



HELLENIC REPUBLIC
Ministry of Digital Policy,
Telecommunications and Media



IEEE 5G Greece Summit

Tuesday, July 11, 2017

Thessaloniki, Greece

Conference Centre of Piraeus Bank (12-14 Katouni st., Thessaloniki, Greece)

Program-at-a-glance

Opening Session

(08:45 – 09:00)

Panel: The Global 5G Vision, Standardization and Telecommunication Policies

(09:00 – 10:45)

Coffee Break (10:45 – 11:00)

Session 1: The Network and Verticals Perspective

(11:00 – 13:30)

Lunch Break (13:30 – 14:00)

Session 2: The 5G eco-system and IoT

(14:00 – 15:15)

Session 3: The Radio Perspective for 5G

(15:15 – 16:30)

Coffee Break (16:30 – 16:45)

Session 4: European Research Projects on 5G

(16:45 – 19:00)

Closing Session

(19:00 – 19:15)

Information about the Distinguished Speakers

Dr. Erik Dahlman

Ericsson



Talk: *NR - The new 5G radio access*

Abstract: The presentation will provide an overview of the 3GPP 5G specification activities targeting completion of the first release of NR, the new 3GPP 5G radio-access technology, at the end of 2017.

Bio: Dr. Erik Dahlman is currently Senior Expert in Radio Access Technologies within Ericsson Research. He was deeply involved in the development and standardization of 3G radio access technologies (WCDMA and HSPA), first in Japan and later within the global 3GPP standardization body. Later on he was involved in the standardization/development of the 3GPP Long Term Evolution (LTE) and its continued evolution. His currently focuses on research and development of future 5G wireless access technologies.

Mariana Goldhamer
4GCelleX



Talk: *Towards a 5G mobile system architecture - standardization update*

Abstract: The presentation will focus on 5G radio access system requirements and new architecture solutions as reflected in the latest 3GPP 5G drafts and published standards.

Bio: Mrs. Mariana Goldhamer is the owner and principal consultant of 4GCelleX, Israel, having a vast expertise in the standardization of wireless systems, including regulatory aspects. She has participated actively in 3GPP, IEEE, ETSI, ITU-R and ECC, serving also in officer positions. Mariana currently participates in 3GPP 5G standardization in RAN3, following also developments in RAN, RAN1, RAN2 and SA2; she has contributed to 5G requirements and architecture. In ETSI BRAN she acts as Rapporteur of the study on coordinated coexistence in 5GHz. In ECC PT1 she contributed in relation to the improvement of European regulations for allowing flexible duplex in FDD up-link channels. As partner in EC FP7 project COHERENT, in addition to RTD activities, she is responsible of standardization and leads the activity related to dissemination, IPR and exploitation. She authored a chapter in the ISTE-Wiley book "Radio Resource Management in WiMAX".

Dr. Riccardo Trivisonno

Huawei



Talk: *5G Phase 1 Standardization: Reality Check*

Abstract: The presentation will address the key features that will be included in the first 5G System release, according to the current work about to be completed by relevant standardization bodies. The presentation will also hints to some relevant requirements which might not be fully addressed by the first 5G system release.

Bio: Dr. Riccardo Trivisonno received his MSc. and PhD in Telecommunications Engineering from University of Bologna, in 2000 and 2005 respectively. He has over 17 year experience in R&D departments of cutting edge telecommunication companies. In his career he mostly focused on the standardisation, design, development and deployment of Mobile Broadband Networks, covering both Radio Access and Core Network technologies. He joined the Future Network Technologies department at Huawei ERC in 2012, and since then he has been working on 5G End to End Network Architecture definition, Fixed-Mobile Convergence and Network Slicing. He is currently leading the End to End Architecture and Slicing team at Huawei ERC, in Munich.

Dr. Tilemachos Doukoglou
COSMOTE S.A.



Talk: 5G, a Network Operator's Point of View

Abstract: The important aspect of 5G for Network Operators that plan to rollout and operate a 5G network are being presented. Namely the importance of Network Slices as well as the need for new Radio Interfaces and Spectrum are discussed. Network Slicing is a concept for running multiple logical networks as virtually independent business operations on a common physical infrastructure. Network Functions Virtualization (NFV) and Software-Defined Networking (SDN) and Software-Defined Radio (SDR) technologies are key components for the successful implementation of Network Slices. Finally the key focal points for the DT-group (including OTE/Cosmote Group of companies) with respect to 5G and the Vertical Fields of Development (i.e. massive IoT, Automotive and Energy) are mentioned.

Bio: Dr. Tilemachos D. Doukoglou holds a diploma in Electrical Engineer from the Aristotle University of Thessaloniki - Greece (1986) and an M.Eng. (1989) and a Ph.D. (1994) degree in Electrical and Biomedical Engineering from McGill University of Montreal-Canada. He has also been a Visiting Research Eng. and Post-Doc in the Bioinstrumentation Lab of the Massachusetts Institute of Technology, Cambridge, MA-USA (1994 & 1995). Since 1995 he has been involved in various EU R&D Programs as Technical Responsible and Project Manager in the areas of Biomedical Eng., Telemedicine, IT, Networking and Telecommunications. Dr T. Doukoglou is currently the Head of OTE's group Laboratories responsible for new technologies test and evaluation. His interests are in the area of Broadband Network Technologies and Services (G.fast, Super-Vectoring, XG-PON, and Hybrid Access), development of platforms for new service and service-support like IMS, SDN/NFVs, Telemetry (SmartGRID & Smart Metering) and Networking & Cloud (i.e. Virtual CPEs).

Argiris Darzentas
Vodafone Group Services Limited



Talk: NR - The path to 5G: Impact & challenges for MNO network

Bio: Mr. Argiris Darzentas is an Access Transmission Design Manager at Vodafone, reporting to Europe Head of Transmission & Transport Networks. He drives engineering activities related to planning, design and optimization of Access Transmission Networks for all countries in the European Region. He is a telecom professional with almost 20 years in field experience, 10 of which in managerial positions. He has contributed in planning, design & deployment of broadband telecommunications in Greece and he carries extensive knowledge in both Fixed and Mobile technologies. He joined Vodafone in 2009. Mr. Darzentas holds a Diploma in Mechanical Engineering from the Polytechnic School of University of Patras.

Victor Pascual

ZTE



Talk: *ZTE vision on 5G technology-Leading 5G Innovations*

Abstract: ZTE is a leader in 5G research globally, and 5G will be critical for the digital transformation for operators and enterprises. In this presentation we are taking the opportunity to talk about the 5G leading innovations, our vision and where exactly this is taking us to by being actively involved in standardization proposals. In sight of the huge requirements of data volumes in every area of telecommunication systems including the mobile world 5G will be the first major answer to that by expanding the spectrum, slicing it in even more tiny parts and effectively providing numerous connections to machines that reach the order of thousands - this is nothing more than the IoT (Internet of Things). ZTE's target for earliest commercialization renders our solution a promising one indeed in combination to the fact that we have already been exposed to 5G since 2009 starting with the most fundamental white papers to the most recent developments regarding the Pre-5G launching, the new dedicated R&D Center in Tokyo and the first prototypes that came into existence. Last but not least, the commence of collaborations with renown operators worldwide is presented to complete our talk in the IEEE 5G Greece Summit.

Bio: Victor Pascual is a Senior wireless technology leader and highly motivated professional. Driven innovator with strong expertise in Radio and Network IP deployment for the last 15 years. He joined ZTE in 2014 in the role of Chief RAN Responsible for Iberia (Spain & Portugal) and Lead Responsible for promotion of Pre5G & 5G in Europe. Prior to ZTE, Victor worked for Operators specializing in strategy definition mostly as RAN & Technology Director in Clearwire where he led all aspects of business strategy, R&D, and rollout deployments around Europe. Later he was the Technical Responsible in the Orange Spain LTE ramp-up deployment. Worked on the development of Wimax and LTE specifications in WimaxForum and 3GPP. Victor has a MSc in Telecommunication Engineering, Telematics & Bioengineering from Universidad Politecnica de Madrid UPM (Spain).

