5G Finnish Open Research Collaboration Ecosystem 5GFORCE

Aalto University

Ingredients for successful 5G/6G research

1) Get smart and multidisciplinary people together
2) Remove silos and build common research infrastructure
3) Build Open platform that supports verticals and external partners

Get smart & multidisciplinary people together

Academic partners

Aalto University

VTT

TAMPERE UNIVERSITY OF TECHNOLOGY

UNIVERSITY OF HELSINKI

UNIVERSITY OF OULU

TURUN AMMATTIKORKEAKOULU

Centria AMMATTIKORKEAKOULU

Industry partners

NOKIA

ERICSSON

tieto

F-Secure

WIREPAS Things connected – Naturally

MEDIATEK

Mobile operators and regulators

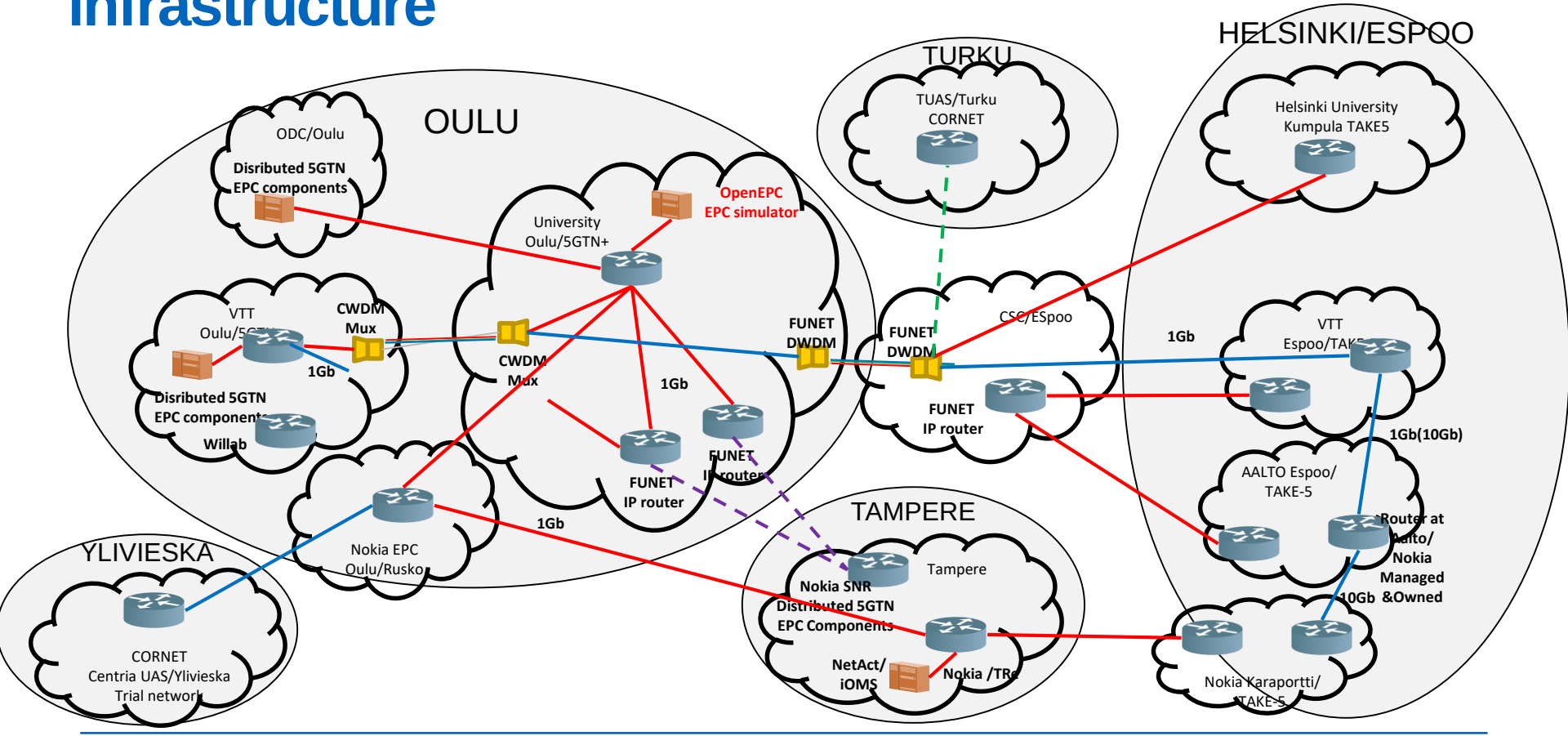
elisa

Telia

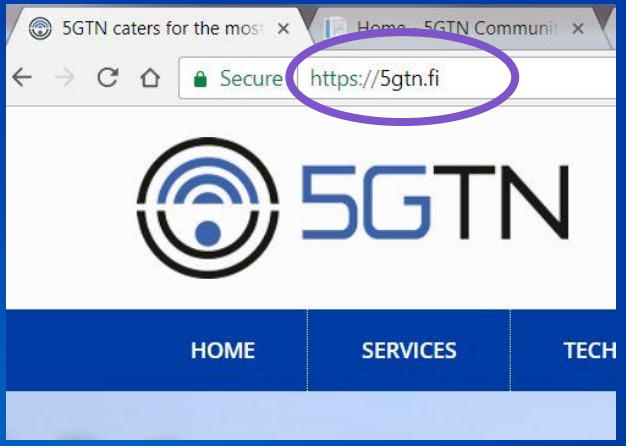
DNA

TRAFICOM Liikenne- ja viestintävirasto

Remove silos and build common research infrastructure



- Frequency permissions (in co-operation with VTT - yliopisto):
  - 700MHz (B28) BW=10MHz, Loan from Elisa
  - 2100MHz (B1) BW=10MHz, TTO-license
