4.6 Open Plug and Play Commmunication Architecture

Bottom Line Up Front	
Challenge	
Operating force demand for more complex and more capable Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) is driving a need to develop an open source, open architecture based specification for tactical vehicles that allows plug and play mission capabilities. The demand signal from the operational forces is very clear as articulated in Urgent Universal Need Statements (UUNS), Deliberate Universal Need Statements (D-UNS), and a myriad of field modifications to vehicle platforms to achieve better C4ISR capabilities and more functionality and tactical agility for existing platforms. The MAGTF's ability to provide network capabilities and adequate force protection is dependent on a more organized approach to vehicle platform based C4ISR capabilities. The key to increased capability with dwindling resources is a common architecture and standards for all tactical vehicles. The specification for a common C4ISR architecture must be affordable, scalable, and operationally feasible for use on legacy platforms.	
Potential Solutions	
PEO LS / ONR / MCSC / RDECOM / TARDEC / NSWC	NUCLEUS MVP JLTV MRAP and M-ATV
TARDEC	VICTORY Architecture Development and Standard Maturation. Plug-n-Play Architectures for Ground Vehicles. Open Framework for Legacy Integration. Vehicle Electronics Architecture SIL. Deterministic High Speed Data Bus. Soldier System Fusion. VICTORY Standards maturation. SWAP-C Reductions. Power Architecture and Standards. Hi/Low Temperature Power Electronics.
SBIR	OTM HF Antenna performed by Astron Wireless Ka/Ku OTM Satellite Communications performed by NanoSonic, Inc.

Potential Solutions

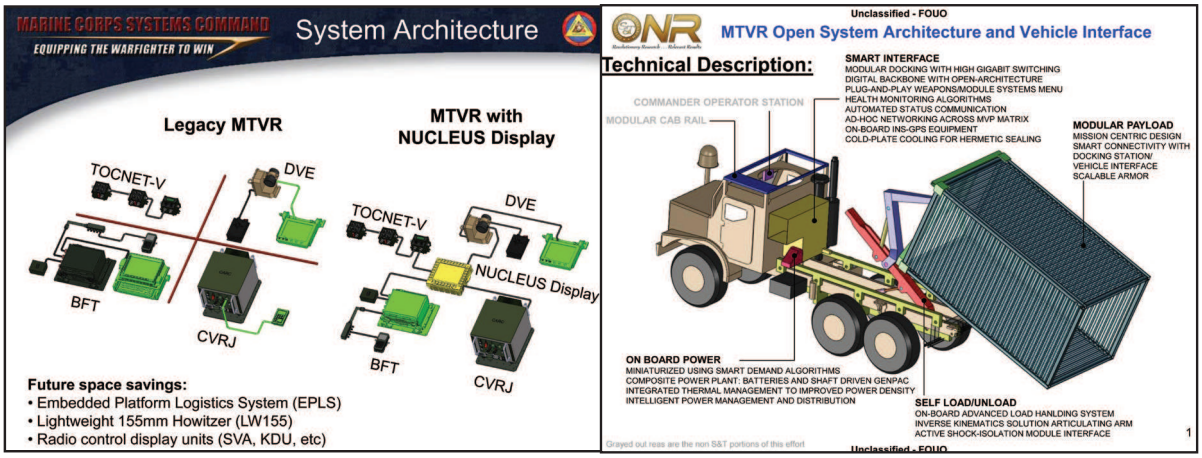
PEO LS Efforts

PEO LS is engaged with Office of Naval Research (ONR), Marine Corps Systems Command (MCSC), US Army Research, Development, and Engineering Command (RDECOM) Automotive Research, Development and Engineering Center (TARDEC), Naval Surface Warfare Center (NSWC) Dahlgren as well as various industry partners and other agencies to address the Marine Corps' vehicle C4ISR challenges. To date, there have been several disparate efforts to develop C4ISR solutions for USMC vehicles, but the effort has lacks consolidated requirements is subject to, rapid technological change and frequently involves a stove-pipe approach to platform design. Previous and ongoing work toward a common vehicle C4ISR architecture includes:

Networked User Control of Locally Embedded and Unique Systems (NUCLEUS). MCSC Systems Engineering, Interoperability, Architecture, and Technology (SIAT) sponsored an effort by NSWC Dahlgren and Space and Naval Warfare Systems Command (SPAWAR) San Diego to rapidly develop a common display for the Marine Tactical Vehicle Replacement (MTVR).

