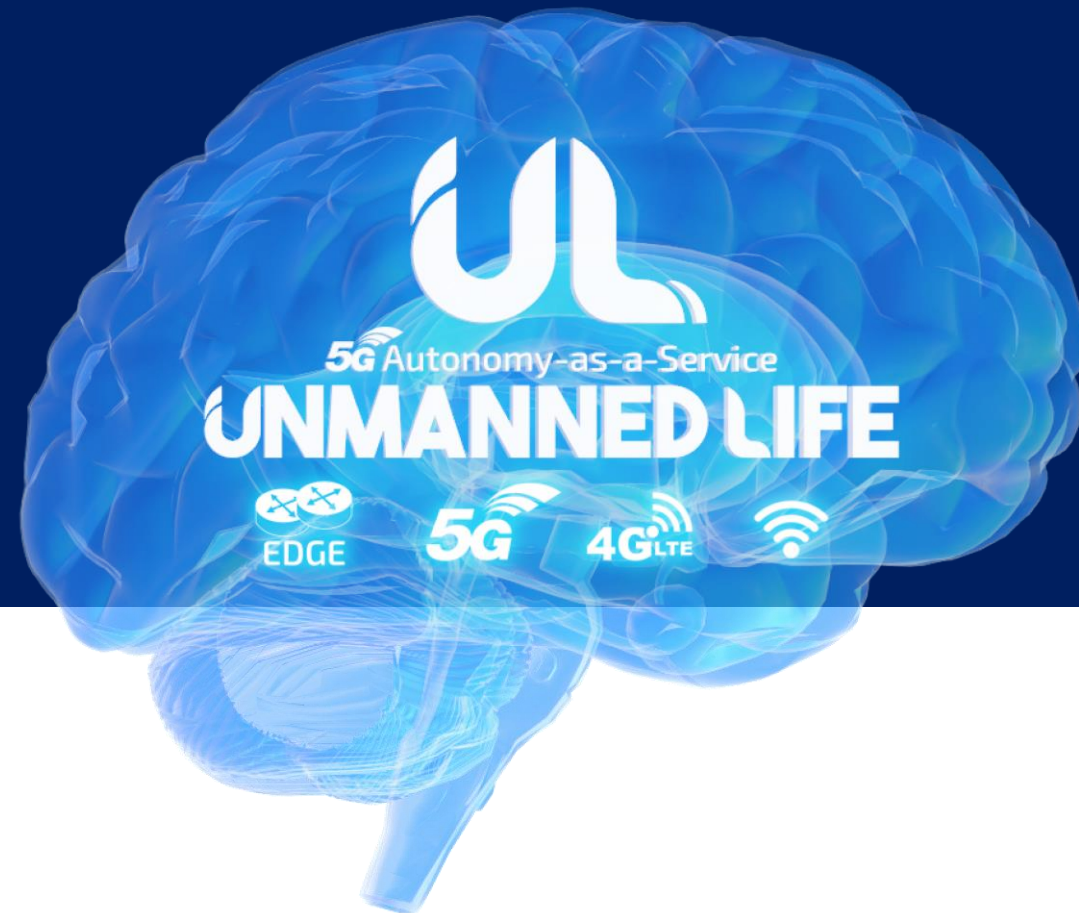


The Software Platform For Seamless Orchestration Of Autonomous Robotics



NTA
National Technology Awards 2018
UK's National Technology
Award

Alibaba Group
阿里巴巴集团
Most Innovative
Company

NTT Group
Most Innovative
Technology

accenture
Most Innovative
Company

TechWorks
UK's Best Disruptive
Innovation Award

Multi-Award-Winning AI for Autonomy Software Platform for Industry 4.0, Smart Cities,
deploying commercial-grade Autonomous fleets of different types of vehicles, robots and drones that work together collaboratively



THE PROBLEM



+1 Million Commercial Drones

are estimated to be flying in the US by 2025
according to FAA and projections



+4 Million Commercial Robots

Will be installed in +50,000 warehouses around
the world by 2025



Fragmentation of robotics due to multiple operating systems of vertically integrated solutions

