness (UNSA), as well as other mission critical functionality enhancements.

ABOUT THE AIRBORNE DOMAIN

By CPT Thomas Eddy, U.S. Army, Assistant Product Manager

Airborne team members have been actively involved in managing development of the next generation tactical datalink. TTNT provides high data rate and long-range communication links for airborne participants. As a

complement to the existing Link-16 tactical data link network, TTNT adds to the current airborne network capacity and provides increased message throughput. The minimal network planning requirements of TTNT will make airborne networking easier to establish by enabling participants to enter and exit the network without extensive pre-planning. TTNT version 7 is under development by Rockwell Collins and is slated to start qualification testing in August of 2014. In coordination with the Joint Staff and Acquisition, Technology, and Logistics, the DoD Chief Information Officer provided interim approval for TTNT to support the U.S. Navy's networking communications requirements hosted on the Multifunctional Information Distribution System (MIDS) terminal. The Airborne team has been actively engaged in the development of new capabilities for the Link-16 waveform, including a crypto merge that will upgrade the platform and provide enhanced capability to the Warfighter. The Airborne team recently facilitated the award to BAE Systems an over $5 million contract for MIDS On Ship, which will create enhanced Link-16 functionality including the addition of navigation features for ship borne platforms. The Airborne team has also been working with assets at SSC LANT for improvements to the HAVE QUICK II and VULOS waveforms. This effort will see both waveforms merged into a new, combined software based waveform providing enhanced VHF and UHF communications, as well as the secure voice communications of HAVE QUICK, in a single software definable platform for use by aviation assets.

ABOUT MUOS FQT

By CDR Enrique Molina, USN, Assistant Product Manager

The Project Manager, Joint Tactical Networks (JTN), facilitated successful completion of the Formal Qualification Test (FQT) of the Mobile User Objective System (MUOS) Waveform v3.1 (Wfv3.1) on November 30, 2012. The MUOS Wfv3.1 FQT is a significant milestone marking the completion of the full, encrypted waveform that can be ported to the Handheld, Manpack and Small Form Fit (HMS) radio as well as other program of record (POR) and non-developmental item (NDI) software defined radios. MUOS is a worldwide communications system with modern cellular-based service capabilities, which will provide secure, global communications to the Warfighter and satisfy other DoD agency requirements. The MUOS waveform component facilitates terminal access to the MUOS system by offering secure streaming video, netted communications, and voice/data in real time to provide essential connectivity. The MUOS waveform application is based on the commercial 3G Wideband Code Division Multiple Access waveform application, with some significant modifications to account for long satellite access delays and to add DoD-unique functionality. Moreover, the MUOS waveform supports various MUOS network components that consist of mobile devices and applications, stationary gateways, and core network servers. Successful completion of the MUOS Wfv3.1 FQT validates waveform requirements in a laboratory environment on developmental radios and the MUOS network equipment.

MUOS satellite antenna Earth terminals installed in Wahiawa, Hawaii. (U.S. Navy Photo / Released)

The MUOS waveform, when ported on the HMS Manpack or other JTRS-capable terminals will provide end users with worldwide voice/data capability over satellites.

Atlas V MUOS-1 Launch on 24 February 2012. (Photo by Pat Corkery, United Launch Alliance)

The first MUOS satellite is currently in orbit, and, when the entire constellation is populated, the MUOS waveform will transform DoD global cellular capability around the world particularly in areas where communications are deemed challenging.

Product Manager JENM (JTN-J)

NETOPS Systems and JENM Integration Efforts

By David Fusco, Assistant Product Manager

With the maturity of networking waveforms comes the need to consolidate the planning and management of these waveforms into a single and joint management system. The Project Manager Joint Tactical Networks (PM JTN), Assistant Product Manager for JTRS Enterprise Network Manager (JENM) Integration (APdM JTN-J Integration) are focused on this task as well as managing future development and integration of JENM services. A key aspect of this work is ensuring JENM interfaces and Software Architectures conform to standards that are accepted across the Department of Defense (DoD) Network Operations (NetOps) community. Two team efforts critical to the support of this mission are: the development of a standardized JENM Interface Control Document (ICD) and the establishment of a Joint Service Oriented Architecture (SOA) Taxonomy for Tactical Network Managers.

