EUCNC

THE CONNECTIVITY REVOLUTION

European Conference on Networks and Communications

Dubrovnik
Croatia
June 16-17 2020

VIRTUAL CONFERENCE FINAL PROGRAMME



VIRTUAL CONFERENCE

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MESSAGE FROM THE TECHNICAL PROGRAMME COMMITTEE CHAIR



Vlatko Lipovac
Technical Programme Committee Chair



Filipe Cardoso
Technical Programme Committee Co-chair

It is our great pleasure to welcome you to the 29th edition of the European Conference on Networks and Communications EuCNC 2020, which was supposed to take place in Dubrovnik, Croatia.

However, due to the well-known unfortunate circumstances that have almost shut down the world, the event turned to virtual. So, unfortunately, at this time, we will not have a chance to show and demonstrate to you all good things that we have been carefully preparing throughout almost two years for you to see, feel and taste in our beautiful city, the jewel of the Mediterranean.

Nevertheless, still we are delighted that we have lived up the motto "The Connectivity Revolution", preserving the wide recognition of EuCNC as the premier forum for presentation of research results, and being the best meeting point for technology visionaries and innovators from academia and industry to exchange their newest results and experience, paving the way to the overall success in this cutting-edge industry, aimed to revolutionize the mission of ICT in general.

As 5G is on its way to maturity, vision on beyond-5G, as well as even 6G, is under way to provide much more than just an evolution to even wider bandwidth and lower latency, but become a key enabler of end-to-end solutions through solving ever growing challenges in research and development, manufacturing and exploitation of the exciting new technologies for connecting the world at a pace it has never seen before.

The EuCNC heritage dates all the way back to 2G, and continues up to nowadays when state-of-the-art high-bandwidth and real-time 5G systems have become a key enabler of many new and unexpected application areas, among them autonomous driving, vehicle-to-everything communications, (industrial) Internet-of-Things with massive machine-type communications, as well as ultra-reliable low latency communications among others.

In this EuCNC edition, 134 submissions were received from 44 countries, not only from Europe, but also as much as 24.9 % from other regions, namely Asia/Pacific, USA, Middle East and Africa, Canada and Latin America. Each paper was reviewed by at least three qualified reviewers, with an overall acceptance rate of 50%.

Both on Tuesday, June 16th, and Wednesday, June 17th, the conference program starts and ends with a highlight of the latest research trends provided by renowned keynote speakers from academy and industry, whereas the panels will be centered on open RAN, Cybersecurity and 5G for verticals. Accepted papers and posters are organized in 6 tracks and 16 sessions.

We thank all authors for submitting their manuscripts, as well as the track co-chairs and reviewers for their devotion to selecting high quality contributions. Special thanks go to European Commission, the EuCNC 2020 sponsor and IEEE, as well as to Huawei Technologies, our Platinum Patron.

Finally, we would like to emphasize the hard work of the Local Organising Committee consisting of our young colleagues, and we thank them for their enthusiasm even when we realized that this event could not be organized the way we all planned and gladly expected.

We hope that you will enjoy the EuCNC 2020 program and consider contributing to EuCNC 2021 to be held in Porto, Portugal.

DUBROVNIK
Walk through centuries

An independent, merchant republic for 700 years (abolished by Napoleon in 1806), it traded with Turkey and India in the East (with a consul in Goa, India) and had trade representatives in Africa, in the Cape Verde Islands. It even had diplomatic relations with the English court in the Middle Ages. (There is a letter from Elizabeth I on display in the City Museum in Dubrovnik). Its status was such that powerful and rich Venice was envious of this Croatian-Slav city.



THE HISTORY OF DUBROVNIK IS REMARKABLE.

Dubrovnik's history witnesses the changing fortune of a borderland Mediterranean city-state that for centuries lived in harmony with its surroundings.

Originally called Ragusa, the city was founded in the 7th century as a refuge for coastal residents fleeing the advancing barbarians.

From the outset, the city was protected by defensive walls. The borderland status of the town was to be a determining factor in its history. Part of the Mediterranean cultural constellation, yet intimately connected to the Balkans. Catholic yet surrounded by Islamic and Orthodox neighbours.

The new city-state used its status as a crossroads between cultures and civilisations. The city thrived through extensive trade with other maritime ports such as Genoa, Pisa and Venice. Its continental trade networks also extended its reach into the Balkans with the Ottoman Empire. At the beginning of the 13th century, Dubrovnik fell under the control of the Most Serene Republic, staying under its Control until 1358.

Towards the end of the middle Ages, Dubrovnik's Maritime influence meant that it was the chief competitor of the Venetian empire for the Adriatic waterways. Its European educated diplomats and its widespread commerce allowed it to expand its influence beyond the Adriatic. Machiavelli was a notable luminary so impressed by the city that he applied to work there. City authorities were not impressed and turned him down.

Dubrovnik's ascent received a major blow in 1667 as a catastrophic earthquake destroyed a large amount of Renaissance art and architecture in the city. The Sponza and the Rector's palace were the only buildings that survived the natural disaster. The city was reconstructed in the baroque style that has survived intact until today. Despite the reconstruction, the decline of the Mediterranean as a hub for trade meant that Dubrovnik, like other Mediterranean ports, began a steady decline. By the time Napoleon arrived at the gates in 1806, the Republic of St Blaise was a shadow of itself.

The Congress system and Napoleon's campaign had extinguished the last vestiges of the Republic. In 1815, like much of the eastern Adriatic coast, Dubrovnik became part of the Habsburg Empire, where it would remain until 1918.

THE BEGINNING OF TOURISM

The period of Austrian dominance saw the early beginnings of tourism. Lord Byron on his Grand Tour was said to have called Dubrovnik 'the Pearl of the Adriatic'. Later, prominent authors like Bernard Shaw and Agatha Christie were dazzled by the perfectly preserved baroque oasis.

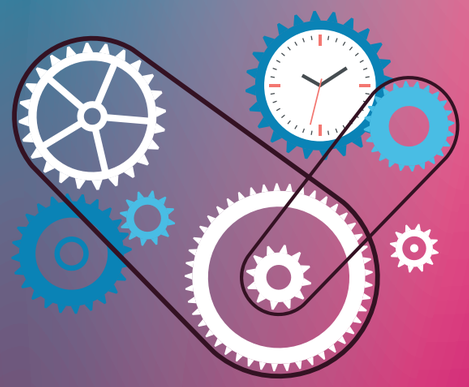
During the second Yugoslav period after 1945, the popularity of the city grew worldwide and millions marvelled at the medieval splendour. The importance of tourism meant that Dubrovnik was put on UNESCO's world heritage list in 1979.

RECENT HISTORY

Due to its historic borderland status, Dubrovnik was significantly affected by the break-up of Yugoslavia. In the early 90s, Greater Serb aggression resulted in Dubrovnik suffering its most serious existential threat. Over two-thirds of the historic town's buildings were hit by artillery. The town's cobbled streets were struck by hundreds of direct hits. For the first time in history, the medieval city walls themselves received over a hundred direct hits. Many historic palaces were badly damaged by the resulting fires. The renowned Sponza and Rector's Palace, St Blaise's church, the Franciscan monastery and the Amerling and Onofrio fountain all suffered severely.

Source: www.dubrovnik-travel.net

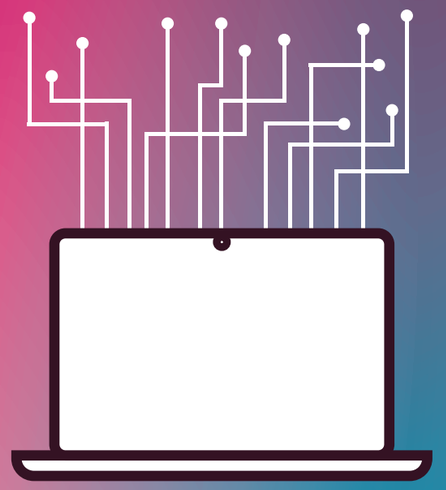




DEVELOPMENT
CAREER
OPPORTUNITY
MENTORSHIP
SUPPORT
DIVERSITY







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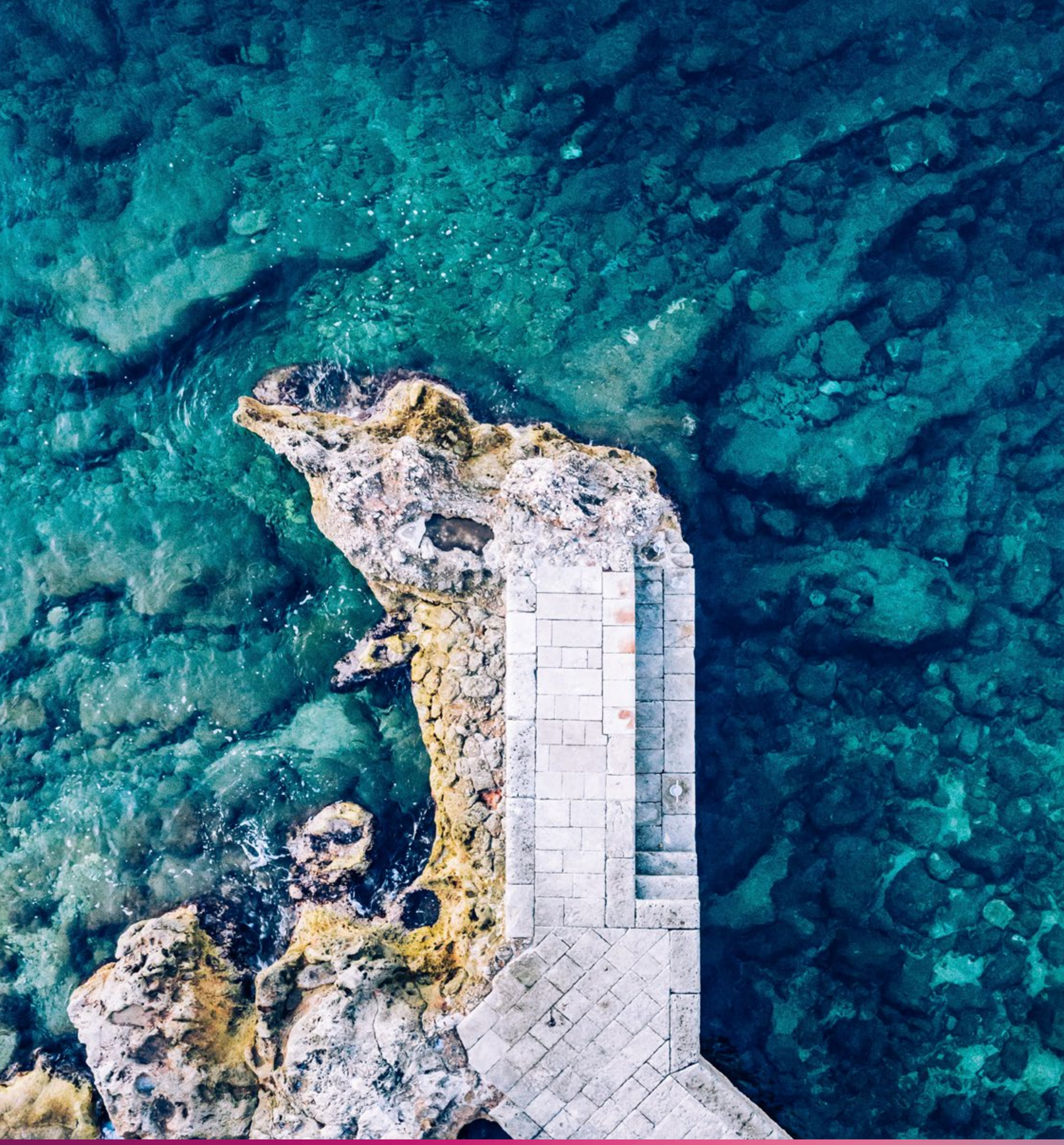

