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SUITING THE FUTURE

Visions for Future Communications Summit

Lisbon, October, 2017

Ubiwhere

Pedro Diogo
pdiogo@ubiwhere.com

Focus Areas

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TELECOM
&
FUTURE
INTERNET

SMART
CITIES

Overview

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Research

H2020

14 new projects until 2020

PT2020

Together with H2020, ensure 50% of total costs

Products

Research results integrated into commercial solutions

Remember the focus areas? #telco #smartcities

Current status (H2020)

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#telco

- SHIELD
- **5G-PPP Phase 1**
  - SONATA
  - SELFNET
- **5G-PPP Phase 2**
  - 5GCity

#smartcities

- EMBERS
- symbIoTe
- SmartSDK
- SynchroniCity
- SELECT for Cities

sonata

Selfnet

SHIELD

5GCity

EMBERS

symbIoTe

SMART SDK

SYNCHRONICITY

SELECT for Cities

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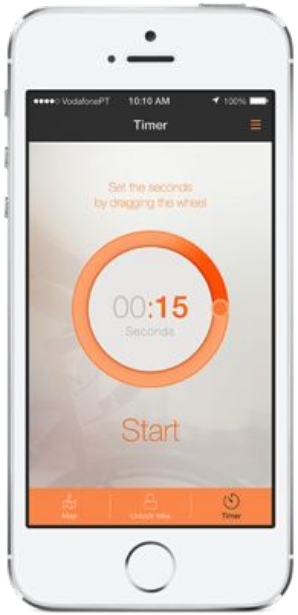
COMMERCIAL SOLUTIONS

bike emotion®

Bike Sharing Technology

1
2
3
4
5
6


Timer
Set the seconds
by dragging the wheel
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Seconds
Start

Map

Success Story - Birmingham (Alabama, US)

citibrain:

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"*Smart solutions for global challenges*"

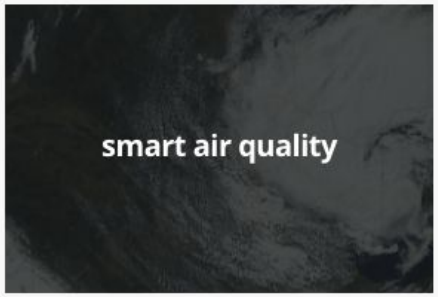
Commercial joint venture with three Portuguese SMEs:

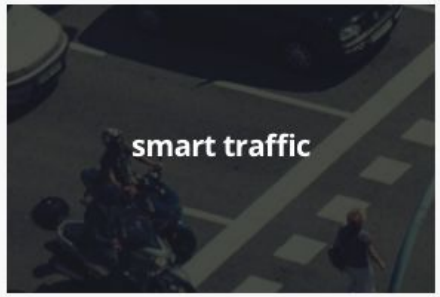
Micro I/O (Electronics)

Ubiwhere (Software)

Wavecom (Low-Power Networks)

Focus on Mobility and Environment





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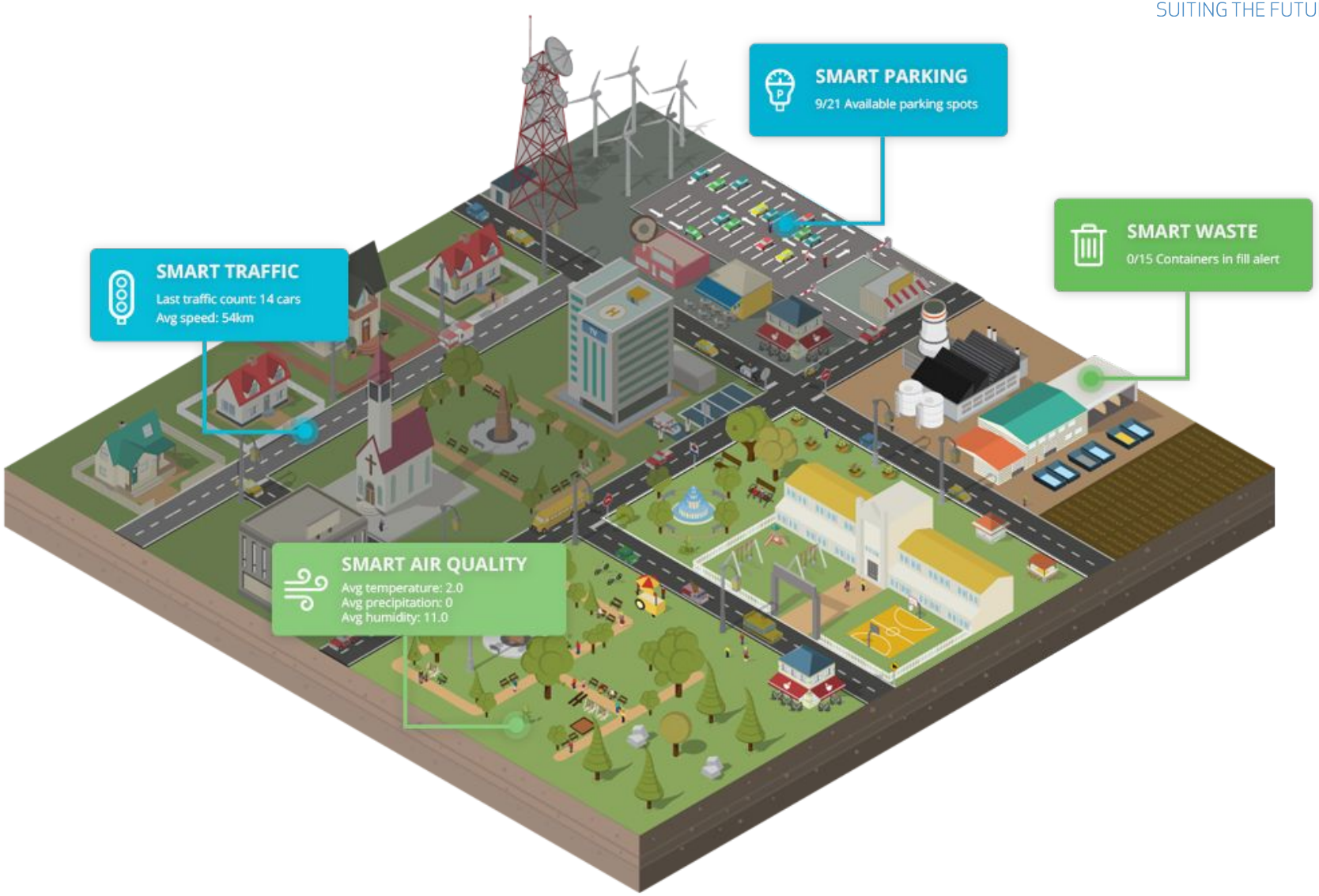

smart lamppost

Smart Lamppost - Consortium

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Smart Lamppost - Modular Concept

