

ABOUT IEEE COMSOC CHAPTER BANGALORE NEWSLETTER

The IEEE ComSoc Chapter, Bangalore Newsletter includes news useful to its members, non-members and highlights most important technology development. It also highlights important concluded and upcoming events. Links for few important topics from current issue of *IEEE Communication Magazine* are also embedded.

EDITOR MESSAGE

Dear Readers,

We are delighted to present the 8th edition of ComSoc newsletter, Bangalore Chapter, December 2020 issue. At the outset we would like to thank the chair and ExeCom for giving us the opportunity in bringing the eighth issue of the newsletter.

The newsletter highlights the activities and achievements which happened in the second half of the year 2020. We have included some high-quality technical articles of current trends like 5G and some nontechnical article in communication community and higher education information relevant to national and international institutes.

INSIDE THIS ISSUE

We discuss in one of the articles how the potent combination of AI-ML techniques can be applied in 5G for improving network efficiency, improving quality of services and security while at the same time simplify the deployment. While we are on the path to embracing 5G going forward from 4G, the aspect of security has never been more important. In one of the articles, we touch upon the recently discovered flaws which potentially allow attackers to intercept calls and track phone location. Blockchain technology has been utilized for safe exchange of things like cash, property, contracts without any intermediary agent. Another student article on the related topic of security explains how Blockchain technology can be used for improving security in IoT networks. Continuing on the theme of security we also have a student article discussing about threat modelling in networks. With the advent of 5G, Edge Computing and Cloud computing have become the main pillars. There is hardly any telecom operator who does not have an edge compute strategy to give enhanced services. We have an article which delves in some details of types of data processing in Edge Computing and how it is enabled by the Cloud. The 5G technology tutorial series part 8, also touches on this important topic.

In this newsletter, we also present consolidated reports from Student Branch Chapters related to IEEE ComSoc and future planned technical activities and views, findings, and advancements. We will be happy to receive more articles from various streams in the field of communication, technical research, and social awareness to publish in the next issues.

IEEE ComSoc Bangalore Chapter Newsletter Team:
Anindya Saha, Shobha KR & Navin Kumar

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CHAIRMAN MESSAGE



Dear IEEE Members,

Wish you all a Happy New year! A Prosperous 2021!

A natural question is: as Chair of 2020, what sense did I have of the year? My response has been: A Sense of Resilience, A Sense of Accomplishment, and A Sense of Gratitude. When we realized that we will be in lockdown for a while, we quickly changed all of our activities to online mode. We continued conducting our Execom meetings once per month. When we understood that this pandemic may continue longer, we started utilizing a plethora of tools to host in-depth workshop in virtual mode, stream them for wider dissemination, and carry out remote programs for students and young professionals.

We conducted a series of workshops on different "Technologies underlying 5G": edge computing, new radio (NR), AI infusion, multiple-access, IoT machine communication and many more. Our members significantly contributed to IEEE 5G World Forum anchored in Bangalore. From technical sessions to practical demos, all were carried out online in Sept. The second half also saw events around WiFi 6.0 and beyond, Cloud-native computing. Hyper-connected Networks et al.

Our student branches ensemble organized week-long seminars, each evening hosted by a member college. Our student branches now have grown to 9 from 7 a year back. Ph.D. EDITS program has been a great success. For young professionals, we specifically conducted Research Methodology workshops towards Publications, took new initiative for session on 'How to write your first Patent' and launched workshop on 'What does it take to participate in Open Source'.

Execom members' and volunteers' indomitable spirit as well as valuable knowledge have helped us grow our membership base in 2020 by 35% over last year. Our members have been inducted in IEEE Standards Association Governing Council, Indian standard body TSDSI GC, OCF association Chair for IoT Interoperability and so on. Also, two awards spoke volume about our team accomplishments: the first, best large-section chapter award in Bangalore Section; and the second, Best ComSoc chapter award in Asia-Pacific region.

I am very thankful for entrusting me to continue leading this vibrant society in 2021 also. We will strive to make this society stronger in terms of professional growth and community engagement. My sincere thanks go to all of you for your time and effort. We have started off the year with a 90-minute AGM today (9th Jan 2021) followed by an hour-long execom meeting. Possibilities are galore. Our mindset is expansive. I am looking forward to your continued participation to make Y2021 a unique year!

Dr. Aloknath De,
Chair 2020 and 2021, IEEE Bangalore ComSoc Chapter,
CTO ~ Samsung India, Bengaluru.

Dear Reader, we plan to dedicate this page for 5G Tutorial Series. Starting from the basic, I would like to continue discussing about 5G Cellular System and Technologies in sequence (starting from Part 1, Part 2, etc). The tutorial will be in continuation from the previous issue. I hope, we will go in parallel with ongoing 5G research and development. It is believed that the reader will gain better understanding of 5G Cellular System if they follow the tutorial. In the last part VII, we discussed on Edge Computing and Multi-Access Edge Computing. In this issue we are continuing our discussion on Mobile Edge Computing.

Navin Kumar, PhD, Associate Professor, Amrita School of Engineering Bangalore

5G TECHNOLOGY AND CELLULAR SYSTEM TUTORIAL SERIES: PART VIII – EDGE COMPUTING CONTINUED...

Sheeba Kumari M and Navin Kumar, PhD

In the previous part of the series, we familiarized edge computing with specific attention to its benefits and drawbacks. With edge computing, the goal is to bring the computing process near to the source of the data, thereby reducing the reliance on remotely located cloud servers as well as bringing down latency. Furthermore, we had briefly discussed the concept of multi-access edge computing (MEC). In this part, we will detail the MEC architecture.

Multi-access edge computing, also known as mobile edge computing (MEC), is a network architecture concept defined by the European Telecommunications Standards Institute (ETSI) MEC Industry Specification Group (ISG) standardization organization. It specifies a complete orchestration architectural framework and defines a number of well-defined open and standard APIs for using the information produced by distinct services/applications. The framework can be dynamically deployed on top of a virtualized infrastructure. A thorough understanding on the multi-access edge system can be obtained from the MEC reference architecture. The architecture typically defines the functional entities with their relations to each other. The MEC architecture, as shown in Fig.1, differentiates among mobile edge system and mobile edge hosts levels.