Maria Boura

Ericsson South East Europe



Talk: 5G and its business potential for digitalization

Abstract: 5G is not just another generation of mobile communications technology. 5G can be seen as "the network of networks" and it is going to have a profound impact on all human activities, the economy and the society. In fact, 5G can be seen as the digitalization catalyst for industries, as a variety of use cases will be either enhanced or created by the use of 5G. Immersive gaming, autonomous driving, remote robotic surgery and augmented reality support in maintenance and repair situations are just some of the use cases that will mostly benefit from the introduction of 5G. But what is the business potential of 5G? Ericsson, together with Arthur D. Little recently made a unique study in order to understand the industrial digitalization revenues for ICT players in 8 key industries. We will share these findings with the Summit's audience.

Bio: Maria Boura is currently the Head of Government & Industry Relations and Communications at Ericsson South East Europe (10 countries) since October 2016. A thought leader and strategist with solid business understanding and international experience in complex high technology multi-customer, multi-country environment, Maria has matured a long, solid experience from leadership positions across a variety of functions in the ICT industry. Distinguished speaker and senior Ericsson spokesperson at events and industry conferences. Maria is used to leading change across large organizations and has a proven ability to build trusted customer relationships and to deliver win-win results in fast-paced, complex environments. She has worked both in Greece and abroad, speaks four languages and has an international culture and mindset. Before Ericsson, Maria has worked at Intracom S.A., a Greece-based leading ICT company, as well as at the National Centre for Scientific Research Demokritos. She has a Bachelor's Degree in Physics from the University of Patras in Greece, as well as a Master's Degree in Telecommunications from the National & Kapodistrian University of Athens. Maria is passionate about promoting more women in leadership positions and in ICT. Since May 2016, she is one of the founding members of the non-profit Women Leadership Hub Association – WLH. She has served in the past as Member of the Board of Directors at WOMEN (Women Manager & Entrepreneurs Institute) of the Hellenic Management Association. She is also a volunteer expert at the startup accelerator Metavallon.

Dr. Dimitrios Vergados

Hellenic Telecommunications and Post Commission



Talk: Spectrum and regulatory considerations for the 5G

Bio: Dimitrios D. Vergados received the Ph.D. degree from the National Technical University of Athens, Zografou, Greece. He is currently an Assistant Professor with the Department of Informatics, University of Piraeus, Greece. He has several publications in journals, books, and conference proceedings. His research interests are in the area of computer networks and telecommunication systems, cloud computing and green technologies, and computer vision. Dr. Vergados has served as a committee member and evaluator in national and international organizations and agencies and as a chair and a technical program committee member in several international conferences. He is a member of the editorial board in international journals and a reviewer in several journals and conferences.

Abhimanyu Gosain

PAWR Project Office, Northeastern University



Talk: Platforms for Advanced Wireless Research (PAWR): Exploring a new Research Paradigm

Abstract: The overwhelming growth in the types and number of mobile devices that are accessing the Internet create a growing demand for smarter architectures at all abstraction layers. To meet the challenge, we present PAWR (Platforms for Advanced Wireless Research); a \$100M US public-private research partnership program to support creation of four at-scale experimental platforms. We share our vision of creating a platform architecture, which is extremely agile, dynamic, cost-effective, adaptable, sliceable and extensible, giving unprecedented programmability and control to a broad set of researchers. The talk details an emerging research paradigm supported by PAWR, where heterogeneous edge devices, new air interfaces and multi-tier cloud architectures can collaborate to sense, process, analyze data and create many novel applications.

Bio: Abhimanyu Gosain is the Technical Program Director for the Platforms for Advanced Wireless Research (PAWR) Project office at Northeastern University. He has previously worked as Network Scientist at Raytheon BBN Technologies and Lead wireless system engineer for the NSF GENI project. He has developed, operated and managed multiple large scale distributed research test-beds and services. Abhimanyu is an IEEE Senior Member. He received his M.Sc. degree in Electrical Engineering from Tufts University and MBA from Boston University.

Dr. Konstantinos Samdanis

Huawei



Talk: 5G Network Slicing: Use Cases and Key Technologies

Abstract: Network slicing has evolved from a simple fixed network overlay concept to a fundamental feature of the emerging multi-provider fifth generation (5G) systems, enabling new business opportunities by facilitating flexible and agile support for multi-service and multi-tenancy. Network slicing can drastically transform the monolithic “one network fits all” architecture by abstracting, isolating, and separating logical network behaviors from the underlying physical network resources, opening the network to third parties and providing the means of integrating vertical market segments. This presentation brings light into some of the fundamental use cases and associated requirements of network slicing providing and overview of the key technologies.

Bio: Konstantinos Samdanis (konstantinos.samdanis@huawei.com) is a principal researcher at Huawei for 5G carrier networks. He is involved in research for 5G architectures and network slice OS, while being also active at BBF in wireless-wired converged networks and the 5GPPP Architecture Working Group. Previously he worked for NEC Europe, Germany, as a senior researcher and a broadband standardization specialist, involved in numerous EU projects including 5G-NORMA, iJOIN, BeFemto and 3GPP SA2 and SA5. He is the author of more than 50 academic publications and 20 patent applications. He received his Ph.D. and M.Sc. degrees from Kings College London.

Dr. Xavier Costa-Pérez
NEC Laboratories Europe



Talk: *5G Network Slicing for Industry Verticals*

Abstract: Mobile Networks shall transform from today's rigid solutions to SDN/NFV-based networks able of simultaneously supporting a diverse range of networking and computing requirements to meet the specific needs of vertical industries. A new networking paradigm known as "Network Slicing" has emerged for 5G as the most promising approach to address this challenge. 5G Networks are expected to adopt the "Network Slicing" paradigm by provisioning and managing slices tailored to the needs of vertical industries such as automotive, healthcare and media. In this talk, we will review the state-of-the-art of network slicing and present current R&D efforts towards achieving the 5G Networks vision.

Bio: Xavier Costa-Pérez is Head of 5G Networks R&D at NEC Laboratories Europe, where he manages several projects focused on 5G mobile core, backhaul/fronthaul and access networks. He is a 5GPPP Technology Board member and the Technical Manager of the 5G-Crosshaul and 5G-Transformer projects. His team contributes to NEC projects for products roadmap evolution as well as to European Commission R&D collaborative projects and has received several NEC's R&D Awards for successful technology transfers. In addition, the 5G team contributes to related standardization bodies: 3GPP, ETSI NFV, ETSI MEC, IETF and OPNFV. Xavier has served on the Program Committees of several conferences (including IEEE Greencom, WCNC, and INFOCOM), published at top research venues and holds multiple patents. He received both his M.Sc. and Ph.D. degrees in Telecommunications from the Polytechnic University of Catalonia (UPC) and was the recipient of a national award for his Ph.D. thesis.

Dr. Kostas Katsalis
Huawei Munich



Talk: *Network Slices Towards 5G Communications*

Abstract: The upcoming 5G ecosystem is envisioned to build business-driven Network Slices to accommodate the different needs of divergent service types, applications and services in support of vertical industries. In this presentation we describe the Network Slicing concepts, by unveiling a novel Network Slicing architecture for integrated 5G communications. Further, we demonstrate its realization, for the case of evolved LTE, using state of the art technologies. Finally, we elaborate on the LTE specific requirements towards 5G and point out existing challenges and open issues.

Bio: Dr. Kostas Katsalis is a Senior Researcher in Eurecom, France. He holds a Ph.D. and a MSc in Electrical Engineering both from University of Thessaly, Greece under the supervision of Prof. Leandros Tassioulas. He received his diploma in Electrical and Computer Engineering from University of Patras, Greece in 2005. He has participated in the technical management activities for the FP7 CONTENT and 5G-PPP XHAUL, and he is now involved in the 5G-PPP COHERENT and the Fire+Q4Health projects. He is also a member and funding member of the MOSAIC-5G open source community. His research interests focus on Network Function Virtualization, Software Defined Networks, Network Slicing, Network Security, RAN technologies, Service Differentiation, QoS.

