PriMO-5G

VIRTUAL PRESENCE IN MOVING OBJECTS THROUGH 5G

Project Overview and Selected Results

Dr. Edward Mutafungwa, Aalto University

5G Test Network Finland (5GTNF) results seminar

28th August 2020

Overview of the project and its use cases

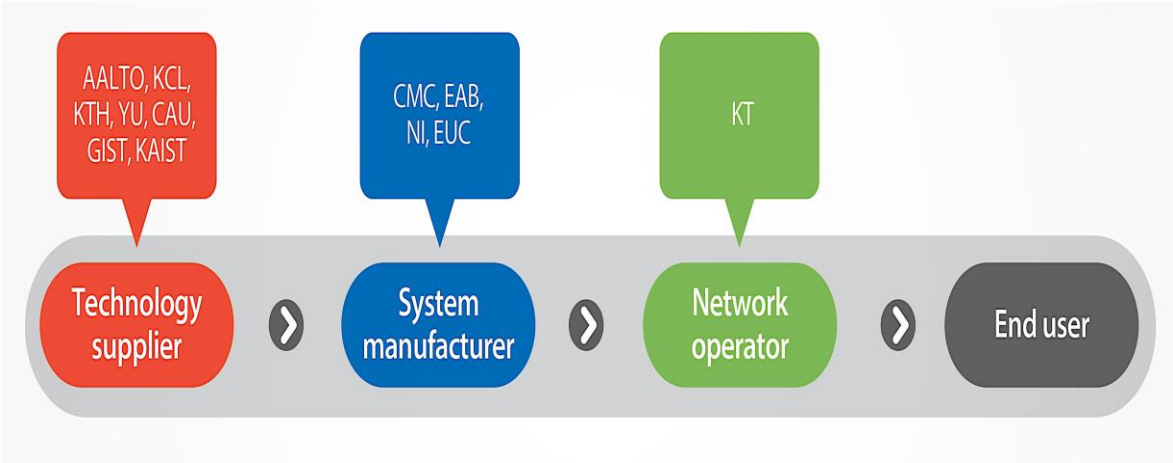
Project Goal

- Three-year EU-Korea collaboration project (*07/2018-06/2021*) funded by IITP and EU H2020 (grant agreement No 815191)
  - Research and Innovation Action (RIA) that is heavy on demos

- PROJECT GOAL
  - To demonstrate an end-to-end 5G system providing immersive video services for moving objects. This will be done by cross-continental testbeds that integrate radio access and core networks developed by different PriMO-5G project partners.

- OBJECTIVES
  - **Objective 1**: To demonstrate an end-to-end 5G system providing immersive video services for moving objects
  - **Objective 2**: To develop technologies of mmWave access, 5G core networks, and AI-assisted communications fulfilling requirements for Objective 1
  - **Objective 3**: Input to 5G standardization and spectrum regulation activities

Consortium



EUROPEAN PARTNERS

Aalto University
(Project Coordinator)

Cumucore

Ericsson AB

King's College London

KTH Royal Institute of Technology

National Instruments Dresden GmbH

KOREAN PARTNERS

Yonsei University
(Project Co-Coordinator)