The Multi-access Edge System (MES) consists of several multi-access edge hosts and the multi-access edge management entities necessary to execute multi-access edge applications within an operator network. The core element here is the mobile edge orchestrator that maintains a complete view of the mobile edge hosts, including their available resources and services. The mobile edge orchestrator on-boards and records applications, performing integrity checks while confirming the rules and requirements, for running the software packages, comply with operator policies. It can hence select the most appropriate mobile edge host which will be used to instantiate an application based on the available services, required resources and infrastructure demands, such as latency.

As seen in Fig.1, the Multi-access Edge Host (MEH) entity contains a Multi-access Edge Platform (MEP) and a virtualization infrastructure (VI). The MEP, within the

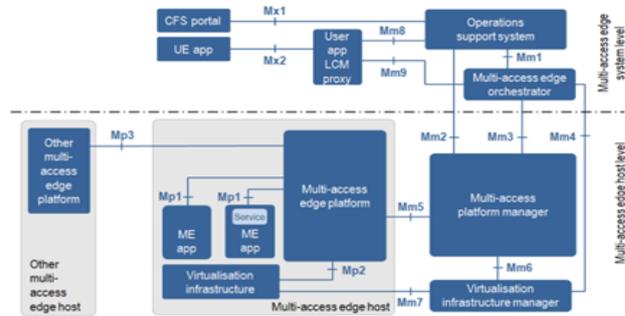


Fig. 1: ETSI MEC reference architecture
Source: <https://doi.org/10.3390/electronics9091392>

host provides service and application assistance for mobile applications. It provides a functional environment where applications can discover, advertise, consume and offer multi-access edge services. Basically, all the data related to each mobile edge application instance is stored within the platform. This includes any transport dependencies, traffic rules and DNS rules. MEP controls all the mobile edge applications under the direction of the mobile edge platform manager (MEPM) which acts as the element management of the MEP. In fact, MEPM manages all the aforesaid data related to the mobile edge applications and performs their lifecycle management. It also informs the MES of any relevant application-level events. Furthermore, the MEPM receives and processes status reports and performance measurement information from the virtualization infrastructure manager (VIM). In the MEC architecture, VIM is responsible for allocating, managing, and releasing virtualized resources, thereby preparing the VI to run a software image. The VI is basically a Network Function Virtualization Infrastructure (NFVI) which provides compute, storage, and network resources for running multi-access edge applications on top of it. It includes a data plane that executes the traffic rules received by the MEP, routing the traffic among applications, services, DNS server/proxy and both, local networks, and external networks. The multi-access edge applications running as virtual machines are thus instantiated on the VI of the MEH based on configuration or requests validated by the mobile edge management.

To conclude this discussion, the key to deploying MEC services is to have a virtualized architecture and 5G services will eventually require mobile edge computing capabilities to cater for a wide set of its promised use cases. We will continue this discussion little more in the next issue.

COMMUNICATION SOCIETY MEMBERSHIP STATISTICS AND GROWTH IN 2020

TOTAL MEMBERS: 485 (DEC 2020)		MORE THAN 125 INCREASE FROM LAST YEAR.	
FELLOW + LIFE FELLOW:	5	GRADUATE STUDENT MEMBER	74
SENIOR MEMBER	109	STUDENT MEMBER	130
MEMBER	142	OTHERS:	35

IEEE COMSOC EXECOM 2021

OFFICE BEARERS		
1	Dr. Alok Nath De, CHAIR	Samsung -R&D Institute
2	Dr. Ganesan Thiagarajan, CHAIR-ELECT	MMRFIC Pvt. Ltd.
3	Mr. Subhas Chandra Mondal, VICE CHAIR	Wipro
4	Ms. Sheeba Kumari M, SECRETARY	Amrita Vishwa Vidyapeetham University
5	Prof. Mahesh Kumar Jha, TREASURER	CMR Institute of Technology
EXECOM MEMBERS		
6	Dr. Saptarshi Chaudhuri	Radisys
7	Dr. Jyotsna Bapat	IIIT-Bangalore
8	Mr. Tushar Vrind	Samsung-SSIR
9	Mr. Anindya Saha	Saankhya Labs Pvt Ltd
10	Mr. Jomy Jose	L&T Technology Services Ltd
11	Mr. Subodh Gajare	CISCO R&D
12	Dr. Vinosh James Babu	Qualcomm
13	Dr. Shobha KR	Ramaiah institute of technology
14	Dr. Sreeja Sukumaran	Christ University
15	Ms. Gnanapriya C	Infosys Technologies Ltd
16	Dr. Sanjeev Gurugopinath	PES university
17	Mr. Ravikanth Pasumarthi	Altran
18	Mr. Bighnaraj Panigrahi	Tata Consultancy Services
19	Mr. Shushrutha K S	RV College of Engineering
20	Mr. Chengappa M R	Hewlett Packard Enterprise
21	Mr. Paramvir Singh	Nokia
22	Dr. Ashwin T S	St Joseph Engineering College
23	Dr. Prasad H L Bhat	Astrome Technologies Pvt. Ltd
PAST CHAIRS		
24	Dr. Navin Kumar	Amrita Vishwa Vidyapeetham University
25	Dr. Dilip Krishnaswamy	Reliance Jio Platforms Ltd

EVENTS CONDUCTED (JULY TO DEC 2020)