The JENM ICD development, which is being supported by the JTNC Technical Directorate Standards Team, is a continuation of earlier work performed with the Soldier Radio Waveform Network Manager (SRWNM) product and interested industry partners. This efforts' success is seen through successful development of a network manager that supports both Program of Record (POR) and Non-Program of Record (Non-POR) SRW capable radios. By the systematic maturity of the JENM ICD, the Standards Team has significantly reduced the effort required for radio vendors (POR, and non-POR) and JTN-J to ensure all interface requirements are met for each radio platform. The next release of the JENM ICD is currently planned for January 2013 and will include: interface definitions for planning, monitoring and configuring Wideband Networking Waveform (WNW) and planning and configuring Mobile User Objective System (MUOS) waveform. The January 2013 release of the JENM ICD will mark a significant milestone in that it will be the first version of the ICD voted on by JTNC stakeholders, and managed in the same way that JTRS waveform and radio standards have been successfully managed to date.

The team has also begun initial development on a Joint SOA Taxonomy for Tactical Network Managers. In addition the team is working with the OSD Network Management Working Group (NMWG) to build a Tactical NM Ontology in conjunction with the review of the taxonomy. The taxonomy is a classification of "Services/Objects", as well as the principles and definitions underlying the functions contained within each service which promotes the ability to reuse services across different NetOps programs (see Figure 1).

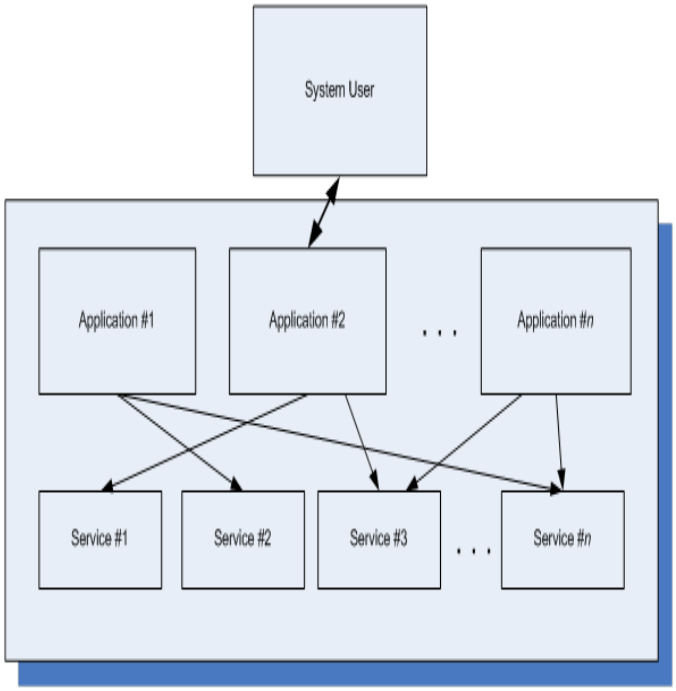


Figure 1 - Logical Relationship of SOA Applications and Services

For JENM the taxonomy will define the JENM services, ensuring the different applications understand how to make calls into a service like monitoring, for example, and define the format, data, and inputs that are supported by each service. Figure 2, below, outlines how the taxonomy would provide the associations needed within the service broker to ensure the right correct and appropriate service is being requested.