Korea Advanced Institute of Science and Technology

KT Corporation

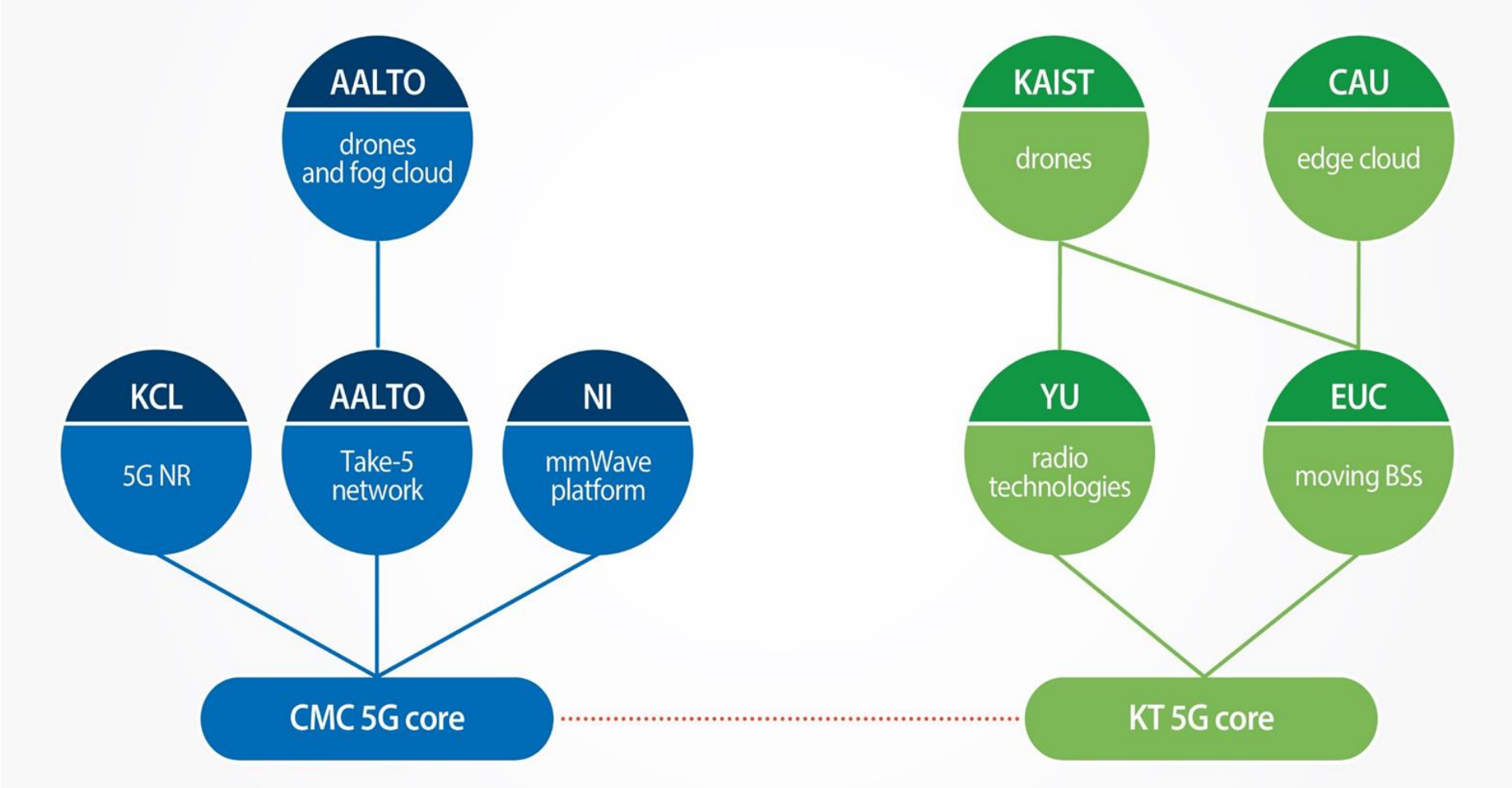
EUCAST

Note: Changes in Year 2

- *Chung-Ang University (CAU)* replaced by *Korea University (KU)*
- *Gwangju Institute of Science and Technology (GIST)* left the consortium

