

When One Software Language Doesn't Fit All, Translator Technology Provides a Solution

Claire Heininger

The mission of today's warfighter relies primarily on information, and it's flowing through faster, more diverse channels than ever. With troops conducting simultaneous offensive, defensive, and stability operations, the Army has developed sophisticated tools that help Soldiers observe, report, and act on a wide variety of information. But when it's time to transfer that information from one system to another? It might as well be gibberish.

SMART enables interoperability for tactical systems, including airspace management. The U.S. Army Communications-Electronics Research, Development, and Engineering Center's Command and Control Directorate is working with Assistant Product Manager Tactical Airspace Integration System to increase situational awareness in the cockpit. (U.S. Army photo by CW4 Daniel McClinton, courtesy of 1st Cavalry Division Public Affairs.)



“There are interoperability shortfalls across functional boundaries, services, and nations,” said Marvin Goldin, an engineer at the U.S. Army Communications-Electronics Research, Development, and Engineering Center (CERDEC).

CERDEC’s solution to this challenge? Get SMART: Semantic Mediation for Army Reasoning and Teamwork.

The technology has clear potential to benefit warfighters, said 1LT Andrew Campbell of the 159th Combat Aviation Brigade, which experimented with SMART during a recent exercise. “This program allows our analysts to quickly and efficiently translate incoming reports into a retrievable database,” Campbell said. “Soldiers then spend more time organizing and analyzing data and less time retyping every new report. More time spent analyzing will directly lead to better results on the battlefield.”

The Interoperability Gap

Current software tools—a mix of government-off-the-shelf, commercial-off-the-shelf, and homegrown applications—use different means to store and transmit information.

Today, military analysts charged with disseminating certain field reports can face a laborious, time-intensive process. To transfer data manually from one system to another, they not only must copy and paste, which is subject to human error, but also extensively reformat the data to match the input requirements of the second system. By automating pieces of that translation process according to users’ specifications, SMART frees the analysts to focus on other tasks.

While ideally all systems could be brought onto a single, standard data structure, that approach is time- and cost-prohibitive, CERDEC officials said. They cited a 2006 research paper published by Carnegie Mellon’s Software Engineering Institute,

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“Ultra-Large Scale Systems: The Software Challenge of the Future.” The report predicted that as DOD vigorously pursues information dominance, “systems will necessarily be decentralized in a variety of ways, developed and used by a wide variety of stakeholders with conflicting needs, evolving continuously, and constructed from heterogeneous parts.”

The report reinforced the notion that “one size does not fit all,” said Ron Szymanski, Chief Architect for Software and Technology for CERDEC’s Command and Control

Directorate (C2D). “Large systems are inherently heterogeneous, ever evolving, and decentralized,” he said. “We should embrace and move to standards, but will probably never get there.”

If software systems could not be forced to speak the same “language,” the C2D team decided they could instead create a translator. However, the problem of enabling interoperability between disparate software systems is significantly more complex than translation from one software language to another; the C2D team needed a solution enabling complex mediation of data while

A Soldier monitors input from the tactical operations center during a test at White Sands Missile Range, NM. With the proliferation of systems that use different means to store and transfer information, interoperability has become a pressing concern. SMART allows systems to share more information faster to enhance collaboration, deconfliction, and integration. (U.S. Army photo.)



preserving the meaning of those data. Data mediation involves mapping data between existing, incompatible data formats, allowing multiple software systems to share information.

The result is SMART, a solution that allows systems to share more information faster, enhancing collaboration, deconfliction, and integration.

Adapting to Existing Systems

Rather than forcing different systems and users to abide by a single, one-size-fits-all “language,” SMART is flexible. It enables the solution to be introduced without additional requirements for training and day-to-day operations.

“SMART does the ‘hard work’ by bridging all those non-interoperable data schemas and services and does not force any changes on the existing systems or users,” Szymanski said. “Early interaction with warfighters improved the technology design, so there are few to no changes to the user experience when SMART is introduced.”

The SMART approach is to build upon successful past mediation solutions, including Data Mediation Service, Data Dissemination Service, Publish and Subscribe Service, and others, to tie them together into an overarching, enterprise-oriented interoperability framework, said Matthew Wilson, Director of Business Development for Future Skies Inc., who is supporting the project.

Unlike current data translation methods, SMART is extremely scalable to existing and future systems. It was specifically designed to allow for rapid introduction of new connectors to enable new systems to come online and share information with legacy systems.

Putting SMART to the Test

The need for mediation solutions is not limited to Army systems, but also relates to managing data from joint,

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interagency, and multinational systems. The ability of the SMART architecture to support multiple domains will be demonstrated through an upcoming exercise that aims to provide a clearer picture of the airspace to joint forces and coalition nations, said Goldin, the project’s technical lead.

The exercise will show how SMART can unite information from different systems, officials said.

“SMART brings the potential to facilitate transparent coalition interoperability between native systems without requiring modifications to those systems,” said Goldin. “By improving interoperability and automation among functional boundaries, services, and nations, better decisions in airspace management and utilization can be realized, hopefully reducing the burdens on the warfighter and improving the outcomes of missions.”

“What SMART does not do is remove the human from the process. There is, and should always be, a human in the loop to verify the final product,” Szymanski said. “The end result is a significant reduction in the amount of time required to obtain, process, analyze, and transmit information.”

SMART is one of the technologies and capabilities under development as part of the Collaborative Battlespace Reasoning and Awareness Army Technology Objective (COBRA ATO), which seeks to improve collaboration and interoperability within all levels of command, control, communications, computers, intelligence, surveillance, and reconnaissance. Also part of

the COBRA ATO are Command and Control Multitouch Enabled Technology, which uses touch- and gesture-based technology to improve warfighter collaboration, and customized battlefield applications for hand-held devices. The COBRA ATO also conducts research and development in support of Battle Command Web, a Web-based collaboration tool developed by Product Manager Strategic Battle Command within Program Executive Office Command, Control, and Communications-Tactical (PEO C3T). Battle Command Web is expected to reduce the hardware footprint to increase sustainability and efficiency.

This year, SMART is scheduled to be fielded with an operational unit, the 159th Combat Aviation Brigade, for the first time, and the technology is being transitioned to Product Director Common Software (PD CS). PD CS is assigned to Project Manager Battle Command, part of PEO C3T.

“SMART can be applied to the information needs of multiple communities, from airspace deconfliction to the military medical community,” said Michael Anthony, Chief of the Mission Command Division for CERDEC C2D. “SMART enables interoperability today.”

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