Robots will save millions only if they are able to function Autonomously and
working together as one Autonomous workforce

UNMANNED LIFE VISION

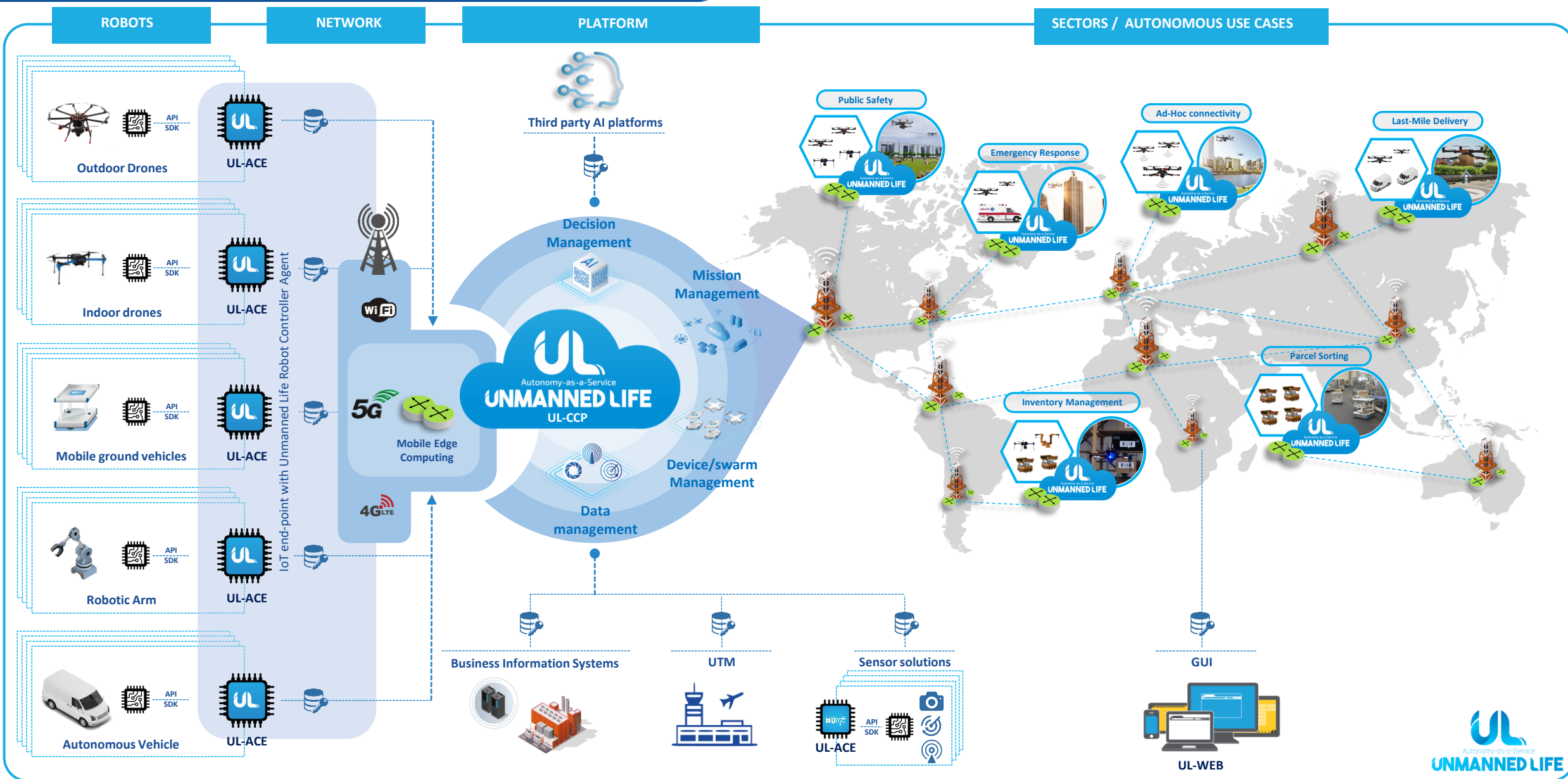
*The Go-To Software Platform for
Seamless Orchestration of
Autonomous Robotics*



