5G INDUCE

5G infrastructures for Non-Public Networks:
The case of 5G-INDUCE project

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The 5G-INDUCE Project: Helicopter view

Case in focus for this session

Valencia-Madrid, Spain
Ford factory in Valencia, Spain, interconnected through Ericsson's edge node technology to 5TONIC test-bed in Madrid

Lavrio-Athens, Greece
Public Power Corporation industrial site in Lavrio, Greece, interconnected to OTE 5G laboratory infrastructures in Athens

Genoa-Biandronno, Italy
Whirlpool factory in Biandronno (Varese), Italy, interconnected to CNIT's lab infrastructure in Genoa through Wind3 network, serving also as the DevOps testbed for new NetApps

Industrial Priorities + Ecosystem = Innovation
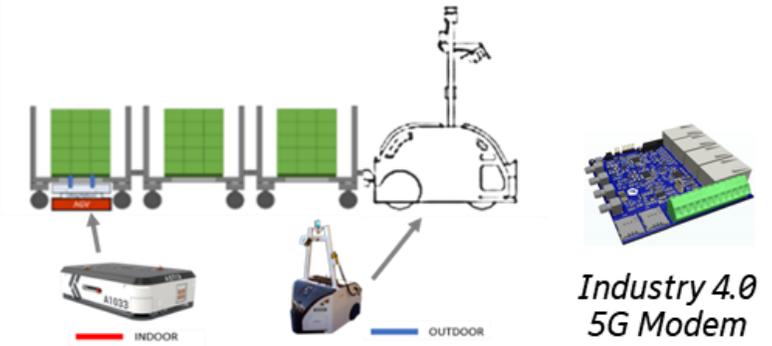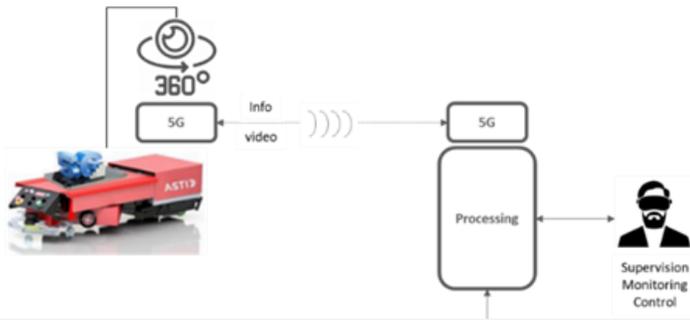

https://www.youtube.com/watch?v=xg2OouRBbRw

https://www.ericsson.com/en/news/2021/2/ford-engine-production-5g-dedicated-network

Use Cases in Focus

Augment the quality of monitoring with AR+5G

VR immersion and AGV control

Combine VR and 5G capabilities to provide live immersive view of the AGVs

Simplify human-machine interaction with AI+5G

Smart operation based on human gesture recognition

Control industrial operations of AGVs through human movements without using any type of special equipment.

Unify connectivity for Indoor+Outdoor with 5G

Industry 4.0 5G Modem

Indoor&Outdoor AGV fleet coordination

Manage a fleet of Indoors & Outdoors AGVs with simultaneous localization and mapping (SLAM) navigation, leveraging 5G, AI and Edge

