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Preface

Studies on the IPv6 protocol began in the early 1990s in The Internet Engineering Task Force (IETF). One of the main reasons for initiating this work at the standardization body was a prediction on accelerated IPv4 address space consumption in the near future and limited free address space available for new allocations. Current forecasts on the IPv4 address exhaustion made by the Internet Assigned Numbers Authority (IANA) indicate that these addresses will run out in May 2011 (http://inetcore.com/project/ipv4ec/index_en.html).

The use of the IP protocol in new application areas, such as mobile phones or the Internet of Things has forced increased budget and efforts on the development of the IPv6 protocol and services and applications associated with it. At the same time, work on acceleration of migration processes, implementation of IPv6 in telecommunication operators' networks and end-user operating systems was intensified.

Transformation from IPv4 into IPv6 is one of short-term aims to be achieved in Europe. To accelerate this process in Poland, we have devoted one of work packages of a national project entitled Future Internet Engineering project (http://www.iip.net.pl/) to recommend best practices and to develop a set of tools supporting this transformation. The partners involved in this work package are from the following organizations: Poznań Supercomputing and Networking Center, Gdańsk University of Technology, National Institute of Telecommunications in Warsaw, AGH University of Technology, Wrocław University of Technology and Warsaw University of Technology.

This issue of the *Journal of Telecommunications and Information Technology*, **edited by Artur Binczewski, Wojciech Burakowski and Józef Woźniak as Guest Editors**, contains four papers related to this project as well as paper written by S. Kukliński, P. Radziszewski and J. Wytrębowicz, focused on the development of the IPv6 technology and practical results achieved.

The first paper, *Why is IPv6 Deployment Important for the Internet Evolution?* by J. Mongay Batalla, A. Binczewski, W. Burakowski, K. Chudzik, B. Gajda, M. Gajewski, A. Grzech, P. Krawiec, J. Kwiatkowski, T. Mrugalski, K. Nowicki, W. Procyk, K. Sienkiewicz, R. Szuman, J. Śliwiński, J. Światowiak, P. Wiśniewski, and J. Woźniak, covers the issue of replacing the IPv4 protocol with IPv6 in the Internet as one of the aims of the European Union policy. The main reason for this replacement is the IPv4 address space exhaustion, which can cause serious complications in the evolution of the Internet and its adoptation in new

areas, e.g., in next generation mobile telephony or so called Internet of Things. Simultaneously, the addressing capabilities of the IPv6 protocol are practically unlimited and its new functionalities increase the attractiveness of its usage. The article discusses problems related to IPv6 deployment in the regular Internet. Especially, the rules for IPv6 deployment and for cooperation of IPv4 with IPv6 (including cooperation tests) at both network and application levels are presented. Moreover, the European projects' results and the activity's directions of the national project "Future Internet Engineering" are discussed.

The second paper, *Iv6 Virtualization Environments* by K. Chudzik and J. Kwiatkowski, provides a short overview of the key features of IPv6 and discusses the possible levels of network virtualization. The research environment for testing the level of support for IPv6 protocol by virtualization environments is proposed. The results of tests conducted using the proposed research environment for Hyper-V virtualizer are presented.

The paper *IPv6 in Wireless Networks – Selected Issues* by S. Kukliński, P. Radziszewski and J. Wytrębowicz presents problems related to the construction of autonomous wireless networks based on the IPv6 protocol. Prospects of implementation of IPv6 in wireless networks and IPv6 features and mechanisms important in such applications are discussed, together with an outline of potential research directions for the use of IPv6 in wireless networks. The selected concepts are described in detail, arising from the course of the EFIPSANS project. Concepts presented in the paper apply to wireless ad hoc mesh networks. Their nature and aspects related to their auto-configuration and autonomously operating routing are discussed, with particular focus on wireless autonomic routing framework (WARF).

In the paper *On Implementing IPTV Platform with IPv4 and IPv6 Devices* by J. Mongay Batalla and P. Krawiec, a global solution for integrating all devices, these working on the IPv4 protocol stack and these IPv6-enabled, under the same IPTV platform is proposed. This solution allows end users to receive IPTV streams irrespectively of the IP protocol used. The proposed solution is especially relevant for small IPTV systems, which step by step are progressing towards IPv6.

The last paper devoted to IPv6 technology, *On Testing IPv6 in Small ISP's Networks* by K. Sienkiewicz, M. Gajewski and J. Mongay Batalla, proposes a new approach to IPv6 tests with the particular focus on supporting the IPv6 deployment in small networks. It presents tools and specifications for IPv6 tests and proposes a test platform tailored to needs of small ISPs. The test platform is a dedicated LiveCD distribution based on FreeBSD operating system with the IPv6 test environment and a set of predefined tests. This solution allows to launch the test tool software on any computer equipped with an Ethernet card and a CD-ROM/DVD-ROM drive. The LiveCD test tool allows users to execute tests and analyzes the results in the graphical environment. Authors believe that this approach will help to simplify and shorten IPv6 testing in small ISP's networks.

