

## Emerging Wireless Networks: Challenges and Perspectives

- **10:00**  
**Welcome**  
Giuseppe Araniti, Assistant Professor in Telecommunication, DIIES Dep., University Mediterranea of Reggio Calabria, Italy
- **10:20**  
**Secure and Reliable, Cloud and Remote Service Connections for IoT Applications**  
Jiří Hošek, Research Group Coordinator and Senior Researcher at Brno University of Technology, Czech Republic
- **10:40**  
**Intelligent Connectivity Enablers for Converged Heterogeneous 5G-IoT Ecosystem**  
Sergey Andreev, Senior Research Scientist at Tampere University of Technology, Finland
- **11:20**  
**Coffee Break**
- **11:40**  
**Analytical Performance Evaluation of Cooperative and Multi-Radio Concepts in Emerging Wireless Networks**  
Olga Galinina, Researcher at Tampere University of Technology, Finland
- **12:20**  
**Quantification of User Experience with Mobile Data Services**  
Jiří Hošek, Research Group Coordinator and Senior Researcher at Brno University of Technology, Czech Republic
- **12:40**  
**New challenges for machine-type communications over 5G systems**  
Massimo Condoluci, PhD Student, DIIES Dep., University Mediterranea of Reggio Calabria, Italy
- **13:00**  
**Conclusions**

***Giovedì 29 Ottobre ore 10:00/ Thursday 29th October, at 10:00 AM***  
**Aula del Consiglio Dipartimento DIIES**  
**REGGIO CALABRIA**

## Emerging Wireless Networks: Challenges and Perspectives

*Special topic*

**Secure and Reliable, Cloud and Remote Service Connections for IoT Applications**

**Quantification of User Experience with Mobile Data Services**

*Guest Seminar*

Dr. Jiri Hosek

BRNO UNIVERSITY OF TECHNOLOGY

*Special topic*

**Intelligent Connectivity Enablers for Converged Heterogeneous 5G-IoT Ecosystem**

*Guest Seminar*

Dr. Sergey Andreev

W.I.N.T.E.R. GROUP, TAMPERE UNIVERSITY OF TECHNOLOGY

*Special topic*

**Analytical Performance Evaluation of Cooperative and Multi-Radio Concepts in Emerging Wireless Networks**

*Guest Seminar*

Dr. Olga Galinina

W.I.N.T.E.R. GROUP, TAMPERE UNIVERSITY OF TECHNOLOGY



TAMPERE  
UNIVERSITY OF  
TECHNOLOGY



October 29th, 2015 – 10:00 – Aula del Consiglio – 5<sup>th</sup> Floor

### *Special topic: Secure and Reliable, Cloud and Remote Service Connections for IoT Applications*

One of the crucial issues in IoT domain is a secure and reliable remote service connection. There are many candidates for a communication infrastructure between the smart home ecosystem and service providers, distribution centres or end-users accessing smart home applications remotely. Optimally the access and communication service technology should be already deployed in order to minimize initial investments and in parallel must provide sufficient reliability and security even for critical applications. Therefore, already deployed telco platforms have a strong potential to become the key communication technologies for smart home domain. The existing IP Multimedia Subsystems (IMS) embedded in or associated with telecommunication networks are providing all the required standards, security and dedicated communication service frameworks for universal remote access methods out of the box. In combination with an IMS-enabled and OSGi-compliant IoT Gateway, they provide a ready-to-use basis for a performing and cost-effective IoT service platform. That is why we investigated the applicability of residential gateway access technology for emerging home automation services. Finally, we developed and demonstrate a middleware solution enabling the “state of technology” IP-based home gateway to serve as a universal multi-purpose enabler for connected home automation systems like smart metering and private grid, alarm systems, photo-voltaic energy production systems, and much more being fully comparable with multi-purpose Gateway Agent concepts.

### *Special topic: Quantification of User Experience with Mobile Data Services*

Cellular network operators are currently seeking for simple but accurate methods to measure and predict the levels of satisfaction for their customers using the mobile data services. Even though the ultimate user demands are known to be influenced by multiple factors, there is one clear trend – people require an increasingly higher quality of mobile Internet connection. For mobile industry, there is thus an increasing demand in effective Quality of Experience (QoE) mechanisms that have to be integrated into the operators’ traffic management systems, where QoE is typically defined as the user’s overall acceptability of a service or application. Inspired by that and following our extensive research in this field, we will introduce the key outcomes of our recent QoE studies conducted in cooperation with cellular operator in Czech Republic. The main goal of both campaigns, focused on two most emerging mobile domains – web services and YouTube, was to identify the key parameters specifying the mobile user’s behaviour and experience while using his / her handheld device. In order to sufficiently quantify user experience, we have developed our own QoE analytical model to estimate the user satisfaction level as function of well-recognized Mean Opinion Scale (MOS). The introduced results reveal several crucial aspects of the cellular networks and behaviour of their users as well which is a key understanding for operators to manage their deployments more efficiently.