Sl.No	Date	Event Title (Venue)
1.	2/7/2020-4/7/2020	IEEE Conference CONNECT 2020 (COMMUNICATION TRACK) (Virtual Event)
2.	18/7/2020	Nurturing Career Amidst Adversities during Pandemic (Virtual Event)
3.	25/7/2020	Intellectual Property: how to write your first Patent. (Virtual Event)
4.	18/8/2020	Research Methodology and Authorship Lab Workshop jointly with KSTA -Inaugural, Defining Research Problem (Virtual Event)
5.	19/8/2020	Research Methodology and Authorship Lab Workshop jointly with KSTA -Addressing the Research Problem -Authorship (How to write a quality paper and publish) (Virtual Event)
6.	20/8/2020	Research Methodology and Authorship Lab Workshop jointly with KSTA -Peer Review Process -IPR (Filing Procedure) (Virtual Event)
7.	21/8/2020	Research Methodology and Authorship Lab Workshop jointly with KSTA -Tools for Documentation (Virtual Event)
8.	29/8/2020	Cloud Native Computing Architecture in 5G (Virtual Event)
9.	2/9/2020	Wireless Communication Workshop- Experimental Testbeds in V2X Research (Virtual Event)
10.	3/9/2020	Wireless Communication Workshop- Radio Technologies in LTE (Virtual Event)
11.	4/9/2020	Wireless Communication Workshop- Use cases of ML, AI Algorithms in 5G and Beyond (Virtual Event)
12.	5/9/2020	Wireless Communication Workshop- Mathematical foundation for Error Control Coding (Virtual Event)
13.	7/9/2020	Wireless Communication Workshop- MCM and MIMO for DSL and LTE (Virtual Event)
14.	8/9/2020	Wireless Communication Workshop- D2D Communication (Virtual Event)
15.	26/9/2020	Hyper Efficient and Intelligent Future Networks (Virtual Event)
16.	10/10/2020	Introduction to Quantum Communication Systems (Virtual Event)
17.	22/10/2020	DL -Full Duplex Radio (Virtual Event)
18.	7/11/2020	UAV System: 3GPP Perspective (Virtual Event)
19.	8/11/2020	IEEE PhD EDITS 2020 (Virtual Event)
20.	28/11/2020	3 rd One day workshop on 5G in Intelligent Transportation Systems (ITS): How 5G can Solve Bangalore Traffic problem (Virtual Event)
21.	05/12/2020	EEE Authorship Lab - How to Write and Publish Technical Article (Virtual Event)
22.	12/12/2020	Open Source in Communication Virtual Workshop Organized By IEEE ComSoc Bangalore with Samsung R&D Institute – Bangalore

RECENT IMPORTANT EVENTS

A very successful half day VIRTUAL workshop was organized on 29th August 2020, on Cloud Computing architecture in 5G. The workshop was attended by over 130 participants.



IEEE ComSoc Bangalore Chapter
IEEE SA STANDARDS ASSOCIATION

IEEE ComSoc Bangalore jointly with SA & Section organize workshop on
Cloud Native Computing Architecture in 5G

Cloud technologies have gained prominence over last two decades. Evolution of cloud computing has transformed the way we design, build, and host scalable applications. The flexibility and scalability of cloud technologies have catalyzed transformation of platform-specific enterprise applications to run in containerized environments provided by the cloud platforms. The enterprises are increasingly relying on public cloud to scale their business applications keeping the co-processed data closer.

As 5G adopts microservices architecture, cloud native architecture becomes significant as Virtualized Network Functions (VNF) are increasingly moving towards Cloud Native Functions (CNF). This evolution provides rapid scalability of telecom network infrastructure while maintaining the carrier grade performance.

Learn from **IEEE DMTS Architects** on the Cloud Native architecture evolution and how it is being effectively leveraged across industries to handle highly scalable, concurrent and resilient systems. The session also covers cloud agnostic architecture and its best practices; trends in Serverless, Cloud Native languages and operations; deployment options in edge node and deep dive of popular Cloud Native Edge platforms like K3s, KubEdge, Akamai K2L.

Virtual Workshop
29 Aug 2020 (Saturday)
10:00 –13:00
(Mark your calendar)

<http://in.explara.com/cloud-native-5g>

Registration
 IEEE Member: 150/- INR
 Non IEEE: 250/-
 ComSoc & SA Member: FREE
 Student (member or none member): FREE

Contact for more information
 navinkumar@ieee.org
 sylvia.monday@ieee.org

Time	Title of talk	Speaker
10:00-10:15am	Opening Remarks	Alokesh Bg, ComSoc Chair, Puneet Mishra, Section Chair, Srichandrashekhar, SA Director
10:15-10:30	Introduction of Speakers	Prof. Navin Kumar, Aurora University, Subhas Mondal
10:35-10:35	Why Cloud native computing in 5G?	Wojciech Foltys and Chair Architect-5G
10:35-11:30	Cloud Native Architecture and future directions	Arunesh Ajay Yarra - Telco, Chief Architect, Bharath Kasimani - DMTS-Senior Member
11:35-12:05	Cloud Agnostic vs Cloud Native	Dr. Rajesh Kashani - DMTS-Distinguished Member
12:05-12:35	Cloud Native Edge Platforms	Abhinav Jain- DMFS-Senior Member
12:35-12:55	Q & A	All panellists
12:55-13:00	Closing Remarks	ComSoc ExecCom

REGISTER: <https://in.explara.com/cloud-native-5g>

WELCOME, MEMBERS!
 Welcome, members!

Pay for a Year and get membership for 16 months. Renew your membership. Join Now. Add a Society. Get your company enjoyed.

A very innovative VIRTUAL workshop was Organized on November 2020, on UAV systems in collaboration with Vehicular Technology Society. . The workshop was attended by 372 participants.



IEEE ComSoc Bangalore Chapter
IEEE VTS

IEEE VTS jointly with ComSoc Bangalore organizes workshop on
UAV System

Unmanned aerial vehicle (UAV) widely known as drone is an aircraft without a human pilot on board and a type of unmanned vehicle. UAVs are a component of an unmanned aircraft system (UAS), which include a UAV, a ground-based controller, and a system of communications between the two. The flight of UAVs may operate with various degrees of autonomy: either under remote control by a human operator, autonomously by onboard computers or piloted by an autonomous robot. UAVs is being discussed by 3GPP in Rel. 15, 16 and also in Rel. 17. Some part has been discussed in LTE as well.

UAVs have many potential applications. Starting from military applications, their use is rapidly expanding to commercial, scientific, recreational, agricultural, and other applications, such as polling and surveillance, product deliveries, social photography, infrastructure inspections, smuggling, and even drone racing.

Join this workshop to hear from industry leaders and professionals to understand the development and research/standards activities of UAV system.