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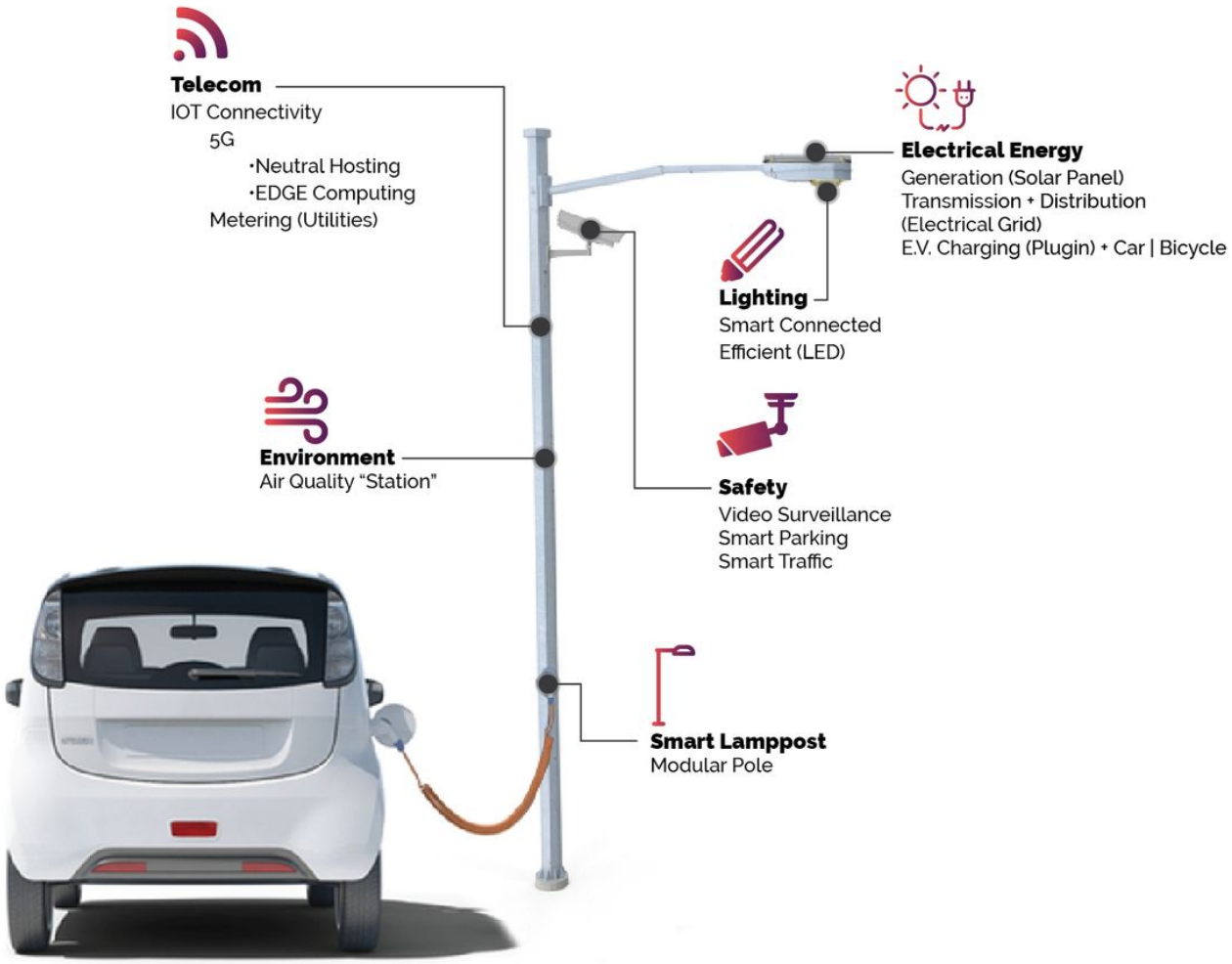

Smart Lamppost - From concept ...

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Smart Lamppost - ... to production

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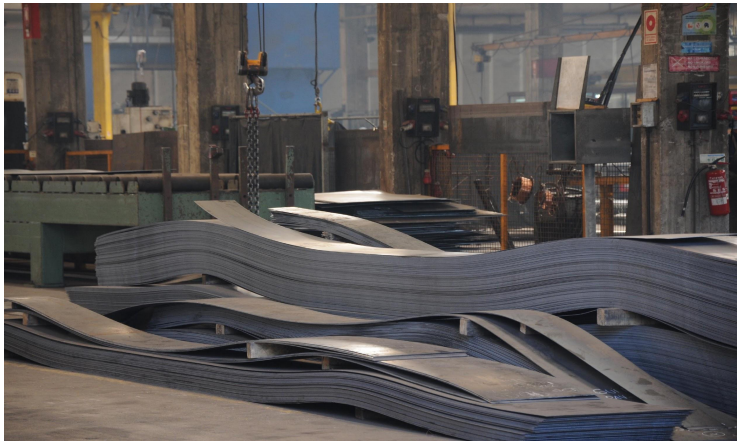

Will be demoed during upcoming SCEWC @ Barcelona

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FUTURE INTERNET

Smart Lamppost - 5G Enabler

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How to achieve 5G KPIs?