Prof. Panagiotis Demestichas

University of Piraeus



Talk 1: Emerging 5G technologies and insights from experiments with selected vertical domains

Abstract: The talk will start from an introduction of certain technology advancements that are advanced and matured towards the introduction to 5G systems. These are: (a) the new radio interface below 6 GHz; (b) the joint management of spectrum range that encompasses bands up to the millimetre wave range (as well as diverse licensing regimes). The second part of the talk will place attention on technical challenges that need to be further addressed: (a) the advent and exploitation of “software networks”, the ability to conduct “on-the-fly” network optimization and service management, including the optimal deployment of 5G functionality in a fog/edge/cloud context; (b) the partitioning of functionality between hardware and software, and the necessary hardware developments. A third part of the talk will be targeted to the needed stronger engagement of artificial intelligence in the management of 5G systems; there is need for realizing essential upgrades in the 5G intelligence, which will need to be embedded at the MAC, RRM and management layers, in order to deliver the diverse services, handle the proliferation of devices, and efficiently utilise the available resources. Finally, an important part of the talk will be on application areas. In particular, an area that will be addressed is that of enhancing industrial automation, in terms of latency and reliability, through selected 5G technologies, therefore, realizing an essential part of the Factory of the Future vision.

Talk 2: Framework for the Design, Development and Orchestration of 5G-ready Applications and Network Services, over Sliced Programmable Infrastructures

The talk will present the objectives and approach of the 5G PPP phase 2 MATILDA project. MATILDA will design and implement an operational framework for enabling applications to become 5G-ready. The framework will comprise a unified programmability model, control abstractions, and an open development environment relevant to application, as well as network functions developers. Intelligent and unified orchestration mechanisms will be developed for the automated placement of the applications, and for the creation and maintenance of the required network slices. A set of optimisation mechanisms will be offered (of application components and/or network functions), in order to provide the best deployment plans and runtime adaptations (of application components

and/or network functions), taking into account high level objectives and policies. Network and application-oriented analytics and profiling mechanisms will be supported based on realtime as well as a posteriori processing of the collected data from a set of monitoring streams. Multi-site management of the IoT and cloud/edge computing resources will be supported. Network management activities will be provided by a multi-site NFV Orchestrator (NFVO). The talk will cover the planned developments and validation activities, as well as foreseen exploitation and impact.

Bio: Prof. Panagiotis Demestichas received the Diploma and the Ph.D. degrees in Electrical Engineering from the National Technical University of Athens (NTUA). He is full Professor (since April 2012) and has been the Chairman (September 2011 – September 2015) of the Department of Digital Systems of the University of Piraeus. From October 2015 to September 2016 he was on Sabbatical, collaborating with the University of Surrey and in particular its 5G Innovation Center. He has over 25 years of experience in R&D in the fields of wireless/mobile broadband networks, fixed-mobile broadband convergence, Internet technologies, network planning and management, smart utilities, smart cities and environment management. Recent interests include 5G aspects, and especially, the exploitation of spectrum beyond 6 GHz, overall spectrum management, 5G architectures, artificial-intelligence-based and predictive management, virtualization technologies based on SDN and NFV. He has several publications in these areas in international journals and refereed conferences. At the European level, he is coordinating and contributing to a number of international research and development programs. He has shaped several development collaborations with international and national industrial entities, as well as public-sector organizations. He has organized the European Conference on Networks and Communications (EUCNC 2016), which took place in Athens, Greece in June 2016, and was focused on technologies and use cases signalling “The Dawn of 5G”. In terms of standardization, he has contributed to various standardization bodies such as ETSI and IEEE. He was also chairing Working Groups of WWRF related to next-generation networking and advanced management technologies. He is a senior member of the IEEE, member of ACM and the Technical Chamber of Greece.

Dr. Carla Fabiana Chiasserini
Politecnico di Torino



Talk 1: 5G and Automotive The Perfect Storm?

Abstract: The talk will provide an overview of the 3GPP standardization roadmap and current status for what concerns the support of automotive applications. It will also highlight the main pillars of the 5G technology that will be exploited for the support of such services, specifically, network slicing, multi-access edge computing, vehicular communications and mmWave communications.

Talk 2: 5G-Transformer: 5G Mobile Transport Platform for Verticals

Abstract: 5G-Transformer is a phase-2 5G PPP H2020 project, which will design the 5G transport network for the effective support of a large variety of computing and networking requirements that meet the needs of vertical industries, namely, automotive, media and healthcare. The project will define services and how they should be implemented, leveraging the SDN and NFV technologies. Special effort will be devoted to the realization of vertical and horizontal slices spanning across different domains.

Talk 3: 5G-Crosshaul Project overview and Demo Activity

Abstract: 5G-Crosshaul is a 5G PPP H2020 project that aims at optimally integrating the fronthaul and backhaul segments of the network. This new transport network flexibly interconnects distributed 5G radio access and core network functions, hosted on in-network cloud nodes, through the implementation of novel network elements. The project demonstrates innovative services for the integration and exploitation of mmWave radio communications and efficient management of user mobility, energy and network resources.

Bio: Carla Fabiana Chiasserini is an Associate Professor at Politecnico di Torino, Italy. She holds the Italian habilitation for a Full Professor position in the field of Telecommunications. Carla is also a Research Associate with the Italian National Research Council (CNR), a member of the Scientific Committee of the Bruno Kessler Foundation, and a member of the EU Network2020 Expert Group. She has been a Visiting Researcher at UC San Diego from 1998 to 2003, and a Visiting Professor at

Monash University in 2012 and 2016. Her research interests include 5G Networks, Mobile Edge Computing, and Connected Vehicles. She published over 280 journal articles and referred conference papers. Her h-index is 44. Currently, she serves on the Executive Editorial Committee of the IEEE Transactions on Wireless Communications and on the journal editorial boards of IEEE Transactions on Mobile Computing, European Transactions on Emerging Telecommunications Technologies, and Computer Communications (Elsevier). She holds four patents. Carla has been involved in many National and International research projects, either as a coordinator or a participant, including the EU H2020 5G-Crosshaul, 5G-TRANSFORMER and I-REACT projects.

Dr. Athanasios Lioumpas

CYTA Hellas



Talk: Network slicing: A key technology for 5G and its impact on virtual mobile network operators

Abstract: The industrial telecommunications sector stands currently at the forefront of a new era, which is marked by the transition to the new generation of wireless communications, namely the rise of 5G. With the recent explosion of the Machine-to-Machine (M2M) communications and the Internet-of-Things applications, the internet traffic is growing exponentially. Future networks should support applications with extremely variant Quality of Service (QoS) requirements, from low throughput and generally medium delay (M2M) to very high throughput and low delay (high definition real-time video). To this end, network slicing is becoming extremely important for such network and service deployments, especially for virtual network mobile operators (MVNOs), where the optimization of the network resource utilization is very crucial. Network slicing is expected to provide services in a “plug-and-play” fashion, which will enable faster provisioning and more efficient utilization of resources. Especially for MVNOs, the project is expected to provide an easier and more effective way to select the mobile network operator to be connected to, which would result in important cost savings and better QoS.

Bio: Athanasios Lioumpas has been working at Cyta Hellas since 2013, being the scientific lead in the company’s research projects in the Telecoms sector, while also being a principal engineer in the company’s MVNO network. He holds a Diploma in Electrical & Computer Engineering (2005) and a PhD in Telecommunications Engineering (2009), both from Aristotle University of Thessaloniki. He has published more than 50 scientific articles in international journals and conferences in the field of M2M, IoT and mobile communications, while he has been granted 5 patents.

Dr. Manolis Chaniotakis

Forthnet Group



Talk: *Forthnet / Nova in 5G*

Abstract: The talk introduces Forthnet / Nova to the audience presenting the company's history and current business and technology data. The talk explores then our expectations from the 5G era considering business models applied to emerged end-user services and how a content provider like Nova can exploit the advanced 5G capabilities. Finally, the presentation points out in high-level some challenges to be faced in 5G design and rollouts that may deem the adoption level and the success of 5G services.