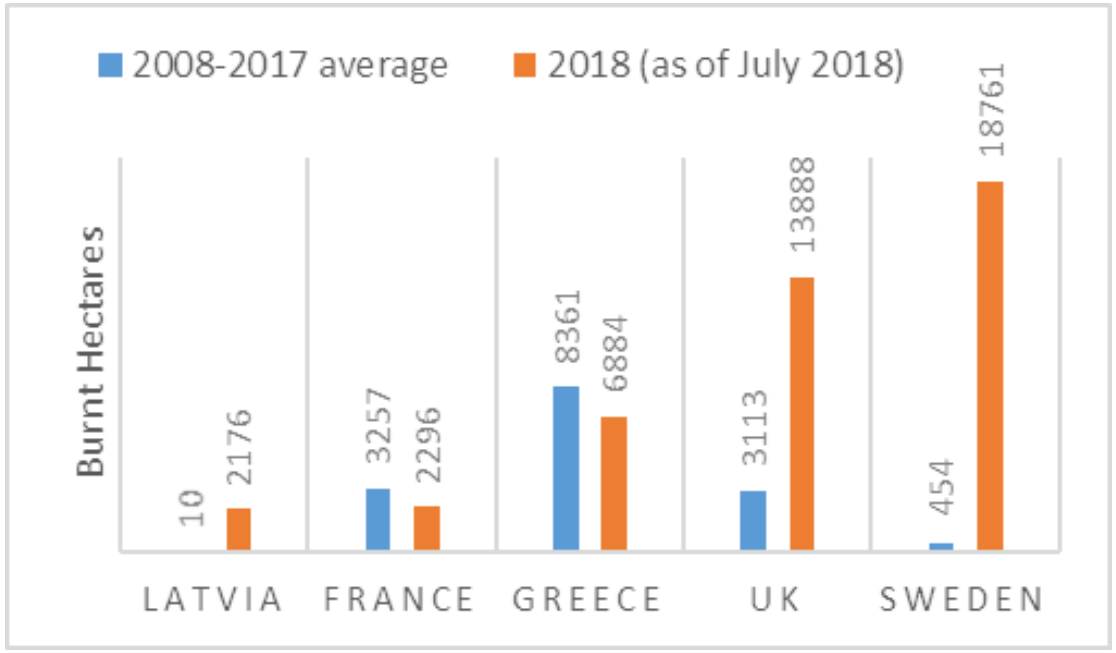
Testbeds and experimental assets

AALTO: Aalto University (Finland)
KU/CAU: Korea University (Korea)
CMC: Cumucore (Finland)
EUC: EUCAST (Korea)
KAIST: Korea Advanced Institute of Science and Technology (Korea)
KCL: King's College London (UK)
KT: Korea Telecom (Korea)
NI: National Instruments (Germany)
YU: Yonsei University (Korea)



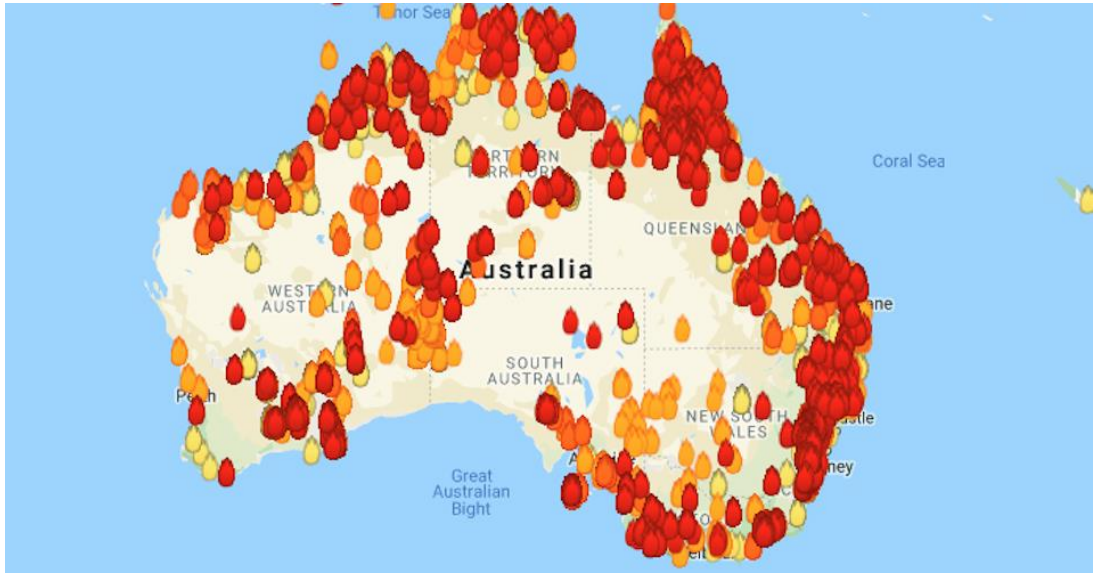
Fires are an ever-growing challenge

- Estimated burnt land hectares in European countries



Source: European Forest Fire Information System (EFFIS) of the European Commission Joint Research Centre, http://effis.jrc.ec.europa.eu

- Australian large-scale forest fires



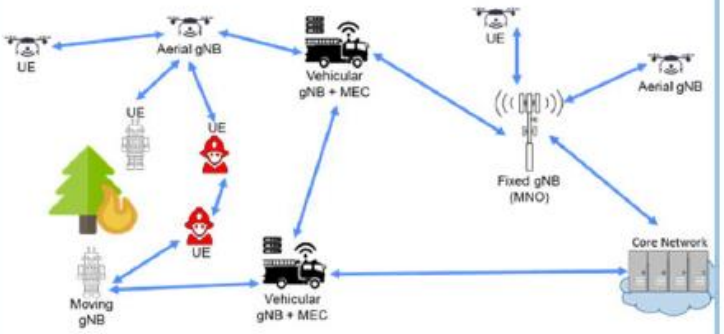
Source: https://www.commondreams.org/news/2019/12/21/everything-burning-australian-inferno-continues-choking-access-cities-across-country

