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IEEE 5G Summit Dresden

PRESENTED BY

5G Lab GERMANY

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INTERNATIONAL CONGRESS CENTER DRESDEN, GERMANY

IEEE ComSoc IEEE Communications Society

IEEE 5G SUMMIT

TECHNISCHE UNIVERSITÄT DRESDEN

5G Lab GmbH **Contact**

Dr. Rico Radeke

T +49 351 463 39245
F +49 351 463 37163
E contact@5glab.de
H www.5glab.de

IEEE 5G Dresden Summit

Content

5G Lab Germany **Partners**

Industry Partners are welcome to join our initiative. 5G Lab Germany is offering a platform for companies to explore the impact of 5G on their business and gain experience of 5G technologies through our unique interdisciplinary approach, access to the latest research results and close contacts to world-class experts.

The 5G Lab Germany is already supported by highly innovative companies:

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IEEE **5G Summit Dresden**

The 5G Lab Germany at TU Dresden and IEEE are happy to welcome you to the 3rd IEEE 5G Summit Dresden on September 25, 2018 at the International Congress Center in Dresden, Germany. We are proud to be the 38th IEEE 5G Summit of a series held worldwide. The summit will address a holistic approach on 5G system design, ranging from hardware, wireless, network & edge cloud, towards Tactile Internet applications. We will exchange visions and ideas on future 5G technology developments in order to make 5G a great success.

As a leader in defining the roadmap of 5G, 5G Lab Germany will once more - in cooperation with several industry partners and academic institutions - bring forward a festival of ideas and display a wide variety of technical demonstrators on more than 1700 sqm, showing how real some 5G technology already is today. The summit builds on the 20 year history of the Industry Partner Program Event and the two previous IEEE 5G Summits in Dresden.

Lastly, we are excited to announce that we will host the 2nd IEEE 5G World Forum from September 30 – October 2, 2019, including the 4th IEEE 5G Summit Dresden 2019 on October 1. We are happy to have you here and look forward to seeing you again next year!

Yours faithfully,

Gerhard Fettweis
5G Lab Germany
Coordinator

Frank Fitzek
5G Lab Germany
Coordinator

Welcome Address

Dear Participants of the IEEE 5G Summit Dresden,

we are witnessing a fascinating change. The digitalisation of industry and society is changing our work processes, our everyday lives and ourselves. I find it understandable that especially less technology-inclined citizens have their concerns, but I am convinced that these changes involve great opportunities. We need only think of telemedicine, which will ensure better health care for many citizens even if there is no doctor located nearby. Or new mobility services, such as rideshare services, interconnected transport or automated driving. Or companies that can organise their orders, production, storage and deliveries in a much more efficient manner.

Many processes will become unnecessary, everything can take place faster and we will save time, energy, resources and, of course, costs. Digitalisation makes it possible. And so does 5G!

This standard will give mobile communications an entirely new, industrial policy dimension. It is a prerequisite for intelligent, future-proof mobility services, smart cities, Industry 4.0 and various innovations that will make everyday life easier.

Thus, the Federal Government is fully committed to introducing 5G in Germany as quickly as possible. Currently, we are focusing on the forthcoming award process for spectrum in the 2 GHz and 3.6 GHz bands. By awarding rights of use until 2040, we will set the course far into the future. The Federal Network Agency is responsible for the preparation of the spectrum auction, which will most likely take place at the beginning of 2019. We will champion demanding conditions to ensure a supply that is consistent with demand. In short: The award process leads to expectations, but also to challenges.

It is only when the households are provided with universal coverage that all citizens and all entrepreneurs can benefit from well-developed mobile communications networks,

no matter whether they live in rural or urban areas. With an eye to equal living standards, I consider this indispensable.

However, we are not only focusing on better coverage for households, but increasingly also on upgrading work along transport infrastructure, even beyond motorways and ICE lines. Because many innovations can only be applied if the transport infrastructure is covered with area-wide mobile communications networks that are consistent with demand and that can virtually transmit data in real time. Only then can, for instance, cars warn each other of a dangerous end of a tailback behind the next bend or of an object on the road.

5G enables communication in the blink of an eye. Vehicles, machines and robots will be able to react much faster than a human being ever could. This is progress in the best sense of the word!

