EUCNC | 6G Summit

Gothenburg, Sweden ▪ 6-9 June 2023

— Final Programme —

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Message from the General Co-Chairs

Pearse O'Donohue and Magnus Frodigh

Thank you for joining us at the 2023 EuCNC & 6G Summit in Gothenburg! We are excited to host this year's conference, which combines two of Europe's premier events in communication networks: the European Conference on Networks and Communications (EuCNC) and the 6G Summit.

After the challenging years of COVID-19 restrictions, we are excited to host this year's conference exclusively for in-person attendance in the beautiful city of Gothenburg, known for its spirit of new horizons, trade, culture, knowledge, and discoveries.

This year's conference is significant. It will showcase 6G visions and early technology following the launch of numerous regional 6G initiatives. It is rewarding to witness Europe's prominent position in mobile communications research with the Smart Networks and Services (SNS) joint undertaking. It's rewarding to see the start of multiple projects concentrating on radical technological advancements for 6G.

The SNS is led jointly by industry and the European Commission. It has set out both the strategy and the tools to develop technology capacities for 6G systems. Only recently, it has launched 35 projects with a combined EU funding of around EUR 250 million. And more is expected this year with a call for project proposals of EUR 132 million. These efforts involve experimental infrastructures, large-scale trials, and pilots for various industries.

At EuCNC & 6G Summit this year, we will showcase the state of the art of research in communication networks and associated topics, with numerous exciting keynotes, panels, sessions, workshops, tutorials, exhibitions with a Speakers' Corner, and an outstanding social programme.

At Ericsson, we are thrilled to welcome EuCNC & 6G Summit back to Sweden after 15 years. In 2008, the event was known as ICT-Mobile Summit and was held in Stockholm. Back then, for every 100 people, there were about 60 mobile subscriptions, and the total number of broadband subscriptions was around 400 million. Today, mobile communications data global consumption has increased by approximately 7,000 times to a staggering 115 exabytes per month. This growth demonstrates the critical role of mobile connectivity not only for economic growth but also as a fundamental pillar of society. As a global ICT player with a strong research and technology development presence, Ericsson is proud to be part of the EuCNC & 6G Summit in Gothenburg. We have established several research centres in Sweden, including a significant one in Gothenburg. Our close collaboration with local institutions, such as Chalmers, KTH, LTH, and others, is vital to strengthen the local research ecosystem and contribute to the broader European research ecosystem. EU-funded programs, such as Framework, Horizon, and SNS programs, have been instrumental in propelling the EU to lead mobile communications research in the last two decades, with projects such as WINNER, METIS, Hexa-X, Hexa-X-II and 5G-SMART.

At the EuCNC & 6G Summit, we advocate for global dialogue and collaboration to develop mobile communications standards. The road to 6G extends beyond mobile communications technology and spans the entire value chain, from components and devices to AI, Cloud, and security. The 6G era will be driven by four important factors: trustworthy systems, sustainability, accelerated automation and digitalisation, and limitless connectivity. Each generation of mobile communications technology has moved beyond the sole purpose of increasing connectivity to prioritising the creation of essential infrastructure, energy efficiency, and positive societal impact. Our goal is to design mobile communications technology and systems that prioritise the well-being of both humanity and the planet.

We hope you enjoy the conference and your stay in Gothenburg. Let's work together to shape the future of our connected world!

Pearse O'Donohue & Magnus Frodigh, Conference General Co-Chairs

Message from the Local Organiser and Technical Programme Committee Chairs

Tommy Svensson (Local Organiser and TPC Chair) and Ari Pouttu (Vice Chair)

Welcome to EuCNC & 6G Summit 2023!

It is our honour as the lead local organiser and chair/ vice chair of the Technical Programme of the 32nd edition of the European Conference on Networks and Communications (EuCNC) that for the third year is co-organized with the 6G Summit to welcome all patrons, authors, exhibitors and attendees. The conference will take place in Gothenburg June 6-9, 2023, at The Swedish Exhibition & Congress Centre, a renowned Scandinavian centre for exhibitions, conferences, and meetings.

After many years of active contributions to the EU research community, we are thrilled to invite you again to the north of Europe, to Gothenburg, located on the beautiful West Coast of Sweden, which is celebrating its 400th Anniversary starting June 2. Gothenburg is the home of the Chalmers University of Technology, which is the lead local organiser of the conference this year, and several high-tech companies, such as the top patron Ericsson but also other technology companies such as Volvo Cars, Volvo Group, SKF, SAAB, Beyond Gravity, AstraZeneca, and prominent SMEs. We hope you will also seize the opportunity to discover what this green city can provide when it comes to dining, museums, sights and activities, as well as visit one of the World's finest Archipelagos.

The motto for EuCNC & 6G Summit 2023 is "6G for a Green and Digital Transition". 6G is in an excellent position to help address most of the societal needs as identified by the United Nations Sustainable Development Goals (UN SDGs), targeted for 2030. To this end, 6G needs to be sustainable. It should look after its carbon footprint and enable other sectors to become sustainable, offering tools for increasing our handprint within the verticals. From a technical perspective, 6G should enable interactions between the human world of our senses, bodies, intelligence and values; a digital world of information, communication and computing; and a physical world of objects, processes, and organisms. To create such an internet of senses, it is foreseen that there will be a technical convergence in 6G of terrestrial and non-terrestrial communications, radio-based sensing, as well as computing and storage with artificial intelligence.

We are very proud of the technical program with top-level keynotes, panels, regular paper sessions, special sessions, convened sessions, poster sessions, workshops, tutorials, exhibitions with a Speakers' Corner, and an outstanding social programme. This exciting conference programme has been made possible thanks to exceptional contributions from the EU and global research community, the Technical committee with volunteering Co-chairs and TPC members, the Organizing Committee, Steering Committee, Conference general chairs, the Awards Committee, Meetx conference organiser, Chalmers staff and volunteers. Specifically and with great gratitude, we would like to highlight the role of our Patrons – Ericsson, Huawei, Nokia, Technology Innovation Institute, Keysight, National Instruments, Rohde & Schwarz, IMEC, Qamcom, and Virginia Diodes, and our Sponsors – the European Commission, Gothenburg City, CEA-Leti, IEEE Comsoc, EURASIP and EurAAP, who have made significant contributions to make this extraordinary event a reality.

We look forward to hearing about latest research findings generated in 6G research programmes around the world at EuCNC & 6G Summit 2023.

Welcome, and looking forward to seeing you all in Gothenburg!

Tommy Svensson, Lead local organizer, Technical Programme Chair, Chalmers University of Technology, Sweden

Ari Pouttu, Technical Programme Vice-Chair, University of Oulu / 6G Flagship, Finland

Welcome to Gothenburg

A friendly city on the west coast of Sweden, home to a vibrant cultural scene, world-class restaurants, sustainable living and picturesque archipelago islands. This year we are celebrating Gothenburg's 400th anniversary – come and join the festivities!

Read more here: https://www.goteborg.com/

Opening Session

Wednesday, 7 June 2023, 8:30-9:45, Kongresshallen

Chair: Tommy Svensson, Univ. Chalmers, SE

Tommy Svensson
Lead local organizer & TPC Chair of EUCNC & 6G Summit 2023, Univ. Chalmers, SE
Welcome Address

Håkan Eriksson
First Deputy Lord Mayor, SE
Welcome Address by Gothenburg City
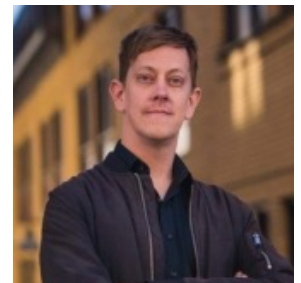
Pearse O'Donohue
Director, Future Networks, European Commission DG CONNECT & Conference General Co-Chair, BE
Welcome Address by Conference General Co-Chair

Magnus Frodigh
Vice President & Head of Research, Ericsson & Conference General Co-Chair, SE
Welcome Address by Conference General Co-Chair

Erik Slottner
Minister for Public Administration in Sweden, SE
6G research and innovation – the key to democratic technological leadership

Closing Session

Friday, 9 June 2023, 12:30-13:00, Kongresshallen

Chair: Erik Ström, Univ. Chalmers, SE

Tommy Svensson
Lead local organizer & TPC Chair of EUCNC & 6G Summit 2023,
Univ. Chalmers, SE
Closing Address

Pavlos Fournogerakis
Program Officer at Smart Networks and Services Joint Undertaking (SNS JU), BE
Smart Networks and Services –achievements and way forward

Ingrid Moerman
EuCNC & 6G Summit 2024 Host, IMEC – Ghent University, BE
Presentation of the 2024 Antwerp Conference

Johann Marquez-Barja
EuCNC & 6G Summit 2024 Host, IMEC – University of Antwerp, BE
Presentation of the 2024 Antwerp Conference

Peter Van Daele
EuCNC & 6G Summit 2024 Local Chair, IMEC - Ghent University, BE

Conference Program Overview

TIME-SLOT	TUESDAY JUNE 6	WEDNESDAY JUNE 7	THURSDAY JUNE 8	FRIDAY JUNE 9
AM 1	Workshops, Tutorials	Opening, Keynote	Keynotes	Keynotes
	Break	Break	Break	Break
AM 2	Workshops, Tutorials	Oral Sessions	Oral Sessions	Panel
AM 3	Lunch	Poster Sessions	Poster Sessions	Closing
		Lunch	Lunch	
PM 1	Workshops, Tutorials	Panel	Panel	
	Break	Break	Break	
PM 2	Workshops, Tutorials	Oral Sessions	Oral Sessions	
PM 3		Panel		
EVENING	Welcome Reception		Banquet	

Conference Program Overview
Day 1 – Tuesday 6th of June

Time (CEST)	Tuesday, June 6								
09:00-10:30	WS3 Session 1 RoomG3 — The 6G series workshop by Hexa-X and Hexa-X-II	WS1 Session 1 RoomG4 — Synergies between communication, localization, and sensing towards 6G	WS7 Session 1 RoomH1 — Aligning European NTN Convergence and Integration	Tut3 Session1 RoomG1 — Non-Terrestrial Networks for 6G	Tut4 Session1 RoomG2 — Unravelling the potential of softwarized programmable networks – From theory to practice	WS6 Session1 RoomJ1 — Reconfigurable Intelligent Surfaces from sub-6GHz to THz: Recent Advances and Open Challenges	WS5 Session1 RoomJ2 — Exploring the Intersection of 6G and Artificial Intelligence: Unleashing the Potential of Next-Gen Technologies	WS9 Session1 R22-R23 — Empowering Transatlantic Platforms for 5G Advanced and 6G Network	WS2 Session1 R24-R25 — The Role of AI in Edge 6G topologies
10:30-11:00	Coffee Break								
11:00-12:30	WS3 Session2 RoomG3 — The 6G series workshop by Hexa-X and Hexa-X-II	WS1 Session2 RoomG4 — Synergies between communication, localization, and sensing towards 6G	WS7 Session2 RoomH1 — Aligning European NTN Convergence and Integration	Tut3 Session2 RoomG1 — Non-Terrestrial Networks for 6G	Tut4 Session2 RoomG2 — Unravelling the potential of softwarized programmable networks – From theory to practice	WS6 Session2 RoomJ1 — Reconfigurable Intelligent Surfaces from sub-6GHz to THz: Recent Advances and Open Challenges	WS5 Session2 RoomJ2 — Exploring the Intersection of 6G and Artificial Intelligence: Unleashing the Potential of Next-Gen Technologies	WS9 Session2 R22-R23 — Empowering Transatlantic Platforms for 5G Advanced and 6G Network	WS2 Session2 R24-R25 — The Role of AI in Edge 6G topologies
12:30-14:00	Lunch								
14:00-15:30	WS3 Session3 RoomG3 — The 6G series workshop by Hexa-X and Hexa-X-II	WS1 Session3 RoomG4 — Synergies between communication, localization, and sensing towards 6G	WS7 Session3 RoomH1 — Aligning European NTN Convergence and Integration	Tut2 Session1 RoomG1 — Data-driven modelling and optimization of green future mobile networks	WS10 Session1 RoomG2 — Future deterministic programmable networks for 6G	WS6 Session3 RoomJ1 — Reconfigurable Intelligent Surfaces from sub-6GHz to THz: Recent Advances and Open Challenges	WS8 Session1 RoomJ2 — Measuring societal value impact in 6G with KVIs	Tut1 Session1 R22-R23 — Reinforcement Learning for 5G and beyond radio access networks: from design to implementation	WS4 Session1 R24-R25 — International workshop on Wireless Communications in Terahertz (IWCT)
15:30-16:00	Coffee Break								
16:00-17:30	WS3 Session4 RoomG3 — The 6G series workshop by Hexa-X and Hexa-X-II	WS1 Session4 RoomG4 — Synergies between communication, localization, and sensing towards 6G	WS7 Session4 RoomH1 — Aligning European NTN Convergence and Integration	Tut2 Session2 RoomG1 — Data-driven modelling and optimization of green future mobile networks	WS10 Session2 RoomG2 — Future deterministic programmable networks for 6G	WS6 Session4 RoomJ1 — Reconfigura-ble Intelligent Surfaces from sub-6GHz to THz: Recent Advances and Open Challenges	WS8 Session2 RoomJ2 — Measuring societal value impact in 6G with KVIs	Tut1 Session4 R22-R23 — Reinforce-ment Learning for 5G and beyond radio access networks: from design to implementation	WS4 Session2 R24-R25 — International workshop on Wireless Communications in Terahertz (IWCT)
18:30-20:00	Welcome Reception								

Day 2 – Wednesday 7th of June

Time (CEST)	Wednesday, June 7										
8:30-9:45	Opening Session Congresshall										
9:45-10:30	Keynote 1: Magnus Frodigh: 6G – Connecting a cyber-physical world Congresshall										
10:30-11:00	Coffee Break										
11:00-12:30	Conv1 Congresshall 5G-PPP – The value generated for Europe	SPS1 RoomG3 5G for CAM in cross-border scenarios: challenges and lessons learnt	SPS12 RoomG4 Evolution of network exposure from 5G to 6G	SPS9 RoomH1 6G enabled Network Applications for the Future of Connected Robotics	Conv6 RoomG1 Embedding sustainability into 6G: the race to deliver green digital solutions	PHY1 RoomG2 Reconfigurable intelligent surfaces	PHY5 RoomJ1 AI/ML in the PHY/PHY layer security	6VS1 RoomJ2 6G Visions and Sustainab.	NET1 RoomR2 Cognitive network management & Quality aware networking	AIU1 R22-R23 IoT Service Management	OPE1 R24-R25 Large-scale open testbeds and experiment
12:30-13:00	Poster Session A										
13:00-14:00	Lunch										
14:00-15:30	Panel 1: Speeding up digitalization and closing digital divide in 6G era Congresshall										
15:30-16:00	Coffee Break										
16:00-17:30	Panel5 Congresshall Careers in Practicing and Research Engine-ering	SPS3 RoomG3 Dependable wireless com. systems and deterministic 6G com.	Conv5 RoomG4 Bridging the gap to exploitation and deployment	Mix2 RoomH1 RAS & 6VS	Conv2 RoomG1 WiTaR: Women in telecom. and Research	PHY2 RoomG2 AI/ML in the PHY layer	PHY6 RoomJ1 Massive and ultra-massive MIMO	WOS1 RoomJ2 Non-terrestrial networks	NET2 RoomR2 AI/ML in service provisioning (1)	AIU2 R22-R23 IoT Solutions	OPE2 R24-R25 Beyond 5G and 6G trials and experiments
17:30-18:30	Panel 2: Dialogue with Industry Leaders Congresshall										

Day 3 – Thursday 8th of June

Time (CEST)	Thursday, June 8										
9:00-9:45	Keynote 2: Ted Rappaport – Looking towards the 6G era – what may we expect, and why Congresshall										
9:45-10:30	Keynote 3: Peter Vetter – 6G getting into next gear Congresshall										
10:30-11:00	Coffee Break										
11:00-12:30	Conv4 Congresshall A European collaborative initiative with a strong vertical impact on a global level	SPS5 RoomG3 Achievements of EU-Taiwan Joint Projects and discussing future possibilities of cooperation in 6G SNS	SPS11 RoomG4 Security and trust – key enablers for 6G	SPS2 RoomH1 6G Architecture – European View	Conv3 RoomG1 The path to 6G standard.	PHY3 RoomG2 Radio based localization	PHY7 RoomJ1 Beyond 5G (1)	WOS2 RoomJ2 Radio access networks in 5G and beyond	NET3 RoomR2 AI/ML in service provisioning (2)	AIU3 R22-R23 Factory Automation and V2X Solutions	MIX3 R24-R25 OPE & 6VS
12.30-13.00	Poster Session B										
13.00-14.00	Lunch										
14.00-15.30	Panel 3: Sustainability challenges and opportunities for 6G Congresshall										
15.30-16.00	Coffee Break										
16.00-17.30	SPS6 Congresshall 6G Industry Projects in the German 6G Program	SPS8 RoomG3 Challenges and solutions for enabling intelligent routing in ORAN using RIC and integrating satellite networks	SPS4 RoomG4 Enabling innovation in Transport and Logistics operations: a 5G approach	SPS10 RoomH1 Mega-Constellation Non-Terrestrial Network for 6G	SPS7 RoomG1 Novel technologies in disaggregated packet-optical networks to support 6G	PHY4 RoomG2 Propagation and channels	PHY8 RoomJ1 Beyond 5G (2)	WOS3 RoomJ2 Wireless and optical communic.	MIX4 RoomR2 NET & WOS	RAS1 R22-R23 Radio Access and Softwaris.	MIX1 R24-R25 PHY & CMA
19.00-01.00	Banquet										

Day 4 – Friday 9th of June

Time (CEST)	Friday, June 9
9:00-9:45	Keynote 4: Andrea Conti – Localization-of-Things towards 6G Ecosystems Congresshall
9:45-10:30	Keynote 5: Wen Tong – On the Convergence Route for 6G Congresshall
10:30-11:00	Coffee Break
11:00-12:30	Panel 4: Research Challenges and Opportunities in 6G Congresshall
12:30-13:00	Closing Session Congresshall
13:00-14:00	Lunch

Useful Information

EuCNC & 6G Summit 2023 Registration and Info Desk:

Located at the Svenska Mässan in Gothenburg

eucnc2023@meetx.se
Phone: +46 31 708 86 90
Postal address: Sweden Meetx AB, 412 94 Gothenburg

Opening times:

Tuesday 7 June: 08:00 - 19:00
Wednesday 8 June: 08:30 - 17:00
Thursday 9 June: 08:00 - 17:00
Friday 10 June: 08:00 - 13:00

Social Media

Follow us on social media and be the first to hear the latest news, exciting happenings, and updates.

Twitter: https://twitter.com/EuCNC 2023 EuCNC & 6G Summit @EuCNC

LinkedIn: https://www.linkedin.com/company/eucnc-6g-summit/

EuCNC & 6G summit Facebook: https://www.facebook.com/eucnc6gsummit @eucnc6gsummit

YouTube: https://www.youtube.com/c/EuCNC6GSummit 2022 Joint EuCNC & 6G Summit

Share your own stories and photos!

Include our official hashtags: #EuCNC2023 and #6Gsummit

Watch our live video stream on the conference website: www.eucnc.eu

EuCNC & 6G Summit 2023 app

Use the official conference app at EuCNC 2023 & 6G Summit
"Download Conference App "Conference 4 me" for EuCNC & 6G Summit 2023.

This year, the conference is using the Conference 4 me, where you can see the

full program, vote for the best booth, check the exhibitors, add sessions to your

agenda.

To download the Conference App:

- Download "Conference 4 me" in the App store, Google Play or Windows Phone (or use the QR Code above)
- Select the conference "EuCNC & 6G Summit" and download the information. No need to register.
- Make sure to "check for update" at least once a day in order to have all the new information (on the 3 dots on the right of your screen) https://conference4me.psnc.pl/download/

EuCNC & 6G Summit 2023 offers an exceptional social program to make the event a worthwhile and memorable experience. The participants will be welcome to attend the social events, outside the official program, where they enjoy unique Swedish gastronomy in spectacular places around the city. Excellent opportunity for networking and socializing with your colleagues.

Welcome Reception

Date: Tuesday, 2023 June 6th

Time: 18.30-20.00

Location: Universeum, Södra vägen number 50, Gothenburg

Welcome reception will share by 2023 EuCNC & 6G Summit which will be held on the first workshops and tutorials day after the end of the official programme. All participants are
welcome to relax and enjoy networking opportunities and meet old and new friends in the spectacular Universeum , which is located in the heart of the city of Gothenburg and three minutes' walk from the venue.

Universeum is a public science centre and museum in Gothenburg, Sweden that opened in 2001. It is a part of Evenemangsstråket, the thoroughfare of events – close to Korsvägen and Skånegatan – which includes sights of interest like Scandinavium, Ullevi, Svenska Mässan (Swedish Exhibition Centre), Liseberg and the Museum of World Culture.

Universeum is divided into six sections, each containing experiment workshops and a collection of reptiles, fish and insects. Universeum occasionally gives Swedish secondary school students a chance to debate with Nobel prize-winners and professors.

Capacity: 900 standing participants, 3 min walk from the venue.

Welcome reception hosted by Gothenburg City

More information here: https://www.universeum.se/en/

Walking distance: 4 min from Sv Mässan
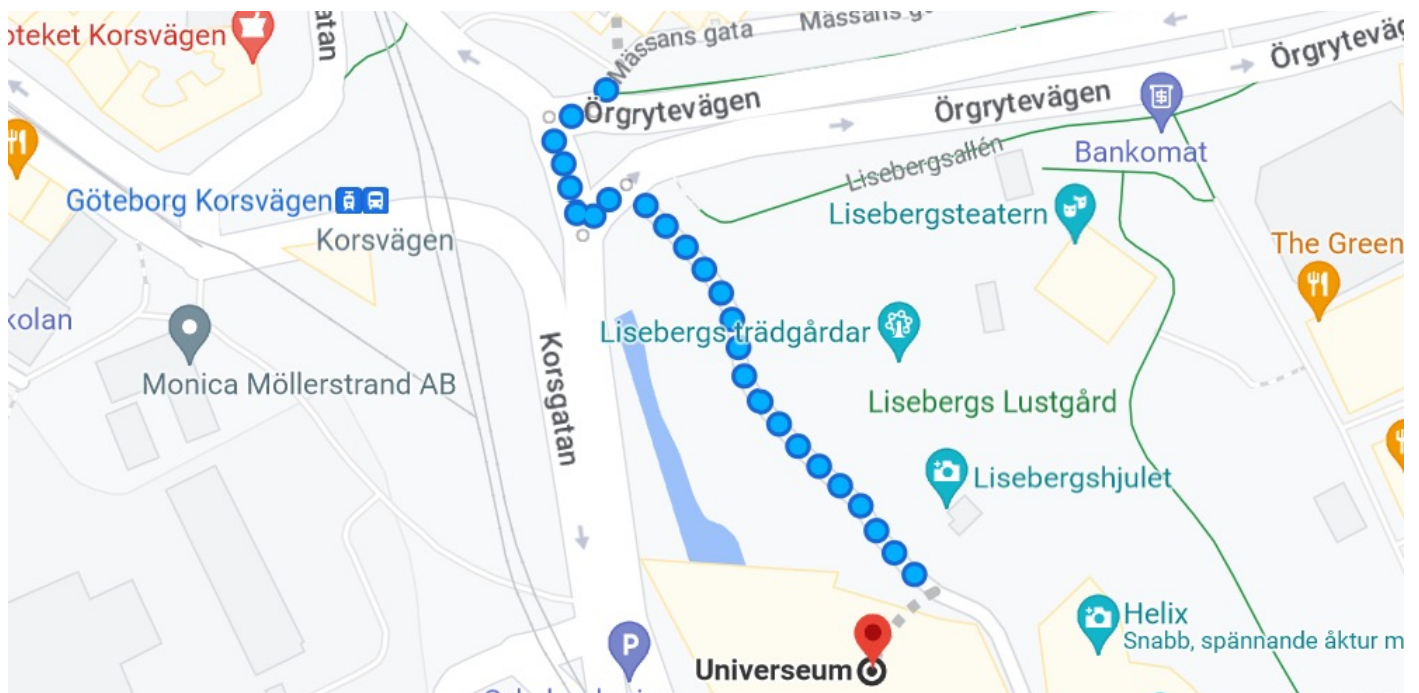
Gala Dinner

Date: Thursday, 2023 Jun. 8th
Time: 19.00-01.00
Location: Kajskjul 8/Wharf shed 8
**Packhuskajen 11 · SE-411 13 Gothenburg**

Wharf shed 8 is a former wharf shed at the Packhuskajen in the Port of Gothenburg. The shed was built around 1885 and was used as a warehouse. The railway went right up to the building so that goods could be loaded into the shed and over to ships, or vice versa.

In 1995, the shed was rebuilt to fit in with the renewal of Packhus platsen and to be able to be used at various events. The shed is one of the few remaining wooden buildings along Gothenburg's quays. A registration to the gala dinner is required through the online registration system.

Please note that not all conference passes include the gala dinner pass. Don't miss this special event, the venue is unique!

More information here: https://kajskjul8.se/en/

Walking distance: 32 min from Sv Mässan
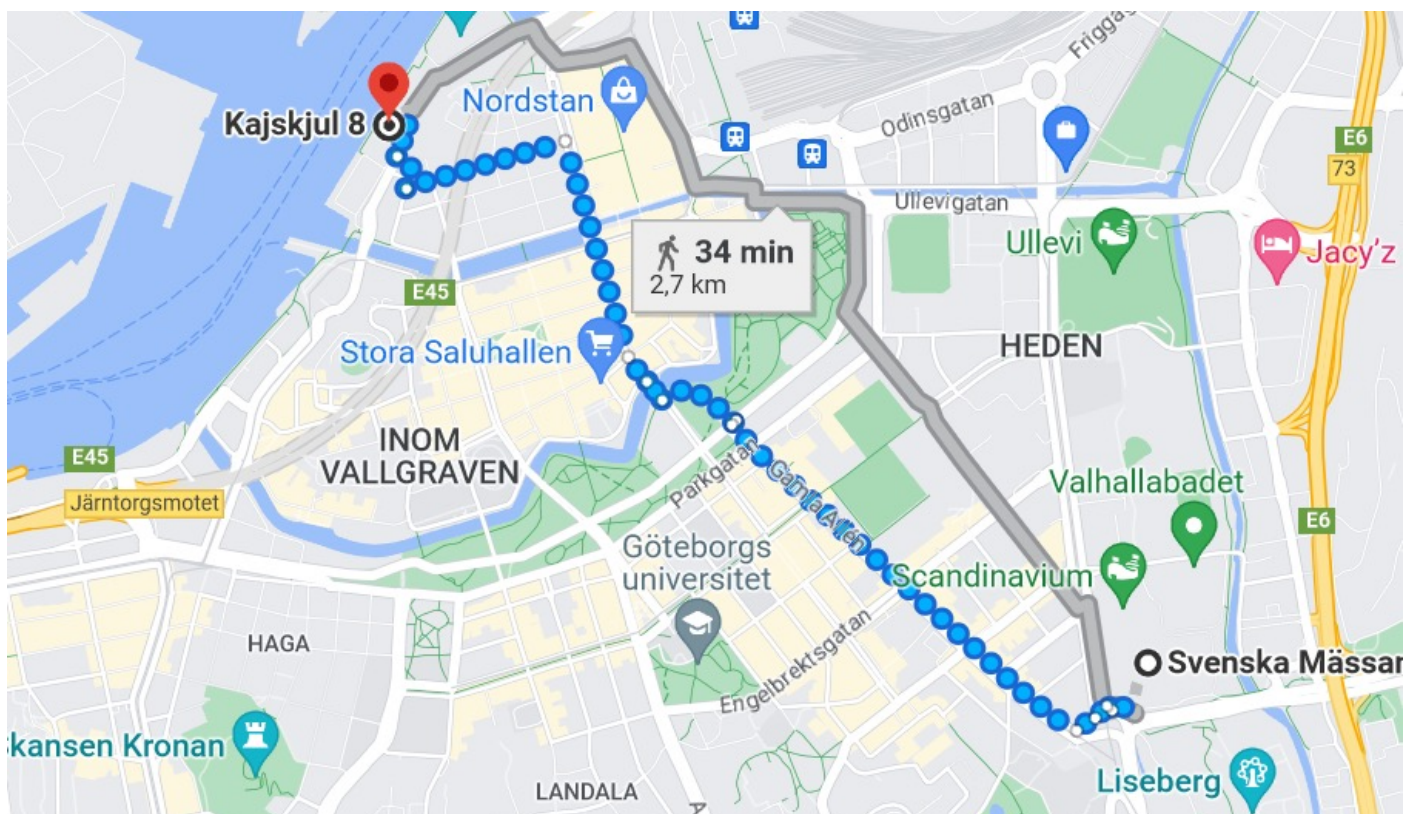
Venue

2023 EuCNC & 6G Summit will take place at the Swedish Exhibition & Congress Centre

The Swedish Exhibition Centre has arranged conferences and exhibitions since 1918 and has grown over the time to become the biggest venue in Scandinavia.
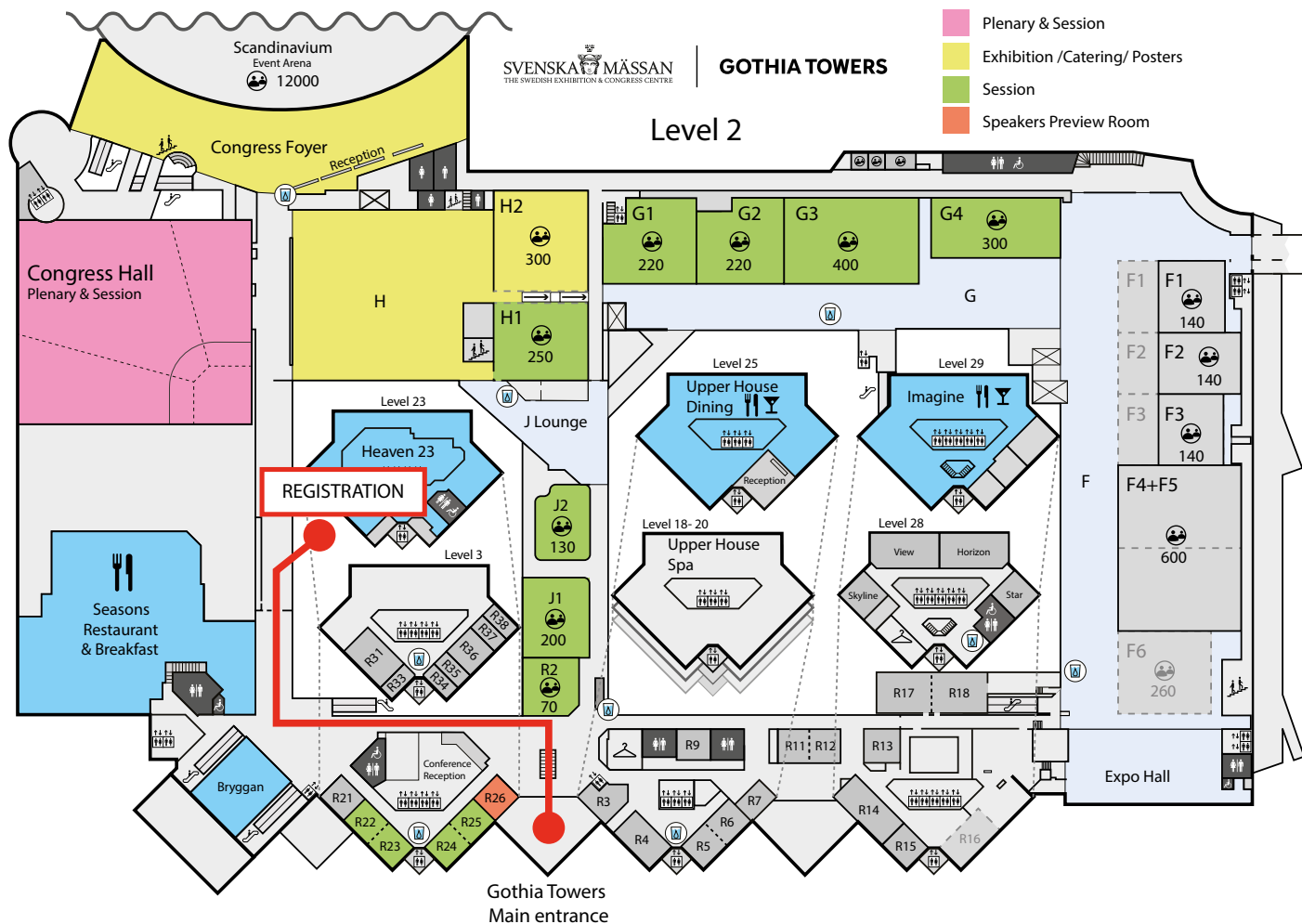
Address: Mässans Gata/Korsvägen, 412 94 Göteborg.

