# CLEEN2018 workshop

## final panel discussion

Sixth International Workshop on
**Cloud Technologies and Energy Efficiency
in Mobile Communication Networks
(CLEEN 2018)**
**In conjunction with VTC2018-spring, 3 June 2018, Porto, Portugal**

Porto, June 3rd, 2018

Dario Sabella
(INTEL, Next Generation and Standards)

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**15:30**   Panel Discussion,

**MEC and V2X: the role of edge computing in Automotive use cases**

Panelists:

- prof. Thomas Haustein, Fraunhofer Institute for Telecommunications, HHI
- Rui Frazao, CTO, Vasona Networks
- Leonardo Gomes Baltar, WG1 vice-chair in 5G Automotive Association (5GAA), Intel
- Frank Schaich, One5G project coordinator, Nokia Bell Labs

Moderator: Dario Sabella (Intel)

**16:30**   Wrap-Up & Closing by the Workshop Chair

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# 5GAA White Paper on Edge Computing

In Dec 2017, 5GAA published a white paper (led by INTEL):

- This white paper provides an overview of automotive use cases and shows how Edge Computing provides compute/storage/networking capabilities at the network edge, and how it can be considered a supporting technology for multiple services for connected AD vehicles.
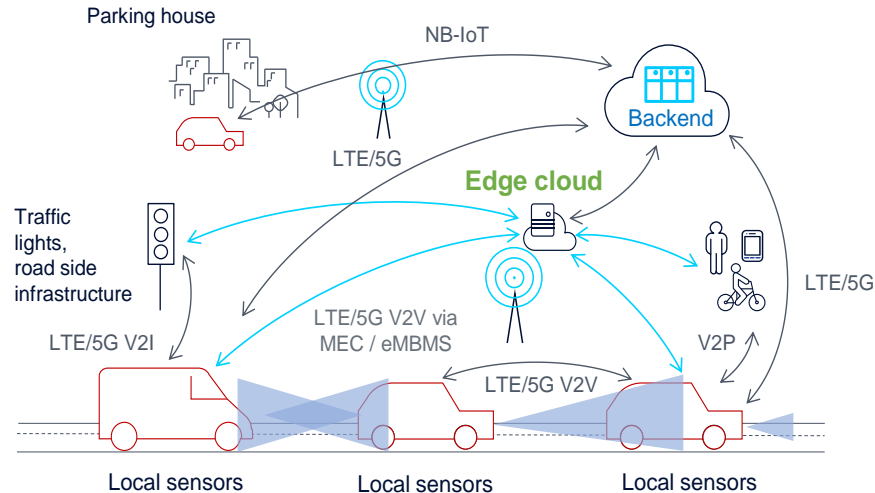


http://5gaa.org/wp-content/uploads/2017/12/5GAA_T-170219-whitepaper-EdgeComputing_5GAA.pdf

# 5GAA use cases relevant for MEC

The 5G Automotive Association (5GAA) categorizes a comprehensive list of connected vehicle applications, categorized in four main groups of use cases (*): Safety, Convenience, Advanced Driving Assistance and Vulnerable Road User (VRU).

The 5GAA WP on Edge Computing provide an analysis of uses cases relevance for MEC:

| Use case | description | Relevance for MEC |
|---|---|---|
| Intersection Movement Assist | Warn driver of collision risk through an intersection. | High |
| Software Updates | Deliver and Manage Automotive Software Updates | Mid |
| Real-Time Situational Awareness & High Definition Maps | Alert driver of Host Vehicle (HV) moving forward of hazard (icy) road conditions in front. | High |
| See-Through | Driver of Host Vehicle that signals an intention to pass a Remote Vehicle (RV) using the oncoming traffic lane is provided a video stream showing the view in front of the RV. | High |
| Cooperative Lane Change (CLC) of Automated Vehicles | Driver of Host Vehicle (HV) signals an intention to change the lane with at least one Remote Vehicle (RV) in the target lane in the vicinity of the HV. | High |
| Vulnerable Road User Discovery | Detects and Warns drivers of VRUs in the vicinity. | High |