It is our goal to make Germany a lead market for 5G applications. In the Coalition Agreement, we agreed that we want to continue and intensify research and trials with 5G. And you, dear participants of this summit, contribute to it, with your work, your ideas, your enjoyment of experiments, your innovations, your expertise and your curiosity.

And this is what I would like to thank you for! I hope you have an exciting time and many inspiring moments at the IEEE 5G Summit Dresden!

Andreas Scheuer
Member of the German Bundestag

Federal Minister of Transport and Digital Infrastructure

5G Summit **Morning Agenda**

08:00 **REGISTRATION AND WELCOME COFFEE**

08:45 **WELCOME ADDRESS**
Prof. Hans Müller-Steinhagen
Rector // TU Dresden

08:50 **PLENARY KEYNOTE** // 5G Lab Germany Vision
Prof. Frank Fitzek
Prof. Gerhard Fettweis
Coordinators 5G Lab Germany // TU Dresden

09:30 **PLENARY KEYNOTE** // The TAO to make 5G move
Volker Ziegler
Head of 5G Leadership // Nokia

09:50 **PLENARY KEYNOTE** // First 5G Services – Turning Vision into Commercial Reality
Alexander Lautz
Senior Vice President 5G // Deutsche Telekom

10:10 **PLENARY KEYNOTE** // Demystifying 5G - Test & Measurement Challenges
Christian Leicher
Group President and CEO // Rohde & Schwarz

10:30 **PLENARY KEYNOTE** // Chances and Challenges for Service and Support with 5G
Kerstin Grosse
Chairwoman of Supervisory Board // KOMSA

10:50 **COFFEE BREAK & EXHIBITION**

11:30 **PARALLEL TRACKS** // Morning Sessions

13:00 **LUNCH** & **EXHIBITION**

5G Summit **Afternoon Agenda**

14:30 **PARALLEL TRACKS** // Afternoon Sessions

16:20 **COFFEE BREAK** & **EXHIBITION**

17:30 **PLENARY KEYNOTE** // RF Opportunities and Challenges in the Connected World
Anton Kathrein
CEO // Kathrein

17:50 **PLENARY KEYNOTE** // 5G is Open for Business – Success Factors to Build Ecosystems Together
Jan-Peter Meyer-Kahlen
Head of ICT Development Center // Ericsson

18:05 **PLENARY KEYNOTE** // 5G - Shaping the Future
Manuel Cubero
CCO // Vodafone Germany

18:20 **PANEL DISCUSSION**
Michael Hohmuth
CEO // Kernkonzept

Jorge Pereira
Principal Scientific Officer // European Commission

Jan-Peter Meyer-Kahlen
Head of ICT Development Center // Ericsson

Manuel Cubero
CCO // Vodafone Germany

19:30 **NETWORKING SESSION INCL. DINNER** // until Midnight

Hardware & **Wireless Track** Agenda

→ ***Hardware*** & ***Wireless Track***
Hall 3

11:30 **KEYNOTE** // Integrated Photonic Devices for 5G Applications
Prof. Kambiz Jamshidi // TU Dresden

11:45 **KEYNOTE** // Industrial Sensing with 5G Enabled Networks
Mario Montana
VP and Corporate GM, Automotive and Industrial Group // IDT

12:05 **KEYNOTE** // Compact Antenna System for 5G and Field Experiments
Naoto Ishii
Senior Researcher // NEC

12:25 **KEYNOTE** // 5G Co-Design in 22FDX
Saquib Bin Halim
Principal Engineer // Globalfoundries

12:45 **KEYNOTE** // Package Reliability for 5G and Automotive
Karsten Meier // TU Dresden

12:55 **KEYNOTE** // Interconnect (packaging) Technologies for Wireless and Optical Communication
Krzysztof Nieweglowski // TU Dresden

13:05 **LUNCH** & **EXHIBITION**

Hardware & **Wireless Track** Agenda

→ ***Hardware*** & ***Wireless Track***
Hall 3

14:30 **KEYNOTE** // 5G – The Door Opener to 6G and Open RAN Challenges?
Prof. Gerhard Fettweis // TU Dresden

14:45 **KEYNOTE** // Working with Facebook to Connect the World
Marc Sommer
Director Business Development & Operator Partnerships | EMEA // Facebook

15:05 **KEYNOTE** // 5G SoCs, all you need is Semiconductor IP?
Joachim Kunkel
GM Solutions Group, Corporate Staff // Synopsys Inc.