Venue Facts

- **City-centered all-inclusive and well-connected venue**
- **41,000 sqm exhibition space**
- **60+ meeting rooms**
- **Auditorium style plenary seats 1,500 persons**
- **1,200 hotel rooms**
- **8 restaurants and 5 bars; from 24 hours grab n' go café to Guide Michelin starred.**
- **Several banquet halls**
- **Generous net-working areas**
- **Free Wi-Fi and latest technical equipment**
- **Eco-certified, 100% powered by wind energy**
- **24 hour service**
- **ATM services on site**
- **Airport bus stop outside, 20 minutes from airport**

EuCNC & 6G Summit 2023 -
Map of venue/Conference area

Level 2

Legend:
- Plenary & Session
- Exhibition /Catering/ Posters
- Session
- Speakers Preview Room

SVENSKA MÄSSAN
THE SWEDISH EXHIBITION & CONGRESS CENTRE | GOTHIA TOWERS

Scandinavium
Event Arena
12000

Congress Foyer
Reception

Congress Hall
Plenary & Session

Seasons
Restaurant
& Breakfast

Bryggan

REGISTRATION

Heaven 23
Level 23

Level 3

Conference
Reception

H2
300

H
H1
250

J Lounge

J2
130

J1
200

R2
70

R31 R33 R34 R35 R36 R37 R38

R21 R22 R23 R24 R25 R26

R3 R4 R5 R6 R7

G1 220
G2 220
G3 400
G4 300

G

Upper House
Dining
Level 25

Imagine
Level 29

Upper House
Spa
Level 18-20

View | Horizon
Level 28

Skyline | Star

R17 R18

R9

R11 R12 R13

R14

R15 R16

Expo Hall

F1 140
F2 140
F3 140

F4+F5
600

F6
260

F

Gothia Towers
Main entrance

EuCNC & 6G Summit 2023
6-9 June

Entrance 8

Congress Foyer

G1 G2 G3 G4

G

H1

J2

J1

R2

R9

R11 R12 R13

R17 R18

Level 2

Keynote Speaker

Wednesday, 7 June 2023, 9:45-10:30, Kongresshallen

Title: 6G – Connecting a cyber-physical world

Magnus Frodigh
Vice President & Head of Research, Ericsson, SE

Chair: Tommy Svensson (Chalmers University of Technology, SE)

Abstract

Incredibly, today's networks have formed an intelligent digital infrastructure offering endless possibilities to individuals, enterprises, and governments worldwide. The rollout of 5G will enable robust new solutions for a wide range of social, environmental, and economic challenges. We are already on the way towards the next paradigm shift formed by a combination of emerging technology trends. That paradigm shift will take us to the 6G era which will give rise to challenges beyond what even 5G can meet. The increasing expectations set a clear target for us in the industry and research community — 6G should contribute to an efficient, human-friendly, sustainable society through ever-present intelligent communication. This presentation will outline Ericsson's vision where 6G will enable a cyber-physical continuum blending the physical real world of sensing, action and experience with a programmable digital representation of that same world and call on the audience to engage in the shaping of the future network platform.

CV

Dr. Magnus Frodigh is Vice President and Head of Ericsson Research. In this role he leads Ericsson's long-term technology research organization, its close collaboration with academia and industry, and its contributions to the Ericsson business and product development. He holds a Master of Science degree from Linköping University of Technology, Sweden, and a Ph.D. in Radio Communication Systems from the Royal Institute of Technology, where he is also adjunct Professor in Wireless Infrastructures. He is a Fellow of the Royal Swedish Academy of Engineering Sciences (IVA). Frodigh joined Ericsson in 1994 and has over the past three decades held various key senior positions within Research & Development and Product Management, throughout the generations of mobile technology, from 2G all the way to current research on 6G technologies. He holds 29 patents.

Keynote Speaker

Thursday, 8 June 2023, 9:00-9:45, Kongresshallen

Title: Looking towards the 6G era – what may we expect, and why

Ted Rappaport
New York University, US
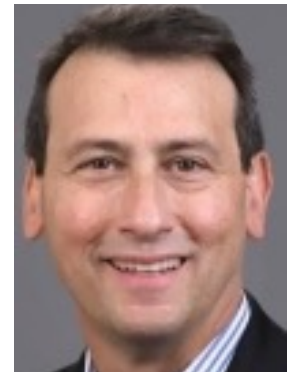
Chair: Luis M. Correia (IST/INESC-ID – University of Lisbon & INESC, Portugal)

Abstract

Recent work has shown that the fundamentals of the radio propagation channel will enable mobile communications all the way to 900 GHz, offering bandwidths of tens of GHz. An amazing fact that is all but disregarded is that the three fundamental technological breakthroughs of 5G, namely millimeter wave technology, small cell densification, and massive multiple-input multiple-output (massive-MIMO) antenna systems, are paving the way for the next several decades of the wireless industry. This talk demonstrates how the 5G era will futureproof wireless networks as we enter the 6G era and beyond — an era of wireless cognition and human-style computing. In fewer than 20 years, wireless networks will carry information at the computation speed of the human brain. Yet, how will engineers ensure that we build these networks with sustainability and power efficiency in mind? This talk offers some solutions and promising areas of exploration to ensure the future 6G era is lightning fast yet kind to planet earth.

CV

Theodore (Ted) S. Rappaport is the David Lee/Ernst Weber Professor at NYU. He founded NYU WIRELESS and the wireless research centers at the University of Texas Austin (WNCG) and Virginia Tech (MPRG). His research has provided fundamental knowledge of wireless channels used to create the IEEE 802.11 standard, the first U.S. digital TDMA and CDMA standards, and the first public Wi-Fi hotspots, and recently proved the viability of millimeter wave and sub-THz frequencies for 5G, 6G, and beyond. He founded two companies that were sold to publicly traded companies – TSR Technologies, Inc. and Wireless Valley Communications, Inc. – and was an advisor to Straight Path Communications, which sold 5G millimeter wave spectrum to Verizon. He is a registered professional engineer, a member of the Wireless Hall of Fame, a Fellow of the National Academy of Inventors, and a member of the US National Academy of Engineering. He is a life-member of the American Radio Relay League and has amateur radio callsign N9NB.

Keynote Speaker

Thursday, 8 June 2023, 9:45-10:30, Kongresshallen

Title: 6G getting into next gear

Peter Vetter
President of Bell Labs Core Research, Nokia, US

Chair: Luis M. Correia (IST/INESC-ID – University of Lisbon & INESC, Portugal)

Abstract

6G is no longer a mere long-term aspiration. It is a framework of technologies that will become reality by the end of the decade. We are transitioning from the idea-generation phase to systematization and proof-of-concept realization. In this talk, we will present progress on many of the key technologies Nokia and its partners are envisioning for future 6G systems. These technologies include network-as-a-sensor, which will introduce new spatial and contextual awareness capabilities, the AI-native air interface, which will give radios the ability to learn, and new spectrum technologies, which will deliver the capacity and flexibility necessary to meet future demands. We will also discuss how an intent-based automated network management will bring dynamic X-as-a-service to life.
In the same talk, Peter will invite Mr. Takehiro Nakamura from NTT DOCOMO to share his view on potential 6G use cases.

CV

Peter Vetter is President of Bell Labs Core Research and Bell Labs Fellow. He leads an eminent global research organization with the mission to create game changing innovations that define the future of networks and insure portfolio leadership for Nokia's core business.
During an international career of thirty years in research leadership mostly in fixed and mobile networks, he and his teams have realized several world-first system demonstrations and successfully transferred industry leading concepts to the business groups.
He received a PhD at Ghent University (Belgium) in 1991 and was a post-doctoral fellow at Tohoku University (Japan) until 1993. He then joined the research center of Alcatel (now Nokia) in Antwerp and has worked at Bell Labs in Murray Hill, New Jersey since 2009.
He is an IEEE Fellow and Honorary Professor of KU Leuven.

Keynote Speaker

Friday, 9 June 2023, 9:00-9:45, Kongresshallen

Title: Localization-of-Things towards 6G Ecosystems

Andrea Conti
Professor, University of Ferrara, IT

Chair: Ari T. Pouttu (Centre for Wireless Communications University of Oulu, Finland)

Abstract

Real-time situation awareness is essential for current and future wireless applications, particularly those involving Internet-of-Things and towards 6G ecosystems. In particular, the reliable localization and navigation of people, objects, and vehicles – Localization-of-Things – is critical for providing situation awareness in a diverse set of applications including smart environments, vehicle autonomy, asset tracking, medical services, and environment sensing. The coming years will see the emergence of network localization and navigation in challenging environments. We will discuss the limitations of traditional positioning and move on to the key enablers for high-accuracy location awareness with sub-meter accuracy and minimal infrastructure requirements in beyond 5G ecosystems towards 6G.

CV

Andrea Conti is a Professor at the University of Ferrara and Research Affiliate at the MIT Wireless Information and Network Sciences Laboratory. His research interests involve theory and experimentation of wireless systems and networks including network localization, distributed sensing, and quantum communications. He received the HTE Puskás Tivadar Medal, the IEEE Communications Society's Stephen O. Rice Prize in the field of Communications Theory, and the IEEE Communications Society's Fred W. Ellersick Prize. Dr. Conti has served as editor for IEEE journals, as well as chaired international conferences. He has been elected Chair of the IEEE Communications Society's Radio Communications Technical Committee. He is a co-founder and elected Secretary of the IEEE Quantum Communications & Information Technology Emerging Technical Subcommittee. Professor Conti is an elected Fellow of the IEEE and of the IET, and he has been selected as an IEEE Distinguished Lecturer.

Keynote Speaker

Friday, 9 June 2023, 9:45-10:30, Kongresshallen

Title: On the Convergence Route for 6G

Wen Tong
CTO, Huawei Wireless, Huawei Technologies, CA

Chair: Ari T. Pouttu (Centre for Wireless Communications University of Oulu, Finland)

Abstract

The 6G research is gaining a global momentum, since 6G will be the foundational ICT platform for everything of our live and work, therefore, the technology impact of 6G is imperative. In this talk, we present the common view on the key use cases for 6G and the vision converged vision framework for 6G. We discuss the potential enabling technologies of choice and their capabilities, in particular, we provide a deep dive on the AI and AGI as mainstream applications in the 6G era, including the convergence of the AI computing and 6G connectivity. One of the key differentiations for 6G is new capabilities of beyond-communications, this will open many new doors not only for the consumer market but also the vertical market, such as the consumer-robot and business-grade high performance computing service.

CV

Dr. Wen Tong is the CTO, Huawei Wireless and a Huawei Fellow. He is the head of Huawei wireless research, and the Huawei 5G chief scientist and led Huawei's 10-year-long 5G wireless technologies research and development.
Dr. Tong is the industry recognized leader in invention of advanced wireless technologies, for the past three decades, he had pioneered fundamental technologies from 1G to 6G wireless. Dr. Tong was elected as an IEEE Fellow. He was the recipient of IEEE Communications Society Industry Innovation Award 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". He is also the recipient of R.A. Fessenden Medal.
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 is a Fellow of Canadian Academy of Engineering.

Panels - Panel 1

Wednesday, 7 June 2023, 14:00-15:30, Kongresshallen

Speeding up digitalization and closing digital divide in 6G era

Organiser/Moderator: Matti Latva-aho, Univ. Oulu, FI

Motivation and Background

The opportunity to define networks for the 6G era has been successfully framed from a value perspective: To help the world act together, key value indicators for 6G should include sustainability, trustworthiness and digital inclusion. In this panel, we will explore options of speeding up digitalization to help meet and exceed objectives of societal and economic value capture and digital inclusion. While 5G related innovation will likely continue to make impact until the end of the decade, the big promise of productivity increase in various sectors of industry and enhanced user experience with 5G is still mainly a promise. Of course 5G technology needs little bit more time to unfold its full potential and mature towards cost and energy efficient solutions, but we can also question the existing business models and operator models: should we enable and encourage new players to invest, build and operate the networks and to develop location & context dependent applications & specialized services? Taking into consideration the availability of higher spectrum bands for 6G operation, maybe the time has come to change spectrum licensing and net neutrality policies for the higher spectrum bands foster gowth and business innovation. In addition to specialized, local and often private networks, many future applications require wireless connectivity in rural or remote areas as well (autonomous vehicles of different sorts on ground, underground, air and seas). Many of the challenges for providing digital services in remote areas are non-technical; the whole value chain needs to be re-evaluated, e.g. who will contribute building the infrastructure, who will operate the network, what should the role of public players be, are we going to have local/private 6G networks open to public, who will provide unique local services are some of the questions to be answered.

Questions

1. What is the potential of existing terrestrial systems for providing rural large area coverage?

2. Why satcom is needed for 6G? What's the role of it in the 6G ecosystem?

3. How the regional differences (ability to use and affordability; regulations; availability of business ecosystem) must be taken into account when connecting the last 3 billion?

4. What is the role of local connectivity solutions (public vs. private) in 6G era and how different regional regulatory schemes should be taken into consideration?

5. Will 6G tolerate access agnosticity when developing future business models?

6. Which is driving 6G: industrial metaverse or societal needs?

Participants

The panel is composed of (see CVs below):

*   Chair: Matti Latva-aho (Moderator) (Director, 6G Flagship, Univ. of Oulu, FI)

*   Jaap van de Beek (Professor, Luleå University of Technology, SE)

*   Marko Höyhtyä (Research Professor, VTT, FI)

*   Sudhir Dixit (6G Flagship, Univ. of Oulu, FI

*   Akihiro Nakao (Professor, The University of Tokyo, JP)

*   Hanne-Stine Hallingby (Senior Research Scientist, Telenor RI, NO)

*   Volker Ziegler (Senior Technology Advisor, Nokia, DE)

Panels - Panel 2

Wednesday, June 7, 2023, 17.30-18.30, Kongresshallen

Dialogue with Industry Leaders

Organiser/Moderator: Bernard Barani, Deputy Head of Unit, DG CONNECT – Future Connectivity Systems, at European Commission

Motivation and Background

There are currently many issues around the development of 6G, not only from the technological viewpoint but also addressing other dimensions, such use cases and societal impact. The development of 6G in all its dimensions has been a theme for discussion in many fora, which includes the positioning of many industries and the so-called verticals, the sustainability of networks, the way that communications systems relate to climate change, among many other aspects. This panel is intended to be a lively discussion among industry leaders, exploring all these dimensions of 6G and looking at the future of the development of 6G.

Questions

1. What are the panel views on the most promising application domains of 6G, how do they differentiate from 5G capabilities and are there verticals we should work with as a priority?

2. What are the panel views on the best approach to realise significant energy savings with 6G? At network level, are there critical technologies to consider and should we define, in addition to the FCAPS network management model an additional "E" set of parameters used to manage energy consumption in networks? If the focus has to be in the application use cases, do we need to develop specific network exposure capabilities beyond what 5G provides?

3. What are the panel views on new radio interfaces for 6G, the role of AI and the possibility to fully unify technology between NTN and terrestrial nets?

4. What are the views of the panel for 6G? what will be the role of virtualisation/softwarisation/disaggregation for 6G, will all open issues have been solved and will so called "open architecture" be the default implementation model? What microelectronics capabilities are needed to be compatible with future requirements?

5. What are the panel views on AI and its role for 6G, what is an AI native architecture and what can be expected beyond what 5G AI developments already plan? Does an AI native architecture require to revisit the SBA architecture developed for 6G?

Participants

The panel is composed of (see CVs on the web):

- Chair: Bernard Barani (Moderator) Deputy Head of Unit, DG CONNECT - Future Connectivity Systems, at European Commission, BEMagnus Frodigh (Ericsson, SE)

- Peter Vetter (Nokia, US)

- Wen Tong (Huawei, CA)

- Micaela Giuhat (Microsoft, US)

- Eric Hardouin (Orange, FR)

Panels - Panel 3

Thursday, June 8, 2023, 14.00-15.30, Kongresshallen

Sustainability Challenges and Opportunities in 6G

Organiser/Moderator: Micaela Giuhat, Microsoft, US

Motivation and Background

Sustainability is in focus for the 2030 society and is therefore naturally a key challenge for future networks to address. The ICT community needs to consider both a direct impact from networks (labelled Sustainable 6G), working on reducing footprints, and an enabled effect from use of networks (labelled 6G for sustainability), working on supporting use cases that bring about sustainable transformation of society. Important aspects to discuss are trade-offs between different types of sustainability, and possible trade-offs between performance benefits and societal benefits.

Questions

1. What is the biggest sustainability challenge with current networks?
2. What is the most important step to take in 6G to reduce the environmental footprint from ICT?
3. Do you see any good possibility for 6G to address the UN SDGs?
4. Are there any sustainability risks that 6G could give rise to through its usage?
5. How do we best ensure that 6G is developed in a direction that addresses sustainability challenges?

Participants

The panel is composed of (see CVs on the web):

- Chair: Micaela Giuhat (Moderator) (Microsoft, US)
- Pernilla Bergmark (Ericsson, SE)
- Ali Rezaki (Nokia)
- Liesbet Van der Perre (KU Leuven, BE)
- Thierry Lestable (TII, AE)
- Azeddine Gati (Orange, FR)

Panels -Panel 4

Friday, June 9, 11.00-12.30, Kongresshallen

Research Challenges and Opportunities in 6G

Organiser/Moderator: Eric Hardouin, Orange, FR

Motivation and Background

6G research is now well on its way across the globe. In Europe, Hexa-X-II started in January 2023 with the aim to bring 6G to a complete system concept ready to feed standardization from 2025. In addition, initial discussions on 6G requirements and capabilities have started in the ecosystem, e.g., in ITU-R in the framework of the IMT.Vision document, and in NGMN with the publication of the the NGMN 6G Requirements and Design Considerations. As the coming months and years should see the crystallization of both the vision of what 6G should deliver in terms of value and services, and its technological foundations, this panel will gather experts from different backgrounds and regions of the world to exchange perspectives on remaining research challenges and opportunities raised by 6G. In addition to measuring the level of alignment between different regions on 6G visions, it will also be the occasion to discuss how to foster global alignment towards a common 6G standard.

Questions

1. Do we need a 6G? why?

2. How do we maximise the chances to end up with one standard and not several?

3. How do we guarantee trustworthiness in 6G?

4. What else is critical for 6G to be a success? From a technology perspective or any other dimension?

Participants

The panel is composed of (see CVs on the web):

- Chair: Eric Hardouin (Moderator) (Orange, FR)
- Mitch Evans (Next G Alliance, US, TW)
- Amina Boubendir (Airbus, FR)
- Erik Dahlman (Ericsson, SE)
- Egon Schulz (Huawei, DE)
- Marja Matinmikko-Blue (Uni Oulu, FI)

Panels -Panel 5

Wednesday, June 7, 16:00 – 17:30, Kongresshallen

Careers in Practicing and Research Engineering

Organiser/Moderator: Luis M. Correia (Prof. IST/INESC-ID – University of Lisbon, PT)

Motivation and Background

Having a career in the area of communications has always been an interesting and challenging one, i.e., technology evolves very fast, every decade a new wireless cellular system emerges, the center of the area has changed from a very physical basis to one based on software, new technologies have invaded the "traditional" areas and the economic landscape of the business changes also at a high speed, just to name a few aspects. The number of students in the area has been decreasing in recent years in many countries, due to a growing attractiveness of other areas of technologies (even within ICT in general) and a perception that Telecommunications are not "modern" anymore. As a consequence, there's a shortage of graduates in this area and organizations are facing difficulties in hiring qualified human resources that can be part of their teams. A contribution to the solution to this problem is to present what a career in communications, the general conditions that are available, the benefits offered to collaborators and the problems that are currently being addressed, among other matters. This panel addresses these aspects and provides an opportunity for a follow-on exchange of information, between hiring organizations and graduate students or recently graduated ones

Questions

1.   What are the differences between a career in research or in practicing engineering?

2.   What are the differences between a career in industry or in academia?

3.   What are the differences between a career in large industries or in start-ups?

4.   Is there a strong mobility of jobs between the different companies?

5.   How important is the first job to define a career?

Participants

The panel is composed of (see CVs on the web):

•   Chair: Luis M. Correia (Prof. IST/INESC-ID – University of Lisbon, PT)

•   Anki Ljung (Ericsson, SE)

•   Lena Wosinska (U. Chalmers, SE)

•   Jane Jeffreys (Huawei, DE)

•   Patryk Urban (West Pomeranian Univ. Szczecin, PL)

•   Ömer Bulakc (Nokia, DE)

Workshop 1: Synergies between communication, localization, and sensing towards 6G

Tuesday, June 6, 9:00-10:30/11:00-12:30/14:00-15:30/16:00-17:30, Room G4

Organisers:

- Henk Wymeersch (Chalmers University of Technology, SE)
- Benoit Denis (CEA Leti, FR)
- Liesbet Van der Perre (KU Leuven, BE)
- Angeliki Alexiou (University of Piraeus, GR)
- Ahmad Nimr (TU Dresden, DE)
- Markku Juntti (University of Oulu, FI)
- George Alexandropoulos (National and Kapodistrian, University of Athens, GR)

Motivation and Background

Residing on the 3GPP Release 17 era, the 5G NR development cycle is now mature and several such networks have been already deployed around the globe. Hence, the research interest has started shifting towards the potential of novel technologies and systems for 6G. Moreover, there is an ever-growing demand for exciting new use cases and services that connect human, digital, and physical worlds, such as digital twinning, telepresence, and collaborative robots, which simply are not possible with present-day NR technologies. Thereby, it is time to assess future 6G enabling technologies spanning up to very high carrier frequency at the THz band as well as more efficient lower frequencies through distributed and cell-free massive MIMO, very wide bandwidth communications, a massive number of antenna elements and smartly-excited passive radiating elements (e.g., metamaterials and metasurfaces), as well as discuss plausible deployments and infrastructure with built-in wireless cognition, sustainability, and trustworthiness. To this end, the synergetic role of communications, localization, and sensing offers the potential for smart multi-objective wireless connectivity, enabling novel rate-, latency-, and massive-connectivity-demanding applications. But this convergence also raises a number of non-trivial -and yet open- research challenges regarding e.g., fundamental performance limits and tradeoffs, optimal resource allocation in complex multi-service contexts, new holistic approaches to drastic power consumption reduction, design of a dedicated multipurpose physical layer and its associated transceiver architecture, distributed sensing techn iques. The 7 invited EU projects have significant activities in all of these areas, which we believe will be of wide interest toattendees from both industry and academia.

Structure

Session 1 – Opening Session and Introduction the THz SNS projects (90 mins)

- Keynote by Gerhard Fettweis (TU Dresden) on "How can 6G RAN include joint communications and sensing?" (45 min)
- TERA6G presentation on "TERA6G: Towards THz Ultra-Massive MIMO Wireless Networks", by Joonas Kokkoniemi (20 min)
- TERRAMETA presentation " Through the development of reconfigurable electromagnetic surfaces at sub-THz: Actual technology and future challenges," A. Clemente (20 min)

Session 2 – Status update on ICT 52 projects (90 mins)

- REINDEER presentation on "Propagation characteristics and channel models for large scale antenna arrays: Application to RadioWeaves infrastructure for communication and positioning," Thomas Wilding, TU Graz (30 min)
- ARIADNE presentation on "Tailoring the Application of Reconfigurable Intelligent Meta-Surfaces in Beyond 5G Networks" by Angeliki Alexiou (30 min)
- RISE6G presentation on "Recent Advances in Estimation and Control for RIS-aided Localization and Sensing: The RISE-6G Proposals," Benoit Denis (30 min)

Session 3 – From Hexa-X to Hexa-X II (90 mins)

- Keynote by Erik Dahlman (Ericsson) on integrated sensing and communication (45 mins)
- Hexa-X and Hexa-X-II presentation, "Final results on localization and sensing from the Hexa project and introduction on the JCAS activities in Hexa-X-II", H. Wymeersch and A. Nimr (45 min)

Session 4 – Closing Session (90 mins)

- Presentations on demonstrations & plans in the different projects (45 mins)
- Panel session with Q&A (45 mins)

Workshop 2: The Role of AI in Edge 6G topologies

Tuesday, June 6, 9:00-10:30/11:00-12:30, Room R24-R25

Organisers:

- Fred Buining (HIRO-MicroDataCenters BV, NL)
- Oriol Sallent (Universitat Politècnica de Catalunya (UPC), ES)
- Elli Kartsakli (Barcelona Supercomputing Center (BSC), ES)
- Nikolaos Bartzoudis (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC-CERCA), ES)

Motivation and Background

The goal of this workshop is to discuss the close synergy between Artificial Intelligence (AI) and edge computing, as two key enabling technologies shaping 6G, and identify the roadmap for more holistic, sustainable and future-proof design of AI- and edge-enabled solutions. The use of AI can significantly support, accelerate and augment human decision-making processes in the context of 6G in two broad directions. On the one hand, AI can play a key role in the efficient management, automation and optimization of the immensely complex 6G ecosystem, whereas, on the other hand, it is leveraged to deliver emerging services, such as XR, autonomous driving, smart manufacturing, etc. Applying such concepts at the edge, where resources and architectures are highly heterogeneous and constrained is more challenging, but the rewards can be significant: efficiently exploiting data locality can lead to reducing latency, increasing energy efficiency, enhancing security, etc. Furthermore, the deployment of edge applications, especially AI applications, is sometimes hampered by its energy consumption. Thus, the workshop will also focus on how AI can be leveraged to optimise the RAN configuration from an application perspective in order to provide energy consumption savings. This workshop will discuss the current vision in evolving edge computing architectures and "AI at the edge" design, presenting the perspective of 5 EU-funded R&D projects, namely BRAINE, VERGE, ACES, SmartEdge and BeGREEN and invited experts in the field. In addition to exposing the different approaches of each project, the workshop will aim to provide a more holistic view on how to design open, secure and modular edge computing architectures, empowered by trustworthy and interoperable AI.