PROGRAMME

TUESDAY, 16 JUNE 2020

Time (CEST)	Recommended re-viewing	Live interaction	Non-Live interaction (Chat)
09:15 – 10:00	**KEYNOTE 1** MATTI LATVA-AHO		
10:00 – 10:30		***OPENING SESSION***	
10:30 – 10:45		**KEYNOTE 1** MATTI LATVA-AHO	
10:45 – 11:30	**PANEL 1** **CYBERSECURITY IN 5G, INCLUDING VERTICALS**		
11:30 – 12:15		**PANEL 1** **CYBERSECURITY IN 5G, INCLUDING VERTICALS**	
12:15 – 14:30	**NET1:** Network Slicing for Innovative Beyond 5G Applications **OPE1:** Operational & Experimental Insights #1 **PHY1:** Emerging Aspects on Propagation for Wireless Applications **POS1:** Poster Session 1 **RAS1:** Radio Access and Softwarisation **VAP1:** IoT Security and 5G economy **VAP2:** IoT Security and Performance Analysis **WOS1:** 5G NR and Beyond		**NET1:** Network Slicing for Innovative Beyond 5G Applications **OPE1:** Operational & Experimental Insights #1 **PHY1:** Emerging Aspects on Propagation for Wireless Applications **POS1:** Poster Session 1 **RAS1:** Radio Access and Softwarisation **VAP1:** IoT Security and 5G economy **VAP2:** IoT Security and Performance Analysis **WOS1:** 5G NR and Beyond
14:30 – 15:15	**PANEL 2** **OPENRAN, INCLUDING INTEROPERABILITY/ INTERWORKING WITH VENDOR SOLUTIONS**		
15:15 – 16:00		**PANEL 2** **OPENRAN, INCLUDING INTEROPERABILITY/ INTERWORKING WITH VENDOR SOLUTIONS**	
16:00 – 16:45	**KEYNOTE 2** DAN KILPER		
16:45 – 17:00		**KEYNOTE 2** DAN KILPER	

WEDNESDAY, 17 JUNE 2020

Time (CEST)	Recommended re-viewing	Live interaction	Non-Live interaction (Chat)
09:45 – 10:30	**KEYNOTE 3** NICOLAS DEMASSIEUX		
10:30 – 10:45		**KEYNOTE 3** NICOLAS DEMASSIEUX	
10:45 – 11:30	**PANEL 3** **5G FOR VERTICALS: BUILDING AND EXPLOITING SYNERGIES**		
11:30 – 12:15		**PANEL 3** **5G FOR VERTICALS: BUILDING AND EXPLOITING SYNERGIES**	
12:15 – 14:30	**NET2:** Virtualisation, Cloud, and Convergence **NET3:** Software-based and Self-driving Networks **OPE2:** Operational & Experimental Insights #2 **PHY2:** Emerging Transmission Techniques for Next Generation Wireless Communication Systems **PHY3:** Emerging Coding Techniques for 5G **POS2:** Poster Session 2 **VAP3:** IoT and the Urban Ecosystem **WOS2:** Aerial and V2X Networks		**NET2:** Virtualisation, Cloud, and Convergence **NET3:** Software-based and Self-driving Networks **OPE2:** Operational & Experimental Insights #2 **PHY2:** Emerging Transmission Techniques for Next Generation Wireless Communication Systems **PHY3:** Emerging Coding Techniques for 5G **POS2:** Poster Session 2 **VAP3:** IoT and the Urban Ecosystem **WOS2:** Aerial and V2X Networks
14:30 – 15:15	**KEYNOTE 4** WEN TONG		
15:15 – 15:30		**KEYNOTE 4** WEN TONG	
15:30 – 16:00		***CLOSING SESSION***	



KEYNOTES

TUESDAY, 16 JUNE 2020

KEYNOTE 1
KEY DRIVERS AND RESEARCH CHALLENGES FOR 6G



Matti Latva-aho
Director for 6G Flagship,
University of Oulu, Finland

Recommended re-viewing
Tuesday, 16 June 2020, 09:15-10:00 CEST

Live interaction
Tuesday, 16 June 2020, 10:30-10:45 CEST

PROGRAMME

Abstract

As 5G research is maturing towards a global standard, the research community must focus on the development of beyond-5G solutions and 2030 era, i.e. 6G. It is not clear yet what 6G will entail. It will include relevant technologies considered too immature for 5G or which are outside the defined scope of 5G. It is envisioned that we need new KPI drivers towards 6G besides the current 5G technical superiority KPIs: global megatrends, UN sustainability goals, emerging new technical enablers are emerging critical drivers towards 2030 solutions. Global coverage with services scaling, super efficient short range connectivity and accurate localization are missing features within current mobile systems and deserve special attention. Value chains are likely to be revolutionized via emergence of different verticals needs as well as local spectrum licensing. To summarize, 6G is not only about moving bits: it will become a framework of services, including communication service where all user specific computation and intelligence may move to edge cloud. Integration of sensing, imaging and highly accurate positioning capabilities with mobility opens a myriad of new applications in 6G era.

CV

Matti Latva-aho received the M.Sc., Lic. Tech. and Dr. Tech (Hons.) degrees in Electrical Engineering from the University of Oulu, Finland in 1992, 1996 and 1998, respectively. From 1992 to 1993, he was a Research Engineer at Nokia Mobile Phones, Oulu, Finland after which he joined Centre for Wireless Communications (CWC) at the University of Oulu. Prof. Latva-aho was Director of CWC during the years 1998-2006 and Head of Department for Communication Engineering until August 2014. Currently he serves as Academy of Finland Professor in 2017 – 2022 and is Director for National 6G Flagship Programme for 2018 – 2026. His research interests are related to mobile broadband communication systems and currently his group focuses on beyond 5G systems research. Prof. Latva-aho has published close to 500 conference or journal papers in the field of wireless communications. He received Nokia Foundation Award in 2015 for his achievements in mobile communications research.

TUESDAY, 16 JUNE 2020

KEYNOTE 2
INTELLIGENT OPTICAL SYSTEMS FOR A 5G WORLD



Dan Kilper
Director, Center for Integrated Access Networks, University of Arizona, USA

Recommended re-viewing
Tuesday, 16 June 2020, 16:00-16:45 CEST

Live interaction
Tuesday, 16 June 2020, 16:45-17:00 CEST

PROGRAMME

Abstract
Optical communication system technology development has historically been driven by performance advances in the backbone of the Internet. In recent years, markets have shifted, and the role of optical systems is being redefined. Metropolitan traffic growth continues to outpace long haul traffic growth, bringing more focus onto capacity and the use of optical systems in the network edge. The emergence of edge cloud computing and demanding requirements for 5G networks are adding fuel to this trend. Optical transmission inherently provides the deterministic, ultra-low latency and high speeds targeted in 5G and beyond networks. As a result, optical systems are undergoing a transformation from a high performance, capacity driven backbone technology to a scalable, flexible software defined edge network technology. Open and disaggregated optical line systems are being introduced in whitebox platforms using software defined networking controls. The system complexity required to handle the optical physical layer, however, remains an obstacle. The challenge for optical systems is to embrace a new roadmap that untangles this complexity in order to achieve the flexibility and intelligent software control needed to deliver on the full promise of the 5G vision.

CV
Dr. Dan Kilper is the Director of the Center for Integrated Access Networks and a research Professor in the College of Optical Sciences at the University of Arizona, Tucson. He holds adjunct faculty positions at the Columbia University Data Science Institute and Trinity College Dublin. He is a faculty appointee at NIST. He received MS (1992) and PhD (1996) degrees in Physics from the University of Michigan. From 2000-2013, he was a member of technical staff at Bell Labs, and he co-founded Palo Verde Networks, a startup developing optical technologies for AI controlled software-defined optical networks. He holds thirteen patents and authored six book chapters and more than one hundred sixty peer-reviewed publications. His research is aimed at solving fundamental and real-world problems in communication networks, addressing interdisciplinary challenges for smart cities, sustainability, and digital equity.

WEDNESDAY, 17 JUNE 2020

KEYNOTE 3
6G.WHY?



Nicolas Demassieux
Senior Vice President Research,
Orange, France

Recommended re-viewing
Wednesday, 17 June 2020, 09:45-10:30 CEST

Live interaction
Wednesday, 17 June 2020, 10:30-10:45 CEST

PROGRAMME

Abstract
As 5G deployments are happening around the globe, the research community has started to look into what could be the network technologies for the 2030 horizon. So far, research is ongoing on basic technology components, but initiatives are on preparation to build an initial vision on what a "Beyond 5G" or "6G" system could be and should do, like the ICT-52 call for projects in Europe. But after 30 years of successful development of mobile networks and of their extraordinary global adoption, we are entering a different era: what drove the technical evolutions (increase of coverage, throughput, capacity with lower latencies) could well be challenged by needs of a very different nature (sustainability, security and resilience, frugality...). In Orange, we think the technology has to respond to needs of the society. Citizens, enterprises, public services and communities should have a growing part of defining what comes next. The economics, energy and more generally environmental impacts need to guide the development of any large scale technological effort. This leads to trade-offs between requirements, tradeoffs that will need to be decided in the system design or to be left settable by operators and/or users when the technology is deployed. Therefore, we think it is essential that a vision of the needs of the society in 2030-2040 is framed in parallel with technological research, before we engage into putting together the technical components into an actual system design. In this talk, we will share our vision on the stakes of the 2030-2040 society that future networking technologies will need to address, as well as our priorities for Beyond 5G system design.

CV
Nicolas Demassieux leads the research of Orange, a company ranked 19th in BCG's 2018 most innovative companies report. With his team, he drives the vision, strategy and execution of research programs involving 700+ engineers and PhD students in multiple countries. A strong advocate of an integrative research culture, fully digital and human, he is involved in the domains of connectivity, infrastructure virtualization, IoT, Artificial Intelligence, Security and Trust, with application domains such as digital personal life, digital societies (cities, agriculture, transport, health, industry...), digital enterprises and digital emerging countries. Inspired by his interest in natural sciences (biology, ecology, geology) and his humanist vision, Nicolas is passionate about ethics, sustainable digital technology, and the evolution of our complex physical and biological planet.

WEDNESDAY, 17 JUNE 2020

KEYNOTE 4
6G: THE NEXT HORIZON



Wen Tong
Huawei Fellow, CTO, Huawei Wireless, Huawei Technologies, Canada

Recommended re-viewing
Wednesday, 17 June 2020, 14:30-15:15 CEST

Live interaction
Wednesday, 17 June, 15:15-15:30 CEST

PROGRAMME

Abstract
Today, 5G becomes a reality as we have witnessed the global roll-out of 5G networks. The 5G deployment will realize the vision of "connect of everything" and become the fundamental platform to enable the digital transformation for every vertical business.
Next on the horizon, we see the emerging of 6G, 6G is believed to realize "connected intelligence", and solving human challenges in many aspects. The research community start to look into the vision and requirements to define the 6G, the long term process for technology research, ecosystem alignment and global standardization will continue to carry on for next 5 to 8 years, in this talk we share our perspective on the 6G evolution and its path.
We also present the earlier definition for 6G and the view on enabling technologies. The spectrum allocation opportunities and envisioned timeline. We discuss the key question regarding the applications and services which can be enabled by 6G.