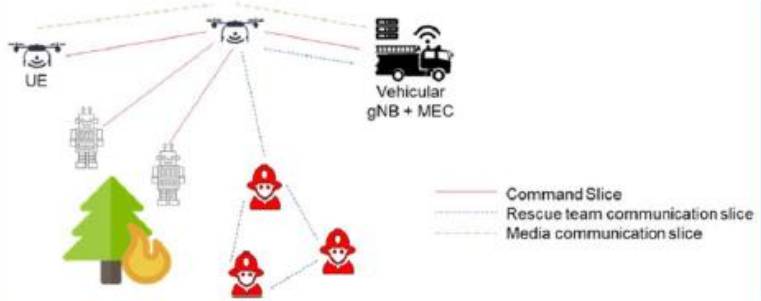
PriMO-5G firefighting use cases

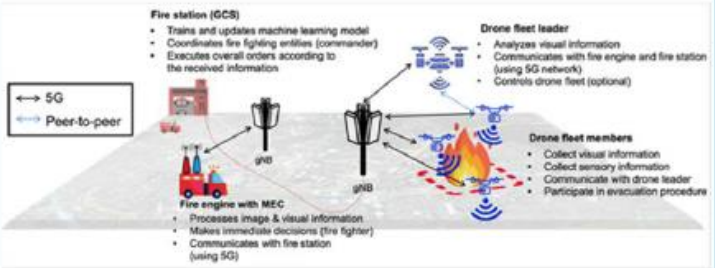
- Aspects firefighters care about:
  - ☐Enhanced situational awareness
  - ☐Common operating picture
  - ☐Joint decision making
  - ☐Firefighter tenability

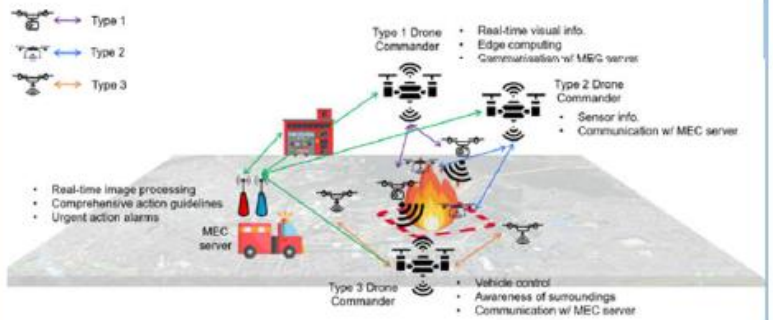
Source: Time Magazine, 3rd August 2018

Scenarios	Use cases	
Scenario A: Forest firefighting with robots and UAVs	*Use case A1. Placement of communication and computing for forest firefighting*	*Use case A2. Network slice management for forest firefighting*
Scenario B: Smart firefighting with UAVs in urban area	*Use case B1. UAV-assisted preparatory measures for smart urban firefighting*	*Use Case B2. Differentiated UAV fleet management for smart urban firefighting*



