Draft Agenda

- 9:00-9:05: Welcome and Roll Call (Zhisheng)
- 9:05-9:06: Approval of Agenda (Zhisheng)
- 9:06-9:07: Approval of November 21 ETC meeting minutes (Zhisheng)
- 9:10-9:20: Report: Ad Hoc Committee on TC Reorganization (Wei)
- 9:25-9:40: Discussions: How to increase synergies among ETIs, TE&Is, and TCs (Heiner & Zhisheng)
- 9:40-10:25: Brief ETI Status Updates (ETI Chairs or Delegates)
  - Backhaul/Fronthaul Networking & Communications (Muhammad Zeeshan Shakir)
  - Machine Learning for Communications (Carlo Fischione)
  - Quantum Communications & Information Technology (Lajos Hanzo)
  - Aerial Communications (Fabrizio Granelli)
  - Reconfigurable Intelligent Surfaces (Vincenzo Sciancalepore)
  - Network Intelligence (Faten Zhani)
  - Integrated Sensing and Communications (Fan Liu)
  - Next Generation Multiple Access (Yuanwei Liu)
- 10:25-10:30: New Business
- 10:30: Adjourn
Emerging Technologies Committee (ETC)

- The Emerging Technologies Committee (ETC) is responsible for identifying and nurturing new technology directions through various activities including the formation of initiatives in areas that are of high interest to ComSoc members.

Committee Roster (2022-2023)

- Chair | Zhisheng Niu
- Voting Members

- EIC, IEEE Communications Magazine | Antonio Sanchez-Esguevillas
- EIC, IEEE Journal on Selected Areas in Communications (JSAC) | Petar Popovski
- Representative, Strategic Planning Committee | Zhisheng Niu
- Chair, Industry Communities | Chonggang Wang

2022-2024 | Guangyi Liu (China Mobile, Industry), Shigeru Shimamoto (Waseda Univ., Satellite)
2021-2023 | George Rouskas (North Carolina State Univ., Optical), Carla Fabiana Chiasserini (Politecnico di Torino, Wireless, F.)
2020-2022 | Damla Turgut (Univ. of Central Florida, Wireless, F.), Halim Yanikomeroglu (Carleton Univ., Wireless)

- Secretary: Yuxuan Sun (Tsinghua University, Edge Computing, F.)
- Staff | Cynthia Sikora
Existing ETIs & New ETI

- **Backhaul/Fronthaul Networking** (Muhammad Zeeshan Shakir): est. in 2015
- **Quantum Communications** (Lajos Hanzo): est. in 2015
- **Network Intelligence** (Faten Zhani): est. in 2017
- **Machine Learning for Communications** (Carlo Fischione): est. in 2018
- **Full Duplex Wireless Communications** (Gabor Fodor): est. in 2018
- **Aerial Communications** (Fabrizio Granelli): est. in 2019
- **Reconfigurable Intelligent Surfaces** (Vincenzo Sciancalepore): est. in 2020
- **Integrated Sensing and Communications** (Fan Liu): est. in 2021
- **Next Generation Multiple Access** (Yuanwei Liu, Queen Mary Univ., academic; Yan Chen, Huawei Canada, industry), proposed & approved in 2022
JSAC Special Issue Proposals in 2022

- **Special Issue on Full Duplex and Self-Interference Cancellation: challenges and applications**
  - **Besma Smida**: University of Illinois at Chicago
  - **Gábor Fodor**: Ericsson Research & KTH Royal Institute of Technology
  - **Ashutosh Sabharwal**: Rice University
  - **Himal A. Suraweera**: University of Peradeniya, Sri Lanka
  - **Chan-Byoung Chae**: Yonsei University, South Korea

- **Special Issue on Integrated Access and Backhaul for 5G and Beyond**
  - **Behrooz Makki**, Ericsson Research
  - **Mohamed-Slim Alouini**, King Abdullah University of Science and Technology (KAUST)
  - **Ismail Guvenc**, North Carolina State University
  - **Shu-ping Yeh**, Intel Corporation
  - **Harpreet S. Dhillon**, Virginia Tech.
  - **Muhammad Zeeshan Shakir**, University of West of Scotland
Special Session on “New Technologies Initiatives” @ GC 2022