  - 2600MHz (B7) BW=10MHz, TTO-license
  - 2600MHz (B7) BW=5MHz, Loan from Elisa
  - 3.5GHz (B43) BW 60MHz, TTO-license (will change to B42 at some point..)
- 2 Macros (B28) with NB-IoT and Cat-M
- 1 Macro (B7)
- 1 Macro (B42), LTE-TDD
- 20 Picos (B1+B7) on air (10+ picos available/in use for different tests)
- Hundreds of Sim-cards available
- 1 EPC (CMM17), 1 OpenEPC, 1 Cumucore EPC
- 1 Bluetooth –based positioning system, (200 nodes)
- 1 LoRa network
- 1 MEC eli edge computing server



- Appr. 400 sensors installed around Univ campus, connected mainly through LoRa but also through NB-IoT

5G research platform-TAKE5

- Massive Distributed Multiantenna System (M-MIMO)
- Currently 4 macro base stations and 10 indoors pico base stations (2.6GHz)
- 700 MHz for NB-IOT (Ericsson Donation under installation in the Campus)
- Cloud servers (2-3 Dell PowerEdge 715):
- Multi-Access Edge Computing-MEC (Nokia donation)
- Several LTE Mobile Cores (Nokia EPC, Aalto own SW, Cumucore , OAI)