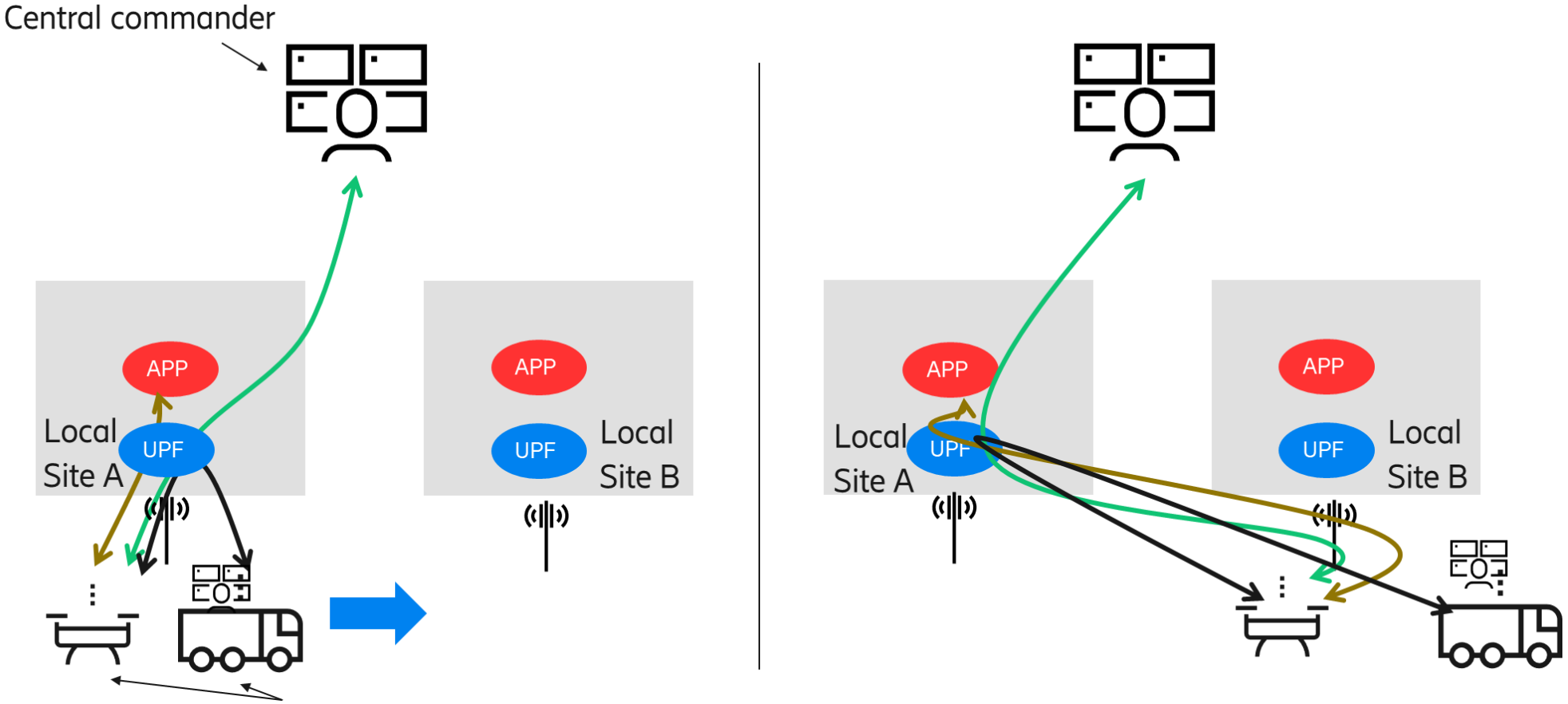






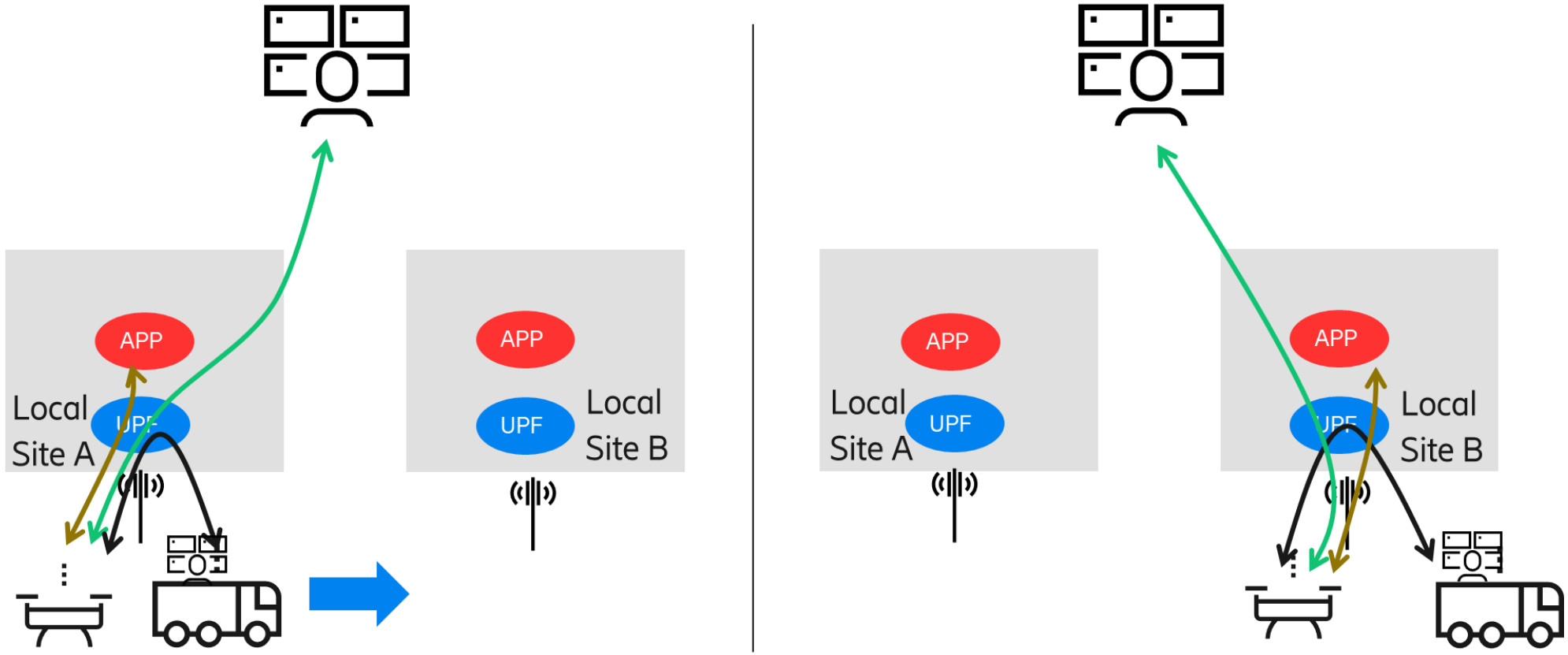
Selected project results and activities

Optimal routing & application relocation



