

Overview of IEEE ComSoc and Summit Framework

Stefano Galli, Ph.D.

VP, Industry and Standards Council

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Director of Industry and Education Activities

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May 6, 2019



IEEE Membership By Region

Total Membership

421,355

 R1 to 6 — **194,167**

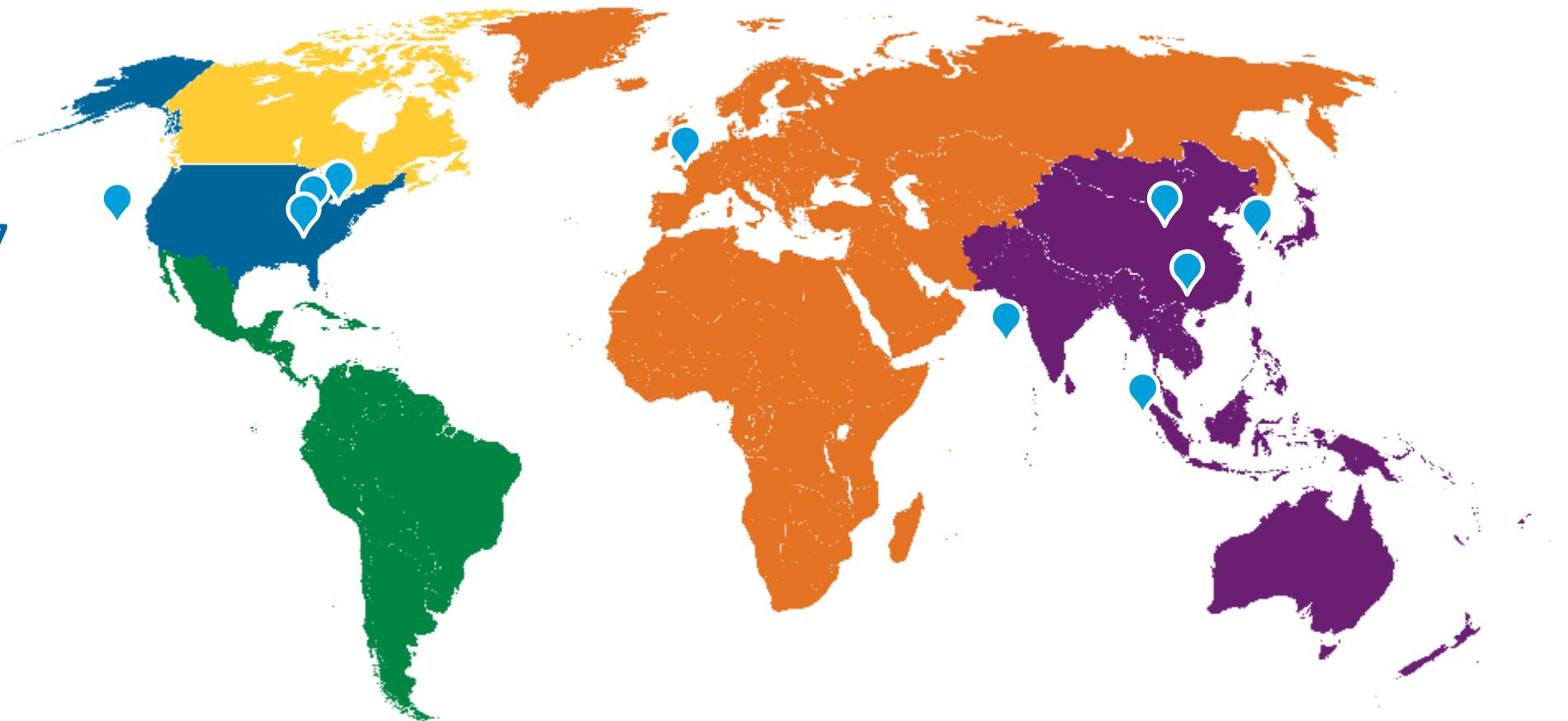
 R7 — **17,163**

 R8 — **77,883**

 R9 — **18,569**

 R10 — **113,573**

 IEEE Offices



Top-class technical expert base: IEEE Technical Societies and Councils

Aerospace and Electronic Systems Society
Antennas and Propagation Society
Biometrics Council
Broadcast Technology Society
Circuits and Systems Society
Communications Society ✓
Components, Packaging, and Manufacturing Technology Society
Computational Intelligence Society
Computer Society
Consumer Electronics Society
Control Systems Society
Council on Electronic Design Automation
Council on Superconductivity
Dielectrics and Electrical Insulation Society
Education Society
Electron Devices Society
Electromagnetic Compatibility Society
Engineering in Medicine and Biology Society
Geoscience and Remote Sensing Society
Industrial Electronics Society
Industry Applications Society
Information Theory Society
Instrumentation and Measurement Society
Intelligent Transportation Systems Society

Magnetics Society
Microwave Theory and Techniques Society
Nanotechnology Council
Nuclear and Plasma Sciences Society
Oceanic Engineering Society
Photonics Society
Power Electronics Society
Power & Energy Society
Product Safety Engineering Society
Professional Communications Society
Reliability Society
Robotics and Automation Society
Sensors Council
Signal Processing Society
Society on Social Implications of Technology
Solid-State Circuits Society
Systems, Man, and Cybernetics Society
Systems Council
Technology Management Council
Ultrasonics, Ferroelectrics, and Frequency Control Society
Vehicular Technology Society



**IEEE
ComSoc**TM
IEEE Communications Society

IEEE ComSoc

The global community of communications professionals.

Communications Society (ComSoc)



Over 27,000 members in more than 149 countries on a mission to promote technological innovation and foster creation and sharing of information among the global technical community

The Society provides services to members for their technical and professional advancement and forums for technical exchanges among professionals in academia, industry, and public institutions

Paving the way for strategic & technical advancements in key areas including:

- 5G
- IoT
- Fog Computing
- Big Data
- Sustainable ICT
- Fiber Optics
- And more