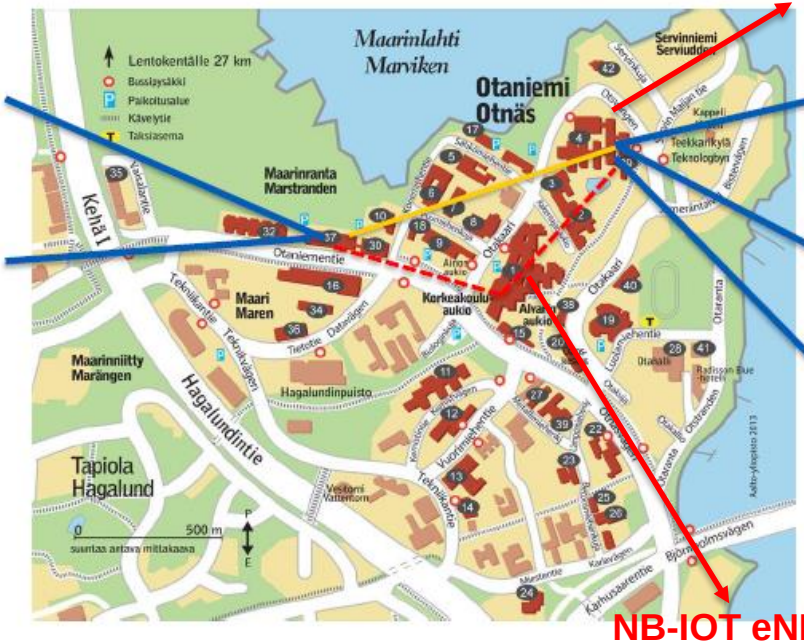
The platform serves research in the areas of

- Communications engineering
- Networking technology
- Mobile and edge computing
  - *VR/AR*
  - *Gaming*
- IOT hackathon
- Industrial Internet i.e. URLLC and IoT (AALTO Industrial Internet Campus)

5G research infrastructure

5G research infrastructure refers to the technical platform built incrementally throughout several research projects with academic and industry partners

Action Area



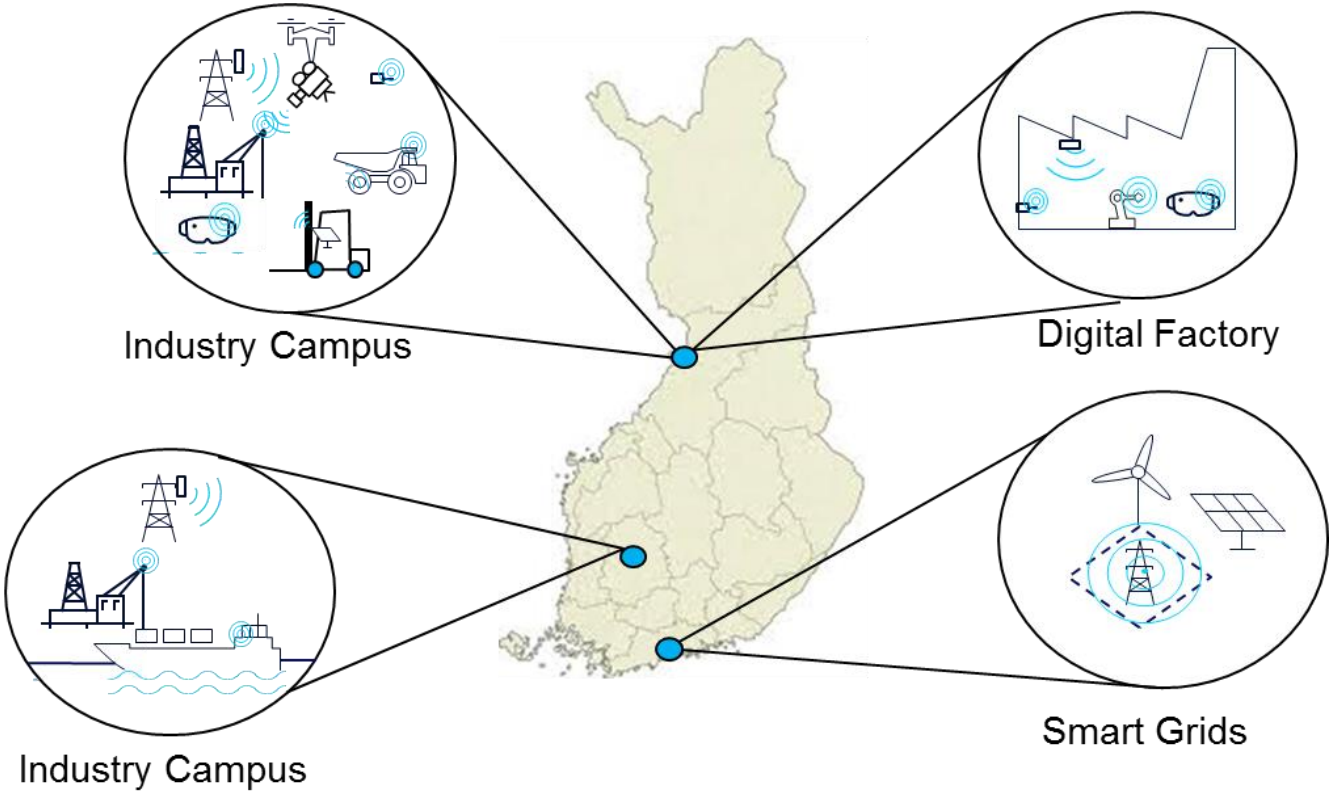
Current running setup with SDR and remote control via fiber