Bio: Dr. Manolis Chaniotakis was born in Athens, Greece on August 30, 1975. He received his Dipl-Ing. Degree and his Ph.D from the Electrical and Computer Engineering School of the National Technical University of Athens (NTUA) in 1999 and 2003 respectively. He employed as a research associate in the Telecommunications Laboratory of NTUA for more than 6 years and he has participated in many EU funded and national projects. Since 2005, he holds managerial positions in networks design and technology development departments in various telecommunications service providers in Greece, dealing with large scale telecommunications projects. He is currently leading the Engineering department of Forthnet, the largest 3Play service provider in Greece. Among his interests are broadband and optical transmission technologies, SDN/NFV architectures, services and applications engineering including Video OTT, VAS and data analytics. He is member of the Technical Chamber of Greece.

Dr. Mahesh K. Marina
The University of Edinburgh



Talk: *Towards a Future Multi-Service Mobile Network Architecture*

Abstract: 5G is on the horizon. In this talk, I will take a service-oriented perspective of 5G aimed at supporting a wide range of services, differing significantly in their service requirements and device types (including machine-type devices). As a one-size fits all architecture is unlikely to be suitable for such diverse use cases, realizing the service-oriented 5G vision necessitates a highly flexible mobile network architecture that can turn the underlying physical infrastructure into multiple logical networks or slices, one per service instance. I'll highlight our RAN-centric work on developing FlexRAN and Orion systems that form the key building blocks for a flexible end-to-end mobile network architecture and enable network slicing in 5G. Time permitting, I'll also outline challenges to be addressed going forward.

Bio: Dr. Mahesh Marina is currently a Reader in the School of Informatics at the University of Edinburgh, where he has been since November 2006. Before joining Edinburgh, he had a two-year postdoctoral stint at the UCLA Computer Science Department. He received his PhD in Computer Science from the State University of New York at Stony Brook. A key focus of his current research is on next-generation mobile networks, spanning various aspects including network architecture, spectrum management, QoE optimization and universal Internet access.

Dr. Gennaro Boggia
Politecnico di Bari



Talk: *Narrow-band IoT: an opportunity to extend IoT world with 5G*

Abstract: The Internet of Things (IoT), with its promise to create a connect world, with billions of interconnected smart objects, will pave the way to novel pervasive services in many application domains. But, new problems arise and it is no so clear how to create a so large interconnected domain of “things”. At the same time, the new Narrowband IoT (NB-IoT) technology has been introduced with the last cellular solutions (e.g., LTE and LTE-A). With its characteristics it could addresses main IoT key requirements: deployment flexibility, low device complexity, long battery lifetime, support of massive numbers of devices in an area. Therefore, it could be the best solution to extend the coverage of IoT domains creating a real connected world. In this talk, these aspects will be discussed trying to understand how to catch the opportunity of 5G to realize an IoT world.

Bio: Gennaro Boggia received, with honors, the Dr. Eng. Degree in Electronics Engineering in July 1997 and the Ph.D. degree in Electronics Engineering in March 2001, both from the “Politecnico di Bari,” Italy. Since September 2002, he has been with the Department of Electrical and Information Engineering at the “Politecnico di Bari”, Italy, where he is currently Associate Professor. From May 1999 to December 1999, he was visiting researcher at the TILab, TelecomItalia Lab, Italy, where he was involved in the study of the Core Network for the evolution of 3G cellular systems. In 2007, he was visiting researcher at FTW (Vienna), where he was involved in activities on passive and active traffic monitoring in 3G networks. He has authored or co-authored more than 120 papers in international journals or conference proceedings, gaining more than 3000 citations (source: google scholar). His research interests span the fields of Internet of Things (IoT), Network Security, Wireless Networking, Cellular Communication, Information Centric Networking, Protocol stacks for industrial applications, Internet measurements, Network Performance Evaluation. He is active in the IETF ICNRG working group and in the IEEE WG 6TiSCH. He is also regularly involved as member of the TPC of many prestigious international conferences. Currently, he serves as Associate Editor for the Springer Wireless Networks journal and Wiley Transactions on Emerging Technologies.

Dr. Marco Di Renzo
CNRS – CentraleSupélec



Talk: Spatial Modulation Based on Reconfigurable Antennas – A New Air Interface for the Internet of Things

Abstract: The emerging market of the Internet of Things (IoT) requires new energy-efficient and low-complexity Multiple-Input-Multiple-Output (MIMO-) aided radio access technologies. This trend will have a profound impact on both the theory and practice of future communication networks, which will not be purely optimized for approaching the attainable capacity anymore, but will explicitly include the energy efficiency during the design and optimization of the entire protocol stack. In this talk, we put forth a recently introduced modulation scheme for IoT applications, which leverages the concepts of Reconfigurable Antennas (RecAnts) and Spatial Modulation (SM). RecAnt-SM constitutes a promising new air interface in the context of MIMO-aided transmission, which can be beneficially invoked for the design of medium-throughput, low-complexity and energy-efficient communication systems by using a limited number of RF chains and the flexibility of simple RecAnts designs. Theoretical and experimental results will be illustrated.

Bio: Marco Di Renzo received the "Laurea" and Ph.D. degrees in Electrical and Information Engineering from the University of L'Aquila, Italy, in 2003 and 2007, respectively. In October 2013, he received the Doctor of Science degree from the University Paris-Sud, France. Since 2010, he has been a "Chargé de Recherche Titulaire" CNRS in the Laboratory of Signals and Systems of Paris-Saclay University - CNRS, CentraleSupélec, Univ Paris Sud, France. He is an Adjunct Professor at the University of Technology Sydney, Australia, a Visiting Professor at the University of L'Aquila, Italy, and a co-founder of the university spin-off company WEST Aquila s.r.l., Italy. He serves as an Editor of IEEE COMMUNICATIONS LETTERS, IEEE TRANSACTIONS ON COMMUNICATIONS, and IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS. He is a Distinguished Lecturer of the IEEE Vehicular Technology Society and IEEE Communications Society. He is a recipient of several research awards, which include the Marie Curie Global Fellowship from the European Commission, the CNRS Award for Excellence in Research and in Advising Doctoral Students, the IEEE Jack Neubauer Memorial Award, the UK Royal Academy of Engineering Distinguished Visiting Fellowship, the IEEE ComSoc Best Young Researcher Award for Europe, Middle East & Africa Region (EMEA), the Network of Excellence in Wireless Communications Best Paper Award and several conference best paper awards. He is frequent tutorial and invited speaker at IEEE conferences..

Prof. Jean-Marie Gorce
INSA de LYON



Talk: *Toward haptic communications for IoT in 5G*

Abstract: Supporting IoT communications in future 5G networks is an important challenge that will be addressed in standardization. IoT services will rely on the deployment of billions of things communicating various traffic under many different quality of service requirements. In this sense, IoT requires a new wireless network paradigm especially for services based on bursty traffic of low rates but under strong reliability, security and real-time constraints. For this kind of services often referred to as tactile internet, where IoT nodes are deployed in smart environments (e.g. smart cities), high reactivity and reliability are mandatory to provide haptic communications. In this presentation we consider scenarios where there are a very large number of nodes in each cell that transmit with a very low probability, and we describe the cutting edge technologies and solutions that will allow to balance and optimize the different KPI: energy efficiency; spectral efficiency; complexity; reactivity and reliability.

Bio: Jean-Marie Gorce is Professor at the University of Lyon and the director of the Telecommunications department of INSA Lyon. He holds the Internet of Things industrial and research chair of INSA Lyon sponsored by SPIE ICS. JM Gorce received the PhD degree in Electrical Engineering from INSA Lyon in 1998. He is a co-founder of the Centre for Innovation in Telecommunications and Integration of Services (CITI) of which he was the director (2009-2014). He has been associated to Inria since 2003 and he was a visiting scholar at Princeton University from Sept. 2013 to Aug.2014. He is the scientific coordinator of the experimental facility FIT-CorteXlab and he was the principal investigator of several French or European sponsored projects related to wireless networks. He is an associate editor of the Eurasip journal of Wireless Communications and Networking (Springer). His research interests lie in wireless networking and communication theory, focusing on realistic modeling, wireless system optimization and performance assessment considering both infrastructure-based and ad hoc networks. He published more than 150 conference and journal articles.