ComSoc Highlights

CONFERENCES AND EVENTS

100+ technical conferences and industry events in emerging technologies

PROFESSIONAL DEVELOPMENT

In-depth instruction on communications technologies, wireless certification

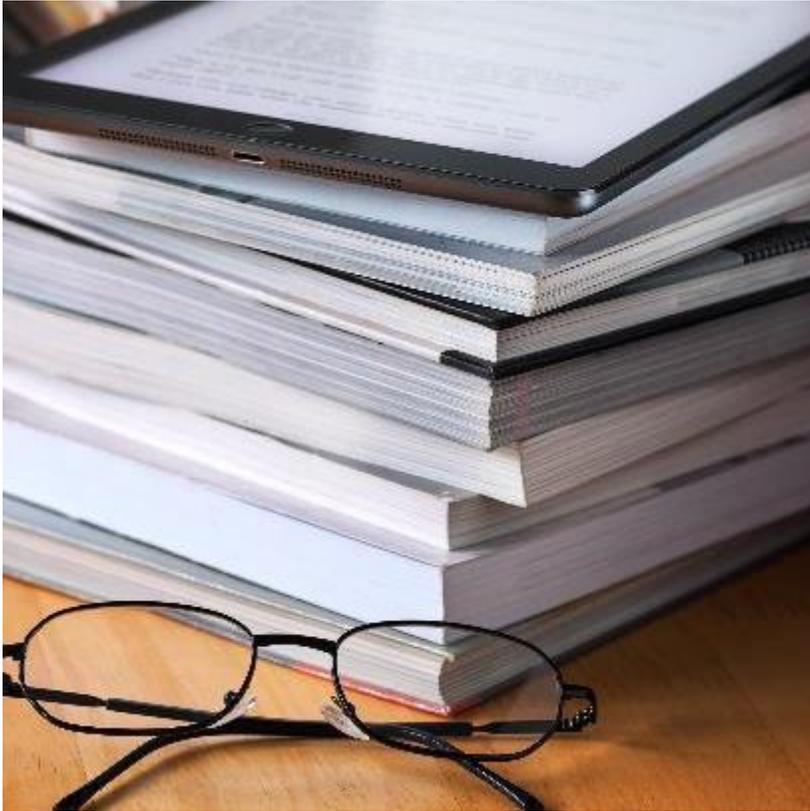
TOP CITED PUBLICATIONS

9 technical magazines and 23 scholarly journals

STANDARDS

Promoting and advancing communications standards in partnership with the IEEE Standards Association; managing pre- and post-standardization activities

ComSoc Membership Benefits



IEEE Communications Magazine (traditional & electronic delivery)

IEEE communications surveys & tutorials (electronic)

Online access to IEEE Journal of Lightwave Technology, IEEE OSA Journal of Optical Communications and Networking & IEEE RFID Virtual Journal

Valuable discounts on:

- ComSoc conferences/Summits/Tutorials
- Award-winning publications
- IEEE WCET Certification program
- Award-winning training courses
- Other exclusive member-only products

Industry Outreach Board (IOB)

Ashutosh Dutta – Director IOB ashutosh.dutta@ieee.org – JHU/APL

Ex-Officio – Stefano Galli – VP Industry and Standards sgalli@ieee.org - Huawei

Industry Community Liaison – Ian Wong – Director Industry Community - ian.wong@ni.com – National Instruments

Members-at-Large

Nirwan Ansari - Nirwan.Ansari@njit.edu – NJIT

Neelesh B. Mehta - neeleshbmehta@gmail.com – Indian Institute of Science

Komlan Egoh - komlan@gmail.com – Stroz Friedberg

Shiny Abraham - abrahamash@seattleu.edu – Seattle University

Nominations from Council/Boards

Prof. Luis M. Correia – Conference Council Representative - luis.m.correia@tecnico.ulisboa.pt IST/INESC-ID, Univ. Lisbon

Koichi Asatani – MGA Council - asatani@ieee.org Nakai University

Stefano Galli – Standards and Program Development Board

Yuguang "Michael" Fang – Publication Council - fang@ece.ufl.edu – University of Florida

Periklis Chatzimisios – Educational Services Board - peris@it.teithe.gr - Alexander TEI of Thessaloniki and Bournemouth University, UK

DL Committee – Sudhir Dixit sudhir.dixit@gmail.com – Basic Internet Foundation

Non-Voting Members:

Saurabh Sureka - saurabh911@gmail.com – A10 Networks

Rose Qingyang Hu - rose.hu@usu.edu – Utah State University

Priyadarsan Patra - priyadarsan.patra@gmail.com – Ex-Intel Employee

Christian Makaya - wchrismak@gmail.com - IBM

Titus Lo - titus.lo@ieee.org - Industry Consultant, Ex AT&T

Eman Hammad – Toronto Chapter Chair, Industry (New)

ComSoc Staff:

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Carol Cronin - c.cronin@comsoc.org

Munir Mohammed m.mohammed@ieee.org

**Connecting the Industry, Academic,
Entrepreneurs and Government Around the
World**

GLOBAL

IS

WHAT IS NEEDED

LOCALLY EVERYWHERE

More than 50 Summits

IEEE 5G Summit Series – 2015 - 2019 (www.5gsummit.org)

50+ 5G Summits, More than 7500 attendees (onsite and online), 800 Speakers,
IEEE.TV Streaming available