AUTONOMY-AS-A-SERVICE

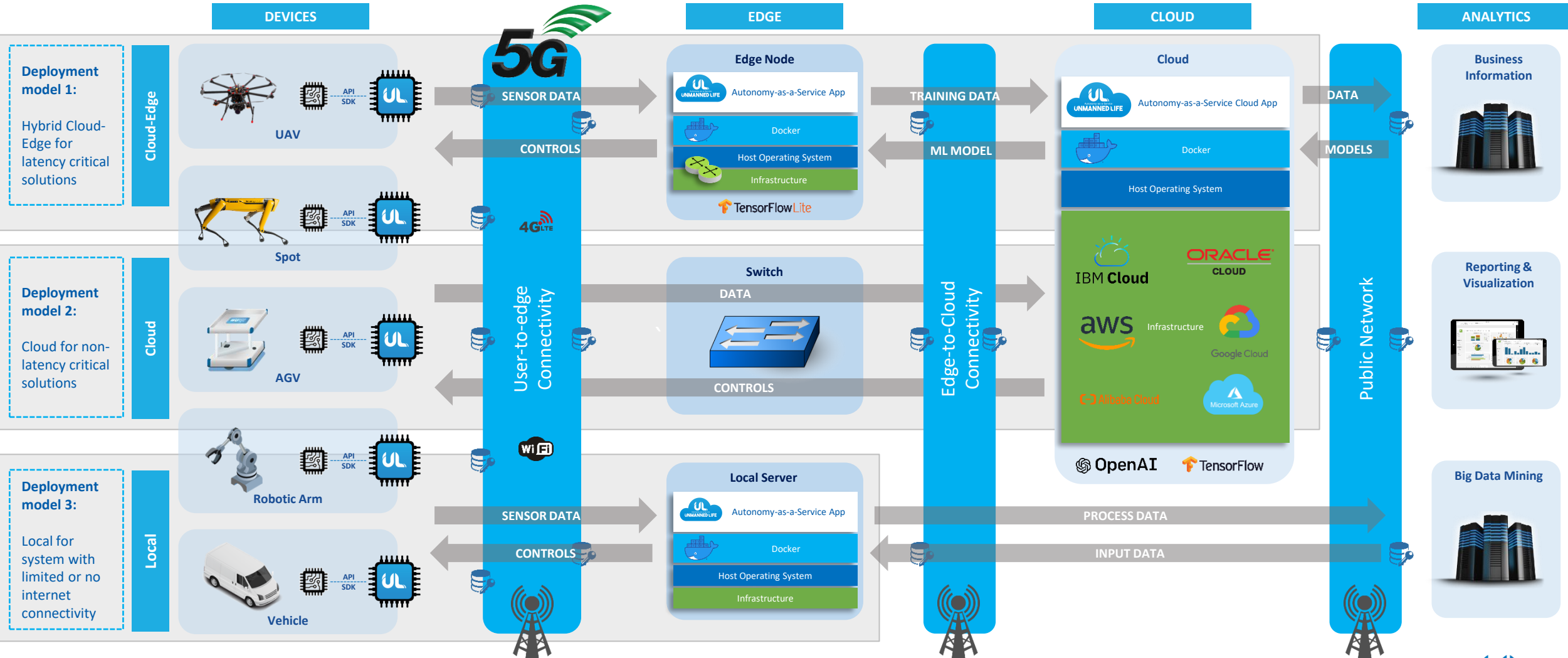
AUTONOMY-AS-A-SERVICE

Solutions Architecture



AUTONOMY-AS-A-SERVICE

Deployment Model Variations





USE CASES

USE CASES

Verticals & Applications



Industry 4.0

Logistics

Warehousing, distribution centres, sorting centres, e-commerce fulfillment centres, supply chain management, third-Party Logistics (3PL) companies



Surveillance

Security | Surveying

Warehouse & Industrial campus security, supply chain safety, mining, oil & gas pipelines, cattle and agriculture surveillance.