Virtual Workshop
07 Nov 2020 (Sat)
9am – 5:30p
(Mark your calendar)
Registration Link

SCHEDULE

Time (IST)	Event	Speaker
9:25-9:30am	Opening Remarks	Dr. Nitesh, Akhlesh Bg, and Puneet ComSoc and section leader
9:30 - 10:15am	UAV, Advanced Aerial Mobility – Technical and Social Challenges	Prof. Karanish Namdarik, City of North Texas, USA
10:15 - 11:00am	Balanced LTE support for aerial vehicles Rel.15,16	Senita Sengupta, Chief Architect, Network Solution Group, IATA, Constellation Services
11:00 - 11:45pm	Rel.17 enhancement for supporting UAVs from 3GPP system and application layer aspect	Nitesh Anand, Group Executive, Network Solution Group, IATA Constellation Services
11:45-12:30pm	Autonomous Navigation in constrained indoor environments for industrial use cases	Arundhanji T, DMFS Senior Member & CVIS Solution Director
12:30 - 13:15pm	Unmanned Traffic Management (UTM)	Sandeep Parthasarathy CEO, Deepjays Software
13:30 - 14:15pm	Remote Identification and Tracking	Abhinav Bhattacharjee, Founder, Aigantek Technologies
15:00 - 16:00pm	Panel Discussion: UAV opportunities in India	Panellists
16:00-16:15pm	Closing remarks	Chair and Coordinators

IEEE Member: 200/-
 Non IEEE: 400/-
 Free for ComSoc & VTS Member

Contact for more information
 paramvir@ieee.org

JOIN IEEE: Join a society & Get Many Free registration opportunity

<https://in.explara.com/uav-system>

IEEE ComSoc Bangalore Chapter | **Nokia - IEEE ComSoc Workshop 2020** | **NOKIA**

Hyper Efficient and Intelligent Future Networks

- Open RAN
- Reliable and Interruption-free mobility
- Distinguished Lecture Talk from Nokia Global Speaker : AI/ML in Physical Layer
- Cloud Native Telecom Products
- Hyper Intelligent Enterprise

Panel discussion – Beyond 5G ???

Date : 26th September 2020
Time : 9:30 AM to 02:00 PM

REGISTER HERE: <https://in.explara.com/e/hyper-efficient-and-intelligent-future-networks>
Free for IEEE/Nokia; Non-IEEE: 100/- INR (Schedule Next Page)
Contact: navinkumar@ieee.org /// paramvir.singh@nokia.com

IEEE COMSOC BEST READINGS

- <https://www.comsoc.org/publications/best-readings/network-localization-and-navigation>
- <http://www.comsoc.org/>
- <http://www.comsoc.org/whitepapers>
- <https://www.comsoc.org/publications/ctn/be-or-not-be-there-person-what-future-technical-conference>

Multiple PhD and Postdoc positions at Vienna University of Technology

Postdoc and PhD positions are available at the Institute for Information Systems Engineering, Vienna University of Technology, Vienna, Austria. The candidates are expected to have a background in one or more of the following fields: Software engineering, systems science, distributed systems, virtualized HPC systems, systems monitoring, dependency, data science, distributed machine learning, sustainable computing, and environmental informatics.

The deadline for applications is January 20, 2021. More information and details about the application procedure can be found at: http://rucon.ec.tuwien.ac.at/files/Positions_2021

Open Post-Doc openings at Chalmers University of Technology, Sweden (on Machine Learning and on B5G localization)

1. Postdoctoral Researcher in "Localization and Sensing for Beyond 5G". This position is part of the Hexa-X project (see <https://hexa-x.eu>), the European Union's first flagship project on 6G. Hexa-X brings together the key industry stakeholders, along with the full value-chain of future connectivity solutions ranging from network vendors, operators, verticals, and technology providers (e.g. software and Internet of Things (IoT) solutions), as well as prominent European research institutes and universities.

Application Closing Date: January 15, 2021

Application Link: <https://www.chalmers.se/en/about-chalmers/Working-at-Chalmers/Vacancies/Pages/default.aspx?rmpage=job&rmjob=9081&rmlang=UK>

More information: henkw@chalmers.se

2. Postdoctoral Researcher in "Machine learning for physical layer communication". This position is one of 5 positions within a new project (HOT-OPTICS, in collaboration with Nvidia, Volvo Cars, and Saab Surveillance) on communication in harsh computing environment. Please feel free to share this email with interested colleagues and your recent PhD graduates.

Application Closing Date: January 31, 2021

Application Link: <https://www.chalmers.se/en/about-chalmers/Working-at-Chalmers/Vacancies/Pages/default.aspx?rmpage=job&rmjob=9027&rmlang=UK>

More information: henkw@chalmers.se

Postdoc position at Virginia Tech, Department of Electrical and Computer Engg.

The laboratory of research in optimization, learning, and energy (ROLE), led by Dr. Ming Jin in the Bradley Department of Electrical and Computer Engineering at Virginia Tech has one open position for postdoc researcher in the area of reinforcement learning and control theory. The research project is on trustworthy reinforcement learning.

If your interests are compatible, please feel free to send me your CV along with one or two representative papers. Recent PhDs with strong mathematical backgrounds and have publications in

the areas of optimization, control theory, machine learning, and statistics are preferred.

More information: Prof Ming Jin,
Homepage: <http://www.jinming.tech/>
Email: jinming@vt.edu

Multiple positions at Eindhoven University of Technology

The Information and Communication Theory Lab (ICT Lab) at the Eindhoven University of Technology has multiple vacancies in the general areas of communication and information theory. These include post-master (PDEng), PhD and PostDoc positions in the following topics.

- (1) Sensing and Communications for Vehicular Networks (PostDoc),
- (2) Information Theory of Fiber Optical Communications (PostDoc),
- (3) Multi-access and Interference Management in Wireless Communications (PhD),
- (4) Statistical Learning and Inference Theory (PhD),
- (5) FPGA Implementation of High-speed Coding and Shaping algorithms (PDEng or PostDoc).