- IP addresses unchanged (for drone UE and firetruck UE)
- UPF and APP instance does not change -> increased latency for UE-to-UE and UE-to-APP

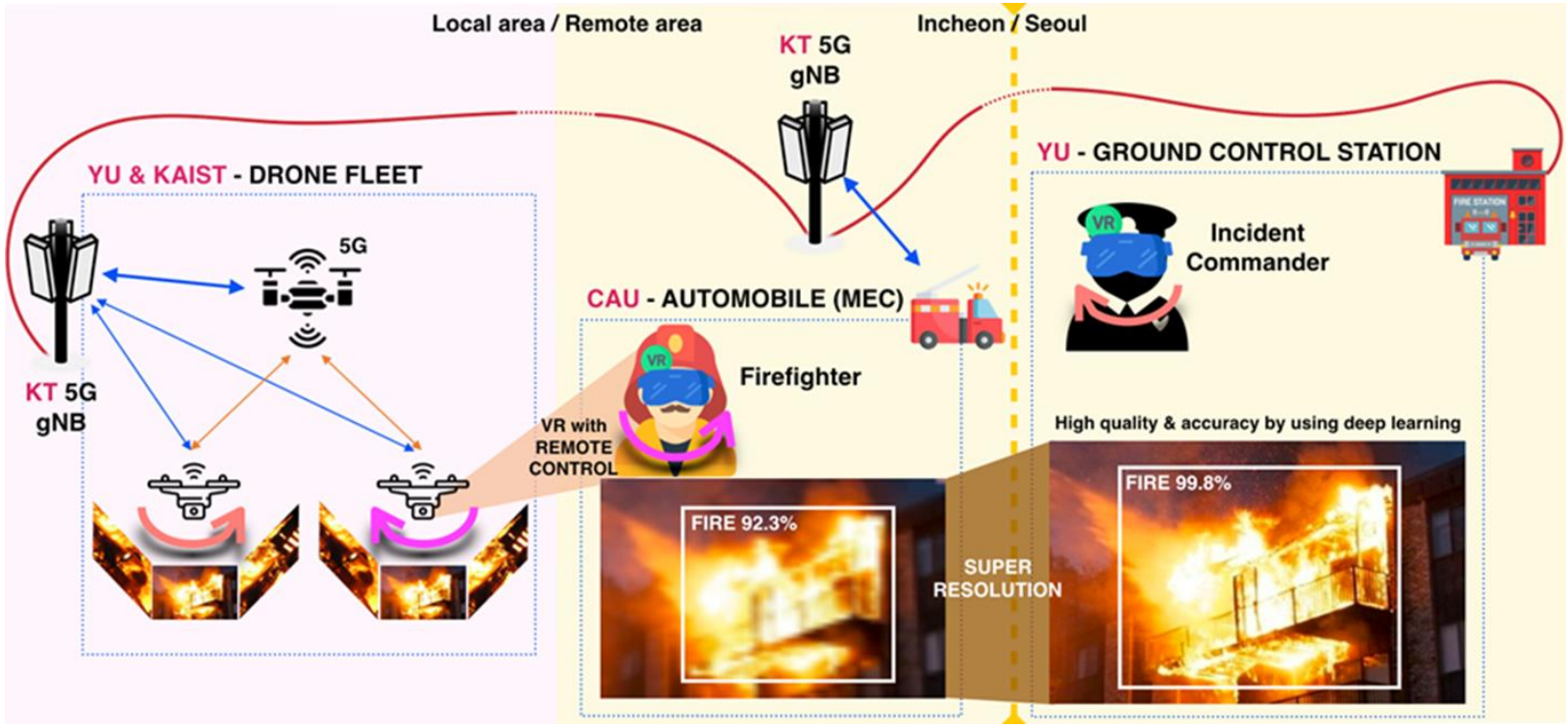
Optimal routing & application relocation



