USMC Studying Mobile Ad-Hoc Network Communications Architectures with STK

STK Provides Quantitative Analysis for USMC Tactical Operations

THE MISSION BRIEF: As USMC forces increasingly depend on rapid, reliable information transfer within the battlespace; they develop, purchase, and field new radio devices. These devices can form Mobile Ad-Hoc Networks (MANETs)—autonomous systems of mobile nodes equipped with radio transmitters and receivers—to connect dispersed nodes with data-communications capabilities.

THE ENGAGEMENT: To study MANET over traditional architectures—and determine effective deployment—the USMC used Systems Tool Kit (STK) from AGI. This software provided quantitative analysis of MANET value—along with how to best them within the infantry battalion. STK helped analysts discover important aspects of MANET that will inform future acquisition decisions and change tactics, techniques, and procedures. Analysts conducted a rigorous comparative analysis using various network simulation and optimization techniques. They developed a network formulation to model key communications aspects. They then simulated and gauged network performance in environments ranging from low-fidelity, theoretical representations to realistic, high-fidelity combat scenarios.

> "Previous to this study, we had no quantitative analysis describing the value of MANETs or how to best employ them within the Marine Corps infantry battalion. This information will potentially inform future acquisition decisions and changes in Marine Corps tactics, techniques, and procedures. STK was the only software we have that could do the job."
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> — PAUL NICHOLAS, OPERATIONS RESEARCH ANALYST
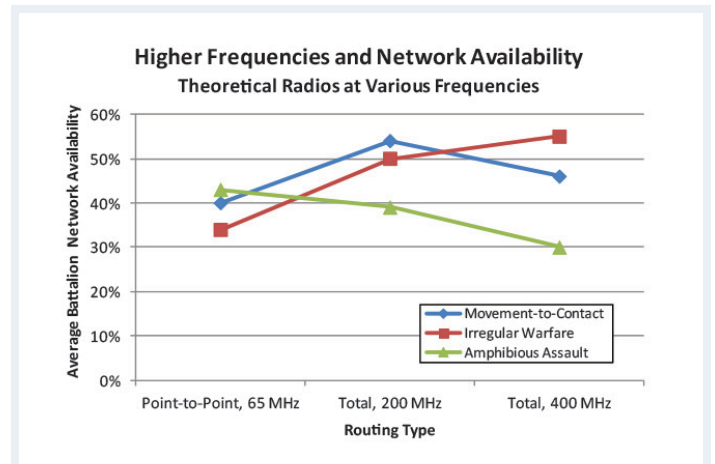
Average battalion network availability with varying operating frequencies.

USMC forces are increasingly dependent on rapid, reliable information transfer in the battlespace. They are developing, purchasing, and fielding new radio devices capable of forming Mobile Ad-Hoc Networks (MANETs) to connect dispersed nodes with data-communications capabilities. The USMC needed to study tactical considerations of MANETs over traditional architecture—along with effective tactical employment.

AGI IN ACTION: STK—with the Terrain Integrated Rough Earth Model (TIREM) extension—explored three challenges faced by planners employing MANET technology within the battalion. It examined and quantified MANET ability to support communications between mobile units in rugged terrain over long distances with low-power radios. It analyzed the ability to use intermediate nodes to overcome range limitations at higher frequencies. It considered the allocation of bandwidth to enable sufficient throughput rates.

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