Another paper devoted to IP networks is *Dynamic Contracting of IP Services – System Architecture and Prototype* by Piotr Arabas and Mariusz Kamola, dealing with dynamic contracting of IP services, presenting a reservation system which serves requests issued by users demanding setting up network service of specified parameters (QoS). DiffServ technology together with traffic engineering and admission control are used. While similar solutions were developed previously, they failed to find acceptance with network operators. Implementation details and promising results of tests on prototype system set up in NASK laboratory are described. Necessary extensions and possibility of commercialization of such a system are discussed.

D. M. S. Sultan and Md. Taslim Arefin in the paper *GPON, the Ultimate Pertinent of Next Generation Triple-play Bandwidth Resolution* deal with next generation access (NGA) infrastructure, as optical fibers are becoming necessary to satisfy rising demand for bandwidth and reliability, created by services like IP television (IPTV) and video on demand (VoD). While the latest xDSL solutions (i.e., VDSL/VDSL2+, SHDSL) can satisfy bandwidth needs, transmission distance is severely restricted; high bandwidth and long reach can be combined only in a fiber to the home (FTTH) network. One way is to install a passive optical network (PON); of those, Gigabit PON (GPON) is the most advanced PON solution used by European and US providers, while providers in Asia predominantly use EPON/GePON variants. The paper provides overview of GPON network – its architecture, mechanisms and key services.

The article *Developing a Secure Image Steganographic System Using TPVD Adaptive LSB Matching Revisited Algorithm for Maximizing the Embedding Rate*, by P. Mohan Kumar and K. L. Shanmuganathan presents work on hiding a secret message in a variety of multimedia carriers like images, audio or video files. Multiple steganographic algorithms have been proposed and development of steganalytic tools to detect them has progressed, too. This paper concentrates on integrating Tri-way pixel value differencing approach and LSB matching in a new way. The secret data embedded in images were images, text and audio signals so far. The proposed scheme has also come with the executable file as secret data. Experiments shown that necessary properties of steganographic system such as imperceptibility, capacity and resistance against steganalytic tools have been achieved.

The last three papers in this issue are devoted to different issues in radio networks. Multimedia services often have to deal with poor transmission quality, especially to portable devices. In their paper *An Efficient Chaotic Interleaver for Image Transmission over IEEE 802.15.4 Zigbee Network*, Mohsen A. M. M. El-Bendary, Atef Abou El-Azm, Nawal El-Fishawy, Farid S. M. Al-Hosarey, Mostafa A. R. Eltokhy, Fathi E. Abd El-Samie, and H. B. Kazemian present study on transmission of images over IEEE ZigBee 802.15.4, a short-range wireless network, that could be used for multimedia transmissions. The ZigBee network is a wireless personal area network (WPAN), which needs a strong interleaving mechanism for protection against error bursts. A novel chaotic interleaving scheme for this purpose is proposed, utilizing the chaotic Baker map. A comparison study between the proposed chaotic interleaving scheme and the traditional block and convolutional interleaving schemes for image transmission over a correlated fading channel is presented, demonstrating the superiority of chaotic interleaving scheme over the traditional approach.

The next contribution, *Higher Order Cumulants for Identification and Equalization of Multicarrier Spreading Spectrum Systems* by Said Safi, Miloud Frikel, Abdelouhab Zeroual, and Mohammed M'Saad, describes two blind algorithms for multicarrier code division multiple access (MC-CDMA) system equalization. In order to identify, blindly, the impulse response of two practical selective frequency fading channels called broadband radio access network (BRAN A and BRAN E) normalized for MC-CDMA systems, higher order cumulants (HOC) were used to build accurate simulation algorithms. Simulation results for different signal to noise ratios (SNR) successfully demonstrated that the proposed algorithms are able to estimate the impulse response of these channels blindly (without any information about the input), except that the input excitation is identically and independent distributed and non-Gaussian. In the MC-CDMA part, a zero forcing and the minimum mean square error equalizers were used.

Performance of microwave and satellite networks can be significantly degraded by rain-induced attenuation, and the last paper *Characteristics of Measured Rainfall Rate at Ogbomoso, Nigeria for Microwave Applications* by F. A. Semire and T. I. Raji presents characteristics of rainfall rate useful in estimation of attenuation due to rain, based on data collected between January and October, 2009. Result shows that power law relationship exists between the equiprobable rain rates of two different integration times. The value of conversion factor CE and CR obtained for Ogbomoso are 0.28(60) and 0.64(90) respectively. The results show that different conversion factor is required for different location, even within the same climatic region.

We hope the Readers will find this issue of the *Journal of Telecommunications and Information Technology* useful and interesting.

Paweł Szczepański
Editor-in Chief