- **Chairs**: Heiner Stütten (Chair, TE&I Committee) & Zhisheng Niu (Chair, ETC)
- **Session description**: ComSoc has several mechanisms in place to incubate new activities beyond what ComSoc's TCs are already doing today, which include Emerging Technology Initiatives (ETIs) & Technology Evolution & Initiatives (TE&Is). This special session aims at promoting these mechanisms, as well as the ETIs and TE&Is are currently in place.
- **Agenda** (*tbd*)
Brief ETI Status Updates
ETI Backhaul/Fronthaul Networking & Communications: Achievements & Plans

- **Chair**: Muhammad Zeeshan Shakir – University of the West of Scotland
- **Website**: [https://bnc.committees.comsoc.org/](https://bnc.committees.comsoc.org/) - updated
- **Founded**: 2015 with over 50 members from academia and industry with focus on Backhaul/fronthaul for small cells
- **Members**: 151 active members (Mailing list server)
- **Activities**: Over 50 activities - Workshop (19); Publications (15); Tutorials/Talks (15)
- **Standard participation**: 3GPP IAB Rel 17 (enhancements); Rel 18 (mobile IAB); past participation includes 802.11ad and 1914.1(NGFI) and 1914.3 (RoE)
- **Future**: ETI members supports elevation of ETI to full TC and continue to engage with members.
ETI-MLC: Key Accomplishments in 2021/06-2022/04

• Regular Journals with dedicated ML/AI areas
  • IEEE Trans. Wireles. Commun.: Topic Area Machine Learning and Artificial Intelligence for Wireless (O’Shea, Carvalho)
  • IEEE Trans. Commun.: Topic Area Machine Learning & Communications (Fischione, Schmalen)
  • IEEE Trans. on Cog. Commun. and Netw. (O’Shea)
  • IEEE JSAC Series Machine Learning in Communications and Networks (Fischione, Carvalho)

• Special Issues
  • >8+ Special Issues in various IEEE journals

• Conference Organization
  • >20 workshops, symposia, conferences at leading IEEE venues

• Tutorials, Distinguished Lectures, Panels
  • >15 events

• Data Competitions and Standards
  • >7 events

• Online Content
  • Research library (830 entries), News, Datasets
Challenges/opportunities for 2022

- MLC is very healthy & growing, with vibrant community & activities
- One of the hottest topics in comms right now, trend is unlikely to stop
- Opportunities:
  - Broaden scope towards other groups
  - More Data sets and competitions
  - Prepare for elevation/integration to an Artificial Intelligence TC?
  - Organization of a dedicated IEEE conference “AICOM”?
- Challenges:
  - Reach out to other AI/ML-related SAC tracks at GC/ICC which could form a basis for a new conference
QCIT Committee

1) The traditional QCIT Workshop evolved into the SAC Track
2) IEEE Quantum Week took place in virtual mode with 1100 participants
3) 238 companies, 206 universities and 39 government labs from 50 countries
4) Keynote lectures on Quantum communications: EWDTS’21; ICL London
5) IEEE ComSoc Course, April’22
6) IEEE Signal Processing Society Webinar
URL: https://rc.signalprocessingsociety.org/webinars/SPSWEB00373.html
7) ComSoc Webinar https://wtc.committees.comsoc.org/seminars/
8) IEEE ComSoc Network SI on Quantum Communications, April’22
9) Discussing a regular CommsMag FT with the EIC
AC ETI: Key Accomplishments in 1st semester of 2022

• Conference/Workshops Organization
  • Successful continuation of workshop series (Dronecom @ IEEE INFOCOM 2022, ACM DroneCom @ ACM Mobicom 2022)
  • ICC’22 SAC track on Aerial Communications (Chair: Sahil Garg): second edition of the track, first edition (GC’21): 60 submissions
  • GC’22 & ICC’23 SAC track on Aerial Communications (Chair: S. Pollin / K. Kaur), ICC’24 and GC’24 nominations are coming