### *Short biography:*



Dr. Jiri Hosek is a Wislab (<http://wislab.cz>) research group coordinator and Senior Researcher at Brno University of Technology, Czech Republic. Jiri deals mostly with industry-oriented R&D projects in the area of future mobile networks, Internet of Everything and home automation services. Jiri (co-) authored more than 60 research works on networking technologies, wireless communications, quality of service, quality of experience and IoT applications. Jiri is an experienced speaker regularly participating and actively presenting his research work on premier international conferences and workshops (see the list of publications: <https://www.vutbr.cz/en/people/jiri-hosek-47655/publikace>).

*Special topic: Intelligent Connectivity Enablers for Converged Heterogeneous 5G-IoT Ecosystem*

In this talk, we comprehensively review recent advancements in radio connectivity enablers at the intersection of the 5G and the IoT realms. We explore the potential of a wide range of devices requiring connectivity at different scales (macro, micro, pico, femto, etc.) and across diverse radio access technologies (e.g., cellular and WLAN) to augment system capacity and improve connectivity experience in next-generation heterogeneous deployments. Further, we discuss the emerging concept of proximate device-to-device communication and the changes it introduces to conventional networking paradigm. We also address the unique challenges posed recently by an impressive variety of machine-type devices, with their characteristic stringent performance requirements, and the capabilities that both short- and long-range radio technologies would need to develop while accommodating those. Finally, we consider the novel spectrum usage paradigms for the future 5G-IoT ecosystem, including millimeter-wave access and licensed shared access techniques. Our study is a combined pursuit of mathematical analysis, system-level simulations, standardization, and production-ready prototyping of the key 5G-IoT solutions.

*Short biography:*



Dr. Sergey Andreev is Senior Research Scientist at Tampere University of Technology (Finland), where he is coordinating W.I.N.T.E.R. Group (<http://winter-group.net/>) focusing on 5G and IoT centric research. He has (co-)authored over 100 papers (including those in IEEE JSAC, IEEE Communications Magazine, and IEEE Wireless Communications), several patents, and a number of IEEE and 3GPP standardization contributions in the areas of multi-radio heterogeneous networking, cooperative and proximate communications, energy efficiency, and machine-to-machine applications. This innovation activity has been well covered in media on both national (Interface science magazine, Finland) and international (Eurescom message, EU) levels. Sergey has been reviewer for numerous visible conferences as well as a large number of top-level international journals, and named Exemplary Reviewer by IEEE Communications Letters in 2013. He has also been invited expert at 5G-PPP Experts Workshop, China-Finland 5G Workshop, held many guest lectures at industry (Intel, Ericsson, NSN, etc.) and academia worldwide. Recently, he has been recipient of highly competitive personal research grant by the Academy of Finland (9% success rate), as well as several other prestigious scholarships and awards.

*Special topic: Analytical Performance Evaluation of Cooperative and Multi-Radio Concepts in Emerging Wireless Networks*

For the past years, the analysts have been predicting a tremendous and continuous increase in mobile traffic, causing much of industry and academia to seek out all methods to improve wireless network capacity. In the envisioned fifth-generation (5G) deployments, each user device may employ multiple radio access technologies for communicating with the network infrastructure or other proximate devices. With the growing number of such multi-radio consumer devices, network operators are increasingly willing to leverage spectrum across diverse radio technologies to boost capacity and enhance quality of service.

We propose a novel methodology for performance evaluation of systems of multi-radio users, which is based on coupling stochastic nature of both spatial user locations and traffic time dynamics. By means of applying theoretical findings to the future 5G technologies, where the distributed unlicensed-band network (e.g., WiFi) may take advantage of the centralized control function residing in the cellular network (e.g., 3GPP LTE), we classify the most widespread types of heterogeneous network in terms of provided methodology and propose a set of analytical methods for each of them to evaluate and predict the integrated cooperative behavior on the system level.

*Short biography:*



Dr. Olga Galinina received her Ph.D. degree from the Department of Electronics and Communications Engineering at Tampere University of Technology, Finland. She previously received her B.Sc. and M.Sc. degrees in Applied Mathematics from the Department of Applied Mathematics, Faculty of Mechanics and Physics, Saint-Petersburg State Polytechnical University, Russia. She has publications on mathematical problems in the novel telecommunication protocols in internationally recognized journals and high-level peer-reviewed conferences. Her research interests include queueing theory, stochastic processes, optimization theory and their applications; heterogeneous wireless networking, machine-to-machine, wearable and device-to-device communications.