Experiences and Lessons Learned

Webinar on the results and insights from the 5G-MOBIX Finland Trial Site
16 June 2022, 14:00 – 15:00 CET

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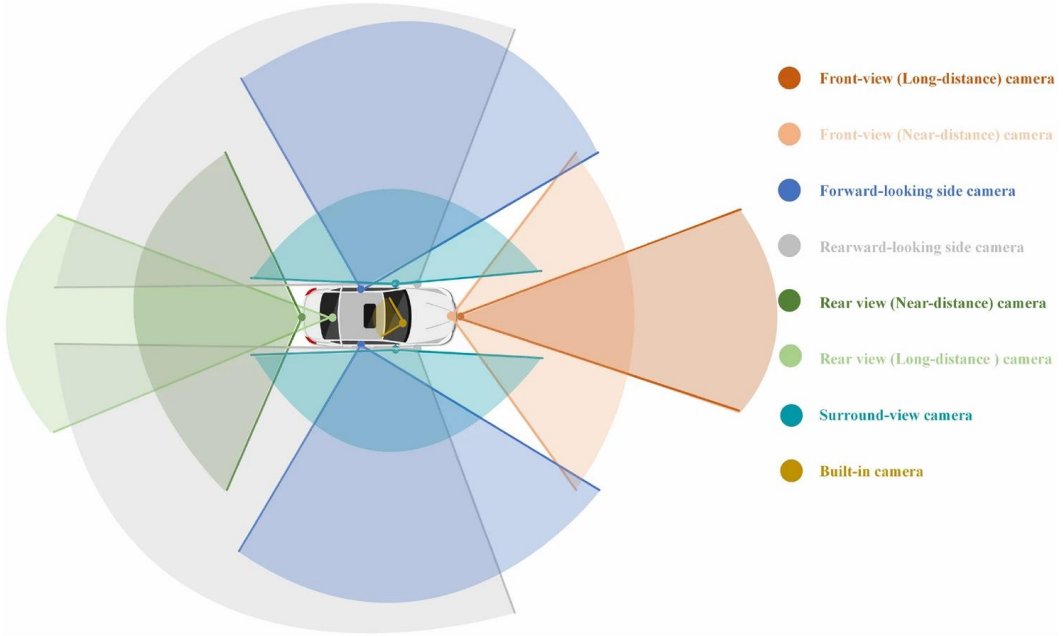
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 825496

Multi-SIM as considered solution for service continuity (1)

- Finland trial site remote driving trials have noted the improvements of service continuity when multi-SIM solution compared to the single-SIM, particularly with uplink (UL) heavy traffic flows
- However, current scenario of DL having x5-7 the UL capacity means bottlenecks will be severe during network and road busy hour periods, or with vehicles demanding more UL capacity (e.g. more cameras)
- **There is still need for a reconsideration of how the DL and UL are dimensioned, for connected and automated mobility**



Wang, C., *et al.* On the Application of Cameras Used in Autonomous Vehicles. *Arch Computat Methods Eng* (2022).

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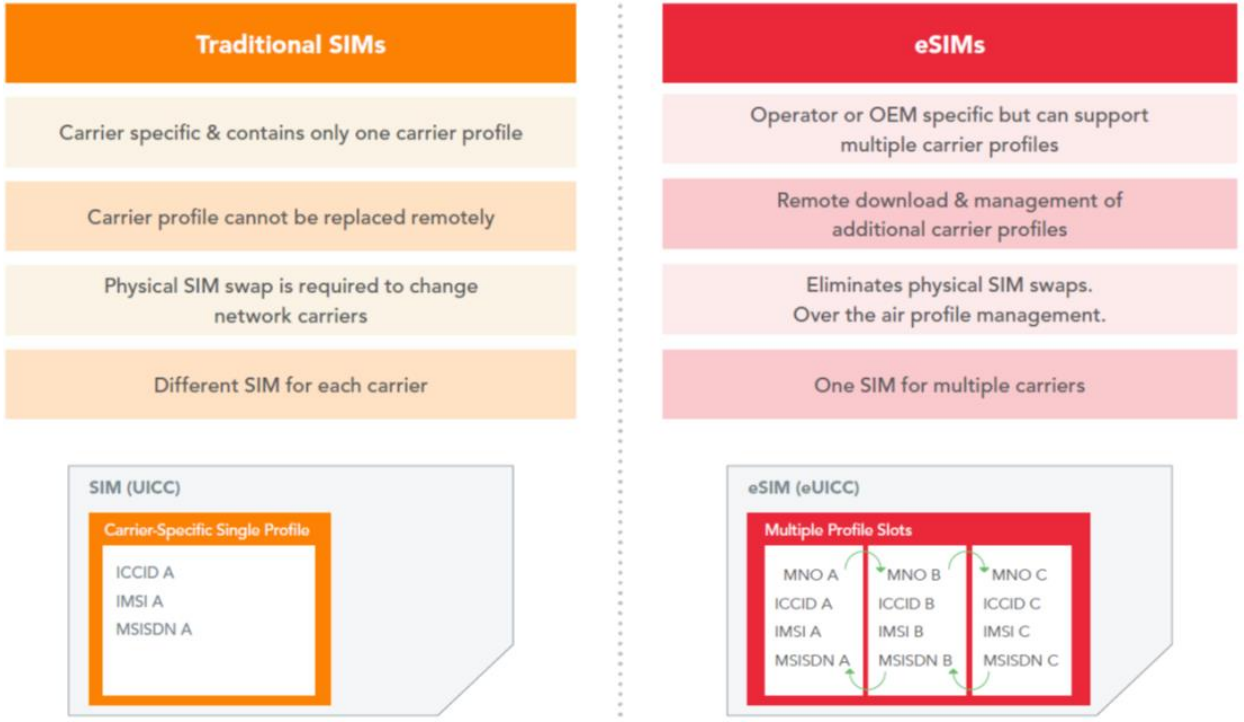
Multi-SIM as considered solution for service continuity (2)