The Workshop will focus on the following challenges:

- Evolving open, secure and decentralised edge architectures to enable AI
- Heterogeneity and interoperability aspects for an integrated compute continuum and sustainable AI solutions
- Closed-loop automation and cognition for the joint AI-driven orchestration of network, radio and compute resources at the Edge
- Extreme and conflicting KPIs at network and compute level
- KPIs versus KVIs tradeoffs in Edge resource orchestration
- Security, privacy, trustworthiness and data sovereignty in distributed edge topologies
- Decentralised edge intelligence and advanced learning algorithms
- Explainable AI/ML algorithms, to identify which network functions need to be optimised and the contributory factors that lead to this need for optimization

Structure

The first part of the Workshop will be based on presentations of two-page papers to set the scene. This part will count with contributions from BRAINE, ACES, VERGE, SmartEdge and BeGREEN projects. BRAINE was one of the first EU-funded projects to target the implementation of AI at the edge in infrastructure and applications. Analysing BRAINE will create a perspective of 'inward and outward focus', exploring the design of AI solutions within and beyond the scope of the project, respectively, which will be further discussed during the Workshop. The second act of the Workshop will count with 2 Invited Speakers presentations, which will broaden the perspective. Finally, a panel featuring the Technical Managers (or key contributors) of the 5 projects and 2 invited speakers will drive an open discussion on the challenges identified above. Detailed structure (to be adapted according to Chair indications):

Introduction (10 min), Fred Buining (HIRO-MicroDataCenters BV)

Part 1 – Setting the scene (6×10 min)

- BRAINE: Big data processing and artificial intelligence at the network edge (Suresh Patoria (HIRO-MicroDataCenters BV)

- ACES: Autopoietic cognitive edge-cloud services (Fernando Ramos, INESC-ID)

- SMARTEDGE: Semantic low-code programming tools for edge intelligence (Simon Pryor, Accelleran)

- BeGREEN: AI-driven energy optimization for edge computing applications. (Mir Ghoraishi, Gigasys solutions)

- 6G-Sandbox: Edge resources management for a disaggregated open RAN 6G networks (Adam Flizikowski, IS-Wireless)

- VERGE: AI-powered eVolution towards opEn and secuRe edGe architEctures (Jose Oriol Sallent, UPC)

Part 2 – Invited talks (2×20 min)

- Fernando Ramos, Associate Professor INESC-ID (PT)

- - Miquel Payaró, Director of Open Innovation and Science at CTTC (Spain)

- - Dan Warren, Director, Advanced Network Research – 5G/6G Research at Samsung Research (UK)

- - Xueli An, Principal Researcher and Industry Development Specialist at Huawei Technologies (Germany)

Part 3 – Panel discussion

Workshop 3 - The 6G series workshop by Hexa-X and Hexa-X-II

Tuesday, 6 June 2023, 9:00-10:30/11:00-12:30/14:00-15:30/16:00-17:30, Room G3

Organisers:

- Patrik Rugeland (Ericsson Research, SE)
- Mikko Uusitalo (Nokia Bell Labs, FI)
- Mauro Boldi (Telecom Italia S.p.A., IT)
- Hamed Farhadi (Ericsson Research, SE)

Motivation and Background

The European 6G flagship research project Hexa-X (H2020 ICT-52) have been leading the work towards building the foundation for a future 6G system and exploring a plethora of technical enablers. The research in the project have consolidating the views from the 25 partners from leading academic institutions and industry players and conducting leading edge technological exploration and development related to enhanced radio performance and combined communication and localization/sensing; Connected intelligence with integrated AI/ML; Network evolution expansion, exploring new network architectures and novel verticals. Hexa-X-II, the successor 6G flagship research project (HORIZON-JU-SNS-2022-STREAM-B-01-05) will continue the work with an expanded consortium of 44 partners, covering the entire value chain to create the blueprint system design of 6G. As such, the workshop will accurately address the conference tracks 'Wireless, Optical and Satellite Networks', 'Network Softwarization', 'RAS – Radio Access and Softwarisation' and '6G Visions and Sustainability', by providing a consolidated view on the 6G research from the major European players. This workshop provides an opportunity to solidify Hexa-X's position as a leading 6G project on a global scale, showcasing the work done with presentations and live demos, and to hand over the reins to Hexa-X-II, as well as provide an opportunity to connect and align with the 6G research perform elsewhere. This will be accomplished by inviting other ICT-52 and SNS-JU Stream B 6G technical enabler projects to present.

Structure

Session 1 – 6G system vision (90 min) (session host Mikko Uusitalo):

- Keynotes, Ericsson's view on 6G – Erik Dahlman (Ericsson) [12 min + 3 min Q/A]
- Keynote#2 Nokia's view on 6G – Harish Viswanathan (Nokia) [12 min + 3 min Q/A]
- European Vision for 6G networks – Colin Willcock (Nokia) [12 min + 3 min Q/A]
- Update from Hexa-X, Hexa-X-II and global alignment – Mikko Uusitalo (Nokia) [12min + 3 min Q/A]
- Hexa-X: Overview of 6G radio enablers – Hamed Farhadi (Ericsson) [12 min + 3 min Q/A]
- Hexa-X-II: Draft foundation for 6G system design – Patrik Rugeland (Ericsson) and Sylvaine Kerboeuf (Nokia) [12 min + 3 min Q/A]

Session 2 – 6G and sustainability (90 min): (session host Patrik Rugeland)

- Hexa-X: 6G for sustainability: the enablement effect – Mauro Boldi (Telecom Italia) [12 min + 3 min Q/A]
- SUPERIOT: Towards a truly sustainable internet of things: Concepts and technologies – Marcos Katz (U Oulu) [12 min + 3 min Q/A]
- RISE-6G: Sustainable RIS solutions – Emilio Calvanese Strinati (CEA-Leti) [12 min + 3 min Q/A]
- Enhancing standardized methodologies for assessing indirect effects to explore impacts of future systems – Pernilla Bergmark (Ericsson) [12 min + 3 min Q/A]
- Panel discussion: 6G sustainability: a long-term challenge, [30 min]
- Panel chair: Maurizio Cecchi (PIIU)

- Panellists:
  - Marja Matinmikko-Blu (U Oulu)
  - Pernilla Bergmark (Ericsson)
  - Aimilia Bantouna (WINGS)
  - Esteban Selva (Orange)
  - Emilio Calvanese Strinati (CEA-Leti)

Session 3 – 6G architecture (90 min): (session host Sylvaine Kerboeuf)

- Hexa-X/Hexa-X-II: 6G E2E architecture, architectural components and enablers – Bahare Masood Khorsandi (Nokia) and Mårten Ericson (Ericsson) [15 min + 3 min Q/A]
- A unified 6G architecture for vertical markets: the 6G-NT N vision – Mohamed El Jaafari (Thales Alenia Space), Nicolas Chuberre (Thales Alenia Space), and Alessandro Vanelli-Coralli (University di Bologna) [12 min + 3 min Q/A]
- B5G OPEN – Architectures for Multi-band optical continuum network– Oscar Gonzalez de Dios (Telefonica) [12 min + 3 min Q/A]
- DETERMINISTIC6G – a 6G architecture for deterministic communication – Joachim Sachs (Ericsson) [12 min + 3 min Q/A]
- Hexa-X Demo overview: Flexible topologies for expanding the service offering and efficiency in 6G – Panagiotis Demestichas (WINGS) [20 min + 5 min Q/A]

Session 4 – Connecting intelligence (90 min): (session host Hamed Farhadi)

- AI-driven communication & computation co-design, Nandana Rajatheva (U Oulu) [10 min + 2 min Q/A]
- DESIRE6G – Employing deep programmability and distributed intelligence for real-time 6G networks – Chrysa Papagianni (U Amsterdam) [10 min + 2 min Q/A]
- The DAEMON Network intelligence stratum and services – Andrés Garcia Saavedra (NEC Laboratories Europe) [10 min + 2 min Q/A]
- CENTRIC – Towards an AI-native, user-centric air interface for 6G networks – Petar Popovski (U Aalborg) [10 min + 2 min Q/A]
- AI@Edge – Intelligent network architecture – Neiva Linder (Ericsson) [10 min + 2 min Q/A]
- Panel discussion: AI and 6G: opportunities and challenges [30 min]
- Panel chair: Hamed Farhadi (Ericsson)
- Panellists:
  - Dani Korpi (Nokia Bell Labs, Senior Specialist)
  - Emil Björnson (KTH, Host of the podcast Wireless Future)
  - Ather Gattami (Bitynamics, Host of the podcast AI-podden)
  - Petar Popovski (U Aalborg)
  - Nandana Rajatheva (U Oulu)

Workshop 4 - International workshop on Wireless Communications in Terahertz (IWCT)

Tuesday, June 6, 14:00-15:30/16:00-17:30, Room R24-R25

Organisers:

• Kenta Umebayashi (Tokyo University of Agriculture and Technology, JP)

• Aarno Pärssinen (University of Oulu, FI)

Motivation and Background

The goal of this workshop is to enhance synergistic effect for the cooperation among the experts from different research fields, such as RF circuit design, hardware modelling, and digital signal processing for Terahertz wireless communications. In the future wireless communication systems, massive number of devices with extremely high data rate, such as hundred Giga-bit-per-second (Gbps), will be served and it requires huge amount of spectrum resources. Terahertz and sub-Terahertz (0.1 – 10THz) frequency bands have sufficient spectrum resource to achieve the extreme requirements for the future wireless communications. For realizing practical wireless communications in the THz bands, a variety of issues and challenges are recognized, such as device technologies for THz transceivers, RF amplifiers, antenna design and development in extremely high data-rate signal processing. In the digital signal processing, modulation/demodulation, equivalization, synchronization, as well as analog and digital beamforming techniques signal for very large arrays, lenses, and reflective antennas. In addition, the wave propagation and channel modelling in THz frequency band are also important issues. In this workshop, the experts in these different fields will introduce their works and issues, and discuss openly and interactively. The cooperation among different fields have a potential to solve the difficult challenges, and relax the requirements/issues. In addition, comprehensively covering the issues can lead to an efficient approach for the appropriate THz wireless communications/networks. In this workshop, not only the members from EU project, such as Hexa-X: (A flagship for B5G/6G vision and intelligent fabric of technology enablers connecting human, physical, and digital worlds), but also the other non-EU members are involved to enhance the international for activities for THz wireless communications.

Structure

90 min * 2 sessions
Current session plan is as follows:

1st session (90 min)

– Opening
– 1st keynote presentation

Prof. Fujishima, Hiroshima Univ., Japan: "The Future of 300 GHz Band Wireless Communications"

– 2nd keynote presentation

Prof. Aarno Pärssinen, University of Oulu, Finland: "Designing radios towards Tbps data rates – where we are and what may happen next?"

Coffee break

2nd session (90 min)

4 Invited talks:

• Prof. Takuji Arima, Tokyo University of Agriculture and Technology, Japan : Far-field Analysis in the Multiple-Region (MR)/FDTD Method for THz Frequency Band

• Dr. Nuutti Tervo, University of Oulu, Finland: "Impact of RF Nonidealities in 6G"

• Prof. Kenta Umebayashi, Tokyo University of Agriculture and Technology, Japan: "Digital signal processing for THz wireless communications,"

• Dr. Ahmad Nimr, Vodafone Chair Mobile Communications, Systems, Germany: "Energy-efficient Waveform Design for Abundant Spectrum in sub-THz and Beyond"

Workshop 5 - Exploring the Intersection of 6G and Artificial Intelligence: Unleashing the Potential of Next-Gen Technologies

Tuesday, June 6, 9:00-10:30/11:00-12:30, Room J2

Organisers:

• Adzic Jovanka (TIM SpA, IT), (moderator)

• Roberto Riggio (Polytechnic University of Marche, IT)

• Irene Facchin (Fondazione Bruno Kessler, IT)

• Evangelos Kosmatos (WINGS ICT Solutions,)

Motivation and Background

This workshop will explore the intersection of artificial intelligence (AI) and 6G technology. 6G is the next generation of mobile networks that promises to revolutionize the way we connect and interact with the world around us. With its high-speed, low-latency, and high-bandwidth capabilities, 6G has the potential to enable new and exciting use cases in a variety of industries, including transportation, healthcare, and manufacturing. AI, on the other hand, has the potential to drive innovation in a wide range of fields, including computer vision, natural language processing, and decision-making. The workshop will focus on the potential of AI and 6G to work together to create new business opportunities and support new application verticals. In the workshop we will discuss the latest research and developments in these areas, as well as the challenges and opportunities that lie ahead. The workshop will be a great opportunity for researchers, engineers, and industry professionals to learn about the latest developments in AI and 6G and to network with other experts in the field. It will also provide a platform for attendees to share their own research and ideas, and to explore potential collaborations. Overall, this workshop aims to provide an in-depth understanding of the potential of AI and 6G to drive innovation and create new opportunities in a wide range of industries. It will be a valuable learning and networking experience for anyone interested in the future of technology.

Structure

• "Beyond 5G – lessons not learned" – Per Odling, Lund University

• "Initial approaches to validate 6G AI air interface" – Michael Dieudonne & Alan Anderson, Keysight Technologies

• "Beyond 5G with Network and Artificial Intelligence. The DAEMON approach" – Evangelos Kosmatos, WINGS ICT Solutions

• "AI for Networks and Networks for AI" – Toktam Mahmoodi, King's College London

• "Bringing the AI to the EDGE – The AI@EDGE Proposal and Challenges" – Jovanka Adzic & Daniela Di Rienzo, TIM SpA

• "Federated Learning Application Enablement for Beyond-5G Intelligent Automotive Services" – Konstantinos V. Katsaros, Institute of Communication and Computer Systems

• "AI-driven communication & computation co-design" – Nandana Rajatheva, University of Oulu

• "Predictive Quality of Service for cooperative and connected automotive applications: Models, architecture and application" – Nehal Baganal, University of Duisburg-Essen/University of Ulm

• "AI@EDGE Network Architecture and Automation of Future Telecom network" – Neiva Linder, Ericsson Research

Workshop 6 - Reconfigurable Intelligent Surfaces from sub-6GHz to THz: Recent Advances and Open Challenges

Tuesday, June 6, 9:00-10:30/11:00-12:30/14:00-15:30/16:00-17:30, Room J1

Organisers:

- George C. Alexandropoulos (National and Kapodistrian University of Athens, GR)
- Halid Hrasnica (Eurescom GmbH, DE)
- Stefano Buzzi (University of Cassino and Lazio Meridionale, IT)

Motivation and Background

The recent research results confirm that the effective deployment of Reconfigurable Intelligent Surfaces (RISs) as controllable reflection surfaces (as well transmission and reception/sensing) can enhance network coverage for a wide range of frequencies, creating various opportunities for emerging applications, such as localization, sensing, energy efficiency, secrecy, and reduced electromagnetic-field exposure. The RISs can be designed as self-configuring parts of a wireless network infrastructure, adjusting their electromagnetic characteristics in response to dynamic traffic demands and actual propagation characteristics. Besides the research activities world-wide considering various aspects of applications of the RIS technology in frequencies ranging from sub-6GHz to THz, related research is also being conducted in public European projects, such as in the RISE-6G, METAWIRELESS, ARIADNE, TERRAMETA projects, as well as some others from the 5G PPP arena. The purpose of this workshop is to present and discuss the latest research achievements in Europe, as produced by the ongoing projects RISE-6G, METAWIRELESS, ARIADNE, TERRAMETA, and identify future scientific directions and challenges. In particular, the workshop will include presentations (submitted either as extended abstracts or full papers) from these four (4) ongoing projects in RIS modelling and simulators, hardware designs and demos, network integration and RIS optimization algorithms, as well as on future research challenges.

Structure

The proposed full-day workshop consists of four (4) conference time slots dedicated to presenting and discussing key technical findings of the four (4) ongoing projects on RISs. The workshop will conclude its content with a panel comprising the project's technical managers that will the lessons learnt, the open challenges, and the road ahead with the RIS technology in 6G networks from sub-6GHz to THz frequencies.

Session 1 – RIS Modelling and Simulators (1h40min)

- Presentation #1: "The Vienna system-level simulator for 6G wireless networks with reconfigurable intelligent surfaces," Le Hao (20min+5min Q&A)
- Presentation #2: "Ray-tracing-based study of RIS performance in an urban environment," Joonas Kokkoniemi, Juha Pyhtilä, Pekka Sangi, and Markku Juntti (20min+5min Q&A)
- Presentation #3: "Simulation scenarios for the assessment of reflective intelligent surfaces in THz backhaul applications," Bo Kum Jung and Thomas Kuerner (20min+5min Q&A)
- Presentation #4: "RIS electromagnetic model based on impedance formalism: Validation on practical designs" Gabriele Gradoni, Antonio Clemente, and Raffaele D'Errico (20min+5min Q&A)

Session 2 – Hardware Designs and Demos (1h40)

- Presentation #5: "Engineering of intelligent reflective surfaces: physical optics and angular stability," Mohammad Javad (20min+5min Q&A)

- Presentation #6: "Efficient anomalous reflector design based on array antenna scattering synthesis," Sravan Vuyyuru (20min+5min Q&A)

- Presentation #7: "THz RIS for ultra-high rate wireless communications: element design and synthesis," Sergio Matos (20min+5min Q&A)

- Presentation #8: "RISE-6G's RIS Prototypes," Raffaele D'Errico (20min+5min Q&A)

Session 3 – Network Integration and Optimization (1h30)

- Presentation #9: "EMF exposure and secrecy spectral efficiency optimization with RISs," Tommy Svensson (speaker), Dinh-Thuy Phan Huy (20min+5min Q&A)

- Presentation #10: "Design of wireless links aided by RIS with global reflection constraints," Robert Kuku Fotock, Alessio Zappone, and Marco Di Renzo (20min+5min Q&A)

- Presentation #11: Study of optimal RIS position and orientation: From partially to fully illuminated RIS," Georgios Stratidakis, Sotiris Droulias, and Angeliki Alexiou (20min+5min Q&A)

- Presentation #12: "Control channel options in wireless systems with reconfigurable intelligent surfaces," Fabio Saggese, Victor Croisfelt, Kyriakos Stylianopoulos, Radoslaw Kotaba, George C. Alexandropoulos, and Petar Popovski (20min+5min Q&A)

Session 4 – Open Challenges (1h40min)

- Presentation #13: "Reconfigurable technologies for integrating RIS elements at THz: New approaches and challenges," Qi Luo (20min+5min Q&A)

- Presentation #14: "RISE-6G architecture and two key challenges: RIS area and bandwidth of influence," Vincenzo Sciancalepore (20min+5min Q&A)

- Panel: "The RIS technology status, trends, and road to standardization," by the projects' representatives: Stefano Buzzi, Angeliki Alexiou, Luís Manuel Pessoa, and Vincenzo Sciancalepore (45min)

- Workshop's Conclusion (5min)

Workshop 7 - Aligning European NTN Convergence and Integration

Tuesday, June 6, 9:00-10:30/11:00-12:30/14:00-15:30/16:00-17:30, Room H1

Organisers:

• Adam Kapovits (Eurescom GmbH)

• Maria Guta (ESA)

Motivation and Background

3GPP has completed Release-17 of the global fifth generation (5G) wireless technology standard, making Non-Terrestrial Networks (NTN) and satellite segments part of the 5G/6G connectivity infrastructure and ecosystem. NTN multi-layer systems and terrestrial networks must work in harmony to fulfil the vision of a connected, sustainable B5G/6G architecture and support sustainable connectivity and fulfilment of the social and sustainable development goals. The NTN family includes satellite communication networks, high altitude platform systems (such as HAPS, UAVs), and air-to-ground networks. Satellites complement 5G networks nicely and specifically help improving the value of 5G networks by addressing coverage challenges and complex use-cases that ground-based infrastructures cannot address efficiently alone. Given the proliferation of new projects in the European context with the shared goal of integrating NTN with 5G and 6G Terrestrial Networks (TN), the ambition of the workshop is to create an overview of the activities and see how the various initiatives can all contribute to a coherent strategy to achieve NTN/TN convergence in Europe. Achievements here are given more importance because of the IRIS² (Infrastructure for Resilience, Interconnectivity and Security by Satellite) initiative of the EU for a new EU Secure Satellite Constellation.

Structure

Session 1 morning (SNS projects)

• Opening and introduction to the day

• Keynote – still to be confirmed

• 5G-STARDUST: The Potentials of 5G-Advanced from the Sky – Mohamed El–Jaafari, Thales Alenia Space France

• ETHER – sElf-evolving terrestrial/non-Terrestrial Hybrid nEtwoRks – Konstantinos Ntontin, Uni Luxemburg

• The SNS JU 6G-NTN project – Alessandro Vanelli-Coralli, Uni Bologna

• 6G-SANDBOX: Technology Validation and Measurement Campaigns for Non-Terrestrial Networks – David Artuñedo Guillen, Telefonica

Session 2 morning (ESA projects)

• Intelligent Satellite Access for 3GPP Systems Serving Automotive Use Cases – Helmut Zaglauer, Airbus Germany

• A comprehensive view on the 3GPP work on Non-Terrestrial Network: 3GPP-Release 17/18 and beyond – Mohamed El–Jaafari, Thales Alenia Space France

• The Importance of Comprehensive Testbeds for the Development of Space-based Communication – Marius Corici, Fraunhofer FOKUS

• 5G-NTN Prototyping and Experimentation Results – Adam Kapovits, Eurescom GmbH

• Demonstration of direct 5G broadband access from LEO to small aperture terminals – Riccardo di Roberto, Tyvak

Session 3 afternoon (National NTN projects)

- AI for Satellite 5G Communications (the ESA ARTES AIComS project) – Armin Dekorsy, Uni Bremen

- 6G-TakeOff: Holistic 3D Communication Networks for 6G – Markus Breitbach, DT

- AROMA3D: Towards Reliable B5G/6G Communications in 3D Networks – Musbah Shaat, CTTC

- Integration of Terrestrial and Non-Terrestrial Networks: challenges and perspectives within the RESTART project – Alessandro Guidotti, National Inter-University Consortium for Telecommunications (CNIT), DEI - University of Bologna

- INSTRUCT: INtegrated Satellite – TeRrestrial Systems for Ubiquitous Beyond 5G CommunicaTions – national research project from Luxembourg, speaker tbc

Session 4 afternoon Panel

- Celtic-next 6G SKY project – Cicek Cavdar, KTH, Sweden

- Panel discussion: Michael Fitch, University of Surrey (6GIC + ESA 5G TINA) + Marko Höyhtyä, VTT (6G-SATMTC project) + Mohamed El–Jaafari, Thales Alenia Space France + Helmut Zaglauer, Airbus Germany + Joel Grotz, SES + Markus Breitbach, Deutsche Telekom, BMW (name to be provided) + HEXA-X II representative

Workshop 8 - Measuring societal value impact in 6G with KVIs

Tuesday, June 6, 14:00-15:30/16:00-17:30, Room J2

Organisers:

* Gustav Wikström (Ericsson Research & 6G-IA, SE)

Motivation and Background

There is a very high attention on technology developers to address outstanding societal challenges – notably sustainability – and demonstrate that 6G can have a positive impact. But measuring impact on societal challenges entails studying different values rather than technical performance, which calls for a new approach in R&D. For this purpose, Key Value Indicators have been proposed as a framework for quantifying and measuring impact on societal values. In this workshop the ideas behind KVIs will be discussed as well as how they can be applied in research projects. This view will be accompanied with views from academic researchers on how to work with societal values. The workshop will be wrapped up with a panel on the topic of how 6G development should be steered towards usages with a positive societal impact.

Structure

* 5 presentations of 30min each (20-25min presentation + 5-10min questions):
* Gustav Wikström, 6G-IA Vision SNVC – What are KVIs and how to use them?
* Jose Almodovar, Hexa-X-II project – Role of Key Values in 6G
* Hanne-Stine Hallingby, 6G-IA Vision BMVE – Business value and sustainability
* Katrina Petersen, PSC Europe – measuring societal values
* Marja Matinmikko-Blue, U. Oulu – Requirements, capabilities and KVIs. Mapping UN SDGs to 6G.
* 1 panel at the end with the presenters + extra guest
* Moderator Kostas Trichias (6G-IA).
* Panel questions:
* How to ensure that 6G is developed in a sustainable direction?
* What should be the next step for a KVI-based approach?

Workshop 9 - Empowering Transatlantic Platforms for 5G Advanced and 6G Network

Tuesday, June 6, 9:00-10:30/11:00-12:30, Room R22-R23

Organisers:

- Serge Fdida (Sorbonne Université, FR)
- Didier Bourse (Nokia, FR)
- Alain Mourad (InterDigital, UK)
- Stavroula Maglavera (InterDigital, UK)
- Abhimanyu Gosain (Northeastern University, UK)

Motivation and Background

Various countries and regions have already started formal plans of government support for their research and development efforts that will define 6G. One of the primary goal of this workshop is to bring industry, government, and academia to discuss the mission and vision of test facilities, including reference design, data curation and sharing and reproducibility issues. The enabling technologies such as separation between the network and the compute, virtualization, distribution and Cloud SaaS offer us the opportunity to define physical and digital platforms for at scale research and experimentation. This trend is going to impact the telecommunication and computer-based sectors, from design to products to operation and this is where the testbeds meet the network as a fully controllable, programmable virtualized test platform. The science of Digital Infrastructures raises multiple complex challenges to the research community that already started to explore them in the context of the forthcoming 6G. Experimentation is becoming an even more important methodology to assess and qualify the diverse design assumptions and choices in realistic conditions. It is now timely not only to strengthen existing facilities ready for 5G and 5G Advanced testing but most importantly start developing early 6G platforms as most components are software-based. This is the motivation for developing a holistic approach where all resources (compute, storage, network) are associated to continuously design, integrate, test, operate and automate the full life cycle management of applications and services. Experimental platforms should be able to address the end-to-end scenario, integrating all technologies and components. Such platform will allow researcher and industry to question scientific challenges regarding the future technologies and services. They will be based on a technology roadmap that will be consolidated on the basis of the analysis of several inputs provided by the community regarding the wireless technology advances, that are pertinent to the evolution of new radio (NR) and core network (CN) until-2030. It is important to note that initiatives exist at the international level with ambitious projects and programmes like EU ESFRI SLICES (2021-2040, 250M€), EC H2020 5G Infrastructure PPP (2015-2023, 700 M€) and EC HEU SNS JU (2022-2030, 900 M€), in the US (NSF PAWR 2017-2022 100M$, NSF FABRIC 2019-2024 20M€), BRIDGES (2021-2024, 2.5M$) and China (CENI 018-2022 190M€), and efforts also developing in Japan (NICT, 200M$).

Structure

This workshop main objective is to further put in contact key persons on Europe and USA to further develop collaborations and discuss possible joint activities and evolution of the wireless platforms at both sides of the Atlantic towards 5G Advanced and 6G technologies. The workshop will be mainly driven by EU ESFRI SLICES, EU 6G IA and NSF PAWR representatives.

09:00 – 09:30 Session 1: Opening

Presentation by Serge Fdida (Sorbonne University).

Presentation by Abhimanyu Gosain (Northeastern University).

09:30 – 10:30 Session 2: Presentation of the EU and US platforms

- Presentation from SLICES, by Serge Fdida (Sorbonne University).
- Presentation from ARA (Hongwei Zhang, Iowa State University) and AERPAW (Ismail Guvenc, NCSU) platforms – (Videos)
- Presentation from SNS Phase 1 Stream C projects platforms and targeted use-cases, by Kostas Trichias (6G-IA).
- Presentation from COLOSSEUM RF Digital Twin platform, by Tommaso Melodia & Abhimanu Gosain (Northeastern Univ).
- Presentation from OAI by Allen Ksentini (Eurecom).

10:30 – 11:00 Coffee break

11:00 – 11:30 Session 3: The Networking Channel – Key lessons learnt since June 2022 and 2023+ plans

Presentation from the Networking Channel, by Stavroula Maglavera (University of Thessaly).

11:30 – 12:00 Session 4: EU and US Programmes

NSF Portfolio related to 6G and relevant test platforms, Torlak, Murat (NSF) – (Video)

Presentation from the EC SNS JU and 6G-IA including related Platforms and EU-US Cooperation, by Didier Bourse (Nokia).

Presentation from US and EU programs (tbc)

12:00 – 12:30 Round Table (30min)

Round table of representatives of EC and US Platforms. Active discussion on the future of the Platforms their expected technology evolution and potential for joint activities.

Moderator(s) :

- Serge Fdida (Sorbonne University).
- Abhimanyu Gosain (Northeastern University).

Workshop 10 - Future deterministic programmable networks for 6G

Tuesday, June 6, 14:00-15:30/16:00-17:30, Room G2

Organisers:

• Dhruvin Patel (Ericsson, SE)

• Chrysa Papagianni (Universiteit van Amsterdam, NL)

• Antonio de la Oliva (University Carlos III of Madrid, ES)

• Valerio Frascolla (Intel, DE)

Motivation and Background

6G is envisioned to accelerate the path started in 5G for catering to the needs of a wide variety of vertical use cases, both current and emerging. This will require major enhancements of the current 5G capabilities especially in terms of bandwidth, latency, reliability, security, and energy. Next generation networks should consider new KPIs enhancing the network to be more reliable, predictable and time-sensitive, by developing an end-to-end 6G solution including architectural enhancements and protocols that can guarantee seamless provisioning of services for vertical use cases that require extremely tight timing and reliability constraints. To succeed, the solution will target deterministic network infrastructures at large, including wired and wireless segments and their interconnections with the edge and cloud domains. At the same time, networks are consistently being softwarized since the past few years, making them increasingly flexible. Programmable networks are not yet able to fulfil the stringent requirements of deterministic networks, not even for wired network, not to say about wireless domains. New technologies and developments are needed to enable programmability of packet schedulers, replication and filtering of frames or expedited forwarding and queuing. On this environment, three key European projects, are developing new technologies to tackle determinism at a global scale in the yet to be defined 6G architecture. The bespoken concepts to be developed under these projects will enable future 6G deterministic programmable networks. The aim of this workshop is therefore to open a space for discussion of the different approaches to determinism these projects are choosing, discussing open points and possible collaboration topics. In addition, we will invite experts from the field to provide their view on the different deterministic and programmable approaches for WLAN, IEEE 802.1TSN, DetNet, OPC, and 3GPP TSC.