5G Summits at a Glance 5gsummit.org



3 IEEE 5G Summits in 2015



8 IEEE 5G Summits in 2016



19 IEEE 5G Summits in 2017



14 IEEE 5G Summits in 2018

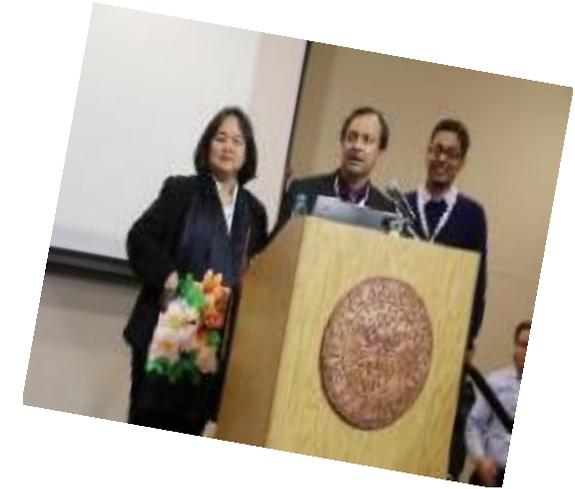


12 IEEE 5G Summits Planned in 2019

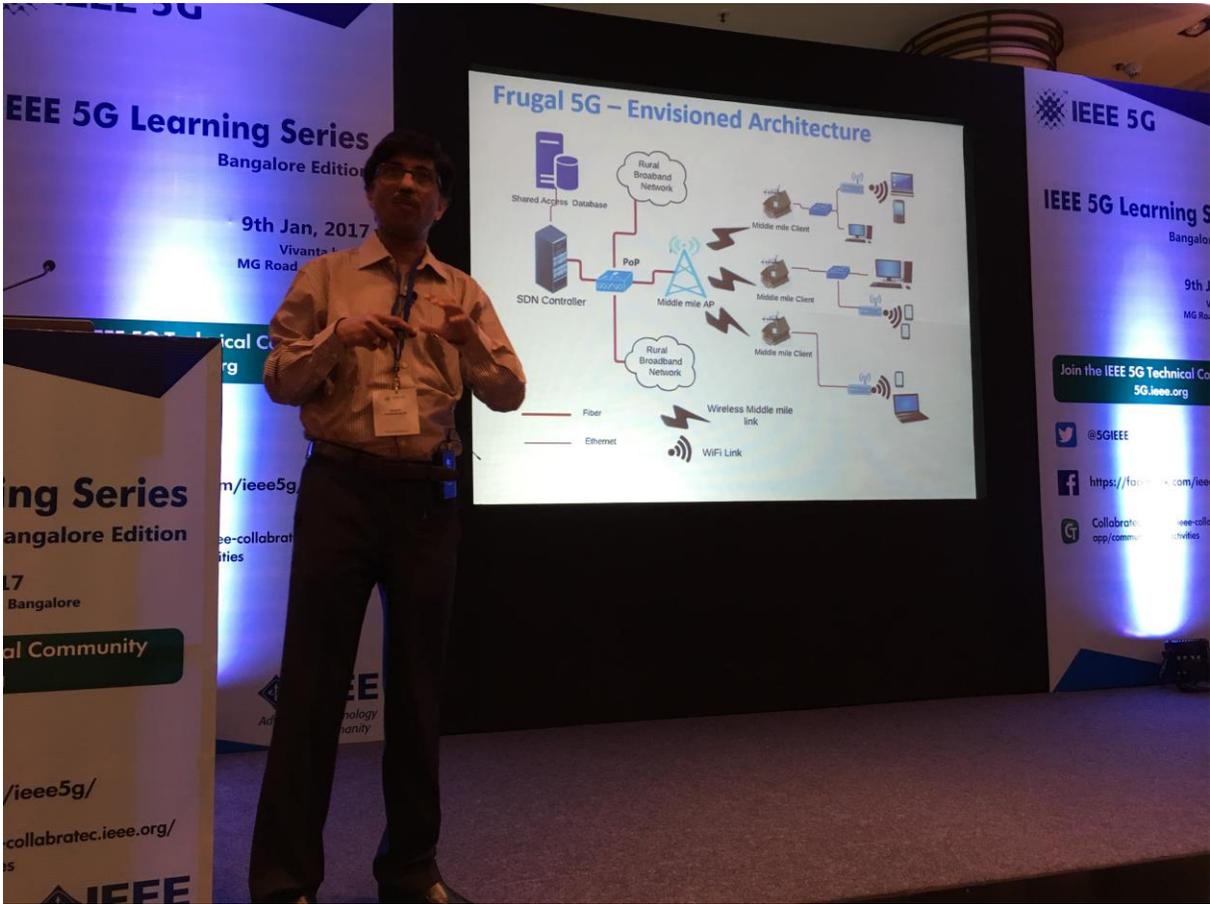
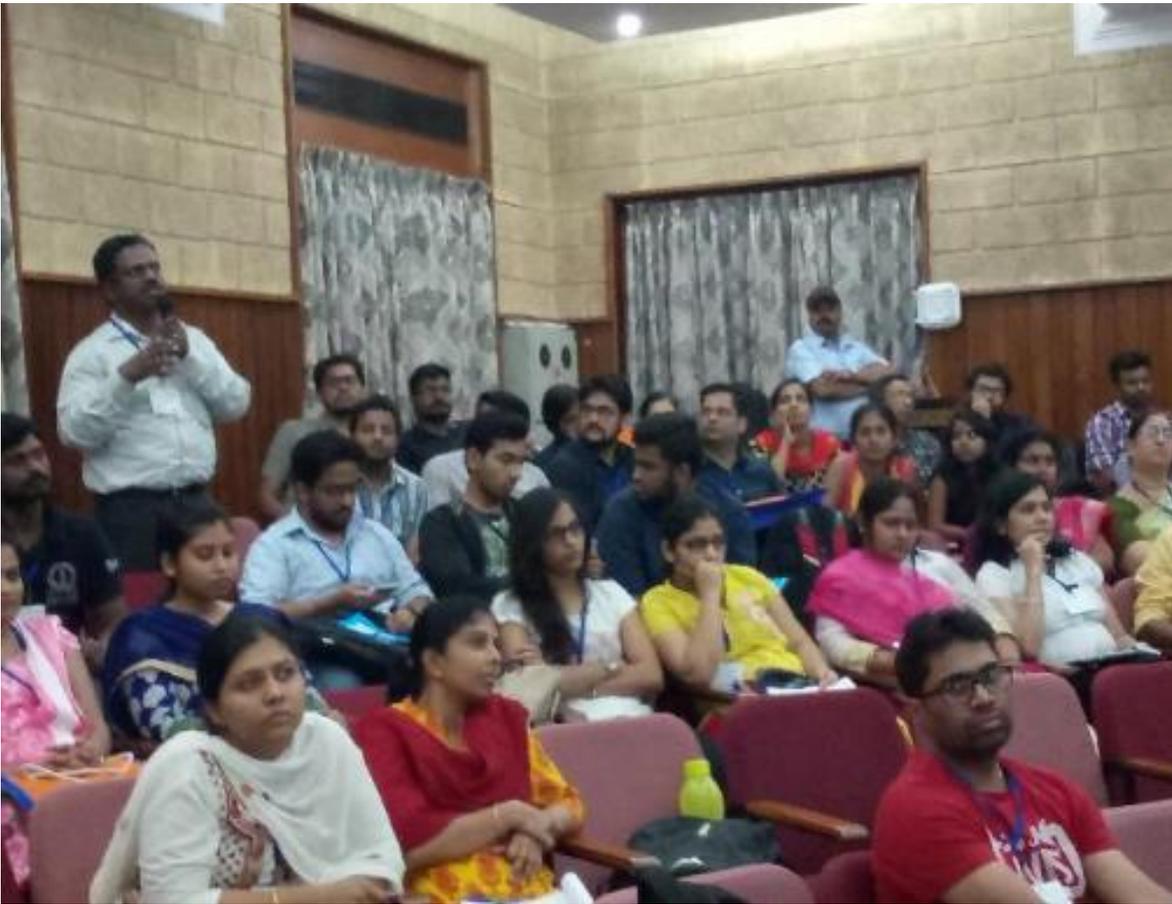
First IEEE 5G Summit Princeton University May 2015



SANTA CLARA SUMMIT, 2015



BANGALORE SUMMIT 2017



Model A: Model A is based on financial sponsorship, and requires a commitment from a chapter to hold no fewer than three summits in a 12-month period. Attendance Fees are typically much lower or free ComSoc members. The Industry and Standards Activities Council subsidizes the difference between the discounted ComSoc member admission and market rate via a grant to the chapter, and the Industry Outreach Board selects and works with the chapters to participate in this model.

Model B: Model B covers single summits organized by chapters that wish to charge below-market rates to all attendees, or charge no admission. In this model expenses are covered from local chapter funding, university funding or local sponsorship. Some chapters/local organizers want only technical co-sponsorship and in some cases would like to make the event free for the attendees.

Model C Model C covers single summits organized by ComSoc and non-chapter partners, such as the 5G Summit at Connectivity Jam (with the Telecommunications Industry Association), the 5G Summit at IMS (with MTT), the Connected and Automated Vehicle Summit (with VTS), and the Dresden Summit (with TU Dresden.) In these models, ComSoc commits staff and volunteer time and effort in exchange for a percentage of net revenue. ComSoc also shares the financial risk with partners under this model, with details spelled out in an MoU or Commercial Services Agreement.