1000 times higher mobile data volume per geographical area
10 times to 100 times higher typical user data rate
10 to 100 times more connected devices
10 times lower energy consumption
End-to-End latency of < 1ms
Ubiquitous 5G access including in low density areas (small cell capillarity)

Innovation Pillars

Edge / Fog Computing (MEC) + NFV & SDN (DevOps model)
Small Cell massive rollout + mmWave
Neutral hosting

Business Opportunity for such demanding market

Disruptive technology demands an equally disruptive business model

Smart Lamppost - NFV & SDN

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Network	4G & 5G (Small Cell)
	WiFi
Neutral Hosting	Subscription Business Model
	Multi-tenant solution (autonomic network slicing deployment)
	CAPEX & OPEX reduction (re-use existing infrastructure)
	Monitor KPIs and SLAs

Smart Lamppost - MEC

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Innovation Enabler

Real-time access to Radio Network Information (radio-aware)
Applications running closer to the UE
Low latency communication
Smarter applications
High throughput

Edge Cloud

MEC applications compliant with Open Standards (ETSI MEC / M-CORD)
ARM SBCs managed by OpenStack (Edge VIM)

Telco Operators:

Leverage lamppost's Edge Computing Capabilities
Deploy special applications closer to their client's UE

General Clients:

PaaS to run Linux Containers / Unikernels on available resources
Serverless architecture

Smart Lamppost - ETSI MEC

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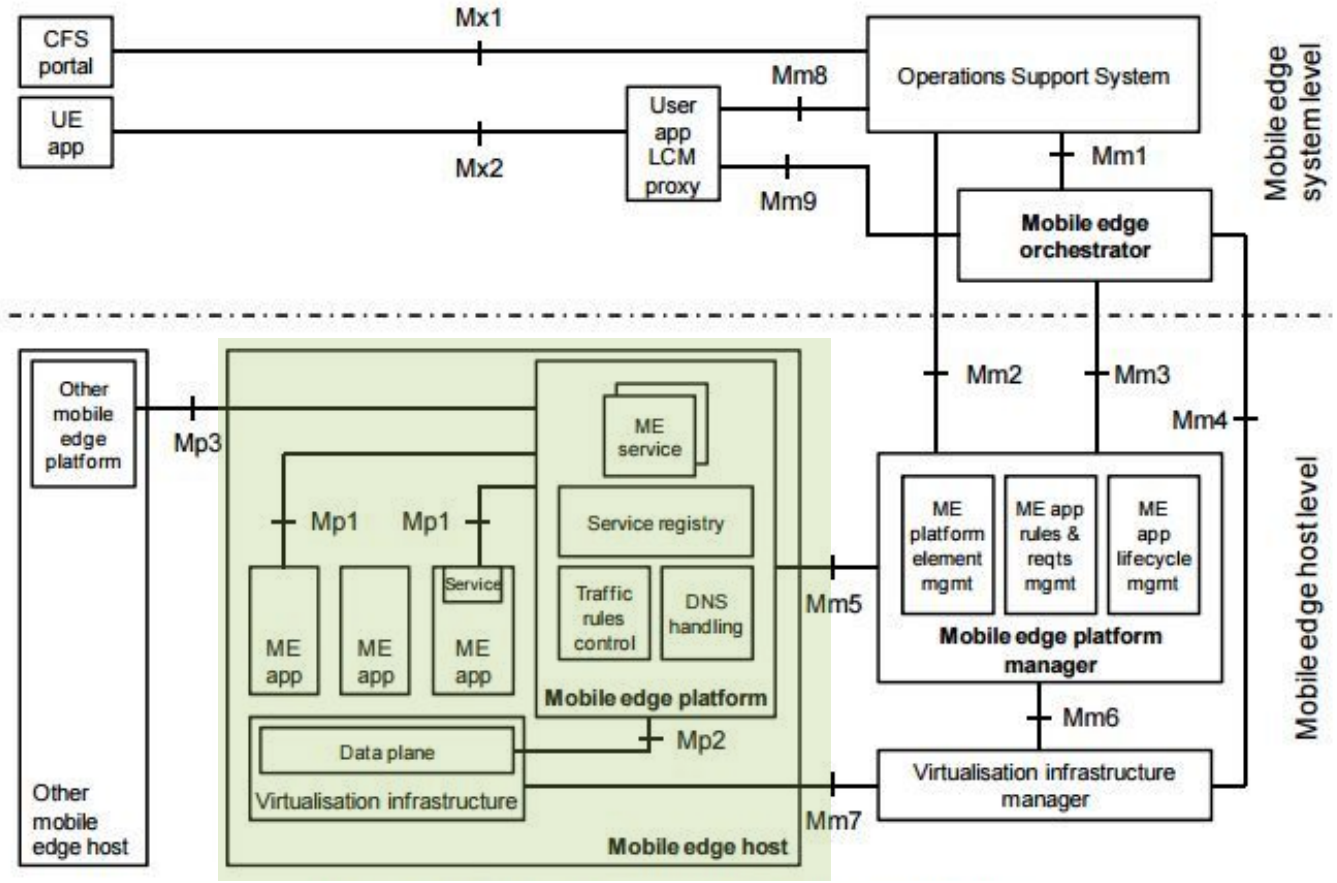

Smart Lamppost - ETSI MEC

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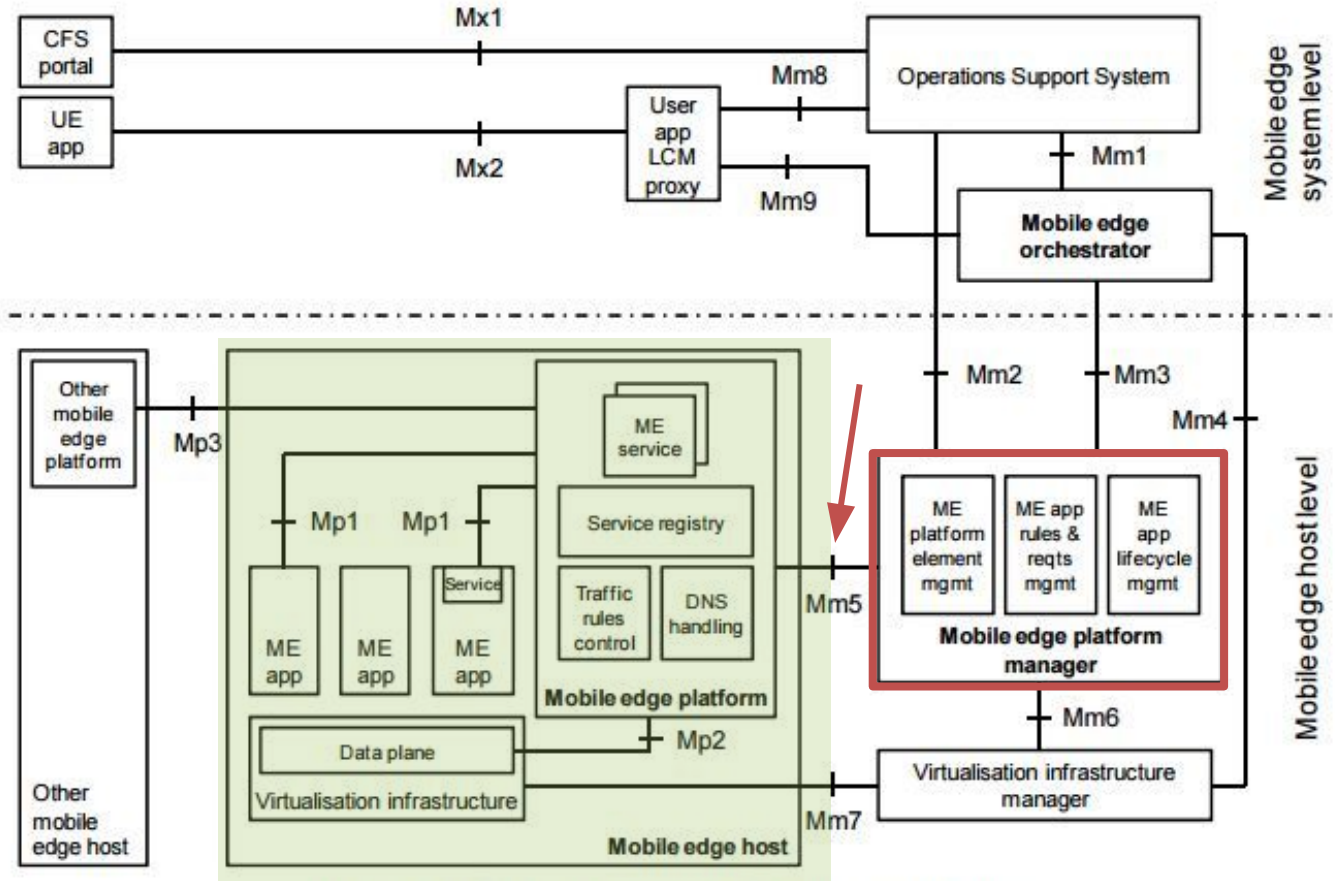

