mmWave use cases: the visions of the 5G-MiEdge and 5GCHAMPION projects
(Olympic Games are coming ...)

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Intel
**Project name:** 5G Communication with a Heterogeneous, Agile Mobile network in the Pyeongchang Winter Olympic Competition

**Funding scheme:** FP8, Europe-Korea co-funding, 2016.06 – 2018.05

**Key Targets:**
- The first 5G proof-of-concept in conjunction with the 2018 Korean Winter Olympics,
- Synergize satellite and terrestrial technologies,
- Strong impact on Standards bodies.

1. CEA-Leti (Coordinator), France
2. Nokia, Finland
3. Intel, Germany
4. Thales Alenia Space, France
5. University of Oulu, Finland
6. Fraunhofer HHI, Germany
7. Telespazio, France
8. iMinds, Belgium
9. ETRI (Coordinator)
10. Seoul Metropolitan Rapid Transit
11. South Korea Telecom
12. HFR
13. Clever Logic
14. Seoul National University
15. Dankook University
16. Hanyang University
17. Korea Telecom
18. Etron
19. Insoft
20. Mobigen
21. Gwangju Institute of Science and Technology
5GCHAMPION – Use cases

- Use Cases in focus:
  - Wireless backhaul connecting heterogeneous radio access,
  - Ultra-high data rate 5G downlink,
  - Accurate indoor-outdoor positioning,
  - Satellite interoperability via 5G IoT devices,
  - Hi-user mobility,
  - Shared short-latency applications,
  - Shared broadband applications.
5GCHAMPION – UC 3: Accurate indoor-outdoor positioning

- **Accurate indoor-outdoor positioning:**
  - Stationary 5G terminals and moving vehicles
  - Combination of GNSS and 5G mmWave technologies
  - Sub-meter location accuracy

<table>
<thead>
<tr>
<th>Application scenario</th>
<th>Indoor environment</th>
<th>Outdoor environment</th>
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<tbody>
<tr>
<td>Autonomous vehicles</td>
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<td>✓</td>
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<td>Drones</td>
<td>✓</td>
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<td>Guidance of visually impaired people</td>
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<tr>
<td>Guidance of consumers in shopping malls</td>
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<td>Indoor robotics</td>
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<td>Augmented reality</td>
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More info in Deliverable D2.2, Available online at: http://www.5g-champion.eu/Pages/DELIVERABLES.aspx
5G-MiEdge (5g-miedge.eu)

- **Name:** Millimeter-wave Edge Cloud as an Enabler for 5G Ecosystem

- **Funding scheme:** FP8, Europe-Japan co-funding, 2016.06 – 2019.05

- **Key Target:** 5G proof-of-concept in conjunction with the 2020 Japanese Summer Olympics.

- **Key technology enablers:**
  - mmWave Access & Backhaul,
  - Liquid RAN Control-plane,
  - User / Application Centric Orchestration.

Technology enablers and related KPIs:

- **Data rate**
  - mmWave
  - Massive MIMO

- **Connectivity**
  - HetNet
  - C/U splitting

- **E2E latency**
  - MEC
  - Novel ARQ

- **CAPEX/OPEX**
  - Shared license
  - RAN virtualization

**mmWave Edge Cloud**

Prefetch/cache user data/application and transfer them instantaneously between MiEdge AP & UE

**Liquid RAN C-plane**

Collect context (location, action, etc.) information and provide traffic forecast to users and application providers

**User/application centric orchestration**

Network orchestration of MiEdge AP (SDN) by user or application provider
5G-MiEdge - Use cases

- Use cases in focus:
  - Tokyo 2020 Olympic Games,
  - Omotenashi services,
  - Moving hotspot,
  - Dynamic crowd,
  - Automatic driving.

- Target: 5G Phase II

Key technologies

- Millimeter Wave Edge cloud
- Liquid RAN C-plane
- User/Application centric orchestration

Target: 5G Phase II

- Ultra High Speed
- Low Latency Communications

Data rate

5G Phase 2

- eMBB
- uHS LLC

5G Phase 1

- mMTC
- uRLLC
5G-MiEdge – UC1: Tokyo 2020 stadium

- Tokyo 2020 olympic games:
  - Data showers on top of the entrance gates
  - AR/VR enhanced experience
  - Data showers on the viewers via dedicated masts
  - Synergize between mmWave and MEC technologies

UHD cameras mmwave streaming to a concentrator

Stadium entrance gates with mmWave data shower
Questions?

Disclaimers

5G-MiEdge: The research leading to these results are jointly funded by the European Commission (EC) H2020 and the Ministry of Internal affairs and Communications (MIC) in Japan under grant agreements N° 723171 5G MiEdge in EC and 0159-(0149, 0150, 0151) in MIC.

5GCHAMPION: The research leading to these results was supported by the Institute for Information & communications Technology Promotion (IITP) grant, funded by the Korea government (MSIP) (No.B0115-16-0001, 5GCHAMPION), and received funding from European Union H2020 5GPPP under grant n. 723247.