Reti Radiomobili

Ciclo di seminari: Aspetti e Prospettive dei Sistemi Radiomobili di Nuova Generazione

Prof. Giuseppe Araniti

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- **04.05.2020 – 9:00-11:00**

Massimo Condoluci: “*5G Network Architecture and Procedures*”

- **05.05.2020 - 11:00-13:00**

Giovanni Interdonato: “*Multiple Antenna Communications and Radio Stripes for 5G and Beyond* ”

- **11.05.2020 - 9:00-13:00**

Antonino Orsino: “*5G New Radio: Current Status and Future Directions in 3GPP*”

- **12.05.2020 - 11:00-13:00**

Luca Piccinelli: “*5G Use Cases: Introduction and Best Practices*”

- **18.05.2020 - 9:00-13:00**

Saverio Orlando: “*Managing a 5G Virtual Network*”

- **19.05.2020 - 9:00-11:00**

Chiara Suraci: “*Security Risks in 5G Virtualized Cellular Networks*”

Massimo Condoluci

Massimo Condoluci is an Experienced Researcher at Ericsson Research, Stockholm, Sweden, since 2018. He is contributing to 3GPP standardization activities and is serving as 5GAA delegate. His current research area focuses on new concept design of network architectures and protocols for beyond 5G networks. He has been contributing to the enhancement of network architecture and protocol for introducing network proactiveness in 5G, with focus on automotive use cases. He is a member of the editorial board of Mobile Information Systems and Wireless Communications and Mobile Computing. From 2016 to 2017, he was a Research Associate at the Centre for Telecommunications Research (CTR), King's College London, UK, where he focused on fixed-mobile convergence and radio-access optimization for haptic communications. He received the Ph.D. degree in information technology in 2016 from the University Mediterranea of Reggio Calabria, Italy, where he focused on access optimization for MTC and resource allocation for multicasting. From the same university, he received the M.Sc. and B.Ss. degrees in telecommunications engineering in 2011 and 2008, respectively.

5G Network Architecture and Procedures

5G systems take advantage of several new features introduced in their design. With focus on network architecture, network functionalities have been simplified and the design has moved towards a service-based architecture being more cloud-friendly and allowing to implement in an easier way enhanced network features such as network slicing, service exposure, network optimization, etc. Features such as QoS managements have been empowered, not only in terms of network capabilities to fulfill extreme requirements but also in terms of providing enhanced interaction between network and application to support more advanced use cases requiring enhanced knowledge of network capabilities, e.g., automotive use cases. Finally, the system architecture started to introduce dedicated functions for analytics and forecasts. All these enhancements together offer the possibility to 5G system to become a proactive mobile system, supporting advanced network configurations and extreme applications.

Giovanni Interdonato

Giovanni Interdonato ha ricevuto la Laurea Magistrale in Ingegneria Informatica e dei Sistemi per le Telecomunicazioni dall'Università Mediterranea di Reggio Calabria nel 2015, e il Licentiate degree of Engineering in Communication Systems dall'Università di Linköping (LiU), Svezia, nel 2018. Attualmente è studente all'ultimo anno di dottorato presso il dipartimento di Electrical Engineering (ISY), LiU. Inoltre, dal 2015, è ricercatore presso il dipartimento di Radio Network di Ericsson Research, Ericsson AB, Linköping. Dal 2015 al 2018 è stato un Marie Sklodowska-Curie Research Fellow, parte del progetto H2020 ITN denominato 5G wireless, e beneficiario di una borsa di studio dall'Unione Europea. Le sue attività di ricerca riguardano principalmente sistemi Massive MIMO e cell-free Massive MIMO, e protocolli di comunicazione in sistemi 5G NR. È co-inventore di circa 20 brevetti riguardanti i sistemi Massive MIMO