- Finland trial site utilized a dual SIM configuration (2 physical SIMs)
- This may not be scalable for scenarios e.g.
  - Further alleviate UL bottlenecks by using more than 2 networks
  - Vehicle crosses border with multiple networks either side
- **eSIM (embedded subscriber identity module) technology are a promising solution**
  - GSMA's specification for remote (OTA) programming of MNO profiles to eSIM
  - Automotive use cases are among the main drivers



Source: KORE

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Growing Telecom/Auto Industry support for Multi-eSIM solutions

ERICSSON

*"eSIM will provide enhanced security for a range of connected services, enable the vehicle to be **connected by multiple Operators** and **allow the selection of local Operators' connectivity** at the vehicle's country of destination."*

https://www.ericsson.com/en/blog/2020/9/esim-driving-global-connectivity-in-the-automotive-industry

GSMA

*"For connected vehicles…eSIM allows for a steady, compliant, **high performant local connection**, and most important, **seamless**."*

https://www.gsma.com/esim/transforming-the-connected-car-market/

TCA TRUSTED CONNECTIVITY ALLIANCE

*"**eSIM solutions are uniquely positioned to deliver the advanced security required for connected vehicles**, to address hacking, privacy, authenticity, integrity and anti-piracy among other security requirements… A particular feature of their success has been device and network authentication, which ensures that only authorised devices are connected. This offers lower costs and **reduces the risk of security breaches in connected vehicle networks**.*

https://trustedconnectivityalliance.org/connected-vehicles/

JUNIPER RESEARCH

*"Operators could generate an **additional $3 billion of service revenue by 2025 from cars equipped with eSIM**… In 2025, 25% of cellular data generated by vehicles will be attributable to 5G-capable vehicles by the same year, despite representing only 14% of the installed base of vehicles with embedded connectivity…. As a result, operators will need to charge a premium for 5G automotive connections, in order to account for the additional network traffic generated by 5G-based automotive traffic."*

https://telecoms.com/506320/telcos-eye-3bn-esim-opportunity-from-connected-cars/

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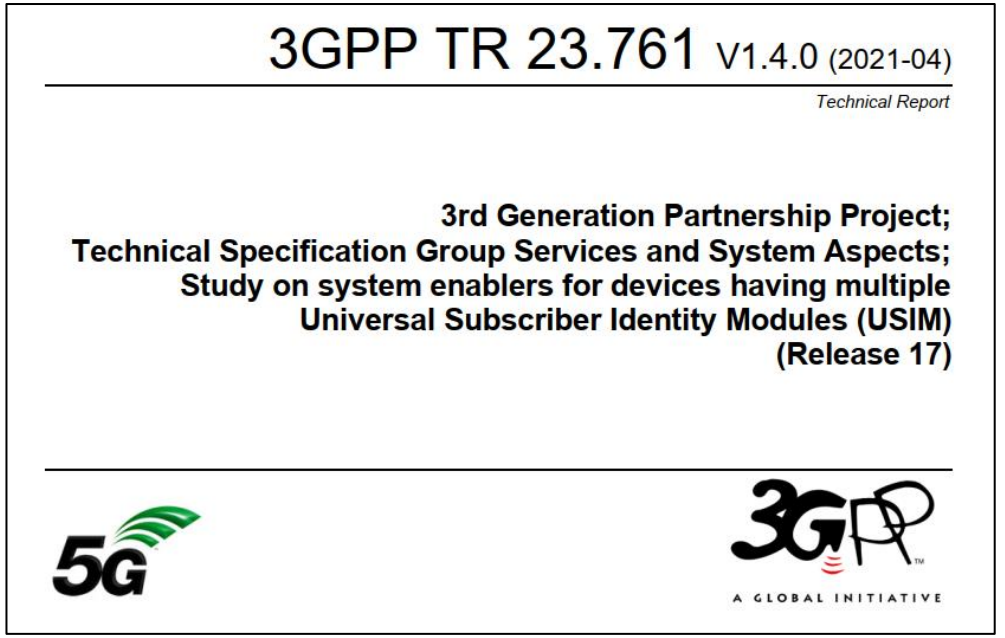
Multi-SIM as considered solution for service continuity (3)