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Adam Greenberg – a.greenberg@comsoc.org

Join Now: comsoc.org/membership



ADVANCING TOGETHER: BECOMING A MEMBER

As a community of ICT engineers, we support our mission by supporting our fellow members, their vital work, and the innovation of communications and networking technologies worldwide.

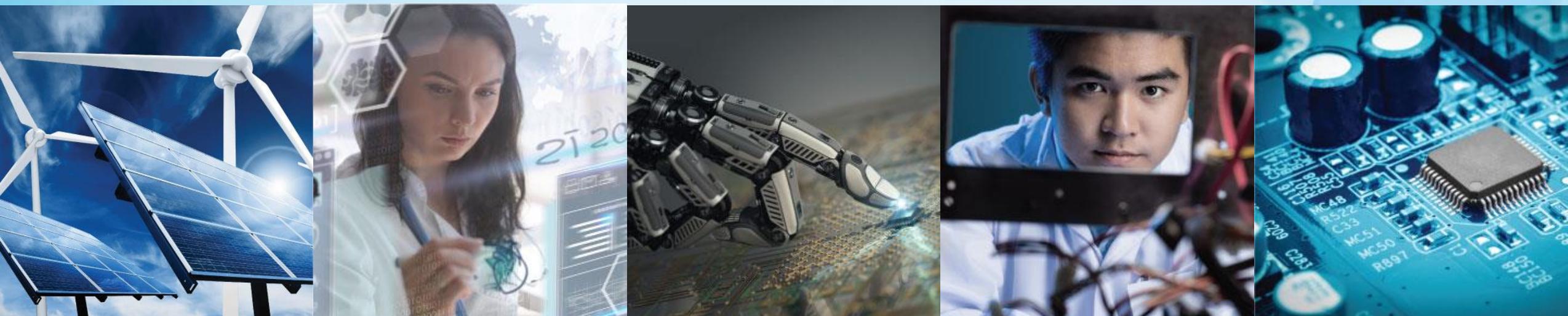
**Make your mark on the communications technology of the future.
Make our community your community.**

[Become a Member](#) [Renew Membership](#)

Membership has its benefits.

As a member of this distinguished community, you will receive exclusive personal, career, and business benefits—allowing you to achieve your professional and personal goals.

- **Discover the latest breakthroughs** with access to cutting-edge information and research on communications technologies.
- **Deepen your understanding of key aspects of communications technologies** through quality training and certification programs.
- **Connect and collaborate** by taking advantage of networking opportunities at conferences and events held around the world.
- **Achieve more with special member pricing** on key IEEE ComSoc publications, conferences, and professional development programs.



IEEE Future Networks Initiative

Enabling 5G and Beyond

Co-Chairs: Ashutosh Dutta (JHU/APL), Gerhard Fettweis (TUD), Timothy Lee (Boeing)

Harold Tepper, IEEE Senior Program Director

May 6, 2019



2018 FDC Initiatives & Activities

Small Projects

Environmental
Engineering



Roadmaps Strategy and
Governance (IRSG)



Quantum Computing



Graduated Initiatives



iee.org/futuredirections

From IEEE 5G to IEEE Future Networks

- 5G has promised us **ultralow latency** and **record-breaking data speeds**, which will enable advances in everything from **small cell research** to **virtual reality applications**. This technology will create **tremendous growth opportunities**, but it won't stop there. That is why, in August 2018, the **IEEE 5G Initiative** has rebranded to become the **IEEE Future Networks Initiative**. The Initiative will pave a clear path through development and **deployment of 5G and beyond**. We will accomplish this through the creation of:



Standards



Webinars



Testbeds



Publications



Tutorials



Podcasts



Newsletters



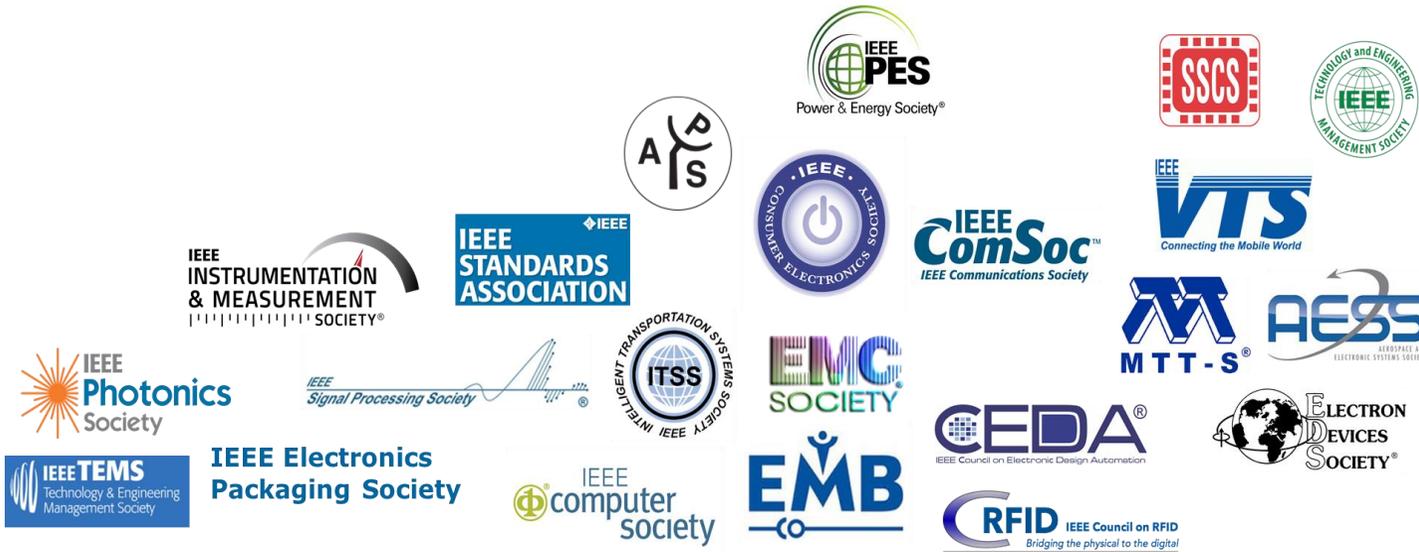
Roadmaps

AND MORE

Sign up for free at futurenetworks.ieee.org

Key Stakeholders

IEEE Societies (22 so far)



Industry



Academia, Students



IEEE OUs

IEEE STANDARDS ASSOCIATION

IEEE EDUCATIONAL ACTIVITIES

Initiative Profile

- ▶ Launched August 2016
- ▶ Technical Activities Board Funded
- ▶ 20+ Participating Societies/OUs



6G Wireless Summit

Paving the Road for the Coming of 6G

IEEE Future Networks Tutorials
IEEE 5G Summit
6G Wireless Summit

www.6gsummit.com

6G WIRELESS SUMMIT
Levi • Lapland • Finland
24-26 March 2019

What's New

Call for Papers/ Tutorials/ Proposals:
IEEE 5G World Forum
Call for Papers, Vertical/Topical Areas
and more
[Learn more.](#)