In these projects, the candidates will perform fundamental research and/or investigate efficient hardware implementation techniques with our collaborators from industry. Positions are offered by our academics Prof. Frans Willems, Assoc. Prof. Alex Alvarado, and Asst. Prof. Hamdi Joudeh.

For more details on all vacancies, please visit this link: <https://www.sps.tue.nl/ictlab/vacancy/>

Research positions are open @ IIT-CNR, Pisa, Italy, on the following topics:

#1. Big Data Analysis and Decision Support Systems for Smart Healthcare applications

** Position type: Research Assistant, 12 months

** Scientific Supervisor: Franca Delmastro -

<https://www.iit.cnr.it/franca.delmastro/>
<https://scholar.google.it/citations?user=fiw73vIAAAAJ>

** Net salary: ~ EUR 1500 per month

#2: Cooperative Ubiquitous Opportunistic Charging with Intelligent Battery Aging Mitigation

** Position type: Postdoctoral Fellowship, 12 months

** Scientific Supervisor: Theofanis Raptis -

<https://www.iit.cnr.it/theofanis.raptis/>
https://scholar.google.com/citations?user=aDoDo_kAAAAJ

** Net salary: ~ EUR 1625 per month

** Starting date: Q1 2021

** Location: Ubiquitous Internet Research Unit (RU) @ IIT-CNR, Pisa,

Italy - <http://www.iit.cnr.it/>

** RU Leader: Andrea Passarella -

<https://scholar.google.it/citations?user=sesKnygAAAAJ>

** Application deadline: continuous evaluation, up until mid-February 2021

STUDENT BRANCH CHAPTERS CORNER

INDIAN INSTITUTE OF SCIENCE, BANGALORE

The ComSoc Student Branch Chapter was formed on 13th January 2011. The branch has 18 ComSoc members.

Faculty advisor: Prof. T. Srinivas

Student Chair: Chandana S Deshpande

AMRITA SCHOOL OF ENGINEERING, BANGALORE CAMPUS

The ComSoc Student Branch Chapter was formed in April 2016. The student branch has largest number of student members over 120 and perhaps the largest Student ComSoc Members. They conduct lot many activities and are highly active.

Faculty advisor: Sagar Basavaraju

Student Chair: D Meher Vamsi

RAMAIAH INSTITUTE OF TECHNOLOGY, BANGALORE

The ComSoc Student Branch Chapter was formed in 9th Dec 2019. The branch has 30 ComSoc members.

Faculty advisor: Dr . Shobha K R

Student Chair: Shreshtha Mehrotra

RVCE, BANGALORE

The ComSoc Student Branch Chapter was formed in July 2016.

Faculty advisor: Shushrutha K S

Student Chair: Kashish Malhotra

ST JOSEPH ENGINEERING COLLEGE, MANGALURU

The ComSoc Student Branch Chapter was formed on 28 April 2018.

Faculty advisor: Dr Rohan Pinto

Student Chair: Valona Mandonca.

CMRIT, BANGALORE

The ComSoc Student Branch Chapter was started in late 2012 but was inactive for a short period. It was restarted on 30 April 2019.

Faculty advisor: Mahesh Kumar Jha

Student Chair: Rashmi T

MALNAD COLLEGE OF ENGG, HASSAN

The ComSoc Student Branch Chapter was formed in Oct 2019.

Faculty advisor: Triveni.C.L

Student Chair: Chalana S.

NEW CHAPTERS STARTED IN 2020

REVA UNIVERSITY, BANGALORE

The ComSoc Student Branch Chapter was formed on 25th September 2020.

Faculty advisor: Abdul Haq N

Student Chair: Bhoomika M

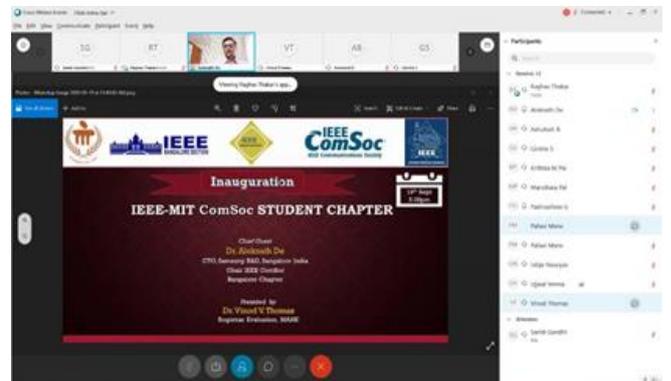


MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL

The ComSoc Student Branch Chapter was formed on 27th August 2020 and inaugurated on 19th September 2020.

Faculty advisor: Dr Ujjwal Verma

Student Chair: Krithika M Pai



ARTIFICIAL INTELLIGENCE AND 5G: A REVOLUTIONARY COMBINATION IN WIRELESS NETWORKS

Abdul Haq Nalband, Assistant Professor
 Dr. Mohammed Riyaz Ahmed , Assistant Director
 REVA University

Artificial Intelligence (AI) replicates human-like intelligence such as perception, logic, and learning. 5G and AI are two of the most disruptive technologies the world has seen in decades. Each is individually revolutionizing industries and enabling new experiences. While 5G offers capabilities to support low latency and very high speeds (eMBB), a massive number of devices (mMTC), heterogeneous mix of traffic types from a diverse and demanding suite of applications (URLLC), AI complements by learning from complex patterns to provide scope for autonomous operation, transforming 5G into a scalable real-time network that is data driven. The five key factors driving AI adoption by telecom service providers (telcos) include network optimization, improved sales and marketing, enhanced customer experiences, monetization of consumer data, and new services. Industries have made numerous investments in AI in an effort to help network operators reduce operational costs and optimize their networks for faster, more reliable communications.

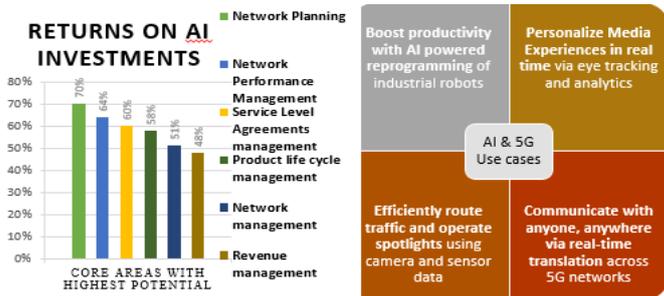


Fig.1. Chart with returns on AI and AI&5G use cases.