CV
Dr. Wen Tong is the Huawei Fellow, CTO, Huawei Wireless.
Dr. Tong is the head of Huawei wireless research. In 2011, He was appointed the Head of Communications Technologies Labs of Huawei, currently, he is the Huawei 5G chief scientist, spearhead to lead Huawei's 5G wireless technologies research and development.
Prior to joining Huawei in 2009, Dr. Tong was the Nortel Fellow and head of the Network Technology Labs at Nortel. He joined the Wireless Technology Labs at Bell Northern Research in 1995 in Canada.
Dr. Tong was elected as a Huawei Fellow and an IEEE Fellow. He was the recipient of IEEE Communications Society Industry Innovation Award for "the leadership and contributions in development of 3G and 4G wireless systems" in 2014 and IEEE Communications Society Distinguished Industry Leader Award for "pioneering technical contributions and leadership in the mobile communications industry and innovation in 5G mobile communications technology" in 2018. He had pioneered fundamental technologies from 1G to 5G wireless with 440 granted US patents.
Dr. Tong is a Fellow of Canadian Academy of Engineering, and he also serves as Board of Director of WiFi Alliance.



PANELS

TUESDAY, 16 JUNE 2020

PANEL 1
CYBERSECURITY IN 5G, INCLUDING VERTICALS

Organizer:
Demosthenes Ikonomou
(Head of Operational Security Unit, ENISA, EL)

Recommended re-viewing
Tuesday, 16 June 2020, 10:45-11:30 CEST

Live interaction
Tuesday, 16 June 2020, 11:30-12:15 CEST

PROGRAMME

Motivation and Background

5G is expected to bring important befits to the EU economy, as well as the society, since it is designed to support applications and services that go well beyond the typical mobile broadband communications. It is expected to support, and open new opportunities for, a number of critical sectors of European economy such as energy, transport, health, etc – the so-called verticals.
In order for 5G to reach its full potential, cybersecurity plays a critical role, even if comes at a cost.
The main objective of this panel is to provide a forum for the exchange of views on the cybersecurity challenges of 5G, not only from the perspective of 5G network operators and equipment vendors but also from the perspective of the vertical markets that are expected to benefit from the deployment of 5G technology.

Questions

1. How much does it cost and who is going to pay for Cybersecurity?
2. Who/where is the weakest link? How to reduce the attack surface?
3. Who will be liable? Operators and/or clients?
4. Does the toolbox need to be extended or adapted for private networks?
5. How to include external, private clouds from an end-to-end perspective?

Participants

The panel is composed of:

- **Chair: Demosthenes Ikonomou** (Moderator) (Head of Operational Security Unit, ENISA, EL)
- **John Hickey** (Security Engineer, Nokia, IE)
- **Ioannis Krontiris** (Privacy Engineer, Huawei, DE)
- **Fabio Martinelli** (Head of Research, Security Group, IIT – CNR & vice-chair of European Cyber Security Organisation, IT)
- **Mansoor Hanif** (Executive Director, Technology and Digital Infrastructure, Neom, KSA)



Demosthenes Ikonomou

Demosthenes Ikonomou, joined the European Union Agency for Cyber Security (ENISA) in 2008 and currently holds the position Head of Operational Security Unit. He received his Masters of Science in Electronics and Computer Sciences and his Ph.D. in applied sciences from the University of Southampton, United Kingdom, in 1992 and the Université catholiquue de Louvain-la-Neuve (UCL), Belgium, in 2002 respectively. Between 1996-2008 he worked for DG Information Society & Media of the European Commission (now Communications Networks, Content and Technology, CONNECT) mainly involved in the management of R&D projects in the fields of wireless and personal communications as well as networked media.



John Hickey

John Hickey is a senior security engineer with Nokia. With over 30 year's experience in the telecommunications industry, John has been involved in both system engineering and system verification of wireless access systems including GSM, WCDMA and LTE systems primarily. Today his focus is on security of both fixed and wireless systems and particularly security assurance of 5G systems. John leads the Nokia effort to align product security with global security assurance standards. He represents Nokia at the GSMA security assurance forum (SECAG) and is currently deputy chairperson of that group. He holds a Bachelor of Electronic Engineering degree (Honours) from the University of Limerick. He is a Certified Information Systems Security Professional (CISSP) since 2009.



Ioannis Krontiris

Dr. Ioannis Krontiris is a senior researcher at the European Research Center of Huawei in Munich, Germany, where he has been deeply involved in security and privacy technologies for vertical industries and in the last two years he has been focusing on Security and Privacy in C-V2X Identity Management. He has been serving as delegate to 5GAA Privacy and Security Working Group for the last two years. He has a Ph.D. Degree in Computer Science from University of Mannheim in Germany, and a M.Sc. Degree in Information Technology from Carnegie Mellon University in USA.



Fabio Martinelli

Fabio Martinelli is a research director of the Italian National Research Council (CNR) responsible for cyber security activities. He is also member of the Italian Committee for Cyber Security Research and is the co-chair of the Italian technological platform in homeland security (SERIT). His main research interests involve security and privacy in distributed and mobile systems and foundations of security and trust. He manages R&D projects on information and communication security and in particular, he has been the Project Coordinator of the EU Network on Cyber Security (NeCS) and of the Collaborative information sharing and analytics for cyber protection (C3ISP) project. Since 2004, he is in the board of directors of the international school on Foundations of Security Analysis and Design (FOSAD). He founded and chaired the WG on Security and Trust management (STM) of the European Research Consortium in Informatics and Mathematics (ERCIM). He is currently chair of the WG 11.14 in secure engineering of the International Federation of Information Processing (IFIP). He chaired the WG3 on Research and Innovation of the Network and Information Security (NIS) Platform promoted by the European Commission. He also serves as expert in the H2020 Protection and Security Advisory Group (PASAG) and acts as Vice Chairman of the Board of the European Cyber Security Organization (ECSO).



Mansoor Hanif

Mansoor Hanif is the Executive Director of Engineering in the Technology & Digital sector of NEOM. In his role, Mansoor oversees the design and implementation of all of NEOM's fixed, mobile, satellite and subsea networks. In addition, his team leads NEOM's initiatives on emerging technologies such as advanced robotics and human-machine interfaces. Mansoor has 26 years' experience in planning, building, optimising and operating mobile networks around the world. He was Director of Radio Networks at EE from 2011 to 2016. During the acquisition of EE by BT, he led the EE network Integration team. At BT, Mansoor was Director, from 2016 to 2018, of the Converged Networks Research Lab. From 2018 to 2020, Mansoor was CTO at Ofcom the UK's media and telecoms regulator, a role which included the responsibility to oversee the security and resilience of the UK networks.

TUESDAY, 16 JUNE 2020

PANEL 2
OPENRAN, INCLUDING INTEROPERABILITY/INTERWORKING WITH VENDOR SOLUTION

Organizer:
Jorge Pereira, Principal Scientific Officer, European Commission, BE

Recommended re-viewing
Tuesday, 16 June 2020, 14:30-15:15 CEST

Live interaction
Tuesday, 16 June 2020, 15:15-16:00 CEST

PROGRAMME

Motivation and Background

Quoting the Telecom Infra Project (TIP) industry association, OpenRAN is an initiative to define and build RAN solutions based on a general-purpose vendor-neutral hardware and software-defined technology. This will help operators cut the cost of building mobile networks by lowering the barriers to work with new vendors and improving network economics. With vendor-neutral hardware, it will reduce the reliance on a small number of vendors[, thus increasing supply chain security,] by de-coupling the hardware and software components of the network, and [will] decrease the expenditure incurred on network infrastructure.
OpenRAN – together with OpenCore – is expected to speed up of 5G network development through its open architecture by allowing for more innovative solutions, in particular those targeting verticals and private networks in general. For all that, the interworking with public systems, and namely with vendor solutions, is essential.
In this panel, we will discuss the challenges and opportunities of OpenRAN and the way forward in terms of facilitating deployment of 5G in a variety of scenarios, especially in a post-COVID recovery context.

Questions

1. What early deployment/coexistence lessons can be learned?
2. Which requirements need to be fulfilled in order to allow end-to-end "command-and-control", namely by enabling slicing across domains?
3. How to maximize synergies between vendor equipment and the innovation brought about by the OpenRAN ecosystem?
4. How to use OpenRAN as a means to secure the business chains, enlarge the ecosystem and achieve autonomy?

Participants

The panel is composed of:

- **Chair: Jorge Pereira** (Moderator) (Principal Scientific Officer, European Commission, BE)
- **Colin Willcock** (Head of Radio Network Standardization, Nokia, DE)
- **Pedro Merino** (Department of Computer Sciences and Languages, Univ. Malaga, ES)
- **Thomas Magedanz** (TU Berlin/ Fraunhofer FOKUS, DE)
- **Uwe Herzog** (Programme Manager, Eurescom, DE)



Jorge Pereira

Jorge Pereira has been with the European Commission since 1996, becoming Principal Scientific Officer in 2005. He has been dealing with ICT, covering a broad variety of areas, with a focus on networking, devices, applications and services, testing and validation, as well as deployment. He is, since 2016, in the area of Future Connectivity Systems, focusing on 5G and beyond, being responsible for the areas of Advanced Spectrum Management; optical-wireless convergence; Connected and Automated Mobility; and Public Protection and Disaster Relief. He obtained the Engineering and M.Sc. degrees in Electrical and Computer Engineering from Instituto Superior Técnico (IST), Lisbon, Portugal in 1983 and 1987, respectively, and a Ph.D. in Electrical Engineering-Systems from the University of Southern California (USC), Los Angeles, in 1993.



Colin Willcock

Colin Willcock graduated from the University of Sheffield, UK, with a B.Sc in Physics in 1986, an MSc. In Astronomical Technology from the University of Edinburgh in 1987 and a Ph.D. in Parallel Computation from the University of Kent at Canterbury in 1992. Dr. Willcock joined Nokia in 1999, and is currently Head of Radio Network Standardization. He has participated extensively in standardization activities at ETSI, ITU-T and 3GPP, and also has extensive experience of European research having led a number of European projects. Colin Willcock is currently the chairman of the board of the 5G Infrastructure Association.



Pedro Merino

Pedro Merino is professor at University of Malaga (UMA). His research interests are new generation Internet, 5G networks and automated methods for software reliability. He has led more than 30 national and international research projects, most of them in collaboration with industry. He leads a 4G/5G outdoor testbed at Malaga city. Pedro Merino was the chair of the ERCIM WG on Formal Methods for Industrial Critical Systems, and member of the Executive Committee of ERCIM. He represents University of Malaga in Networld2020 ETP and 5G Industrial Association. Pedro Merino is coordinator of EuWirelss project, technical manager of 5GENESIS project and Director of ITIS Software at University of Malaga.



Thomas Magedanz

Thomas Magedanz has been professor at the Technische Universität Berlin, Germany, leading the chair for next generation networks (www.av.tu-berlin.de) since 2004. In addition, since 2003 he has been Director of the Business Unit Software-based Networks (NGNI) at the Fraunhofer Institute for Open Communication Systems (FOKUS) in Berlin. For more than 30 years, he has been working in the convergence field of telecommunications, Internet and information technologies. He created many internationally recognized prototype implementations of global telecommunications standards that provide the foundations for the efficient development of various open technology testbeds around the globe. His current interest is in software-based 5G networks for different verticals, with a strong focus on edge computing, network slicing, and private industrial networks.



Uwe Herzog

Uwe Herzog is Programme Manager at Eurescom. He has more than 25 years of professional experience. Uwe has been involved in a number of EC research projects as project coordinator, work-package leader and in other roles, including projects such as WINNER, SPEED-5G, ORPHEUS, 5G EVE, To-Euro-5G and Full5G. Currently he is coordinator of the 5G PPP INSPIRE-5Gplus project that will advance the 5G and beyond security vision by progressing 5G Security. Uwe has several roles in the organization and operation of 5G PPP and NetWorld2020 ETP.
Uwe has been evaluator in the FP7 and H2020 in the area of Future Networks and SME-Instrument on Open Disruptive Innovation. Uwe holds a M.Sc. degree in electrical engineering from the University of Chemnitz, Germany, and an MBA from the University of Mannheim and ESSEC Business School Paris.

