# MILITARY COMMUNICATIONS

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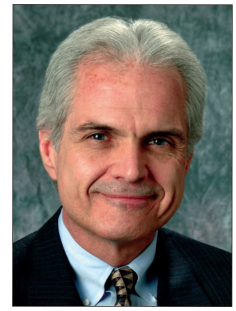

*Kenneth Young*

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The five papers in this year's feature topic on military communications are about tactical radios and networking. To obtain the necessary quality when using commercial products in a tactical environment while obtaining speed during limited connectivity in critical maneuvers is challenging. In tactical networks, one of the challenges is to provide all soldiers with a common operational picture (COP) which provides information about where your friends and your enemies are, how to request assistance, and how to avoid a surprise attack. This COP is distributed to everybody.

Focusing on the information rather than on the endpoints is called "Information-centric networking" and makes it possible to pick up the COP from your neighbor rather than from headquarters, which results in transmission savings. In the article by Skjegstad *et al.*, this concept is explained and examples are given for MANETs and for delay-tolerant services suitable for NATO's Core Enterprise Services.

The COP can also be distributed by the Tactical Ground Reporting System (TIGR) presented in the article by Evans *et al.* TIGR is actively used at hundreds of sites by thousands of deployed U.S. Army and British Army soldiers in parts of Afghanistan and throughout the world, as well as the continental U.S. The TIGR model is web-based, using Web Services Description Language (WSDL) interfaces. It uses standard open technologies and a cloud-like data provider, and as in the previous article, has put effort into an efficient traffic flow. It easily supports new requirements across multiple computing environments to include mounted, handheld, sensor, and command post.

Tactical radios have been used for more than one hundred years. The article by Elmasry focuses on the post-Vietnam War radios and uses examples from the U.S. Department of Defense major acquisition programs. The Software Defined Radios initiative brought about the ability to develop different "application-waveforms," entirely in software in the absence of a defined hardware platform. This turned out to be trickier than planned since it is expensive to make programmable radio components while keeping the boot time and power consumption low. For the civilian market a similar, but less ambitious similar trend, was the development of apps using location-aware services and flexible directory services etc., for smart phones as foreseen by Mitola and Maguire already in 1999.

The IP packet header is not tailored to minimize the bandwidth required for radio transmission where the bandwidth is dear. Therefore, in mobile networks the IP network layer header is compressed before the packet is sent to the link layer. The best type of IP header compression is dependent on several factors including encryption, the IP type, the routing topology and service, etc., and there are naturally types of compression best suited for the tactical edge. The article by Cheng *et al.* provides a nice overview of the different IP header compression options.

Tortonesi *et al.* present an experimental system called NetProxy in their article titled "Enabling the Deployment of COTS Applications in Tactical Edge Networks." Their solution features a transparent proxy that captures data transmitted by applications, manipulates the data to reduce its footprint, and then re-maps it over transport solutions such as Mockets and DisService that can cope with the challenges of tactical edge networks. The proxy-based approach represents a very effective solution to supporting the deployment of COTS and legacy applications in such environments. The approach is consistent with recent findings and recommendations from NATO research. See, for example, the final report of NATO RTO/IST-090, "SOA Challenges in Real-Time and Disadvantaged Grids," where proxy servers are identified as an important success factor for bringing COTS Web services to the tactical edge.

For the next feature topic on military communications, to be published one year from now, we encourage papers in the field of military communication to be submitted before 1 April 2014.

## 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) received his M.S. and Ph.D. in electrical engineering from the University of Vermont in 1992 and 1994. He is currently with the MITRE Corporation in Bedford, Massachusetts, where he serves as program director for a portfolio of programs that deliver ground-based communications capabilities to Air Force users in garrison and deployed. He has also served as department head for Communications and Networking and conducted research in support of the U.S. Department of Defense. As a member of corporate R&D at Texas Instruments in Dallas, he was previously involved in research and development of highly integrated switching architectures for gigabit networking and holds several patents in this area. He has also served as director of optical and wireless networking in the telecommunications industry. He has been the principal investigator on a number of research programs ranging from satellite communications to tactical wireless networking. Recent research interests focus on network science, autonomic networking, cross-layer design methodologies, dynamic resource management in wireless networks, and the performance evaluation of multihop wireless networks. He has published numerous technical articles and served as technical program committee member and session organizer for major IEEE Communications Society conferences.

KENNETH YOUNG [SM] (kyoung@appcomsci.com) 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 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.

## CALL FOR PAPERS

### ENABLING NEXT GENERATION AIRBORNE COMMUNICATIONS

Due to the increased needs for sharing information among airborne platforms (both manned and unmanned) as well as the desire to use an airborne infrastructure to rapidly deploy communications capabilities to ground based users in disaster areas, there has been a renewed interest in the research, design, and development of airborne communications networks. Airborne networks are mobile multi-hop networks characterized by their high aircraft speeds and platform dynamics, long line-of-sight transmission ranges, and significant cost of integration for communication systems. The airborne communications and networking domains can be comprised of four sub-domains, each with unique characteristics and challenges: High Capacity Transport, Range Extension, Air Tactical, and Heterogeneous Internetworking. Achieving the vision for future Airborne communications and networking requires researching technologies and prototyping solutions for each of these sub-domains.

The High Capacity Transport domain provides the ability to transport large amounts of data among airborne platforms at high rates and extended ranges. Air-Surface Range Extension uses the aerial layer to connect disparate ground nodes or networks that may not be able to reach each other directly through ground radios perhaps due to distance or perhaps because due to line-of sight obstructions such as buildings or mountains.

There are unique challenges associated with providing communications in each of these domains. Differences between the domain characteristics include number of nodes, data rates, range, point-to-point versus point-to-multipoint topologies, omni-directional versus directional links, and mobility patterns. Common challenges amongst the airborne domains include the mobile ad hoc nature of the network as well as Doppler and on-off link characteristics due to body blockage. This feature topic is aimed at the wide variety of communications research challenges and prototype descriptions within the air domain.

**Manuscript Deadline:** October 1, 2013

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