• Standards
  • IEEE P1920.1 and IEEE P1920.2 Standards working Groups (Jointly sponsored by ComSoc and VTS)
  • IEEE Mobinet-SC participation: PAR accepted: Summer 2021, P1954: Spectrum-agile UAV V2V Communications started: 2022

• Projects:
  • Air Corridors (Granelli/Kamesh), co-sponsored by VTS/ComSoc
    • VTS funded the initiative with 30k$: $10K for Innovation Challenge, $10K for virtual workshop/training, $10K for Flight Tests
    • ComSoc pre-approved the possibility of a drone-focused ComSoc School in 2023

• Publications:
  • IEEE Wiley book on drone communications
  • IEEE Commag Feature Topic on Aerial Communications 5/20 accepted, in press
  • IEEE JSAC proposal (under preparation)

• Actions for 2022:
  • Become a full-fledged TC!
Reconfigurable Intelligent Surfaces (Vincenzo Sciancalepore)

- **Academic research activities**
  - IEEE GC’22, ICC’23, GC’23 SAC on RIS (accepted), ICC’24 (TBC)
  - Workshop on RIS at IEEE ICC 2022
  - Special issue on RIS in the well-read quarterly English Journal “ZTE Communications” 2022
  - JSAC SI on “Beyond Shannon Communications: A Paradigm Shift to Catalyze 6G”
  - Special Session on Reconfigurable Intelligent Surfaces at IEEE European Wireless 2022
  - EuCAP 2022 Convened Session “Metasurfaces and Reconfigurable Intelligent Surfaces to Tailor Radio Propagation: Modeling, Applications, Prospect”

- **119 subscribers, 30 officers and 20 active contributors**

- **ETI current objectives and future plans:**
  - ✓ involve industry and attract more business players
  - ✓ foster standardization activities on the RIS topic
  - × liaise with other communities (such as ACM, ect.)

- **Standardization activities**
  - ETSI ISG RIS approved 3 new work items:
    - GR RIS-001, “Use Cases and Deployment Scenarios”
    - GR RIS-002: “Study on Technological challenges and Impact on networks and standards”
    - GR RIS-003: “Communication Models, Channel Models, and Evaluation Methodology”

- **Industrial activities**
  - Reconfigurable Intelligent Surface Tech Alliance (RISTA)
  - Industrial panel on RIS at IEEE ICC 2022
  - 6G workshop at GLOBECOM 2022
  - On-line seminar (Dec. 2) on “Deployment scenarios and challenges in Reconfigurable Intelligent Surface”, as part of RIS seminar series of IMT-2030 (China)

- **Becoming a TC?**
**Most Well-Recognized Topics:**
- Waveform Design
- Wireless Sensing
- Vehicular ISAC

**Important But Challenging Topics:**
- Fundamental Limits & Tradeoffs
- Network Architecture and Performance Analysis

**Emerging Topics:**
- Hardware and Transceiver Design
- Security and Privacy
- OTFS for ISAC
- ISAC With Edge Intelligence

* The publication data was collected from IEEE Xplore in Dec. 2021
**ISAC-ETI: Recent Highlights**

**Highlights in 2021**
- JSTSP, “Joint Comms and Radar Sensing”, *published*.
- JSAC, “Integrated Sensing and Communication”, *published*.
- ISAC-Focus: ISAC-ETI Newsletters, *3 issues published*.
- Workshops: 2x VTC-Fall, 2x PIMRC, WCNC, ICC, ICTC.
- Special Sessions: 3x ICASSP, 2x SPAWC, Asilomar, RadarConf, *all in 2021*.
- Tutorials: ICASSP, SPAWC, WCNC, ICC, GLOBECOM, *all in 2021*.
- ICC/GLOBECOM SAC Track: *start from ICC 2023*.
- 1st IEEE ComSoc-SPS ISAC Webinar Series: 6 world-class academic/industrial leader on ISAC.
- GitHub ISAC Research Library Project: “Must-Readings on ISAC”, 190+ papers, 90+ stars on GitHub, 200+ unique visitors per week.
- Collaborations: with SPS ISAC-TWG (MOU signed), AESS Radar Panel, and One World Signal Processing (OWSP) Seminar Series.