WEDNESDAY, 17 JUNE 2020

PANEL 3
5G FOR VERTICALS: BUILDING AND EXPLOITING SYNERGIES

Organizer:
Markus Dillinger, Director for 5G Industry Communications, Huawei, DE

Recommended re-viewing
Wednesday, 17 June 2020, 10:45-11:30 CEST

Live interaction
Wednesday, 17 June 2020, 11:30-12:15 CEST

PROGRAMME

Motivation and Background

5G is the first wireless generation conceived with and for Verticals! Various industry organizations, as well as 5G PPP H2020 research and innovation projects, were established over the last years to elicit vertical use cases requirements and develop first 5G solutions addressing a number of verticals. The requirements from Verticals are now partly addressed in 3GPP releases 15 and 16 and we expect future requirements will be addressed beyond R16. In parallel, many 5G trials, both EU-funded and private, were launched to better understand benefits and shortcomings of current 5G technology. The major concern from stakeholders is that highly specialized 5G requirements might prevent economy of scale in terms of 5G terminals and infrastructure, leading to high R&D, product engineering, capital and operational costs, resulting in a poor business case for all and much slower rates of adoption. Hence, our aim must be to bring together highly specialized sectors and to maximize common requirements for research, standardization and product development. In this panel, we address namely Agriculture, Automotive, eHealth, Industry 4.0 and PPDR, whilst identifying common R&D areas and feature requirements, as well as major implementation concerns and barriers, with a view towards using Verticals and 5G to accelerate the recovery after the COVID-19 crisis.

Questions

1. What are the lessons learnt from trials or early 5G deployments?
2. Which requirements are not yet addressed in 5G testbeds, products and 3GPP R15 and R16?
3. How to maximize synergies between vertical sectors?
4. How to accelerate the use of 5G in vertical sectors?
5. How can we use 5G and the Verticals to accelerate the recovery after the COVID-19 crisis?

Participants

The panel is composed of:

- **Chair: Markus Dillinger** (Director for 5G Industry Communications, Huawei, DE)
- **Alicia Fuentes** (CEO, QUATERNIUM, ES)
- **Luisa Andreone** (FCA Product Development, FCA, IT)
- **Adam Wolisz** (TU Berlin & Fellow of Einstein Center for the Digital Future, DE)
- **Andreas Mueller** (Head of Communication and Network Technology, Corporate Research Department, Robert Bosch GmbH, DE)
- **Luís Cordeiro** (CTO, OneSource, PT)



Markus Dillinger

Markus Dillinger received his Diplom-Ing. degree in telecommunications in 1990 from the University of Kaiserslautern, Germany. In 2010, he joined Huawei Germany and was director for enterprise solutions for smart grid. In 2013, he moved to Huawei European Research Centre as Head of Wireless Internet Technologies where he runs private and public R&D programmes for e.g. car-to-car and automation supporting 3GPP standardization and normative work for the vertical industry. He was the initiator of 5GAA and leads the Munich team for their technical contributions to Working Groups in 3GPP / 5GAA. In September 2016, he was appointed as Executive Committee member for the 5GAA and re-assigned in following years.



Alicia Fuentes

Alicia Fuentes is a serial entrepreneur with over 12 years of experience leading innovation projects in the tech sector. She is currently the CEO of Quaternium, a pioneer European drone manufacturer, selected as one of the 10 most innovative drone startups in the world. Quaternium Technologies provides state-of-the-art aerial solutions in the fields of agriculture, first response and aerial filming. Under her leadership, Quaternium has grown over 100% and it has achieved two World Records of performance, positioning as the leader in its niche.



Luisa Andreone

Luisa Andreone is Member of the Advanced Technology & Pre-Development Programs Collaboration & Network in FCA Product Development, coordinating collaborative projects on "Vehicle Automation & Connectivity": she is currently working as FCA-CRF reference for public funded activities on connected vehicle technologies, vehicle automation and human machine interface. Her expertise includes the design and development of collision prevention systems, connected services and HMI solutions for vehicles. She coordinated the European co-funded projects DARWIN, EUCLIDE, EDEL, WATCH-OVER. Today she is Member of the Steering Committee of the European co-funded projects L3Pilot on vehicle automation testing and leader of the piloting tests. She is leader of the EUCAR Expert Group "Driver Vehicle Dialogue", deputy leader of the EUCAR Expert Group "Automation" and Member of the Strategy Committee of ERTICO ITS Europe.



Adam Wolisz

Adam Wolisz received the Diploma, Ph.D., and Habilitation degrees from the Silesian University of Technology, Gliwice, in 1972, 1976, and 1983, respectively. He joined the Technical University of Berlin in 1993 as Chaired Professor for telecommunication networks (1993-2018) and became Executive Director with the Institute for Telecommunication Systems (2001-2018). He has also been Adjunct Professor with the Department of Electrical Engineering and Computer Science, University of California, Berkeley (2005-2017). Since 2018, he is retired professor at TU Berlin and Fellow of the Einstein Center Digital Future. His research interests are in architectures and protocols of communication networks and their applications, as well as cyber physical systems.



Andreas Mueller

Andreas Mueller is the Head of Communication and Network Technology in the Corporate Research Department of Robert Bosch GmbH in Stuttgart, Germany and coordinates the 5G activities of Bosch in the context of Industry 4.0 across the different business units. He also serves as Chairman of the Board of the "5G Alliance for Connected Industries and Automation" (5G-ACIA. Prior to joining Bosch, Andreas was a Research Staff Member at the Institute of Telecommunications of the University of Stuttgart, Germany. He worked as a Systems Engineer for Rohde & Schwarz, developing a novel software-defined radio based communication system for the German Armed Forces. Andreas holds a German Diploma degree as well as a Ph.D. degree in Electrical Engineering (with distinction) and an M.Sc. degree in Information Technology, all from the University of Stuttgart, Germany.



Luís Cordeiro

Luis Cordeiro is a Senior Researcher and Product System Architect at OneSource. He has been actively involved in European and national research projects (e.g. FP7 LiveCity, FP7 CityFlow, FP7 SALUS, FP7 Mobile Cloud Networking, H2020 EMPATIA, Eureka Catrene Mobitrust, P2020 Mobilizador 5G). He also led several software development and systems integration projects, as well as large-scale security certifications processes. Since 2012, he has been leading the development of a Public Protection and Disaster Recovery (PPDR) situational awareness platform that has been tackling the limitations of mobile communications for critical scenarios. Since 2018, he has been working on the integration of this platform with 5G and evaluating how this new communications paradigm can successfully address the current limitations.



REGULAR & POSTER SESSIONS

TUESDAY, 16 JUNE 2020

10:00 - 10:30 PROGRAMME
OPENING SESSION

12:15 - 16:45 PROGRAMME
NET1: NETWORK SLICING FOR INNOVATIVE BEYOND 5G APPLICATIONS

Achieving Network Slice Communication Service Distribution Across 5G Micro-Operator Multi-tenants
Idris Badmus (Centre for Wireless Commmunications, University of Oulu, Finland); Abdelquoddouss Laghrissi (Centre for Wireless Communications, University of Oulu, Finland); Ari T. Pouttu (Centre for Wireless Communications University of Oulu, Finland)

SLA Management Procedures in 5G Slicing-based Systems
Apostolos Papageorgiou (Nokia, Germany); Adriana Fernández-Fernández (Fundació i2CAT, Spain); Leonardo Ochoa-Aday (Fundació i2CAT, Internet i Innovació Digital a Catalunya, Spain); Miguel Silva Peláez (Fundació i2CAT, Spain); Muhammad Shuaib Siddiqui (Fundació i2CAT, Internet i Innovació Digital a Catalunya, Spain)

The Isolation Concept in the 5G Network Slicing
Andres J Gonzalez (Telenor Research, Norway); Jose Ordonez-Lucena (Telefonica I+D, Spain); Bjarne E. Helvik (NTNU - Norwegian University of Science and Technology, Norway); Gianfranco Nencioni (University of Stavanger, Norway); Min Xie (Telenor Research & Telenor Group, Norway); Diego Lopez (Telefonica I+D, Spain); Pål R. Grønsund (Telenor & University of Oslo, Norway)

5Growth: AI-driven 5G for Automation in Vertical Industries
Chrysa Papagianni (Nokia Bell Labs, Belgium); Josep Mangues-Bafalluy (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Pedro Bermudez (Telcaria, Spain); Sokratis Barmpounakis (University of Athens, Greece); Danny De Vleeschauwer (Nokia, Belgium); Juan Brenes (Nextworks, Italy); Engin Zeydan (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Claudio E. Casetti (Politecnico di Torino, Italy); Carlos Guimarães (Universidad Carlos III de Madrid, Spain); Pablo Murillo (Telcaria, Spain); Andres Garcia-Saavedra (NEC Labs Europe, Germany); Daniel Corujo (Instituto deTelecomunicações Aveiro & Universidade de Aveiro, Portugal); Teresa Pepe (Ericsson, Italy)

5G Network Slice Brokering: A Distributed Blockchain-based Market
Nima Afraz (CONNECT Center, Trinity College Dublin, Ireland); Marco Ruffini (CONNECT, Trinity College Dublin, Ireland)

OPE1: OPERATIONAL & EXPERIMENTAL INSIGHTS #1

PROGRAMME

The LSA Based Spectrum Sharing Solution for Wireless Research Networks Utilizing Commercial MNO Networks
Mika Hoppari (VTT, Finland); Ilkka S. Harjula and Jarno E. Pinola (VTT Technical Research Centre of Finland, Finland)

5GCroCo Barcelona Trial Site for Cross-border Anticipated Cooperative Collision Avoidance
Raul Muñoz (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Spain); Francisco Vázquez-Gallego (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Ramon Casellas and Ricard Vilalta (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Spain); Roshan Sedar (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Pol Alemany and Ricardo Martinez (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Spain); Jesus Alonso-Zarate (Centre Tecnologic de Telecomunicacions de Catalunya - CTTC, Spain); Apostolos Papageorgiou (Nokia, Germany); Miguel Catalan-Cid (i2CAT Foundation, Spain); F Moscatelli and Giada Landi (Nextworks, Italy); Xavi Vilajosana, Andrea Bartoli and Denis Guilhot (Worldsensing, Spain); Soumya Kanti Datta and Jérôme Härri (EURECOM, France); Rodrigo Silva (PSA, France); Laurent Dizambourg and Antonio Fernández (PSA, Spain); Maciej Muehleisen (Ericsson GmbH, Germany)

Cross-domain Slice Orchestration for Advanced Vertical Trials in a Multi-Vendor 5G Facility
Jose Ordonez-Lucena (Telefonica I+D, Spain); Christos Tranoris (University of Patras, Greece); Joao Antonio Pereira Rodrigues (Nokia, Portugal); Luis M. Contreras (Telefonica, Spain)

Validation of IaaS-based Technologies for 5G-Ready Applications Deployment
Roberto Bruschi (CNIT, Italy); Franco R. Davoli (University of Genoa & National Inter-University Consortium for Telecommunications (CNIT), Italy); Fernando Diaz (ATOS, Spain); Chiara Lombardo (University of Genoa & CNIT-Research Unit of the University of Genoa, Italy); Sergio Mangialardi and Jane Frances Pajo (University of Genoa, Italy)

A Monitoring Framework for Multi-Site 5G Platforms
Ramon Perez (Telcaria Ideas, Spain); Jaime Garcia-Reinoso (Universidad Carlos III de Madrid, Spain); Aitor Zabala (Telcaria Ideas, Spain); Pablo Serrano and Albert Banchs (Universidad Carlos III de Madrid, Spain)

TUESDAY,
16 JUNE
2020

PHY1: EMERGING ASPECTS ON PROPAGATION FOR WIRELESS APPLICATIONS

PROGRAMME

A Model for Off-Body Propagation Channels in Indoor Scenarios at mmWaves
Kryštof Zeman (Brno University of Technology, Czech Republic); Kenan Turbic (INESC-ID / IST, University of Lisbon, Portugal); Jiri Hosek (Brno University of Technology, Czech Republic); Luis M. Correia (IST/INESC-ID - University of Lisbon & INESC, Portugal)

