On-the-Move Network to Increase Armored Formation Survivability, Lethality

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To be successful in a future multi-domain operational fight against a near-peer adversary, U.S. armored formations will require robust, resilient network connectivity, and they'll need it on the move. A recent Army pilot assessment of new and emerging commercial on-the-move (OTM) network capabilities demonstrated how modernized commercial command and control (C2) capabilities could enable mobility, increase survivability and ensure lethality at the decisive point across all warfighting functions.

The Army's armored-formation OTM network pilot – supported by Spartan Brigade, 2nd Armored Brigade Combat Team (ABCT), 3rd Infantry Division – was conducted at Fort Stewart, GA, in January and February 2022. The pilot was not a formal operational test or acquisition down-select but an opportunity for the Army to inform operational and technical concepts, requirements, technological maturity and affordability supporting the service's network modernization Capability Set 25 design goals.

During the pilot, Soldiers evaluated innovative commercial network technology from more than 20 industry partners integrated onto the unit's available surrogate armored command vehicles. Intended platforms for future network integration include the Armored Multi-Purpose Vehicle and Joint Light Tactical Vehicle. Three battalions received three unique commercial-network communications equipment sets with varying satellite communication and line-of-sight (LoS) capabilities. Soldiers provided their feedback on how well each equipment set delivered mobile, simple, flexible and resilient C2.

Figure 1. Soldiers assigned to the Can-Do Battalion, 3rd Battalion, 15th Infantry Regiment, 2nd ABCT, 3rd Infantry Division, test, assess and provide feedback on one of the three commercial OTM network equipment sets during the U.S. Army's three-week armored-formation OTM network pilot at Fort Stewart, GA, Feb. 2, 2022. The Army will use Soldier feedback and the data collected to inform the Army's Capability Set 25 network design and market research to determine currently available and maturing industry solutions for potential armored formation network integration. *(U.S. Army photo by CPT Detrick Moore)*

Pilot intent, capabilities

Lessons-learned from previous combat training center (CTC) experiences drove the brigade's goals and desired outcomes for the armored-formation OTM network assessment. For example, during the brigade's most recent CTC rotation at the Joint Multinational Readiness Center (JMRC) in Hohenfels, Germany, in September 2020, the unit experienced long delays while trying to establish Upper Tactical Internet. In one instance, command-post

relocation caused a loss in operational tempo when a battalion needed to establish Upper Tactical Internet to enable communication.

With these things in mind, the brigade commander's intent was to meet Army pilot objectives by answering the following questions:

- Will these systems increase the survivability of the warfighter on the ground while enhancing lethality?
- Can these systems increase the accuracy of the common operating picture to inform the commander's decisions to allocate resources?
- Are these systems simple to use and reliable?
- Do they enhance the unit's primary, alternate, contingency and emergency (PACE) plans for increased network resiliency?

The unit executed the pilot during three weeks, with each week dedicated to a different battalion and equipment set. The pilot's commercial OTM network prototype systems provided several enhanced network capabilities across the battalion-specific equipment sets, along with several satellite communications (SATCOM) antenna prototypes at the brigade command post. These included SATCOM integrated onto individual vehicles that required a "flip of a switch" to operate, as well as brigade and battalion LoS mesh networks.

The battalion LoS mesh enabled redundant SATCOM. If one vehicle's SATCOM was degraded or inoperable, it could use another vehicle's feed within the LoS mesh. For contrast, one battalion operated solely with vehicle-level SATCOM connectivity and had no internal mesh network. The brigade LoS mesh provided Upper Tactical Internet connectivity via LoS to the battalions using a tethered drone that could reach up to 200 feet, a vehicle-mounted quick erecting antenna mast or a non-vehicle mounted 15-meter mast.

Figure 2. Soldiers assigned to the Can-Do Battalion, 3rd Battalion, 15th Infantry Regiment, 2nd ABCT, 3rd Infantry Division, set up a satellite terminal to test and assess one of the three commercial OTM network equipment sets during the U.S. Army's three-week armored-formation OTM network pilot at Fort Stewart, GA, Feb. 2, 2022. The Army will use Soldier feedback and the data collected to inform the Army's Capability Set 25 network design and market research to determine currently available and maturing industry solutions for potential armored formation network integration. *(U.S. Army photo by CPT Detrick Moore)*

Movement and maneuver

The commercial OTM network capabilities in this assessment were critical to the movement and maneuver warfighting functions. Network connectivity is a fundamental condition check with the brigade before initiating decisive action.

Currently a battalion command post must come to a halt and wait while establishing Upper Tactical Internet communications, and it's limited to Lower Tactical Internet only. The equipment assessed during the OTM network pilot enabled continuous Upper Tactical Internet connectivity at the battalion level with two of the three equipment sets, and it reduced connection time at-the-quick-halt for the last battalion down to five minutes.

Retaining near-constant Upper Tactical Internet significantly reduces a battalion commander's need to stop to set conditions for an operation. Armored formations must retain mobility to balance dispersion and survivability with the ability to mass at the decisive point.

Command and control

C2 is essential in support of all warfighting functions. A key focus of OTM network connectivity in support of the Army's network modernization Capability Set 25 design is to develop a network architecture that is transport-agnostic with multiple digital data-transportation pathways where the transmission path is unknown to the user. Currently, armored formations at brigade and below rely on a singular SATCOM transport method with their at-the-halt satellite-transportation terminals. Unfortunately this singular transmission pathway is not conducive to network resiliency.