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CCAM:
Cooperative, Connected and Automated Mobility

CCAM: New name for V2X / C-ITS

CCAM - It is happening ...

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NHTSA (National Highway Traffic System Administration, USA)

Moving forward with the 2014 proposed rulemaking (April 2017)
All vehicles required to talk to each other by 2023

Qualcomm

Released 9150 C-V2X chipset (1 month ago)
Intelligent Transportation Systems (ITS) V2X stack

NVIDIA

Released Drive PX “Pegasus” (2 weeks ago)
Dedicated hardware with “datacenter-class processing power”, for autonomous cars

How can we derive value from all this intelligence + communication capabilities?
What sort of network architecture is needed to leverage and coordinate all of this?

Smart Lamppost - 5GCITY CCAM Use Case

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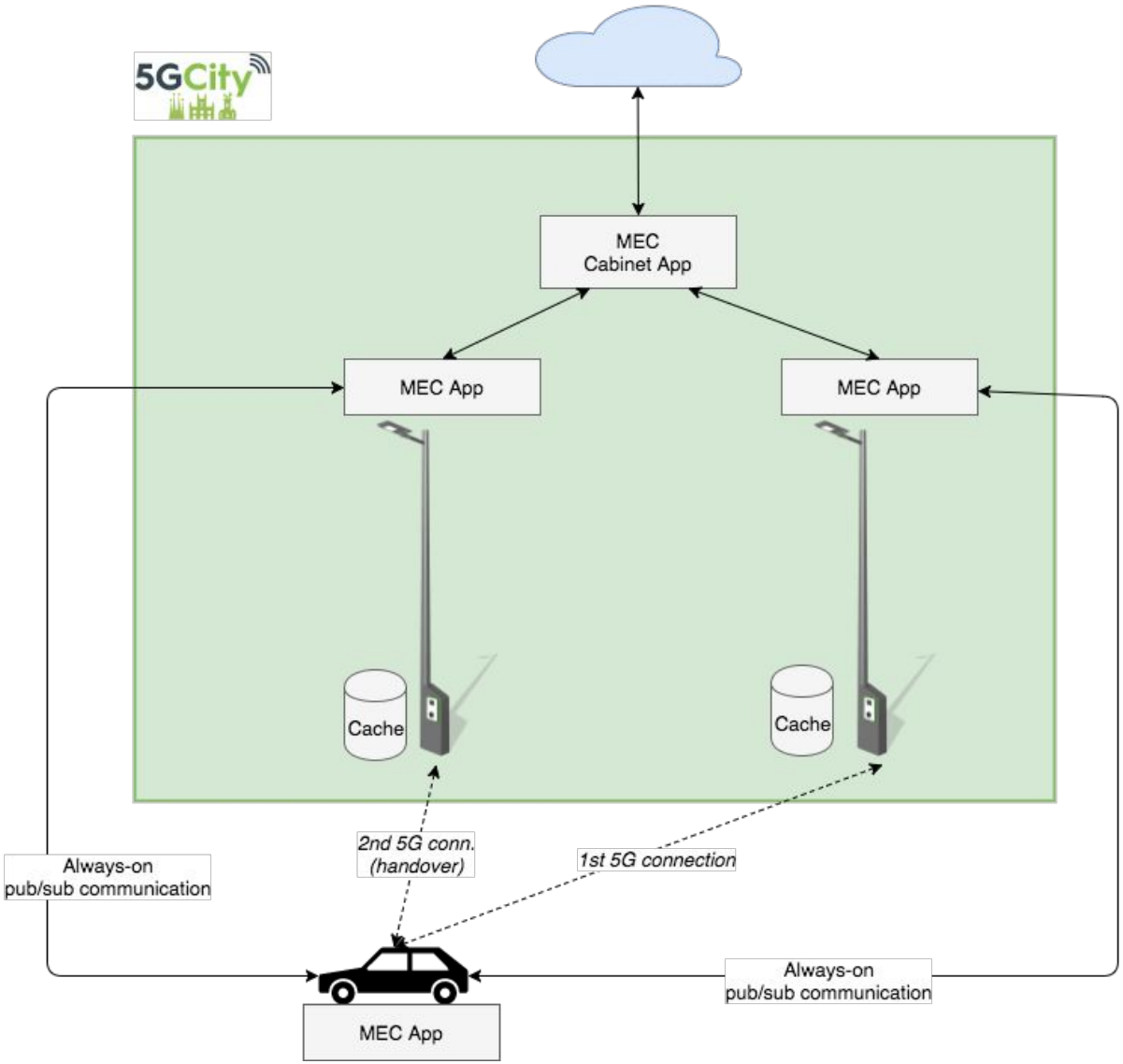