Structure

00:00 – 00:05 **Workshop introduction**
00:05 – 00:25 **DESIRE6G introduction – Chrysa Papagianni**
00:25 – 00:45 **DETERMINISTIC6G introduction – Dhruvin Patel**
00:45 – 01:05 **PREDICT-6G introduction – Antonio de la Oliva**
01:05 – 01:30 **Coffee Break**
01:30 – 02:00 **Keynote (5G-ACIA: learnings on 5G for industries", Dr. Afif Osseiran, vice-chair 5G-ACIA)**
02:00 – 02:20 **DESIRE-6G – "End-to-end data plane abstraction for supporting deep slicing in 6G"– Sandor Laki**
02:20 – 02:40 **DETERMINISTIC6G – "Data driven aspects for 6G deterministic communication", — James Gross**
02:40 – 03:00 **PREDICT-6G – "Can TSN be the standard communication protocol for robotics?" — Milan Groshev**
03:00 – 03:30 **Panel discussion with involvement of audience – Chair Valerio Frascolla**

Tutorials

TUTORIAL 1: "REINFORCEMENT LEARNING FOR 5G AND BEYOND RADIO ACCESS NETWORKS: FROM DESIGN TO IMPLEMENTATION"

Tuesday, June 6, 14:00-15:30/16:00-17:30, Room R22-R23

Speakers: Irene Vilà Muñoz (Universitat Politècnica de Catalunya, ES)

Motivation and Context

5G systems offer increased flexibility and efficiency through the introduction of new features, but their growing complexity requires automation tools. Artificial Intelligence (AI), and more specifically, Machine Learning (ML) mechanisms have been identified as key enablers for 5G networks and beyond [1]. Standardization initiatives like the O-RAN alliance [2], 3GPP [3] or ITU [4] have already considered incorporating AI tools into mobile network architecture. For the Radio Access Network (RAN), Reinforcement Learning (RL) techniques are of special interest due to their capability to optimally solve decision-making problems [5]. The applicability of RL solutions in the RAN embraces radio resource management and self-organizing functions, and network radio network management. Designing and implementing RL solutions for the RAN requires the use of several tools and technologies, embracing notable complexity. The programming of these solutions requires RL software libraries for RL algorithms (e.g., TensorFlow Agents, Keras RL, etc.). Furthermore, the training and validation must be performed on simulated environments of the RAN, either available online (e.g., Gym environments) or self-developed. Besides, the use of network digital twins for training, performance evaluation and benchmarking is gaining momentum. Further challenges arise when a given RL solution is to be
implemented: RL solutions require to be packaged appropriately to run on realsystems (e.g., Docker containers), and the interfaces and protocols specified by standards need to be implemented (e.g., NETCONF for parameter configuration). Therefore, the pathway from the conception of a RL solution to its design, evaluation and, eventually, implementation is challenging and can pose entry barriers to researchers in the field of beyond 5G networks. This tutorial aims at facilitating the introduction to the implementation aspects of such solutions, presenting the main concepts, tools and technologies involved in the stages from design to implementation and using a specific use case to provide some hands-on experience.

Structure and Content

In the above context, the tutorial will cover the contents described and structured in the following:

1 – Role of Artificial Intelligence (AI) in 5G and beyond (10 min):

The tutorial will start by introducing and motivating the need to integrate AI in 5G and beyond networks, followed by describing the vision and work of different standardization bodies on the integration of AI in networks.

Speakers: Dr. Valerio Frascolla (Intel Deutschland GmbH), Dr. Irene Vilà (UPC)

2 – Machine Learning (ML) algorithms (20 minutes):

An overview of ML algorithms will be given, introducing the principles of supervised, unsupervised and reinforcement learning (RL) subtypes. A special focus will be given to RL due to its relevance to the RAN, and different RL solution types and algorithms will be presented, such as the Deep Q-Network (DQN) algorithm.

Speakers: Dr. Yansha Deng (King's College London), Dr. Irene Vilà (UPC)

3 – Applicability of Reinforcement Learning algorithms for the Radio Access Network (25 minutes):

A discussion of RL applicability in the different layers of the next generation RAN architecture and the associated Operations and Support Systems (OSS) for network management will follow. Also, edge computing will be introduced as key technology for the applicability of such solutions for the RAN, discussing its enabling role in distributed AI solutions that allow reduced latency, increased privacy, high accuracy, etc. The explanation will be supported by various illustrative application examples.

Speakers: Dr. Valerio Frascolla (Intel Deutschland GmbH), Dr. Irene Vilà (UPC)

4 – Road from design to production for RL solutions (80 minutes):

The process that includes the design, programming, evaluation and implementation stages of RL solutions for the RAN will be described from a practical perspective. Regarding the design stage of such solutions, some considerations on modelling them to be compatible with the standards will be given (3GPP, O-RAN). Next, an overview of available software tools for the development of RL solutions will be given (e.g., TensorFlow Agents, Keras RL), as well as their operation principles and requirements. This will be followed by some guidelines and considerations for the training of these solutions, covering aspects such as the development of simulated environments of the RAN for training and evaluation, the requirements of training data according to the expected inference data, the need to incorporate retraining capabilities in the solution or the role of network digital twins in this context. Finally, the tools and technologies needed to integrate the RL-based solutions with the platform where the solution will be executed in the real network will be described. This will embrace details on the implementation of the interfaces according to the technologies specified in O-RAN (e.g., NETCONF) and the containerization of RL-based solutions.

Speakers: Dr. Irene Vilà (UPC)

5 – Use case example: Capacity sharing solution for RAN slicing (45 minutes):

A specific deep RL-based solution to the capacity sharing problem for RAN slicing will be presented [7]. This will include both the algorithmic definition and the implementation description [8], supported by the demonstration of the software developed for the solution [9], its containerization using Docker and the implemented O-RAN interfaces.

Speakers: Dr. Irene Vilà (UPC)

The format of the tutorial will mainly consist of an oral presentation of the contents proposed above with the support of slides. In addition, the tutorial will include the demonstration of the developed software for the presented use case and its implementation. Both are available in the Github repository in [9]. Note that the attendants will be able to follow the demonstration in detail by following the Github, containing hands-on materials on the concepts throughout the tutorial.

TUTORIAL 2: "DATA-DRIVEN MODELLING AND OPTIMIZATION OF GREEN FUTURE MOBILE NETWORKS"

Tuesday, June 6, 14:00-15:30/16:00-17:30, Room G1

Speakers:

- Nicola Piovesan (Huawei Technologies, FR)
- Antonio De Domenico (Huawei Technologies, FR)
- David Lopez Perez (Universitat Politècnica de València, ES)

Motivation and Context

The fifth generation (5G) of radio technology is changing our everyday lives, by enabling a plethora of new use cases, through its better coverage, larger capacity and massive connectivity. Thanks to its ultra-reliable low-latency communications, 5G also allows a high degree of automation, thus helping to expand cellular systems into new ecosystems. Importantly, 5G has already become an integral part of governmental and industrial environmental programs, as it is envisioned that an intelligent exploitation of their resources through 5G will significantly decrease carbon emissions. Despite its unprecedented capabilities, however, 5G networks must further improve in certain key technology areas, particularly in that of network energy efficiency. While current third generation partnership project (3GPP) new radio (NR) deployments provide an improved energy efficiency of around 4x w.r.t. 3GPP long term evolution (LTE) ones, they still consume up to 3x more energy, resulting in increased carbon emissions and electricity bills for operators. Even if the 3GPP NR specification provides a rich set of tools to meet IMT-2020 energy efficiency requirements, it is important to note that one of the main challenges to 5G network energy efficiency is the complexity of their optimization in wide-area deployments: a large-scale, stochastic, non-convex and non-linear optimization problem. In light of the increasing interest in this field, this one-of-a-kind tutorial shares the author's industrial view on the 5G energy efficiency challenge. This tutorial provides a detailed, up-to-date overview of the most relevant technologies that a 5G radio access network can use to increase its energy efficiency from both a theoretical and practical perspective. Moreover, this tutorial shows how increasing the network energy efficiency by exploiting such technologies in practical scenarios highly depends on the accuracy of the models used to characterize the network. In this line, this tutorial exhaustively surveys and presents machine learning techniques which are being used to create accurate network models for most network components and processes, and optimize a large-scale 5G network.

Structure and Content

The tutorial is structured into three parts

Part I: Energy efficiency in 5G networks (~30min)

- The energy efficiency challenge in 5G networks
- Main hardware and software energy efficiency enablers
- Overview on recent NGMN Green Future Network project guidelines

Part II: Advanced sleep modes and traffic redistribution (~30min)

- Advanced sleep mode solutions: carrier, channel and symbol shutdown
- Traffic redistribution/load balancing for network energy savings
- Overview on recent 5G NR energy efficiency specificationenhancements

Part III: 5G NR network energy efficiency modelling and optimization (~2h)

- 5G NR energy efficiency optimization problems and their complexity
- Big data and ML for accurate 5G NR network modeling
- Traffic demand forecasting
- ML-based base station power consumption modelling
- Data-driven load transfer modelling due to cell shutdown and traffic redistribution/mobility load balancing
- ML- and white box-based large-scale network modelling of energy efficiency and spectral efficiency
- Optimization of energy consumption and network throughput tradeof

TUTORIAL 3: "NON-TERRESTRIAL NETWORKS FOR 6G"
Tuesday, June 6, 09:00-10:30/11:00-12:30, Room G1

Speakers:

Aryan Kaushik (University of Sussex, UK) and Muhammad Z. Shakir (University of the West of Scotland, UK)

Motivation and Context

Proposers have also published a recent news article in IEEE ComSoc CTN on Non-Terrestrial Networks [1]. There is an indispensable need of technical advancements and digital transformation for the next generation communication networks not only supporting terrestrial setups but also the emerging satellite and sky-oriented technologies. In the direction of non-terrestrial networks (NTNs) technology, evolving signal processing methods, edge and cloud computing, deep learning techniques, artificial intelligence (AI) assisted deployments for unmanned aerial vehicles (UAVs) in NTNs and coverage hole detection, etc., have drastically changed the current realization of the space, sky and terrestrial communication networks. Deployment of 5G Advanced and 6G technologies envisioning NTNs as one of the key fundamental technologies which includes space-net, UAVs, satellite networking, backhaul/fronthaul and access, and their standardization is a mission critical task.

The overview, use cases, deployment scenarios and various architectures on 5G-envisioned NTNs are provided in [2]. In terms of the Third Generation Partnership Project (3GPP) work on the evolution of the 5G technologies, there has been a recent focus on NTNs for their latest release, i.e., Rel-17, whereas Rel-16 addressed the enabling 5G New Radio (NR) support for NTN technology including architecture, higher-layer protocols and physical layer (PHY) aspects [3]. The current trends of NTNs in 5G, 5G Advanced and 6G-envisioned communications is highlighted in [4]-[6]. There is remarkable industrial and academic involvement into UAVs, LEO satellites and other flying platforms, implementing technically advanced and robust solutions [7]-[12]. Furthermore, efficient backhauling/fronthauling of either the small cell base station (SBSs) or drone-BS remains a significant challenge. The EuCNC and 6G Summit attendees will benefit from this tutorial which presents comprehensive overview of the emerging NTN based wireless networking including fundamentals, requirements and emerging problem design concepts. The tutorial will cover key enabling technologies for NTNs towards the development of exciting new vertical frameworks.

Structure and Content

Time	Tutorial Schedule
20 mins	Introduction to NTNs and Roadmap to 6G
45 mins	AI Deployment and Coverage Hole Discovery in NTNs
25 mins	Break
45 mins	NTNs based Flying Platforms for Fronthaul/Backhaul
30 mins	Deep Learning and Edge Computing Assisted NTNs
15 mins	Conclusion of the Tutorial and QnA

TUTORIAL 4: "UNRAVELLING THE POTENTIAL OF SOFTWARIZED/ PROGRAMMABLE NETWORKS – FROM THEORY TO PRACTICE"

Tuesday, June 6, 09:00-10:30/11:00-12:30, Room G2

Speakers:

- Johann M. Marquez-Barja (IMEC & University of Antwerp, IDLab-Faculty of Applied Engineering, BE)
- Nina Slamnik-Kriještorac (IMEC & University of Antwerp, IDLab-Faculty of Applied Engineering, BE)
- Vincent Charpentie (IMEC & University of Antwerp, IDLab-Faculty of Applied Engineering, BE)

Motivation and Context

Along with the evolution of applications and services, networks have evolved in order to support such new applications and services. Nowadays, networks are not any more traditionally designed, built, and managed. Current networks, such as 5G and Beyond networks, rely on softwarized solutions to dynamically orchestrate and manage the different resources involved in the network from networking to computing components. Such softwarized solutions results from the combination of different technologies (SDR, SDN, NFV) and techniques (sharing, scheduling, virtualization) applied at different levels/segments of the end-to-end networks, i.e., RAN, MEC, Core, Cloud. While having to deal with such a plethora of solutions, traditional human-managed networks are not able to cope with the dynamics of such new networks, therefore automation comes into play. In order to automatize network management, we need to improve the network management lifecycle steps i.e., orchestration, control, and monitoring. Within this tutorial, we will discuss the evolution of network programmability and how such programmable capabilities enable flexible networks able to provide tailored connectivity/services to the different verticals. We will start with the basic background on programmability and network softwarization moving towards the state-of-the-art and beyond technologies and techniques that provide networks flexible capabilities to new-generation networks and innovative use cases. Furthermore, we will complement the theory with practice and demos on how to set
up the different software-based toolkits in order to orchestrate (decision-making), control (configure/re-configure the network), and monitor (verify the service) a programmable network remotely deployed in the high-performance distributed cloud, MEC, SmartCity, and Smart Highway testbeds located in different locations of Belgium, and the 5G testbed built in the scope of the VITAL-5G project and the Antwerp trial site for transport & logistics use cases.

Structure and Content

The proposed tutorial will take half a day (3 hours). The tentative outline is presented below.

Part A – Theory (90 min; led by J. M. Marquez-Barja):

- Introduction of general terms and concepts: network softwarization, programmable networks, goal of flexible networking.
- Timeline of programmability: How did we get here?
- Definition of Micro and Macro programmability: Examples of Micro and Macro programmability and use cases.
- Principles of Sharing network resources: The startingpoint.
- Principles of Virtualization: What can we achieve?
- Network softwarization: Challenges and benefits.
- Life-cycle management: Orchestration, Control, and Monitoring.
- High Performance Testbeds: Real-life experimentation with softwarized networks.
- Coffee Break (15 min)

Part B – Practice: 5G Multi-Access Edge Computing (MEC) for Vehicular Communications (V2X) and Transport & Logistics (T&L) (75 min; led by V. Charpentier and N. Slamnik-Kriještorac)
In this section, we cover the following topics:

- Vehicular MEC: We introduce the concepts of MEC and V2X, and position them inside the broad and heterogeneous 5G ecosystem. The benefits of combining these two concepts in 5G and beyond are discussed, reflecting on the specific use cases that will be enhanced by bringing V2X services closer to the vehicles and other traffic participants.

- 5G and MEC for T&L sector: In this part of tutorial, we showcase the experimentation facility that has been built in the scope of the VITAL-5G project, which consists of the trial site for 5G-assisted vessel navigation in Port of Antwerp area, and the 5G testbed. In addition, we present the Edge Network Application framework that facilitates the creation of vertical services in 5G and beyond ecosystems.

- What can we get from the management and orchestration systems?: Here we discuss the challenges in some of the emerging V2X and T&L use cases (e.g., emergency situation awareness, cooperative lane merge, assisted vessel navigation), and how they can be mitigated by applying management and orchestration techniques.

- V2X service for public safety in emergency situations: A high-level overview of the system architecture is presented, including the details on service operation, and hints on how this type of service can be managed and orchestrated in distributed MEC environments.

- Software for orchestration: We make an overview of the most frequently utilized software frameworks for management and orchestration, focusing on Kubernetes, as well as cloud-native design of services using Docker. We demonstrate the VITAL-5G platform with all full set of software toolkits that can be used for Network Application creation and deployment, and 5G network slice performance monitoring.

- Building a Proof-of-Concept on the testbeds: We describeso me useful practices that we adopted to build a proof-of-concept for testing and validating the impact of management and orchestration on the V2X and T&L service performance, while utilizing the real-life testbeds such as Smart Highway and Smart City in Antwerp, and Virtual Wall in Ghent, Belgium.

- The content and material of this tutorial is solidly backed by years of experience of the Flexible Networking Group at IDLab imec-UAntwerp led by Prof. Marquez-Barja. The referenced papers provide both the background and the practice for this tutorial, transitioning from techniques to share network resources for 5G to orchestrating services at the MEC to fulfill critical services for emergency vehicles.

Special Sessions

SPECIAL SESSION 1: 5G FOR CAM IN CROSS-BORDER SCENARIOS: CHALLENGES AND LESSONS LEARNT

Wednesday, 7 June 2023, 11:00-12:30, Room G3

Session chair:

- Markus Dillinger (Huawei)
- Johann Marquez-Barja (IMEC, BE)
- Maria Chiara Campodonico (Martel, CH)

To get the CAM (Connected Automated Mobility) services off the ground in Europe the seamless 5G continuity has to be guaranteed and particularly whilst crossing the border between the coverage areas. The ICT-53: 5G for CAM projects (5G-Blueprint, 5GMED, 5GRoutes, 5GRAIL) are focussed on the validation of the latest available 5G specification in the context of innovative CAM applications under realistic conditions and seamlessly functioning across borders from technical (5G network coverage, 5G performances, validation of the network coverage in supportof the selected use cases), business and governance (e.g. national spectrum licence vs harmonized framework in EU for seamless roaming) perspectives. The ongoing activities in ICT-53 projects leverage on the results of the recently concluded ICT-18 Automotive Projects (5G-Mobix, 5GCroCo, 5GCARMEN) in terms of research, implementation, and demonstration of refined 5G solutions for CAM. In this special session, the challenges encountered will be discussed, along with the applied solutions to overcome them, and the lessons learned will be outlined. The concept of the session is to have an open discussion where participants will be encouraged to provide their input on these topics. The session will address unresolved issues and challenges for future research tasks.

Program:

Special session Moderator: Markus Dillinger

Huawei

Head of 5G R&D for verticals

Executive Committee member of 5G Automotive Association (5GAA) and co-initiator WG CAM vice chairman

Duration: 1h30min

Schedule:

Panel discussion on seamless CAM services enabled by 5G technologies in cross-border scenarios:

- DG CONNECT representative, European Commission
- One representative from:
    - 5G-Blueprint: Johann Marquez-Barja, imec
    - 5GMED: Francisco Vázquez-Gallego, i2CAT
    - 5GRoutes & 5GCroCo: Miquel Payaró – CTTC
    - 5GRAIL: Léo Mendiboure, UGE
    - 5G-Mobix, 5GCARMEN: Andreas Georgakopoulos, WINGS ICT Solutions

SPECIAL SESSION 2: 6G ARCHITECTURE – EUROPEAN VIEW
Thursday, 8 June 2023, 11:00-12:30, Room G4

Session chair:

- Marco Gramaglia (University Carlos III of Madrid, ES)

- Ömer Bulakci (Nokia,)

- Xi Li (NEC Laboratories Europe,)

- Anastasius Gavras (Eurescom,)

- Mikko Uuistalo (Nokia,)

- Patrik Rugeland (Ericsson, SE)

- Mauro Boldi (TIM,)

The 5G networks have been deployed globally in large part of the world today and initial learnings have been derived from these commercial networks. The need for continuous evolution of 5G networks to enable support for new features and use cases has prompted 3GPP to begin standardization related to 5G Advanced systems starting from Release 18. 5G Advanced builds on the 5G baseline defined by 3GPP in Releases 15, 16, and 17, and provides corner stones in areas that will influence the future 6G system and, thus, bridges 5G with 6G. In parallel to 5G and 5G Advanced standardization efforts, the 5G Public Private-Partnership (5G PPP) in the scope of the European Framework for Research and Innovation is currently concluding, having linked around 100 projects in all relevant areas of 5G, while paving the way towards 6G. At the same time, the European networking research community has started a new program along with 33 projects on the Smart Networks and Service (SNS) programme that will focus on 5G advanced and 6G. The 5G PPP Architecture Working Group (WG) has issued several white papers; being the last one focusing on the topics that are the target of this workshop: the architectural evolution towards 6G that goes beyond the efforts targeted by the current 5G/5GA standardization. The goal of this special session is two-fold. On the one hand, the session will discuss novel key architectural innovations required for future 6G mobile and wireless networks. On the other hand, it will provide the key consolidated highlights emerging from the latest generation of projects in Europe and peer projects worldwide, which are working on formulating research items toward the 6G system. The focus of the thematic topics will be on technology enablers and design recommendations that will allow to move from 5G and beyond towards a fully-fledged 6G architecture.

Program:

The special session is structured in the following way:

– Key European activities on the 6G Architecture (15 minutes)
Presenter: Ömer Bulakci (Nokia) / Xi Li (NEC)
In this presentation, the Architecture WG chairs will present an overview of the European Funded Activities in the field of 6G Network Architecture design. The presentation will discuss the main research areas on the different network domains and the pre-standardization efforts.

– 6G Architectural Pillars and Technology Enablers (30 minutes)
Presenters: Patrik Rugeland (Ericsson), Mårten Ericson (Ericsson), Bahare Masood Khorsandi (Nokia)
This presentation will provide a bird's eye view on the current technical activities in 6G network architectural research. The presentation will be structured along the following topics:

- Efficient Access   Precise Positioning

- Intelligent Networks   Sustainable Networks

- Programmable Networks   Secure Networks

– Panel: The pathway towards 6G Architecture (45 minutes)

In this panel we will focus on the main 6G architectural topics that were also reviewed in the previous presentation, allowing an open discussion with the audience. The panellists will be:

• Ömer Bulakci (Nokia)

• Xi Li (NEC)

• Patrik Rugeland (Ericsson)

• Anastasius Gavras (Eurescom)

• Marco Gramaglia (University Carlos III of Madrid)

• Chair: Mikko Uuistalo (Nokia)

SPECIAL SESSION 3: DEPENDABLE WIRELESS COMMUNICATION SYSTEMS AND DETERMINISTIC 6G COMMUNICATION

Wednesday, 7 June, 16:00-17:30, Room G3

Session chair:

- Raheeb Muzaffar (Silicon Austria Labs, AT)
- Dhruvin Patel (Ericsson, SE)
- James Gross (KTH Royal Institute of Technology, SE)
- Joachim Sachs (Ericsson, SE)

The digital transformation of future industrial systems is fostered by the optimization of manufacturing processes through intelligently networked infrastructures to increase productivity. The development towards Industry 5.0 has been initiated that emphasizes sustainability, resilience, and a human-centric approach. The digitization of the physical processes together with the advancements in the cloud and edge computing, artificial intelligence, and robotics, opens new dimensions in revolutionizing these processes. Furthermore, digital twinning of the physical entities enable support for engineering, maintenance, reconfiguration, and recycling of industrial automation systems. These developments are expected to converge towards a cyber-physical continuum, between the connected physical world of senses, actions, experiences, and their programmable digital representations. The cyber-physical continuum spans across several application areas such as Industry 5.0 use cases, wearable robotics or exoskeletons, and extended reality (XR) that demand stringent deterministic communication requirements. These requirements necessitate a new type of deterministic communication behavior from an "end-to-end" (E2E) perspective that enables support from the sensors through the cyber-physical representation to the actuators. The emerging requirements from 6G envisioned use cases mean that the future 6G technology must ensure E2E deterministic communication flows across multiple heterogeneous domains including wired and wireless communication infrastructure as well as across the applications hosted in the cloud. The aim of this special session is to discuss the developments of deterministic communication from OPC UA, DetNet, IEEE 802.1 time-sensitive networking, and 3GPP time-sensitive communication and how DETERMINISTIC6G envisions them to be streamlined as a secure integrate deterministic communication solution.

Program:

The session consists in total of 5 presentations, of which one is an invited presentation and the other 4 are paper presentations. For the latter 4 presentation papers are requested to be submitted by the submission deadline on April 14.

The session is organized by the DETERMINISTIC6G project. Two of the solicited papers will come from the DETERMINISTIC6G project consortium, and two further papers will come from other research groups working with related topics:

- Invited talk: "6G for critical use cases – learnings in Hexa-X /Hexa-X-II", Patrik Rugeland (technical manager in Hexa-X-II and former technical manager in Hexa-X)
- James Gross, et al. "Challenges and directions for Deterministic Communication in 6G"
- Fabian Kurtz, Andreas Nota, Stefan Böcker, Selma Saidi and Christian Wietfeld, "Open Platform for enabling context-aware latency guarantees and their continuous monitoring"
- Petar Popovski, et al. – "Randomized Control of Wireless Temporal Coherence via Reconfigurable Intelligent Surface"
- Raheeb Muzaffar, "Time synchronization for deterministic communication"

As contingency, two more paper candidates have been identified. It has been confirmed that those papers could be submitted on short notice, in case that one of the confirmed papers above would not be received, so that the execution of the special session is guaranteed.

- Joachim Sachs, "Evolving wireless communication for deterministic 6G communication"
- Gourav Prateek Sharma, "Data-driven latency characterization for deterministic communication"

SPECIAL SESSION 4: ENABLING INNOVATION IN TRANSPORT AND LOGISTICS OPERATIONS: A 5G APPROACH
Thursday, June 8, 16:00-17:30, Room G4

Session chair

Sofoklis Dais (Centre for Research & Technology Hellas (CERTH)/Hellenic Institute of Transport (HIT), GR)

Time	Topic	Speaker/Presenter
	Welcome note by the moderator of the Special Session	
16:00-16:05	5G in Research and Innovation	Jorge Pereira (DG-CONNECT)
16:05-16:15	5G-PPP in Transport and Logistics	Marius Iordache (Orange Romania)
16:15-16:25	Transport and Logistics and 5G/6G technologies	Martin Bakhuizen (Huawei)
16:25-16:30	Introduction to the Special Session's presentations by the moderator	Sofoklis Dais (CERTH)
16:30-16:40	Enabling Innovation in Transport & Logistics: A 5G Approach – A common approach of the projects (FOR-FREIGHT, VITAL-5G, 5G-Blueprint, 5G-LOGINNOV, FENIX)	Sofoklis Dais (CERTH)
16:40-16:45	5G Experimentation Facilities for the Future of Transport and Logistics: The VITAL-5G Approach	Andreas Gavrielides (eBOS)
16:45-16:50	Enabling End-To-End Freight Transport Visibility Using 5G Technology: The Case of the FOR-FREIGHT Project	Sokratis Barmpounakis (WINGS)
16:50-16:55	Online Media Innovations in the Service of Transport and Logistics 4.0: a 5G Paradigm	Elli Symeou (eBOS)
16:55-17:00	Integrated Solution Based on Innovative Digital Technologies for Smart Ports	Cosmina Stalidi (BEIA)
17:00-17:30	Round-table discussion on relevant achievements	Sofoklis Dais (CERTH), Marius Iordache (Orange Romania), Martin Bakhuizen (Huawei), Andreas Gavrielides (eBOS), Sokratis Barmpounakis (WINGS) Johann Marquez-Barja (IMEC), Pavlos Basaras (ICCS) Cosmina Stalidi (BEIA), Elli Symeou (eBOS)

The Special Session will be moderated by the Special Session's Chair, Sofoklis Dais (CERTH).
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SPECIAL SESSION 5: ADVANCING EU-TAIWAN JOINT PROJECTS & FUTURE COLLABORATION IN 6G SNS

Thursday, June 8, 11:00-12:30, Room G3

Background

Since 2016, EU and Taiwan have invested 18 million Euros in four joint projects, involving more than 30 teams from industry and academia across ten countries. These collaborations focused on Smart Manufacturing and Disaster Prevention and Relief with Drones; furthermore, the joint efforts had resulted in the development of new technologies and products in both Taiwan and the EU. The bilateral cooperation has been complementary and mutually beneficial.

Objective

The Special Session aims to encourage EU-Taiwan collaboration on 6G projects in SNS. Through sharing knowledge, promoting innovation and identifying mutual interests, it seeks to strengthen the strategic partnership and building consortia to developing cutting-edge technologies. The special session on Taiwan at EuCNC will exchange insights from EU-Taiwan joint projects in 5G and explore new collaborations in 6G. It will provide an overview of Taiwan's 6G research and feature leading Taiwanese companies such as Chunghwa Telecom, Auden, Compal, and Liteon. Cutting-edge technologies like Joint Communications and Sensing (JCAS), AI-Native technologies, Reconfigurable Intelligent Surfaces (RIS), and Video Coding will also be discussed.