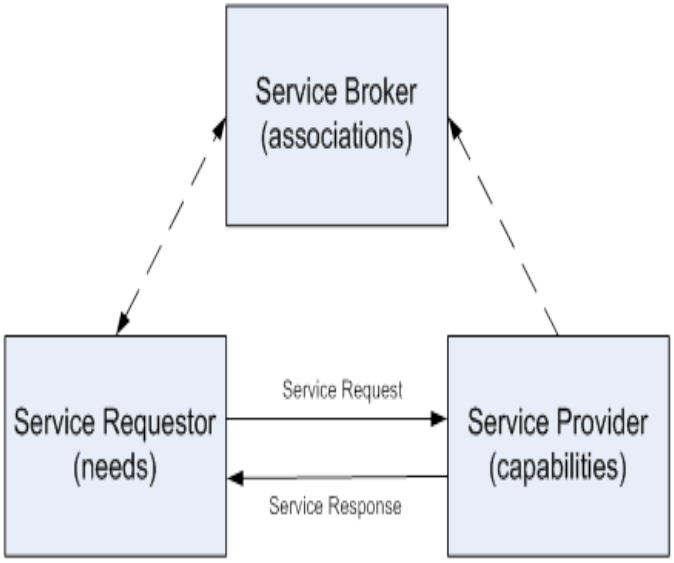


Figure 2 - SOA Services Calls

For example: If the Warfighter Information Network-Tactical (WIN-T) Network Management System (NMS) requests performance monitoring data, the taxonomy would describe the data and the service(s), that would support the request. The ontology builds on this, providing a data model that represents a set of concepts within a domain and the relationships within those concepts. The development of an ontology, for JENM, will define the services that need to be shared (exposed) and to what level. The JENM SOA framework is based on commercial standards that if, adopted by other systems will lend itself to increased software reuse (increasing value) and the elimination of redundancy and complexities. In SOA the standards are coupled to an excepted taxonomy that classifies "services" (functions within the software i.e. WNW planning) within the systems and the ontology will help to define the relations between the systems.

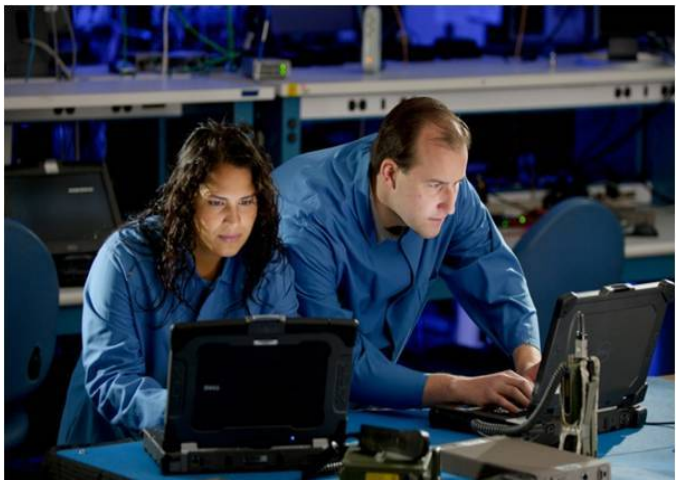
In a joint system both the JENM ICD and a SOA defined taxonomy and ontology will be critical to maintain and improve a Joint SOA construct. Furthermore, a Joint SOA will facilitate rapid and straightforward integration with Service, Joint NetOps systems, and Commercial off-the-shelf (COTS)/Government off-the-shelf (GOTS) applications.

With the establishment and acceptance of proper governance and standards (ICD, Taxonomy and Ontology), a SOA based NetOps solution will provide a long term cost effective solution with numerous benefits and advantages over existing NetOps software architectural approaches.