MTVR Cab before (numerous bolt-on applications) and after (consolidated display) application of prototype NUCLEUS technologies

Modular Vehicle Platform (MVP). The intent of this ONR 30 Manuever Thrust effort is to develop modular functionality for a common C4 architecture with vehicle wide power and thermal management to allow plug-n-play mission modules for current and planned vehicles. Based on user demand, the need to lighten the MAGTF load and the applicability of modularity across the MAGTF, ONR 30 has established a core program for MVP in FY12. This effort will refine the technology requirements behind an MVP capability to drive future investment through the FNC program, ONR core or other funding methods.



This is an example of MVP technologies being considered for the MVP FNC by the Office of Naval Research

TARDEC Efforts

Vehicular Integration C4ISR/EW Interoperability (VICTORY). TARDEC and RDECOM sponsored, multiyear effort to develop and demonstrate a joint specification for a common digital backbone that includes a suite of interactive systems engineering tools to support decision makers in defining vehicle specifications. The requirements optimization process allows multiple vehicle subsystems to be varied concurrently while assessing differing vehicle performance attributes, such as power train performance, vehicle dynamics, human factors, and transportability.

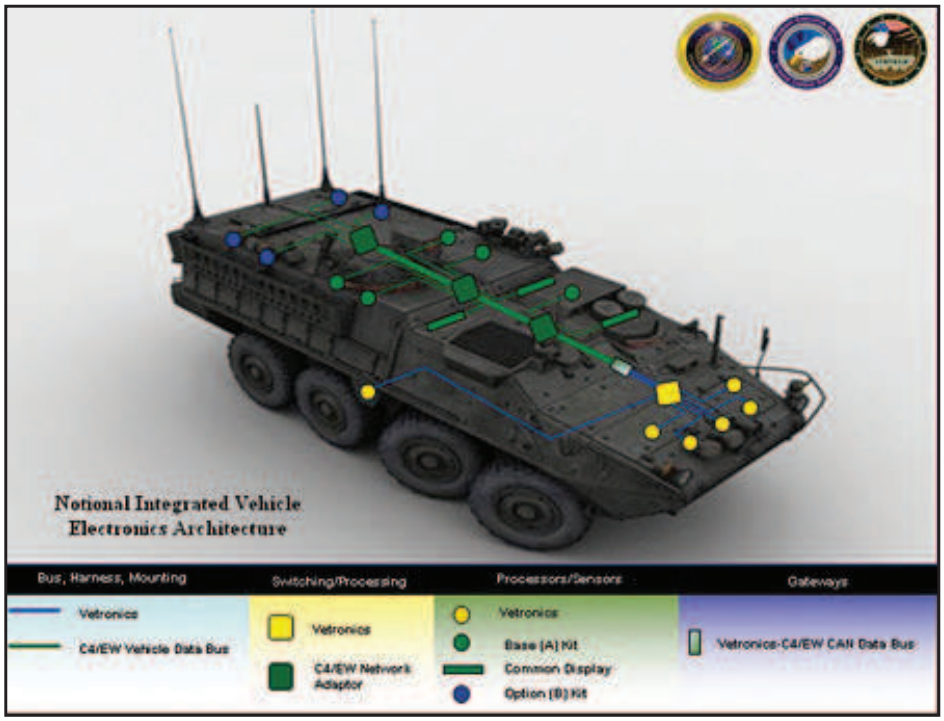


Figure 6 – Notional VICTORY Architecture

Architecture Development and Standard Maturation. Develop and adopt VICTORY specifications. Develop a System Integration Lab (SIL) reconfiguration package to perform validation and verification for the standards.

Plug-n-Play Architectures for Ground Vehicles. Define Plug-n-Play for Military Ground Vehicles and assess the feasibility of implementation. Develop, integrate, and demonstrate a Plug-n-Play capability for a Military Ground Vehicle in a System Integration Lab (SIL) environment.

