Enabling VICTORY Data Bus Network for an Armored Ground Vehicle

CURTISS–WRIGHT

DEFENSE SOLUTIONS

Challenge

- Connect C4ISR/EW equipment to VICTORY data bus

- Affordable, high TRL, low risk COTS hardware

- Satisfy information assurance and environmental requirements

Solution

- Rugged COTS VICTORY infrastructure switch LRU

- SWaP-C optimized subsystem qualified for tracked vehicles

- Modular architecture capabilities for switch, processor, PNT hub

Results

- Met budget and TRL with low-cost, rugged COTS solution

- VICTORY network support with low-risk, SWaP optimized switch

- Modular subsystem enables optional functional upgrade

Challenge

Momentum continues to build within U.S. military ground vehicle programs to architect and implement the vetronics systems standard, referred to as VICTORY (Vehicle Integration for C4ISR/EW Interoperability). This C4ISR modernization initiative provides a common ground vehicle infrastructure to ease the integration of new technologies, while improving size, weight and power (SWaP). This progressive initiative uses open network interfaces, data formats, and protocols to enable integration and sharing of network, processing, Position Navigation Timing (PNT) and display resources. In the end, VICTORY aims to not only enhance situational awareness for the warfighter, but also provide a roomier vehicle cabin and more efficient data sharing, but reduce overall life-cycle cost for maintaining the platform.

A major systems integrator with proven successes developing combat vehicles for U.S. and foreign defense forces required a VICTORY compliant Ethernet switch for a new armored vehicle platform. This small form factor (SFF) switch Line Replaceable Unit (LRU) would provide mission electronics onboard the command and control (C2) variants of this new vehicle with a digital backbone for Ethernet connectivity for supporting VICTORY architectures. The platform would utilize the network switch to connect tactical radio and communications systems (i.e. JTRS, WIN-T), smart displays, electronic warfare, friendly force tracking, and battle command systems. The switch would support key program operational priorities and concerns, including SWaP, schedule, cost, and information assurance (IA). It would also need to meet the environmental requirements for heavy brigade combat team (HBCT) platforms per MIL-STD-810 and MIL-STD-461.

Parvus® DuraDBH-672

Solution

Driven by a comprehensive joint program office / prime contractor trade study, the U.S. Government surveyed the marketplace to find the highest performance VICTORY switching solution with the most affordable price, highest Technology Readiness Level (TRL) and lowest risk. Not only were multiple COTS switch LRUs from Curtiss-Wright included in the trade study, but the Parvus DuraDBH-672 Digital Beachhead model was ultimately selected for this program. In fact, for commonality and for logistics purposes, two of these switch LRUs were specified per mission command vehicle to enable users to swap out units or have the second unit take over as bus controller in the event of damage or failure to the primary.

With 16-ports of Gigabit Ethernet (GbE) switching in a SFF rugged design, the DuraDBH-672 offered the vehicle program a COTS "VICTORY Infrastructure Switch" that was in production and qualified to MIL-STD wheeled and tracked vehicle environmental requirements. It also afforded nuclear survivability with optional nuclear event detection (NED) capabilities. Of great customer interest was the fact that this second-generation VICTORY system extended capabilities introduced by the original Digital Beachhead (commonly referred to as the "VICTORY starter kit" already used by the U.S. Army), but in a lower-cost, smaller form factor chassis more optimized for SWaP and more flexible in terms of I/O scalability. The unit could support functional upgrades via Mini-PCIe add-on cards (for more serial/Ethernet/DIO

ports), along with modularity to host an embedded SASSM or M-Code military GPS receiver, as well as other Assured-PNT components like a Chip Scale Atomic Clock (CSAC) or Inertial Measurement Unit (IMU)—important capabilities for Army vehicles operating in GPS-denied environments. In addition to VICTORY switching, an optional processor module could support the U.S. Army TARDEC's libVICTORY API and serve as a "VICTORY Shared Processing Unit" if needed.

Results

Leveraging proven, high-TRL rugged COTS subassemblies and multi-generational design experience with VICTORY switch architectures, the DuraDBH-672 was deemed the best solution to meet the customer's budgetary, functional, and product maturity requirements. This SWaP-C optimized GbE switch LRU will enable the Government to roll-out VICTORY infrastructure switching capabilities for their new armored vehicle platform to network onboard C4ISR equipment and improving situational awareness for the warfighter. Complementary to the customer's vision for incrementally adding new electronics equipment and technologies onboard the vehicle over time, the scalable DuraDBH-672 can potentially consolidate what have traditionally been multiple standalone LRUs into a single multifunction system solution. Modular VICTORY subsystems like this will enable vehicle system architects to significantly reduce integration, SWaP and complexity, while supporting future capability enhancements.

Figure 1: DuraDBH-672 block diagram