Dr. Elias Yaacoub
Arab Open University



Talk: *Green Virtualization for Multiple Collaborative Cellular Operators: Benefits and 5G Challenges*

Abstract: This talk describes the synergy between smart grids and virtualization in cellular networks. A green virtualization framework for infrastructure sharing among multiple cellular operators, whose networks are powered by a combination of conventional and renewable sources of energy, will be discussed. Under the proposed framework, the virtual network formed by unifying radio access infrastructures of all operators is optimized for minimum energy consumption by deactivating base stations (BSs) with low traffic loads. The users initially associated to those BSs are off-loaded to neighboring active ones. A fairness criterion for collaboration based on roaming prices is introduced to cover the additional energy costs incurred by host operators. The framework also ensures that any collaborating operator is not negatively affected by its participation in the proposed virtualization. This green virtualization with multiple collaborative cellular operators faces significant challenges in a 5G context: How to account for massive machine type communication (mMTC), ultra reliability and low latency (URLLC) systems, and device to device (D2D) communications while still achieving energy gains? These challenges will also be addressed during the talk.

Bio: Elias Yaacoub received the B.E. degree in Electrical Engineering from the Lebanese University in 2002, the M.E. degree in Computer and Communications Engineering from the American University of Beirut (AUB) in 2005, and the PhD degree in Electrical and Computer Engineering from AUB in 2010. He worked as a Research Assistant in the American University of Beirut from 2004 to 2005, and in the Munich University of Technology in Spring 2005. From 2005 to 2007, he worked as a Telecommunications Engineer with Dar Al-Handasah, Shair and Partners. From November 2010 till December 2014, he worked as a Research Scientist / R&D Expert at the Qatar Mobility Innovations Center (QMIC). Afterwards, he joined Strategic Decisions Group (SDG) where he worked as a Consultant till February 2016. He is currently an Associate Professor at the Arab Open University (AOU). His research interests include Wireless Communications, Resource Allocation in Wireless Networks, Intercell Interference Mitigation Techniques, Antenna Theory, Sensor Networks, and Physical Layer Security.

Prof. Symeon Papavassiliou

NTUA



Talk: *COOL: Common Optimization and Operation framework based on network utility theory for 5G technologies & IoT*

Abstract: The proliferation of emerging networks and architectures, wireless access technologies and multi-homing smart devices, create a competitive environment where users and devices have access to various providers, resources and are offered with multiple service options. The latter is intensified with the emergence of several new paradigms including 5G technologies and Internet of Things (IoT) that increase both complexity and flexibility to unprecedented levels. This fact demands and motivates the development of user/device-centric distributed resource management, optimization and operation frameworks, which enable user's and device's self-optimization and autonomy. In such a competitive and distributed environment, network utility maximization theory and game theory arise as natural choices and powerful theoretical tools to cope with the corresponding problems, while properly capturing and reflecting users' behavior within the competitive arena of system's resource allocation. In the main part of the talk, the formulation of resource allocation problems in 5G wireless communication systems is discussed and game theoretic approaches are proposed to determine stable solutions. Multi-wireless communication networks are examined covering and reflecting several dimensions of heterogeneity, diversity and multiplicity, such as multi-tier architectures, multi-resources in nature or in properties, multi-services reflecting different QoS requirements and multi-providers. Adopting and studying a utility-maximization framework within the infrastructure of H2020 MONROE (Measuring Mobile Broadband Networks in Europe) project, we also study the interrelation between Quality of Experience (QoE) and Quality of Service (QoS) in mobile networks within the new emerging 5G environment. QoE-QoS mapping results are used in the designed utility functions for the support of several QoE-aware network operations, such as the selection of the interface that maximizes the user and/or network utility and QoE perceived by the users.

Bio: Symeon Papavassiliou is a full professor in the School of Electrical and Computer Engineering at the National Technical University of Athens. He received the diploma in electrical engineering from the National Technical University of Athens, Greece, in 1990 and the MSc and PhD degrees in electrical engineering from Polytechnic University, Brooklyn, New York, in 1992 and 1995, respectively. His main research interests lie in the area of communication networks, with emphasis on the analysis, optimization and performance evaluation of mobile and distributed systems, wireless

networks and complex systems, Internet of Things. From 1995 to 1999, he was a senior technical staff member at AT&T Laboratories, New Jersey. In August 1999 he joined the Electrical and Computer Engineering Department at the New Jersey Institute of Technology, USA, where he was an associate professor until 2004. He has an established record of publications in his field of expertise, with more than 250 technical journal and conference published papers. He received the Best Paper Award in IEEE INFOCOM'94, the AT&T Division Recognition and Achievement Award in 1997, the US National Science Foundation Career Award in 2003, the Best Paper Award in IEEE WCNC 2012, the Excellence in Research Grant in Greece in 2012, the Best Paper Award in the 7th International Conference on Ad Hoc Networks (ADHOCNETS 2015) in 2015 and the Best Paper Award in the 23rd International Conference in Telecommunications (ICT) in 2016. Dr. Papavassiliou also served on the board of the Greek National Regulatory Authority on Telecommunications and Posts (2006– 2009).

Prof. Petar Popovski
Aalborg University



Talk: *Research Challenges towards Ultra-Reliable Wireless Communications*

Abstract: One of the most innovative features brought by the 5G wireless systems is Ultra-Reliable Low-Latency Communication (URLLC), used for mission critical communications, such as reliable remote action with robots or coordination among vehicles. Once a system or service designer can safely assume that wireless connectivity is “truly anywhere and anytime” and can be guaranteed e.g. >99.99% of the time, the approach to system design and operation changes fundamentally. This talk will present several building blocks for achieving ultra-reliable communications, such as wireless channel models, packetization, and protocol design.

Bio: Petar Popovski is a Professor at Aalborg University. He received his Dipl.-Ing. /Magister Ing. in communication engineering from Sts. Cyril and Methodius University, Skopje, and his Ph.D. from Aalborg University. He is a Fellow of IEEE, holder of an ERC Consolidator Grant (2015) and recipient of the Danish Elite Researcher award (2016). He is an Area Editor for IEEE Transactions on Wireless Communications. His research interests are in wireless communications/networks, communication theory and 5G wireless systems.

Dr. Michalis Matthaiou
Queen's University Belfast



Talk: *Low Cost Massive MIMO: A key technology for 5G*

Abstract: Massive MIMO has been identified as a core technology for 5G networks. Huge spatial degrees-of-freedom are achieved by coherent processing over these massive arrays, which provide strong signal gains, resilience to imperfect channel knowledge, and low interference. This comes at the price of more infrastructure; the hardware cost and circuit power consumption scale linearly/affinely with the number of BS antennas. In this presentation, we will overview the concept of low-cost massive MIMO that promises to overcome these limitations by deploying low-quality hardware on each antenna branch. Some of our recent results will be presented along with a list of open challenges that need to be addressed in the immediate future.

Bio: Dr. Michalis Matthaiou is currently a Senior Lecturer at the ECIT Institute, Queen's University Belfast, U.K., after holding an Assistant Professor position at Chalmers University of Technology, Sweden. He has also held research visiting appointments at the University of Wisconsin-Madison, U.S.A. and Linköping University, Sweden. His research interests span signal processing for wireless communications, massive MIMO systems, hardware-constrained communications, and performance analysis of fading channels. He has co-authored some 150 papers on these topics.

Prof. Ana García Armada

UC3M



Talk: *A different look to Massive MIMO*

Abstract: Massive MIMO has emerged as a promising enabler of 5G and beyond because of its potential energy- and spectral-efficiency. By now its theoretical basis is well understood while there are many implementation issues that must be solved. Conventionally, massive MIMO is assumed to be deployed in time division duplex (TDD) networks where the required channel estimation for precoding and coherent detection is feasible. Yet, calibration to compensate the differences in RF equipment is needed and the pilot contamination remains as a problem to solve for a good system-level performance. Moreover, in the most widespread configuration under study, single-antenna User Equipment (UE) are assumed to be communicating with Base Stations (BS) equipped with a very large number of antennas. In this talk a different look to massive MIMO is presented. First, non-coherent massive MIMO is proposed as a way to dispense with channel estimation and ease implementation. Second, a textile antenna hub is shown as a way to deploy a very large number of antennas also at the UE side. In both cases, the involved technologies are explained and their performance is analyzed in the context of the potential applications for 5G and beyond.