AI for Network Slicing

Network slicing allows service providers to segment their 5G networks to support services and deploy multiple logical networks for different service types over one common infrastructure. This flexibility lets different applications use varying bandwidth, and importantly, maintain varying levels of reliability depending on need. Dedicated network slices give a multitude of opportunities for service providers to grow their business, especially towards industrial use cases. These new use cases bring new and more diverse network requirements which increase the complexity beyond human control. To ensure that networks become agile and flexible, as well as easy to operate, AI and automation are imperative. AI makes it possible to create self-healing networks and hence Telcom operators have intentions to embed AI-infused solutions that can identify problems, suggest, and apply solutions in a proactive manner. Figure.2 depicts 5G network slicing,

indicating 3 applications which require different network resources.

AI in the network and on the device

Applying AI to both the 5G network and the device will lead to more efficient wireless communications, longer battery life, and enhanced user experiences.

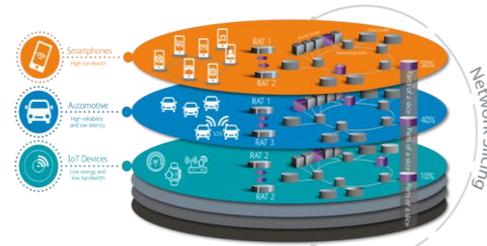


Fig.2. 5G Network slicing (Source: VIAVI)

AI has to be adopted on important wireless challenges that are both difficult to solve with traditional methods and are also a good fit for machine learning. AI will have a strong impact on several key areas of 5G network management. On device AI is going to improve the 5G end-to-end system. Radio awareness is at the heart of how AI will improve 5G, using machine learning rather than a hand-crafted algorithm, is the perfect tool to make sense of the complex RF signals around the device.

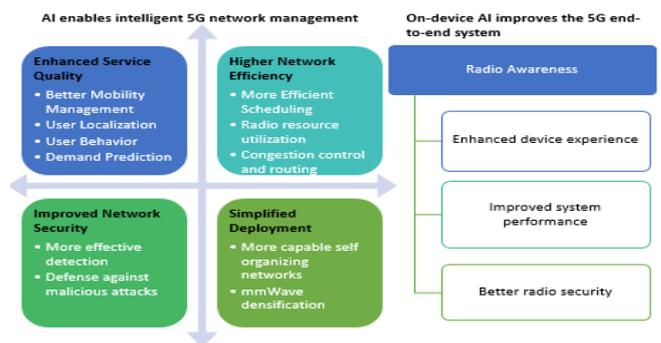


Fig.3. AI in 5G network management and on the device

5G making AI-powered experience better.

The promising features and techniques for 5G will enable many new experiences such as next-generation edge convergence with AI systems on chip (application of cross technology network interfaces), massive device concurrency replenishing AI data lakes in real time (application of massive connectivity), ultra-fast, high-volume streaming for low-latency AI (application of low-latency in 5G), and distributed learning over wireless.

AI challenges

The biggest challenge is the lack of AI models tailored to their specific use cases. To build these AI and ML models, they need high-quality data that is not siloed or fragmented. Hence there is a need to develop effective mechanisms for collecting, structuring, and analyzing the huge volumes of data that AI is capable of amassing. There are also security concerns associated with data lakes since a large amount of data is accessible from one location.

NEW FLAWS IN 4G, 5G ALLOW ATTACKERS TO INTERCEPT CALLS AND TRACKPHONE LOCATIONS

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Highlights

- Vulnerability allows attackers to track phone's location.
- Additional attacks could let hackers intercept phone calls and messages.
- Vulnerability impacts both 4G and 5G networks.

A group of academic researchers from Purdue University and the University of Iowa have revealed vulnerabilities in 4G and 5G infrastructure that allow those with malicious intent to track the location of any mobile phone. More worrisome is their claim that the vulnerabilities they have discovered could also allow hackers to intercept phone calls.

This is supposedly the first-time vulnerability has been discovered that impacts both 4G and the upcoming 5G standard. Besides higher data speeds and lower latencies, 5G also promised improved security, which this new flaw seems to be able to circumvent. The researchers are to present their paper on the topic at the Network and Distributed System Security Symposium in San Diego. TechCrunch has had early access to the paper and have had a look at how the three attacks work to achieve their goal.

The first attack is called Torpedo and exploits the paging protocol which carriers use to notify the phone about an incoming text or call before it is received. The attack involves calling the target phone a number of times in short duration, which triggers a paging message without alerting the target device to an incoming call. This can be used by the attacker to track a victim's location.

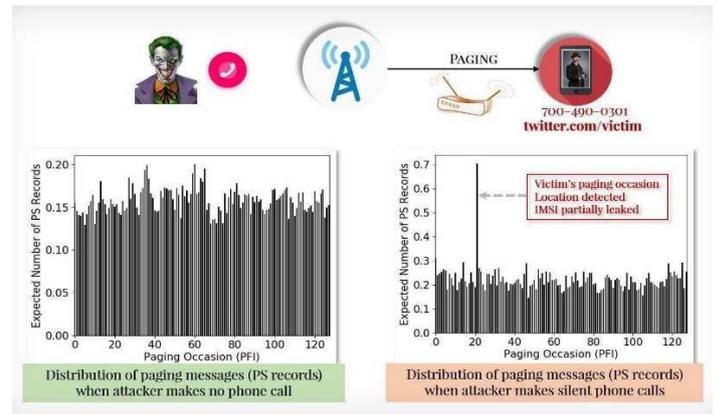


Fig: The Torpedo attack – or “TRacking via PAGING mESsage DistributiON.

Torpedo further allows two more attacks; Piercer and IMSI-Cracking attack. The former refers to the attack's ability to identify the International Mobile Subscriber Identity of a cell phone. IMSI is supposed to be encrypted. The IMSI Attack can further use brute force against the IMSI number, which allows the attacker to track a phone's location and intercept calls and messages.

