JOURNAL OF TELECOMMUNICATIONS AND INFORMATION TECHNOLOGY

Preface

Transformation of the military war fighting capabilities in order to align them to new and emerging strategic challenges necessitates fundamental changes in military doctrine and operational concepts, military forces organization, and the war fighters' equipment and training.

The concept of Network Centric Warfare (NCW) originated in the USA. The NCW along with its NATO counterpart, the NATO Network Enabled Capability (NNEC), are key innovational ideas that are seen as supporting the transformation of military operations. The transformation effort is aimed at increasing combat power by networking sensors, decision makers and shooters to achieve shared awareness, increased speed of command, higher tempo of operations, greater lethality, increased survivability, and an acceptable level of self-synchronization.

This calls for a systematic and comprehensive evaluation of the possibilities and the effectiveness of emerging information and communications technologies and their compliance with strict requirements, especially related to interoperability, mobility, security, adaptability, flexibility and integrity.

This issue of the *Journal of Telecommunications and Information Technology* is entitled "Military Communications and Information Technologies" and contains 12 carefully selected papers that reflect major trends in information technology development with application to the military domain. It covers a wide spectrum of questions relevant to NNEC, with a special focus on command and control (C2) systems, decision support and interoperability solutions, tactical communications protocols and security issues, wireless sensor networks, software defined and cognitive radios, as well as mobile and ad hoc networks.

The first paper, by N. Bau, M. Gerz and M. Glauer, refers to the basic questions of ensuring C2 systems interoperability in a coalition environment. It gives an overview of the Multilateral Interoperability Programme (MIP), its aims, and the steps that are taken within the programme to test compliance with the standards being developed to, ensure interoperability of disparately developed C2 systems. The authors describe in detail the novel techniques and tools developed by them to provide an automated environment that can deliver repeatable testing of standards conformance. The next paper by A. Najgebauer *et al*. describes an innovative method of terrorist threat analysis aimed at implementation within decision

support tools in early warning systems. The idea is based on semantic and complex networks that are used to extract useful information for terrorist threat identification and assessment. The authors also describe the basic features of a prototype implementation of the concept that they have developed.

Today's radio communications systems are mainly designed to utilize a single or a very small number of waveforms. In practice this inflexibility often means that warfighters are faced with significant interoperability issues when the radios are fielded. The next two papers cover topics related to software defined radio (SDR), as well as cognitive radio concepts, that may significantly contribute to overcome this drawback and achieve flexibility, architectural efficiency, energy efficiency and portability. E. M. Witte *et al.* describe an extension to the SDR implementation concept based on a waveform development environment. They present a method for improving the porting process of a waveform implementation onto a SDR platform by feeding stimulus data from a hardware implementation back to a system simulation, which allows an efficient error analysis in the simulation environment. A cognitive radio has first to analyze the availability and characteristics of radio signals before making the decision which transmission type will be the most favorable one to use to set up a new radio link. Today, OFDM is a widely used modulation format which has found application in many wireless short range and broadcast radio systems. F. Liedtke and U. Albers analyze a number of OFDM sample signals recorded from the HF frequency band in order to identify various discriminating features that can be used for automatic signal classification.

The next two papers are focused on wireless sensor network implementation in the military environment. The first one by M. Winkler *et al.* is aimed at exploring the military requirements for wireless sensor networks and identification of the research areas which would improve military usability, mainly related to distributed data processing and routing. B. Scheers, W. Mees and B. Lauwens present the results of ongoing research efforts on IEEE 802.15.4-based wireless sensor networks performed at the Belgium Royal Military Academy. They compare the results of theoretical analysis of effective data capacity to measurements performed in an experimental environment and discuss the basic differences. They summarize the paper with a brief discussion on accuracy and applicability of using received signal strength indicators (RSSI) as a method for determining the positions of sensor nodes.

The next papers examine some specific aspects of the implementation of wireless mobile networks in a tactical environment and the evaluation of the utility of routing and other protocols in such an environment. The paper by N. Aschenbruck, E. Gerhards-Padilla and P. Martini gives an overview of different node mobility models that can be applied to performance evaluation of network protocols in a simulation environment. These models can be used for concept development and validation and could help to identify the most promising concept(s) to be verified in a field trial. The authors summarize their considerations and make recommendations regarding the implementation of mobility models in some specific tactical scenarios. H. Bongartz and T. Bachran present their test results of different mobile ad hoc wireless routing protocols, particularly for transport of multicast data. In addition, they describe a layer 2 routing protocol and demonstrate through quantitative measurements some of its advantages. Lastly they compare the measured performance of the routing protocols in their test-bed with simulation results and make comments regarding the observed differences. C. Adjih *et al.* present extensions to an OLSR protocol that supports QoS and security provisions in a mobile ad hoc network. They also describe a router concept which interconnects the wireless network, which uses an OLSR routing protocol, with a wired network, which uses an OSPF routing protocol. Furthermore, the authors discuss in the paper architecture, design, and implementation of extensions to the OLSR protocol that take account of radio channel interferences, high dynamics and low capacity resources and that have been implemented in a real MANET/OLSR test-bed. A question of providing secure information exchange within groups of users is discussed in a paper by T. Aurisch *et al.* They propose a mechanism for integrating automatic detection of IPsec devices into an efficient key management protocol that provides protection of multicast data traffic. The authors define a specific scenario for the assessment of the security mechanisms. They discuss the results of experiments executed in a test-bed environment and explore the applicability of the proposed solution in a coalition network.

The next paper by M. Małowidzki and P. Bereziński is focused on implementation of a technology independent concept of network management that enables automation of the network planning and network configuration processes. The solution is based on the SNMP protocol; however, the authors demonstrate that implementation of the NETCONF protocol would yield a number of benefits, including simplification of the planning and configuration processes.

The last paper, by P. Gajewski. J. M. Kelner and C. Ziółkowski, presents a novel method of determining subscriber location in a military communication network. After a brief description of how the Doppler effect can be exploited for radio emission location, the authors describe the basic features of their concepts and define a new quality measure that enables improvement of the precision of the location measurements. They also discuss some experimental results they have conducted and specify the areas of applicability of the proposed method.

The guest editors would like to take this opportunity to express their thanks to the authors and reviewers for their efforts in the preparation of this issue of the *Journal of Telecommunications and Information Technology*. They trust that the readers will find the papers dealing with the most recent research results in the area of military information and communication systems both useful and interesting.

Markus Antweiler (*Institute for Communications, Information Processing and Ergonomics, Germany*)
Marek Amanowicz (*Military Communication Institute, Poland*)
Peter Lenk (*NATO Consultation, Command and Control Agency*)
Guest Editors