Measurements and Ray Tracing Simulations: Impact of Different Antenna Positions on Meeting Room Coverage at 60 GHz
Muhammad Usman Sheikh, Kalle Ruttik, Riku Jäntti and Jyri Hämäläinen (Aalto University, Finland)

Effect of Plastering Mesh on Radio Signals: Modelling and Practical Measurements
Ari Asp and Jussa Pikkuvirta (Tampere University, Finland); Arto Hujanen (VTT Technical Research Centre of Finland, Finland); Ismo Huhtinen (VTT, Finland); Mikko Valkama (Tampere University, Finland)

A Low-Overhead Hierarchical Beam-tracking Algorithm for THz Wireless Systems
Giorgos Stratidakis (University of Piraeus, Greece); Georgia D. Ntouni (Intracom Telecom, Greece); Alexandros-Apostolos A Boulogeorgos (University of Piraeus, Greece); Dimitrios S. Kritharidis (Intracom Telecom, Greece); Angeliki Alexiou (Universityof Piraeus, Greece)

A Comparison of Stochastic and Deterministic Channel Models for V2V Applications
Nils Dreyer (TU Braunschweig, Germany); Thomas Kürner (Technische Universität Braunschweig, Germany)

D-band Point to Multi-Point Deployment with G-Band Transport
Claudio Paoloni (Lancaster University, United Kingdom (Great Britain)); Viktor Krozer (Goethe University of Frankfurt am Main, Germany); François Magne (WHEN-AB & SARL, France); Quang Trung Le (HF Systems Engineering GmbH & Co. KG, Germany); Rupa Basu, Jeevan Rao and Rosa Letizia (Lancaster University, United Kingdom (Great Britain)); Ernesto Limiti (University of Rome Tor Vergata, Italy); Marc Marilier (OMMIC, France); Giacomo Ulisse (Johann Wolfgang Goethe-Universität, Germany); Antonio Ramirez (Fibernova Systems, Spain); Borja Vidal (Universidad Politecnica de Valencia, Spain); Hadi Yacob (9 Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Germany)

POS1: POSTER SESSION 1

PROGRAMME

Experimental Assessment of Electromagnetic Fields in a Commercial 5G Network
Chrysanthi Chountala, Jean Marc Chareau, Pravir K Chawdhry, Philippe Viaud, James Bishop and Tiziano P Pinato (European Commission - Joint Research Centre, Italy)

CRAN Option 7-3 Splitting: A Novel Comparative Real-time Study
Shahriar Basiri (Sharif University of Technology, Iran); Azad Ravanshid (NOMOR, Germany); Babak Hossein Khalaj (Sharif
University of Technology, Iran)

Data-driven UAV Trajectory Optimization
Hajar El Hammouti (KAUST, Saudi Arabia); Abdulkadir Celik (King Abdullah University of Science & Technology, Saudi Arabia); Basem Shihada (KAUST, Saudi Arabia); Mohamed-Slim Alouini (King Abdullah University of Science and Technology (KAUST), Saudi Arabia)

5GCroCo Use Cases and Key Performance Indicators for Cross-border Trials
Dirk Hetzer (T-Systems, Germany); Maciej Muehleisen (Ericsson GmbH, Germany); Apostolos Kousaridas (Huawei Technologies, Germany); Jesus Alonso-Zarate (Centre Tecnologic de Telecomunicacions de Catalunya - CTTC, Spain)

D-band Point to Multipoint Wireless Testbed
Antonio Ramirez (Fibernova Systems, Spain); Viktor Krozer (Goethe University of Frankfurt am Main, Germany); Quang Trung Le (HF Systems Engineering GmbH & Co. KG, Germany); Rupa Basu, Jeevan Rao and Rosa Letizia (Lancaster University, United Kingdom (Great Britain)); Ernesto Limiti (University of Rome Tor Vergata, Italy); François Magne (WHEN-AB & SARL, France); Marc Marilier (OMMIC, France); Giacomo Ulisse (Johann Wolfgang Goethe-Universität, Germany); Hadi Yacob (9 Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Germany); Borja Vidal (Universidad Politecnica de Valencia, Spain); Roberto Llorente (Universitat Politècnica de València, Spain); Claudio Paoloni (Lancaster University, United Kingdom (Great Britain))

Inter-Numerology Interference in Filtered-OFDM Waveforms
Chrysanthi Chountala (European Commission - Joint Research Center, Italy); Jean Marc Chareau and James Bishop (Joint
Research Centre of the European Commission, Italy); Fausto Bonavitacola (Fincons Italia S.p.A., Milan, Italy)

Autonomous Vehicles Impact on 5G Network Base Station Inter-Site Distance
António Serrador (Polytechnic Institute of Lisbon & ISEL, Portugal); Grazielle Bonaldi Teixeira (Lisbon High Institute of Engineering - ISEL, Portugal); Mirtes Lima and Rafael Fernandes (ISEL, Portugal)

MAC-agnostic Swarm-Based Directional Antenna Control for Wireless Sensor Networks
Tim van der Lee and George Exarchakos (Eindhoven University of Technology, The Netherlands); Sonia Heemstra de Groot (Eindhoven Technical University, The Netherlands)

5G-CLARITY: Integrating 5GNR, WiFi and LiFi in Private Networks with Slicing Support
Daniel Camps (i2CAT, Spain); Mir Ghoraishi (Gigasys Solutions, United Kingdom (Great Britain)); Jesús Gutiérrez (IHP -
Leibniz-Institut für Innovative Mikroelektronik, Germany); Jose Ordonez-Lucena (Telefonica I+D, Spain); Tezcan Cogalan
(University of Edinburgh, United Kingdom (Great Britain)); Harald Haas (The University of Edinburgh, United Kingdom (Great
Britain)); Antonio Garcia (Accelleran, Belgium); Vladica Sark (IHP - Leibniz-Institut für Innovative Mikroelektronik, Germany);
Erik Aumayr and Sven van der Meer (Ericsson, Ireland); Shuangyi Yan (University of Bristol, United Kingdom (Great Britain));
Alain Abdel-Majid Mourad (Interdigital Europe Ltd, United Kingdom (Great Britain)); Oscar Adamuz-Hinojosa (University of
Granada, Spain); Jordi Pérez-Romero (Universitat Politècnica de Catalunya (UPC), Spain); Miguel Granda (BOSCH, Spain); Rui Bian (University of Edinburgh, United Kingdom (Great Britain))

Joint 5G-LTE-WiFi Prototyping Platform for RAT Interworking Experiments
Walter Nitzold and Clemens Felber (National Instruments, Germany)

TUESDAY,
16 JUNE
2020

RAS1: RADIO ACCESS AND SOFTWARISATION

PROGRAMME

Resource Allocation for a Reliable D2D Enabled Cellular Network in Factories of the Future
Idayat Sanusi (University of Greenwich, United Kingdom (Great Britain)); Karim M. Nasr (University of Greenwich & University of Surrey, United Kingdom (Great Britain)); Klaus Moessner (University of Surrey, United Kingdom (Great Britain))

QoS-Aware Spectrum Sharing for D2D Communication in Cellular Networks
Abubaker Matovu Waswa (Technische Universität Ilmenau, Germany); Stephen S. Mwanje (Nokia Bell Labs, Germany); Jens Mueckenheim (University of Applied Sciences Merseburg, Germany); Andreas Mitschele-Thiel (Ilmenau University of Technology, Germany)

5G-RANGE: A Transceiver for Remote Areas Based on Software-Defined Radio
Wheberth Damascena Dias, Alexandre Ferreira, Roberto Kagami, Juliano Silveira Ferreira, Daniely Gomes Silva and Luciano Leonel Mendes (Inatel, Brazil)

On the Impact of Normalized Interference Threshold for Topological Interference Management
Hassan Kallam (Université de Lyon & INRIA, INSA Lyon, CITI-INRIA, France); Leonardo S. Cardoso (Université de Lyon & INRIA, INSA-Lyon, CITI-INRIA, France); Jean-Marie Gorce (INSA-Lyon & CITI, Inria, France)

Unsupervised Learning for Detection of Mobility Related Anomalies in Commercial LTE Networks
Jessica Moysen (Elisa Oyj, Finland & Fundaciò i2CAT, Spain); Furqan Ahmed (Elisa Corporation, Finland); Mario Garcia-Lozano (Universitat Politècnica de Catalunya, Spain); Jarno Niemelä (Elisa Corporation, Finland)

Outage Prediction for URLLC in Rayleigh Fading
Andreas Traßl (Technische Universität Dresden & Centre for Tactile Internet with Human-in-the-Loop, Germany); Lucas Scheuvens (TU Dresden, Germany); Tom Hößler (TU Dresden & Barkhausen Institut, Germany); Eva Schmitt (TU Dresden, Germany); Norman Franchi and Gerhard P. Fettweis (Technische Universität Dresden, Germany)

VAP1: IOT SECURITY AND 5G ECOMOMY

PROGRAMME

Design and Implementation of IoT DDoS Attacks Detection System Based on Machine Learning
Yi-wen Chen and Jang-Ping Sheu (National Tsing Hua University, Taiwan); Yung Ching Kuo (National TsingHua University, Taiwan); Nguyen Van Cuong (National Tsing Hua University, Taiwan)

Consideration on Data Conformance Toward Building Trust in Supply Chain
Yuto Nakano (KDDI Research, Inc., Japan); Toru Nakamura (Advanced Telecommunications Research Institute International,
Japan); Yasuaki Kobayashi and Masahito Ishizaka (KDDI Research, Inc., Japan); Masayuki Hashimoto (Advanced Telecommunications Research Institute International, Japan); Hiroyuki Yokoyama (ATR, Japan); Yutaka Miyake (KDDI Research, Inc., Japan); Shinsaku Kiyomoto (Information Security Laboratory, KDDI Research Inc., Japan)

The CARAMEL Project: a Secure Architecture for Connected and Autonomous Vehicles
Christian Vitale (KIOS CoE, Cyprus); Nikos Piperigkos (University of Patras, Greece); Christos Laoudias and Georgios Ellinas (University of Cyprus, Cyprus); Jordi Casademont (Technical University of Catalonia (UPC), Spain); Pouria Sayyad Khodashenas (i2CAT Foundation (i2CAT), Spain); Andreas Kloukiniotis, Aris S. Lalos and Konstantinos Moustakas (University of Patras, Greece); Pablo Barrientos Lobato (Atos IT Solutions and Services Iberia, Spain); Javier Moreno Castillo (FICOSA, Spain); Petros Kapsalas (Panasonic Automotive, Germany); Klaus-Peter Hofmann (T-Systems Enterprise Services GmbH, Germany)

TUESDAY,
16 JUNE
2020

Hierarchical Blockchain Topologies for Quality Control in Food Supply Chains
Spyros Voulgaris (Athens University of Economics and Business, Greece); Nikos Fotiou (Mobile Multimedia Lab, Athens University of Economics and Business, Greece); Vasilios A. Siris and George C. Polyzos (Athens University of Economics and
Business, Greece); Artemios Tomaras and Sotiris Karachontzitis (Synelixis Solutions Ltd., Greece)

5G Ecosystem Dilemmas: Sharing Roles and Revenues
Costas Kalogiros (Athens University of Economics and Business, Greece); Hanne Kristine Hallingby (Telenor, Norway); Olai-Bendik Erdal (Telenor Research and Innovation, Norway)

PROGRAMME

VAP2: IOT SERVICES AND PERFORMANCE ANALYSIS

Accurate Narrowband LPWA Ranging: Principles, Performance in AWGN and Multipath Channels
Florian Wolf (CEA Grenoble & University of Limoges, France); Sébastien de Rivaz (CEA-LETI, France); Francois Dehmas (CEALeti Minatec, France); Valérian Mannoni (CEA, France); Vincent Berg (CEA LETI, France); Jean Pierre Cances (University of Limoges, France)