Current location lab antennas and core network(fiber, synchronization)

Current core network(fiber)

Plan core network(fiber)

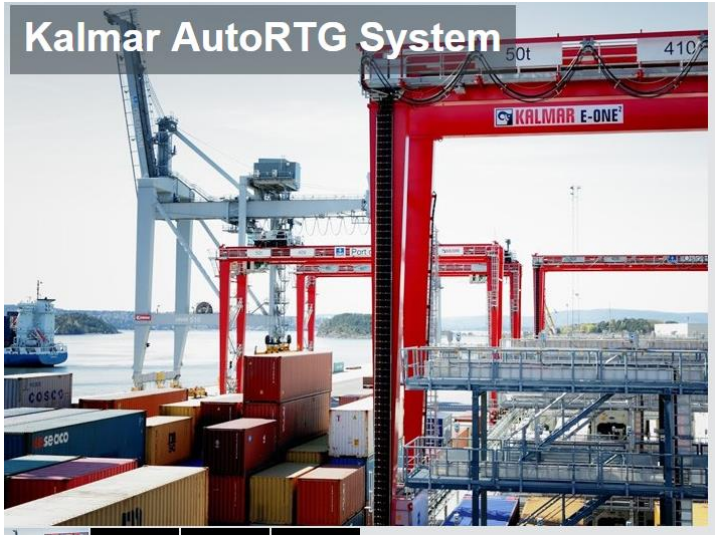
Promote 5G Verticals supporting industry growth



WIVE 5G verticals: URLLC, mMTC

Ultra Reliable Low Latency (URLLC)

Pilot Goal "*to study possibilities to use 5G communication link as a replacement for a optical communication link to achieve cost savings and improved mobility*"



Massive Machine Type Communications and NB-IoT

Pilot Goal "*Discover the bottlenecks on the radio access, mobile backhaul and core network managing large amount of devices. Examine connectivity and scalability constrains.*"

Enablers that made 5G research infrastructure happen

- Government support (Trafficom): Granted Aalto University license to operate 3.5GHz test network independently
- Funding agencies (Business Finland): Financial support facilitating private sector-academia and government organizations working together.
- Industry contribution to build the 5G research infrastructure for co-creation and innovation.
- Commitment from academic partners i.e. Aalto, VTT, UH,TUT, UOULU to focus research on this area and provide additional investment.

Outcome

- 5G infrastructure to bring together multi-disciplinary research.
- Facilitate the deployment of new use cases for verticals to support industry players to monetize investment in 5G mobile networks
- Engage additional SME, startups and industry players to test the benefits of 5G features.
- Attract external investments to experiment with local companies using the 5G infrastructure.

THANK YOU

Contact: {jose.costa, riku.jantti, raimo.kantola}@aalto.fi