Program:

10:30 AM	Registration
11:00 AM	Opening Remarks
	l Dr. Alexandros Kaloxylos, Executive Director, 6G Smart Networks and Services Industry Association (6G-IA)
	l Dr. Chih-Hsiang Chang, Officer, Department of Industrial Technology, Ministry of Economic Affairs
11:10 AM	Session 1: EU-Taiwan Project Experience Sharing and 6G Collaboration Possibilities
	Moderator: Dr. Odysseas Pyrovolakis, Program Officer
	Smart Network and Services Joint Undertaking
	l Dr. Thomas Haustein, Head of the Department Wireless Communication and Networks, Fraunhofer HHI (5G-CONNI)
	l Dr. Antonio De La Olivia Delgado, Professor, UC3M (Universidad Carlos III de Madrid) (5G-CORAL & 5G-DIVE)
	l Mr. Ying-Wei Lin, Deputy Resident Representative, ISTI, ITRI
11:35 AM	Session 2: Overview of 6G Industrial Research and Innovation in Taiwan
	l Overview of Taiwan's 6G Academic Research
	- Dr. Tzong-Lin Wu, Professor, National Taiwan University
	l Overview of Taiwan's 6G Industrial Proposals
	- Dr. Pang-An Ting, General Director of the Information and Communication Research Laboratories, ITRI
12:05 AM	Session 3: NTN, Open RAN, 5G Private Network, RIS Solutions
	- MediaTek Inc.
	- Francesc Boixadera, Head of EU Cellular Research and Standards
	- Auden Technology Corp.
	- Dr. Yu-Bin Chang, Chairman
	- Compal Electronics, Inc.
	- Mr. Aaron Chuang, Director General
	- YTTEK Technology Corp.
	- Mr. Jiangson Chen, CEO & Founder
12:25 AM	Q&A
	Host: Dr. Mitch Tseng, Research Consultant, Information and Communication Research Laboratories, ITRI

SPECIAL SESSION 6: 6G INDUSTRY PROJECTS IN THE GERMAN 6G PROGRAM

Thursday, June 8, 16:00-17:30, Room Kongresshallen

Session chairs:

- Michael Karrenbauer (University of Kaiserslautern, Germany),
- Hans D. Schotten (University of Kaiserslautern, Germany)

The 6G Platform Germany is the umbrella organisation of the German 6G program. Recently, 18 industry projects and 7 projects on resilience joined the 6G platform. This session aims to provide an overview on structure and progress of the 6G program and to present use cases and technical focus of the 6G industry project in detail. The objective of the session to initiate a match-making process between German 6G projects and interested projects of other European research programs addressing similar use cases or having the same technical focus. Use case scenarios and application areas addressed in the German 6G program are for example campus networks (automation, campus logistics, …), medical scenarios (hospitals, emergency, operation theatre, …), mobility (automotive, commercial vehicles, drones, …) and IoT with ubiquitous coverage (deep indoor, rural areas, in-X networking, …). Almost all components and many new system engineering concepts of 6G systems are covered including Joint Communications and Sensing, Realtime and sync'ed networking, D2D, infrastructure-less/nomadic and organic networking, device management, authentication, security concepts, disaggregation, Open RAN evolution, OpenXG, open interfaces for third parties, massive usage of AI as well as microelectronic components for almost all system components.

Programme

- Welcome and Introduction of German 6G Program (Hans D. Schotten, 5 min)
- Overview on use cases and technical focus of 6G industry projects (10 min)
- Detailed presentation of industry projects:
- 6G-ANNA (Flagship project, 6G system engineering), Nokia (Marco Hofmann), 15 min
- 6G_Next, (massive XR, SW integration), Deutsche Telekom (Mandy Galkow-Schneider), 15min
- 6G-ICAS4Mobility (Mobility scenarios, JCS), Bosch (Andreas Müller), 15 min
- CampuSens (JCS, SecurityCampus networks), Infineon (Manuela Neyer), 15 min
- Presentation of White Papers of 6G Platform (green ICT, Use Cases), 10 min
- Concluding remarks (5 min)

SPECIAL SESSION 7: NOVEL TECHNOLOGIES IN DISAGGREGATED PACKET-OPTICAL NETWORKS TO SUPPORT 6G

Thursday, June 8, 16:00-17:30, Room G1

Session chairs:

- Ricard Vilalta (CTTC, ES)
- Ramon Casellas (CTTC, ES)

6G supposes a new challenge to disaggregated networks. Network capacity increase, and thus new CAPEX investments shall be overcome by OPEX reduction through network automation. The digitization of network operations can help to reduce operational costs and improve service agility. Optical fibre infrastructure continuing to expand, becoming nearly ubiquitous. Smart society infrastructures can improve services for all while reducing their cost. Overcoming the green challenge is critically important for the planet and the sustainability of the network. At the same time, the business environment continues to change, and this can have major impacts on the network. To enable autonomous network management, techniques such as intent-based management, knowledge graph for fault management, and network information gathering can be used. Novel optical technologies such as multi-band, SDM, flexi-grid, and F5G can tackle the stringent network requirements of envisioned 6G networks.The special session presents contributions from 5GPPP/SNS/CL4 research communities, with the aim of facilitating discussion, and exchange of ideas and practices, and successfully promotes innovative solutions towards network automation to support 6G requisites.

Programme

The session is organized as a set of technical presentations from key actors and experts in the field of transport networks. The proposed list of speakers tries to highlight both the role of industry (operators, and vendors) as well as academia. The session ends with a 20 min panel discussion and lasts 1h30.

- Introduction to the session, session chairs, Ricard Vilalta and Ramon Casellas (CTTC) 10min
- Invited: An operator's perspective on 6G requirements for Transport Networks, Pablo Armingol-Robles (Telefónica), 20min (TeraFlow)
- An operators' perspective on the migration to multi-band networks, Emilio Riccardi/Marco Quagliotti (TIM), 10min (B5GOpen)
- Towards ultra-low energy and secure optical networks, Tolga Tekin (IZM Fraunhofer), 10min (ALLEGRO)
- Scaling Capacity in support of Beyond 5G networks, Filippo Cugini (CNIT), 10min (SEASON)
- Flexibly Scalable Energy Efficient Networking, Raul Muñoz (CTTC), 10min (FlexScale)
- Discussion, 20min

SPECIAL SESSION 8: CHALLENGES AND SOLUTIONS FOR ENABLING INTELLIGENT ROUTING IN ORAN USING RIC AND INTEGRATING SATELLITE NETWORKS

Thursday, June 8, 16:00-17:30, Room G3

Session chairs:
Ashweeni Beeharee (Satellite Applications Catapult, United Kingdom (Great Britain))

With the realisation of satellite communications mega-constellations, it appears that seamless and ubiquitous connectivity is within the grasps of 6G in the current decade. However, can existing non-terrestrial technology already strengthen the value proposition of O-RAN (Open Radio Access Network) technology?
The O-RAN architecture constitutes the foundation for building the virtualized RAN on open hardware and cloud platforms, while leveraging the power of AI/ML to better manage radio resources. The O-RAN infrastructure, combined with increasing RAN virtualization and data-driven intelligence, will allow complexity reduction, faster innovation and significant decrease in deployment and operational cost. RIC (Radio Intelligent Controller) plays a crucial role in O-RAN architecture, as it allows the management of radio resources by providing real-time intelligence to the O-RAN controller. The integration of RIC in O-RAN has the potential to provide intelligent routing and network management in multi-RAT and multi-vendor environments. This can enable enhanced services and reduce latency; however, this integration also brings challenges such as network synchronization, spectrum management, and security. One of the key security challenges is the protection of RIC from unauthorized access, as it holds sensitive information about the network. Another challenge entails securing the integrity and availability of the RIC data. Finally, ensuring that the RIC is tamper-proof can be also tricky to achieve.

Programme

Content of Special Session:

The Special session will have the format of a panel discussion.
The panel discussion will focus on the challenges and solutions for enabling intelligent routing in O-RAN (Open Radio Access Network), using the RIC (Radio Intelligent Controller) and integrating it with satellite networks.
The panel will bring together experts from industry and academia to discuss topics such as:

- The potential of using RIC in O-RAN for intelligent routing and network management in multi-RAT and multi-vendor environments.
- The challenges and opportunities of integrating O-RAN and satellite networks, and the impact on coverage, capacity, and latency.
- The security and privacy challenges associated with deploying RIC in O-RAN and identifying potential solutions to secure the network.
- The role of network orchestration techniques in enabling automated and intelligent network management of integrated O-RAN and satellite networks.
- Highlight the experiences, results and lessons learnt from successful O-RAN deployments.

The panel discussion will provide the attendees with a deeper understanding of the current state of enabling intelligent routing in O-RAN using RIC, and the challenges and solutions for integrating it with satellite networks. Moreover, it will provide the attendees with the information and knowledge to identify potential opportunities, challenges, and solutions to implement these technologies in their network.

Invited Speakers:
- Nikolaos Tsamperis (ERTICO-ITS, Belgium)
  Topic: "Privacy-first Security Enablers for 6G Networks"
- Alexander Hofmann (Fraunhofer IIS, DE)
  Topic: "Radio aspects of ORAN/Direct NTN"
- Arnaud Polster (Accelleran, BE)
  Topic: "RIC aspects of 5G ORAN systems"
- Alexandros Mavromatis (University of Bristol, UK)
  Topic 1: "The role of network orchestration techniques in enabling automated and intelligent network management of integrated O-RAN and satellite networks"
  Topic 2: "Experiences, results and lessons learnt from successful O-RAN deployments"
- Yogesh Pandey (Capgemini, UK)
  Topic: "NTN using HAPS in ORAN

10:30 AM	Registration
11:00 AM	Opening Remarks
	l Dr. Alexandros Kaloxylos, Executive Director, 6G Smart Networks and Services Industry Association (6G-IA)
	l Dr. Chih-Hsiang Chang, Officer, Department of Industrial Technology, Ministry of Economic Affairs
11:10 AM	Session 1: EU-Taiwan Project Experience Sharing and 6G Collaboration Possibilities
	Moderator: Dr. Odysseas Pyrovolakis, Program Officer
	Smart Network and Services Joint Undertaking
	l Dr. Thomas Haustein, Head of the Department Wireless Communication and Networks, Fraunhofer HHI (5G-CONNI)
	l Dr. Antonio De La Olivia Delgado, Professor, UC3M (Universidad Carlos III de Madrid) (5G-CORAL & 5G-DIVE)
	l Mr. Ying-Wei Lin, Deputy Resident Representative, ISTI, ITRI
11:35 AM	Session 2: Overview of 6G Industrial Research and Innovation in Taiwan
	l Overview of Taiwan's 6G Academic Research
	- Dr. Tzong-Lin Wu, Professor, National Taiwan University
	l Overview of Taiwan's 6G Industrial Proposals
	- Dr. Pang-An Ting, General Director of the Information and Communication Research Laboratories, ITRI
12:05 AM	Session 3: NTN, Open RAN, 5G Private Network, RIS Solutions
	- MediaTek Inc.
	- Francesc Boixadera, Head of EU Cellular Research and Standards
	- Auden Technology Corp.
	- Dr. Yu-Bin Chang, Chairman
	- Compal Electronics, Inc.
	- Mr. Aaron Chuang, Director General
	- YTTEK Technology Corp.
	- Mr. Jiangson Chen, CEO & Founder
12:25 AM	Q&A
	Host: Dr. Mitch Tseng, Research Consultant, Information and Communication Research Laboratories, ITRI

SPECIAL SESSION 9: 6G ENABLED NETWORK APPLICATIONS FOR THE FUTURE OF CONNECTED ROBOTICS

Wednesday, June 7, 11:00-12:30, Room H1

Session chairs:

- Renxi Qiu (Bedfordshire Uinversity, United Kingdom (Great Britain))
- Dayou Li (University of Bedfordshire, UK)
- Nancy Alonistioti (one6G Association, NKUA , GR)

A future is envisioned where 6G will allow to unleash the potential of smart connectivity for a secure, resilient and sustainable development of our society. We believe robotics will be the new blue ocean that will be empowered by 6G. Robots with different appearances, optimized for different tasks, are able to work in groups and able to interact with people in all areas of life e.g. at care at home, delivery services, in both public spaces as well as indoor environment. To successfully support the foreseen demand of robotics applications in different scenarios, mobile communication systems must be capable of supporting stringent performance requirements, ensure required service availability at anytime and anywhere, provide highly accurate environment awareness, support highly dynamic Quality of Service (QoS) mechanism to ensure safety when in close proximity with humans, and enhance sensing capability to aid robot operation efficiency, etc. Apart from enhancing communication system performance, developing robotics systems with much higher-degree of programmability and context awareness by exploiting capabilities such as cloud-native and AI technologies is required to help develop cost-effective and lean robots that are able to operate in diverse scenarios. The future of connected Robotics should be skilful in maximising Quality of Experience (QoE) for its vertical users rather than solely reacting to QoS. Therefore, the Network Applications for the future of connected robotics focus on a user-centric paradigm of integrating vertical knowledge into the existing standardised network and communication systems to improve QoE for the connected robots as their digital skills. The session is designed to discuss and promote digital skills and the trustworthiness of Network Applications that need to be implemented for connected robots by steering digital transitions through human-centred technologies and innovations. Furthermore, the session will include lessons learned from various use cases applied across various vertical sectors and the required physical and virtualised infrastructure to provide the necessary QoS and QoE. The session will also discuss how scaling up mobile communication technology enhanced robot deployment in broader domains is feasible via seamlessly integrating network and communication concepts into native robot design and how various communities work together to develop these novel solutions. Another important aspect that will be discussed is how the development of solutions developed as part of enhanced and connected Robotics can be integrated into the market and what the benefit is for 3rd party users in accessing such resources to develop or new products as well as what consumers can expect in the immediate future and how this will impact society. This special session is endorsed by one6G association, NetworldEurope Vertical WG and H2020 5G enhanced robot autonomy research project.

Programme

The proposed Special Session covers topics such as cloud-native applications, 5G and 6G-enabled communication between robots and cloud-native applications, orchestration of such applications and others.

The session proposed will be structured based on the following pillars:

Welcome and opening (10 mins)

- by Nancy Alonistioti, one6G Chairwoman & Prof. Maziar Nekovee (Chair of NetworldEurope Vertical WG)
- by Prof. Renxi Qiu, scientific coordinator of 5G enhanced robot autonomy research project & the co-chair of the 5G-PPP Software Networks Working Group, Mr. Marius Iordache.

Pillar 1: Advanced mobile communication technologies for Connected Robotics: Telecom industry view (30 mins)

- A joint presentation by Mrs. Christina Lessi (OTE, Greece), Dr. George Agapiou (WINGS, Greece), Dr. Lanfranco Zanzi / Dr. Xi Li (NECLAB, Germany) on 5G network infrastructure and enhanced enablers for robotic applications (15 mins).
- Josef Eichinger (one6G WG4 Chair) for presenting the 6G robotic testbeds & pilots (15 mins).

Pillar 2: Network applications for Connected Robotics: end-user perspectives and emerging use cases (30 mins)

- Presentation from Dr. Vittorio Solina (Cal-Tek Manufacturing, Italy), Guillem Garí (RobotNik Automation SLL) and Dr. Matúš Kašuba (BringAuto, Czech Republic) applications of 5G-enabled autonomous robots in the manufacturing, transport, logistics and PPDR sectors respectively (10 mins).

- Presentation: "Communication framework for 5G-enabled Network Applications" by Michal Kapinus (Brno University of Technology, Czech Republic) (5 mins).

- Presentation: "Cloud-native network application for real-time collision avoidance tasks" by Roman Juranek (Cognitechna s.r.o, Czech Republic) covering a case study of technologies developed, namely middleware and reference framework for the development of Network Applications. (5 mins).

- Presentation: "Network Applications Using PaaS to integrate 5G Technologies with Robotics" by Bartosz Bratus (University of Bedfordshire, UK) about the development of a robotic Platform as a Service (PaaS) paradigm that facilitates the management process of the 5G enhanced robot services. (5 mins).

- Presentation: "Implementation Challenges of Single-Hop, Device-To-Device Communication in 5G Networks" by Dr. Loizos Christofi (eBOS, Cyprus) (5 mins).

Pillar 3: Official launch of the 5G-ERA Network Application for the robots' community (ROS) (10 mins)

- Presentation by Prof. Renxi Qiu and Mr. Adrián Lendínez on integrating Network Applications with Robotics via ROS (5 mins)

- Presentation: "Business opportunities arising from the connected robotics and the standardization potential" by Dr. Andreas Gavrielides (eBOS, Cyprus) (5 mins).

Pillar 4: Conclusion and future vision (10 mins)

- Discussion remarks moderated by Dr. Andreas Gavrielides and Dr. Xueli An.

- This will bring the total time of the session to 1h30.

- As part of the project's commitment to the special session, the following papers have been prepared and submitted to the 2023 EuCNC & 6G Summit:

Full papers:

- Alessio Baratta, Antonio Cimino, Maria Grazia Gnoni, Letizia Nicoletti and Vittorio Solina, "Human Robot Collaboration: An Assessment and Optimization Methodology Based on Dynamic Data Exchange" under the track AIU – Applications, IoT, Use cases.

Short Papers

- Roman Juránek, Petr Klepárník, Michal Kapinus and Pavel Smrž "Real-time computer vision tasks as a Network Applications in 5G-enhanced environment" under the track 6VS – 6G Visions and Sustainability

- Zdeněk Materna, Michal Kapinus, Petr Dobeš and Pavel Smrž "Communication framework for 5G-enabled Network Applications" under the track AIU – Applications, IoT, Use cases.

- Bartosz Bratus, Renxi Qiu, Radu Popescu, Diwali Diwali and Adrián Lendínez Ibáñez "Network Applications Using PaaS to integrate 5G Technologies with Robotics".

SPECIAL SESSION 10:
MEGA-CONSTELLATION NON-TERRESTRIAL NETWORK FOR 6G

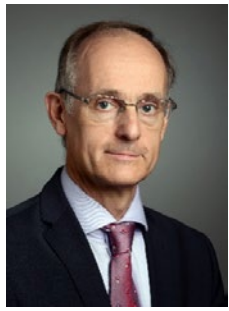## Thursday, June 8, 16.00-17.30, Room H1

Session Chair:

Wen Tong (Huawei Technologies, CA)

The development of non-terrestrial networks (NTN) has gained significant momentum in recent years, with numerous mega constellations planned or already initiated. These constellations are expected to provide complementary services to terrestrial networks, especially in areas with limited connectivity. The cost of launching rockets and satellites has decreased in recent years, making it more feasible to build and deploy large-scale constellations. One of the significant advantages of low-cost mega constellations in Low Earth Orbit (LEO) or Very Low Earth Orbit (VLEO) is their lower orbit altitude, which allows for low latency and seamless roaming between cellular and non-terrestrial networks. Moreover, the vast scale of these constellations provides a much higher area capacity than traditional satellite networks. These combined features, including low latency, high capacity, and seamless roaming, will help create a superior user experience.

However, the full potential of these mega constellations can only be realized if we overcome various technical and operational challenges. In this regard, experts from both industry and academia are invited to a deep dive session, to explore the challenges and potential research directions for the future of integrated mega constellation networks. This will ensure that NTN becomes a reliable and essential part of global connectivity solutions in 6G era.

Organiser's CV	Dr. Wen Tong is the CTO, Huawei Wireless and a Huawei Fellow. He is the head of Huawei wireless research, and the Huawei 5G chief scientist and led Huawei's 10-year-long 5G wireless technologies research and development.
	Dr. Tong is the industry recognized leader in invention of advanced wireless technologies, Dr. Tong was elected as a Huawei Fellow and an IEEE Fellow. He was the recipient of IEEE Communications Society Industry Innovation Award 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 is also the recipient of R.A. Fessenden Medal. For the past three decades, he had pioneered fundamental technologies from 1G to 6G wireless.
	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 is a Fellow of Canadian Academy of Engineering, and the Royal Society of Canada.
Convened Session Title	Mega-Constellation Non-Terrestrial Network for 6G

Motivation and Context	The development of non-terrestrial networks (NTN) has gained significant momentum in recent years, with numerous mega constellations planned or already initiated. These constellations are expected to provide complementary services to terrestrial networks, especially in areas with limited connectivity. The cost of launching rockets and satellites has decreased in recent years, making it more feasible to build and deploy large-scale constellations.
	One of the significant advantages of low-cost mega constellations in Low Earth Orbit (LEO) or Very Low Earth Orbit (VLEO) is their lower orbit altitude, which allows for low latency and seamless roaming between cellular and non-terrestrial networks. Moreover, the vast scale of these constellations provides a much higher area capacity than traditional satellite networks. These combined features, including low latency, high capacity, and seamless roaming, will help create a superior user experience.
	However, the full potential of these mega constellations can only be realized if we overcome various technical and operational challenges. In this regard, experts from both industry and academia are invited to a deep dive session, to explore the challenges and potential research directions for the future of integrated mega constellation networks. This will ensure that NTN becomes a reliable and essential part of global connectivity solutions in 6G era.
Structure	Session Chair:
	Wen Tong, Huawei Technologies Canada Co., Ltd., Canada
	Speakers:
	· Rahim Tafazolli, University of Surrey, UK
	· J. Markus Breitbach, Deutsche Telekom, Germany
	· Prof. Aryan Kaushik, University of Sussex, UK
	· Alessandro Guidotti, CNIT, Italy
	Programme
	Presentations on Non-Terrestrial Network for 6G 60' (15' for Each speaker)
	Panel Discussion, 30'
	Moderator: Wen Tong
	Rahim Tafazolli is Regius Professor of Electronic Engineering, Professor of Mobile and Satellite Communications, Founder and Director of 5GIC, 6GIC and ICS (Institute for Communication System) at the University of Surrey. He has over 30 years of experience in digital communications research and teaching. He has authored and co-authored more than 1000 research publications and is regularly invited to deliver keynote talks and distinguished lectures to international conferences and workshops. Professor Tafazolli was awarded the 28th KIA Laureate Award in 2015 for his contribution to communications technology.

J. Markus Breitbach
Markus Breitbach is a Senior Expert in Deutsche Telekom's Group Technology, working as systems engineer in the area of end-to-end network architecture. Before he joined Deutsche Telekom in 2006, he has been with a major infrastructure supplier as UMTS Radio Systems Engineer, where he designed scheduling mechanisms for HSPA. His work in Deutsche Telekom on network virtualization and campus networks allowed him to extend his scope from the radio part to the overall system aspects of cellular communication networks. Currently he is engaged in Deutsche Telekom's NTN activities and coordinating the research project 6G-TakeOff. Holding both a PhD in electrical engineering and an MBA in economics, his ambition is to design innovative network concepts that fit well into the surrounding ecosystem and business picture.

Prof. Aryan Kaushik is Assistant Professor at the University of Sussex, UK, since 2021. Prior to that, he has been with University College London, UK, University of Edinburgh, UK, and Hong Kong University of Science and Technology, Hong Kong. He has held visiting appointments at Imperial College London, UK, University of Luxembourg, Luxembourg, Beihang University, China, and Athena RC, Greece. His interests are broadly in 6G, wireless communications, signal processing and AI. He is the Editor of upcoming book on "Integrated Sensing and Communications for Future Wireless Networks: Principles, Advances and Key Enabling Technologies," Elsevier, and Co-Editor of upcoming book on "Non-Terrestrial Networks for Advanced Global Connectivity," Elsevier. He has been involved in several collaborative projects of international importance as PI/Co-I or research lead. He has been involved in PhD Thesis Evaluation Committee internationally such as at UC3M, Spain. He is an Associate Editor of IEEE Open Journal of the Communications Society (OJCOMS), IEEE Communications Letters, IET Signal Processing and IET Networks, and Lead/Co-Lead Guest Editor for Special Issues at IEEE Internet-of-Things Magazine, IEEE OJCOMS, IET Signal Processing and IET Networks.

He has delivered speeches at several international conferences and academic/industrial events worldwide. He has been an Invited Panel Speaker at IEEE VTC-Spring 2023, and EuCNC and 6G Summit 2023, Tutorial Speaker at IEEE WCNC 2023, IEEE BlackSeaCom 2023, EuCNC and 6G Summit 2023, and IEEE SmartGridComm 2023, Keynote/Invited Speaker at IEEE WCNC 2023 workshop, ICASIS 2023, WiSPNET 2023, FutureWei USA University Days Workshop 2023, Huawei UK Vision Forum 2023, and many other venues globally. He has been involved in chairing at several IEEE international conferences such as Track Chair at IEEE ICC 2024, IEEE WCNC 2023, and IEEE WF-PST 2024. He has been serving as Publication Chair at IEEE WCNC 2024 and IEEE ICMLCN 2024, Tutorial Chair at IEEE WF-PST 2024, Special Sessions Chair at IEEE ICMLCN 2024, and General Chair for several workshops at IEEE Globecom 2023 (two workshops), IEEE PIMRC 2022-23, IEEE WCNC 2023 (two workshops), IEEE MeditCom 2023, IEEE SmartGridComm 2023 and IEEE SECON 2022. He has been serving as TPC Member at IEEE ICC 2021-23 and IEEE Globecom 2023, Sessions Chair at IEEE ICC 2023 and IEEE WCNC 2023, and Conference Champion for IEEE PIMRC 2020. Website: https://sites.google.com/view/aryankaushik/

Alessandro Guidotti received the master degree (magna cum laude) in telecommunications engineering and the Ph.D. degree in electronics, computer science, and telecommunications from the University of Bologna, Italy, in 2008 and 2012, respectively. From 2009 to 2011, he was a representative for the Italian Administration within CEPT SE43. From 2014 to 2021, he was a Research Associate with the Department of Electrical, Electronic, and Information Engineering, University of Bologna. From 2021, he is a Researcher with Consorzio Interuniversitario delle Telecomunicazioni (CNIT). He is active in national and international research projects on satellite communication systems in several EC and ESA funded projects. He has been serving as TPC and Publication Co-Chair at the ASMS/SPSC Conference since 2018 and he is Workshop Co-Chair of the 2023 IEEE WiSEE Conference. His research interests include Non-Terrestrial Networks, 5G/6G wireless communication systems, interference management, AI and Machine Learning.

SPECIAL SESSION 11:
SECURITY AND TRUST – KEY ENABLERS FOR 6G

Thursday, June 8, 11.00-12.30, Room G4

Session chairs:

Fredrik Tillman (Ericsson AB, SE)

6G is envisaged to impact the consumer market in addition to the enterprise market beyond what is accomplished by 5G today. Connected factory floors and smart businesses will be accompanied by fully connected and intelligent consumer ecosystems. However, for this evolution to happen, trust must be earned among users and supported by innovative design. Unless consumers can rely on secure handling of data and uncompromised privacy, their willingness to use connected devices and personal robots will diminish substantially. All these are essential for realizing a paradigm shift through 6G. One example of ongoing innovation relates to enclaves which will be an integral part of future telco hardware architectures. Not only for the cloudification of the Core Service Based Architecture, but also to ensure the isolation of slices in the Radio Access Network. We will need to have a much more agile architecture of the enclaves and be able to dynamically extend the trust barriers into other peripherals in addition to the memory. From a regulatory view and monitoring, it is also important to combine the enclave with a controlled way of tapping information from the trusted environment to authorized processes on the host. Other examples of technology innovation can be found in the recently launched COREnext project (Horizon Europe), which brings together leading European players from industry and academia to tackle the trust challenge. As security must be addressed in multiple layers the scope stretches from compute architectures and software handling to hardware detection using ML algorithms. The purpose of this convened session is to highlight different perspectives of network and device security and discuss measures to reach a trustworthy 6G system

Programme

- Introduction (5'):
  Fredrik Tillman (Ericsson, SE)

- Secure enclave challenges for telco (15'+5' Q&A)
  Patrik Ekdahl (Ericsson, SE)

- The COREnext project- enhanced trustworthiness by design (15'+3' Q&A)
  Gerhard Fettweis (TU Dresden, DE)

- Radio fingerprint using ML algorithms (15'+5' Q&A)
  Anastasia Grebenyuk (Ericsson, SE)

- Trustworthiness and IoT devices (15'+5' Q&A)
  Panagiotis Demestichas (WINGS, GR)

- Concluding remarks by the commission (5')
  Mario Scilia (EC, BE)

SPECIAL SESSION 12: EVOLUTION OF NETWORK EXPOSURE FROM 5G TO 6G

Wednesday, June 7, 11.00–12:30, Room G4

Session chairs:

Bessem Sayadi (Nokia Bell-Labs, FR)

Vilho Räisänen (Nokia Bell Labs, FI)

It is expected that the communication fabric and the manner in which network services are consumed will evolve towards 6G, building on and extending capabilities of 5G networks. Network as a code, Network as a service, Service APIs, Network APIs are different aspects of network exposure, which provides the communication service providers a way to monetize the network capabilities. Allowing the developer community to use network capabilities via APIs is an emerging area for network monetization. Thus it is important that network exposure caters for the needs of developers serving different markets, e.g., different vertical industry segments. The notion of "Network Applications" is introduced following this idea. It is defined as a set of services that provides certain functionalities to verticals and their associated use cases. In practice, a network application uses the exposed APIs from the network and can either be integrated with (part of) a vertical application or expose its APIs (e.g., service APIs) for further consumption by vertical applications. The special session introduces the business need for the network exposure, and put the light on technological solution like CAMARA project and Network as a Code approach. The view from the standard will be also important to share. The special session will aim to facilitate discussion, and exchange of ideas and practices, and successfully promotes innovative solutions towards network exposure to support 6G requisites.

Programme

The session is organized as a set of invited keynotes from actors and experts in the field. The proposed list of speakers tries to highlight both the role of industry (operators and vendors) as well as academia. The session ends with a panel discussion and lasts 1h30.