15:25 **KEYNOTE** // On the Self-Organization of 5G Networks
Meryem Simsek
Senior Researcher // International Computer Science Institute, Berkeley

15:45 **KEYNOTE** // Resource Sharing in 5G, LTE, and WiFi
Prof. Eduard Jorswieck // TU Dresden

16:00 **KEYNOTE** // RF Semiconductors for 5G RAN and UE
Ludger Verweyen
Head of Product Line RF Communication // Infineon Technologies

Network & **Cloud Track** Agenda

→ *Network & Cloud Track*
Hall 2

11:30 **KEYNOTE** // 5G Communication Networks for Tactile Internet with Humans in the Loop
Prof. Frank Fitzek // TU Dresden

11:45 **KEYNOTE** // Convergence of IT and OT enabled by 5G
Gerald Kleyn
Director Hyperscale Server Hardware R&D // Hewlett Packard Enterprise

12:05 **KEYNOTE** // OPPORTUNITY IS HIDING IN PLAIN 5IGHT
Anders Lindblad
Industry Managing Director for Communications & Media practice Europe // Accenture

12:25 **KEYNOTE** // From Formal Analysis to Synthesis under Cost-Utility Constraints
Sascha Klüppelholz // TU Dresden

12:40 **KEYNOTE** // Multimode 5G/NR Chipset to Address Global Markets – Challenges and Requirements
Robert Würth
Senior Director Product Management 5G // Intel

13:00 **LUNCH** & **EXHIBITION**

Network & **Cloud Track** Agenda

→ *Network & Cloud Track*
Hall 2

14:30 **KEYNOTE** // Secrets Management and Secure Processing
Prof. Christof Fetzer // TU Dresden

14:45 **KEYNOTE** // What does Statistical Machine Learning tell about Ultra-Reliable Wireless Communication
Prof. Petar Popovski // Aalborg University

15:05 **KEYNOTE** // Engineering a Reliable 5G Ecosystem – from Base Stations to Data Centers
Sudhir Sharma
Director, Global High-Tech Industry Strategy // ANSYS

15:25 **KEYNOTE** // 5G Beam Fingerprinting RAN Analytics
Jens Voigt
RF Engineering Manager // Amdocs

15:40 **PANEL DISCUSSION**
Wen Xu
Head of Radio Access Technologies // Huawei

Prof. Petar Popovski // Aalborg University

Wolfram Drescher
CEO // Airrays

Michael Kaiser
CEO // Smart Systems Hub

Tactile Internet Applications Track Agenda

→ *Tactile Internet Applications Track*
Hall 4

11:30 **KEYNOTE** // Fog Computing - a New Technology for Co-Working Robotics
Prof. Uwe Aßmann // TU Dresden

11:45 **KEYNOTE** // Future Mobility -or- How New Entries Shape the Automotive Future with 5G
Heinz Huber
CEO // Telemotive

12:05 **KEYNOTE** // Towards Radar-based Silent Speech Recognition
Prof. Peter Birkholz // TU Dresden

12:20 **PANEL DISCUSSION**
Sascha Berger
CEO // Digades

Wolfgang Pitz
CEO // SpaceTech

Christian Piechnick
CEO // Wandelbots

Matthias Schmitt
Director Product Innovation and Strategic Projects // HERE

13:00 **LUNCH** & **EXHIBITION**

Tactile Internet Applications Track Agenda

→ *Tactile Internet Applications Track*
Hall 4

14:30 **KEYNOTE** // Opportunities of Deep Learning in Wireless Physical Layer
Prof. Marwa Chafii // Cergy-Pontoise University, France

14:45 **KEYNOTE** // Industrial 5G - Challenges and Opportunities of IT/OT Convergence
Dirk Schulz
Principal Scientist // ABB

15:05 **KEYNOTE** // Toward High-Fidelity Remote Touch Experiences
Prof. Eckehard Steinbach // TU München

15:25 **KEYNOTE** // Multi-Model Interaction with an Advanced Robotic System
Simon Haddadin
CEO // Franka Emika

15:45 **KEYNOTE** // Enabling Self Driving Cars and Mobility as a Service towards an Autonomous World - Challenges and Requirements on Mobile Communication
Matthias Schmitt
Director Product Innovation and Strategic Projects // HERE

