

RTI UNIVERSITY PROGRAM

# University of Brighton

VETRONICS RESEARCH GROUP

*“Developing advanced applications utilizing DDS can be complex. Having designed and built complex integration and demonstration research testbeds for the UK Ministry of Defence land systems domain for the last four years, I can attest that RTI’s tools and documentation were utterly invaluable and of an extremely high standard. We built applications collecting data from sensors using assembly, then passed that data to C then to C++ and finally had it displayed through a C++ QT GUI – all utilizing RTI’s implementation of DDS.”*

Sean Murphy  
Computer Scientist,  
Vetronics Research Group,  
University of Brighton

## VETRONICS RESEARCH GROUP

The Vetronics Research Group (VRG) is the only academic group in the United Kingdom (UK) conducting research and training on Military Vetronics (Vehicle Electronics). This work is sponsored by the UK Ministry of Defence (MOD) and supported by Defence Science Technology Laboratory (DSTL) and Defence Equipment and Support (DE&S). The VRG plays an active role in state-of-the-art research for current and future military land vehicles and crew stations, primarily to inform and support the design of current and future crew systems for UK military land platforms.

The VRG currently contributes to the development of the UK’s Defence Standard 23-009 Generic Vehicle Architecture (GVA) through the GVA working group. It also serves as an active member of the Military Vetronics Association (MilVA), an association of government agencies and industries promoting vetronics in the military environment. The VRG also contributes to the development of the STANAG 4754 NATO Generic Vehicle Architecture (NGVA) through the MILVA NGVA Working Group.

The University of Brighton’s Vetronics Research Group (VRG) uses RTI Connex DDS to research, develop and deploy new concepts in the UK’s current and future military land platform capabilities. Connex DDS serves as the core communications backbone, providing real-time communication and interoperability between the complex subsystems in the military land platforms. RTI’s robust software tools, documentation and community-based support helps to accelerate their research.

To address the unique challenges faced by defence agencies, the VRG selected the RTI Connex DDS framework to demonstrate the flexibility and benefits of the DDS specification in a real-time environment for military land systems.

## CHALLENGE

UK military land platform designs are informed by the Def Stan 23-009 GVA. These standards define the guidelines for vetronics sub-systems design with regards to power and data infrastructure, aiding sub-system integration within new and existing land platforms by following the Interoperable Open Architectures (IOA) design ethos. Throughout these standards, DDS is the current recommended specification to provide real-time communication and support interoperability between the complex subsystems found within current and future military land platforms.

The evolution of modern military land systems has created increasingly complex systems engineering problems to be overcome during the last two decades. The increase

of Vetronics has been considerable, which in turn has significantly increased data driven communication between sub-systems. All this data from many disparate systems (which are often designed and built by many different suppliers) must be presented to the crew operating these vehicles, in a timely, coherent manner. Additionally, military land vehicles normally have a service life cycle of up to 50 years, hence system upgrades and maintenance costs are incredibly high. To drive down costs and increase safety for crews and civilians (when these large vehicles are being operated within urban environments) an assessment was conducted for the use of Commercial off the Shelf (COTS) automotive sensing technologies to improve safety, reduce costs and increase crew's situational awareness.

## SOLUTION

The recent research scope for the VRG was to assess the applicability of DDS for sensor fusion within military land vehicles, integrating automotive COTS sensing technologies with real time data transfer while utilizing Precision Time Protocol (PTP IEEE 1588) to synchronise all the nodes across

the entire electronic architecture. This would be combined with the concept of an Intelligent Digital Assistant (IDA) to reduce the cognitive burden placed on the crew when in critical situations. The core communications backbone for these systems is driven by RTI Connex DDS.

When dealing with complex data structures being transmitted across multiple systems, it is a nontrivial task to debug and optimize the communication interfaces that drive these systems across heterogeneous languages (assembly, C, C++) and architectures (ARM / x86\_64). The full featured RTI Admin Console provides many robust tools to quickly view the entire DDS infrastructure in extremely high detail. Additionally, multiple tools are also provided that significantly help to further reduce development time through integration with Python, XML API's and Simulink®.

RTI's dedication to maintaining robust user manuals and API documentation - plus their extensive toolset and the RTI-hosted forums-based community - provided the VRG with the ability to rapidly deploy and develop novel research concepts for the UK's current and future military land platform capabilities.

## ABOUT RTI

Real-Time Innovations (RTI) is the Industrial Internet of Things (IIoT) connectivity company. The RTI Connex® Databus is a software framework that shares information in real time, making applications work together as one, integrated system. It connects across field, fog and cloud. Its reliability, security, performance and scalability are proven in the most demanding industrial systems. Deployed systems include medical devices and imaging; wind, hydro and solar power; autonomous planes, trains and cars; traffic control; Oil and Gas; robotics, ships, and defense.

RTI lives at the intersection of functional artificial intelligence and pervasive networking<sup>SM</sup>.

RTI is the largest vendor of products based on the Object Management Group (OMG) Data Distribution Service™ (DDS) standard. RTI is privately held and headquartered in Sunnyvale, Calif.

Download a free 30-day trial of the latest, fully-functional Connex DDS software today: <https://www.rti.com/downloads>.

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2 • rti.com