• Introduction to the session, Session Chairs: Bessem Sayadi (NOKIA Bell-Labs) and Vilho Raisanen (NOKIA Bell-Labs), 5min

• «6G Value Creation : the role of exposure », Patrick Everaert, NOKIA Bell-Labs Consulting, 15 min

• "Network as Code", Tanja De Groot, NOKIA, 15 min

• "CAMARA Project", Angela Burgaleta Ledesma, Telefónica, 15 min

• "6GFlagship", Jussi Haapola, University of Oulu, 15 min

• "Advancing Network Apps and Service Exposure in Multi-generation Ecosystems", Håkon Lønsethagen

• Telenor, 15 min

• Discussion, 10min

Convened Sessions

CONVENED SESSION 1: 5G-PPP – THE VALUE GENERATED FOR EUROPE

Wednesday, 7 June 2023, 11:00-12:30, Room Kongresshallen

Session chair:

David Kennedy (Eurescom, DE)

The 5G Public Private Partnership (5G-PPP) has been fostering Research and Innovation (R&I) activities on the greater ICT sector focusing on (B)5G technologies during the past decade. As part of the 5G-PPP programme 95 R&I projects have been funded since 2014, involving more than 700 distinct beneficiaries and resulting in thousands of scientific publications, a significant number of contributions to standardization bodies and multiple innovations, tested in advanced 5G testbeds across Europe. To achieve these results and also identify common trends and widely acceptable solutions, apart from the individual 5G-PPP projects, researchers have been organized in Working Groups. Each working Group has been focusing on specific aspects of technology and/or application field, enabling stakeholders to exchange, knowledge, ideas, results and insights. This has led , to improved understanding of the underlying issues, optimal design of solutions and immediate feedback among the 5G PPP projects. As the 5G PPP programme approaches its completion, this convened session, will highlight the key achievements of the 5G PPP programme and the value generated for Europe. A dedicated panel of the experts that have led this work from multiple positions (SB and TB chairs, 5G PPP WG chairs), will provide their insight about the results of the 5G PPP Programme, as well as the lessons learned so that the continuation framework (i.e., Smart Networks and Services) will provide even better results. The session will conclude with an outline how the collaborative work on these issues may be continued in the SNS JU context and a discussion on the goals of this.

Programme

Presentations of the 5GPPP programme and its highlights, 30'

- 5G for Europe, Peter Stuckmann (EC)
- The importance of 5G PPP for the private sector, Colin Willcock (6G-IA)
- Dan Warren (5G-PPP SB Chair),
- Mikael Fallgren (5G-PPP TB Chair)

The achievements of the 5G-PPP Panel, 40' Chairs from 5G PPP WGs

Moderator: Mikael Fallgren

- Didier Arnaud Bourse, former TB chair
- Bessem Sayadi, Software networks WG
- Vangelis Kosmatos, TMV WG
- Tasos Gavras, Network Management WG
- Jesus Alonso Zarate, 5G4CAM WG
- Oemer Bulakci, Architecture WG

Passing the WG Baton to the SNS JU, 20'

Moderator: David Kennedy

Future of WGs in the SNS community, Priorities and Objectives

Max 3 Speakers from:

• New SNS WGs

• SNS Projects

• SNS Office/ 6G-IA office

CONVENED SESSION 2: WITAR: WOMEN IN TELECOMMUNICATION AND RESEARCH

Wednesday, 7 June 2023, 16:00-17:30, Room G1

Session chair:

- Bahare Masood Khorsandi (Nokia, DE)
- Marie-Helene Hamon (Orange, FR)
- Yaning Zhou (Nokia, DE)
- Pooja Mohnani (Eurescom,)
- Tommy Svensson (Chalmers, SE)
- Didier Bourse (Nokia,FR)
- Marja Matinmikko-Blue (University of Oulu, FI)
- Oluwatayo Kolawole (Samsung, UK)
- Irene Alepuz Benaches (iTeam, ES)

Women in Telecommunications and Research (WiTaR) is an EU-level initiative that promotes gender equality, inclusion and empowerment in the 6G Research & Innovation (R&I) community. The group started its activity as part of European 6G flagship project Hexa-X.

This Convened Session, leveraging the Convened Session organized during EuCNC & 6GS 2022, aims at communicating the WiTaR initiative up-dates and plans to the European and global 6G R&I community, further raising awareness of gender inclusivity and engaging different stakeholders and EU projects to discuss possible actions to improve gender diversity and inclusivity in the R&I activities especially in the Smart Network and Services (SNS) Joint undertaking (JU).

Programme

The proposed structure is envisioned for the 1h40 minutes slot

16:00 – 16:05: Welcome from WiTaR chairs (Bahare M. Khorsandi and Marie-Helene Hamon)

16:05 – 16:15: Video from leaders around Europe stating the importance of gender inclusivity in deep tech and 6G (Didier Bourse)

16:15 – 16:20: Welcome and WiTaR up-dates and achievements (Bahare M. Khorsandi)

16:20 – 16:25: Overview of related initiatives in Europe and Globe (Pooja Mohnani)

16:25 – 16:35: Invited speaker – Chiara Mazzone Programme Officer @ Smart Networks and Services Joint Undertaking (SNS JU)

16:35 – 17:05: Industry and academia's view and their practice to encourage gender diversity

Cinzia Sartori Nokia 10 min

Maria Barros Weiss IONOS 10 min

Dan Warren Samsung 10 min

17:05 – 17:30: Panel

Panel: Gender inclusivity in research community and outcomes of Smart Networks and Services Projects – 30-40 minutes (Moderator Marja Matinmikko-Blue)

Survey: By using the toll Menti (Pooja Mohnani)

17:30 – 17:35: Conclusion (Bahare M. Khorsandi)

The proposed structure is envisioned for the 1h40 minutes slot:

Video(s) from leaders around Europe stating the importance of gender inclusivity in deep tech and 6G – 5-10 minutes – Didier Bourse

Welcome and WiTaR up-dates and achievements (Marie-Helene Hamon & Bahare M. Khorsandi) – 10 min

Overview of related initiatives in Europe and Globe (Pooja Mohnani)

Invited speaker: Chiara Mazzone – 10 min

Industry and academia's view and practice to encourage gender diversity – 10 min each speaker

Cinzia Sartori Nokia

Dan Warren Samsung

Maria Barros Weiss IONOS

Representative from Chalmers university (TBC)

Analyze and present the current statistics in SNS in aspects of women participation – 5 min

Panel: Gender inclusivity in research community and outcomes of Smart Networks and Services Projects (4, 5 panellist) – 30-40 minutes (Moderator Marja Matinmikko-Blue)

Survey: By using the toll Menti, we populate few questions during the EUCNC conference. Tool can gather more information on the issues in diversity and also can be a nice conversation started for the panel. (Pooja Mohnani)

CONVENED SESSION 3: THE PATH TO 6G STANDARDIZATION
Thursday, 8 June 2023, 11:00-12:30, Room G1

Session chair:

• Bernard Barani (Deputy Head of Unit, DG CONNECT – Future Connectivity Systems, at European Commission, BE)

• David Boswarthick (ETSI)

• Riccardo Trivisonno (5G PPP Chair of the pre standardisation WG, DE)

The success of the Smart Networks and Services (SNS) Joint Undertaking relies not only on the technical results of the projects but also on a strong valorisation of EU research in standardisation bodies. Whilst the 6G standardisation race is not yet officially started, it is important for EU stakeholders to prepare for this crucial phase that may open in the 2025 time frame. Mid 2023, the ITU is expected to deliver a global 6G (IMT 2030) vision that will be very important to frame and further focus the R&I developments that have started all over the world. Also new developments are happening in industry, like disaggregation and sofwarisation of networks, the raising importance of cloud technology that may eventually have an influence on the standardisation process. Similarly, new topics like sustainability will have to be taken up more prominently than in previous generation standardisation, whilst the way to standardise them may be open for debates, in the wake of the proposal to develop "Key Value Indicators" (KVI) as proposed by the Hexa-X flagship project on 6G. Against this background, the purpose of this convened session is to raise awareness of the standardisation directions, focus, priorities and challenges that the SNS community should take into account with the objective of preparing the widest possible EU industrial base to the upcoming 6G standardisation, and also to prepare for the next SNS phases implementation which will have a strong standardisation and sustainability component.

Programme

- Proposed structure:
5 ' Opening Statements on SNS and standards Colin Willcock, chairman of the 6G-Industry Association (6G-IA)

Talks/Panel – Towards 6G Standardisation

60' Moderator: Riccardo Trivisonno

• – Facilitating the path from R&I to standards, David Boswarthick, ETSI Director

• – IMT 2030 vision, what target for future standards Uwe Loewenstein, Counsellor ITU-R SG 5

• – ORAN: 6G objectives, what impact on standardisation Chih Lin I, Chief Scientist China Mobile and ORAN Alliance

• – 3GPP: how to prepare EU stakeholders for 6G standardisation Giovanni Romano, Technology Trasformation, Standardization and IPR, TIM

• – Invited talk 1: how to bring vertical industries into standardisation from the onset: Dr. Afif Osseiran, director of Industry Engagements & Research Ericsson and Vice chair of 5GACIA

• – Invited talk 2: how to bring sustainability issues and KVI into standards: Eric Hardouin, VP Networks and Infrastructures Research, Orange

• Panel, 20' Q/A. (all above speakers)
Closing statements, Colin Willcock, David Boswarthick

CONVENED SESSION 4: SNS: A EUROPEAN COLLABORATIVE INITIATIVE WITH A STRONG VERTICAL IMPACT ON A GLOBAL LEVEL

Thursday, 8 June 2023, 11:00-12:30, Room Kongresshallen

Session chair:

• Alexandros Kaloxylos (6G Smart Networks and Services Industry Association (6G-IA))

The success of the Smart Networks and Services JU relies not only on the technical results of the projects but also on acceptance and adoption of these results at European and global level. The journey for the creation of 6G networks requires the establishment of a collaboration environment at European and global level. In this environment, stakeholders will be able to exchange information and fine-tune their activities to maximize their results. The SNS-ICE CSA project has the mandate to establish these communication links and establish dialogues among the key stakeholders on a global level. The purpose of this convened session is to present to the community the SNS strategy behind this collaboration framework and kick off the discussion among a) activities taking place mainly at European level (i.e., national initiatives and related HEU Partnerships) and b) Vertical users.

Programme

Proposed structure:
• 10' Opening EC/DG-CNECT (Peter Stuckmann)
• 10 ' Opening Statements – 6G-IA (Colin Willcock)

• 1st Panel – European Initiatives
  35' Moderator: Toon Norp (TNO)
  KDT – AENEAS association: Nadja Rohrbach
  Photonics21 – Mohand Achouche (Nokia)
  Germany – Hans Schotten (Univ. of Kaiserslautern)
  Finland – Ari Pouttu (OULU)
  France – Marc Jamet (coordinator National Strategy for Future Networks Technologies)
  Netherlands – Jos Beriere (TNO)

• 2nd Panel – 6G for verticals: Expectations and the way forward
  35' Moderator: Raffaele de Peppe (6GIA Board Member and Vice Chair)
  5GAA – Maxime Flament
  5G-ACIA – Andreas Mueller
  PSCE – David Lund
  ERTICO – Nikos Tsampieris
  ECSO – Emmanuel Dotaro
  AIOTI – Georgios Karagiannis
  6G Health Institute – Christoph Thuemmler

CONVENED SESSION 5: BRIDGING THE GAP TO EXPLOITATION AND DEPLOYMENT

Wednesday, 8 June 2023, 16:00-17:30, Room G4

Session chair

• David Kennedy (Eurescom, DE)

The Horizon 2020 and the now the Horizon Europe framework programmes have been fostering RD&I initiatives for many years now. However, there are still many emerging results or deployment opportunities that are not making it to market for commercial exploitation because there is a need for more support post research projects, or to stimulate deployment where the market forces are not strong enough to ensure deployment without support or where the risk of further developments is still too high for private investments only. In many cases there still is a significant gap between public funding support and when the private funding can and will take over. This session explores what support is available and how far support can go while still being precompetitive.

This session will first present the opportunities available for projects to achieve results with higher TRLs – closer to the market – with the support of National funding through the Eureka Clusters Programme. Specifically, the CELTIC-NEXT and the XECS Clusters will show the potential for projects in the ICT and Microelectronics sectors to get support for the later stages of innovation – to take emerging technological concepts and convert them into exploitable solutions. The second major part of the session would be to present the opportunities for 5G studies and deployment projects to be supported under the CEF2 Digital programme. The Connecting Europe Facility (CEF Digital) will support and catalyse both public and private investments in digital connectivity infrastructures between 2021 and 2027. CEF Digital will help support an unprecedented amount of investment devoted to safe, secure, and sustainable high-performance infrastructure. In particular, Gigabit and 5G networks across the EU for the provision of connected and automated mobility and for promoting local innovation. This action will be important in supporting Europe's digital transformation, as outlined in the Path to the Digital Decade proposal.

Furthermore, CEF Digital will contribute to the increased capacity and resilience of digital backbone infrastructures in all EU territories, in particular the Outermost Regions. This is crucial for Europe's ambition to continue being digitally sovereign and independent in the years to come.

The session will conclude with a Q&A panel involving all speakers where the audience can explore the opportunities presented and discuss if there needs can be addressed under either of these programmes.

Presentations of the Eureka ICT and Microelectronics Clusters Ambitions and opportunities. 35'

- Eureka Clusters Programme, TBC
- CELTIC-NEXT, Xavier Priem, Director
- Xecs, Nadja Rohrbach, Director

The CEF2 Digital Ambitions and opportunities 35'

- CEF2 Digital Introduction, TBC
- 5G Corridors, TBC,
- 5G Communities, TBC

A national perspective on both programmes 10'

- National authority viewpoint, TBC

Q&A session, 20'

Moderator: David Kennedy
Discussion and elaboration of the opportunities in response to Audience interest.

CONVENED SESSION 6: EMBEDDING SUSTAINABILITY INTO 6G: THE RACE TO DELIVER GREEN DIGITAL SOLUTIONS

Wednesday, 7 June 2023, 11:00-12:30, Room G1

Session chair

- Luis Neves (GeSI, DE)

6G technology will help redefine the way we live, work and communicate, re-shaping industries and societies and delivering connectivity and intelligence to all users across the globe and creating a more inclusive society. 6G technologies can help us tackle the world's most pressing sustainability challenges by delivering smarter, more energy-efficient solutions, making the economy more efficient. With a rich vision and great potential through high data rates, low latency, and ultra-reliable communication system, 6G will usher in potential new customers and new ecosystems, as well as a diverse collection of connected devices in a cost and energy efficient manner. Therefore, green and sustainable development of 6G is a critical requirement for network and terminal designs. Achieving such a feat will require robust monitoring and evaluation systems in place through the use of frameworks that are not only applicable across sectors, but also science based. In this panel, we aim at providing an engaging platform for industry leaders and experts to exchange visions, address technical challenges, as well as policy and research directions to direct 6G development towards a sustainable path.

Programme

Speakers

1. Luis Neves (GeSI, DE) (moderator)
2. Chiara Mazzone (EU Commission, BE)
3. Veronika Thieme (The Carbon Trust, NL)
4. Carlos Ruiz Garvia (UNFCCC, DE)
5. Philipp Buddemeier (Betterearth, DE)

Questions

1. What are the main drivers for 6G and what general components must be embedded into its design?
2. What are the biggest disruptions and challenges in 6G technology on the way towards sustainability?
3. What are the new requirements and dimensions for the sustainable development of 6G?
4. What do you foresee are the expected use cases for 6G and how can it enable other sectors?
5. What is the timeline for 6G?
6. What will the ICT industry look like 5 years from now with the growing focus on sustainability? How can we measure green digital solutions and their enablement potential during this time?

Tracks *For details, see program at www.eucnc.eu/programme/ or in app*

PHY – Physical Layer and Fundamentals

- Beyond 5G & 6G and THz communications
- Reconfigurable radios and new radio heads
- Massive and Ultra-Massive MIMO
- AI/ML in the PHY Layer
- Propagation & channels at mm Waves & THz
- New air interfaces, waveforms, modulation & coding techniques
- Reconfigurable Intelligent Surfaces
- Semantic communications
- Radio based localization, sensing and mapping
- Physical layer security
- 6G Spectrum

WOS – Wireless, Optical and Satellite Networks

- Beyond 5G & 6G access and core networks
- Advances in M2M, WSN, IoT networks
- Next generation passive optical networks
- Satellite and terrestrial networks convergence
- VLEO satellite systems and networks
- Communications for unmanned platforms (UxV)
- TSN for industrial communications
- Communications for navigation and observation
- Green wireless/optical/satellite networks
- AI/ML for wireless/optical/satellite networks
- Novel network architectures

RAS – Radio Access and Softwarisation

- Spectrum management and reutilisation
- Cognitive/ intelligent and green radio
- Configurable radio, resources & SDR
- Energy efficient RRM, radio slicing and virtualisation
- Wireless edge caching
- Radio access architectures

AIU – Applications, IoT, Use cases

- Factory automation and industrial IoT solutions
- Autonomous driving and V2X solutions
- Critical communications and public safety
- Smart farming and environmental monitoring
- Digital health and wellbeing
- Emerging business models
- IoT service management
- Telepresence and mixed reality

NET – Network Softwarisation

- Cognitive network management
- Programmable networks
- Software defined networking
- AI/ML in service provisioning
- Data aware networks and overlays
- Network operating system
- Quality (QoE and QoS) aware networking
- Security, trust and privacy
- Quantum Cryptography
- Blockchain technology in mobile networks
- Mobile edge computing
- ML/AI for autonomous systems optimisation

OPE – Operational & Experimental Insights

- Beyond 5G and 6G trials and experiments
- Large-scale open testbeds and experiments
- Evaluation and analysis of experimental data
- Deployment insights from verticals
- Plug-and-play deployments and experiments
- Network forensics & network instrumentation
- Next Generation Internet architectures and experimentation

CMA – Components, Microelectronics & Antennas

- Novel MIMO & wideband mm Wave devices
- Components for mm Wave and beyond
- Antenna design & integration
- Antenna systems and architectures
- Design and technologies for array antennas
- RIS components & integration
- RF front-end and THz techniques
- Low power silicon RF, including wake up
- Next generations DSP, incl. RISC V & ASIP
- Edge AI component technologies
- Digital HW architecture for ultra-high speed and/or ultra-low latency PHY
- New component technologies and materials

6VS – 6G Visions and Sustainability

- Key performance and key value indicators
- Life cycle assessment techniques for 6G techniques and use cases
- Stakeholder groups are invited to submit thought-provoking 6G visions. Both extended abstracts (not included in IEEE Xplore) and full papers are welcome

SME BOOTH

Exhibit Your Business at the SME Booth

Looking for an efficient way to gain exposure and exhibit your work as a small-to-medium enterprise? Then don't miss out on the SME booth at EuCNC & 6G Summit! Our signature SME booth provides cost-effective opportunities for you to make a lasting impression in front of industry professionals while demonstrating what makes your company unique.

What is the SME Booth?

For SMEs looking for a more cost-efficient alternative to exhibiting their work at EuCNC & 6G Summit, the SME booth is an ideal solution. This desk-style booth offers a smaller area that still allows you to showcase your company and products without breaking the bank!

Why Choose the SME Booth?

Attending EuCNC & 6G Summit's SME booth is an outstanding way to gain exposure and draw attention. By participating in the exhibit, you can display your company, establish relationships with potential partners and customers for potential collaborations or sales opportunities, as well as increase your visibility among attendees.

Important Dates and Information

Join us filling the form below and be part of the conversation on the latest trends and innovations in wireless communications.
The proposal should be submitted by the deadline, 2023 Apr. 14th

SPEAKERS CORNER

EuCNC & 6G Summit will feature a Speakers' Corner.
This unique platform offers a valuable opportunity, especially for exhibitors and SMEs, to connect with like-minded peers and industry professionals, to showcase your brands and to share innovative ideas and success stories in a supportive environment.

The Speakers' Corner will be composed of 5-minute pitches during the breaks, giving an opportunity to reach the global audience of the conference. Join us and be a part of the conversation on the latest trends and innovations in wireless communications.

The proposal should be submitted by the deadline, 2023 Apr. 14th

POSTERS SESSIONS

will be held at Congress Foyer

Extended Abstracts for Poster Sessions are intended for the presentation of initial results worthwhile showing to the community. Poster Sessions will be held during the normal conference days, with dedicated time-slots, i.e., there will not be any parallel sessions to them.

Extended Abstracts will be light-reviewed by the Technical Programme Committee (TPC).

Announcement

EUCNC | 6G Summit

Antwerp, Belgium ▪ 3-6 June 2024

www.eucnc.eu

ANNOUNCEMENT

The 2024 EuCNC & 6G Summit builds on putting together two successful conferences in the area of telecommunications: EuCNC, in its 33rd edition of a series, supported by the European Commission; the 6G Summit, in its 6th edition, originated from the 6G Flagship programme in Finland, one of the very first in its area. The conference is sponsored by the IEEE Communications Society (ComSoc), the European Association for Signal Processing (EURASIP) and the European Association on Antennas and Propagation (EurAAP) and supported by the European Commission. The conference addresses various aspects of Beyond 5G/6G communications systems and networks. It brings together cutting-edge research and world-renown industries and businesses, globally attracting in the last years more than 700 delegates from more than 40 countries all over the world, to present and discuss the latest results, and an exhibition with more than 50 exhibitors, for demonstrating the technology developed in the area, namely within research projects from EU R&I programmes.

The conference program will include:
- Keynotes
- Panels
- Regular oral sessions (papers from open call, to be submitted for uploading to IEEE Xplore)
- Special and Convened sessions, with papers on specific topics
- Workshops, with papers and presentations on specific topics
- Poster sessions (extended abstracts from open call addressing latest results)
- Tutorials
- Demos and exhibitions, with pitches.

Key dates:
26 Jan. 2024 – Deadline for submission of papers for regular oral sessions
26 Jan. 2024 – Deadline for submission of proposals for workshops, special sessions and tutorials
8 Mar. 2024 – Deadline for submission of extended abstracts for posters
8 Mar. 2024 – Notification of acceptance of workshops, special sessions and tutorials
29 Mar. 2024 – Deadline for submission of proposals for exhibitions
1 Apr. 2024 – Notification of acceptance of papers and extended abstracts
12 Apr. 2024 – Deadline for final papers for all sessions and workshops
19 Apr. 2024 – Deadline for authors registration
26 Apr. 2024 – Draft programme available

Steering Committee Chairs
Luis M. Correia, IST - U. Lisbon, PT (Chair)
Pavlos Fournogerakis, SNS JU, BE (Vice-Chair)
Matti Latva-aho, Oulu U. - 6G Flagship, FI (Vice-Chair)
Technical Programme Co-Chairs
Ingrid Moerman, imec - Ghent University, Belgium
Johann Marquez-Barja, imec - University of Antwerp, Belgium
Ari Pouttu, Oulu U. - 6G Flagship, FI
Track Co-Chairs
PHY - Physical Layer and Fundamentals
Sofie Pollin, KU Leuven, BE
Mikko Uusitalo, Nokia Bell Labs, FI
Ke Guan, Beijing Jiaotong University, CN
RAS – Radio Access and Softwarisation
Navid Nikaein, EURECOM, FR
Ilenia Tinnirello, University of Palermo, IT
DongKu Kim, Yonsei University, KR
WOS – Wireless, Optical and Satellite Netw.
Marco Ruffini, Trinity College Dublin, IE
Paulo Monteiro, University of Aveiro, PT
Irene Macaluso, Cablelabs, US
NET – Network Softwarisation
Nina Slamnik-Krijestorac, imec - University of Antwerp, BE
Christos Tranoris, University of Patras, GR
Paul Ruth, RENCI, UNC-Chapel Hill, US
AIU – Applications, IoT, Use cases
Pietro Manzoni, UPV, ES
Vera Stavroulaki, Wings ICT Solutions, GR
Daniel Macedo, Federal University of Minas Gerais, BR
OPE – Operational & Experimental Insights
Pang Zhibo, ABB, SE
Thanasis Korakis, University of Thessaly, GR
Violet Syrotiuk, University of Arizona, US
CMA – Components, Microelectronics & Antennas
Andre Bourdoux, IMEC, BE
Jean-Baptiste Dore (CEA-LETI), FR
Shuhei Amakawa, University of Hiroshima, JP
6VS– Next-Generation Visions & Sustainability
Marja Matinmikko-Blue, Oulu U. – 6G Flagship, FI
Azeddine Gati, Orange, FR
Xueli An, Huawei, DE
Panels Co-Chairs
Liesbet Van der Perre - KU Leuven, BE
Zarrar Youzaf, NEC, DE
Special Sessions Co-Chairs
Claudio Palazzi, University of Padova, IT
Paulo Marques, Allbesmart, PT
Jessica Carneiro, Australo, ES
Workshops Co-Chairs
Maria Chiara Campodonico, Martel, CH
Hans Van den Berg, University of Twente, NL
Leandros Tassiulas, Yale University, US
Tutorials Co-Chairs
Silvia Mirri, University of Bologna, IT
Josef Noll, University of Oslo, NO
Kaushik Chowdhury, Northeastern University, US
Sponsors Co-Chairs
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URSI Liaison
Sana Salous, Durham U., UK
EurAAP Liaison
Jose Garcia-Pardo, U. Cartagena, ES

Exhibition Map – overall view

Legend:
- Plenary & Session
- Exhibition /Catering/ Posters
- Session
- Speakers Preview Room

SVENSKA MÄSSAN
THE SWEDISH EXHIBITION & CONGRESS CENTRE | **GOTHIA TOWERS**

Level 2

Scandinavium
Event Arena
12000

Congress Foyer

Reception

Congress Hall
Plenary & Session

Seasons
Restaurant
& Breakfast

Bryggan

H2
300

H

H1
250

J Lounge

Level 23

Heaven 23

Level 3

REGISTRATION

J2
130

J1
200

R2
70

R21
R22
R23

R24
R25

R26

Conference
Reception

R38
R37
R31
R33
R36
R35
R34

R3

R4
R5
R6
R7

R9

R11 R12
R13

R14
R15
R16

R17 R18

G1
220

G2
220

G3
400

G4
300

G

Level 25

Upper House
Dining

Reception

Level 18- 20

Upper House
Spa

Level 29

Imagine

Level 28

View | Horizon

Skyline

Star

F1
F1
140

F2
F2
140

F3
F3
140

F4+F5

600

F6
260

F

Expo Hall

*Entrance 1,
Level 3:
Exhibitor
entrance*

*Main Entrance
Hotel Gothia Towers*

Exhibition and Demos

Number	Company	Number	Company
H00:02	Imec – EuCNC 2024	H03:01	Rohde & Schwarz GmbH & Co KG
H00:04	University of Oulu, 6G Flagship	H03:12	IHP GmbH
H00:06	CTTC/ ETSI TeraFlowSDN	H03:14	IHP GmbH
H00:08	ALLBESMART, LDA	H03:20	5G-Blueprint Project description/ Martel GmbH
H00:09	EurAAP	H03:21	IQUADRAT INFORMATICA SL
H00:10	CHARITY/ Eurescom GmbH	H03:23	IQUADRAT INFORMATICA SL
H00:12	CELTIC-NEXT / Xecs	H04:11	Adtran/ADVA
H00:14	RPTU Kaiserslautern	H04:19	Hellenic Telecommunications Organization S.A.
H00:16	ITRI	H05:12	Airbus DS SLC
H00:20	Telefónica Investigación y Desarrollo S.A.U (EVOLVED-5G // B5G-OPEN)	H05:14	Tektronix
H00:22	Telefónica Investigación y Desarrollo S.A.U (EVOLVED-5G // B5G-OPEN)	H05:16	UBITECH
H01:02	ARIADNE/ Eurescom GmbH	H05:18	University of Bedfordshire
H01:03	Nokia Solutions and Networks Oy	H05:20	ICT-53 projects: 5GRAIL, 5G-ROUTES, and 5GMED
H01:05	ISEP	H05:21	TERAWAY/Institute of Communication and Computer Systems
H01:10	Technology Innovation Institute	H05:22	ICCS/NTUA
H01:12	Ericsson	H06:11	TRIALSNET/ WINGS ICT Solutions S.A.
H01:19	HUAWEI TECHNOLOGIES Düsseldorf GmbH	H06:12	Fundación IMDEA Networks
H01:20	Keysight Technologies BV	H06:13	Experimentation with distributed Post-5G architectures within SLICES-RI
H01:21	Chalmers University of Technology	H06:14	Hellenic Telecommunications Organization S.A.-OTE
H01:23	CONNECT SFI Research Centre	H06:16	ETRI
H01:25	Public Safety Communication Europe	H06:19	eBOS Technologies Ltd.
H02:02	Bayern Innovativ GmbH -Thinknet 6G	H06:20	CERTH/ITI
H02:06	HEXA-X		
H02:12	EC/Smart Networks and Services JU - Eurescom		
H02:16	DEDICAT 6G/ WINGS ICT Solutions		
H02:19	National Instruments Sweden AB		

BOOTH # H00:02

Imec – EuCNC 2024

The 2024 EuCNC & 6G Summit builds on putting together two successful conferences in the area of telecommunications: EuCNC, in its 33rd edition of a series, supported by the European Commission; the 6G Summit, in its 6th edition, originated from the 6G Flagship programme in Finland, one of the very first in its area. The conference is sponsored by the IEEE Communications Society (ComSoc), the European Association for Signal Processing (EURASIP) and the European Association on Antennas and Propagation (EurAAP) and supported by the European Commission. The conference addresses various aspects of Beyond 5G/6G communications systems and networks. It brings together cutting-edge research and world-renown industries and businesses, globally attracting in the last years more than 700 delegates from more than 40 countries all over the world, to present and discuss the latest results, and an exhibition with more than 50 exhibitors, for demonstrating the technology developed in the area, namely within research projects from EU R&I programmes.

BOOTH # H00:04

University of Oulu, 6G Flagship

6G Flagship is the world's first 6G research program, a global leader in 5G adoption, and a preferred research partner in 6G development.

We promote high-quality 6G research to create future know-how and sustainable solutions for society's needs in the 2030s.

We operate under the University of Oulu, which also funds us together with the Academy of Finland.