16:05 **KEYNOTE** // TA Cloud Based - QoS Concept for Low Data Rate Sensor Networks
Matthias Stege
CEO // Exelonix

5G **Mission**

Understand and Drive the Holistic Requirements and Solutions of 5G

Deliver Technology Breakthrough

Be Opinion Leader in Forming 5G

Deliver Lab Examples and Test Beds

Business Innovation Through Technology Transfer and Cooperation

Simple One-stop Shop for Complex 5G Research Topics

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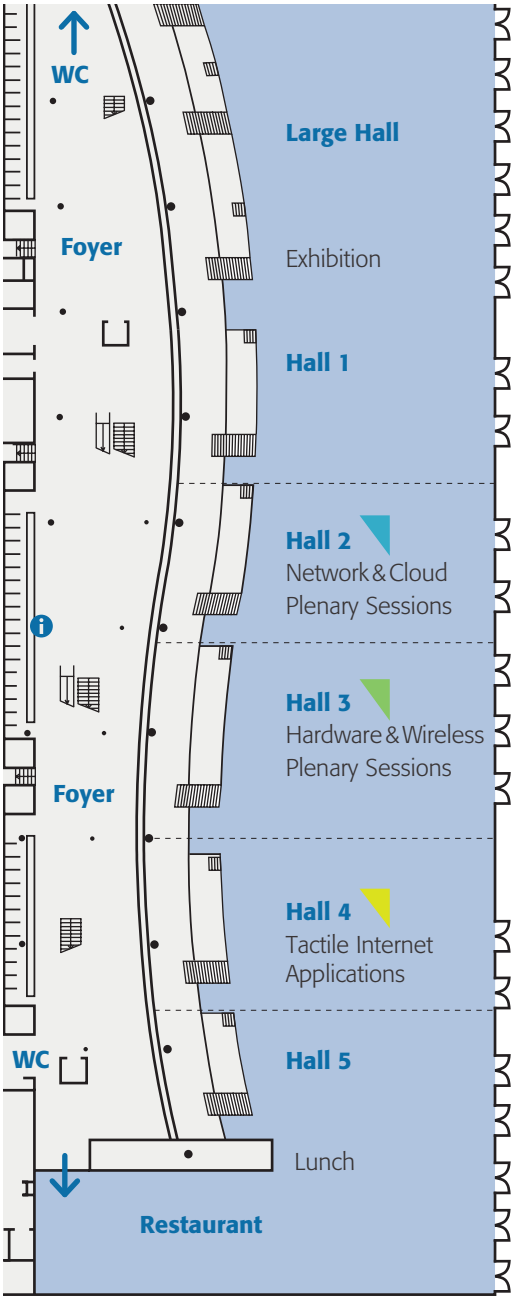
5G Summit **Venue Map**