Smart Lamppost - 5GCITY CCAM Use Case

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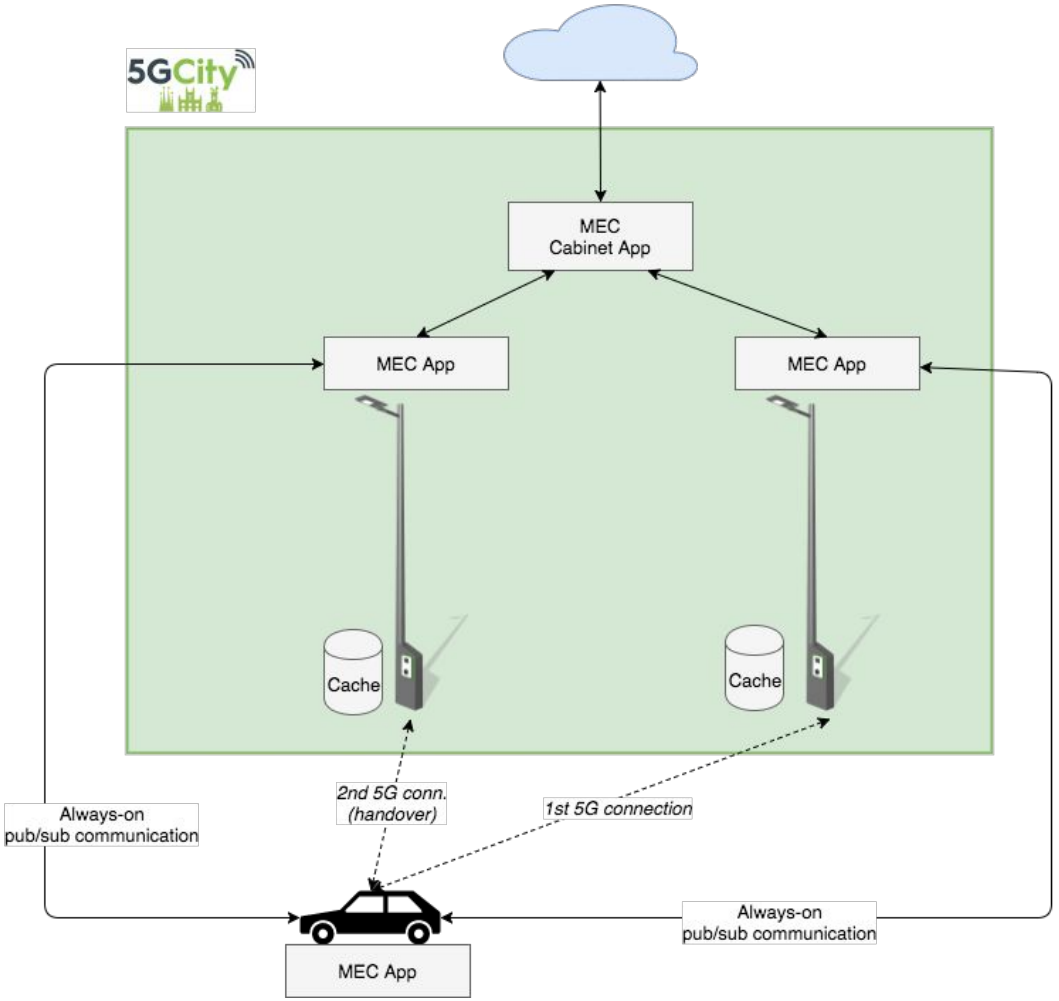
Deployed in

- Bristol
- Barcelona

Coordination mostly with

- Accelleran
- Adlink & PrismTech
- NEC
- Nissan



Smart Lamppost - 5GCITY CCAM Use Case

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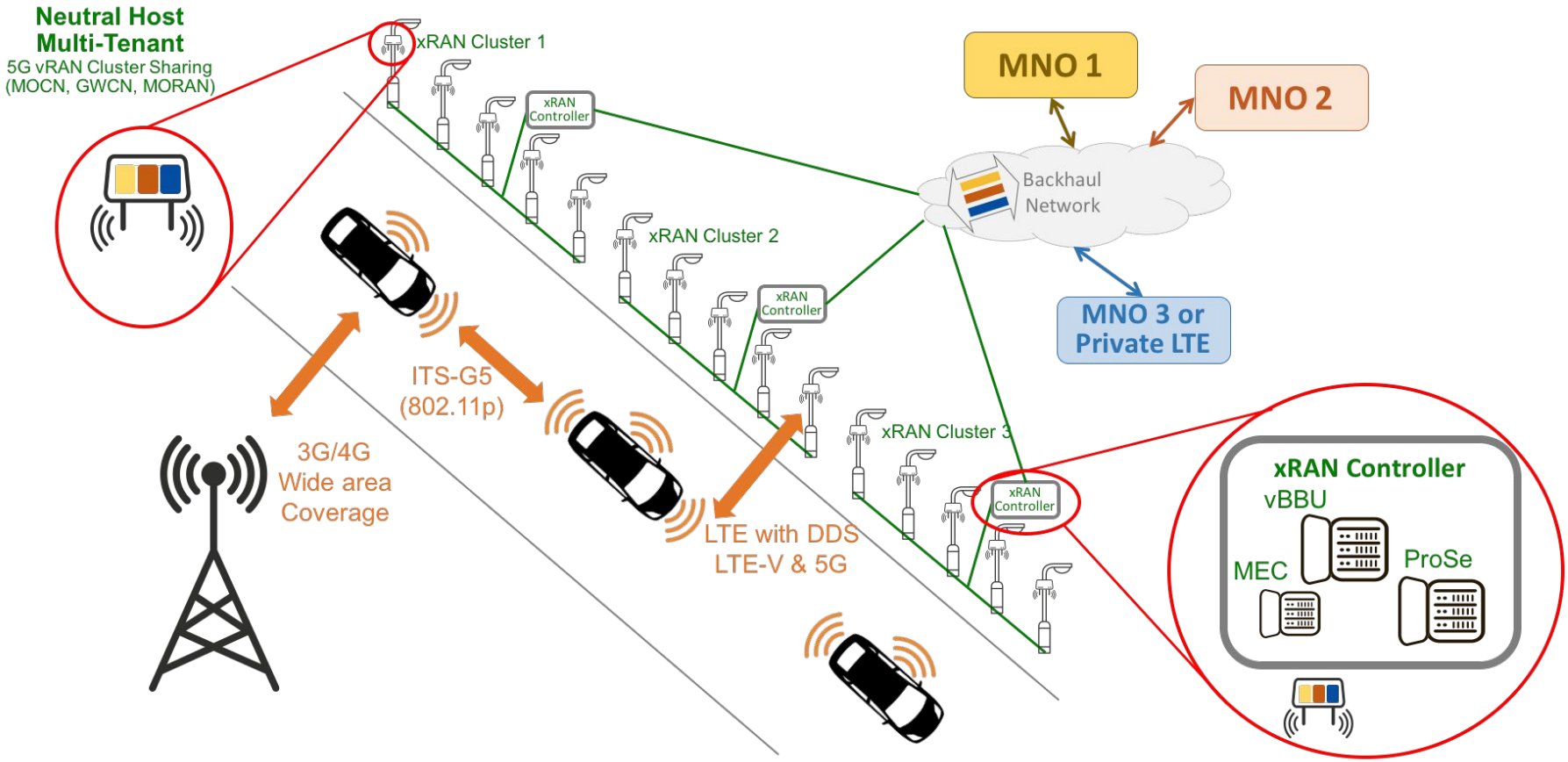