(*) 5GAA Technical Report T-170215 "Use Cases and KPI requirements"

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# First MEC Hackathon:
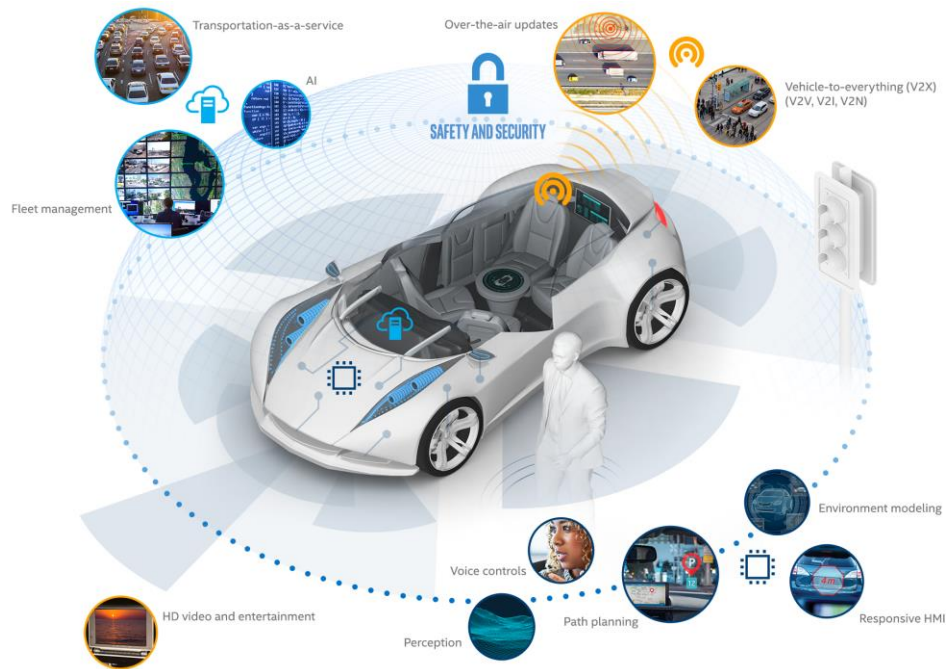
*on Automotive infotainment services using MEC*

# First MEC Hackathon – general theme

- Automotive sector is key for MEC and for 5G.

- In addition to traditional use cases on connected and automated cars, infotainment is also a promising market.

*Excerpt from Intel 5G Connected Vehicles Webinar:*

- *"Intel predicts a new $7 trillion passenger economy will emerge when passengers become riders." […]*

- *"We did a study that shows drivers spend 300 hours a year behind the wheel and 5G offers entertainment opportunities to optimize that time as we transition from drivers to riders."*



Transportation-as-a-service

Over-the-air updates

AI

SAFETY AND SECURITY

Vehicle-to-everything (V2X) (V2V, V2I, V2N)

Fleet management

Environment modeling

Voice controls

Responsive HMI

HD video and entertainment

Perception

Path planning

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# First MEC Hackathon – topic for the challenge