Open Framework for Legacy Integration. Providing open framework for interfacing legacy sensors and components using small pervasive computing devices. Embedded Computing Resources SWAP-C Reduction. This effort is intended to reduce SWAP-C of onboard electrical and electronic components.

Vehicle Electronics Architecture SIL. This is an open architecture SIL with the ability to test any piece of hardware to verify its compatibility with an open architecture and VICTORY compliant system (see Figure 7 on the following page).

Deterministic High Speed Data Bus. The purpose of this effort is to develop the next generation deterministic high speed data bus for ground vehicle platforms to meet the needs of real-time applications for weapons systems and vehicle controls.

Soldier System Fusion. Increased soldier-vehicle system cohesion to provide unprecedented Soldier situational awareness. Planning and control of manned and unmanned systems.

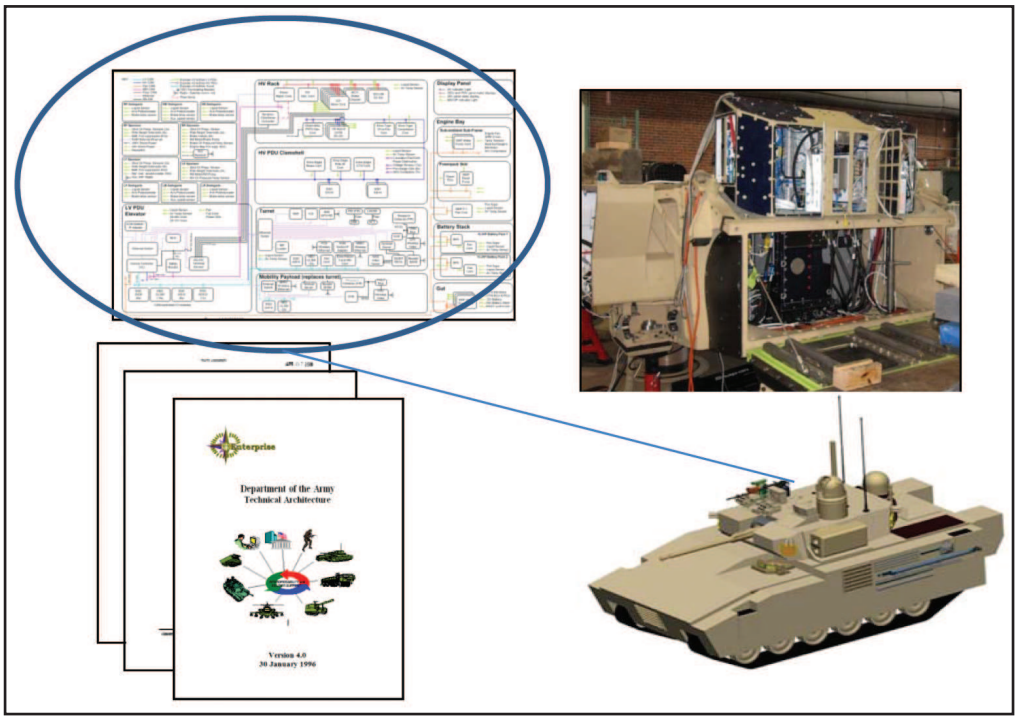


Figure 7 - Vehicle Architecture Program

VICTORY Standards maturation. Continue to mature and maintain the VICTORY specification and architecture. The effort will also mature and maintain a SIL reconfiguration package to perform verification and validation of the specification.

SWAP-C Reductions. Reduces SWAP-C of onboard electrical and electronic components.

Power Architecture and Standards. Update and develop voltage standards and electrical power architectures to provide common standards and interfaces to new start programs and modernizations efforts.

Hi/Low Temperature Power Electronics. Smaller size and weight for power electronics in order to operate at high temperatures without failure. Reduce burden on propulsion cooling, enabling better mobility, more payload and less integration work for future systems.

SBIR Efforts

- **OTM HF Antenna** performed by Astron Wireless
- **Ka/Ku OTM Satellite Communications** performed by NanoSonic, Inc.