Use cases and scenarios resulting from merging mmWave access with Multi-access Edge Technologies

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5G-MiEdge

- EU-JP co-funded research project
- Duration
  - 3 years (2016-2019)
- Target:
  - Propose new 5G enabling technologies, to be showcased at Tokyo 2020 Olympics
- Technology enablers
  - User/Application centric Orchestration
  - mmWave edge Access & Backhaul
  - Liquid RAN C-plane

- Partners:
  - Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute, Germany
  - Commissariat à l’Energie Atomique, France
  - Intel Deutschland GmbH, Germany
  - Telecom Italia, Italy
  - Sapienza University of Rome, Italy
  - Tokyo Institute of Technology, Japan
  - KDDI Research, Japan
  - Panasonic Corporation, Japan
5G Services / Usage scenarios

• The 3 main 5G new services address
  • Several different applications
  • Several vertical markets
  • Future-proof business cases

Enhanced Mobile Broadband
- Gigabytes in a second
- 3D video, UHD screens
- Work and play in the cloud
- Augmented reality
- Industry automation
- Mission critical application, e.g. e-health
- Self Driving Car

Future IMT
- Voice
- Smart City
- Smart Home/Building
- Work and play in the cloud
- Augmented reality
- Industry automation
- Mission critical application, e.g. e-health
- Self Driving Car

Massive Machine Type Communications
- Gigabytes in a second
- 3D video, UHD screens
- Work and play in the cloud
- Augmented reality
- Industry automation
- Mission critical application, e.g. e-health
- Self Driving Car

Ultra-reliable and Low Latency Communications
- Gigabytes in a second
- 3D video, UHD screens
- Work and play in the cloud
- Augmented reality
- Industry automation
- Mission critical application, e.g. e-health
- Self Driving Car

Source: Recommendation of ITU-R M.2083-0
5G Services and KPI

- 5G Services have different KPI as target different use cases

Source: Recommendation of ITU-R M.2083-0
5G Phase 1 standardization introduced new services
- Massive Machine Type Communications (mMTC)
- Enhanced Mobile Broadband (eMBB)
- Ultra-reliable and Low Latency Communications (uRLLC)

5G Phase 2 will bring more advanced services
- Ultra High Speed Low Latency Communications (uHSLLC)
5G-MiEdge focuses on ultra-High-Speed and Low Latency Communication
Technology components, KPI and Use cases
Use case 1: Omotenashi service

- **Omotenashi** is the Japanese style of hospitality, whose scope is to offer ultra-fast wireless connection so that visitors can enjoy high quality services

- Specific applications
  - Ultra-high-speed content download in a dense area
  - Massive video streaming

- Scenarios
  - Airport
  - Train station
  - Shopping mall

- Requirements (excerpts)
  - Peak user rate: 2 Gbps
  - End-to-end latency: not critical (~200ms is acceptable)
Use case 2: Moving hotspot

- A moving hotspot describes a wireless communication system for passengers on trains, buses, or airplanes

- Scenarios
  - Train
  - Bus
  - Airplane

- Specific applications
  - Entertainment contents download
  - Upload and share sightseeing photos/videos in SNS

- Key aspects
  - WLAN/mmWave AP
  - Local MEC & content server

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5G-MiEdge 6/14/2018
Use case 3: 2020 Tokyo Olympic

- ‘MiEdge showers’ at stadium gates deliver pre-loaded contents to visitors
  - Event applications
  - Player profiles ...

- HD cameras collect different angles of view of the game

- Media room process in real-time the several streams and deliver personalized experiences to selected users

- Specific applications
  - Olympic game application/data download
  - Massive SNS sharing
  - 4K/8K multi camera video capturing, 4K/8K video download (video analytics)
Use case 4: Dynamic crowd

- A city outdoor area centre where thousands of people spend their time. The traffic pattern changes dynamically in a day according to users’ activities.

- Specific application
  - Public video surveillance based on MEC
  - 3D live video broadcast of Olympic Games

- Requirements (excerpts)
  - 2 mmWave Access Points of peak data rate of about 6Gbps to cover the crowded square area of 160 m²
Use case 5: Automated driving

- Roadside Units (RSU) monitor the latest traffic conditions and LiDAR sensors, however, this information in the RSU is not fully utilized to assist driving for safety purposes, so far.

- Scenario
  - Cooperative perception of HD maps using extended sensors

![Image of automated driving scenario]
# 5G-MiEdge Use cases

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<th>Use case</th>
<th>Scenarios</th>
<th>Location specific applications</th>
<th>Relevance with other activities</th>
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<td>1. Omotenashi service</td>
<td>Ultra-high-speed wireless access in a dense area such as airport, train, shopping mall, etc.</td>
<td>Ultra-high-speed contents DL, Massive video streaming</td>
<td>mmMAGIC, NMGN, METIS, 5GMF, IEEE</td>
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<td>2. Moving hotspot</td>
<td>High-speed wireless communication for passengers in a vehicle (train, bus, etc.)</td>
<td>Precached/prefetched contents DL and SNS contents' UL from/onto local MEC server on vehicle</td>
<td>mmMAGIC, NGMN, 5GMF</td>
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<td>3. 2020 Tokyo Olympic</td>
<td>Olympic Stadium area and stands</td>
<td>File DL, high definition content DL and sharing, Immersive reality</td>
<td>mmMAGIC, METIS-I/II, 5GMF, NGMN, 3GPP</td>
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<td>4. Dynamic crowd</td>
<td>Outdoor hotspot areas (stations, recreation parks) with dynamic changes of traffic pattern</td>
<td>Public video surveillance and 3D live video broadcast of Olympic games</td>
<td>mmMAIC, NGMN, 5GMF</td>
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<td>5. Automated driving</td>
<td>Automotive traffic environments in urban city</td>
<td>Cooperative perception by exchanging HD dynamic map information between vehicles &amp; roadside units</td>
<td>5GPPP, ETSI MEC, 3GPP TR22.886</td>
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Thanks for your attention

Questions?

Disclaimer: 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.