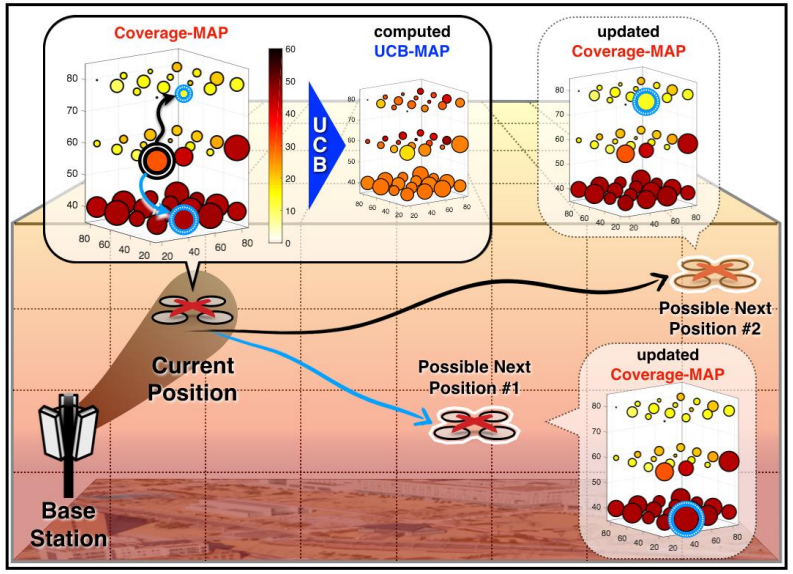
- IP addresses unchanged but UPF changes → lower latency for UE-to-UE
- APP instance relocation → lower latency for UE-to-APP

Further details:
- PriMO-5G Deliverables D2.1, D5.1 and D5.2
- Ali Symeri, ”Application Server Mobility and 5G Core Network”, KTH MSc Thesis, 2019

Aerial video streaming for urban firefighting



- Immersive video streaming with real time object detection and AI-based resolution management for communications and edge compute tradeoffs