Urban | Borders control

Police departments Defense department, Airports, Ports, Surveillance for Smart cities



Emergency Response

Fire Departments, Police Departments, Ambulance Services, Search and Rescue Services, Disaster Management Services and others.



Smart Factories

manufacturing, Automotive, Construction equipment, Construction equipment, Food & Beverages, Industrial Machinery, Pharmaceuticals, Textiles, Industrial Machinery, among others.



Inspections

Asset tracking | Maintenance

Utilities & Telcom Infrastructure Inspection, Construction & Manufacturing Site Surveillance, Container Ships & Infrastructure in Shipyards, Buildings & Structural Inspections for Insurances

Public Infrastructure

Bridges, rail and metro lines, electricity lines security, oil & gas pipelines, offshore platforms



Traffic & Crowd Monitoring

Highway and high density congestion points, sports events and crowd management, country clubs surveillance

AUTONOMOUS USE CASES

Examples of ongoing projects

AUTONOMOUS EMERGENCY RESPONSE



Customers & Partners



Customer

Magenta®

Partner



City of Vienna,
Austria

Deployment

Swarm
Orchestration



Function
combination



Commercial



Object Recognition



No Pilots



Central monitoring



EU AUTONOMOUS 5G COMMERCIAL DRONES PROGRAM



Partners

THALES

AIRBUS

orange™

NOKIA

FREQUENTIS

Deployments



Ad-Hoc
connectivity



Disaster recovery



Testbeds



Situation Awareness



MEC



Central monitoring

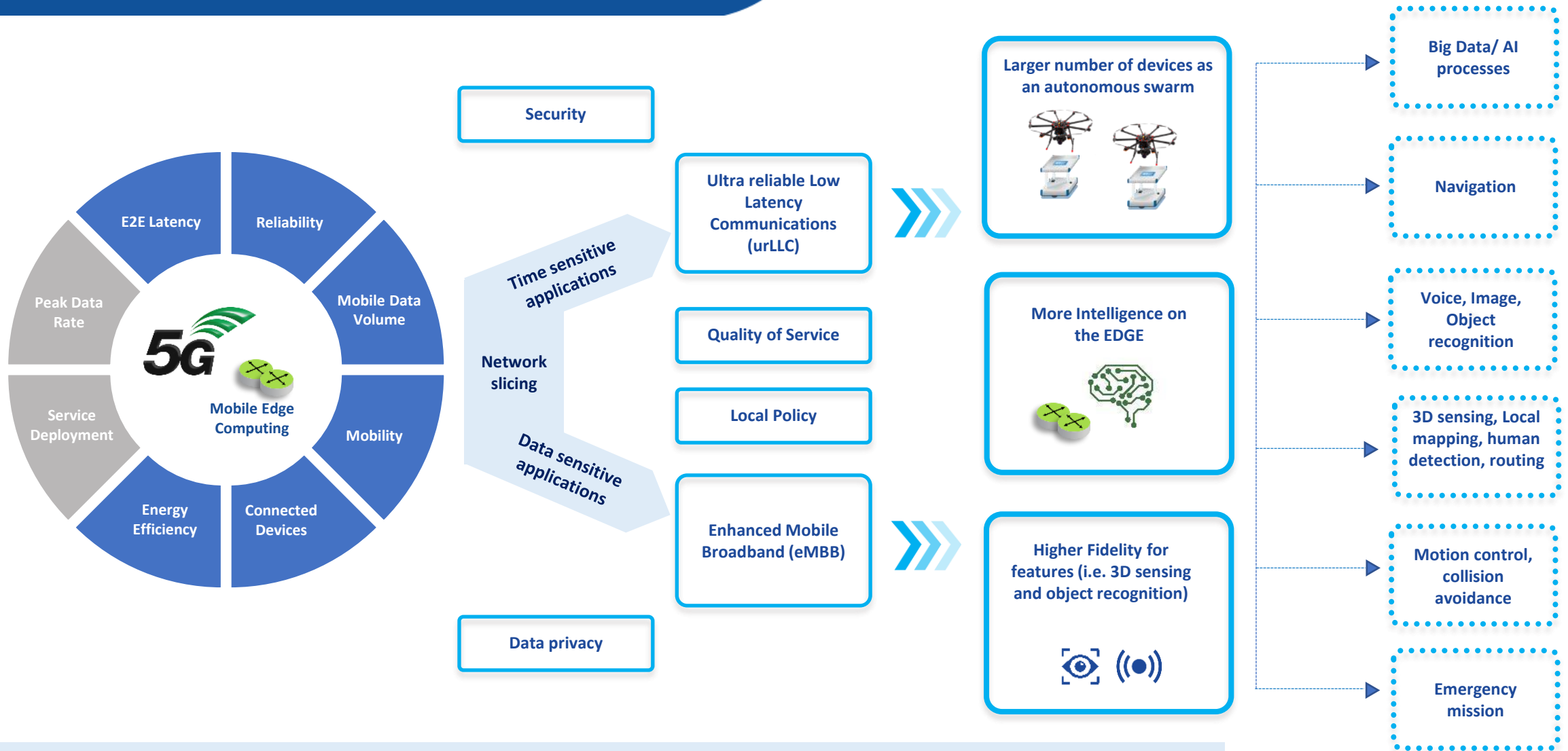




5G & EDGE COMPUTING

NETWORK CHARACTERISTICS

Benefits of 5G and edge computing



Mobile robots such as AMR's, UAV's, AGV's require wireless communication and computational resources. Combining and optimizing computational resources using edge computing in combination with secure network environments for connectivity such as 5G enables secure and add scale deployment of robotic swarms