International Congress Center Dresden // Hall Level

5G Summit **Venue Map**

Welcome Coffee ..... Foyer

Plenary Sessions ..... Hall 2 & Hall 3

Exhibition ..... Large Hall & Hall 1

Network&Cloud Track ..... Hall 2

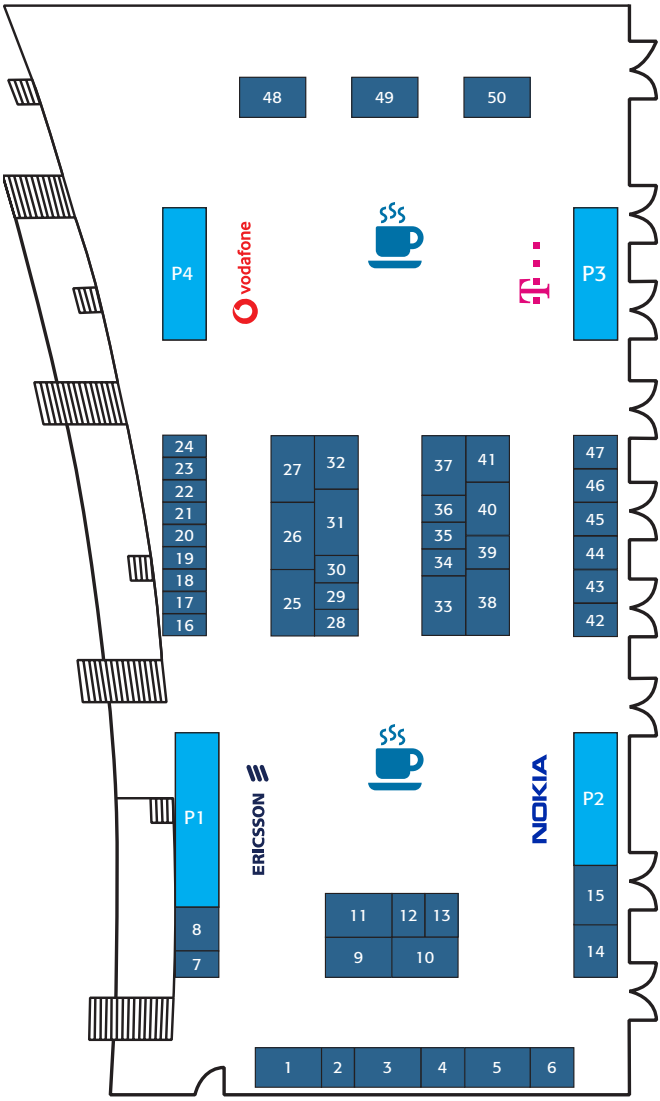
Hardware&Wireless Track ..... Hall 3

Tactile Internet Applications Track ..... Hall 4

Lunch ..... Restaurant & Hall 5

Networking Session incl. Dinner ..... Terrace Level

5G Summit **Exhibition Map**



Platinum Patrons **Companies & 5G Lab Germany**

5G Summit **Exhibition Map**

P1 **Ericsson**

// 5G is open for Business – Let's shape 5G ecosystems together

// 5G for Industries – Industrial low latency with Distributed Cloud Edge

// 5G for Consumers – Data-efficient Virtual Reality

// 5G-ConnectedMobility – Cross-industry 5G Research and Business development project in Germany

P2 **Nokia**

// E2E Network Slicing and EDGE technologies for the 5G era

// E2E Network Slicing for 5G Smart Seaport

// Marketplace for sensor data and sensor box

P3 **Deutsche Telekom**

// Connected Power Grids: the future of electrical distribution

// Agile Mobile Edge Cloud for Connected Cars

// Mobile Edge Cloud for Tactile Internet in a 5G Gaming Application

P4 **Vodafone**

// 5G Industry Robotics

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1 **Rohde & Schwarz** // Coverage improvements from 4G to 5G – Identifying beamforming performance in the field

2 **TU Dresden** // **Deutsche Telekom Chair of Communication Networks (ComNets)** // Random Linear Network Coding in Multiprocessor System-on-Chip (MPSoC)

3 **National Instruments** // 5G New Radio Test and Measurement Real-Time Wi-Fi MAC/PHY Testbed Rapid iteration and validation of DSP algorithms

4 **TU Dresden** // **Vodafone Chair Mobile Communications Systems (MCS)** // Tomahawk: A Heterogeneous MPSoC for 5G Data Processing Applications

5 **IDT** // Industrial Sensing with 5G Enabled Networks

6 **TU Dresden** // **Institute of Electronic Packaging Technology** // 3D additive packaging technologies for 5G

7 **Intap** // The International Talents Project for Dresden

8 **TU Dresden // Deutsche Telekom Chair ComNets** // 5G enabled Smart Sorting Machine for Industry 4.0

9 **TU Dresden // Vodafone Chair MCS**// 5G-Range – A 5G PHY for Remote Area Applications

10 **TU Dresden // Chair of Software Technology** // Software-based Integration of Sensors for Personal Wireless Lighting

11 **Airrays** // Airray 4864

5G Summit **Exhibition Map**

12 **TU Dresden // Deutsche Telekom Chair ComNets** // Massive data dissemination in small cells with NCC Networks

13 **TU Dresden // Vodafone Chair MCS**// Resource Allocation for URLLC in Unlicensed Frequencies

14 **Barkhausen Institut**

15 **Connect**

TU Dresden // CRC 912 - Highly Adaptive Energy-efficient Computing (HAEC):

16 BRISE: Energy-efficient Benchmark Reduction, General Robots

17 HAEC Situation Recognition Simulator

18 PMC at Design Time for the HAEC Box

19 PMC for Runtime for the HAEC Box

20 Energy-Utility Function-Based Resource Control for In-Memory Database Systems

21 A Compiler-Runtime hybrid approach for adaptive energy-efficient execution of multiple applications

22 Energy-Adaptive Graph Data Management

23 HAEC Box: Highly Adaptive Energy-efficient Computing

24 High-speed optical and wireless links for computer communication

25 **TU Dresden // Deutsche Telekom Chair ComNets** // MESHMERIZE: Next Generation Wireless Mesh