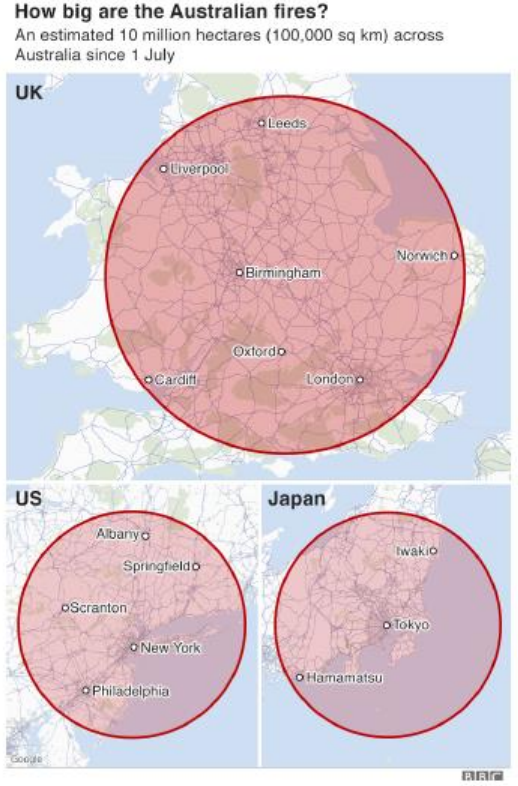


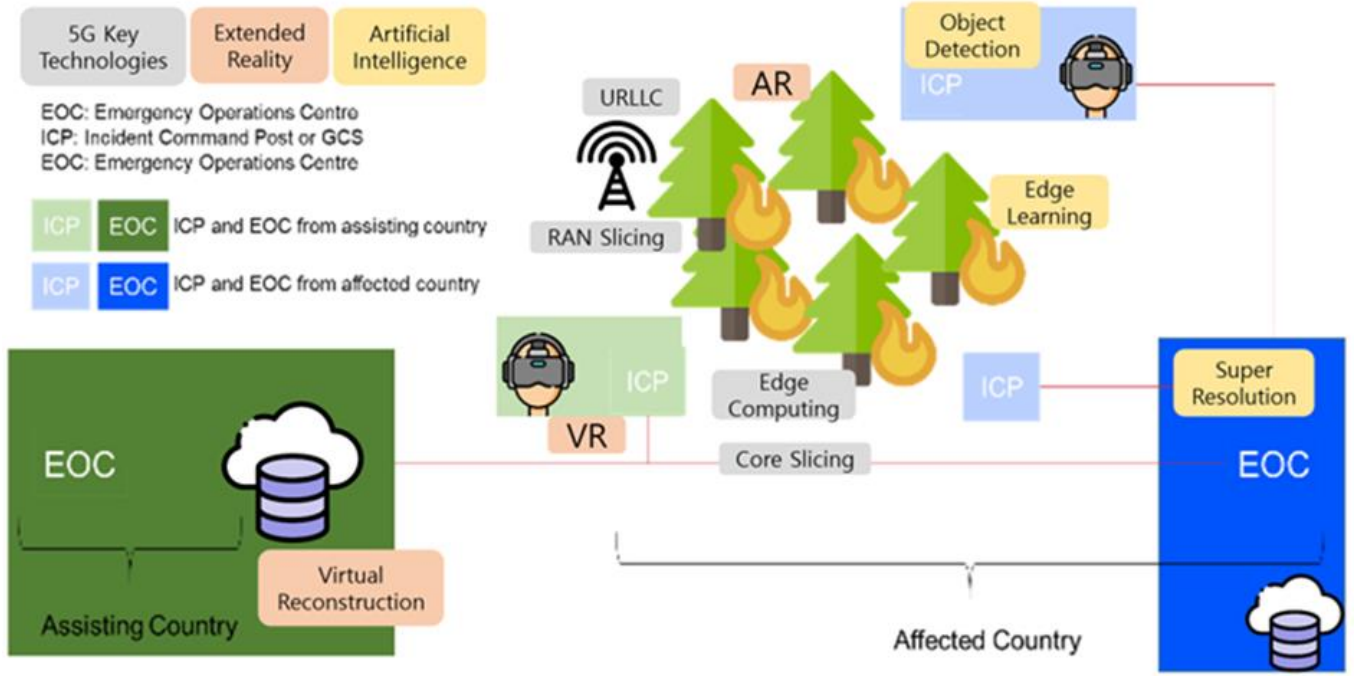
- Developing 3D coverage maps for drone flight missions

Further details:
- PriMO-5G Deliverable D5.1 and D5.2
- https://www.youtube.com/watch?v=gKXCUr99N0I

Intercontinental firefighting

A recent major wildfire event in Australia engulfing a land area of 100,000 km² between July 2019 and January 2020 (see figure below). The scale of the fire required firefighting assistance from five countries as well as local volunteers.





- Demonstrate flexibility of 5G SBA to create network slices with network functions running in different locations
- Possible demo scenarios:
  - Finland is the affected country (RAN and MEC in disaster area) and Korea is the assisting country, and vice versa

Further details:
- PriMO-5G Deliverable D5.1

Key take aways

Take away	Comments
Drones demonstrating great potential in public safety domain	Firefighting, search-and-rescue operations in disaster areas, medical emergencies, wide-area surveillance (e.g. lockdown compliance) etc.
Public safety applications involving drones put stringent and diverse requirements on the network	Mobility, wide-area connectivity, low latency communication, high reliability, service continuity, co-existence of aerial and ground equipment etc.
5G Architecture supports these requirements	Via slicing and edge computing capabilities, Non-Public Networks, Isolated Operation for Public Satefy (IOPS) etc.
PriMO-5G solutions provide further enhancements	For example optimal routing and application instance relocation, AI-assisted communications and computing, cross-continental networks

Contact

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