JENM Version 2.5 Release

BY Tim Rastock, Assistant Product Manager

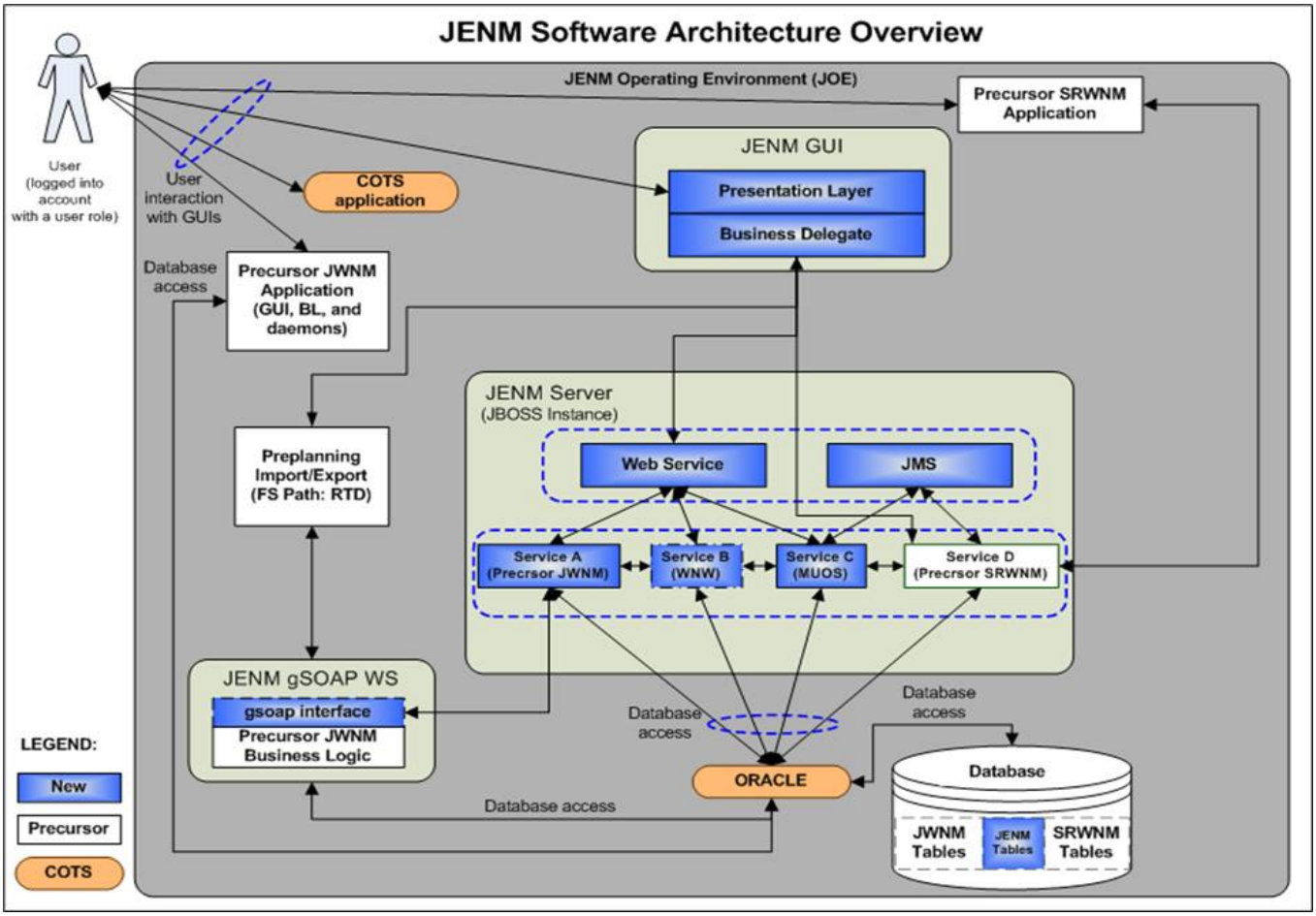
The Joint Tactical Networking Center (JTNC) released its newest version of JENM in December 2012 after successful Formal Qualification Testing (FQT). The new JENM v2.5 release provides exceedingly enhanced planning and monitoring capabilities for the AN/PRC-117G, AN/PRC-152A, AN/PRC-154 Rifleman Radio (RR), AN/PRC- 155 (Manpack), Side Hat and Soldier Radio Rifleman (SR-R) and also integrates terminal provisioning for the MUOS waveform capability. With successful completion of FQT the focus will turn towards usability enhancements to the software, extending the SOA architecture and JENM interfaces for integration with external network managers, mission planning systems, network planning systems, and spectrum planning systems.