Bio: Ana García Armada received the Ph.D. degree in electrical engineering from the Polytechnical University of Madrid in February 1998. She is currently Professor at University Carlos III of Madrid, Spain, where she has occupied a variety of management positions (Head of Signal Theory and Communications Department, Vice-dean of Electrical Engineering, Deputy Vice-Chancellor of International Relations, among others). She is leading the Communications Research Group at this university. She has participated (and coordinated most of them) in more than 30 national and 10 international research projects as well as 20 contracts with the industry, all of them related to wireless communications. She is the co-author of eight book chapters on wireless communications and signal processing. She has published around 150 papers in international journals and conference proceedings and she holds four patents. She has contributed to international standards organizations such as ITU and ETSI and is member of the expert group of the European 5G PPP. She serves on the editorial boards of Physical Communication, IET Communications and IEEE Communications Letters. She has served on the TPC of more than 40 conferences and she has been part of the organizing committee of IEEE 5G Summit-Lisbon 2017, UNET 2017, IEEE Third Women's Workshop on Communications and Signal Processing 2016, EuCNC 2015, and MOBILIGHT 2010. She is an active

member of IEEE ComSoc Communication Theory Committee, Newsletter Editor of the IEEE ComSoc Signal Processing and Consumer Electronics Committee, and Secretary of the IEEE ComSoc Women in Communications Engineering Standing Committee. She has received a Young Researchers Excellence Award and an Award to Best Practices in Teaching, both from University Carlos III of Madrid, Her main interests are multi-carrier and multi-antenna techniques and signal processing applied to wireless communications.

Dr. Claudio Fiandrino

IMDEA



Talk: *Millimeter-Wave Based Networking in 5G Communication Systems*

Abstract: Millimeter-wave (mm-wave) systems exploit frequencies above 10 GHz and have emerged as a key wireless technology in next fifth-generation (5G) networks. Communications at such high frequencies poses unique challenges. On one hand, mm-wave systems achieve data rates that are orders of magnitude higher than systems operating at lower frequencies. On the other hand, they experience high variability in channel quality due to high propagation loss and unfavorable atmospheric absorption, which can be overcome by using highly directional antennas. This results in much higher degree of spatial reuse and lower interference if compared with omni-directional communication at lower frequencies. However, the high directionality may cause communication blockages as the channel may appear and disappear because of beam misalignments. The talk specifically focuses on networking aspects of mm-wave communication systems. It first overviews mm-wave communication characteristics, and then focuses on networking and protocol design aspects, including beam-training, the impact on transport protocols and the application to localization systems. The talk will then present enabling concepts for 5G systems operating in mm-wave bands, including architectural enablers and radioaccess-network functionalities that have been developed in the framework of mmMAGIC project.

Bio: Claudio Fiandrino is a postdoctoral researcher at IMDEA Networks Institute, Madrid, Spain, where he joined the Wireless Networking Group in December 2016. He is currently working on the 5G-PPP mmMAGIC project. Claudio received the Bachelor Degree in Ingegneria Telematica and the Master Degree in Computer and Communication Networks Engineering from Politecnico di Torino in 2010 and 2012 respectively and the Ph.D. Degree from the University of Luxembourg in 2016. Claudio's work on indoor localization over fog computing platforms received the Best Paper Award in IEEE CloudNet 2016. Claudio was a Visiting Ph.D. Student for three months at Clarkson University, NY, USA. He served as Publication and Web Chair at IEEE CloudNet 2014 and as TPC member in several IEEE and ACM conferences and workshops. His primary research interests are in transport-layer performance of mm-wave communications, cloud-ran and mobile crowdsensing..

Prof. Constantinos B. Papadias
Athens Information Technology



Talk: *Terrestrial communication in the X / K bands aided by hybrid antenna arrays and precoding techniques*

Abstract: This talk will focus on the use of hybrid (parasitic) antenna arrays for wireless backhauling in the X / K spectrum bands. These bands are intended for terrestrial communication between base station nodes, but the corresponding ground links may also interfere with satellite-ground links operating in the same frequencies. In the presentation we will show a number of recent results obtained in the context of the H2020 project SANSA and aimed at mitigating the interference and increasing the spectral efficiency of these terrestrial links. The proposed techniques rely on the use of low-cost antenna arrays, which are combined with link-dependent precoding in order to keep a low computational and hardware complexity . The performance is evaluated over simulated terrestrial links that include both measured and modeled channel characteristics.

Bio: Constantinos B. Papadias is the Dean (Scientific Director) of Athens Information Technology (AIT), in Athens, Greece, where he is also Professor and Head of its Broadband Wireless and Sensor Networks (B-WiSE) Research Group. He is also an Adjunct professor at Aalborg University in Denmark. Papadias received the diploma of electrical engineering from the National Technical University of Athens (NTUA) in 1991 and the doctorate degree in signal processing (highest honors) from the Ecole Nationale Supérieure des Télécommunications (ENST), Paris, France, in 1995. He was a researcher at Institut Eurécom (1992-1995), Stanford University (1995-1997) and Bell Labs (as a member of the technical staff from 1997-2001 and as technical manager from 2001-2006). He was also an adjunct professor at Columbia University (2004-2005) and Carnegie Mellon University (2006-2011). His research interests span several areas of advanced communication systems, with emphasis on wireless, cognitive, green and next-generation networks. He has published over 180 papers, one research monograph, two edited books, eight book chapters, and has received over 7,500 citations for his work. He has also made standards contributions and holds 12 patents. He was a member of the Steering Board of the Wireless World Research Forum (WWRF) from 2002-2006, a member and Industrial Liaison of the IEEE's Signal Processing for Communications Technical Committee from 2003-2008 and a National Representative of Greece to the European Research Council's IDEAS program from 2007-2008. He has served as member of the IEEE Communications Society's Fellow Evaluation

and Awards Committees, as well as an Associate Editor for the IEEE Transactions on Signal Processing, the IEEE Transactions on Wireless Communications and the Journal of Communications and Networks. He has participated in several European Commission research grants, including the Horizon2020 project SANSA in the area of satellite-assisted wireless backhauling and another two FP7 research projects where he acts as technical coordinator: HARP, in the area of remote radio heads, and ADEL, in the area of licensed shared access. His distinctions include the Bell Labs President's Award (2002); a Bell Labs Teamwork Award (2003); the IEEE Signal Processing Society's Young Author Best Paper Award (2003); ESI's "most cited paper of the decade" citation in the area of wireless networks (2006); his recognition as a "Highly Cited Greek Scientist" (2011); and the co-authorship of two papers that earned Best Student Paper Awards at the IEEE International Conference on Bioinformatics and BioEngineering (2013 & 2014). He was a Distinguished Lecturer of the IEEE Communications Society for 2012-2013. Dr. Papadias is a member of the Technical Chamber of Greece and a Fellow of IEEE.

Dr. Gunes Karabulut Kurt
Istanbul Technical University



Talk: *Battle of the Waveforms for 5G*

Abstract: Orthogonal frequency division multiple access (OFDMA) became the most popular multiple access technique in wireless networks, addressing the high data rate challenges even in frequency selective fading environments. Yet it still has some vulnerabilities, including the sensitivity to frequency/time offsets and high peak to average ratio values. The techniques to address these issues mainly consider solutions that reduce the energy and spectral efficiency of OFDMA. As 5G requirements are extremely strict in terms of efficiency, researchers have been looking for alternatives to OFDMA in terms of different waveforms. To alleviate the tight synchronization requirements and inefficient spectral characteristics such as high spectral side lobe levels and cyclic prefix overhead, filtered waveforms are considered. This talk will cover the candidate 5G waveforms from an implementation perspective using software defined radio nodes, especially focusing on universal filtered multi-carrier (UFMC) based approaches. An overview of real-time measurement results will be presented, comparing the error performances and side-lobe levels of the candidate waveforms.