Smart Lamppost - 5GCITY CCAM Use Case

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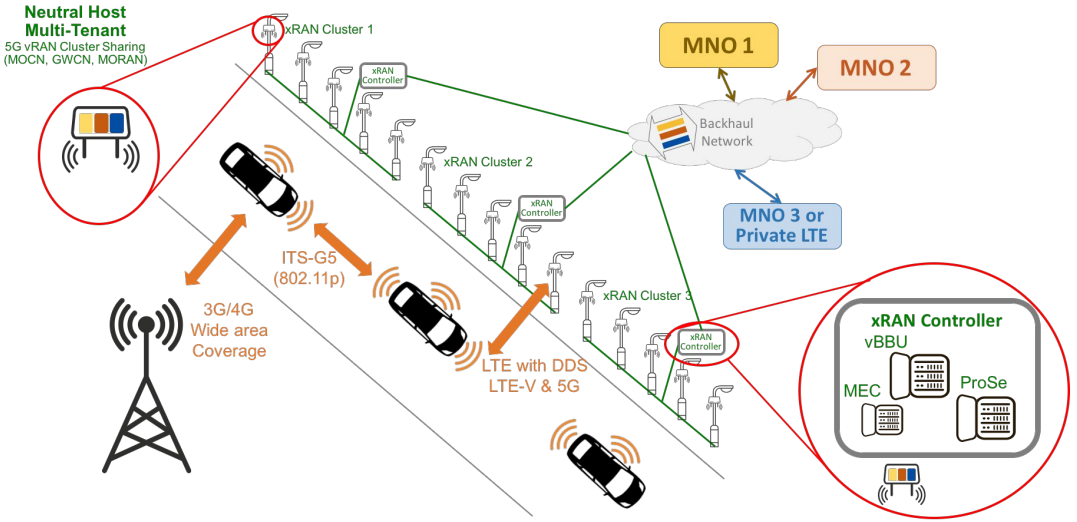
5G

- V2N
- Enable uLLRC between *Vehicle and Network*
- Leverage Cloud connectivity and MEC coordination
- Leverage NFV for network slicing with guaranteed QoS

ITS-G5 / 802.11p / DSRC

- Appropriate for V2V (NLOS)
- Enable uLLRC *between Vehicles* only
  - LTE Direct? (Qualcomm)
- Cooperation as envisioned by European Commission (*5G For Europe: An Action Plan*)



Smart Lamppost - 5G CCAM Challenges

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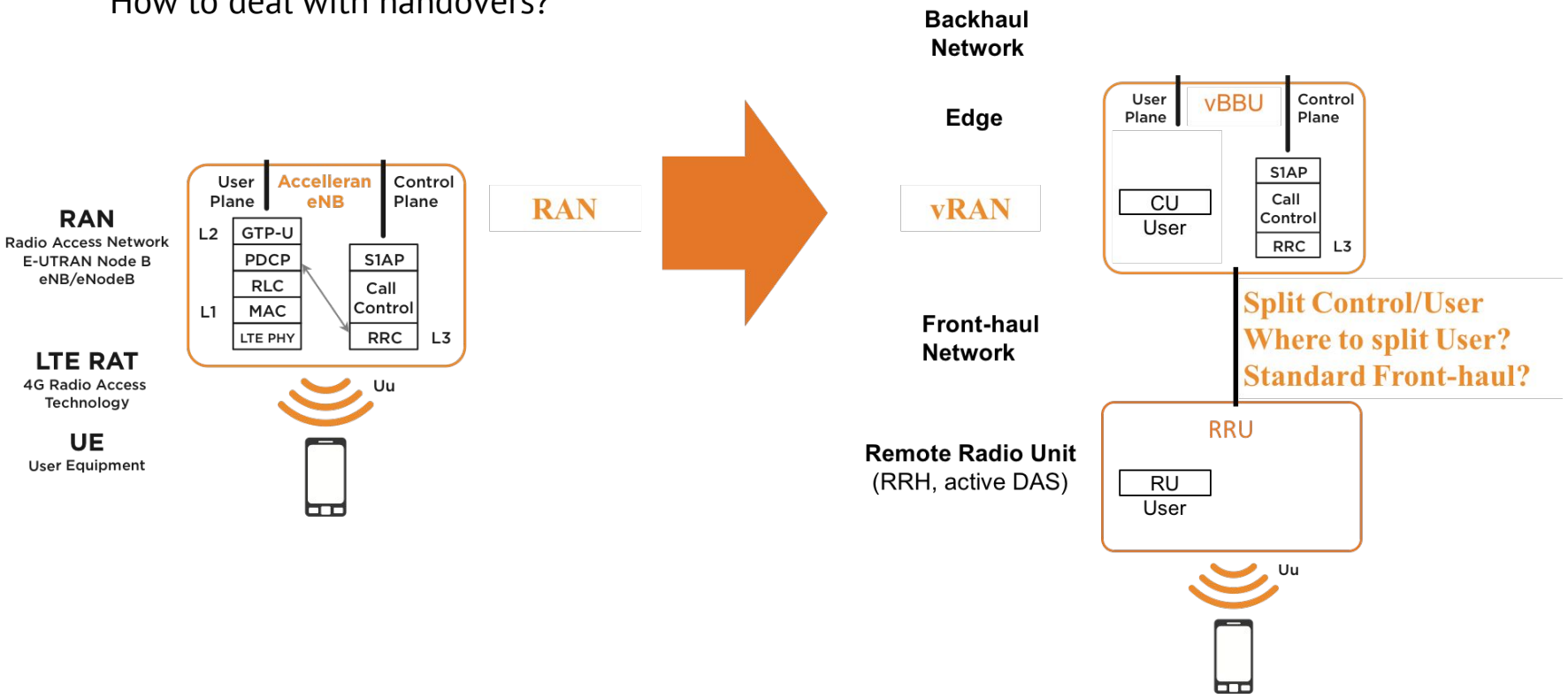
5G NFV: Disaggregating the RAN

Standard RAN architecture might not suffice
Flexible solutions (software / virtualization) tailored to different verticals / UCs
How to maintain uLLRC with fast-moving mobile nodes?
How to deal with handovers?