IEEE Future Networks Upcoming Webinar:
Security in SDN/NFV and 5G Networks
- Opportunities and Challenges
Dr. Ashutosh Dutta, Johns Hopkins
University Applied Physics
Labs (JHU/APL)
[Learn more.](#)

IEEE Future Networks Webinar Series on Demand:
Mitigating Thermal & Power
Limitations to Enable 5G
Dr. Earl McCune, CTO, Eridan
Communications
[View Webinar](#)

IEEE Workshop on 5G Technologies for Tactical and First Responder Networks
View recordings and presentations of the workshop held 23 October 2018
[Learn more.](#)

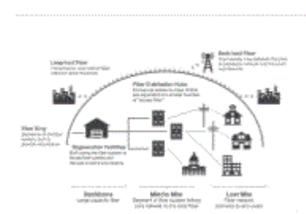
Feature Article



MWC Barcelona 2019: Low Latency 5G Networks Could be a Game-Changer for AR and VR (But Not Until 2020)

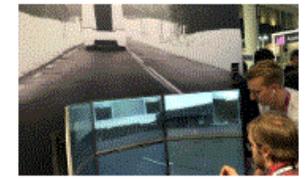
New 5G service could enable multi-player VR games and maybe even eliminate nausea

[Read more at IEEE Spectrum.](#)



Wireless Predictions 2019
[Read more at ECN.](#)

Technology Spotlight



MWC Barcelona 2019: On the Road to Self-Driving Cars, 5G Will Make Us Better Drivers

Long before we have autonomous vehicles, 5G-enabled services could keep us more alert and informed

[Read more at IEEE Spectrum.](#)



Are you Ready to Look at 6G?
[Read more at Telecoms.com.](#)

Useful Links

- [Join the Team - Call for Volunteers](#)
- [Distinguished Lecturer Program](#)
- [IEEE Future Directions Newsletter](#)
- [IEEE ComSoc Technology Blog](#)
- [IEEE 5G Summit](#)
- [IEEE Future Directions Talks Future Networks: Read Q&A Interviews with IEEE experts](#)
- [IEEE Future Directions Blog](#)



Click here to view the Special Report on 5G in The Institute

5G The New Wireless Frontier

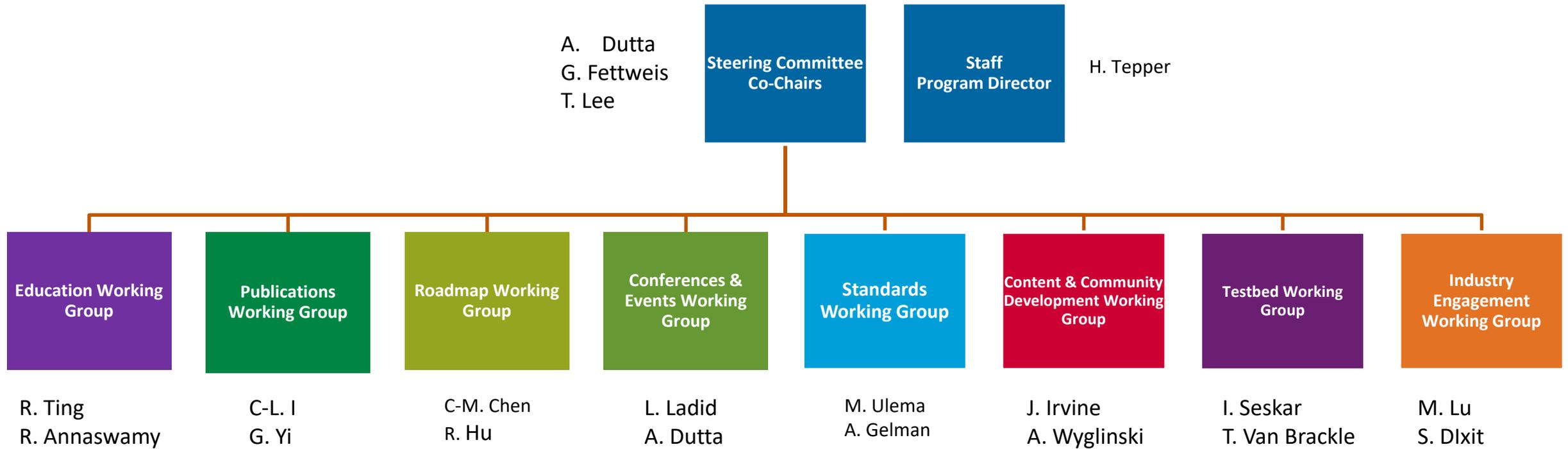
IEEE International 5G Summit

5G Summits in 2019

Piscataway, New Jersey February 25, 2019	Levi, Finland March 25, 2019	Bangalore, India April 12, 2019	San Diego, CA April 20, 2019	Pretoria, South Africa Monday, May 6, 2019
Toronto, Canada May 15, 2019	Boston, USA June 2, 2019	Istanbul, Turkey June 13-14, 2019	Tangier, Morocco Monday, June 24, 2019	Manila, Philippines September 16-17, 2019
Dresden, Germany September 30, 2019		Laurel, Maryland Monday, October 7, 2019		

12 summits in 2019	14 summits in 2018	19 summits in 2017	8 summits in 2016	3 summits in 2015
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IEEE Future Networks Initiative Organization Structure



Led by a steering committee of 30 leaders from a diverse set of Future Networks-related IEEE Societies



The global team of experts involved in IEEE Future Networks are producing programs and activities including...

The Future Networks Roadmap
short-term (~3 years), mid-term (~5 years), and long-term (~10 years) research, innovation, and technology trends

Education
IEEE Future Networks Learning Series
IEEE Live Online Courses, Webinar series
Videos from IEEE 5G Summits

Standards
Global, open, and collaborative

Expert Articles
Published on IEEE Future Networks web portal and in industry media

Conferences & Events
IEEE 5G Summits
IEEE 5G World Forums
Future Networks-related IEEE conferences

Publications
IEEE Future Networks Transmissions podcast series
IEEE Future Networks Tech Focus Newsletter
IEEE Future Directions Talks Future Networks Q&A article series

- Leadership Team: Rose Quingyang Hu/co-chair, Chi-Ming Chen/co-chair
Ashutosh Dutta, Gerhard Fettweis, Timothy Lee, Paolo Gargini

Roadmap Structure – Leadership and Working Group Co-chairs

Standardization Building Blocks
Paul Nikolich
Alex Gelman
Purva Rajkotia
Mehmet Ulema
mmWave and Signal Processing
Timothy Lee
Harish Krishnaswamy
Earl McCune
Hardware
Dylan Williams