HYBRID CLOUD EDGE DEPLOYMENT

Deploying efficiently at scale



KNOWLEDGE BASE

Advanced applications
Data Storage
Deployment management
Centralized learning
Knowledge expertise
Authentication

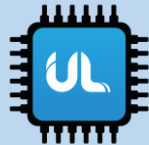
UL-cCCP



SERVICES

Use case applications
Mission management
Data management
Device management
Decision management
Central context

UL-eCCP



END USER

Safety systems
Network integration
Failsafe systems
Device integration

UL-ACE

CLOUD

EDGE

DEVICES/USE CASES



Dynamic Offloading
Computation

Dynamic Offloading
Computation



System of Systems (SoS) approach

Composed out of multiple, dispersed, independent systems in context as part of a larger, more complex system. Each system is a group of interacting, interrelated and interdependent components that form a complex and unified whole and are integrated with other systems composing a full solution architecture.



CHALLENGES

CHALLENGES

Autonomous services and mobile robots

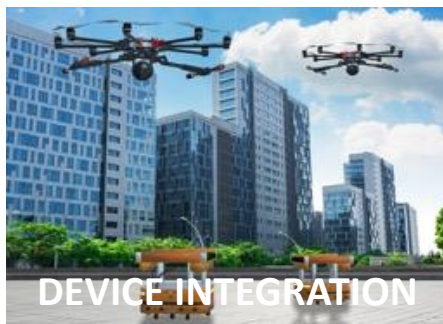
Different fields of expertise collaborating as an eco-system are required to overcome these challenges.



When travelling over large distances it may occur that the network needs to roll back dynamically to a lower quality network or even loses connectivity completely. This can result in limited connectivity and complete loss of connectivity with the edge.



Industrial deployment often makes use of private networks and private edge infrastructure that have restricted or no connectivity with public networks. Autonomous solutions often use cloud-based knowledge bases for decision making or other cloud-based applications.