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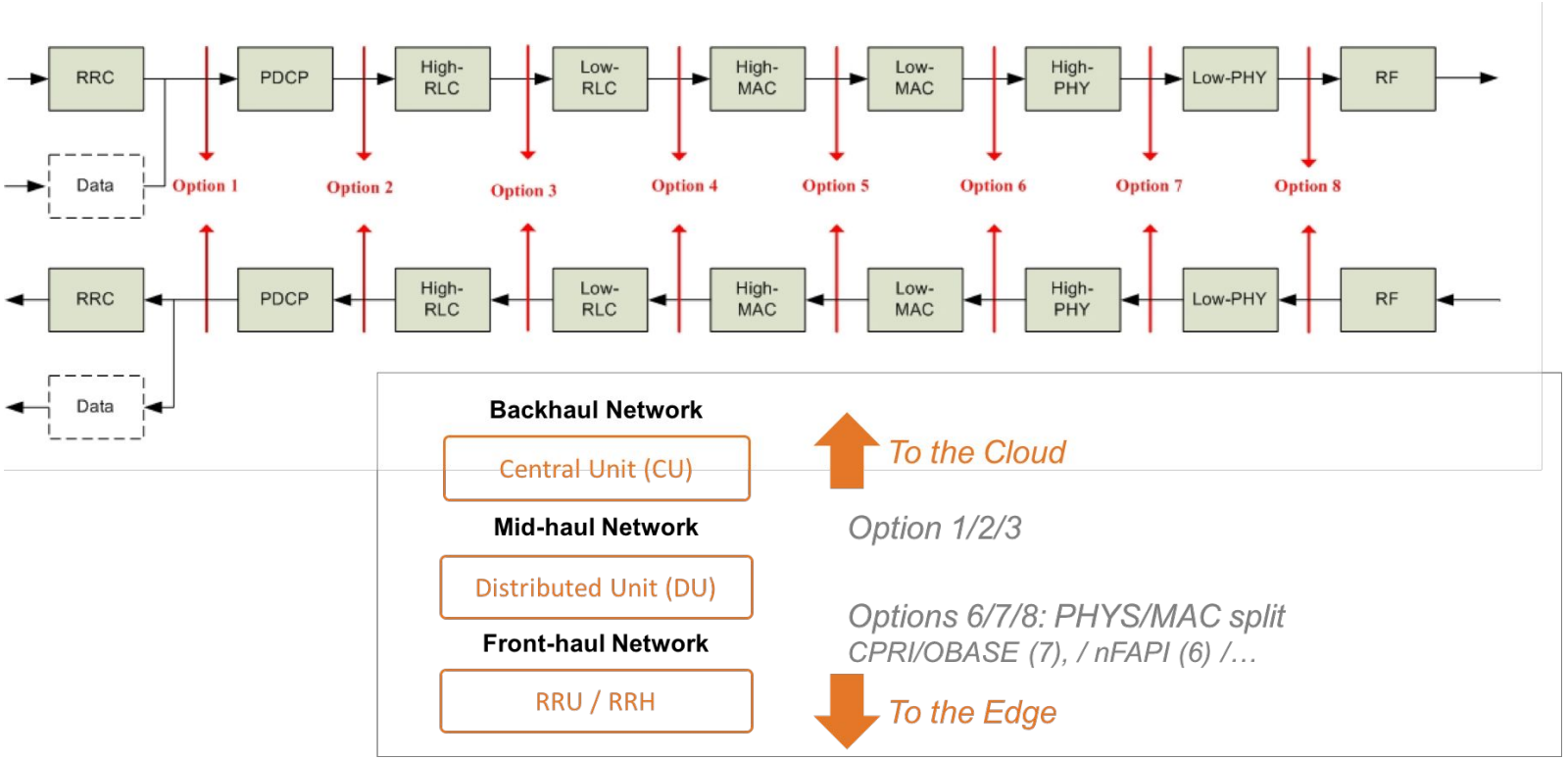
5G RAN Split Options



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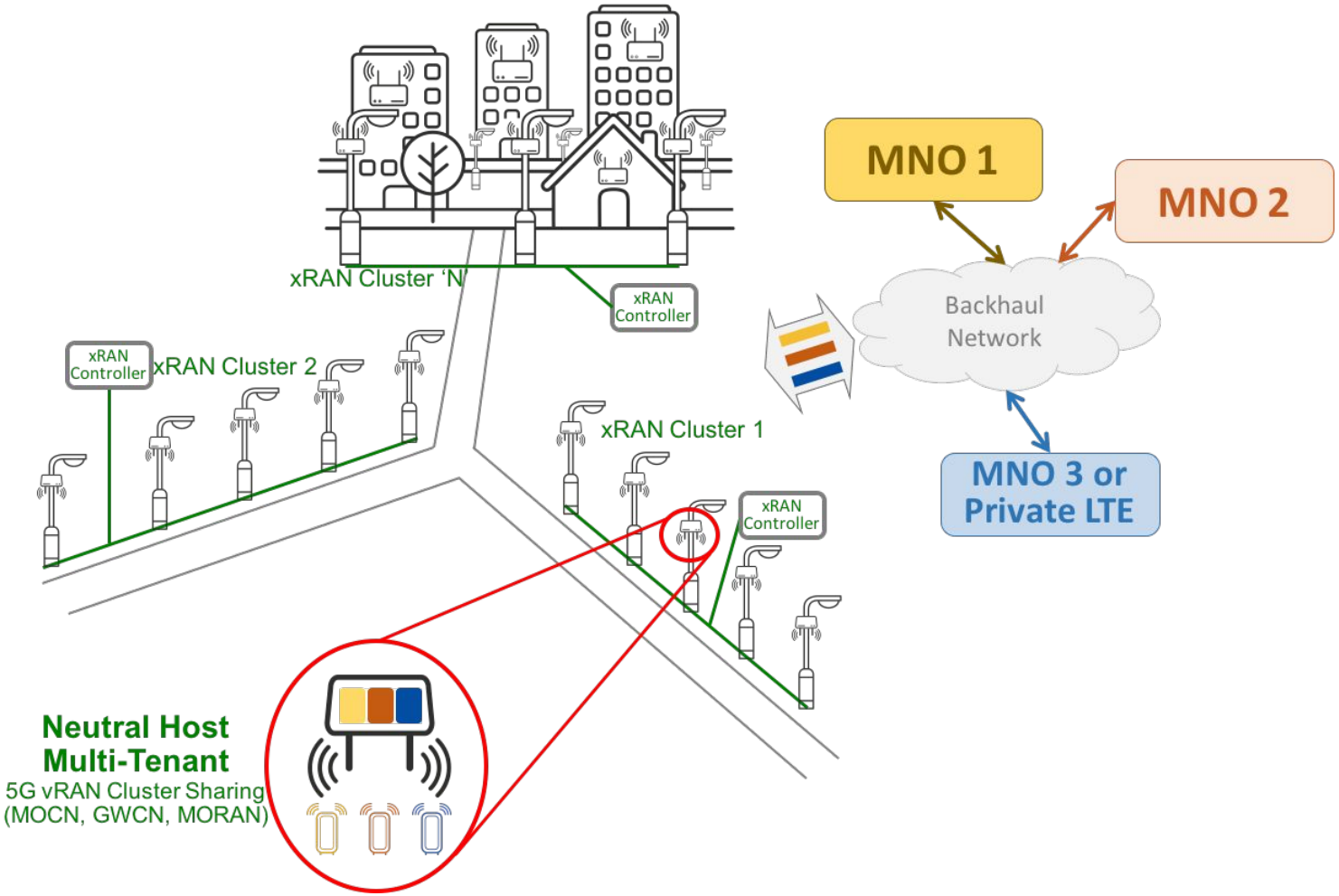

