JOURNAL OF TELECOMMUNICATIONS AND INFORMATION TECHNOLOGY

Preface

This issue of the *Journal of Telecommunications and Information Technology* is devoted to three areas: routing and other subjects related to communication networks, security issues and solutions, and radio technology.

The largest part of the publication is networking, especially mobile networks – reflecting their steady technical development and worldwide expansion, and to routing solutions – in a technology-neutral manner, as the problems and their solutions presented are independent of transmission medium being used.

As the ultimate purpose of a communication network is cost-efficient provision of services meeting contractual quality requirements, there is a need for traffic engineering ensuring effective utilization of available network resources and generation of highest income for network operator, while still providing the Quality of Service (QoS) expected by its customers. Importantly, pursuing those two goals simultaneously is often in conflict. Another big issue is monitoring the QoS received by customers, e.g. for use by market regulator or service provider. The latter is particularly important in case of mass-market Internet access offered for consumers and small business users, who usually lack the knowledge and tools necessary to monitor service quality themselves.

The next set of papers in this issue covers security matters and technologies useful for communication networks, in this case user identification, secure network control, management, and algorithms useful for data encryption. The importance network of security solutions, in effort to make it more resistant to hacking, tampering, illegal access or eavesdropping, is rapidly growing. Alas, network operators and service providers are currently on the defensive, as the growing number of reported security breaches and data leaks confirms. For security researchers and designers of communication systems and equipment, this situation means increasing amount of work (with more funding available) due to demand for technical solutions providing adequate level of security at acceptable cost, and without unacceptable burden on network users.

The set of papers on networks begins with *Link Quality and Energy Aware Geographical Routing in MANETs using Fuzzy Logics* by P. Mishra, Ch. Gandhi, and B. Singh. Authors have analyzed routing in mobile ad hoc networks (MANETs), finding that the algorithms used must deal with problems specific to mobile networks with battery-powered devices (nodes),

in particular variable link quality (due to user movement, propagation issues and variable number of users per base station) and limited, varying energy reserve at each node. The solution proposed is a mix of both greedy and compass routing.

In the next article, G. Zalewski and W. Ogryczak in a paper *Comparison of Selected Fair-optimization Methods for Flow Maximization between given Pairs of Nodes in Telecommunications Network* look at optimizing traffic control in a core network, finding that simple maximization of operator's revenues results in "starvation" or outright blocking of less profitable paths, services and customers. This is not acceptable, and "fair" traffic optimization methods are necessary; two methods analyzed being: ordered weighted average (OWA) and the reference point method (RPM).

P. Białoń in his paper *A Practical Approach to Traffic Engineering using an Unsplittable Multicommodity Flow Problem with QoS Constraints* deals with content-aware networks, where both capacity and QoS demands must be met simultaneously for each path. The author proposes a relatively simple mixed algorithm offering short and predictable calculation time, as well as provision (in case a solution meeting input demands is found impossible) of approximately-feasible solution, showing how to modify demands to retain feasibility. Its disadvantage with respect to other solutions is less efficient utilization of network resources.

The next subject, studied by M. Krzysztoń and E. Niewiadomska-Szynkiewicz in a paper *Heavy Gas Cloud Boundary Estimation and Tracking using Mobile Sensors* is use of field deployed, mobile wireless sensors, forming a MANET, for centralized tracking of a moving cloud of low-lying gas, with estimation of its boundaries. The solution presented is of obvious use in emergency situations (chemical leak, poison gas attack, etc.) and can be adopted for detection and location of other dangerous agents, e.g. radioactive contamination.

The only paper about optical fiber communications is *Variable-Weight Optical Code Division Multiple Access System using Different Detection Schemes*, by S. Seyedzadeh, M. Moghaddasi, and S. B. A. Anas. It includes comparative analysis of Variable Weight OCDMA (VW-OCDMA) system using KS code with three optical detection schemes: Direct Decoding (DD), Complementary Subtraction (CS) and AND subtraction. Of those, the DD variant was found to offer the best performance, with highest number of users simultaneously served.

In the last paper devoted to networks, *Concept for a Measurement Management System for Internet Access Service*, J. H. Klink, M. J. Podolska, and T. Uhl look at very important (also for the consumer) subject of ensuring and monitoring the quality of service (QoS) in Internet access networks, dealing first with applicable European standards and regulations, than with methodology of QoS measurements. The authors propose introduction of a Measurement Management System (MMS) to aid the design, execution and evaluation of efficient, automatic QoS measurements in networks.

Network security is dealt with at multiple levels, complementing each other. On the high level, we have security-oriented network management. A. Wilczyński, A. Jakóbik, and J. Kołodziej, in a paper *Stackelberg Security Games: Models, Applications and Computational Aspects* present use of so-called Stackelberg games (where one player, e.g. network administrator, has privileged position and makes decision before others) for decision support when security issues are the crucial.

Down to the individual user, for secure access, the individual must be reliably identified, preferably without resorting to additional, dedicated hardware or onerous procedures. Two possible biometric solutions are presented and analyzed in papers: *Application of Recurrent Neural Networks for User Verification based on Keystroke Dynamics* by P. Kobojek and K. Saeed and *Cross-spectral Iris Recognition for Mobile Applications using High-quality Color Images* by M. Trokielewicz and E. Bartuzi. The first paper includes results of experiments proving that keystroke sequence can reliably identify a person, in particular avoiding dangerous false positives. One can see this work as extension of familiar method of identifying a wired or wireless telegraph operator by "rhythm" of his keystrokes, successfully used during WWI and WWII. However… a simple keyboard sniffer planted on a victim's PC can provide hackers with enough data for easy replication of his/her biometric signature, possibly by another module of the same malware… The second paper looks on the problem of matching iris scans obtained with different cameras, e.g. low resolution infrared black and white (typical for iris scanners installed at bank, high security facilities, etc. Such images are stored as reference in most security systems) and high resolution, color (RGB, no infrared channel) image generated by camera in a smartphone or other consumer device. The

authors found that grayscale conversion of color images with selective RGB channel choice depending on the iris coloration could improve recognition accuracy for some combinations of eye colors, with error rates reduced to 2%, the best result published so far.

The last line of defense in case of successful hack or eavesdropping is data encryption. In his paper "*Faster Point Scalar Multiplication on Short Weierstrass Elliptic Curves over F_p using Twisted Hessian Curves over F_{p^2}*", M. Wroński proposes new, more computationally efficient variant of elliptic curve cryptography, with estimated gain of 24–30%. Such reduction of processor load is particularly desirable in battery-powered mobile devices.

Radio engineering in this issue of JTIT is represented by two, substantially different papers.

The first one, *Curved-Pentagonal Planar Monopole Antenna for UHF Television Reception* by R. Yuwono, E. B. Purnomowati, and M. Y. Amri is devoted to computer simulations and optimization of mass-produced, household item – TV antenna. While relatively low-tech, this device is still essential for provision of TV broadcast services for consumers living beyond reach of cable or broadband Internet networks.

The last paper: *On Radio-Frequency Spectrum Management* by R. Strużak, T. Tjelta, and J. Borrego, deals with matter of extreme importance: allocation of scarce, limited resource – radio spectrum, to multiple competing networks and applications, especially taking into account rapid evolution of technology and services, and exponential growth of traffic volume, and overall shortage of spectrum. With LTE/5G networks becoming dominant mode of broadband access in many territories, spectrum management has currently huge economic importance, and must be done transparently and carefully. There is also the persistent issue of treating radio licenses primarily as revenue generator for the government. The paper presents evolution of spectrum exploitation, a vision of future, and major dilemmas and challenges.

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