Cooperative Interference Avoidance Scheduler for Radio Resource Management in NB-IoT Systems
Collins Burton Mwakwata and Muhammad Mahtab Alam (Tallinn University of Technology, Estonia); Yannick Le Moullec (Tallinn University of Technology (TalTech), Estonia); Hassan Malik (Tallinn University of Technology, Estonia); Sven Pärand (Telia Estonia Ltd, Estonia)

Alternating Transmission of Packets in Dual Connectivity for Periodic Deterministic Communication Utilising Survival Time
Jens Gebert and Andreas Wich (Nokia Bell Labs, Germany)

The Sampling Period Estimation Based Adaptive Sampling Algorithm for a Self-sustainable Disaster Monitoring System
Changmin Lee and Seong-Lyun Kim (Yonsei University, Korea (South))

LOCUS: Localization and Analytics On-Demand Embedded in the 5G Ecosystem
Nicola Blefari-Melazzi (University of Rome "Tor Vergata", Italy); Stefania Bartoletti (National Research Council of Italy (IEIITCNR), Italy); Luca Chiaraviglio (University of Rome Tor Vergata, Italy); Flavio Morselli (ENDIF University of Ferrara, Italy); Eduardo Baena (Universidad de Málaga, Spain); Giacomo Bernini (Nextworks, Italy); Domenico Giustiniano (IMDEA Networks Institute, Spain); Mythri Hunukumbure (Samsung Electronics, United Kingdom (Great Britain)); Gürkan Solmaz (NEC Laboratories Europe, Germany); Konstantinos Tsagkaris (Incelligent, Greece)

TUESDAY, 16 JUNE 2020

Self-Calibrated UWB Based Device-Free Indoor Localization and Activity Detection Approach
Klemen Bregar and Andrej Hrovat (Jožef Stefan Institute, Slovenia); Mihael Mohorcic (Jozef Stefan Institute & Jozef Stefan
International Postgraduate School, Slovenia); Tomaz Javornik (Jozef Stefan Institute, Slovenia)

WOS1: 5G NR AND BEYOND

PROGRAMME

Multi-antenna Multi-user Clustering for Relay Aided Cellular Massive-MIMO Systems
Ghadir Mostafa (The German University in Cairo, Egypt); Engy Aly Maher (German University in Cairo, Egypt); Ahmed E. El-Mahdy (The German University in Cairo, Egypt)

A Study on a New Type of DDoS Attack Against 5G Ultra-Reliable and Low-Latency Communications
Cheng-Yeh Chen, Guo-Liang Hung and Hung-Yun Hsieh (National Taiwan University, Taiwan)

Synchronization in 5G: a Bayesian Approach
Meysam Goodarzi (Humboldt University of Berlin & IHP - Leibniz-Institut für Innovative Mikroelektronik, Germany); Darko Cvetkovski (Humboldt University of Berlin, Germany); Nebojsa Maletic and Jesús Gutiérrez (IHP - Leibniz-Institut für Innovative Mikroelektronik, Germany); Eckhard Grass (IHP & Humboldt-University Berlin, Germany)

Machine-Learning Based Traffic Forecasting for Resource Management in C-RAN
Rolando Guerra-Gómez (Universitat Politécnica de Catalunya (UPC), Spain); Silvia Ruiz Boqué (UPC, Spain); Mario Garcia-Lozano (Universitat Politècnica de Catalunya, Spain); Joan Olmos (Universitat Politecnica de Catalunya, Spain)

Real-Time Demonstration of ARoF Fronthaul for High-Bandwidth mm-Wave 5G NR Signal Transmission over Multi-Core Fiber
Simon Rommel and Bruno Cimoli (Eindhoven University of Technology, The Netherlands); Evangelos Grivas (Eulambia, Greece); Delphin Dodane (Thales Research and Technology, France); Alvaro Morales (Eindhoven University of Technology, The Netherlands); Evangelos Pikasis (Eulambia Advanced Technologies Ltd, Greece); Jerome Bourderionnet (Theales Research and Technology, France); Gilles Feugnet (Thales Research and Technology, France); Juliana Barros Carvalho (Institute for Photonic Integration & Eindhoven University of Technology, The Netherlands); Michail Katsikis (Intracom Telecom, Greece); Konstantinos Ntontin (University of Barcelona, Spain); Dimitrios S. Kritharidis (Intracom Telecom, Greece); Izabela Spaleniak and Paul Mitchell (Optoscribe, United Kingdom (Great Britain)); Mykhaylo Dubov (Aston University, United Kingdom (Great Britain)); Idelfonso Tafur Monroy (Eindhoven University of Technology, The Netherlands)

WEDNESDAY, 17 JUNE 2020

12:15 - 15:15

NET2: VIRTUALISATION, CLOUD, AND CONVERGENCE

PROGRAMME

Dynamic Provisioning of Network Services on Heterogeneous Resources
Hadi Razzaghi Kouchaksaraei (Paderborn University, Germany); Ashwin Prasad Shivarpatna Venkatesh (University of Paderborn, Germany); Amay Churi (Universität Paderborn, Germany); Marvin Illian and Holger Karl (Paderborn University, Germany)

Orchestrating Edge- AndCloud-based Predictive Analytics Services Venkatarami
Reddy Chintapalli (IIT Hyderabad, India); Koteswararao Kondepu (Sculoa Superiore Sant'Anna, Italy); Andrea Sgambelluri (Scuola Superiore Sant'Anna Pisa, Italy); Antony Franklin A (Indian Institute of Technology Hyderabad, India); Bheemarjuna Reddy Tamma (IIT Hyderabad, India); Piero Castoldi and Luca Valcarenghi (Scuola Superiore Sant'Anna, Italy)

Transparent 3rd-Party Authentication with Application Mobility for 5G Mobile Edge Computing
Asad Ali, Ying-Dar Lin and Chi-Yu Li (National Chiao Tung University, Taiwan); Yuan-Cheng Lai (Information Management, NTUST, Taiwan)

Software Defined Networking in a Converged 5G Fiber-Wireless Network
Nikos Psaromanolakis, Athina Ropodi and Pavlos Fragkogiannis (Incelligent PC, Greece); Kostas Tsagkaris (Incelligent, Greece); Luiz Anet Neto, Anas El Ankouri and Minqi Wang (Orange Labs, France); Gael Simon (Orange, France); Philippe Chanclou (Orange Labs, France)

NET3: SOFTWARE-BASED AND SELF-DRIVING NETWORKS

PROGRAMME

Learning SDN Traffic Flow Accurate Models to Enable Queue Bandwidth Dynamic Optimization
Enrico Reticcioli, Giovanni Domenico Di Girolamo, Francesco Smarra, Alessio Carmenini and Alessandro D'Innocenzo (University of L'Aquila, Italy); Fabio Graziosi (University of l'Aquila, Italy)

A Real-time QoS-Demand-Aware Computational Resource Sharing Approach in C-RAN
Mojgan Barahman and Luis M. Correia (INESC-ID / INOV / IST, University of Lisbon); Lúcio Studer Ferreira (ISTEC / ULHT COPELABS / INESC-ID,Lisbon)

Predicting Bandwidth Utilization on Network Links Using Machine Learning
Maxime Labonne (CEA LIST & Institut Polytechnique de Paris, France); Charalampos Chatzinakis (Communicating Systems Laboratory CEA, France); Alexis Olivereau (CEA, LIST, France)

Fair Share of Latency in Inter-Data-Center Backbone Networks
Nitin Varyani and Zhi-Li Zhang (University of Minnesota, USA)

AI-driven Zero-touch Operations, Security and Trust in Multi-operator 5G Networks: a Conceptual Architecture
Gino Carrozzo (Nextworks, Italy); Muhammad Shuaib Siddiqui (Fundació i2CAT, Internet i Innovació Digital a Catalunya, Spain); August Betzler (i2CAT

Foundation, Spain); Jose Bonnet (Altice Labs, Portugal); Gregorio Martinez Perez (University of Murcia, Spain); Aurora Ramos (Atos, Spain); Tejas Subramanya (University of Trento & FBK CREATE-NET, Italy).

OPE2: OPERATIONAL & EXPERIMENTAL INSIGHTS #2

PROGRAMME

Experiences from Building a Multi-Access Edge Computing Internet of Things Testbed
Alex Mavromatis and Dimitra Simeonidou (University of Bristol, United Kingdom (Great Britain))

AI-Driven Closed-Loop Service Assurance with Service Exposures
Min Xie (Telenor Research & Telenor Group, Norway); Joan Pujol-Roig (Samsung Electronics, United Kingdom (Great Britain)); Foivos Michelinakis (Simula Metropolitan, Norway); Thomas Dreibholz (Simula Metropolitan Centre for Digital Engineering, Guerrero (University Carlos III of Madrid, Spain); Adrián Gallego Sánchez (Universidad Carlos III de Madrid, Spain); Wint Yi Poe (Huawei Technologies - European Research Center, Germany); Yue Wang (Samsung Electronics, USA); Ahmed Mustafa Elmokashfi (Simula Research Laboratory, Norway)

Real-time Experimental Wireless Testbed with Digital Beamforming at 300 GHz
Georgia D. Ntouni (Intracom Telecom, Greece); Thomas Merkle (Fraunhofer IAF, Germany); Eleftherios Loghis, Georgios Tzeranis, Vassilis Koratzinos, Nikolaos Skentos and Dimitrios S. Kritharidis (Intracom Telecom, Greece)

Exploiting and Evaluating Live 360 Low Latency Video Streaming Using CMAF
Mikko Uitto (VTT Technical Research Centre of Finland Ltd, Finland); Antti Heikkinen (VTT Technical Research Centre of Finland, Finland)

PHY2: EMERGING TRANSMISSION TECHNIQUES FOR NEXT GENERATION WIRELESS COMMUNICATION SYSTEMS

PROGRAMME

EXIT Chart Analysis of Cooperative Non-Orthogonal Multiple Access for Next Generation Wireless Communication Systems
Zeyad Elsaraf, Abbas Ahmed, Faheem A. Khan and Qasim Zeeshan Ahmed (University of Huddersfield, United Kingdom
(Great Britain))

Feedback Enhancements for Semi-Persistent Downlink Transmissions in Ultra-Reliable Low-Latency Communication
Trung-Kien Le (EURECOM, France); Umer Salim (TCL, France); Florian Kaltenberger (Eurecom, France)

RFF Based Parallel Detection for Massive MIMO
Varun Chhangani (Research Student, IIIT Hyderabad, India); Rangeet Mitra (ETS Montreal, Canada); Vimal Bhatia (Indian Institute of Technology Indore, India)

WEDNESDAY, 17 JUNE 2020

Enhanced Bit-to-Symbol Mapping for M-ary θ-QAM
Seongjin Ahn, Hyeonho Seo and Dongweon Yoon (Hanyang University, Korea (South))

Experimental Assessment of Modulation Formats for Beyond 5G mm-Wave ARoF Systems
Javier Perez Santacruz, Alvaro Morales, Simon Rommel and Ulf Johannsen (Eindhoven University of Technology, The Netherlands); Antonio Jurado Navas (University of Málaga, Spain); Idelfonso Tafur Monroy (Eindhoven University of Technology, The Netherlands)

PROGRAMME

PHY3: EMERGING CODING TECHNIQUES FOR 5G

Low Latency Decoder for Short Blocklength Polar Codes
Heshani Gamage, Vismika Ranasinghe, Nandana Rajatheva and Matti Latva-aho (University of Oulu, Finland)

Finite Blocklength Analysis of Coded Modulation for Block Fading Channels with Linear Precoding
Maha Zohdy (Rensselaer Polytechnic Institute, USA); Eva Song (Futurewei Technologies, USA); Guosen Yue (FutureWei Technologies, Inc., USA)