Smart Lamppost - 5G CCAM Challenges

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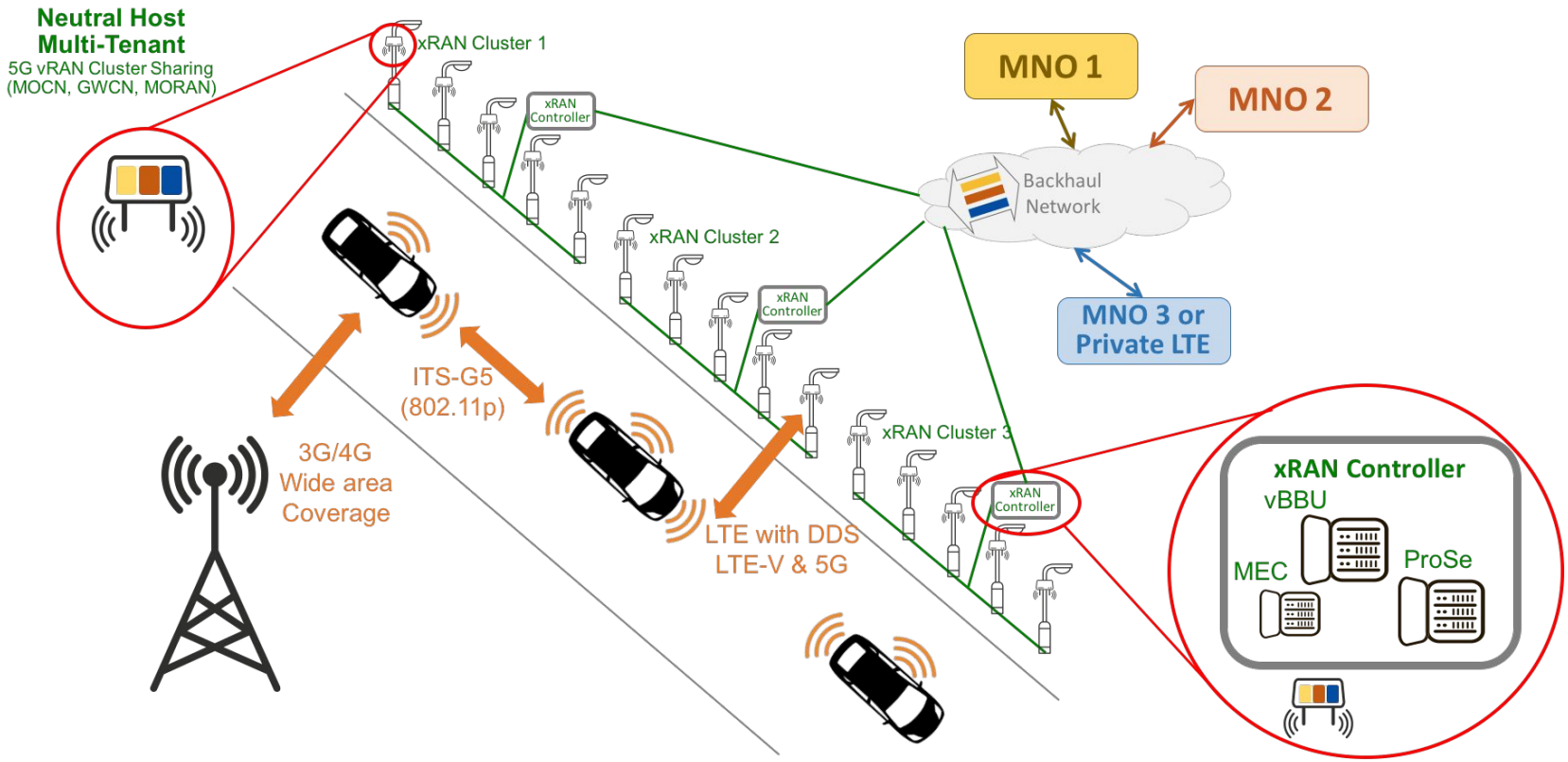

Conclusions (?)

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Awareness between Applications and Radio is key for innovative applications/services to emerge

Softer handovers / re-auth mechanisms

Virtualization & automation is key for Smarter RAN modules placement

Cabinet ? Lamppost ? Core ?

Can we focus on SW development to create a general framework which would allow for a smarter instantiation of VNFs, according to the specific UC, on a distributed infrastructure ?

Throughput ? Latency ? Packet loss ?

Good coordination between cellular (5G) and DSRC (802.11p) - SON ?

How to leverage massive small cell rollout?

Can we make use of Blockchain technology to transmit secure data in a trustworthy manner across this distributed edge infrastructure?

Can we program smart contracts on this network?

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Thank you!