26 **Exelonix //** 5 Live NB-IoT Cloud Demonstrations

27 **TU Dresden // Chair of Data Security** // Sandnet - Next-Gen Deception Networks

28 **TU Dresden // Chair of Systems Engineering** // SCONE-PySpark: Secure and Privacy-preserving Data Analytics

29 **TU Dresden // Deutsche Telekom Chair ComNets** // An Open-Stack based Framework for Multi-access Edge Computing

30 **TU Dresden // Chair of Communications Theory** // Introducing Multi-Operator Services to the German Market

31 **Fast Zwanzig20 //** fast - Project Overview

32 **TU Dresden // Chair of Privacy and Data Security** // Efficient, Intuitive and Secure Network Overlays for Future Smart Systems

33 **TU Dresden // Chair of Operating Systems** // The L4Re Secure Real-Time Hypervisor for 5G, the Edge and Beyond

34 **TU Dresden // Deutsche Telekom Chair ComNets** // 5Gang "5G Applied in Industry" Distributed Sensing and Control

5G Summit **Exhibition Map**

35 **TU Dresden // Deutsche Telekom Chair ComNets** // Resilience in Edge Cloud for Industrial Applications

36 **TU Dresden // Deutsche Telekom Chair ComNets** // The Classical Inverted Pendulum Goes Networking

37 **TU Dresden // Deutsche Telekom Chair ComNets** // Virtualizing Control Algorithms of Industrial Robots

38 **Wirtschaftsförderung Sachsen// SAXONY!** // 5G Business Application potential in virtual and augmented reality

39 **TU Dresden // Deutsche Telekom Chair ComNets** // Remote Control Loop with Computer Vision on Edge Cloud

40 **Steinwurf // TU Dresden // Deutsche Telekom Chair ComNets** // Enabling interactive and delay intolerant services over lossy links with next generation coding

41 **Cadami //** Coded caching - the most efficient media distribution software

42 **TU Dresden // Deutsche Telekom Chair ComNets //** E2E Network Slicing and MEC technology for multi-service coexistence

43 **TU Dresden // Deutsche Telekom Chair ComNets** // 5G NetMobil Platooning

44 **TU Dresden // Deutsche Telekom Chair ComNets** // Remote Controlled Car

45 **Frauenhofer IVI // TU Dresden // Vodafone Chair MCS** // V2X Communication for Cooperative Autonomous Driving

46 **TU Dresden // Deutsche Telekom Chair ComNets** // Magna Telemotive C2X

47 **TU Dresden // Vodafone Chair MCS**// C-V2X: Improving Intersection Safety with Cellular-V2X Communication

48 **TU Dresden // Industrial Design Engineering** // Modern Replacement – Wearables for Distance Choreography Learning

49 **TU Dresden // Industrial Design Engineering** // Lyne Soft Exosuite: Active Training Support for Rowers

50 **TU Dresden // Industrial Design Engineering** // Sensing in Motion: Volleyball Training Support via Motion Comparison