- The developers teams at the Hackathon event will be requested to develop Entertainment and/or VR/AR applications (here called "EVA apps"), as on-car mobile solutions using MEC technologies for riders. EVA services are provided through the in-car WiFi network.
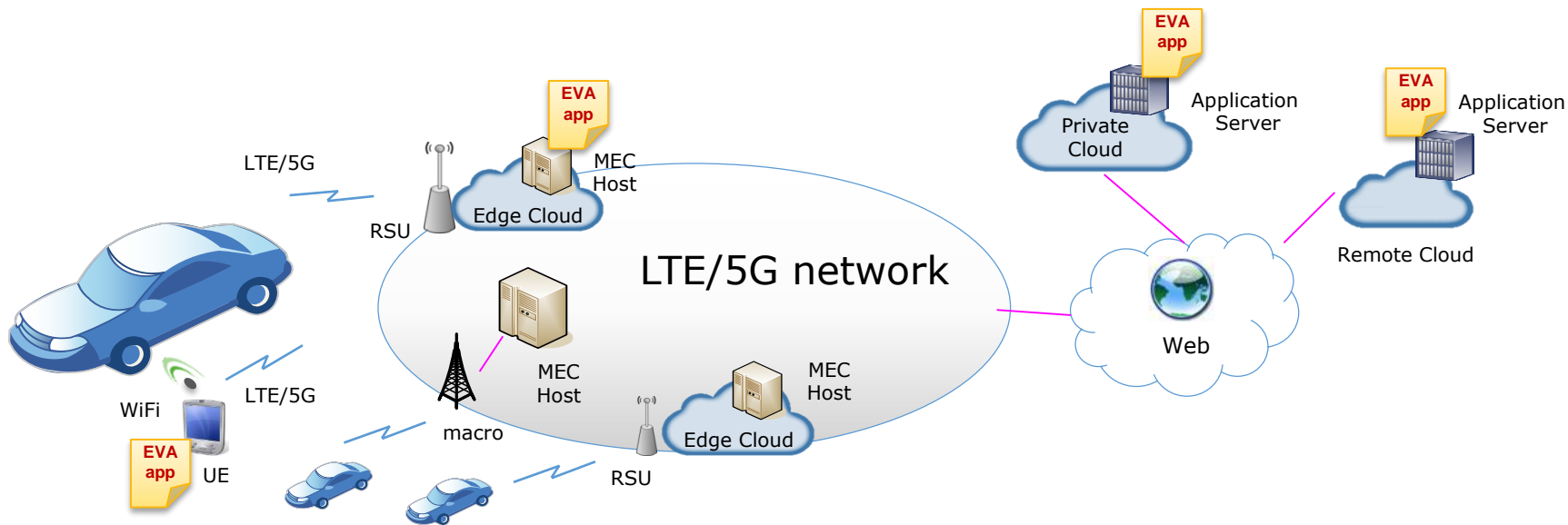


On-car UEs are also connected with their smartphone to the cellular network (either directly or via the in-car WiFi). EVA apps should be designed to run on different instances (on commercial smartphones, on MEC hosts, remote servers).
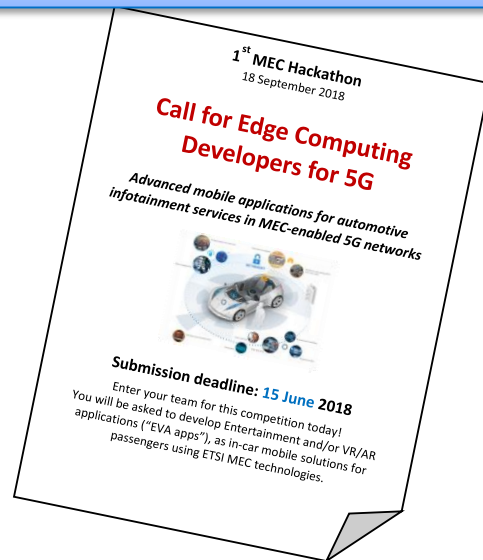
# First MEC Hackathon - organization

- Intel is leading the technical organization of first MEC Hackathon
- Current composition of the organizing committee
  - Intel, Vodafone, ETSI, i3p, ISMB, Saguna, Huawei, VIAVI
- Branded as 3 parallel events, in Berlin, Turin and Beijing.