Engineers view and assess communications networks using the JENM 2.5, a network manager that makes it easier for commanders to manage and monitor multiple, secure communications networks in fast-paced battlefield environments. JENM 2.5 was delivered in 2012 to the Joint Tactical Networking Center for additional government testing. An earlier version of JENM is now used by soldiers serving in Afghanistan and will deploy as part of the Army's Capability Set 13 equipment package this year. (Photo courtesy of Boeing, copyright 2012)

To enable an extensible architecture where the developer can add new waveforms and new platforms, the SOA was adopted for the JENM software architecture. SOA is set of principles and methodologies for designing and developing software in the form of interoperable services. These services are well-defined business functionalities that are built as software components. A system based on SOA will package functionality as a suite of interoperable services that can be used within multiple, separate systems from

several business domains. SOA services feature loose coupling to the client caller and web-based interfaces. The graphic on the following page depicts the generic JENM architecture that it was modeled after. Specifically, for each user role (planner, operator, administrator, and security officer) a set of components is designed to provide the functionality required by that user. It consists of a dedicated user role Graphical User Interface (GUI) client component and supporting SOA services. Additionally, the JENM Operations Application includes a set of components that provide background processing for all user roles. Each JENM Application will follow this architecture structure.



The advancement of the SOA provides the ability for industry radio developers to easily integrate new waveforms and radio platforms to the network manager common architecture by utilizing a standard web service interface. Information can then be accessed and exchanged with external NetOps Network Management (NM) systems such as the WIN-T, the Joint Warfighting Integrated NetOps (JWIN) and Joint Tactical NetOps Toolkit (J-TNT). Warfighter user enhancements of JENM 2.5 extend the pre-existing NM planning and management tool into a single user application allowing the joint services Warfighter to manage and build communication plans across multiple networks increasing the effectiveness of monitoring data for radios supporting the MUOS, WNW and SRW waveforms.

Over the next few months the team will be working to enhance the usability of the tool based on user feedback during demonstrations of the JENM 2.5. These usability changes will augment the user's ability to conduct consolidated communications planning, network configuration, network activation, position reporting, fault management, security management, and provide network health and status reporting needed to plan and manage the Tactical Network Environment Radio Network. JENM version 2.5 will be available on the JTRS Information Repository in Q2 of FY13.

JENM Outcomes-Based Training

By MAJ Rachel Hoagland, U.S. Army, Assistant Product Manager

In January 2013, the JTN trained over thirty network operators from the 4th Brigade Combat Team of 10th Mountain Division to include S-6 communications personnel at Fort Polk in the planning and configuration of HMS Manpacks, Rifleman Radio and Harris radios (AN/PRC 152A & AN/PRC 117G) using the JENM. Leading into New Equipment Training (NET) at Fort Polk, the JENM training team was tasked with modernizing Army training practices that were currently being developed for the JENM system. As a team, we have revolutionized network training through the use of the outcomes-based training concept, giving each Soldier an advantage both in and out of the classroom.

U.S. Soldiers with 4th Brigade of the 10th Mountain Division, receive JENM outcomes based training as part of the units Capability Set 13 new equipment training. (U.S. Army Photo by MAJ Rachael Hoagland / Released)

When explaining outcomes-based training, we propose the analogy of golf. Using the theory of developing an outcomes-based training course for golf, we start by giving a class on trajectory that explains all golf club angles in detail and how each angle affects the flight of a ball after being hit. Once the concept has been presented through discussion, we head to the golf course driving range with several buckets of golf balls. Here the student experiments, learning-by-doing, how each club angle individually affects the flight of the ball. Now that the student understands the basics, he or she can make their way out on the course to put to use their newly acquired knowledge. On the course it is up to the student to pick the correct club and adapt to the changing environment. There is no caddy providing guidance to the student on what club to use.

The question now becomes, how do you adapt outcomes based training to network planning? Knowing that the Soldiers we would encounter when fielding this training at NIE and beyond could potentially cover the gamut of career fields, we needed to start with the theory of the waveform and network architecture, then cover all the tasks necessary to create the network, explaining each piece and how it fits into the functional plan. Within no time, the Soldier is hands on in the planner building their first platoon network with a rudimentary set of skills.

