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Preface

The development of new network technologies which offer higher bandwidth as well as the deployment of mobile communications, modern services, multimedia, unlimited Internet access, etc. create numerous problems and questions, e.g., how to interwork existing services with Next Generation Internet, how to manage and optimize the transmission of growing traffic volumes, how to enhance network performance. In the panoply of tools which help to solve such problems one may find teletraffic theory, performance evaluation and modeling of communication protocols and devices by simulation and mathematical analysis. Mathematical and algorithmic tools are used to solve problems of assuring QoS/QoE, distribution of multimedia, modern routing and switching algorithms including broadcast and multicast traffic control and management, high speed networks, e.g., optical, mobile systems and mobility models, network virtualization. It is easy to conclude that the theoretical analysis of the issues associated with computer networks plays important role for any engineer involved in the development of new communications solutions.

The current issue of *JTIT* brings 15 articles on problems related to the wide range of the network mechanisms that may be included in future networks. What unites published materials, are the authors or co-authors coming from the leading Polish academic research centers specializing in telecommunications. Many of the subjects were inspired by their research inside Polish project Future Internet Engineering (IIP) led by Prof. Wojciech Burakowski and gathering nine Polish academic centers. Each of the articles represents an original look at the issues the authors are dealing with.

In the first paper, *Analysis of the System with Vacations under Poissonian Input Stream and Constant Service Times*, Maciej Sosnowski and Wojciech Burakowski, show how to use an abstract model with vacations, fed with Poisson type stream to dimensioning real system created within Future Internet Engineering project. In this place we encourage our readers to familiarize with results of the whole IIP project itself, starting from its web site, <http://www.iip.net.pl>.

Authors of next papers deal with an issue which is vital to current networks, namely Quality of Service, looking from different points of view. *Approximation of Message Inter-Arrival and Inter-Departure Time Distributions in IMS/NGN Architecture Using Phase-Type Distributions* by Sylwester Kaczmarek and Maciej Sac presents simulation results of QoS investi-

gation in Next Generation Network architecture. OSPF Routing in DiffServ architecture with advanced, self-similar traffic model was investigated in the next paper, *Traffic Type Influence on Performance of OSPF QoS Routing* (Michał Czarkowski, Sylwester Kaczmarek, and Maciej Wolff). Mariusz Fraś and Jan Kwiatkowski in the work *Quality Aware Virtual Service Delivery System* deal with QoS problems in Web-based systems based on SOA concept, and present original architecture of VSDS tool. The paper *Comparison of Resource Control Systems in Multi-layer Virtual Networks* by Bartłomiej Dabiński, Damian Petrecki, and Paweł Świątek make a step toward QoS-aware virtual networks and try to compare different methods and tools for QoS assurance and proposing their own solution.

QoS in wireless systems is harder to achieve than in wired ones, due to multiple factors influencing the transmission. Małgorzata Langer in the article entitled *Quality Management in 4G Wireless Networking Technology Allows to Attend High-Quality Users* discusses qualitative and quantitative indicators of telecommunication services, important for massive growth in traffic volume and in the number of connected devices is observed nowadays.

QoS is tightly coupled with problems of multimedia and content distribution, so we have a pleasure to present work of Krzysztof Walkowiak, Damian Bulira and Davide Careglio, *ILP Modeling of Many-to-Many Replicated Multimedia Communication*, where authors discuss optimization mechanisms dedicated for many-to-many communication, like on-line conferences and telepresence applications. Economical side of upgrading current infrastructure to modern overlay multicast is encountered in the paper *Minimizing Cost of Network Upgrade for Overlay Multicast – Heuristic Approach* by Maciej Szostak and Krzysztof Walkowiak. The authors try to show the way to minimize the costs of required upgrade.

Modeling is important tool for evaluation of new solution for present and future generation networks. Another group of articles shows how to use different modeling methods to uncover the properties of proposed solution. Grzegorz Danilewicz and Marcin Dziuba in *Performance Evaluation of the MSMPS Algorithm under Different Distribution Traffic* paper investigate with simulation scheduling algorithms, emphasizing advantages of their new MSMPS solution. The paper *Call and Connections Times in ASON/GMPLS Architecture* by Sylwester Kaczmarek, Magdalena Młynarczuk, and Paweł Zieńko is devoted to the simulation research on ASON/GMPLS architecture control plane functions. Markovian analysis can be sometimes used as an alternative to simulation modeling, and Maciej Sobieraj, Maciej Stasiak, Joanna Weissenberg, and Piotr Zwierzykowski in *Single Hysteresis Model for Limited-availability Group with BPP Traffic* paper present their results concerning radio interfaces with single hysteresis mechanism obtained with Markovian switching process.

Next part of the *JTIT* issue is devoted to the problems of wireless networks. Krzysztof Gierłowski in his work *Interworking and Cross-layer Service Discovery Extensions for IEEE 802.11s Wireless Mesh Standard* points at the mechanisms lacking in mesh version of popular Wi-Fi standard, 802.11s and proposes some enhancements. Jerzy Martyna uses game theory for Cognitive Radio algorithms in *Cooperative Games with Incomplete Information for Secondary Base Stations in Cognitive Radio Networks* paper, and in *Quasi-Offline Fair Scheduling in Third Generation Wireless Data Networks* the same author proposes new scheduling algorithm for 3G wireless networks demonstrating its advantages with numerical analysis.

The last paper focus on the performance of the generic part of a network – a single node. In the IIP project, virtualization of the network involves not only protocols and applications but the whole nodes which acting as virtual network nodes for different internets. Prototype implementation of virtual nodes was implemented with Xen, and the paper *Performance Tests of Xen-based Node for Future Internet IIP Initiative* by Grzegorz Rzym and Krzysztof Wajda presents the results of performance indices investigation of Xen-based node, used for designing the provisioning module for IIP system.

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