POS2: POSTER SESSION 2

PROGRAMME

Edge Cloud Based Platform for Smart Parking
Naila Bouchemal (ECE Paris, France)

5G Ecosystem: The 3 Combined Critical Requirements, Maximum Network Lifetime, Full Coverage and Connectivity Based Wireless Sensor Networks Communication
Amal Chaffai (Universidad Politecnica de Valencia, Spain)

5G-SOLUTIONS Analysis of Living Labs and KPIs Definition Methodology
Ioannis Markopoulos (FORTHNET, Greece); Andrea Di Giglio (Telecom Italia, Italy); Baruch Altman (LiveU, Israel); Håkon Lønsethagen (Telenor Research, Norway); Christos Verikoukis (CTTC & UB, Spain); Angelos Antonopoulos (Telecommunications Technological Centre of Catalonia (CTTC), Spain); Silvia Canale (Applied Research to Technologies, Italy); Matteo Grandi (IRIS Technology Solutions, Spain); Sofiane Zemouri (IIX, IBM, Ireland)

Non-linear Regression of Delay Percentiles in PONs Using Machine Learning Techniques
José Alberto Hernández (Universidad Carlos III de Madrid, Spain); Amin Ebrahimzadeh (INRS, Canada); Martin Maier (Institut
National de la Recherche Scientifique (INRS), Canada); David Larrabeiti (Universidad Carlos III de Madrid, Spain)

On an Access Control Model Enhancement for the 5G System
Luis Suarez (IRT bcom & Université de Bretagne Occidentale (UBO), France);

David Espes (University of Brest & LabSTICC, France); Frédéric Cuppens (IMT Atlantique, France); Philippe Bertin (Orange Labs & Bcom, France); Cao-Thanh Phan (BCOM, France); Philippe Le Parc (University of Brest, France)

The SPIDER concept:A Cyber Range as a Service Platform
Christos Xenakis (University of Piraeus, Greece); Anna Angelogianni and Eleni Veroni (University of Piraeus, Greece); Eirini Karapistoli (CyberLens, United Kingdom (Great Britain)); Matthias Ghering (CYBERLENS, United Kingdom (Great Britain)); Neofytos Gerosavva and Vasileios Machamint (EIGHT BELLS, Cyprus); Pierluigi Polvanesi and Angela Brignone (ERICSSON TEI, Italy); Jeronimo Nuñez Mendoza (Telefonica, Spain); Antonio Pastor (Telefonica I+D, Spain)

Improving Apache Spot Using Autoencoders for Network Anomaly Detection
Athanasios Priovolos, Georgios Gardikis and Dimitris Lioprasitis (Space Hellas S.A., Greece); Socrates Costicoglou (Space Hellas SA, Greece)

In-Network Knowledge Reasoning with New IP
Lijun Dong (Futurewei Technologies, USA); Lin Han (Futurewei Technologies Inc., USA); Richard Li (Futurewei Technologies, USA)

Design and Implementation of an IoT-based Ambient Intelligence Framework for Smart Built Environments
Reza Tasooji, Archi Dasgupta and Denis Gracanin (Virginia Tech, USA); Kresimir Matkovic (VRVis Research Center, Austria); Matthew LaGro and Mike Mihuc (OSIsoft, USA)

VAP3: IOT AND THE URBAN ECOSYSTEM

PROGRAMME

Altitude-Adaptive and Cost-Effective Object Recognition in an Integrated Smartphone and UAV System
Ignacio Martinez-Alpiste, Gelayol Golcarenarenji and Qi Wang (University of the West of Scotland, United Kingdom (Great Britain)); Jose Maria Alcaraz Calero (University of the West of Scotland & School of Engineering and Computing, United Kingdom (Great Britain))

EagleEYE: Aerial Edge-enabled Disaster Relief Response System
Muhammad Febrian Ardiansyah, Timothy William, Osamah Ibrahiem, Li-Chun Wang, Po-Lung Tien and Maria C. Yuang (National Chiao Tung University, Taiwan)

IoT-based Mobility Tracking for Smart City Applications
Kalkidan Gebru, Claudio E. Casetti, Carla Fabiana Chiasserini and Paolo Giaccone (Politecnico di Torino, Italy)

Fostering Inter-Operable Urban Ecosystems Through the Adoption of Common Frameworks
Luis Diez (University of Cantabria, Spain); Ignacio Elicegui (Universidad de Cantabria, Spain); Luis Sanchez and Luis Muñoz (University of Cantabria, Spain)

Energy Credits Auction Mechanism for Enhancing the Grid's Upward Flexibility Using Datacenters
Ahmed Abada and Marc St-Hilaire (Carleton University, Canada)

WEDNESDAY, 17 JUNE 2020

WOS2: AERIAL AND V2X NETWORKS

Dynamic Standalone Drone-Mounted Small Cells
Igor Donevski and Jimmy J Nielsen (Aalborg University, Denmark)

Actor-Critic Deep Reinforcement Learning for Energy Minimization in UAV-Aided Networks
Yaxiong Yuan, Lei Lei, Thang X. Vu and Symeon Chatzinotas (University of Luxembourg, Luxembourg); Björn Ottersten (University of Luxembourg, Luxembourg)

5G-Sim-V2I/N: Towards a Simulation Framework for the Evaluation of 5G V2I/V2N Use Cases
Thomas Deinlein (University of Erlangen-Nürnberg, Germany); Reinhard German (University of Erlangen, Germany); Anatoli Djanatliev (University of Erlangen-Nuremberg, Germany)

Data-Centric Node Selection for Machine-Type Communications with Lossy Links
Hung-Hsien Chen and Hung-Yun Hsieh (National Taiwan University, Taiwan)

PROGRAMME

15:30 - 16:00 CLOSING SESSION



EUCNC

European Conference on Networks and Communications

Porto, Portugal June 8-11 2021

8—11 JUNE 2021
PORTO, PORTUGAL

WWW.EUCNC.EU

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The conference program will include

- Keynotes
- Panels
- Regular oral sessions (papers from open call, to be submitted for uploading to IEEE Xplore)
- Special sessions, with papers on specific topics
- Workshops, with papers and presentations on specific topics
- Poster sessions (papers from open call addressing latest results)
- Tutorials
- Demos and exhibitions, with pitches

Key Dates

29 JAN. 2021 › Deadline for submission of papers for regular oral sessions
29 JAN. 2021 › Deadline for submission of proposals for workshops, special sessions, and tutorials
12 MAR. 2021 › Deadline for submission of extended abstracts for posters
12 MAR. 2021 › Notification of acceptance of workshops, special sessions, and tutorials
02 APR. 2021 › Deadline for submission of proposals for exhibitions
05 APR. 2021 › Notification of acceptance of papers and extended abstracts
16 APR. 2021 › Deadline for final papers for all sessions and workshops
16 APR. 2021 › Deadline for authors registration
07 MAY 2021 › Draft program available

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WIRELESS TECHNOLOGIES FOR THE CONNECTIVITY OF THE FUTURE

EURASIP Journal on Wireless Communications and Networking will publish a Special Issue with papers submitted to the Thematic Series on "Wireless Technologies for the Connectivity of the Future".
This Special Issue originates from the international conference EuCNC 2020 (European Conference on Networks and Communications), which will be held in June 2020 in Dubrovnik. The Chairs of the conference will select the best papers and will subsequently invite authors to submit an extended version of their paper, by at least one third of their length, for possible consideration in the Special Issue. Only the top ranked papers will be invited to this Special Issue, in order to fulfil its purpose. The Call for Papers for the conference has already been disseminated through the EuCNC 2020 website, as well as through social media platforms and several e-mails reflectors, reaching a wide international global audience.
The main target is to collect and present quality research contributions in the most recent activities related to systems and networks beyond 5G, already presenting ideas for 6G. Through this Special Issue, the state-of-the-art will be presented, and the new challenges will be highlighted, regarding the latest advances on systems and network perspectives that are already being positioned beyond 5G, bridging as well with the evolution of 5G, including applications and trials. Therefore, the motivation for this Special Issue is to present the latest and finest results on the evolution of research of mobile and wireless communications, coming, but not exclusively (since EuCNC is a conference open to the whole research community), from projects co-financed by the European Commission within its R&D programmes.
Authors are invited to submit original manuscripts on topics including, but not limited to:

- Application and services
- Artificial intelligence in communications
- New Air Interfaces
- Network architectures
- Extremely high frequency bands
- Mobile IoT
- Softwarisation of networks
- Wearables bridging with body area networks
- Security and privacy

The authors of the best papers of the EuCNC 2020 conference will be invited to submit an extended version of their paper, with at least 1/3 of additional original material, and the common part to be rewritten from the EuCNC paper.

Submission instructions:
Before submitting your manuscript, please ensure you have carefully read the Instructions for Authors in EURASIP Journal on Wireless Communications and Networking. The complete manuscript should be submitted through the EURASIP Journal on Wireless Communications and Networking submission system. To ensure that you submit to the correct Thematic Series please select the appropriate section in the dropdown menu upon submission. In addition, indicate within your cover letter that you wish your manuscript to be considered as part of the Thematic Series on "Wireless Technologies for the Connectivity of the Future ". All submissions will undergo peer review and accepted articles will be published in the journal as a collection in a single issue.

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Guest Editors:
Filipe Cardoso (ESTSetúbal, Polytechnic Institute of Setúbal and INESC-ID, Portugal) filipe.cardoso@estsetubal.ips.pt;

Vlatko Lipovac (University of Dubrovnik, Dubrovnik, Croatia) vlipovac@unidu.hr;

Luis Correia (IST/INESC-ID, University of Lisbon, Portugal) luis.m.correia@tecnico.ulisboa.pt

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INTERESTING THINGS ABOUT DUBROVNIK



THE LOKRUM CURSE AND RICHARD THE LIONHEART SHIPWRECK

Also known as the island of Kings, LOKRUM ISLAND originally inhabited By Benedictine monks (1023) although carvings in a few of the stones set into the walls of the Monastery testify that the island has been inhabited since prehistoric times. The Benedictian monks were apparently exiled from the island on the orders of a French general and subsequently laid a curse on the island, that whoever bought it for their own personal pleasure would be cursed–the local noblemen who evicted the monks all died, subsequent owners had terrible accidents– became bankrupt overnight or drowned getting there! However, in 1192 it saved the life of Richard the Lionheart when he was shipwrecked off the coast in a storm – his subsequent grateful donation to the local citizens paid for the Dubrovnik Cathedral of the Assumption of the Virgin Mary (the locals having convinced him not to build the cathedral on the island but in the city).

Source: wwwtelegraph.com

DIPLOMACY

Threatened by the ever growing Ottoman Empire not only did they broker a deal whereas they could 'pay tribute' to the Ottomans but they also cleverly negotiated a pardon for any Dubrovnik merchants trading with the Ottomans from the Catholic church. Therefore being the only trading power able to deal with both sides.
Another diplomatic highlight was with the newly blossoming independence of the United States. The US was really anxious to agree trade agreements with the European countries and did a deal with Ragusa, (Some claim Dubrovnik was the first state in the world to recognise the United States of America, in 1783).
They also banned slavery as early as 1416 centuries before anyone else did – Anyone who was caught breaking the law was sentenced to a heavy fine & six months imprisonment.