Multiple Antenna Communications and Radio Stripes for 5G and Beyond

Negli ultimi anni stiamo assistendo ad una crescita esponenziale del traffico dati nei sistemi radiomobili. Tra gli altri, l'obiettivo del 5G (la quinta generazioni dei sistemi mobile) è quello di soddisfare questa incessante domanda garantendo all'utente altissime velocità di trasmissione dati (data rate), basse latenze e copertura onnipresente. Un mezzo con il quale questi requisiti possono essere soddisfatti è la cosiddetta tecnologia MIMO (multiple-input multiple-output) la quale si basa sull'utilizzo di molteplici antenne lato trasmettitore e ricevitore. L'obiettivo di questo seminario è quello di dare una prospettiva sulle diverse tecnologie multi-antenna che si sono susseguite in questi ultimi anni sino ad arrivare alla tecnologia Massive MIMO, fattore chiave nei sistemi 5G, ed alla tecnologia cell-free massive MIMO, considerata potenzialmente una delle tecnologie alla base dei sistemi mobile del futuro (6G). Il seminario si concluderà con la presentazione delle cosiddette Ericsson Radio Stripes, un concept riguardante l'implementazione di un sistema cell-free Massive MIMO. Concept brevettato da Interdonato con tre colleghi di Ericsson e presentato al Mobile World Congress 2019.

Antonino Orsino

Dr. Antonino Orsino is currently a Senior Research at Ericsson Research, Finland, and an Ericsson 3GPP delegate in the RAN2 WG. He received the B.Sc. degrees in Telecommunications Engineering from University Mediterranea of Reggio Calabria, Italy, in 2009 and the M.Sc. from University of Padova, Italy, in 2012. He also received his Ph.D. from University Mediterranea of Reggio Calabria, Italy, in 2017. He is actively working in 5G NR standardization activities and additional research interests include Device-to-Device and Machine-to-Machine communications in 4G/5G cellular systems, and Internet of Things. He is the inventor/co-inventor of 60+ patent families, as well as the author/co-author of 60+ international scientific publications and numerous standardization contributions in the field of wireless networks. He has been a co-organizer of the GET-IoT workshop co-located with the European Wireless 2017 and 2018 conference and co-chair of the Wireless Networking and Multimedia symposium within the IEEE/CIC ICCC 2018. He has served as TPC member and designated reviewer in many international IEEE conferences and journals. He received the Best Junior Carassa Award in 2016 as the best Italian junior researcher in Telecommunications.

5G New Radio: Current Status and Future Directions in 3GPP

New Radio (NR) technology aims to satisfy both urgent market needs - by assisting LTE radio - and the longer-term requirements of the 5th Generation on (5G). In this context, Non-standalone (NSA) NR, by means of EUTRAN-NR Dual Connectivity (EN-DC), where LTE will act as the anchor node while NR provides more throughput as a secondary node, is one of the primary technology components of 5G. The introduction of NSA NR will make the key benefits of 5G technologies available to users much earlier than expected (i.e., Q4 2019/Q1 2020) since it will allow mobile operators to leverage their existing LTE deployments with on-demand NR aggregation. On the other hand, the main aspects of NR standalone (SA) (i.e. NR that can operate without using LTE as an anchor) standardization has also been concluded and network operators are expended to start the commercial deployments as soon as the new 5G spectrum becomes available on a large scale and the last details of the 5G system architecture and 5G core network are completed/standardized.

In this tutorial, we will provide the current status of NSA and NR standalone concepts and describe the key features that have been specified by the 3rd Generation Partnership Project (3GPP) during Release 15 and also describe the further enhancements that are being standardized in Release 16 (expected to end by Q1/Q2 2020). Furthermore, we will analyze the NSA performance with respect to LTE and standalone NR and discuss the new concepts and upcoming features foreseen for the NR standardization such as Multi-RAT Dual Connectivity (MR-DC) cases with the 5G core network, 5GC.