BOOTH # H00:06

CTTC/ ETSI TeraFlowSDN

In February 2023, ETSI TeraFlowSDN open-source group (TFS) has released second version of cloud-native SDN controller for beyond 5G/6G networks. TFS has had support and contributions from 5GPPP TeraFlow project, but in SNS several projects are studying adoption and eventually, contribution. We are looking for ETSI TeraFlowSDN to create awareness and establish relationship with SNS projects to foster its developments and innovations for upcoming releases.

The presented demonstration: "Slice Grouping for Transport Network Slices Using Hierarchical Multi-domain SDN Controllers" showcases how TeraFlowSDN provides support for hierarchical control of multiple heterogeneous SDN domains (through IP, microwave, and optical technologies). Different transport slices are offered with multiple SLAs and grouped to optimize resources. This demo brings multiple innovations tied to the novel release of TeraFlowSDN, both from data and control planes. From the data plane perspective, it is interesting to remark the introduction of whiteboxes that support XR constellation supporting the configuration of optical port bandwidth for point-to-multipoint connections. XR constellations are discovered from Infinera Intelligent Pluggable Manager (IPM) north-bound REST-API using TeraFlowSDN XR driver. Moreover, the support for interfacing to a Microwave SDN controller through the standard ETSI GS mWT 024 REST-based interface is also provided.

From the control plane perspective, the TeraFlowSDN acts as a full-featured IP SDN controller which interacts with ADVA NOS based on OpenConfig. We also provide as a novelty the cloud-native end-to-end SDN orchestration architecture via a parent SDN controller (orchestrator) based on TeraFlowSDN. Finally, we introduce the slice grouping concept to transport network slices, by showcasing a clustering algorithm which processes incoming requests to eventually deploy/allocate the transport network slices.

BOOTH # H00:08

ALLBESMART

Allbesmart is a cutting-edge technology company that was founded in 2015. We specialize in providing expert consultancy services and in-depth knowledge on 3GPP wireless network implementations in OpenAirInterface for customized 5G/6G use cases. As a key contributor to the OpenAirInterface code base and an associated member of the OpenAirInterface Software Alliance, we are at the forefront of technological advancements in the industry.

Our OAIBOX product line (HW+SW) is the leading open-source 5G SA solution in the world, designed for testing, research, and education.

We take pride in being the first team to demonstrate a stable 5G SA connection with an end-to-end OAI solution and COTS UEs, reaching a stable downlink speed of 800 Mbps.

We work with prominent industry leaders in 5G/6G topics such as RAN disaggregation, HW acceleration, and NTN.

BOOTH # H00:09

EurAAP

The European Association on Antennas and Propagation (EurAAP) is an international not-for-profit Association with a scientific, educational and technical purpose, registered in Brussels, Belgium, under European law.
The 4 pillars of EurAAP are the European Conference on Antennas and Propagation (EuCAP), the European School of Antennas (ESoA), the Reviews of Electromagnetics (RoE) and the Working Groups (WG)

BOOTH # H00:10

CHARITY/Eurescom GmbH

Next-generation Immersive Applications, including advanced AR, VR and Holographic-based applications, sometimes called killer applications for the upcoming 6G, are set to transform how we interact with technology. Indeed, they represent one of the most demanding types of services with (extremely) strict requirements (e.g. low latency, high bandwidth, and reliable connectivity). Considering such immersive application categories, the CHARITY project focuses on developing an intelligent and autonomous framework to facilitate the deployment and orchestration of these immersive applications across the edge/cloud continuum. The framework builds on cutting-edge technologies like machine learning, artificial intelligence, and Cloud-Native OSS enablers to ensure seamless resource provisioning, resource optimization, and improved Quality of Experience (QoE), ultimately paving the way for the widespread adoption of these applications.

The demonstration intends to present the CHARITY orchestration capabilities and the CHARITY use cases as part of current research & developments with the primary goal of showcasing and discussing them with a general public audience and experts in the field. By doing that, we aim to communicate and debate the need and benefits of redesigning such services towards distributed cloud-based architectures, the role of the network infrastructure and a cloud-based framework in supporting their orchestration and different requirements, and finally, the key challenges ahead of their full realization.

It will cover two key thematics : the concept behind the CHARITY orchestration framework, its capabilities, components and how it helps to address the needs of immersive services considering a challenging but increasingly heterogeneous scenario composed of different edge resources and cloud providers. Finally, the demo will also include showcasing CHARITY use cases, their current capabilities and limitations and how each can take advantage of the CHARITY framework for seamless, intelligent and automated service provisioning and lifecycle management across the edge-continuum space.

BOOTH # H00:12

CELTIC-NEXT / Xecs

CELTIC-NEXT is the Eureka Cluster labelled for next-generation communications for a secured, trusted, and sustainable digital society. CELTIC-NEXT stimulates and orchestrates international collaborative projects in the Information and Communications Technology (ICT) domain. CELTIC-NEXT is an industry-driven initiative involving all the major ICT industry players and many SMEs, service providers, and research institutions. The CELTIC-NEXT activities are open to all organisations that share the CELTIC-NEXT vision of an inclusive digital society and are willing to collaborate to their benefit, aligned with their national priorities, to advance the development and uptake of advanced ICT solutions.

Xecs

Xecs is a Eureka Cluster specifically designed to accelerate the pace of sustainable industrial innovation in the Electronics Components & Systems (ECS) community. The intent of Xecs is to create an ambitious international collaboration programme that will result in high levels of societal and economic impact for all those who participate in a Xecs project. By engaging with all relevant segments of the industrial landscape – Large Enterprise, SME's, Research and Technology Organisations and Universities – Xecs projects will go beyond the state-of-the-art, encourage disruptive innovation and enable sustainable competitiveness and growth for all those involved.

BOOTH # H00:14

RPTU Kaiserslautern.

The 6G Platform provides scientific and organizational support for the German 6G program. It provides a platform for networking, manages international liaisons, and supports the processes required to successfully implement the program. In its Working Groups, the 6G Platform Germany addresses societal issues of high relevance for the 6G design.

The aim of the project is both to make scientific contributions to the design of the technical content of 6G and to provide scientific and organizational support for the processes required for the successful implementation of the German-European 6G program. To this end, harmonization with international regulation and standardization will be promoted, and opportunities for participation by society and industry will be created. Accordingly, the platform ensures that user groups that are not actively involved in mobile communications research can also contribute to the identification of 6G lead
applications and requirements. The focus is on ensuring efficient harmonization of visions and concepts with the aim of defining a uniform German position. The necessary comprehensive and inclusive consideration of as many stakeholders, projects and key parties as possible is part of the accompanying research activities of the 6G platform. This takes into account that the definition of 6G is a dynamic process with currently still dynamically changing agendas.

BOOTH # H00:16

ITRI.

Industrial Technology Research Institute (ITRI) is one of the world's leading technology R&D institutions aiming to innovate a better future for society. Founded in 1973, ITRI has played a vital role in transforming Taiwan's industries from labor-intensive into innovation-driven. To address market needs and global trends, it has launched its 2030 Technology Strategy & Roadmap and focuses on innovation development in Smart Living, Quality Health, and Sustainable Environment. It also strives to strengthen Intelligentization Enabling Technology to support diversified applications.

Over the years, ITRI has been dedicated to incubating startups and spinoffs, including well-known names such as UMC and TSMC. In addition to its headquarters in Taiwan, ITRI has branch offices in the U.S., Europe, and Japan in an effort to extend its R&D scope and promote international cooperation across the globe. For more information, please visit https://www.itri.org/eng

BOOTH # H00:20 + H00:22

Telefónica Investigación y Desarrollo S.A.U (EVOLVED-5G // B5G-OPEN)

Founded in 1988, Telefónica I+D is the research and development company of the Telefónica Group. Its mission is to contribute to the competitiveness and modernity of the Telefónica group through technological innovation. With this aim, the company applies new ideas, concepts and practices in addition to developing products and advanced services. Telefónica I+D stands as a pioneering private research and development company in Spain. It boasts a remarkable level of activity and ample resources, positioning it among the forefront of such institutions in the country. Notably, it holds an exceptional record in Europe, actively engaging in numerous European research projects. In terms of participation, few organizations rival its extensive involvement, illustrating its vibrant and dynamic presence in the European research landscape.

The main asset of Telefónica I+D is its staff, which is 97% composed of university graduates from over 18 nationalities. It currently collaborates with technological leaders and many organizations from more than 40 countries; among which figure more than 150 universities around the world. It also participates in the most important international forums on technological knowledge of the ICT sector, thus creating one of the largest European innovation ecosystems. In addition to the numerous technical awards it has won since its foundation, the company received the Príncipe Felipe Award for Business Excellence in 2002.

Finally, our direct connection with a global organization providing Internet services at all levels will ease the collection of knowledge from additional experts, as well as the assessment and evaluation of results in (next-to) real environments."

BOOTH # H01:02

ARIADNE/Eurescom GmbH - Artificial Intelligence Aided D-band Network for 5G Long Term Evolution

ARIADNE aspires to transform the current 5G wireless thinking from focusing on "local" network improvements to realizing a longer-term vision of pervasive mobile virtual services. The project brought together a novel, high-frequency advanced radio architecture and an Artificial Intelligence (AI) network processing and management approach in a unified system beyond 5G concept. The ARIADNE booth will present, designed & developed, proof-of-concept demonstrator an innovative wireless communications concept addressing networks beyond 5G. In this concept, ultra-high spectral-efficient and reliable communications in the D-band can be dynamically established and reconfigured by Machine Learning (ML)-based design and intelligent network management, in both "Line of Sight" (LOS) and "Non-Line of Sight" (NLOS) environments.

BOOTH # H01:03

Nokia Solutions and Networks Oy

With every generation of communications technology, the focus of the network changes. The 2G and 3G eras centered on human-to-human communication through voice and text. 4G heralded a fundamental shift to the massive consumption of data, while the 5G era has turned its focus on connecting the Internet of Things (IoT) and industrial automation systems.

In the 6G era, the digital, physical and human world will seamlessly fuse to trigger extrasensory experiences. Intelligent knowledge systems will be combined with robust computation capabilities to make humans endlessly more efficient and redefine how we live, work and take care of the planet. At Nokia, we believe 6G will not just build on existing technologies and systems, it will expand and transform what a network can do. It will liberate human potential, inclusively and sustainably.

Nokia expects 6G systems to launch commercially by 2030, following the typical 10-year cycle between generations. Meanwhile, 5G will be enhanced by 5GAdvanced, which will be a key focus for 3GPP in Release 18 onwards and power commercial networks starting 2025 onwards, well before 6G arrives at the end of

the decade. Powered by world-renowned research from Nokia Bell Labs, Nokia has been the forerunner in defining the fundamental technologies for the 5G era and beyond. To make 6G a reality before 2030, Nokia is leading Hexa-X, the European Commission's 6G flagship initiative for research into the next generation of wireless networks.

BOOTH # H01:05

ISEP

6G BRAINS: H2020 ICT-52 research project, 6G BRAINS aims to bring AI-driven multi-agent deep reinforcement learning (DRL) to perform resource allocation over and beyond massive machine-type communications with new spectrum links including THz and optical wireless communications to enhance the performance with regard to capacity, reliability and latency for future industrial networks. 6G BRAINS will deliver a novel comprehensive cross-layer DRL driven resource allocation solution to support the massive connections over device-to-device (D2D) assisted highly dynamic cell-free network enabled by Sub-6 GHz/mmWave/THz/OWC and high-resolution 3D Simultaneous Localization And Mapping (SLAM) of up to 1 mm accuracy.

BOOTH # H01:10

Technology Innovation Institute

Technology Innovation Institute, the dedicated 'applied research' pillar of Advanced Technology Research Council (ATRC), is a pioneering global research and development center that focuses on applied research and new-age technology capabilities. The institute has seven initial dedicated research centers in quantum, autonomous robotics, cryptography, advanced materials, digital security, directed energy, and secure systems. By working with exceptional talent, universities, research institutions, and industry partners from all over the world, the Institute connects an intellectual community and contributes to building an R&D ecosystem in Abu Dhabi and the UAE. The Institute reinforces Abu Dhabi and the UAE's status as a global hub for innovation and contributes to the broader development of the knowledge- based economy.

BOOTH # H01:12

Ericsson

Ericsson is a world leader in the rapidly changing environment of communications technology. From 5G research and standardization to today's fully operational networks, Ericsson has been a key player in making 5G networks a reality. With pioneering research and early collaborations with academia and other industries, Ericsson has developed and contributed to a standard that meets the needs of different industries and the society.

Now we are well underway on the journey towards 6G. Together with partners, we explore what the network will be able to deliver in 2030 and beyond, and the technology components that will make it possible.

We are a trusted partner to academic institutions, industry, and service providers globally. Ericsson collaborates with top universities, innovative companies, and research institutions.

Ericsson provides hardware, software, and services to mobile operators, to enable the full value of connectivity. About 40% of the world's mobile traffic is carried through our networks. For more than 140 years, our ideas, technology and people have changed the world: real turning points that have transformed lives, industries and society as a whole.

Our vision is a world where limitless connectivity improves lives, redefines business and pioneers a sustainable future. By creating connections that make the unimaginable possible, we are helping to shape an exciting and positive future.

In this vision of the future, limitless connectivity enables Holographic communication, Digital twins, Immersive experiences, achieving Net Zero targets, and much more. https://www.ericsson.com/en/about-us/new-world-of-possibilities/imagine-possible-perspectives/industry5-0-human-centric-manufacturing/

For more information, please visit www.ericsson.com/en/6G

We look forward to meeting you in Gothenburg at this year's EuCNC&6G Summit. Proud to be Diamond Patron of the event, we are eager to share research results and discuss the shaping of future 6G networks with you.

BOOTH # H01:19

HUAWEI TECHNOLOGIES Düsseldorf GmbH

Founded in 1987, Huawei is a leading global provider of information and communications technology (ICT) infrastructure and smart devices. We have 207,000 employees and operate in over 170 countries and regions, serving more than three billion people around the world. We are committed to bringing digital to every person, home and organization for a fully connected, intelligent world.

 https://www.huawei.com/en/corporate-information

Proving scientific predictions can take centuries of trial and error
For illustration purposes only

Exploration begins with sharing minds

A beacon under night sky in Australia

Exploration lights the way forward

BOOTH # H01:20

Keysight Technologies BV

Accelerate 6G Innovation with Keysight
Keysight enables innovators to create the best wireless communication experiences by quickly solving design, emulation, and test challenges. Enable 6G design with AI, improve energy efficiency, and explore future technologies. Keysight accelerates innovation with an end-to-end portfolio of precise measurement hardware and software-driven insights that reduce risk and speed time to market.

About Keysight Technologies
At Keysight (NYSE: KEYS), we inspire and empower innovators to bring world-changing technologies to life. As an S&P 500 company, we're delivering market-leading design, emulation, and test solutions to help engineers develop and deploy faster, with less risk, throughout the entire product lifecycle. We're a global innovation partner enabling customers in communications, industrial automation, aerospace and defense, automotive, semiconductor, and general electronics markets to accelerate innovation to connect and secure the world. Learn more at Keysight Newsroom and www.keysight.com.

BOOTH # H01:21

Chalmers University of Technology

Chalmers University of Technology in Gothenburg on the beautiful Swedish west coast, conducts research and education in engineering and natural sciences at the highest international level. Chalmers has 3100 employees and 10,000 students, and offers education in engineering, science, shipping and architecture. With scientific excellence as a basis, Chalmers promotes knowledge and technical solutions for a sustainable world. Through global commitment and entrepreneurship, we foster an innovative spirit, in close collaboration with industry and society. We coordinate EU's biggest research initiative – the Graphene Flagship and lead the development of a Swedish quantum computer. Chalmers was founded in 1829 and our motto is Avancez – forward.

BOOTH # H01:23

CONNECT, SFI Research Centre for Future Networks & Communications

CONNECT, the SFI Research Centre for Future Networks and Communications, comprises a consortium of Irish academic institutes undertaking world-leading research, development and innovation in future communications networks with a unified purpose and mission: "CONNECT envisions and researches a future of sustainably deployed dependable networks that foster innovation in services and customer experience to empower citizens and improve quality of life."

Over 250 CONNECT researchers across 10 Higher Education Institutes are supported by €90 million of funding from the Science Foundation Ireland Research Centres Programme, the European Regional Development Fund and industry partners.

Communications networks are now part of our critical infrastructure, enabling a vast range of applications that we have all come to rely on. These networks must now evolve to enable services that one day will also become ubiquitous, from augmented reality to autonomous vehicles. At CONNECT, we design the next generation of networks that automatically respond to the services that run on them.

Research Areas
- CONNECT focuses on ten research themes looking to the next generation of networks:
- Dependable Networks
- Sustainable IoT
- Link Performance
- Customised Networks
- AI-driven Network Customisation
- Network Ecologies
- Smart Cities
- Connected Autonomous Vehicles
- Cybersecurity
- Quantum & Satellite Communications

BOOTH # H01:25

Public Safety Communication Europé

"Long-term towards Evolved 5G and 6G research needs mobilization of massive volumes of ideas, from which the best can emerge and be adopted for standardization. With the extremely low latency and huge data capacity of Beyond 5G and 6G networks, the cyber and physical worlds could converge, allowing for the development of services like digital twins and internet of senses applications. This future ecosystem is on track to be more collaborative and inclusive than previous generations of networks.

FIDAL seeks to set the standard by fostering open architectures, large experimentation sites, and adopting a multi-stakeholder approach, thus it steps in, targeting the augmentation of human capabilities, enabling Media & PPDR vertical industry players to carry out advanced technological and business validation in large-scale trial facilities of highly innovative and advanced applications, that take full advantage of Evolved 5G technologies. This will provide significantly beneficial feedback to the broader industry, academia, innovators and community before wide commercial deployments of Evolved 5G networks throughout Europe"

BOOTH # H02:02

Bayern Innovativ GmbH -- Thinknet 6G

Thinknet 6G To ensure that all relevant stakeholders in Bavaria are involved in the research and development of 6G early in this cycle, the Bavarian Ministry of Economic Affairs, Regional Development and Energy founded Thinknet 6G to create an agile ecosystem of industry players, research institutions, associations, innovators, start-ups and incubators. Thinknet 6G is both a think tank and an agile community for all organisations and stakeholders who are interested in any aspect of 6G development.

Thinknet 6G is hosted by the Centre for Digitalisation Bavaria at Bayern Innovativ and will pursue the following main goals and activities:

* Establish a vibrant ecosystem of 6G stakeholders in Bavaria, Germany, Europe, and internationally
* Act as a central point-of-contact and point-of-information for 6G topics and questions
* Stimulate networking and exchange between the relevant stakeholders, to enable collaboration, cooperation and knowledge transfer
* Cooperate and network with 6G organisations in other states and countries
* Support pre-competitive consensus building and reciprocal exchange
* Promote Thinknet 6G and its activities, for example via an annual 6G summit
* Provide expert input and support to define calls for research funding

BOOTH # H02:06

Hexa-X

Hexa-X is the European flagship research initiative to develop the foundation and contribute to industry consensus leading to 6G

* 25 partners
* NW vendors
* Operators
* Industry
* Academia
* SMEs
* Nokia is overall leader
* Ericsson is technical manager

Hexa-X vision on 6G

2030 and beyond the world will face tremendous opportunities and challenges of sustainable growth. The Hexa-X vision is to Connect human, physical and digital worlds with a fabric of 6G key enablers.

Key enabler areas

* Fundamentally new radio access technologies at high frequencies and high-resolution localization and sensing

* Connected intelligence through AI-driven air interface and governance for future networks

* 6G architectural enablers for network disaggregation and dynamic dependability.

Objectives

* Foundation for an end-to-end system architecture towards 6G

* Radio performance towards 6G

* Connecting intelligence towards 6G

* Network evolution and expansion towards 6G

* Impact creation towards 6G

Read more:
hexa-x.eu/about

Actions

* Organisation of public workshops

* Preparation of joint whitepapers

* Active participation in major events

* Development of the foundation and contribution to industry consensus leading to 6G

Read more:
hexa-x.eu/dissemination

BOOTH # H02:12

EC/Smart Networks and Services JU,
Eurescom

The European Smart Networks and Services Joint Undertaking (SNS JU) is a Public-Private Partnership that aims to facilitate and develop industrial leadership in Europe in 5G and 6G networks and services. The SNS JU funds projects that shape a solid research and innovation (R&I) roadmap and deployment agenda by engaging a critical mass of European stakeholders and facilitating international cooperation on various 6G initiatives.

The SNS JU has two main missions:
1 – Fostering Europe's technology sovereignty in 6G by implementing the related research and innovation (R&I) programme leading to the conception and standardisation around 2025. It encourages preparation for early market adoption of 6G technologies by the end of the decade. Mobilising a broad set of stakeholders is key to address strategic areas of the networks and services value chain. This ranges from edge- and cloud-based service provisioning to market opportunities in new components and devices beyond smartphones.

 2 – Boosting 5G deployment in Europe in view of developing digital lead markets and enabling the digital and green transition of the economy and society. For this objective, the SNS JU coordinates strategic guidance for the relevant programmes under the Connecting Europe Facility, in particular 5G Corridors. It also contributes to the coordination of national programmes, including under the Recovery and Resilience Facility and other European programmes and facilities such as Digital Europe Programme (DEP) and InvestEU

BOOTH # H02:16

DEDICAT 6G/ WINGS ICT Solutions

The vision of the H2020 DEDICAT 6G project is to enhance the offering of future networks by further improving latency, adaptability, flexibility and security to support innovative, human-centric applications. In this direction develop a smart connectivity platform using artificial intelligence and blockchain techniques that will enable 6G networks to combine the existing communication infrastructure with coverage extension schemes and novel distribution of intelligence (data, computation, and storage) at the edge and to allow not only flexible, but also energy efficient ealization of the envisaged real-time experience. DEDICAT 6G focuses on four use cases: Smart warehousing, Enhanced experiences, Public Safety and Smart Highway. The use cases pilot the developed solutions via simulations and demonstrations in laboratory environments, and larger field evaluations. The DEDICAT 6G exhibition aims to provide delegates with insights into the concepts and vision of DEDICAT 6G, and how the usage of intelligence distribution, dynamic coverage extension, enhanced security, privacy and trust, human-centric applications and robots, and connected cars can help in building a smart connectivity platform for B5G/6G.

BOOTH # H02:19

National Instruments Sweden AB

At NI, we understand that cellular technology evolves quickly—5G rollouts and enhancements are progressing in parallel with early 6G research. Engineers are tasked with innovating and bringing new products to market with more capabilities. From research and prototyping to high-speed automated test, rapidly generating results is key to making next-generation wireless systems and networks a reality.

With promising technologies like AI, machine learning, sub-THz frequencies, MIMO, and RADAR sensing, the next generation of cellular standards is well under way. NI's 5G and 6G solutions enable researchers to quickly move from mathematical models to over-the-air testbeds—going beyond simulation to real-world experiments.

Our Software Defined Radio (SDR) technology combines flexibility and performance to enable researchers to experiment with new concepts and quickly iterate. Co-processing and FPGA acceleration pair with highly capable RF front ends to deliver real-time systems that are ideal for wireless research and prototyping. Our modular, open architectures allow system extensions to adapt to changing needs as wireless networks evolve beyond 5G.

At NI, we provide the foundation to ensure quality and results that are backed by data. Through integration of hardware and software, NI provides flexible solutions for engineers to rapidly prototype and deploy real-time wireless communications systems.Our offerings and network of support resources ensure that not only are we speaking to our customers, but learning and innovating with them as well. That's what it means to Engineer Ambitiously.

BOOTH # H03:01

Rohde & Schwarz

The Rohde & Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test & measurement, technology systems, and networks & cybersecurity. Founded nearly 90 years ago, the group is a reliable partner for industry and government customers around the globe. On June 30, 2022, Rohde & Schwarz had around 13,000 employees worldwide. The independent group achieved a net revenue of EUR 2.53 billion in the 2021/2022 fiscal year (July to June). The company is headquartered in Munich, Germany.

BOOTH # H03:12/H03:14

IHP GmbH

As deploying 5G solutions for vertical industries in Europe is a well-defined objective, there is a clear need to develop future proof 5G infrastructures to address a wide range of vertical applications adopting a flexible architecture, offering converged services across heterogeneous technology domains deploying unified software control. It is true to say that despite the European strategy to support verticals through 5G solutions, verticals face the problem that they can only practically verify their use cases in small scales in commercially relevant environments before investing in large scale deployments. Through ICT-17 projects, EU has invested in the development of 5G ICT infrastructures that will become available to verticals to test their applications. ICT-17 projects provide small scale testbed infrastructures that in some cases need suitable extensions to enable integration of verticals and allow a small scale testing environment for vertical commercially relevant infrastructures. However, large scale trials are not possible with the current ICT-17 facilities.
In view of this, 5G-VICTORI aims at conducting large scale trials for advanced use case verification in a commercially relevant 5G environment for a number of verticals including Transportation, Energy, Media and Factories of the Future as well as some specific use cases involving cross-vertical interaction (Figure 1). The specific use cases that 5G VICTORI will concentrate on include:

- Enhanced Mobile broadband under high speed mobility", Vertical: Transportation – Rail,
- Digital Mobility", Cross-Vertical – Transportation and Media,
- Critical services for railway systems", Vertical: Rail,
- Smart Energy Metering", Cross-Vertical: Energy and Rail,
- Digitization of Power Plants", Vertical: Smart Factory, and
- CDN services in dense, static and mobile environments", Vertical: Media

BOOTH # H03:20

5G-Blueprint Project description/ Martel GmbH

The 5G-Blueprint project is focused on creating, testing, and validating, a comprehensive 5G-based system for seamless cross-border teleoperated transport. The main outcomes of the project will be a technical blueprint, as well as business and governance models, for operational pan-European deployment of teleoperated transport solutions in the transport and logistics sector, which will be used as a baseline for future collaboration between public and (semi)private parties that are enhancing their business and operation with 5G technology.

In the 5G-Blueprint project, the seamless teleoperation over 5G Standalone (SA) based on 3GPP Release 16 technology is tackling cross-border challenges in terms of advancements in 5G network design and implementation that minimize the service interruption time while teleoperated vehicles/barges are crossing the Dutch-Belgian border. To validate effective teleoperation mechanisms on vehicles, trucks, and skid steers, over the 5G SA, 5G-Blueprint offers two in-country pilot sites located in port environments (Vlissingen in NL, Antwerp in BE), and to achieve seamless cross-border teleoperation, 5G-Blueprint created Zelzate pilot site (BE-NL).

The 5G-Blueprint project defines four use cases in total, which are aiming at developing safe (inter-)harbor teleoperated transport enabled by 5G technology. The selected use cases are: (1) Automated Barge Control, focused on improving the port entry efficiency by reducing crew requirements for barging in busy port environments, (2) Automated driver-in-loop docking, providing the yard tractors and skid steers with optimized docking and maneuvering operation in safety critical situations, (3) CACC based platooning, leveraging 5G connectivity on the highways to combine platooning with teleoperation and full automation, and (4) Remote take-over, which is entirely focused on the teleoperation mechanisms that are later applied to other use cases. The aforementioned use cases are furthered enhanced with the help of so-called enabling functions, whose objective is to improve safety and efficiency of tele-operated transport, thereby increasing awareness of vulnerable road users, enhancing distributed perception, and enabling intelligent traffic lights, among others.

BOOTH # H03:21

IQUADRAT INFORMATICA SL

5GMEDIAHUB- 5G experimentation environment for 3rd party media services

5GMed5GMediaHUB aims to help EU to achieve the goal of becoming a world leader in 5G, by accelerating the testing and validation of innovative 5G-empowered media applications and NetApps from 3rd party experimenters and NetApps developers, through an open, integrated and fully featured Experimentation Facility. This will significantly reduce not only the service creation lifecycle but also the time to market barrier, thus providing such actors that are primarily from SMEs, with a competitive advantage against their rivals outside EU. In particular, 5GMediaHUB will build and operate an elastic, secure and trusted multi-tenant service execution and NetApps development environment based on an open cloud-based architecture and APIs, by developing and integrating a testing and validation system with two existing well-established 5G testbeds (by CTTC and Telenor) for enabling the fast prototyping, testing and validation of novel 5G services and NetApps. 5GMediaHUB will offer: (i) a DevOps environment for Testing as a Service; (ii) a rich set of Experimentation Tools that offer scheduling, validation, verification, analytics and QoS/QoE monitoring mechanisms; (iii) A set of re-usable vertical specific and verticalagnostic NetApps with easy to use APIs that can be consumed by application developers, reducing the complexity and risk of integrations and operations; (iv) a re-usable open-source NetApps Repository; (v) an umbrella crossdomain service orchestrator to deliver cross-domain orchestration of NetApps; (vi) an innovative security framework offering software defined perimeter protection and isolation of NetApps; (vii) incremental validation capabilities of the Experimental Facility evidenced through 3 novel media use cases with 2 scenarios each, over 3GPP R.16 and R.17 5G testbed releases. Our 17-partner consortium (9 SMEs) from 9 countries has extremely rich 5G-PPP experience, since 13 partners have participated in previous 5G-PPP projects and in several 5G-PPP WGs.

