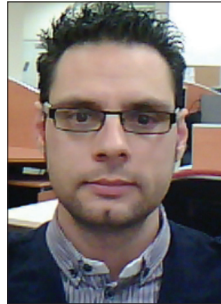


ADVANCES IN NETWORK PLANNING – PART I: FIXED NETWORKS AND CLOUDS



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Network planning is undergoing major changes in terms of the technologies considered and the methodologies. The papers we received for this special issue actually testify to these changes and show the manifold advances made in the area. As the networking industry becomes increasingly cost competitive, planning becomes ever more important, and the articles in the feature topic are particularly timely.

In this first part of the feature topic, we focus on the technological side concerning optical and packet networks, including their interconnection with cloud infrastructures. The second part, to be published in a later issue, focuses on the technological side concerning wireless networks as well as on emerging methodologies to handle traffic uncertainty.

We hope that network and cloud operators, service providers, network (element) suppliers, consultants, researchers, developers, software tool vendors, and anyone interested in the network planning topic find the Feature Topic a useful resource.

The article “Planning of Dynamic Virtual Optical Cloud Infrastructures: The GEYSERS Approach” by Tzanakaki *et al.* presents results from the project Generalized Architecture for Dynamic Infrastructure Services (GEYSERS), addressing the provisioning of optical networks jointly with IT resources, which has attracted growing interest from academia and industry. The developed architecture and solution approach is very promising and expected to have a significant practical impact.

Sabella *et al.* address in “Flexible Packet-Optical Integration in the Cloud Age: Challenges and Opportunities for Network Delaying” the evolution of transport networks toward multi-layer systems with packet and optical technologies. This convergent trend is affecting network

planning and operations at large and implies dealing with the complexity of these technologies.

Multi-layer network planning with a focus on resilience is the topic of “Multi-Layer Capacity Planning for IP-Optical Networks” by Gerstel *et al.* The authors address the issue of providing high service availability, which is compulsory in high-capacity networks. The article details the design methodology for restoration and evaluates current network scenarios.

Velasco *et al.* elaborate in “In-Operation Network Planning” on a control and management architecture that allows for integration of network planning tasks to cope with dynamicity requirements of future networks. The authors highlight the concurrent standardization efforts and illustrate two use cases to narrow down the approach to concrete scenarios.

The article “Planning and Operating Flexible Optical Networks: Algorithmic Issues and Tools” by Kretsis *et al.* touch on the algorithmic issues involved with the emerging spectrum-flexible optical networks. As these networks are subject to a number of physical impairments and system requirements, the planning problems and corresponding solution approaches are particularly challenging and demand for adaptable tooling.

The issue of migration to spectrum-flexible optical networks addressed in “Planning Fixed to Flexgrid Gradual Migration: Drivers and Open Issues” by Ruiz *et al.* The authors elaborate on migration scenarios and an operational architecture, which becomes necessary for any operator running WDM-based networks today. On this basis they also indicate future challenges that are for sure facilitating research ideas in the area.

Migration is also the topic of the article “Advanced Dynamic Migration Planning toward FTTH” by Romero

Reyes *et al.*, addressing access networks. The various transitions between FTTx technologies have to be carefully modeled in order to manage the significant costs involved. The authors develop a representative methodology for optimal migration, which is useful for strategic network planning, and apply it to a case study.

BIOGRAPHIES

DOMINIC SCHUPKE [M'98, SM'08] (dominic.schupke@icloud.com) is with the Airbus Group (previously EADS) in Munich, Germany working in the Innovations unit in the area of Wireless Communication. Prior to EADS he was with NSN, Siemens, and the Institute of Communication Networks at Technische Universität München (TUM). He received his Dipl.-Ing. degree from RWTH Aachen in 1998 and his Dr.-Ing. degree from TUM in 2004. He has over 15 years experience in the area of communication networks, especially their design and optimization. Since April 2009 he has instructed the course "Network Planning" at TUM. Dominic is author or co-author of more than 100 journal and conference papers. His research interests include network architectures and protocols, routing, recovery methods, availability analysis, critical infrastructures, security, virtualization, network optimization, and network planning.

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DAVID TIPPER is the director of the Telecommunications and Networking Program and a faculty member at the University of Pittsburgh. Prior to joining Pitt in 1994, he was an associate professor of Electrical and Computer Engineering at Clemson University in Clemson, SC. He is a graduate of the University of Arizona (Ph.D. EE, MS SIE) and Virginia Tech (BS EE). His current research interests are survivable networks, performance analysis techniques, wireless/wired network design and information assurance techniques. Professor Tipper's research has been supported by grants from various government and corporate sources such as NSF, DARPA, NIST, IBM, ARO, and AT&T. He is the co-author of the textbook *The Physical Layer of Communication Systems* (Artech House, 2006). Also, he is the co-editor and a contributor to *Information Assurance: Dependability and Security in Networked Systems* which was published in 2008.