The researchers say that the flaws were reported to GSMA, the body that represents mobile operators, but received no comment. According to the researchers, the Torpedo attack would be the first priority to address since that is the gateway for the other two attacks. After that, the GSMA would need to address the IMSI attack while the operators would be responsible for fixing the vulnerability that allows the execution of the Piercer attack.

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- <https://www.theverge.com/2019/2/25/18239965/4g-5g-security-flaws-spying-hack-eavesdrop-fake-alert>
- <https://www.infosecurity-magazine.com/news/all-4g-networks-susceptible-to-dos/>

BLOCKCHAIN FOR SECURITY IN IoT

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IoT (Internet of Things) refers to devices or objects connected over the internet. In an age of growing dependency on smart IoT based devices, recent concerns have been raised about IoT's ability to secure data, calling for viable solutions. IoT has been associated with major cyber attacks, often involving the abuse of vulnerable connected devices, such as surveillance cameras, to facilitate malicious activities like "man in middle attack". Here comes blockchain, an emerging technology that aims to reduce the risk of IoT devices' being compromised through a central authority and to improve the scalability of IoT implementations. It focuses to enable protection of IoT networks through a number of ways, using consensus algorithms and smartly detecting and tracing errors enabling a swifter and more focused redressal of the same.

With IoT and blockchain working together, the latter is expected to provide a verifiable and secure recording method for devices and processes associated with the former.

Features of Blockchain

Blockchain is a distributed ledger where the database is shared across a network of computers. All addition, deletion, modification of data gets recorded. It consists of two main components- block & chain. Block is the entity that stores digital representation of data. Chain represents the world state of block giving us information about its status. It is stored in a similar fashion to that of a linked list.

The application of blockchain in IoT security enables direct information sharing between connected devices via decentralized network. This means that no single entity has total control of the database; all changes made to ledgers are decided upon by consensus mechanisms over the network. Each wallet in private blockchain networks can define desired view and edit request access over the network.

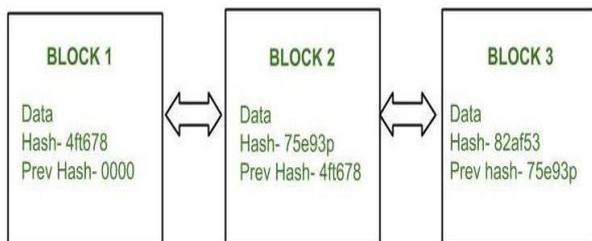


Fig 1: Data stored in Blockchain

Implementation

The most promising and easiest way to introduce block chain security in IoT networks is to install chips in every device. Data will no longer travel from sensors to the cloud to be approved but rather will be sealed by a **private key** in the device and anchored in a public block chain. Hence data ever recorded on a sensor gets recorded on the block chain.

Decentralised approach

Apart from providing shared access and immutability, this approach has other benefits as well. As the IoT scales exponentially, decentralized networks have the potential to reduce infrastructure and maintenance costs to manufacturers. Decentralization also promises increased robustness by removing single points of failure that could exist in traditional centralized networks. By shifting the power in the network from the centre to the edges, devices gain greater autonomy and can become points of transaction and economic value creation for owners and users.

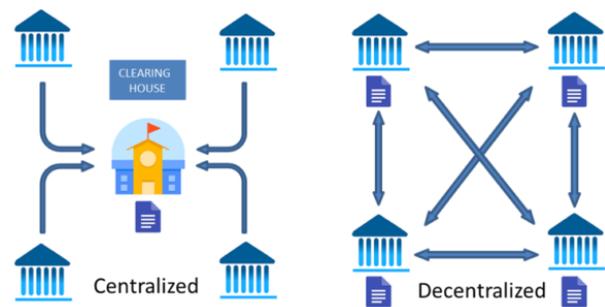


Fig 2: Centralized vs decentralized public ledgers in networks.

Examples of applications

IoT devices seek benefit with blockchain where data integrity is valued, and it is essential to know that data recorded was not tampered with.

1. E-voting
2. Organ/ plasma transport
3. Surveillance systems
4. Automatic dishwasher/ washing machines.

Conclusion:

With blockchain, each device will have strong cryptography, further ensuring secure communication with other devices and affording anonymity in IoT use cases where privacy is of utmost concern. Adopters will have the ability to better track devices and distribute security updates, helping to fortify potentially vulnerable devices.

EDGE COMPUTING

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Introduction

Edge computing is the practice of capturing, storing, processing, and analyzing data near the client, where the data is generated, instead of a centralized data-processing warehouse. Hence, the data is stored at intermediate points at the 'edge' of the network, rather than always at the central server or data center. Edge computing is the idea that processing should happen closer to where data is created, when it makes sense. Edge intelligence refers to the ability to intelligently distribute computing between edge and cloud resources.

Features of edge computing:

1. Ultra-high network performance.
2. Deployment flexibility.
3. Differentiated experiences.
4. Integrated virtual probe and real-time analytics.
5. Automation

Security

The IoT, by its very nature is a distributed, complex network of devices. Having security services also distributed at the edge means that malicious attacks aimed at the network are harder to instigate as attacking single nodes will only have limited impacts. The edge also offers more processing power to prevent attacks such as DDoS in addition to the central core, as well as offering native security for new low latency applications.

By focusing IoT activity at the edge, through selective data generation and collection, some attack vectors could be minimized. Holding and transporting less data makes both the system more secure but also frees up system resources for better security management and authentication.

Data processing

Data processing at the Edge comprises of the following types.

Priority messaging – The process of prioritizing data and thereby giving preference to the critical data of higher priority is called priority messaging.

Data aggregation – As more IoT devices are connected, and more data generated, it is likely there will be more replication of data from those devices. The edge therefore has a role in either selecting which data to send or aggregating common data from multiple sensors together.

Data replication – Data replication is the process of replicating data and storing it into different nodes. Data replication is one of the best practices to avoid any impact due to server failure or system hardware related issues.

Cloud enablement:

IoT edge environments will rarely operate completely in isolation, thus cloud is involved in the edge technology. The hybrid architecture of edge-cloud has several advantages which the end user avails.