Source: wwwtelegraph.com

UNBREACHABLE STONE BOUNDARY

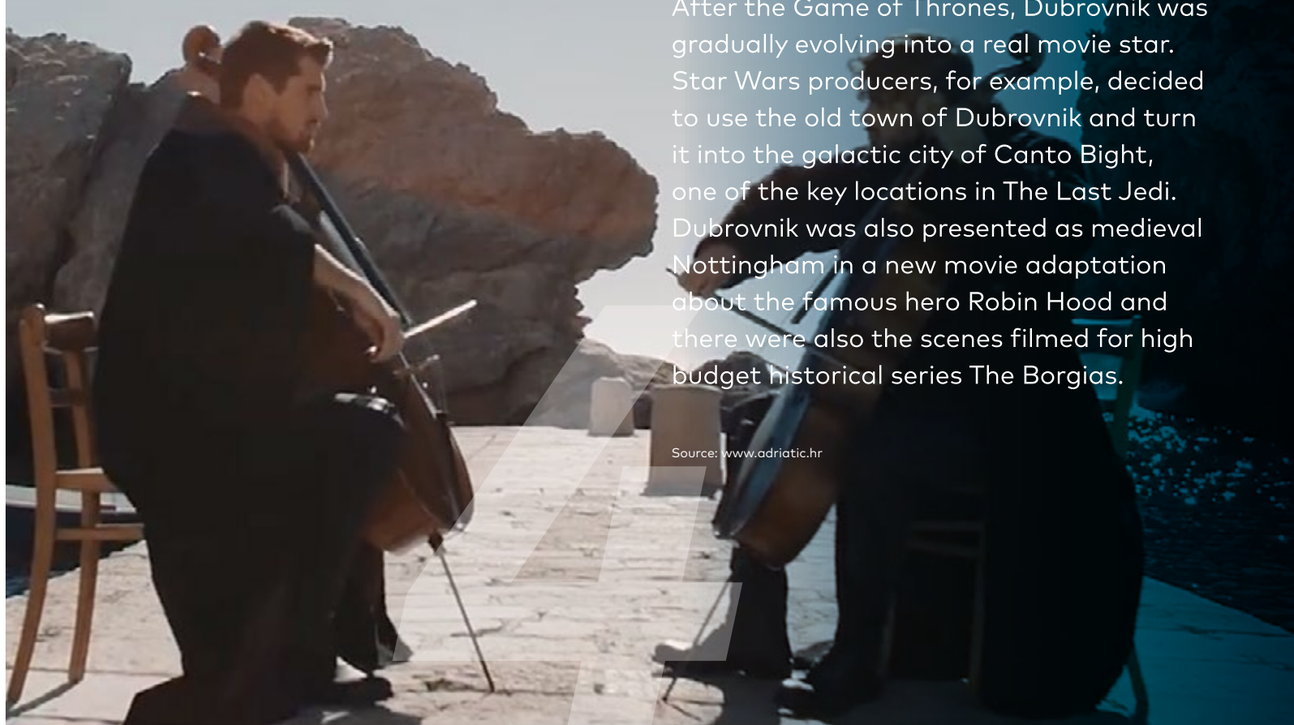
The city's most famous feature is its Famous stone boundary. Constructed Between the 12th and 17th centuries and encircling the old city. Apparently in some places they can be up to 6 metres thick and have never been breached by a hostile army.
Dubrovnik was badly affected during the Homeland War. The city was under siege for nearly eight months by the Yugoslav People's Army in 1991 and 1992 – many people were killed as the Yugoslav army rained shells down on the old city from the hilltops above. Nearly 11,500 buildings sustained damage from the attacks, but the wonderful restoration work since has restored and hidden the worst of the damage. As you enter the city walls there is a map to show which buildings were hit and how much damage was inflicted.

Source: wwwtelegraph.com

FAMOUS FILM LOCATION

Even if you are not a big movie fan, you have probably heard about the famous HBO series called Game of Thrones, which was filmed in Dubrovnik. Thanks to this series and its global audience, Dubrovnik practically became popular overnight.
After the Game of Thrones, Dubrovnik was gradually evolving into a real movie star. Star Wars producers, for example, decided to use the old town of Dubrovnik and turn it into the galactic city of Canto Bight, one of the key locations in The Last Jedi. Dubrovnik was also presented as medieval Nottingham in a new movie adaptation about the famous hero Robin Hood and there were also the scenes filmed for high budget historical series The Borgias.

Source: www.adriatic.hr



THE BEGINNING OF THE QUARANTINE REGULATION IN EUROPE

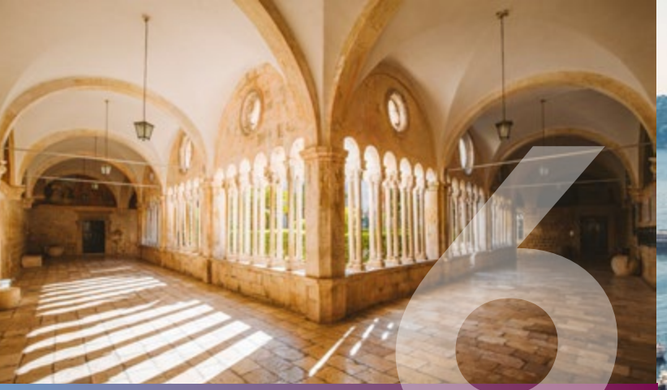
Since ancient times, societies have attempted to separate people with disease from those who remained unaffected, with references to self-isolation dating back to the Old Testament. As Covid-19 sweeps across the globe, we are advised to "self-quarantine" if we have recently returned from a part of the world where the virus is rapidly spreading, or if we have knowingly come into contact with an infected person. To understand the importance of self-quarantining during this modern-day pandemic, it's helpful to look back to the history of the word "quarantine" itself, which traces its origins to medieval Europe.

The word "quarantine" has Italian roots: in an effort to protect coastal cities from the Black Death ravaging 14th-Century Europe, ships arriving in Venice from infected ports were required to sit at anchor for 40 days (quaranta giorni) before landing, a practice that eventually became known as quarantine – derived from 'quarantino', the Italian word for a 40-day period.

Venice that stated all ships and passengers had to be stationed on the nearby island of San Lazzaro until the special health council gave them permission to enter the city."This led to the discrimination of ships and travellers from certain countries as well as other wrongdoing that was occurring in Venice regularly," writes co-author Ante Milošević, PhD, in Lazaretto in Dubrovnik: The Beginning of the Quarantine Regulation in Europe.

Co-author Ana Bakija-Konsuo, MD-PhD, added that Dubrovnik was the first Mediterranean port to sequester people, animals and merchandise coming from infected areas by sea or land, keeping them separate from the healthy population, while Venice stopped all ships and trade, halting life in the city.

Source:bbc.com



FAMOUS FIRSTS

Europe's longest & oldest operating pharmacy in the world is located inside Dubrovnik's Franciscan Monastery, founded in 1317. The monks made herb based cures/ medicines local people and although today it's a proper chemists they still sell a few of the monks original recipes. Dubrovnik lays claim to a number of world firsts (not just the pharmacy).

Source: www.dubrovnik-travel.net



FALL OF THE REPUBLIC

Dubrovnik was hit by an earthquake on 6 April 1667, which killed about 5,000 inhabitants and destroyed much of the city, although the city walls remained standing. The city was much weakened, and when in 1806 Napoleon entered Dubrovnik there was little resistance. The Republic of Ragusa was officially dissolved in 1808 but, after Napoleon's fall, Dubrovnik became part of the Austro-Hungarian Empire in 1815.

Source: www.total-croatia-news.com

FIRST SLAVE BAN

As many know, Dubrovnik used to function as an independent city-state in past. Its local community had strong humanistic values and has believed freedom to be one of mankind's most important ideals. This is why Dubrovnik Republic was one of the first states in the world to implement slavery ban on its premises. The decision has led to a law that all people, both residents of the city and foreigners that arrived, had to respect.
Dubrovnik slave ban is one of the first recorded in history. England banned slaves in 1569, while United States did so in 1865.

Source: www.croatia-times.com

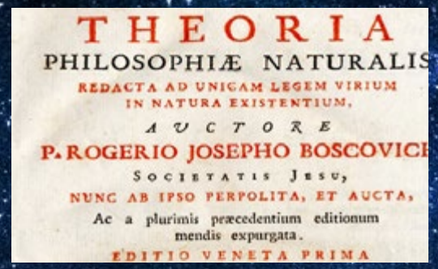


RECTOR'S PALACE

Built in the late 15th century for the elected rector who governed Dubrovnik, this Gothic-Renaissance palace contains the Rector's office and private chambers, public halls, administrative offices and a dungeon. During his one-month term the rector was unable to leave the building without the permission of the senate.
From the end of Venetian rule in Dubrovnik and the departing of their last rector in 1358, all the way through to the end of the Dubrovnik Republic in 1808, Dubrovnik elected 5,366 rectors.
At the time of the Dubrovnik Republic an order was in force that dictated that when the southerly jugo wind was blowing, no important political decisions could be made. This was due to the fact that many believed the low air pressure caused by the wind made people depressed and irritable.

Source: wwwdubrovnikdigest.com

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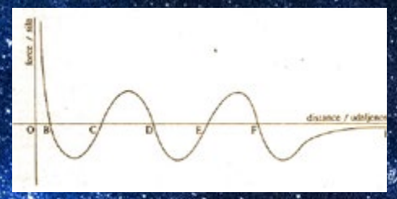

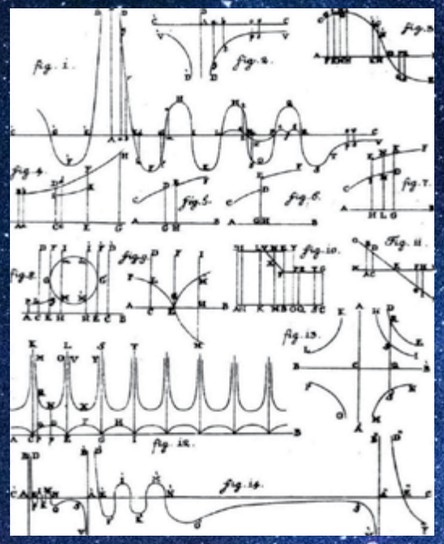

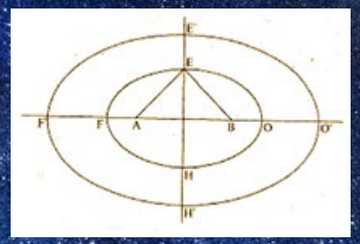



RUDJER BOSKOVIC - CROATIAN LEIBNIZ



Rudjer Boskovic (1711 – 1787) was a physicist, astronomer, mathematician, philosopher, diplomat, poet, theologian, Jesuit priest and a polymath from the Republic of Ragusa (Dubrovnik). He studied and lived in Italy and France where he also published many of his works.

Boskovic produced a precursor of atomic theory and made many contributions to astronomy, including the first geometric procedure for determining the equator of a rotating planet from three observations of a surface feature and for computing the orbit of a planet from three observations of its position. He was even given the nickname"Croatian Leibniz".

Boskovic produced a precursor of atomic theory and was a valued contributor to the field of astronomy. He was also the first to discover that the Moon has no atmosphere, all the way back in 1753. It can be safely said that Boskovic, if anyone, was born long before his time.

He published an impressive number of dissertations. Among them were the transit of Mercury, the figure of the Earth, the Aurora Borealis and the observation of fixed stars. He also wrote extensively about the inequalities of terrestrial gravitation, the application of mathematical science to the theory of the telescope, the tides of the sea and various problems relating to spherical trigonometry. He was consulted, alongside various other men of science, by Pope Benedict XIV as to the most stable means of securing the stability of the dome of Saint Peter's in Rome following the unwelcome discovery of a large crack.

Rudjer Boskovic died in Milan and was laid to rest at the Church of Saint Maria Podone Rudjer Boskovic is remembered and celebrated today, particularly in Dubrovnik and Croatia but by the world as a whole.
His immeasurable contributions to astronomy saw a lunar crater named after him.The largest Croatian institute of natural sciences and technology (Zagreb) is called the Rudjer Boskovic Institute, and the controversial philosopher Nietzsche wrote a fragment titled "Time Atom Theory" in 1873, a reworking of Boskovic's most famed work.

Source: www.total-croatia-news.com

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