To help solve this challenge, during the pilot, each equipment set provided different transport configurations using SATCOM or digital LoS mesh at the brigade and battalion levels. For a network to be genuinely transport-agnostic and simple for the user to operate, it must provide automatic failover. Automatic failover requires zero user interaction when one method of transport fails, compared to switchover, which requires the user to manually select the next method of transport. The pilot demonstrated the network's ability to seamlessly provide failover, thus simplifying the user experience and allowing users to focus solely on their warfighting-function tasks. This auto-PACE capability facilitated the success seen across all warfighting functions.

Figure 3. 1LT Holly Gerber-George, Hound Battalion, 3rd Battalion, 67th Armor Regiment, 2nd ABCT, 3rd Infantry Division, supervises her Soldiers and vehicles as they start movement to begin the Army's armored-formation OTM network pilot Jan. 24, 2022. The Army will use Soldier feedback and the data collected to inform the Army's Capability Set 25 network design and market research to determine currently available and maturing industry solutions for potential armored formation network integration. *(U.S. Army photo)*

Intelligence

The 2nd ABCT, 3rd Infantry Division, evaluated how the OTM network capabilities affected the unit's ability to maintain a current common intelligence picture (CIP) and if the CIP could feed the brigade common operating picture. Maintaining a CIP is typically challenging for units due to the requirement to have connectivity to the Upper Tactical Internet. When battalions are not established on the tactical network, they often do not receive up-to-date higher echelon enemy composition and disposition reports. Battalions are also less likely to provide a holistic picture of the enemy to the brigade command post, leading to decision-making based on stale information.

Unlike the brigade's previous JMRC rotation, where information sharing was a constant challenge, the commercial OTM network prototype capabilities helped solve this problem by providing flexible and resilient digital connectivity at the battalion level. Upper Tactical Internet is required to access the collective shared-intel database such as Distributed Common Ground System-Army Capability Drop 1. The OTM equipment sets enabled near-continuous intelligence data sharing across the brigade using these intelligence warfighting systems. The OTM network systems also improved intelligence reporting timeliness, which increased the effectiveness of the fires enterprise.

Fires

An accurate and timely intelligence picture enables effective brigade-level fires support that shapes the brigade's close-fight and ultimately provides brigade and battalion commanders more decision space. The commercial OTM network capabilities in this assessment facilitated improvements in providing lethal shaping fires. The fires warfighting function realized similar benefits as the intel warfighting function by placing an Advanced Field Artillery Data System in the battalion fires-support-element vehicle. This allowed the fires enterprise to process more fire missions from the battalions, using digital Upper Tactical Internet capabilities instead of slower Lower Tactical Internet methods like very-high-frequency or high-frequency radios. Processing fires on the Upper Tactical Internet is typically up to 10 minutes faster than processing on the Lower Tactical Internet.

Due to the prototype OTM network's digital data-transport design, multiple data pathways supported digital fires processing. Multiple data pathways further reduce Lower Tactical Internet reliance by creating a robust, flexible and resilient network for fires-mission processing. The OTM network pilot's mobile, flexible and resilient capabilities facilitated the brigade's ability to provide timely and lethal shaping fires, which are critical to the survivability of the unit's movement and maneuver elements.

Conclusion

Each equipment set displayed strengths and weaknesses. However, there were common capabilities that enabled authentic OTM network communications for the pilot armored unit.

The commercial OTM network prototypes provided commander's options to improve survivability and lethality without sacrificing C2 of the current operational fight. Commanders could establish command posts according to operational tempo instead of by location. This allowed them to disperse their command posts to increase survivability from indirect fires.

Units could process faster fire missions from sensor-to-shooter through reliable access to Upper Tactical Internet and maintain a more accurate COP across the formation. The OTM network capability could also provide Upper Tactical Internet for reconnaissance operations at combat-trains command posts and sustainment operations at field-trains command posts to increase C2 of sustainment operations, thus improving the timeliness and accuracy of logistics operations.

The OTM network prototype capabilities have the potential to change battlefield network architecture, C2 and the way the Army fights in future multidomain operations. Network mobility and continual resilient connectivity will be key enablers in future near-peer fights.

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Acronym Quick-Scan

ABCT – armored brigade combat team
BCT – brigade combat team

C2 – command and control
CGSC – Command and General Staff College
CIP – common intelligence picture
CTC – combat training center
IBCT – infantry brigade combat team
JMRC – Joint Multinational Readiness Center
LoS – line-of-sight
MCCC – Maneuver Captain's Career Course
OTM – on-the-move
PACE – primary, alternate, contingency and emergency
SATCOM – satellite communications

Figure 4. Soldiers assigned to the Hound Battalion, 3rd Battalion, 67th Armor Regiment, 2nd ABCT, 3rd Infantry Division, speak to Army senior leaders during a distinguished-visitors day about their unit's experimental equipment set for the U.S. Army's three-week armored-formation OTM network pilot at Fort Stewart, GA, Feb. 9, 2022. The Army will use Soldier feedback and the data collected to inform the Army's Capability Set 25 network design and market research to determine currently available and maturing industry solutions for potential armored formation network integration. *(U.S. Army photo by SGT Trenton Lowery)*

Figure 5. Surrogate vehicle platforms integrated with a variety of mature and emerging commercial mobile network technology prototypes assigned to the Spartan Brigade, 3rd Infantry Division, depart the motorpool to commence the three-week armored-formation OTM network pilot at Fort Stewart, GA, Jan. 24, 2022. Soldiers from the pilot unit will evaluate various combinations of network equipment prototypes and provide feedback for the Army to inform the concept of operations for networked armored formations from battalion to division.
(U.S. Army photo by CPT Detrick Moore)