Massive MIMO
Rose Quingyang Hu
Dongming Wang
Chris Ng
Chi Ming Chen
Haijian Sun
Applications and Services
Ravi Annaswamy
Narendra Mangra
Testbed
Ivan Seskar
Tracy Van Brakle

Security
Ashutosh Dutta
Ana Nieto
Ahmad Cheema
Satellite
Sastri Kota
Prashant Pillai
Giovanni Giambene
Edge Automation Platform
Meryem Simsek
Cagatay Buyukkoc
Kaniz Mahdi
Paul Littlewood

NEW FOR 2019
Systems Optimization
Ashutosh Dutta
Kaniz Mahdi
Optics
Ashutosh Dutta
Feras Abou-Galala
Paul Littlewood
Deployment
David Witkowski
Connecting the Unconnected Sudhir Dixit, Ashutosh . Dutta

IEEE Standards Association

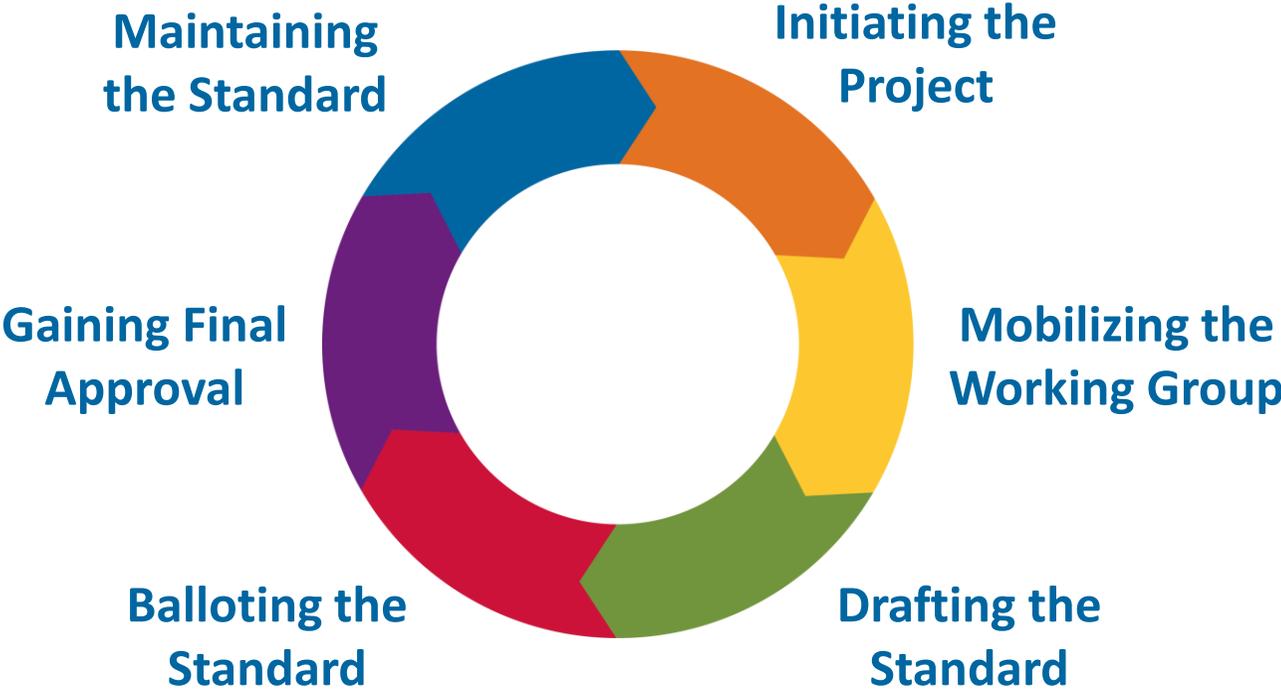
Drives the functionality, capability, and interoperability of a range of products and services that affect the way people live, work, and communicate.

6,879

Individual Members
in 90 countries

187

Corporate Members
in 23 countries



IEEE: Standards and Global Collaboration for 5G

IEEE provides a complete, end-to-end, collaborative framework today for accelerating the realization of 5G and its revolutionary use cases tomorrow.

Mobile Edge Cloud brings SDN/NFV frameworks and data path programmability to the proximity of end users as key enablers for service differentiation

IEEE 802.11
standard supported by almost any mobile device in the market today

SoftRAN is to create a SD RAN flexible enough to control applications with the wireline centric concepts of “fog” in a SD-controller

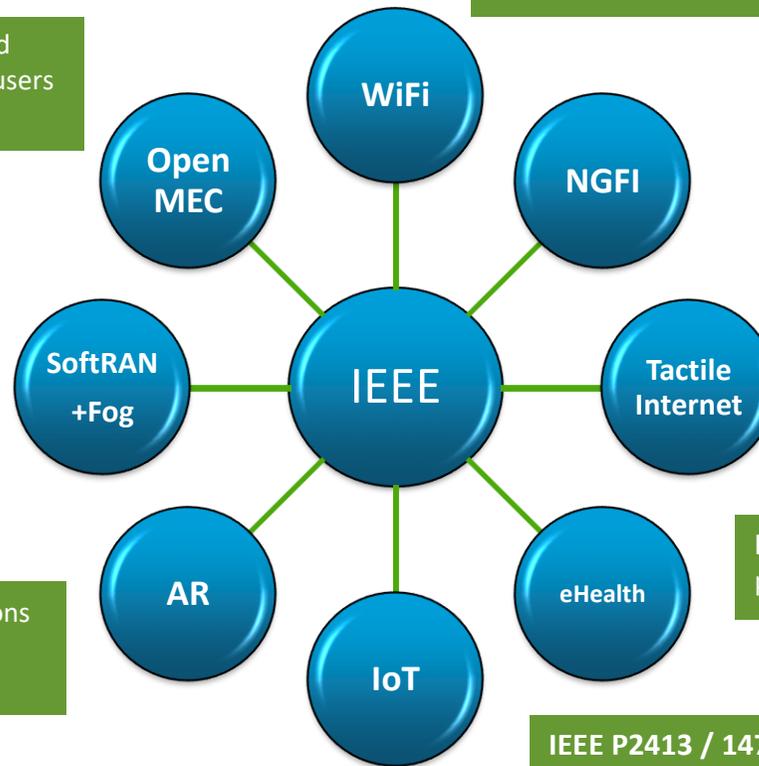
IEEE 1914/1904
flexible, efficient and scalable packet-based fronthaul transport networks

IEEE P1589/P1587.6/P1857.9/P3333.2.4 Industry Connections
the integration of computer-generated sensory content with the physical world

IEEE 1918
non/mission-critical applications (e.g. manufacturing, transportation, healthcare, mobility, edutainment, events)

IEEE 11073
provides a global platform for eHealth stakeholders

IEEE P2413 / 1471 / 42010



Ecosystem Stakeholders

- ❖ End users
- ❖ Application developers
- ❖ Service providers
- ❖ Equipment manufacturers
- ❖ Component suppliers
- ❖ Technology innovators
- ❖ Governments
- ❖ Standards and guidelines producing bodies
 - IEEE-SA
 - 3GPP
 - ITU