Luca Piccinelli

PhD in Ingegneria delle TLC, ha lavorato prima in Space Engineering (1998), poi in Aeronautica Militare ed Alenia (1999-2000), poi in British Telecom, dove ha seguito il lancio dei primi sistemi UMTS. In TIM dal 2002, si è occupato di collaudo ed Ingegneria di sistemi mobili e terminali, contribuendo al lancio della tecnologia LTE. Delegato TIM del 3GPP RAN5 dal 2003 al 2006, Chairman dal 2003 al 2012 del gruppo tecnico dell'ente di certificazione internazionale dei cellulari GCF, è stato Board Director del GCF ed ha siglato il primo contratto di roaming tra TIM e Verizon nel 2012. In HUAWEI dal 2013, prima come Marketing Manager è stato responsabile di soluzioni Core Network LTE (EPC) e sistemi Multimedia Broadcast (e-MBMS), dal 2015 è responsabile di Innovazione, Marketing e Progetti Strategici in ambito Digital Services, Network Transformation, IoT, Video, 5G; è delegato Huawei nello Strategic Committee del progetto MISE Bari Matera 5G.

5G Use Cases Introduction and Best Practices

Saverio Orlando

Saverio Orlando is a seasoned manager with more than 38 years of experience in the ICT and Telco industry. Since 2019 he is a Board of Directors member at Università Mediterranea di Reggio Calabria.

He is co-founder and board of directors member at DigiAdvisors, a new consultancy firm offering advisory services to Telcos and Equity Firms in merge, acquisition and spin-off deals and to companies of different industries in the area of digital transformation.

He joined Telecom Italia in 1991 and he has held several technical and managerial roles in the Company including Interim CTO and Advisor to the CTIO, Head of Network Planning, Governance & Quality, Head of Network Development, Head of Fixed Network Engineering & Innovation, Head of Operations Support Systems, Head of Intelligent Network.

He participated to the evolution of the Mobile Network from 2G to 4G and as interim CTO promoted the first phase of the 5G evolution, including the first field deployment in Bari e Matera.

He participated to the deployment of xDSL technologies and to the evolution of the Fixed Network towards a Fiber and full IP network architecture.

Before to join Telecom Italia he also worked for Italtel (1982 to 1991) with different roles in the area of Data Networks.

He was Board of Directors member at INWIT, the leading tower company in Italy, and Vice President of ASATI, the TIM small shareholders association.

He received the M.Sc. degree in Electronic engineering in 1981 at the Polytechnic of Turin.

Managing a 5G Virtual Network

The 5G is not just a technology evolution from the 4G as was in the past for the evolution from 3G to 4G. The 5G is promising the creation of a new, open and more powerful ecosystem in which many different players should cooperate to create value through the continuous creation of new use cases and services, most of them connecting THINGS more than PEOPLE. In addition the new network architecture will widely use virtualized network functions (VNF), spread not only in the Core but also in the Edge, while the traditional Telco dedicated HW platforms will disappear. The quality of service and the SLAs required will be very challenging, the traffic behaviour less predictable and the network slicing will add complexity. In such environment consolidated processes, like Network Management or Service Activation, need to be completely redesigned as well as the applications used to support them. A new 5G management architecture, implementing a completely different framework, is required and processes need to be supported by technologies like AI, ML and Data Analytics in order to evolve towards a network automation environment.

Chiara Suraci

Chiara Suraci received her M.Sc. degree in Telecommunications Engineering from University *Mediterranea* of Reggio Calabria, Italy, in 2018. Currently, she is a Ph.D. student at the DIIES Department, University *Mediterranea* of Reggio Calabria, with scholarship supported by Vodafone and CNIT (Consorzio Nazionale Interuniversitario per le Telecomunicazioni), in order to investigate potentially harmful security risks for 5G networks. Her current research topics include 5G networks, Device-to-Device (D2D) communications, network security, and virtualization technologies.

Security Risks in 5G Virtualized Cellular Networks

Future fifth generation (5G) systems will mark a turning point in the evolution of mobile networks. Virtualization technologies represent one of the main pillars in the development of 5G. Actually, Multi-access Edge Computing (MEC), Software-Defined Networking (SDN), Network Function Virtualization (NFV), and Network Slicing are considered key enabling technologies for 5G virtualized systems. The aim of this lecture is primarily to identify and describe the main 5G stakeholders, i.e. the actors involved in the development and delivery of services of future generation mobile networks. Then, some business models will be described to illustrate the possible relationships established among the actors. Finally, security risks will be identified for each virtualization technology, with the focus on the stakeholders mainly involved.