- Multi-SIM solutions are still proprietary and may behave quite differently even in same network conditions
- Device (UE-side) solutions, with networks oblivious to fact they are serving a multi-SIM device → suboptimal
- **3GPP has started (from Release 17) to specify network enhancements (awareness) for handling multi-SIM devices**
  - Release 17 → Single-Rx/Single-Tx, Dual-Rx/Single-Tx devices
  - Release 18 → Dual-Rx/Dual-Tx devices


3GPP TR 23.761 V1.4.0 (2021-04)

Technical Report

3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects;
Study on system enablers for devices having multiple Universal Subscriber Identity Modules (USIM) (Release 17)

5G

3GPP
A GLOBAL INITIATIVE

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Realities of operating in open roads

- User story scenario planning and assumptions usually consider ideal conditions
- For trials in open roads each run has unique scenario that that may impact measurement results

Lane closure appears in Day 2 of trials!

Cranes rolling out of construction site

Priority traffic (buses) join road

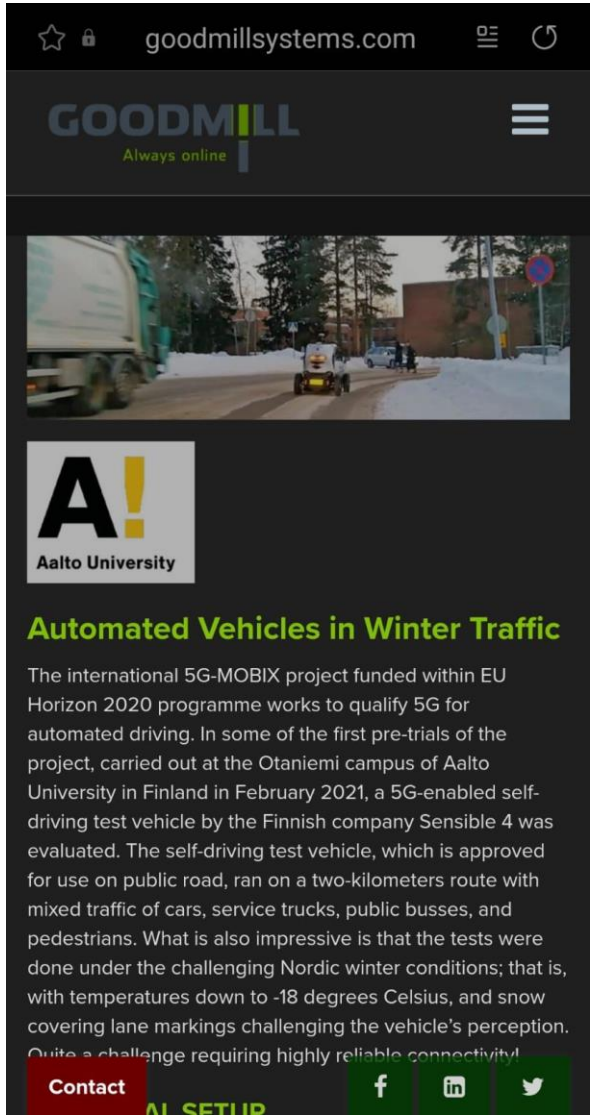
Stakeholder engagement

- Collaboration with the local multi-SIM OBU vendor (Goodmill Systems)
  - Previously, had focused on 3G/4G solutions for mission-critical public safety organisations
  - 5G-MOBIX provided useful venue for testing and developing 5G products

- Finnish Transport and Communications Agency (TRAFICOM) on the 5G-MOBIX advisory board
  - Provider of 4G and 5G test spectrum licenses and multiple PLMN-IDs for AALTO research purporses

- 5G Test Network Finland (5GTNF)
  - Local innovation ecosystem supporting 5G and beyond technology research and validation, vertical industry product development and pioneer company experiments.
  - 5G-MOBIX has had booths, presentations and video demos at 5GTNF events
  - https://5gtnf.fi/projects/5g-mobix/

https://goodmillsystems.com/customers/automated-vehicles-winter-traffic



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5G Finnish Open Research Collaboration Ecosystem 5G-FORCE

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