First challenge is connecting mobile robots to a 5G network as some robots have limited payload capacity. Small light weight commercial radios are not yet available. Second challenge is onboarding of the edge applications.



Deployments over long distances might require to switch between cloudlets to optimize the latency. As the orchestration of devices depends on real-time data it introduces challenges of the data management during switching.



Different types of devices can require requirements for data transmission, even for a specific device different types of data require different prioritization such as C2 or video streaming. To ensure QoS of mission-critical data network slicing will be required.



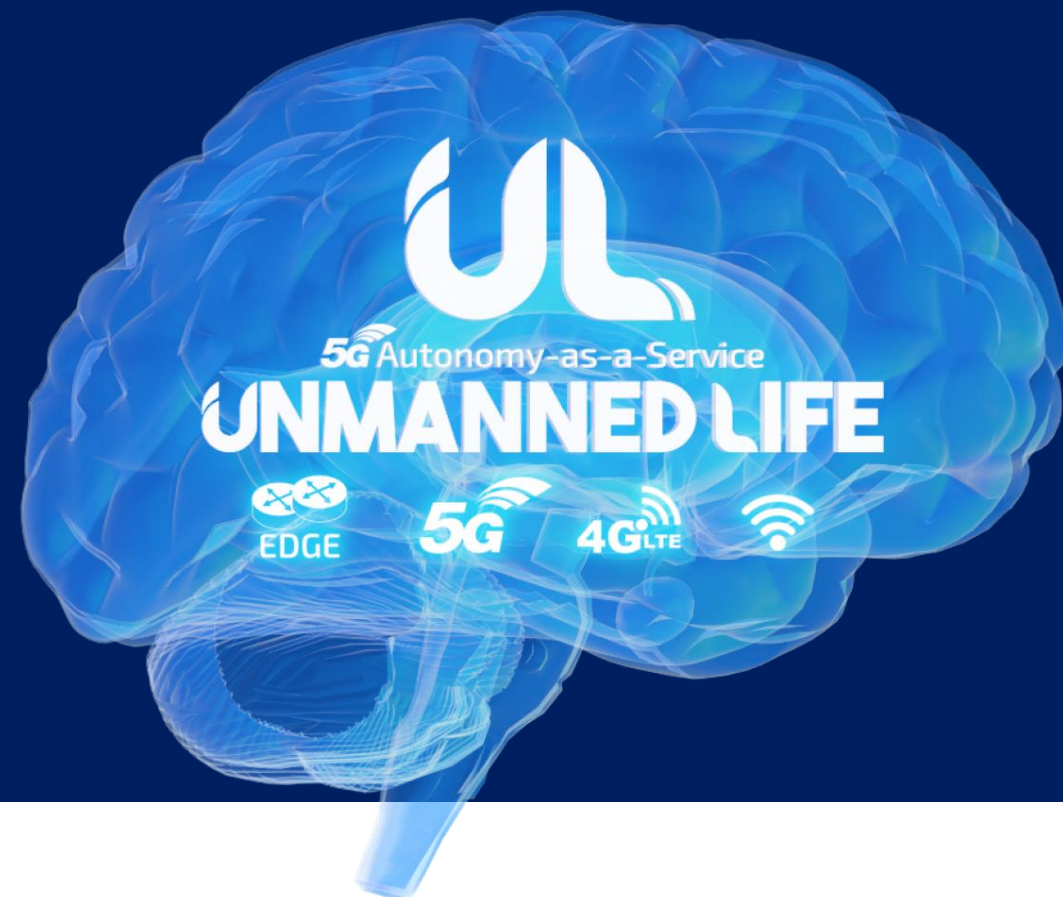
Next to wireless networks is localization a very important input for mobile robots and in many cases robots use on-board sensors in combination with SLAM to localize themselves. Localization obtained through 5G is interesting but precision and accuracy will be key.

THANK YOU



KIM CLEMENT

Chief Technology Officer



Let's talk !

kim@unmanned.life