From Networks and Devices …
to Digital Applications
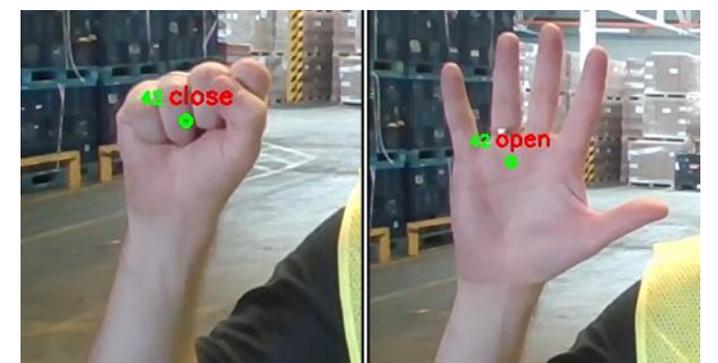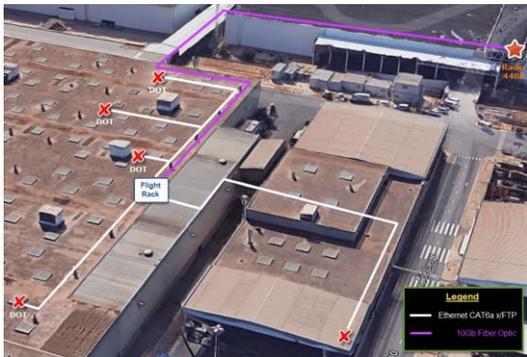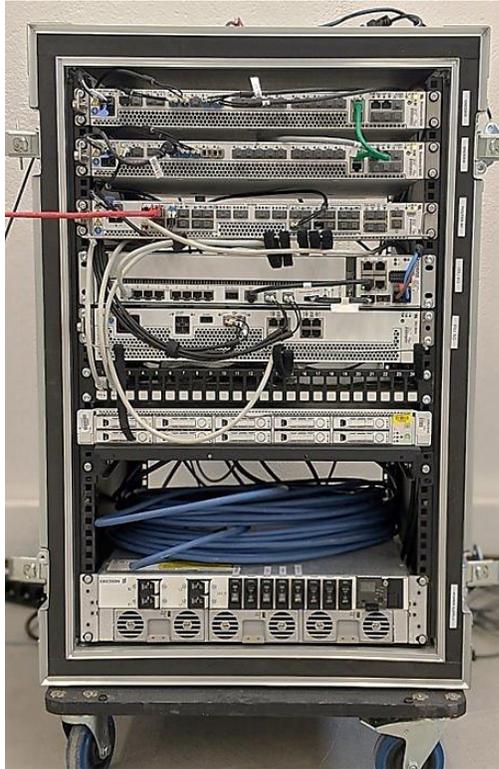
Flight case including all 5G RAN equipment, plus ... ?
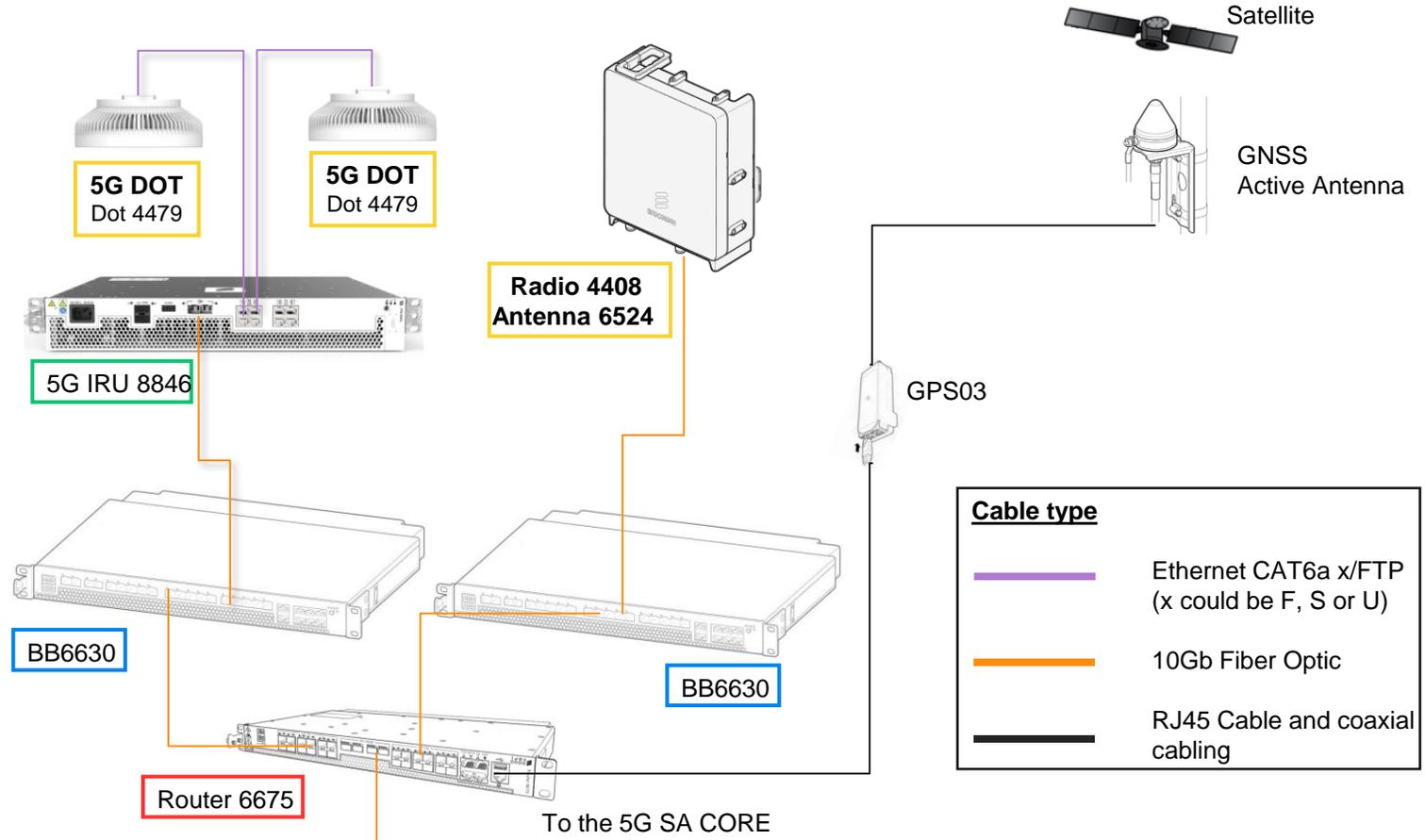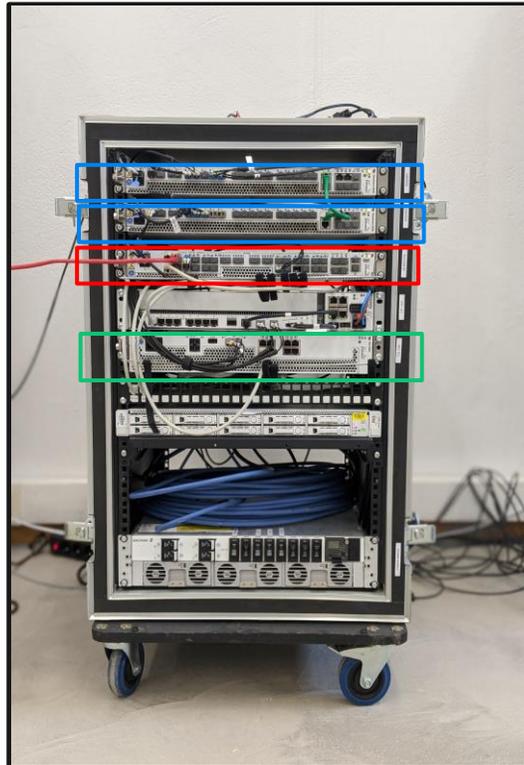
5G-ACIA: Framework for NPN