BOOTH # H03:23

IQUADRAT INFORMATICA SL

6GBRICKS: Building Reusable testbed Infrastructures for validating Cloudto- device breaKthrough technologieS

6G networks, currently only existing as concepts, are envisioned as portals to a fully digitized society, where the physical and virtual world are blended via boundless Extended Reality (XR), and also as an enabler for the Digital and Green transformation of the European Industries. To support this vision, the network capacity must be increased at least by an order of magnitude, while infrastructures must be transformed into a very dense continuum. Thus, academia and

industry have shifted their attention to the investigation of a new generation of Smart Networks and infrastructures. It is clear that to win this race towards shaping the next-generation communication ecosystem, a new generation of testbed infrastructures and breakthrough research and technology development is needed needed, as well as a new generation of testbeds to support future research initiative. To this end, 6G-BRICKS aims to deliver a new 6G facility, building on the baseline of mature ICT-52 platforms, that bring breakthrough cell-free and RIS technologies that have shown promise for beyond 5G networks. Moreover, novel unified control paradigms based on Explainable AI and Machine Reasoning are explored. All enablers will be delivered in the form of reusable components with open APIs, termed "bricks". Finally, initial integrations with O-RAN are performed, aiming for the future-proofing and interoperability of 6G-BRICKS outcomes.

BOOTH # H04:11

Adtran/ADVA

On August 30, 2021, we announced our business combination with ADVA to create a global leader in scalable, end-to-end fiber networking solutions for communication service providers, enterprises and government customers. The merger unites our fiber access, fiber extension, and subscriber connectivity technology with ADVA's innovation in data center interconnect solutions for large enterprises, business Ethernet and network synchronization. Both companies are pioneers in open, disaggregated solutions with a shared vision for the future of fiber networking. Our combined business will offer a comprehensive portfolio for providing homes, businesses and 5G infrastructure with scalable, secure and assured fiber connectivity, paired with cloud-managed Wi-Fi connectivity and SaaS applications. Together we will be a trusted supplier to more customers worldwide, meeting new requirements, optimizing network performance and improving customer experience.

BOOTH # H04:19

Hellenic Telecommunications Organization S.A.

The Hellenic Telecommunications Organisation S.A. (OTE), member of the Deutsche Telekom (DT) Group of Companies, is the incumbent telecommunications provider in Greece. OTE as the leading company of the OTE Group of Companies, offers its customers a wide range of technologically advanced services such as high⊠speed data communications, mobile telephony, internet access, infrastructure provision, multimedia services, TV services, leased lines, maritime and satellite communications, telex and directories. OTE's R&D Department is involved in almost all technological and infrastructural issues and is an active participant in many EU and international collaborative projects. OTE's current R&D activities include broadband technologies and services, next generation network architectures, infrastructure development etc., following to the actual challenges for the development of a fully competitive network infrastructure & a portfolio of innovative services/facilities.

BOOTH # H05:12

Airbus DS SLC

5G ExPerimentation Infrastructure hosting
Cloud-nativE Netapps for public proTection and disaster RElief

5G-EPICENTRE concept and objectives

European SMEs that seek to conduct rigorous experimentation of their solutions that target the public safety market often face several challenges. The 5G-EPICENTRE project intends to minimise barriers to 5G adoption and market entry for by providing an open, federated, end-to-end experimentation facility for such SMEs.

When concluded, the 5G-EPICENTRE will offer an open, end-to-end 5G experimentation platform that focuses on software solutions for PPDR. The platform will offer developers access to the most recent 5G applications, good practices for first responders, crisis management approaches as well as the ability to create and test their own solutions. The 5G-EPICENTRE platform will be based on an open Service oriented Architecture, adhere to the most recent best DevOps practices, and be able to provide open access to 5G networks' resources, acting as a 5G open-source repository for Public Protection and Disaster Relief (PPDR) Network Applications.

The 5G-EPICENTRE key-objectives are:

01. Build an end-to-end 5G experimentation platform specifically tailored to the needs of the public safety and emergency response market players.
02. Pilot 5G systems in PPDR-based trials, successfully demonstrating 5G-EPICENTRE onboarded apps as a crucial communications accompaniment to public safety mission critical communications technologies.
03. Cultivate a '5G Experiments as a Service' model, which will enable developers and SMEs to experiment with PPDR applications in parameterized, easily repeatable, and shareable environments.
04. Facilitate automation, continuous deployment and multi-access edge computing supported by containerized network functions, so as to reduce service creation time and time-to-market for 5G solutions.
05. Leverage Artificial Intelligence for achieving cognitive experiment coordination and lifecycle management, including dynamic 5G slicing, application awareness and insightful ML-driven analytics.
06. Implement impact-driven dissemination, standardisation, and exploitation.

Experimentation in the context of several first-party experiments (e.g., experiments implemented by consortium partners) is anticipated for the evaluation of the 5G-EPICENTRE platform and will be realized as a PPDR vertical. This pilot studies' target is to broaden over all three of the 3 ITU-defined service types (i.e., eMBB, mMTC and URLLC), while offering the means to monitor the platform's secure interoperability capabilities outside the scope of vendor-specific implementations. In the light of this, 5G-EPICENTRE has engaged SMEs and organizations, that will take part in the implementation of the use cases and are active participants in the public security and disaster management markets, serving as crucial facilitators for the evaluation of 5G-EPICENTRE with regard to the actual needs that should be addressed. Last, but not lease, KPIs related to 5G will be measured through the execution of these first-party experiments, particularly those that relate to the creation time of services.

www.5gepicentre.eu

BOOTH # H05:14

Tektronix

Tektronix are the measurement insight company committed to performance and compelled by possibilities.

Tektronix designs and manufactures test and measurement solutions to break through the walls of complexity and accelerate global innovation. Together we empower engineers to create and realize technological advances with ever greater ease, speed, and accuracy. Tektronix solutions have supported many of humankind's greatest advances of the past 70 years. Health. Communication. Mobility. Space. With offices in 21 countries, we are committed to the scientists, engineers and technicians around the world who will define the future. Tektronix has a history in supporting innovation in communications standards for wired, optical, and wireless being at the forefront of the development of coherent optical measurement techniques, IEEE and OIF optical communication standards, and real time RF signal analysis hardware technologies for digital communications.

Tektronix is committed to supporting the research and development of critical technologies for that will enable B5G and 6G applications. Tektronix has 3 core technologies that are helping enable 6G research:

- ultra-wideband signal generation and acquisition hardware supporting the generation of 28Gbaud signal and up to D-Band frequencies.

- Real time sampling technologies researching 200GS/s on multiple channels simultaneously.

- precision multichannel synchronization architecture allowing for the generation and acquisition of up to 16 channels simultaneously.

- Advanced DSP and measurement algorithms/software

This technology allows for precision measurement of IQ modulated signaling at IF and CF frequencies. It also allows users to test and evaluate the signal integrity of different signal attributes including (but not limited to) modulation rates and schemes, IQ impairments, channel losses and equalization, and jitter/phase noise/EVM/BER performance.

BOOTH # H05:16

UBITECH

UBITECH (www.ubitech.eu) is a leading, highly innovative software house, systems integrator and technology provider, established to provide leading edge intelligent technical solutions and consulting services to businesses, organizations and government to allow the efficient and effective secure access and communication with various heterogeneous information resources and services, anytime and anywhere. UBITECH enables real-time valid information processing and decision-making, the realization of intelligent business environments, and B2B and B2C transactions by providing high added-value business –oriented and –based solutions. UBITECH LIMITED is the youngest member of UBITECH Group that has been established in 2005, concentrated initially in the Balkan market and acquiring several EC and national grants for novel R&D initiatives. Currently, UBITECH Group has extended its operations with targeted international activities through its subsidiaries, representation offices, business partners and affiliated companies in Limassol (UBITECH LIMITED), Madrid (Business Development Office), Buenos Aires (UBITECH SRL targeting mainly Argentina, Paraguay, Uruguay and Bolivia) and Guayaquil (Business Partner and Representation Office for Ecuador and Panama), concentrating mainly in the Spanish-speaking countries of Central and Latin America.

Technology innovation constitutes the lifeblood of UBITECH. We are continuously seeking and validating new, emerging technologies, developing new ideas, concepts, and solutions, and improving existing software applications and products for vertical markets or for addressing specific end-user's needs. UBITECH R&D team – that spans across all group's companies, collaborating and exchanging experiences and technological know-how, reinforcing the group's research capacity – is engaged in developing, integrating, deploying, piloting, demonstrating, and evaluating innovative technologies, utilities, features and processes, transferring technological know-how to end-user organizations and adapting breakthrough solutions to end-user's demands. UBITECH R&D team participates in large, multidisciplinary consortiums in complex and highly innovative projects, including experts from universities, research institutes and industry across the enlarged Europe, which partner to provide research, technology integration and skilled project management. UBITECH R&D team members can demonstrate strong involvement in EC and National co-funded research programmes, through the design, development and implementation of research and technological development instruments.

Based on group's strategy for research and innovation, every group member participates actively into the research and development of cutting-edge tools and methodologies to improve the solutions and services of the group. Thus,

UBITECH LIMITED (Cyprus) researchers, depending on their expertise and the local exploitation potential, perform applied research in the areas of Cloud Computing, Software and Services; 5G Technologies; Digital Security, Big Data and Analytics; Cyber-Physical Systems and Internet of Things; Energy Efficiency; Factories of the Future; e/m-Health. UBITECH has a strong a focus on the integration and interoperability of information technology solutions and applies its research results to solve problems in various application-oriented projects in several domains (included but not limited to Life Sciences and e-Health, Ambient Assisted and Independent Living, e-Government and Policy Modelling, Lifelong Education and Technology-enhanced Learning, e-Culture, e-Business and Networked Enterprise, Digital Factories, Security and Environmental Management).

BOOTH # H05:18

University of Bedfordshire

About the University of Bedfordshire

We are a vibrant, ambitious academic community celebrating diversity and the transformative power of education. We are the University of Bedfordshire.

BOOTH # H05:20

ICT-53 projects: 5GRAIL, 5G-ROUTES, and 5GMED

This is a consortium of three 5GPPP projects addressing the challenges of sustainable deployments of 5G technologies critical to support the future Connected Automated Mobility (CAM) services along European transport corridors.

5GRAIL: The Future Railway Mobile Communication System (FRMCS) will be the 5G worldwide standard for railway operational communications, conforming to European regulation as well as responding to the needs and obligations of rail organisations outside of Europe. The work on functional & technical requirements, specification & standardisation in 3GPP as well as regarding harmonised spectrum solutions is currently led by UIC, in cooperation with the whole railway sector. A major challenge is the update by European Railway Agency of the Technical Specifications for Interoperability of Control Command and Signalling (CCS TSI) by the end of 2022 with a full description of FRMCS with respect to interoperability functions. Therefore, the 5GRAIL project aims to verify the first set of FRMCS specifications and standards (FRMCS V1) by developing and testing prototypes of the FRMCS ecosystem.
Visit https://5grail.eu/

5G-ROUTES is a 5G-PPP Phase 3 project whose aim is to validate through robust evidence the latest 5G features and 3GPP specifications (R.16 & R.17) of Connected and Automated Mobility (CAM) under realistic conditions in digitised motorways, railways and shipways throughout Europe. In particular, it will conduct advanced large-scale field trials of most representative CAM applications to demonstrate seamless functionality across a prominent 5G cross-border corridor (Via Baltica-North), traversing Latvia, Estonia and Finland.
Visit https://www.5g-routes.eu/

5GMED will demonstrate advanced Cooperative Connected, and Automated Mobility (CCAM) and Future Railway Mobile Communications System services (FRMCS) along the "Figueres Perpignan" cross-border corridor between Spain and France, enabled by a multi-stakeholder compute and network infrastructure deployed by MNOs, neutral hosts, and road and rail operators, based on 5G and offering support for AI functions.
Visit https://5gmed.eu/

BOOTH # H05:21

TERAWAY

is a 5G-PPP, Research and Innovation Action project funded by the European Commission through the Horizon 2020 programme, launched on November 1st, 2019. Aligned with 5G/B5G vision for a fully mobile and connected society, TERAWAY comes as a technology-intensive project aiming at developing a new generation of THz transceivers able to overcome current limitations in Terahertz wireless communication and challenge the commercial uptake and industrialization of THz technology. The core objective of the project is the development of a photonic-enabled technology base that combines the generation, emission and detection of wireless signals with selectable symbol rate and bandwidth within an ultra-wide range of carrier frequencies covering the W-, D- and THz bands. By leveraging optical concepts and photonic integration techniques, TERAWAY is in the process of developing ground-breaking multi-channel transceivers, operating at the frequency range from 92 up to 322 GHz, with multi-beam optical beamforming capabilities. In parallel, a new software defined networking (SDN) controller and radio-based network slicing tools are under development for the management of the network together with the appropriate SDN mediators and algorithms for the incorporation of the THz transceivers into the network.

All in all, upon its completion, TERAWAY project aims to provide a common pool of potential radio resources that can ensure high-throughput network connectivity in a flexible manner.

BOOTH # H05:22

ICCS/NTUA

The Institute of Communication and Computer Systems (ICCS) of the School of Electrical and Computer Engineering (ECE) of the National Technical University of Athens (NTUA) was founded in 1992. It was founded in order to support the performance of top-quality research, development activities and the provision of scientific service to private and public bodies. Essentially the mission of ICCS was to support the deployment, the realization, and the growth of the research priorities of ECE mainly through seeking, pursuing, and acquiring research funding via the competitive calls for research proposals that the European Commission had instigated. In turn its purpose has been to build a research personnel base alongside ECE's faculty so as to conduct state-of-the-art research and at the same time improve the research laboratory equipment base and infrastructures of the school.

ICCS has adopted a gender equality plan for addressing gender equality, to identify gender related activities and monitoring plans. Equality of opportunity is core to ICCS mission and gender balance is a critical component for the Institute to ensure fair access and equity for our research, managerial and support staff. ICCS following international, community and internal standards, commits to the promotion of equality of opportunities between women and men in its principles and priorities.

Furthermore, ICCS has been organized so as to host and to provide research stipends to postgraduate students and post-doctoral researchers. Since its foundation and up to date, ICCS has been growing and maturing within the complex context of the Greek law governing research, innovation, and higher education affairs in a country where research resources and funding has been maintained at low levels, in comparison to the majority of the developed European countries.

BOOTH # H06:11

WINGS ICT Solutions S.A.

TRIALSNET: Trials Supported By Smart Networks Beyond 5G

TrialsNet, a 6G SNS STREAM D project co-funded by the European Union under the grand agreement number 101095871, is a pioneering initiative focusing on Large Scale Trials and Pilots (LST&Ps) with Verticals. The TrialsNet vision is to enable the realization of compelling societal values and to improve the "liveability" of the urban environment through the implementation of a heterogenous and comprehensive set of innovative 6G applications based on various technologies such as cobots, metaverse, massive twinning, Internet of Senses, and covering three relevant domains of the urban ecosystems in Europe identified by i) Infrastructure, Transportation, Security & Safety, ii) eHealth & Emergency, and iii) Culture, Tourism & Entertainment.

TrialsNet will deploy full large-scale trials with verticals by means of 13 representative use cases developed over wide coverage areas with the involvement of extended sets of real users in 4 geographical clusters, in Italy, Spain, Greece and Romania. To achieve this, TrialsNet will design and deploy platforms and network solutions with advanced functionalities based on dynamic slicing management, E2E orchestration, NFV, MEC and AI/ML methods to be trialled on 3GPP and O-RAN network architectures. Through its activities, TrialsNet will pursue the objective to i) understand where current networks are not sufficient to assure the performance needed by the use cases, and to ii) derive the new requirements for next generation mobile networks.

At EuCNC 23, visitors to the TrialsNet booth will present 6G-oriented applications in the three aforementioned domains. Alongside general information about the project, the demonstrations will introduce the benefits provided by the applications that will developed by TrialsNet, the required network features and envisaged 6G enablers for the implementation towards large scale-trials involving a consistent number of users. In particular, the limitations of the current technology will be highlighted in terms of network performances and functionalities, illustrating how TrialsNet activities will address such issues and propose its innovative solutions to them.. More in detail, the demonstrations will be on:

Smart traffic monitoring and infrastructure management platforms (both with video and demo setup), with a particular focus on the advanced functionalities that will be provided by TrialsNet's solutions.

Remote eHealth monitoring system based on massive twining and XR, leveraging on a currently available digital health and wellness platform (STARLIT); explanation on how the legacy platforms work and description of the innovative elements that will be introduced by TrialsNet to enhance them will be presented.

Immersive fan engagement in which visitors of the booth will be provided with tablets and/or headsets to watch a sport event in an immersive manner through AR and VR technologies, which will be enhanced through B5G network enablers for being offered at larger scale.

BOOTH # H06:12

IMDEA Networks Institute

The success of Beyond 5G (B5G) systems will largely depend on the quality of the Network Intelligence (NI) that will fully automate network management. Artificial Intelligence (AI) models are commonly regarded as the cornerstone for NI design; indeed, AI models have proven extremely successful at solving hard problems that require inferring complex relationships from entangled and massive (e.g., traffic) data. However, AI is not the best solution for every NI task; and, when it is, the dominating trend of plugging 'vanilla' AI into network controllers and orchestrators is not a sensible choice.

Departing from the current hype around AI, DAEMON will set forth a pragmatic approach to NI design. The project will carry out a systematic analysis of which NI tasks are appropriately solved with AI models, providing a solid set of guidelines for the use of machine learning in network functions. For those problems where AI is a suitable tool, DAEMON will design tailored AI models that respond to the specific needs of network functions, taking advantage of the most recent advances in machine learning. Building on these models, DAEMON will design an end-to-end NI-native architecture for B5G that fully coordinates NI-assisted functionalities.

The advances to NI devised by DAEMON will be applied in practical network settings to: (i) deliver extremely high performance while making an efficient use of the underlying radio and computational resources; (ii) reduce the energy footprint of mobile networks; and (iii) provide extremely high reliability beyond that of 5G systems. To achieve this, DAEMON will design practical algorithms for eight concrete NI-assisted functionalities, carefully selected to achieve the objectives above. The performance of the DAEMON algorithms will be evaluated in real-world conditions via four experimental sites, and at scale with data-driven approaches based on two nationwide traffic measurement datasets, against nine ambitious yet feasible KPI targets.

BOOTH # H06:13

Experimentation with distributed Post-5G architectures within SLICES-RI

SLICES is defined and planned as a distributed research infrastructure (RI), with 15 national nodes and centralised governance and a central hub. SLICES is a flexible platform designed to support large-scale, experimental research focused on networking protocols, radio technologies, services, data collection, parallel and distributed computing and in particular cloud and edge-based computing architectures and services. SLICES-RI entered the ESFRI Roadmap in 2021.

The design phase of SLICES ended in 2022, and the preparation phase started in September 2022 and will run up to December 2025. The underpinning of SLICES is based on the scientific excellence of our community and presents the articulation of the required technologies, services and the foreseen components including the reference architecture that will rule them all. The identified technologies are evolving around the latest trends in research in digital infrastructures, as well as the services that can be offered over the top. The starting point of SLICES has been identified as a mixture of the most mature research infrastructures in Digital Infrastructures covering different resources, including advanced programmable radios, mature off-the-shelf radios, configurable wired/optical multi-Gbps transnational links, and a wide range of IoT devices backed by special purpose processors and vast computing resources.

Objectives of the exhibition: The key objective of the exhibition is to demonstrate the latest achievements of the SLICES consortium in providing a first version of the SLICES infrastructure available to external researchers. The exhibition will assist towards raising awareness and extending the SLICES community, by targeted dissemination to all relevant researchers and industrial stakeholders who can take advantage of SLICES. The exhibition will feature besides the demonstration, a separate section on informing on tools available under the SLICES ecosystem, including the portal for accessing resources, Transnational and Virtual Access activities, services offered for enabling access, scheme on funded researcher mobility (long and short mobilities), as well as the integration of the data dimension, with datasets that can be exposed through the European Open Science Cloud (EOSC). Details will be offered on how the SLICES consortium is organized, and the process on including new potential nodes during the implementation phase of SLICES.

BOOTH # H06:14

Hellenic Telecommunications Organization S.A.

MARSAL: Machine Learning-Based, Networking and Computing Infrastructure Resource Management of 5G and Beyond Intelligent Networks

5G mobile networks will be soon available to handle all types of applications and to provide service to massive numbers of users. In this complex and dynamic network ecosystem, an end-to-end performance analysis and optimization will be the key features, in order to effectively manage the diverse requirements imposed by multiple vertical industries over the same shared infrastructure. To enable such a vision, the MARSAL project targets the development and evaluation of a complete framework for the management and orchestration of network resources in 5G and beyond, by utilizing a converged optical-wireless network infrastructure in the access and fronthaul/midhaul segments.
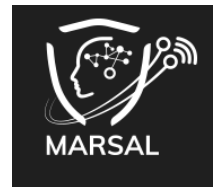
At the network design domain, MARSAL targets the development of novel cell-free based solutions that allow significant scaling up of the wireless Access Points in a cost-effective manner, by exploiting the application of the distributed cell-free concept and of the serial fronthaul approach, while contributing innovative functionalities to the O-RAN project. In parallel, in the fronthaul/midhaul segments MARSAL aims to radically increase the flexibility of optical access architectures for beyond-5G Cell Site connectivity via different levels of fixed-mobile convergence.

At the network and service management domain, the design philosophy of MARSAL is to provide a comprehensive framework for the management of the entire set of communication and computational network resources by exploiting novel Machine Learning (ML) based algorithms of both edge and midhaul Data Centres by incorporating the Virtual Elastic Data Centres/Infrastructures paradigm.

Finally, at the network security domain, MARSAL aims to introduce mechanisms that provide privacy and security to application workload and data, targeting to allow applications and users to maintain control over their data when relying on the deployed shared infrastructures, while Artificial Intelligence and Blockchain technologies will be developed in order to guarantee a secured multi-tenant slicing environment.

NANCY - An Artificial Intelligent Aided Unified Network for Secure Beyond 5G Long Term Evolution (Grant Agreement No.101096456) (Duration: January 01, 2023 – December 31, 2025)

Aim: To introduce a secure and intelligent architecture for the beyond the fifth generation (B5G) wireless network. The overall aim of NANCY is to introduce a secure and intelligent architecture for the beyond the fifth generation (B5G) wireless network. Leveraging AI and blockchain, NANCY enables secure and intelligent resource management, flexible networking, and orchestration. In this direction, novel architectures, namely point-to-point (P2P) connectivity for device-to-device connectivity, mesh networking, and relay-based communications, as well as protocols for medium access, mobility management, and resource allocation will be designed. These architectures and protocols will make the most by jointly optimizing the midhaul, and fronthaul. This is expected to enable truly distributed intelligence and transform the network to a low-power computer. Likewise, by following a holistic optimization approach and leveraging the

developments in blockchain, NANCY aims at supporting E2E personalized, multitenant and perpetual protection. Finally, in order to accommodate the particularities of the new RAN that are generated due to the use of novel building blocks, such as blockchain, multi-access edge computing, and AI, a new experimentally-verified information-theoretic framework will be designed and presented.

For more information: https://nancy-project.eu/

BOOTH # H06:16

ETRI

Established in 1976, ETRI is a non-profit government-funded research institute and has played a leading role in advancing ICT research and development in Korea. As of the end of 2022, ETRI had about 2,270 employees of which about 1,980 are researchers, and 480 million USD for the average R&D budget over the past five years. ETRI aims to contribute to the nation's economic and social development through research, development, and distribution of industrial core technologies in AI, Telecommunications & Media, Convergence technologies, and ICT Materials & Components.

 Standing at the new era of cutting edge, ETRI is challenged to secure original technologies and parts and material technologies in advance for ICT and convergence strategic technologies which is expected to be a new growth engine in the near future. 5G+/6G, AI·SW, AI semiconductor and system semiconductor, meta verse, cyber-security, supercomputer and quantum computer, and material/device technology will be a priority for us as we recognized the importance of securing original technologies.

Building a global network through various partnerships, ETRI shares its technological innovation throughout the world, helping humanity realize its dreams.

BOOTH # H06:19

eBOS Technologies Ltd.

BOOTH # H06:20

CERTH/ITI

The Centre for Research and Technology-Hellas (CERTH) is the only research centre in Northern Greece and one of the largest in the country founded in 2000 (www.certh.gr). Its mission is to promote the triplet Research – Development – Innovation by conducting high quality research and developing innovative products and services while building strong partnerships with industry and strategic collaborations with academia and other research and technology organisations in Greece and abroad. CERTH is essentially a self-supported Research Centre generating an average annual turnover of ~ € 50 Million coming from: 77% from competitive research projects, 13% from bilateral industrial research contracts and 10% as government institutional funding. More than 1150 people work at CERTH with the majority being scientists. CERTH has received numerous awards and distinctions such as the European Descartes Prize, the European Research Council (ERC) Advanced Grant, Microsoft International Contest Prize, the Trading Agents Competition Award and many more and is listed among the Top-25 of the EU's Organisations with the highest participation in H2020 competitive research grants. CERTH has participated successfully in more than 1.200 competitive research projects (with a total budget exceeding 450 M€ and involving more than 4.894 international partner organizations) financed by the European Union (EU), leading industries from USA, Japan and Europe and the Greek Government via the GSRI.

The Information Technologies Institute (ITI) was founded in 1998 as a non-profit organisation under the auspices of the General Secretariat for Research and Technology of the Greek Ministry of Development, with its head office located in Thessaloniki, Greece (www.iti.gr). CERTH/ITI is one of the leading Institutions of Greece in the fields of Informatics, Telematics and Telecommunications, with long experience in numerous European and national R&D projects. It is active in a large number of application sectors (telecommunications (5G/6G, V2X, RIS), anti-drone, (cyber)security, transport, energy, buildings and construction, health, manufacturing, robotics, smart cities, space, agri-food, marine and blue growth, water, etc.) and technology areas such as data and visual analytics, data mining, machine and deep learning, virtual and augmented reality, image processing, computer and cognitive vision, human computer interaction, IoT and communication technologies, navigation technologies, cloud and computing technologies, distributed ledger

technologies (blockchain), (semantic) interoperability, system integration, mobile and web applications, hardware design and development, smart grid technologies/solutions and social media analysis. In the last 3 years (2020 - 2022), CERTH/ITI has participated in more than 428 research projects and R&D contracts with the Private Sector (Industry). More specifically, it has been involved in 239 EU funded H2020 research projects (EU funding: 63.15 M€) and in 189 projects (88 National; 7 Interreg and 94 R&D contracts) funded by Greek National Research Programmes and Consulting Subcontracts with the industry (National projects funding: 8.63 M€; R&D contracts: 4.14 M€). For the last 10 years, the publication record of ITI includes more than 330 scientific publications in international journals, 780 publications in conferences and 100 books and book chapters. These works have been cited in more than 7.500 times.

The Visual analytics lab (VALab) was established in 2015 (https://valab.iti.gr/). Its main purpose is to conduct basic and applied research in topics related to: Cybersecurity solutions such as Cryptographic systems, penetration testing, Intrusion Detection solutions, Cloud Security, Computer Forensics, IoT Security, Cloud Security, Software Security, 5G/6G Security, AI security, Automotive Security. Deployment of machine learning and artificial intelligence methods, pattern identification through deep neural networks, multimodal optimization, in various domains such as healthcare, energy, cybersecurity, Internet of Things (IoT), transport, telecommunications (5G/6G). Self-training algorithms for predictive analytics and Blockchain. Human machine interaction interfaces. Adaptive intelligent systems. Voice-based Interaction Technologies, Personal Health Systems and Personalized Care Delivery. VALab has deployed a 5G-Testbed Infrastructure as an end-to-end 5G/MEC testbed and is actively maintained at CERTH premises. The scope of the testbed is to promote the growth of 5G/SDN/NFV/Cloud-Edge-Fog computing as key technologies of network softwarization by allowing the experimentation of indoor, data center and small-scale office scenarios. The testbed offers a 5G Core Network, a multi-access edge computing (MEC) cloud and fully virtualized 5G RAN, deployed along 8 nodes (2 VNF management/orchestration nodes, 3 computing nodes, 3 MEC nodes). For VNF orchestration and management OSM is utilized with an Openstack and Kubernetes deployment as virtualized infrastructure managers (VIM). For the 5G components, whitebox servers are used to implement all the CN and 5G RAN functionalities (5G gNBs deployed on Gigabyte BRIX connected to USRP B210s SDRs) utilizing the Open Air Interface (OAI) 5G software stack.

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Qamcom is a leading Swedish research and technology company with deep competence within hardware, software and system development. Qamcom offers value-driven technology solutions, products and services in the fields of advanced Signal Processing, Industrial AI and IoT, Wireless Communication and System Engineering. Qamcom's mission is quite simply to turn technology into value for society, industry and people. Based on insights and the needs of end users, Qamcom bridge the gap between technology and application to enable high ambitions for most industries and context.

Qamcom is also a research partner for the EU funded 6G project Hexa-X and Hexa-X-II. Qamcom's part in this next generation wireless connectivity projects concerns the implementation aspects of joint communication and sensing technology. As a first step Qamcom has developed a platform to demonstrate the possibilities of running both wireless communication and radar, using the same hardware. This is an important concept in 6G and a technique we intend to develop further within Hexa-X-II. Find out more are qamcom.com

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VDI manufactures state-of-the-art test and measurement equipment for mm-wave and THz applications. These products include Vector Network Analyzer, Spectrum Analyzer and Signal Generator Extension Modules that extend the capability of high-performance microwave measurement tools to higher frequencies. VDI's component products include detectors, mixers, frequency multipliers and custom systems for reliable operation at frequencies between 50 GHz and 2 THz. All VDI components include in-house fabricated GaAs Schottky diodes and microelectronic filter structures.

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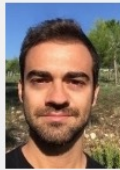
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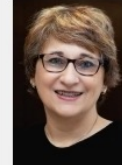
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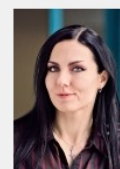Univ. Chalmers, SE
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