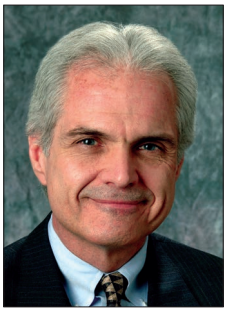
MILITARY COMMUNICATIONS





Torleiv Maseng *Randall Landry* *Kenneth Young*

New and diverse types of threats and military conflicts mean that the requirements for military communications continue to evolve. These requirements, along with reduced military spending, impose considerable challenges on researchers and developers of military communications systems. These challenges are exacerbated by technical and environmental limitations, which include harsh RF propagation environments, severe spectrum limitations, topological variability, mobility, and stringent security requirements. Adding to these fundamental challenges is the fact that military networks need to support a wide variety of applications with needs ranging from time-sensitive delivery to reliable large volume data dissemination. Information will emanate from a large range of sources, including remote sensors and unmanned vehicles, both aerial and terrestrial.

This Feature Topic includes three articles that address some of the more prominent challenges in evolving military networks, with an emphasis on tactical wireless networking in the airborne and naval domains. The foci of the articles range from analysis to design and emulation, integrating and leveraging commercially ubiquitous Internet Protocol (IP) capabilities.

In the article "Design and Practical Deployment of a Network Centric Remotely Piloted Aircraft System," the authors describe the full integration of an IP network capability and an unmanned aerial vehicle (UAV) developed for the Spanish Ministry of Defense. The IP capability, which was integrated into the UAV and tested during live flights, successfully utilized multiple data links, including line of sight (LOS) and beyond LOS (BLOS) radios. The authors describe a secure data transport design that was successfully employed for over-the-air transport of telemetry data as well as the remote command and control of the UAV. Lessons learned and future plans to field the communications system on a next-generation UAV platform are also presented.

The authors of the article "Airborne Network Evaluation: Challenges and High Fidelity Emulation Solution" identify the need for testing and evaluating airborne network technologies in a realistic environment during the research and development phase. The article discusses some of the biggest technical challenges inherent in airborne networks, and presents a flexible wireless emulation capability called RFnest, which can play an important role in the design and validation of airborne network technology. The authors describe how RFnest can be used to validate wireless channel models, produce high fidelity testing environments prior to field testing, evaluate cognitive RF solutions, and produce realistic jamming and electronic warfare scenarios. The article also illustrates how the emulation capability can be used to assist in the development of airborne routers, mobility management solutions, autonomous routing protocols for UAVs, cross-layer protocols, and more.

The final article, "Beyond-Line-of-Sight Communications with Ducting Layer," explores the use of atmospheric ducts as a potential alternative for BLOS connectivity, particularly in naval operating environments. The authors overview the characteristics of communications channels that exploit atmospheric ducts present close to sea surface. The article also discusses various channel modeling approaches and computes the path loss characteristics for an ideal evaporation duct. The authors conclude that ducting layers can provide an effective mode of communications for military naval applications.

We trust that you will find these articles to be interesting and relevant to the challenges facing military communications today. Please look for our Call for Papers soliciting article submissions for the 2015 Feature Topic on Military Communications.

BIOGRAPHIES

TORLEIV MASENG (torleiv.maseng@ffi.no) is director of research at the Norwegian Defense Research Establishment, where he is responsible for communications and information systems. He worked as a scientist at SINTEF in Trondheim for 10 years, involved in design and standardization of GSM. For seven years he was a scientist at the NC3A NATO research center in The Hague. During 1992–1994 he was involved in the startup of the new private mobile operator NetCom GSM in Norway, where he had technical responsibility. Since 1994 he has held a chair in radio communications at the University of Lund, Sweden. In 1996 he took up his employment at the Norwegian Defense Research Establishment (FFI) located at Kjeller, 20 km outside Oslo. Since 2005 he is also Professor II at the University of Oslo. He is the author of more than 150 papers, holds patents, and is a Technical Editor of *IEEE Communications Magazine*. He has received an award for outstanding research and has arranged large international conferences.

RANDALL LANDRY (rlandry@mitre.org) is a technical director at the MITRE Corporation, where he leads a division specializing in advanced computing and networking technologies, including cloud computing, network operations, and security. He has served in a number of roles in support of cyber defense and large-scale network design and deployment for the U.S. Air Force and Department of Defense. Prior to joining MITRE, he worked in Corporate R&D at Texas Instruments, and holds several patents in network algorithms and highly integrated switching architectures for gigabit networking. He has also served in the position of director of optical and wireless networking in the telecommunications industry. He has led research programs in satellite communications, tactical wireless networking, cross-layer design methodologies, and network science. His current interests are in named data networking applied to highly mobile and disadvantaged tactical networks. He has published numerous technical articles, and served as Technical Program Committee member and session organizer for major IEEE communications conferences. He received his M.S. and Ph.D. in electrical engineering from the University of Vermont in 1992 and 1994.

KENNETH YOUNG [SM] is executive director for Government Project Development in the Applied Research organization at Applied Communication Sciences, Basking Ridge, New Jersey. He received his B.S. in physics from St. Joseph's University, and his M.S. and Ph.D. in physics from the University of Pennsylvania. His research interests are in the design and application of mobile ad hoc networking technology for tactical environments. He is the program manager for the Army Research Laboratory's Communications and Networks Collaborative Technology Alliance, a government-industry-academic consortium that performs basic research in survivable wireless mobile networking, signal processing, and tactical information protection. He heads another team developing advanced mobile technology under the U.S. Army CERDEC's Proactive Integrated Link Selection for Network Robustness program. He chairs the IEEE Communications Society's Tactical Communications and Operations Technical Committee and is on the advisory board for the Military Communications (MILCOM) Conference. He is a Telcordia Fellow.