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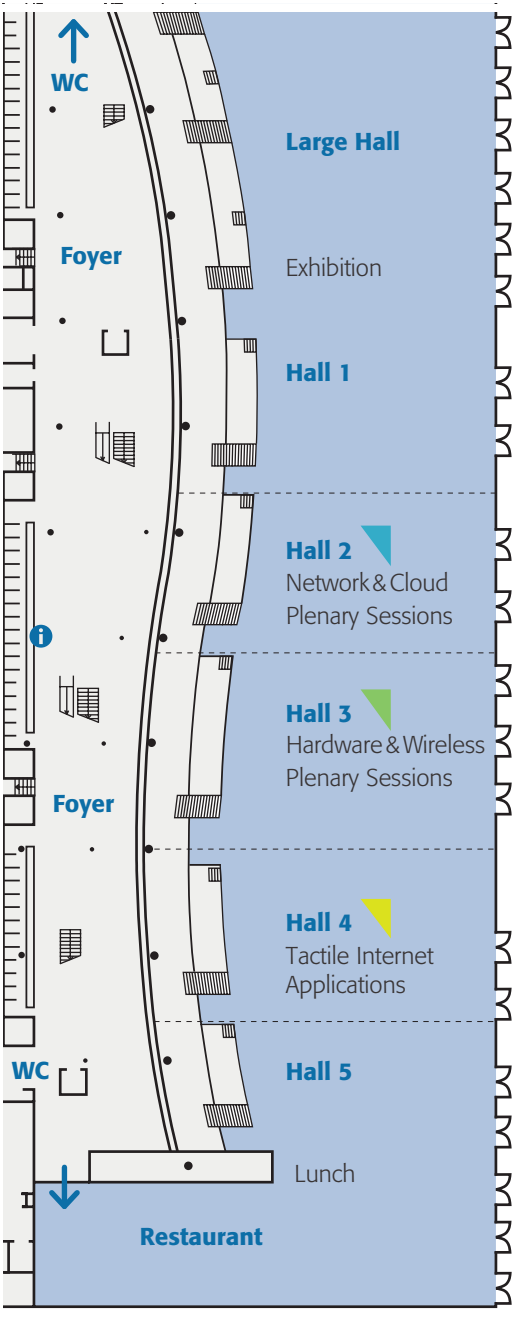
IEEE 5G Summit Dresden **Agenda Overview**

8:45	**Welcome Session and Plenary Keynotes** Prof. Hans Müller-Steinhagen (TU Dresden), Prof. Gerhard Fettweis & Prof. Frank Fitzek (TU Dresden), Volker Ziegler (Nokia), Alexander Lautz (Deutsche Telekom), Christian Leicher (Rohde & Schwarz), Kerstin Grosse (KOMSA)		
10:50	**Coffee Break & Exhibition**		
11:30	**Hardware & Wireless** *(Hall 3)* Prof. Kambiz Jamshidi (TU resden) Mario Montana (IDT) Naoto Ishii (NEC) Saquib Bin Halim Globalfoundries) Karsten Meier (TU Dresden) Krzysztof Nieweglowski (TU Dresden)	**Network & Cloud** *(Hall 2)* Prof. Frank Fitzek (TU Dresden) Gerald Kleyn (HPE) Anders Lindblad (Accenture) Sascha Klüppelholz (TU Dresden) Robert Würth (Intel)	**Tactile Internet Applications Track** *(Hall 4)* Prof. Uwe Aßmann (TU Dresden) Heinz Huber (Telemotive) Prof. Peter Birkholz (TU Dresden) Panel Discussion with: Sascha Berger (Digades) Wolfgang Pitz (SpaceTech) Christian Piechnick (Wandelbots)
13:00	**Lunch & Exhibition**		

14:30	**Hardware & Wireless** *(Hall 3)* Prof. Gerhard Fettweis (TU Dresden) Marc Sommer (Facebook) Joachim Kunkel (Synopsys Inc.) Meryem Simsek (ICSI Berkeley) Prof. Eduard Jorswieck (TU Dresden) Ludger Verweyen (Infineon Technologies)	**Network & Cloud** *(Hall 2)* Prof. Christof Fetzer (TU Dresden) Prof. Petar Popovski (Aalborg University) Sudhir Sharma (ANSYS) Jens Voigt (Amdocs) Panel Discussion with: Prof. Petar Popovski (Aalborg University); Wolfram Drescher (Airrays); Michael Kaiser (Smart Systems Hub), Wen Xu (Huawei)	**Tactile Internet Applications Track** *(Hall 4)* Prof. Marwa Chafii (UCP France) Dirk Schulz (ABB) Prof. Eckehard Steinbach (TU München) Simon Haddadin (Franka Emika) Matthias Schmitt (HERE) Matthias Stege (Exelonix)
16:20	**Coffee Break & Exhibition**		
17:30 - 19:00	**Closing Session and Panel Discussion** Anton Kathrein (Kathrein), Jan-Peter Meyer-Kahlen (Ericsson), Manuel Cubero (Vodafone Germany) Panel Discussion with Jorge Pereira (European Commission), Jan-Peter Meyer-Kahlen (Ericsson) Manuel Cubero (Vodafone Germany), Michael Hohmuth (Kernkonzept)		
19:30	**Networking Session**		

5G Summit **Venue Map**



International Congress Center Dresden // Hall Level