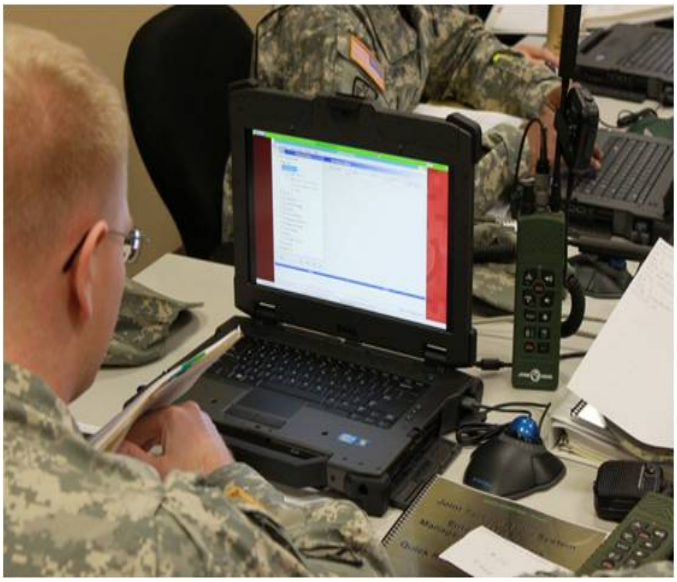
Upon completing the platoon network, it is time to see if what they have built works. If a Soldier builds a functioning network, they now become an assistant instructor to help their battle-buddy troubleshoot. This keeps all students engaged versus sitting around while others get caught up as well as shows that if a Soldier can troubleshoot the network, they understand it.

Now that our platoon networks are up and running, the class moves on to company, battalion, and brigade network planning. Same concept: build, test and troubleshoot.

Once we are confident that a student can build Brigade network plans, the real fun begins. As Soldiers are released on break, the instructors insert problems into their individual plans. As they return from break, the student notices the network is not working properly and is immediately prompted to start troubleshooting. These troubleshooting exercises are challenging for the Soldier forcing them to critically think about the network, interoperability, terrain, radios, crypto, the plan, and more.

With very few briefing charts, minimal lectures, a flexible timeline, and no standard twenty question multiple-choice exam, people are often skeptical of outcomes-based training. Two common questions from these skeptics are: if there is no standard exam, how do you measure a student's capabilities?, and without step-by-step instructions, how is a Soldier expected to complete a task?

While we agree that some sort of measurement does need to exist in outcomes-based training, it does not conform to conventional methods of measurement (e.g., standardized testing). Within our exercise, we have developed a metric to measure a students learning. In this metric there are several factors including, but not limited to: complexity, time, thought process, environment, and accuracy. When eliminating the formal exam process, the course material and instructional objectives must be clearly communicated to the students, so that they completely understand what is required of them from a learning objective viewpoint. [2]



A Soldier with the 4th Brigade of the 10th Mountain Division receives JENM outcomes based training as part of the unit's Capability Set 13 new equipment training. (U.S. Army Photo by MAJ Rachael Hoagland / Released)

When someone asks us: "where are the step-by-step procedures?", we cringe. We are stuck in this Vietnam-era style of training development and failing to adapt to the modern Soldier. During the Vietnam-era, large amounts of Soldiers needed to get pushed through training programs quickly and a high level of control was needed as recruits were not expected to think on their own. Times have changed and Soldiers are willingly joining/reenlisting in a time of war. One of the most consistent pieces of feedback we have received from the Soldiers at NIE was that minimizing our use of briefing charts and freeing up time for hands-on exercises with guided instructions was great. Leading us to support the idea that this newer generation of Soldiers are both technically proficient and individual thinkers which are the traits that we must capitalize on. For example, in one of our reviews, a Soldier stated that "even though this was a challenging concept, they treated me like an adult and made me think." When internally evaluating our effectiveness, this is the exact feedback we are looking for since when Soldiers are deployed, they are going to inevitably encounter situations that do not come with a step-by-step guide and in turn, they are forced to think critically about what they were taught in class and use that guidance.

[2] Whitley, B. E., Jr. & Keith-Spiegel (2002), Academic dishonesty: An educator's guide, Mahwah, NJ: Eribaum

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Program Manager Joint Tactical Networks Newsletter

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About the Joint Tactical Networking Center

As part of the Department of Defense, the Joint Tactical Networking Center (JTNC) develops, sustains and certifies Joint Tactical Networking applications and waveforms for the Warfighter; thus ensuring secure, interoperable and affordable battlefield networking systems. It is the provider for centralized management, development and sustainment of joint waveform and network management applications.

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