- MEC Hackathon announcements:

  (Berlin) www.etsi.org/mec-hackathon-1-berlin

  (Turin) www.treatabit.net/article/mec-hackathon-turin

  (Beijing) developer.huawei.com/ict/cn/site-omf/mec-hackathon-1-Beijing

- In addition, it is also possible to collaborate with us on the organization:
  - partners, car OEM, sponsors, industry groups,
    communities are welcome ( no need to be MEC members ☺ )

**Call for Developers**
Submission deadline: **15 june**

1st MEC Hackathon
18 September 2018

Call for Edge Computing
Developers for 5G

Advanced mobile applications for automotive
infotainment services in MEC-enabled 5G networks

Submission deadline: 15 June 2018
Enter your team for this competition today!
You will be asked to develop Entertainment and/or VR/AR
applications ("EVA apps"), as in-car mobile solutions for
passengers using ETSI MEC technologies.

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Thank you!

dario.sabella@intel.com

Intel Confidential

Save the date:

Edge Computing Congress

PUSHING POWER TO THE NETWORK EDGE

Berlin, 18-20 September 2018

# Backup slides

![Intel - experience what's inside logo]

# Workshop programme

| | |
|---|---|
| 8:30 | Welcome and presentation by the workshop chair, Dario Sabella (Intel) |
| 9:00 | Keynote, Merging new cloud and air-interface capabilities to meet requirements of emerging use cases from verticals in 5G  (prof. Thomas Haustein, Head of Wireless Communications and Networks Department, Fraunhofer Institute for Telecommunications, HHI) |
| 9:30 | Paper #1: "Operating Systems for 5G services infrastructures"; A. Manzalini, TIM; F. Marino, Scuola Superiore Sant'Anna |
| 10:00 | Coffee Break |
| 10:30 | Paper #2: "Energy-Efficient Beamforming and Time Allocation in Wireless Powered Communication Networks"; M. Fu, Shenzhen University; C. Guo, Shenzhen University; S. Zhang, Shenzhen University; D. Feng, Shenzhen University; G. Qian, Shenzhen University |
| 11:00 | Paper #3: "FFR Based Interference Coordination Scheme in the Next Generation WLAN"; P. Sun, Xidian University; R. Hou, Xidian University; X. Ma, Xidian University; H. Li, Xidian University |
| 11:30 | Paper #4: "Joint Transceiver Design in Full-Duplex MISO Wireless Powered Communication Networks with User Cooperation"; R. Cai, Beijing University of Posts and Telecommunications (BUPT); L. Li, BUPT; Z. Wang, BUPT |
| 12:00 | Lunch Break |

# Workshop programme

| | |
|---|---|
| 13:00 | Keynote, *MEC: Building a Bridge to 5G* (Rui Frazao, CTO, Vasona Networks) |
| 13:30 | Paper #5: "Minimizing power consumption in virtualized cellular networks"; G. Nardini, University of Pisa; A. Virdis, University of Pisa; N. Iardella, University of Florence; A. Frangioni, University of Pisa; L. Galli, University of Pisa; G. Stea, University of Pisa |
| 14:00 | Paper #6: "A hierarchical MEC architecture: experimenting the RAVEN use case"; D. Sabella, Intel Deutschland GmbH; N. Nikaein, Eurecom; A. Huang, Eurecom; J. Xhembulla, Politecnico di Torino; G. Malnati, Politecnico di Torino; S. Scarpina, TIM. |
| 14:30 | Paper #7: "The ONE5G approach towards the challenges of multi-service operation in 5G systems"; F. Schaich, Nokia; M.-H. Hamon, Orange; M. Hunukumbure, Samsung Electronics UK; J. Lorca, Telefónica I+D; K. Pedersen, Nokia; M. Schubert, Huawei; E. Kosmatos, WINGS ICT solutions; G. Wunder, Freie Universitaet Berlin; K. Reaz, Freie Universitaet Berlin; |
| 15:00 | coffee Break |
| 15:30 | FINAL PANEL discussion |
| 16:30 | Wrap-Up & Closing by the Workshop Chair |