Bio: Gunes Karabulut Kurt (M06, SM'15) received the B.S. degree with high honors in electronics and electrical engineering from Bogazici University, Istanbul, Turkey, in 2000 and the M.A.Sc. and Ph.D. degrees in electrical engineering from the University of Ottawa, ON, Canada, in 2002 and 2006, respectively. From 2000 to 2005, she was a Research Assistant with the CASP Group, University of Ottawa. Between 2005 and 2006, she was with TenXc Wireless, where she worked on location estimation and radio-frequency identification (RFID) systems. From 2006 to 2008, she was with Edgewater Computer Systems Inc., where she worked on high-bandwidth networking in aircraft and priority based signaling methodologies. From 2008 to 2010, she was with Turkcell Research and Development Applied Research and Technology, Istanbul. Since 2010, she has been an Associate Professor with Istanbul Technical University. Her research interests include sparse signal decomposition algorithms, multicarrier networks, traffic analysis, and network planning/management. She is a Marie Curie Fellow.

Dr. Anna Tzanakaki
University of Bristol



Talk 1: *5G-XHaul: A wireless-optical transport network with SDN control for converged fronthaul and backhaul services in 5G*

Abstract: Orthogonal frequency division multiple access (OFDMA) became the most popular multiple access technique in wireless networks, addressing the high data rate challenges even in frequency selective fading environments. Yet it still has some vulnerabilities, including the sensitivity to frequency/time offsets and high peak to average ratio values. The techniques to address these issues mainly consider solutions that reduce the energy and spectral efficiency of OFDMA. As 5G requirements are extremely strict in terms of efficiency, researchers have been looking for alternatives to OFDMA in terms of different waveforms. To alleviate the tight synchronization requirements and inefficient spectral characteristics such as high spectral side lobe levels and cyclic prefix overhead, filtered waveforms are considered. This talk will cover the candidate 5G waveforms from an implementation perspective using software defined radio nodes, especially focusing on universal filtered multi-carrier (UFMC) based approaches. An overview of real-time measurement results will be presented, comparing the error performances and side-lobe levels of the candidate waveforms.

Talk 2: *5G-PICTURE - Programmable Infrastructure Converging disaggregated neTwork and compUte Resources*

Abstract: 5G-PICTURE will design and develop an integrated, scalable and open 5G infrastructure with the aim to support operational and end-user services for both ICT and “vertical” industries. This infrastructure will rely on a converged fronthaul and backhaul solution, integrating advanced wireless access and novel optical network domains. 5G-PICTURE will adopt the novel concept of Disaggregated-Radio Access Networks through hardware programmability and will rely on network softwarisation to enable an open reference platform.

Bio: Anna Tzanakaki is an Assistant Professor at the National and Kapodestrian University of Athens, Greece and a Research Fellow at the University of Bristol, UK. She has obtained a BSc degree from the University of Crete, Greece, an MSc and a PhD both from the University of Essex, UK. She is a co-author of over 170 publications in international journals and conferences. She is a co-inventor of several granted and published patents and is serving as an associate editor of the IEEE/OSA Journal of

Optical Communications and Networks. She has actively participated in a number of European and national collaborative research projects and is currently the Technical Manager of the EU 5G PPP Phase 2 project 5G-PICTURE. Her research interests include network architectures, technologies and protocols in support of 5G Networks.

Dr. Artemis Voulkidis

Synelixis



Talk: *5G automation and qualification frameworks serving energy networks*

Abstract: The presentation will cover the developments of three 5G-PPP projects, that is Phase I project SONATA and Phase II projects 5G-TANGO and NRG-5. As service deployment automation is fundamental for guaranteeing fast, fault-tolerant and QoS-aware 5G networks, the existence of a relevant service platform facilitating the relevant operations is of primal importance. The 5G-PPP SONATA project provides an integrated service platform, accompanied by a relevant Software Development Kit, that facilitates the design of NFV forwarding graphs of intertwined services and automatically deploys them with a customizable orchestrator, compatible with multiple existing VIMs in the market. The 5G-PPP 5G-TANGO project aims at further enhancing the innovations of SONATA, while proposing a novel store platform with advanced validation and verification mechanisms for VNF qualification, bridging the gap between business needs and network operational management systems. Last, the versatility of 5G and its applicability over inter-disciplinary areas is tested against the smart energy networks case; with the advent of the Smart Grids and the increasing integration of electric vehicles and renewable energy sources in the power grids, the number of services ensuring secure and QoS-aware energy supply is only limited by the communication networks capabilities. The 5G-PPP NRG-5 project will investigate how 5G communications and NFVs implemented with the aid of domain-specific VNFs related to smart energy networks can be integrated under the 5G umbrella to ensure that tomorrow's smart grid networks are part of today.

Bio: Dr. Artemis Voulkidis holds his Dipl.-Ing. Degree in Electrical and Computer Engineering since 2007, his M.S. Degree in Techno-economics since 2010 and his PhD degree since 2013 on autonomous wireless communications with emphasis on WSNs, all from NTUA. He is the CEO and co-founder of Power Operations Ltd, also working as a Technical Director in Synelixis Solutions Ltd. He exploits his visionary spirit through his participation in various national or European R&D projects since 2008, while he is currently involved as senior researcher in EU-funded projects in the area of cloud computing, smart energy systems, Future Internet and 5G technologies within the FP7 and H2020 framework, including FI-PPP XIFI, FI-PPP FINESCE, H2020 DEFENDER and 5G-PPP NRG5. The results of his scientific research have been published in high-impact journals of the ACM and IEEE communities, while he also provides reviews for ACM and IEEE journals and conferences. He is a member of the Technical Chamber of Greece.

Dr. Andreas Miaoudakis
FORTH



Talk: *VirtuWind: Virtual and Programmable Industrial Network Prototype deployed in operational Wind Park*

Abstract: VirtuWind, 5G-PPP phase-1 project, is developing and will demonstrate an SDN & NFV ecosystem, based on open, modular and secure framework showcasing a prototype for intra-domain and interdomain scenarios in real wind parks as a representative use case of industrial networks, and validate the economic viability of the demonstrated solution.

Bio: Andreas I. Miaoudakis was born in Heraklion, Greece in 1973. He received the Diploma in Electrical Engineering from the University of Patras, Greece in 1996. In 1997 he joined the Department of Electrical and Computer Engineering of the University of Patras where he worked as a research engineer in Applied Electronics Laboratory. In 2004 he received his Ph.D. degree in Electrical Engineering from the same University. He has been a member of the non-Ionizing Radiation Laboratory of Applied Informatics & Multimedia department of TEI of Crete. He is a research fellow of the Telecommunications and Networks Lab. of the Institute of Computer Science of the Foundation for Research and Technology - Hellas (FORTH). His research interests include embedded systems, wireless communication, radio system design, RF Integrated circuit design, radio propagation, IoT and Wireless Sensors Networks.

Dr. Olga E. Segkou
Orion Innovations PC



Talk: *5G ESSENCE: Embedded Network Services for 5G Experiences*

Abstract: 5G ESSENCE addresses the paradigm of Edge Cloud Computing and Small-Cell-as-a-Service, proposing improvements through centralisation of Small Cell functions, supporting a growing scale. The edge cloud environment is based on a distributed tier providing low-latency services, and a second centralised tier providing high processing power for computationally intensive network applications. The control and user planes of the Radio Access Network (RAN) are thus decoupled and the benefits of Cloud-RAN are fully exploited without the enormous fronthaul latency restrictions. End-to-end network slicing shares the 5G ESSENCE infrastructure among multiple operators/vertical industries, with customised capabilities per-tenant. High-performance virtualisation techniques are employed for data isolation, latency reduction and resource efficiency. 5G ESSENCE also shows how efficient placement and live migration of Virtualised Network Functions can be achieved through orchestration of lightweight virtual resources.

