INNOVATIVE INTEGRATION

TRANSFORMING TACTICAL COMMAND & CONTROL CAPABILITIES

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When warfighters' lives are on the line, detecting and locating the enemy or fellow soldiers on the battlefield is critical. Situational awareness is a crucial part of understanding current conditions in a Multi-Doman Battle environment to ensure the warfighter can integrate Army, joint, interorganizational, and multinational capabilities that allow him to visualize and create windows of multi-domain superiority through fire and maneuver to positions of relative advantage in decisive tactical and operational level operations for the mounted platform and dismounted user, leader, or commander. To do this, mission command uses a combination of hardware and software to enable centralized interaction while integrating Command, Control, Computers, Communications, Cyber, Intelligence, Surveillance and Reconnaissance (C5ISR). Also, integrating Electronic Warfare (EW) platforms and weapons subsystems into one holistic capability can give the warfighters the ability to monitor, control, and interact with the entire system simultaneously.

In 2014, Leonardo DRS Land Electronics, in partnership with key industry partners, undertook a substantial C4i demonstration of a new tactical command & control capability for a Middle Eastern customer. The experience Leonardo DRS had derived from delivering similar capabilities to the US Army on FBCB2 as well as the Mounted Family of Computer Systems (MFoCS), and with the British Army on Bowman, was the base on which its DDU capability had been designed and built. At the core of Leonardo DRS' approach to this new C4I capability was a highly innovative piece of technology called the Data Distribution Unit (DDU). The DDU, also referred to as the 'Magic Box,'

enables voice, data, sensor and video applications and vehicle services to be integrated via a common line replaceable unit (LRU). This is ideal for a tactical vehicle & command post environment where space is tight and an effective approach to size, weight & power (SWaP) is a key requirement.

The DDU-3, the version of the DDU used for formative phases of this key project, is where all of the primary system functions meet and get integrated. It is open and agnostic and supports multiple Virtual Machines (VM), one of these supporting the Systematic SitaWare™ BMS and Mission Planning application. It also interfaces (either commercial or Selective Availability Anti-spoofing Module (SAASM)) and as a backup to GPS, the option of interfacing enhanced long-range navigation (eLORAN) or L-Band for beyond line of sight Blue Force Tracking (BLOS BFT) services is also possible. The DDU-3 can also be interfaced to an INS/INU to provide system applications with a continuous dead reckoning of position, and velocity. The DDU-3 was the foundation of delivering smart and cost-effective integration of the communications and sensor environment.

A highly effective Vehicle Intercom System (VIS) solution could also be integrated via the DDU-3, either to the network or standalone via its own Radio Interface Unit (RIU). The Leonardo DRS VIS is a digital-quality and resilient solution to providing cost-effective voice communication within tactical vehicles and command posts. The

with the tactical radios. For this Middle Eastern customer, as it is with many such systems, the ability to fully utilize the existing tactical communications infrastructure was vital. The DDU's ability to interface to up to four (4) concurrent tactical radios, potentially each from a different vendor and with disparate waveforms, was a key to providing the voice and data interoperability. An inbuilt Wave-engine provides the ability to securely cross-band between say a Harris 7850M and Thales PR4G or even a 4G/LTE connected user interface (UI) device.

This capability, coupled with the ability to interface the same DDU-3 to SatCom and LTE systems, was a game-changer and provided a degree of flexibility not possible before. The DDU-3 also benefits from an embedded GPS success of the live evaluation followed by implementation of an initial brigade of the new capability was the trigger for the this key customer to roll out the system across additional Brigades where DRS will be providing an enhanced version of the DDU in the form of the DDU-4 along with upgrades to the Vehicle Intercom System and a new multi-touch Commanders Display.

As tactical vehicle environments have become more complex over the years, Leonardo DRS has been required to develop new hardware and software capabilities for the DDU. The Galileo Situational Awareness system being delivered to a SE Asian customer integrates several primary vehicles' systems into a capability that significantly reduces the reaction time to a threat and decision time taken to engage with this threat. The system also provides the means to share situational awareness both on the platform and with other networked vehicles in the same area of operations, as well as with high-echelon command posts and Headquarters (HQ). An interface connects the DDU-4 and the shot detection acoustic

array, with the weapons system turret and the infrared radiation (IR)/day camera and the Battle Management System (BMS).
The system integrates many C5ISR capabilities. A prime example of these capabilities, and one of the primary functions of the system, is to detect a gunshot and locate the source automatically. The system can then geolocate the source of the shot, pass a message to the overhead weapons system and automatically put its weapon and associated sensors, such as the camera and laser range finder, on the detected threat. The commander of the vehicle is presented with this data, and the related imagery from the weapons system and other vehicle cameras through the high-resolution touch screen display and can, in conjunction with other vehicle crew, decide how to engage with the threat. This entire sequence takes seconds and dramatically increases the ability to react rapidly to the threat. The DDU is also connected to the BMS and as a result, the tactical network. The BMS application can be an application running on the DDU or could be an existing BMS system hosted by another processor.

The DDU application has several critical pieces of data that are crucial to sharing any given event with other vehicles that it is deployed with and can assist in suppressing the threat or would benefit from knowing about the threat. The DDU can pass this data to the BMS application, and in turn, the BMS application can plot the details of the detected shot on a battle map that is shared across the network. Data including azimuth and inclination of the vehicle along with Laser Range Finder (LRF) data can also be shared, significantly increasing the level of situational awareness.

Leonardo DRS understands that enhanced situational awareness capabilities will be required to integrate with the military, civil and non-military land and sea platforms in a multi-domain battle environment. The integration includes hosting a variety of software applications on the DDU and interfacing with the various vehicle platforms, its subsystems, current military and commercial networks, and a variety of existing and new sensor technologies. This integration could potentially include platform sensor integration, leveraging additional military and commercial radios and networks for failover communications, weapons systems integration, video collection and distribution, etc. Leonardo DRS has a portfolio of fielded proven capabilities that could enhance any military's position by providing a set of already developed mature technologies that together will provide enhanced situational awareness. These features include but are not limited to the following: advanced IP routing and switching, sensor integration including weapons systems, commercial and military radio integration, voice cross banding, video integration, Battle Management System (BMS) integration and the ability to leverage commercial cellular networks. The new DDU-4 is a powerful Intel Xeon Quad-core computing and networking platform allowing multiple and simultaneous executions of various DRS and third-party applications and software.

The DDU's functionality combines traditional computing, networking and distribution technologies into a small form factor, and embedded technologies allow the DDU to be deployed in a non-obtrusive manner without infringing on critical space or power requirements. The DDU provides an "everything over Ethernet" backbone, allowing one or multiple users to access all electronics data within the vehicle. Numerous standard and non-proprietary interfaces are available on the DDU to allow connection to existing legacy mission equipment as well as support future integration requirements. ■