**Highlights and Plan in 2022**
- IEEE ComSoc Best Readings on Integrated Sensing and Communications, *60+ items, Best Readings list published*.
- IEEE WCM, “Integrated Sensing and Communications for 6G”, *deadline June 1st, 2022*.
- IEEE TGCN, “Integrated Sensing and Communications for Future Green Networks”, *deadline June 1st, 2022*.
- EURASIP JASP, “Signal Processing for Integrated Sensing and Communications”, *deadline July 1st, 2022*.
- COMMAG, “Integrating Sensing into Communications in Multi-functional Networks”, *deadline Aug 1st, 2022*.
- IEEE Joint Comms and Sensing (JC&S) Symposium 2022, organized by 5G+ Lab Germany and ISAC-ETI, *held on Mar. 9-10, Austria*.
- 1st ACM MobiCom Workshop on Integrated Sensing and Communications Systems (ISACom), *deadline June 20*.
- IEEE Workshops/Special Sessions/Tutorials: 2x ICC, WCNC, GLOBECOM, ICASSP, SPAWC, VTC, ICC, EUSIPCO, SAM,...
- ISAC Datasets: Human Activities Recognition using 5G NR Waveform.
- Standardization Activities: IEEE 802.11bf WLAN Sensing Draft 0.1 ready, 1st 3GPP Study Item on ISAC *established*.

**ISAC-ETI Membership**: 900+ mailing list subscribers, 4000+ followers on WeChat, 1500+ WeChat Group Members, 900+ on YouTube/Bilibili.
ETI Group: Next Generation Multiple Access (NGMA)

- **Academic Chair**: Yuanwei Liu, Queen Mary University of London, UK
- **Industrial Chair**: Yan Chen, Huawei Technologies, Canada

- **Vice Chair**:
  - Zhiguo Ding, The University of Manchester, UK (Vice Chair for UK & Ireland Region)
  - Octavia A. Dobre, Memorial University, Canada (Vice Chair for Canada Region)
  - Wei Yu, University of Toronto, Canada (Vice Chair for USA & Latin America Region)
  - Petar Popovski, Aalborg University, Denmark (Vice Chair for Africa & EU Region)
  - Pingzhi Fan, Southwest Jiaotong University, China (Vice Chair for Asia-Pacific Region)
  - Peiying Zhu, Huawei Technologies, Canada (Vice Chair for Industry)

- **Secretary**: Wenqiang Yi, Queen Mary University of London, UK
➢ **Motivation:**

- **Large Network Capacity:** The number of mobile broadband users are expected to expand quickly in 6G, e.g., AR/VR applications
- **Heterogenous QoS Requirements:** New IoT applications with both connectivity and latency requirements
- **Multi-Functional Networks:** The integration of communication, sensing, computation, etc
- **Native AI Services:** The frequent data/model transfer between massive agents for efficient AI learning and inference
- ....

➢ **Mission:**

Provide a research and networking platform for researchers to collaborate, exchange ideas, and promote initiatives on **Next Generation Multiple Access (NGMA)** in wireless networks.
Scope:

- Power and code domain non-orthogonal multiple access under large-scale antenna systems
- Massive grant-free/semi-grant-free access schemes
- Unsourced random access schemes
- AI-enabled multiple access schemes
- Other emerging multiple access schemes
Selected Topics:

- Fundamental limits and performance analysis of NGMA
- Advanced channel coding and modulation for NGMA
- NGMA for ultra-reliable low-latency communication (URLLC)
- Evolution of non-orthogonal multiple access towards NGMA
- Massive/random access schemes
- Grant free and semi-grant free multiple access
- Synchronous and asynchronous multiple access schemes
- Machine learning and big data aided NGMA
- MIMO/Massive MIMO-assisted NGMA
- Interplay between reconfigurable intelligent surfaces (RIS) and NGMA
- NGMA enabled mobile edge computing
- Security provisioning for NGMA
- Massive non-orthogonal multiple aerial access
- NGMA for spectrum slicing and coexistence of services with heterogeneous requirements
- NGMA for emerging technologies, e.g., THz, CoMP, OTFS, VLC, integrated sensing and communication (ISAC)
- Hardware implementation challenges of NGMA
➢ **Strength:**

- Our officers and active contributors come from **different disciplines** related to NGMA (e.g., signal processing, information theory, machine learning & big data, cognitive networks & wireless communications, etc.), which guarantees high-quality research work.
- Our officers have sufficient experience in terms of **organizing research activities** (e.g., journal special issues, tutorials, conference workshops, seminar, etc.), which help the development and impact of NGMA.
- Our industrial partners are from influential companies, which contributes to the realisation and **standardisation** of NGMA.
Activities in Multiple Access Research Area:

Special Issues

- IEEE JSAC Special Issue on “Next Generation Multiple Access”, August 2021
- IEEE WCM Special Issue on “Massive Machine-Type Communications for IoT”, November 2020.
- The IEEE WCM Special Issue on “Non-Orthogonal Multiple Access for 5G”, 2018.

Workshop

- IEEE GLOBECOM Workshops on “Next Generation Multiple Access (NGMA) for Future Wireless Communications”, December 2022.
Tutorials

Difference with Existing ETI Groups:

Compared with existing eight ETI groups (i.e., Aerial Communications, Backhaul/Fronthaul Networking & Communications, Full-Duplex and Self-Interference Cancellation, Integrated Sensing and Communication, Machine Learning for Communications, Network Intelligence, Quantum Communications & Information Technology, and Reconfigurable Intelligent Surfaces), our group mainly focuses on the multiple access design, which is a new research direction.

In the area of NGMA, we will provide
• Solid basis for its academic research
• Wide applications and requirements in the industry community
• Promising designs for actual wireless networks
• Standards for 6G communications.
Benefit:

Thanks to the wide research areas of NGMA, our ETI will achieve insightful designs and valuable contributions to plenty of IEEE ComSoc technical committees:

- Communication Theory
- Communications Systems Integration & Modeling
- Wireless Communications
- Signal Processing & Computing for Communications
- Radio Communications
- Cognitive Networks and Computing for Communications
Future Activities:

- Tutorial proposals to be submitted for presentation at major IEEE communication and signal processing conferences (e.g., ICC, GLOBECOM, WCNC, PIMRC, VTC, ICCC, etc.)
- Special issue proposals to be submitted for IEEE journals (e.g., IEEE WCM, JSTSP, SPM, etc.)
- Organize workshops related to NGMA in major conferences
- ETI website to further promote initiatives and attract new collaborators
- Call to the arms to participate and contribute to this ETI group
- Regular seminars/talks to build relationship between academic and industrial to promote the realisation of NGMA
- Other possible activities for promoting the NGMA society
ETC - Future Goals

- Work with the Ad Hoc Committee to determine a new framework for TCs/ICs/ETIs
  - On hold determining how to evolve existing ETIs until the work of the Ad Hoc Committee(s) is complete

- Work with ComSoc’s TE&I (Technology Evolution & Initiatives) Committee to strengthen the tie with external initiatives, i.e. those originated from IEEE-level or multi-Society initiatives
  - Co-organize a session (1.5h) at ICC 2022 to introduce TE&I and ETIs activities to a broader set of members.

- Open call for **new ETIs** to incubate emerging technologies

- Provide guidance to new ETIs (e.g., NGMA) to help them launch successfully

- Call for interest among ETIs for proposing a **SI of JSAC** in 2022
Adjourn