Applications of edge computing:

1. Smart cities i.e. automated streetlights, automated vehicular traffic management, etc.
2. Health care sector.
3. Automation of industries and manufacturing sectors, and many more.

THREAT MODELING IN NETWORKS

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Threat modeling is well-known among information security professionals as a method for investigating a system's vulnerabilities (Inger Anne Tøndel, 2013). It is a process by which potential threats and vulnerabilities can be identified and mitigations can be planned. Threat modeling "provides a structured way to secure software design, which involves understanding an adversary's goal in attacking a system based on system's assets of interest" (P. Bedi, 2013). This can be employed to optimize security in networks. Threat modeling methods can be classified into manual or automatic modeling, and formal or graphical modeling (Xiong Wenjun, 2019). While in graphical modeling, attack trees, attack graphs and tables are employed, formal modeling relies on mathematical models. There are hybrid models which are semi-automated and formal and graphical as well.

Two widely adopted threat models are STRIDE and DREAD. Some of the threat categories that STRIDE deals with are Spoofing, Tampering, Repudiation, Information disclosure, Denial of Service and Elevation of Privilege. Rating of risks can be done using DREAD model. Damage, Reproducibility, Exploitability, affected users and Discoverability are the key points of DREAD model. Threat modeling and security risk analysis are applicable to Software Defined Networks(Eom, Hong, An, Park, & Kim, 2019). Security assessment framework used in SDN involves SDN Manager, Threat scanner, system model, threat model, security assessment and countermeasures. Long Term Evolution Networks are a part of Internet Service Providers. Threat models can be defined for such LTE networks also (D. Sattar, 2018). Three major risks like availability of network resources, unauthorized access, end user privacy and confidentiality are identified in LTE Networks.

There are many threat modeling tools. Microsoft's free tool SDL was replaced with Threat Modeling Tool (TMT) was based upon STRIDE model. Threat Modeler is another tool that works based on VAST (Visual Agile Simple Threat Modeling) methodology, projects ideas on threats through architecture flow diagrams using the intuitive user interface. In all, threat modeling is very significant to assess risks and mitigate them to secure the network environment and systems. Hence, it is very helpful in framing cyber security policies and in improving trust in business systems.

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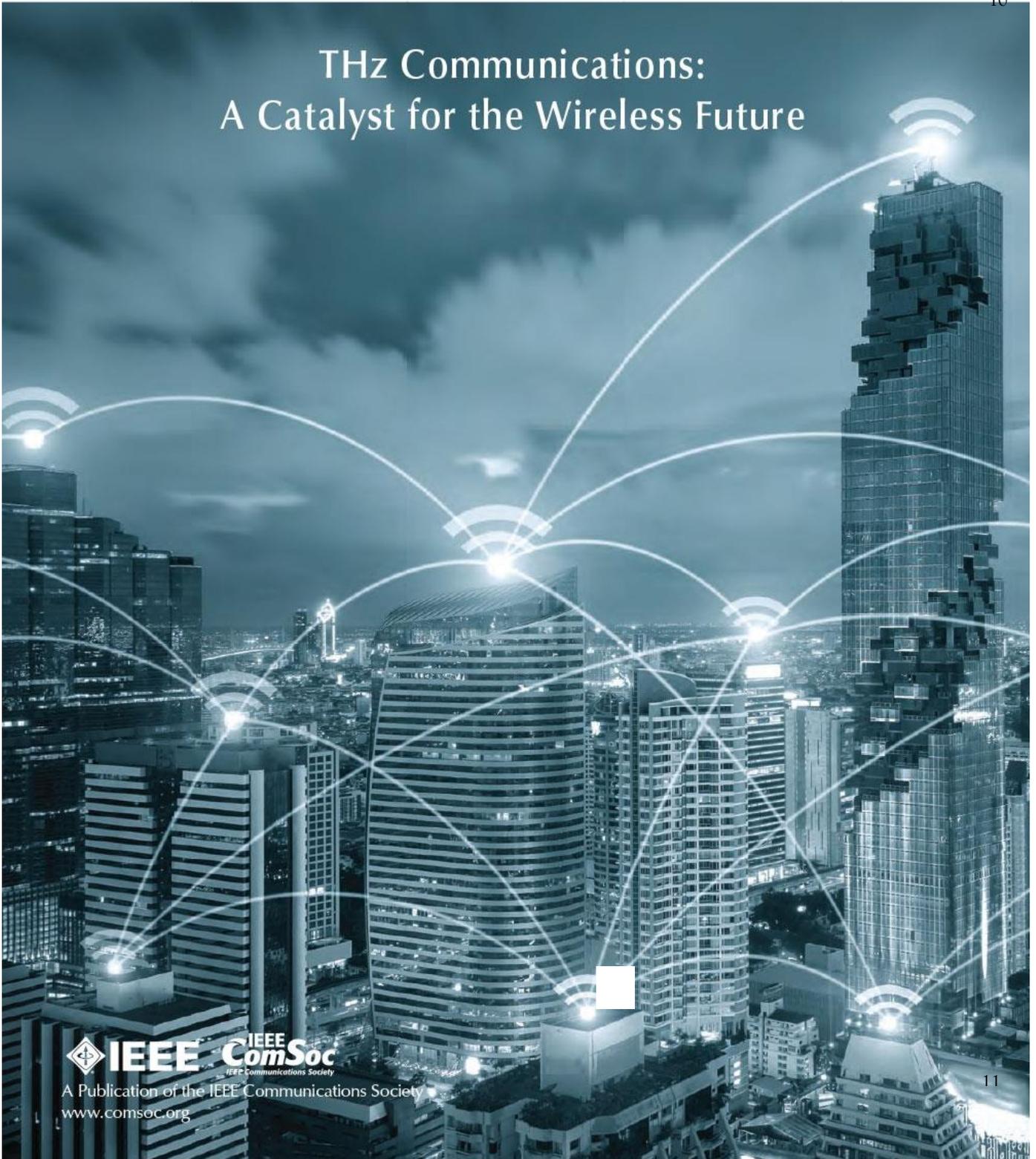
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