Industry Interaction at Large

- ❖ The Roadmap effort will also include a series of meetings to gather additional inputs and feedback on trends related to:
 - ❖ Business
 - ❖ Technology
 - ❖ Societal
 - ❖ New fields
 - ❖ Other industries

Keynote Speakers World Forum 2018



Jin Bains
Facebook



Lee Chen
A10 Networks



Adam Drobot
OpenTechWorks



Monisha Ghosh
NSF



Andrea Goldsmith
Stanford University



Egil Gronstad
T-Mobile USA



Michael Ha
FCC



Chih-Lin I
China Mobile



James Kimery
National Instruments



David Lu
AT&T



Geoff Mulligan
Skylight



Constantine
Polychronopoulos
VMWare



Henning
Schulzrinne
Columbia University



Peter Vetter
Nokia

Program

5G Technical Paper Tracks

- [5G Technologies](#)
- [5G Application and Services](#)
- [5G & IoT](#)
- [5G Security and Privacy](#)
- [5G Trials, Experimental Results and Deployment Scenarios](#)
- [5G Hardware and Test / Measurements](#)
- [Work-in-Progress](#)
- [PhD Forum](#)

Workshops

- [5G Cloud Native Design Workshop](#)
- [Tactile Internet Workshop](#)

5G Vertical Tracks

- [Automotive Intelligent Transport](#)
- [5G for the Industrial Internet of Things \(IIoT\)](#)
- [E-Health and Mobile Health over 5G Networks](#)
- [Disrupting Media and Entertainment in the 5G Era](#)
- [5G Applications](#)

Start-up Forum

Worldwide 5G Industry Fora Session

5G Topical Tracks

- [5G Security and Privacy](#)
- [Open API, Unbundled, Open Source, and Testbeds](#)
- [Policy and Regulation in the 5G Era](#)
- [Standards and Deployment](#)
- [5G Optics](#)
- [5G Design, Test, and Measurement Challenges](#)
- [5G Satellite Integration](#)
- [The Evolving Patent Law Landscape and its Effect on 5G Innovation](#)

Tutorials

- 5G Core / Fundamentals
- 5G Applications

Industry Panels

IEEE 5G World Forum 2019 and 2020

5G World Forum 2019 – Dresden, Germany

**BE PART OF THE GLOBAL COLLABORATION
CREATING 5G FOR THE BENEFIT OF SOCIETY**

**30 September to 2 October 2019
Dresden, Germany
ieee-wf-5g.org**

**IEEE
5G WORLD FORUM**
The flagship event of the IEEE Future Networks Initiative

2019 IEEE 2nd 5G World Forum (5GWF'19)

CALL FOR PAPERS and PROPOSALS

Technical Papers

- Track 1: 5G Technologies
- Track 2: 5G Application and Services
- Track 3: 5G & IoT
- Track 4: 5G Security and Privacy
- Track 5: 5G Trials, Experimental Results and Deployment Scenarios
- Track 6: 5G Hardware and Test / Measurements
- Track 7: 5G Special Verticals
- Track 8: 5G Special Topical

Proposals

- Tutorials
- Industry Forums & Panel Sessions
- Industry Demonstrations
- Doctoral Symposium
- Start-ups
- Exhibitions
- Trackathon
- 5G Vertical Areas
- 5G Topical Areas

The 2019 IEEE 2nd 5G World Forum (5GWF'19) in Dresden, Germany, seeks contributions on how to mature and catalyze 5G technologies and applications for the benefit of society. 5G systems should create a novel mobile network architecture that not only improves peak data rate, but also creates a new ecosystem allowing the deployment of novel services and applications. A key target is to build a novel network architecture that should support not only classical mobile broadband applications and services but also vertical industry (e.g. Intelligent Transport, Industrial IoT, Health, etc.) and other 5G-based services.

This conference aims to bring experts from industry, academia and research to exchange their vision as well as their achieved advances towards 5G, and encourage innovative cross-domain studies, research, early deployment and large-scale pilot showcases that address the challenges of 5G.

Organizing Committee

General Chair
Michael Delle, Robert Bosch GmbH

General Co-Chairs
Ashutosh Dutta, Johns Hopkins University/Applied Physics Lab
Gerhard Fettweis, Technical University of Dresden
Frank Fitzek, Technical University of Dresden
Latif Ladid, University of Luxembourg

Technical Program Committee
TPC Chair, Antonio Skarmata, University of Murcia
TPC Co-Chairs:
Debajani Choudhury, Intel Labs
Debajani Choudhury, Intel
Athul Prasad, Nokia
Essaid Sabir, University of Casablanca

Important Dates:
April 15, 2019: Technical papers
Industry Forum proposals
Tutorial proposals
Vertical/Topical Area proposals
May 15, 2019: Workshop papers

Please submit your papers to: <https://edas.info/N25425>

Please address enquiries regarding the Call for Papers to: wf5g@ieee.org

Accepted and presented technical and workshop papers will be published in the IEEE 5G World Forum 2019 Conference Proceedings and IEEE Xplore®. See the website for a full program requirements. Full details of submission procedures are available at www.ieee-wf-5g.org.

Visit <http://ieee-wf-5g.org/> for more information.







5G World Forum 2020, India



2020 IEEE 5G World Forum (5GWF'20)
Theme: Future Networks
India



CALL FOR PAPERS

The 2020 IEEE 5th 5G World Forum (5GWF'20) in Gurgaon, Germany, seeks contributions on how to mature and catalyze 5G technologies and applications for the benefit of society. 5G systems should create a novel mobile network architecture that not only improves physical data rate, but also creates a new ecosystem allowing the deployment of novel services and applications. A key target is to build a novel network architecture that should support not only classical mobile broadband applications and services but also vertical industry (e.g. Intelligent Transport, Industrial IoT, Health, etc.) and other 5G-based services.

This conference aims to bring experts from industry, academia and research to exchange their vision as well as their achieved advances towards 5G, and encourage innovative cross-domain studies, research, early deployment and large-scale pilot showcases that address the challenges of 5G.

Technical Tracks

- Track 1: 5G Technologies
- Track 2: 5G Application and Services
- Track 3: 5G & IoT
- Track 4: 5G Security and Privacy
- Track 5: 5G Trials, Experimental Results and Deployment Scenarios
- Track 6: 5G Hardware and Test / Measurements
- Track 7: 5G Special Verticals
- Track 8: 5G Special Topical

Sessions

- Workshops
- Special Sessions
- Tutorials
- Industry Forums
- Doctoral Symposium
- Start-ups
- Exhibitions
- 5G Special Vertical Areas
- 5G Special Topical Areas

2020 IEEE 5G World Forum (5GWF'20) INDIA



IEEE 5G WF
IEEE 5G WORLD FORUM 2020
INDIA

www.ieee-wf-5g.org

Please address enquiries regarding the Call for Papers to: wf5g@ieee.org

Accepted and presented technical and workshop papers will be published in the IEEE 5G World Forum 2020 Conference Proceedings and IEEE Xplore®. See the website for author requirements. Full details of submission procedures are available at www.ieee-wf-5g.org.