Bio: Dr. Olga Segkou is an R&D Manager at ORION Innovations P.C. She holds a diploma in Electrical and Computer Engineering from the University of Patras (2008), UoP, Greece. She also holds a PhD from the Electrical and Computer Engineering Department of the National Technical University of Athens (NTUA) and The National Center of Scientific Research “Demokritos”, under a fellowship from the Ministry of Education and the National Centre for Scientific Research “Demokritos”. Her PhD research was conducted in the Integrated Systems Laboratory of the Institute of Informatics and Telecommunications of NCSR “Demokritos” in the areas of indoor localization, ad-hoc networks and embedded systems. She has also been a member of the Technical Chamber of Greece since 2008 and a registered Data Controller with the Hellenic Data Protection Authority since 2014.

Dr. George Agapiou
COSMOTE S.A.



Talk: Main aspects and impact of 5G-Phase II projects Bluespace and 5G-Media

Abstract: The talk will be concentrated on the recent achievements on media-related applications and how these applications can be coupled with 5G-networks and how space division multiplexing (SDM) technology can be coupled with WDM to enable a front-haul infrastructure for overcoming the future high increase in capacity networks.

Bio: Dr. George Agapiou is a telecommunications engineer, holding a PhD from the Georgia Institute of Technology. He is the head of the Measurements and Wireless Technologies Research Laboratory of the OTE SA. He has participated in various FP6, FP7, IST, STREP, Eurescom, e-ten, H2020, 5G-PPP phase I and phase II projects and has published more than 100 papers in scientific journals and proceedings and is the technical manager of the FITCE Association.

Dr. Kostas Pentikousis
Travelping GmbH



Talk: *The 5G COHERENT Architecture*

Abstract: The 5G COHERENT project has published a control and coordination architecture which features three key innovations: a) SDN for Radio Access Networks, b) flexible spectrum management, and c) wireless abstractions and well-defined control interfaces for heterogeneous mobile networks. This talk will introduce the 5G COHERENT architecture blueprint, overview the associated wireless network abstractions, and point to the associated open-source implementations already available to researchers and industry engineers alike.

Bio: Kostas Pentikousis has 20 years of experience in the computer networks area. In the past, he held development, research, and management positions in the United States, Finland, and Germany. As business development manager at Travelping GmbH in Berlin, Germany, he focuses on carrier-grade network functions virtualization and software-defined telecom infrastructures. He holds a Ph.D. in computer science from Stony Brook University.

Dr. Louis Christodoulou

Samsung



Talk: *5G-Xcast , developing Broadcast and Multicast capabilities for the 5G*

Abstract: 5G-XCast is a 5GPPP Phase-2 project dedicated to meeting the large scale demand for next generation immersive multimedia. The project will devise, assess and demonstrate a conceptually novel and forward-looking 5G network architecture for large scale immersive media delivery. With a large and experienced set of partners, the project covers the complete Media and Entertainment value chain from content creation through to the end user device.

Bio: Louis Christodoulou received his Ph.D. degree in electronic engineering from the University of Surrey, U.K., in 2016, focussing on the development of a hybrid unicast broadcast enhanced multimedia delivery framework over LTE. His current research interests include multipoint transmission techniques and with experience working in the television broadcast industry; future multimedia content delivery, mobile broadcast, and radio resource management. He is currently a 5G Research Engineer with Samsung Electronics Research and Development Institute, U.K. contributing to the Fantastic-5G and 5G-Xcast 5GPPP Projects.

Dr. Anastasius Gavras

Eurescom



Talk: End-to-End Cognitive Network Slicing and Slice Management Framework in Virtualised Multi-Domain, Multi-Tenant 5G Networks

Abstract: 5G use cases are so diverse and challenging that the 5G networks must be customisable for a broad range of individual scenarios. 5G network providers are keen to offer “Network as a Service” where logical network slices are created and allocated to use cases flexibly and efficiently in a multi-operator environment. The use of cognitive network management, control and orchestration techniques for the provision and operation of end-to-end slicing across multi-operator domains in 5G networks is the approach that project SLICENET has chosen to design, prototype and demonstrate an innovative, verticals-oriented, QoE-driven 5G network slicing framework. The integrated SLICENET framework is based on requirements from three vertical industries, namely energy, health and smart cities and will demonstrate its capabilities on selected representative use cases from these verticals. Taking into consideration the unique perspectives and requirements of different stakeholders, SLICENET offers a one-stop shop solution to meet the service requirements for 5G vertical businesses. It enables the verticals to plug and play their use cases with bespoke control to employ 5G slices in a scalable, cost efficient way via “Scalable Slicing as a Service” functions. For 5G service providers and users, SLICENET provides unprecedented guaranteed service quality by agile cognitive QoE-optimisation of service creation and delivery. For 5G network operators, SLICENET presents an integrated FCAPS (Fault, Configuration, Accounting, Performance and Security) framework for true end-to-end management, control and orchestration of slices by secured, interoperable, and reliable operations across multi-operator domains..

Bio: Anastasius Gavras has more than 25 years of professional experience in academic and industry research. He joined Eurescom, the leading organisation for managing collaborative R&D in telecommunications, more than 18 years ago as programme manager, focusing on the areas of management of networks & systems, security and middleware. In these areas he has managed a large number of studies and projects on topics, which are of concern to the Eurescom member community of European telecom network operators and the European telecom industry at large. He has served as coordinator of several Research and Innovation projects under the European framework programmes and has experience in standardisation among others in OMG and ITU-T for which he has served as

rapporteur. His current interests are large scale testbed for enabling experimentation in 5G infrastructure technologies and systems among others in the context of the 5G Public Private Partnership (5G-PPP) and Future Internet Research and Experimentation (FIRE). He is interested in innovation on top of 5G infrastructures and Future Internet platforms and the evolution of the networks in general. He is or was steering board member of major European PPPs and initiatives such as 5G-PPP, FI-PPP and FIRE. He is currently the co-ordinator of the project reTHINK (<https://rethink-project.eu>) in the area of Future Internet Architectures and member of the management team of the 5G projects SLICENET and SELFNET. He is author or co-author of several papers, articles and books. He is member of the editorial board of the Eurescom mess@ge magazine and has authored several articles for the magazine, typically with a techno-socio-economic dimension.

Dr. George Kalfas
Aristotle University of Thessaloniki



Talk: 5G-PHOS Project: 5G integrated Fiber-Wireless networks exploiting existing photonic technologies for high-density SDN-programmable network architectures

Abstract: 5G-PHOS aims to architect and evaluate 5G broadband wireless networks for dense, ultra-dense and Hot-Spot area use cases drawing from recent results in optical technologies towards producing and exploiting a powerful photonic integrated circuit technology toolkit. It aims to streamline advances in multi-format and multi-bitrate optical communications, in InP transceiver, in Triplex optical beamformers and in integrated optical add/drop multiplexers in order to migrate from CPRI-based towards integrated Fiber-Wireless (FiWi) packetized C-RAN fronthaul supporting massive mmWave MIMO communications. It will deliver a set of SDN-programmable units, called FlexBox and FlexBox-Pro, that will be compatible with the emerging 25Gb/s PON access networks and can deliver FiWi traffic ranging between 25-400Gb/s as well as a set of three different 64x64 MIMO Remote Radio Head configurations exploiting analog optical beamforming and producing 25Gb/s, 100Gb/s and 400Gb/s wireless data-rates. 5G-PHOS will also present an integrated FiWi packetized fronthaul for supporting Medium-Transparent Dynamic Bandwidth Allocation mechanisms and cooperative radio-optical beamforming, operating under a converged FiWi SDN control plane for optimally orchestrating both the optical and the wireless resources. These blocks will be integrated towards architecting 5G networks for 3 use cases, evaluating their performance in lab-scale and field-trial experiments in telecom operator premises and a football stadium.

Bio: Dr. Kalfas has received his BSc and MSc from the Department of Informatics of the Aristotle University of Thessaloniki in Greece, and his PhD from the Technical University of Catalonia in Barcelona, Spain. Since 2013 he is serving as a research associate in the Aristotle University of Thessaloniki, while in the past (2006-2013) he served as a research assistant in the Information Technologies Institute (ITI) of the Center for Research and Technology Hellas (CERTH). He has extensive expertise in designing and implementing MAC protocols for converged FiWi applications as well as in hybrid optical/wireless networks' throughput and delay mathematical analysis. He has co-authored more than 20 publications in esteemed journals and peer-reviewed conferences.