

# CLEEN2020 workshop

Eighth International Workshop on  
**Cloud Technologies and Energy Efficiency  
in Mobile Communication Networks  
(CLEEN 2020)**

*How cloudy and green will mobile network and services be?*

In conjunction with ICC2020, 11 June 2020, Dublin, Ireland – now VIRTUAL CONFERENCE

June 11th, 2020

Dario Sabella  
(INTEL, Next Generation and Standards)



# CLEEN workshops: the series

## Cloud Technologies and Energy Efficiency in Mobile Communication Networks (CLEEN)

*How cloudy and green will mobile network and services be?*

Purpose: study **novel concepts for 5G, and evolutions toward 6G systems** to allow for flexible mobile networks using **cloud-processing** based on open IT platforms, in conjunction with NFV and MEC.

The aim is to allow:

- guaranteed **high QoS/QoE** for mobile access to cloud-processing resources and services
- future network evolution focused on **energy efficiency** and **cost-effectiveness**.

*This requires new concepts for the design, operation, and optimization of radio access networks, backhaul networks, operation and management algorithms, and architectural elements, tightly integrating mobile networks and cloud-processing.*

# Past editions

Year	CLEEN Workshop	website
2013	1st international Workshop on Cloud Technologies and Energy Efficiency in Mobile Communication Networks (CLEEN 2013), at <b>IEEE VTC fall 2013</b>	<a href="http://www.ict-ijoin.eu/cleen2013">www.ict-ijoin.eu/cleen2013</a>
2014	2nd international Workshop on Cloud Technologies and Energy Efficiency in Mobile Communication Networks (CLEEN 2014), at <b>WCNC 2014</b>	<a href="http://www.ict-ijoin.eu/cleen2014">www.ict-ijoin.eu/cleen2014</a>
2015	3rd international Workshop on Cloud Technologies and Energy Efficiency in Mobile Communication Networks (CLEEN 2015), at <b>EUCnC 2015</b> .	<a href="http://www.ict-ijoin.eu/cleen2015">www.ict-ijoin.eu/cleen2015</a>
2016	4th international Workshop on Cloud Technologies and Energy Efficiency in Mobile Communication Networks (CLEEN 2016), at <b>CrownCom 2016</b> .	<a href="http://www.flex5gware.eu/cleen2016">http://www.flex5gware.eu/cleen2016</a>
2017	5th international Workshop on Cloud Technologies and Energy Efficiency in Mobile Communication Networks (CLEEN 2017), <b>as a regular IEEE conference technically co-sponsored by IEEE ComSoc</b> .	<a href="http://www.flex5gware.eu/cleen2017">http://www.flex5gware.eu/cleen2017</a>
2018	6th international Workshop on Cloud Technologies and Energy Efficiency in Mobile Communication Networks (CLEEN 2018), at <b>IEEE VTC spring 2018</b> .	<a href="https://5g-ppp.eu/cleen2018/">https://5g-ppp.eu/cleen2018/</a>
2019	7th international Workshop on Cloud Technologies and Energy Efficiency in Mobile Communication Networks (CLEEN 2019), at <b>IEEE WCNC 2019</b> .	<a href="https://5g-ppp.eu/cleen2019/">https://5g-ppp.eu/cleen2019/</a>

# CLEEN2020 edition

Special topics for this 2020 edition (co-located with IEEE ICC)

**Keynote**, *5G network functions optimized for automotive use cases - pilot realization in France-Luxemburg-Germany corridor*



Dirk Hetzer,  
Deutsche Telekom AG,  
Technical Manager in  
the 5GcroCo project

Maciej Muehleisen,  
Senior Researcher,  
Ericsson



**Invited talk**, *Automotive Trials for Make-Before-Break 5G Edge Cloud Handover – Results and Takeaways from Joint Trials of Toyota, Vodafone and Ericsson at the Aldenhoven Testing Center.*

# CLEEN2020 workshop

*programme*



# Workshop programme

# 1/2

14:00	Welcome and presentation by the workshop chair, Dario Sabella (Intel)
14:05	<b>Keynote</b> , 5G network functions optimized for automotive use cases - pilot realization in France-Luxemburg-Germany corridor (Dirk Hetzer, Deutsche Telekom AG, Technical Manager in the 5GcroCo project)  <i>Focus of the presentation will be an end-to-end architecture for cross-border network handover, end-to-end Quality of Service (QoS) with network slicing, Mobile Edge Computing/Cloud (MEC) and positioning architecture in 5G networks. Teleoperated driving (ToD), dynamic HD map update service (HD mapping) and Anticipated Cooperative Collision Avoidance (ACCA) are the use cases in the 5GcroCo project to present the power of new 5G solutions.</i>
14:30	Paper #1: Distributed Cloud Association and Beamforming in Downlink Multi-cloud Radio Access Networks (Alaa Alameer Ahmad; Hayssam Dahrouj; Anas Chaaban; Aydin Sezgin; Tareq Y. Al-Naffouri; Mohamed-Slim Alouini)
14:45	Paper #2: Full Duplex Cloud Radio Access Networks: Performance Gains (Askar Mandali Kundu; Thazhathe Veetil Sreejith)
15:00	Paper #3: Joint Redundant MDS Codes and Cluster Cooperation Based Coded Caching in Fog Radio Access Networks (Bao Wang; Yanxiang Jiang; Fu-Chun Zheng; Mehdi Bennis; Xiqi Gao; Xiaohu You)
15:15	Paper #4: A co-simulation framework to evaluate edge deployment options and performance (Antonio Viridis; Giovanni Nardini; Giovanni Stea; Yuankun Shi; Bianny Bian)
15:30	Virtual Coffee Break

# Workshop programme

# 2/2

16:00	<b>Invited talk</b> , Automotive Trials for Make-Before-Break 5G Edge Cloud Handover – Results and Takeaways from Joint Trials of Toyota, Vodafone and Ericsson at the Aldenhoven Testing Center. (Maciej Muehleisen, Senior Researcher, Ericsson)
16:20	Paper #5: MEC-enhanced Information Freshness for Safety-critical C-V2X Communications (Mustafa Emara; Miltiades C. Filippou; Dario Sabella)
16:35	Paper #6: Reinforcement Learning for Delay-Constrained Energy-Aware Small Cells with Multi-Sleeping Control (Ali El Amine; Paolo Dini; Loutfi Nuaymi)
16:50	Paper #7: Towards Very Low-Power Mobile Terminals through Optimized Computational Offloading (Hergys Rexha; Sebastien Lafond; Giovanni Rigazzi; Jani-Pekka Kainulainen)
17:05	Paper #8: An Analysis of Multicast Inefficiencies in Multi-tenant MEC Infrastructures for 5G Networks (Steve Eager; Antonio Matencio Escolar; Jose Maria Alcaraz Calero)
17:20	Paper #9: Design of MEC 5G Cellular Networks: Viewpoints from Telecom Operators and Backhaul Owners (Jin Nakazato; Makoto Nakamura; Tao Yu; Zongdian Li; Gia Khanh Tran; Kei Sakaguchi)
17:35	End the Workshop



# Thank you!

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