Important Dates:

Visit <http://ieee-wf-5g.org/> for more information.

Whether you are a platform provider, operator, manufacturer, or service/content provider, there is a path for you and your business to be seen, heard, and make an impact in 5G and Beyond



...contribute to the IEEE Future Network Initiative Roadmap Working Groups ...

...contribute to our publication, IEEE 5G Tech Focus...

...lead an IEEE 5G use case or infrastructure project.

THANK YOU

and

JOIN US FOR

THE INNOVATION

REVOLUTION



LEARN MORE AT
[5G.IEEE.ORG](https://5g.ieee.org)

Standards Applicable to 5G

- **Computer Society:**
- **IEEE 802.1 - Higher Layer LAN Protocols Working Group**
 - IEEE P802.1CM Profile of Ethernet networks utilizing Time Sensitive Networking
 - IEEE P802.1CF Netw. Ref. Model, and Func. Description of IEEE 802 Access Network
- **IEEE 802.3 - Ethernet Working Group**
 - IEEE P802.3bs 200 Gb/s and 400 Gb/s Ethernet
 - IEEE P802.3ca (EPON) 25 Gb/s, 50 Gb/s, and 100 Gb/s Ethernet Passive Optical Networks
 - IEEE P802.3cc 25 Gb/s Ethernet over Single-Mode Fiber
 - IEEE P802.3cd 50Gb/s, 100 Gb/s, and 200 Gb/s Ethernet
- **IEEE 802.11 - Wireless LAN (aka Wi-Fi) Working Group**
 - IEEE 802.11ac-2013 Up to 7 Gbps in 5 GHz
 - IEEE 802.11ad-2012 Up to 7 Gbps in 60 GHz
 - IEEE P802.11ax Up to 10 Gbps in the 5 GHz
 - IEEE P802.11ay Up to 20 Gbps in the 60 GHz band
 - IEEE 802.11ah-2016 “HaLow”: Massive Machine Type Communications

Standards Applicable to 5G (Cont'd)

– Computer Society:

IEEE 1903–2011 Standard for the Function Architecture of Next Generation Overlay Network

- **IEEE 802.15 - Wireless Personal Area Network (WPAN) Working Group**
 - IEEE 802.15.6 Wireless Body Area Networks (BAN)
 - IEEE 802.15.7 Visible Light Communications
 - IEEE 802.15.12 Upper Layer Interface (ULI)
- **IEEE 802.16 - Broadband Wireless Access Working Group**
- **IEEE 802.18 - Radio Regulatory Technical Advisory Group**
- **IEEE 802.19 - Wireless Coexistence Working Group**
 - IEEE 802.19.1 TV White Space Coexistence Methods
- **IEEE 802.21 - Media Independent Handover Services Working Group**
- IEEE 802.22 Point-to-Multipoint Wireless Broadband
- IEEE 802.11P Vehicular Communication System (amendment to 802.11)



Standards Applicable to 5G (Cont'd)

■ **IEEE Vehicular Technology Society/ Intelligent Transportation Systems:**

- 1609 Series - IEEE Wireless Access in Vehicular Environments (WAVE)

– **IEEE Antennas and Propagation Society/Antennas and Propagation:**

- P211 - Standard Definitions of Terms for Radio Wave Propagation
- P149 - Recommended Practice for Antenna Measurements
- 1720-2012 - IEEE Recommended Practice for Near-Field Antenna Measurements

– **SASB/SCC39-SCC39 - International Committee on Electromagnetic Safety:**

1528-2013 - IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

– **Instruments & Measurements:**

- 1451 Series - Smart Transducer Interface for Sensors and Actuator Wireless Communication Protocols and Transducer Electronic Data Sheet (TEDS) Formats

– **Audio Video Coding Working Group:**

- IEEE P1857.6™ - Standard for Digital Media Content
- IEEE P1857.9™ - Standard for Immersive Visual Content Coding

– **3D Based Medical Application Working Group:**

- IEEE P3333.2.4™ - Standard for Three-Dimensional (3D) Medical Simulation

Standards in Development Applicable to 5G

◦ (Cont'd)

■ IEEE SA Design Automation Standards Committee (DASC)

- IEEE 1666 (SystemC) Modeling of 5G designs at a pre-implementation level
- IEEE 1666.1 SystemC AMS
- IEEE 1800 (SystemVerilog) Design/Verification of 5G devices
- IEEE 1076 (VHDL)
- IEEE 1076.1.1 (VHDL AMS)
- IEEE 1647 (the e language)
- IEEE P1800.2 (UVM)
- IEEE 1801 (UPF) Low power hardware analysis 5G hardware designs
- IEEE 1685 (IPXACT) 5G Semiconductor IP design
- IEEE 1734 (IP quality)
- IEEE 1735 (IP encryption)



Standards in Development Applicable to 5G

◦ (Cont'd) Communications Society

- IEEE P1903.1 Content Delivery Protocols of Next Generation Service Overlay Network (NGSON)
- IEEE P1903.2 Service Composition Protocols of NGSON
- IEEE P1903.3 Self-Organizing Management Protocols of NGSON
- IEEE P2413 Architectural Framework for the Internet of Things
- IEEE P1914.1 Standard for Packet-based Fronthaul Transport Networks
- IEEE P1915.1 SDN and NFV Security
- IEEE P1916.1 SDN and NFV Performance
- IEEE P1917.1 SDN and NFV Reliability
- IEEE P1918.1 Tactile Internet
- IEEE P1918.1.1 Haptic Codecs for the Tactile Internet
- IEEE P1921.1 SDN Bootstrapping Procedures
- IEEE P1930.1 Recommended Practice for (SDN) Middleware
- IEEE 1931.1 Architectural "ROOF" Framework for the IoT



Standards in Development Applicable to 5G

◦ (Cont'd)

■ **IEEE Microwave Theory and Techniques:**

- IEEE P1765 Recommended Practice for Estimating the Uncertainty In Measurements of Modulated Signals for Wireless Communications with Application to Error Vector Magnitude and Other System-Level Distortion Metrics
- IEEE P1770 Recommended Practice for The Usage of Terms Commonly Employed In the Field of Large-Signal Vector Network Analysis
- IEEE P1785 IEEE Frequency Bands and Waveguide Dimensions

■ **IEEE Instrumentation and Measurement Society:**

- IEEE P287 Standard for Precision Coaxial Connectors at RF, Microwave and Millimeter-wave Frequencies
- IEEE P1415-99 Harmonization of Internet of Things (IoT) Devices and Systems

■ **Augmented Reality Learning Experience Model:**

- IEEE P1589 Standard for an Augmented Reality Learning Experience Model