| (1) Deployment as Isolated Network | (2) Deployment with Shared RAN | (3) Shared RAN and Control Plane | (4) NPN deployed in Public Network |
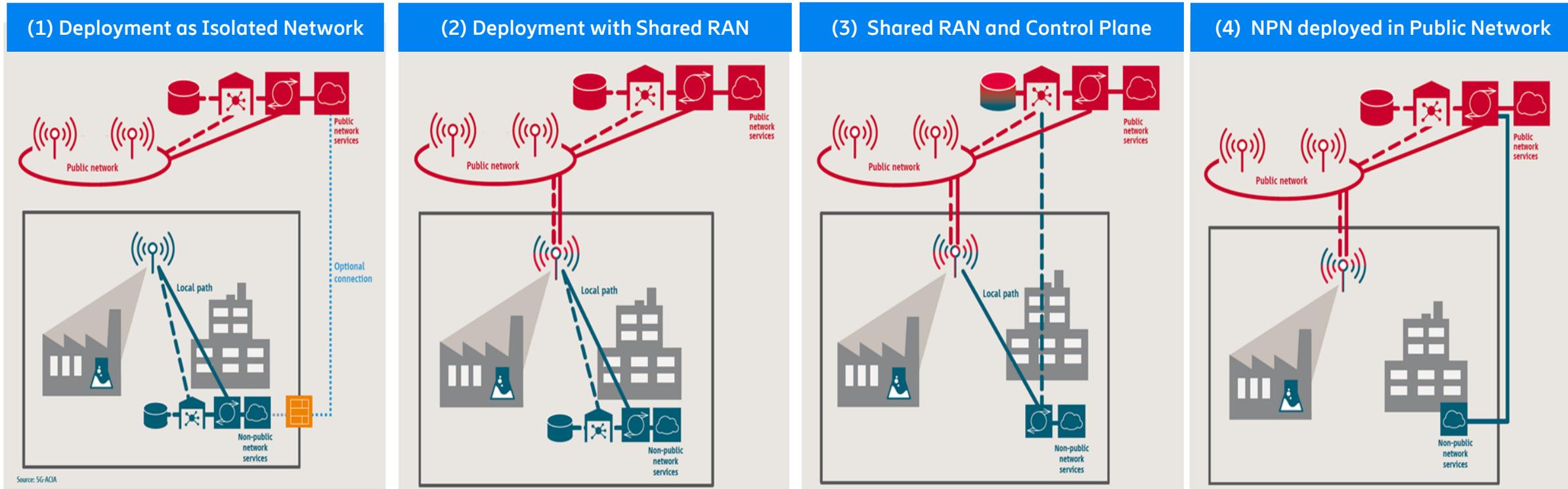
Source*: 5G-ACIA "5G for Connected Industries and Automation", Second Edition, Feb 2019*

3GPP: Standard 5G model for User Plane & Services

Users	RAN	Local edge	Near edge	Central core	Central services

AMF

SMF

UPF

UPF

Services

Services

5G-PPP research: Key trade-offs

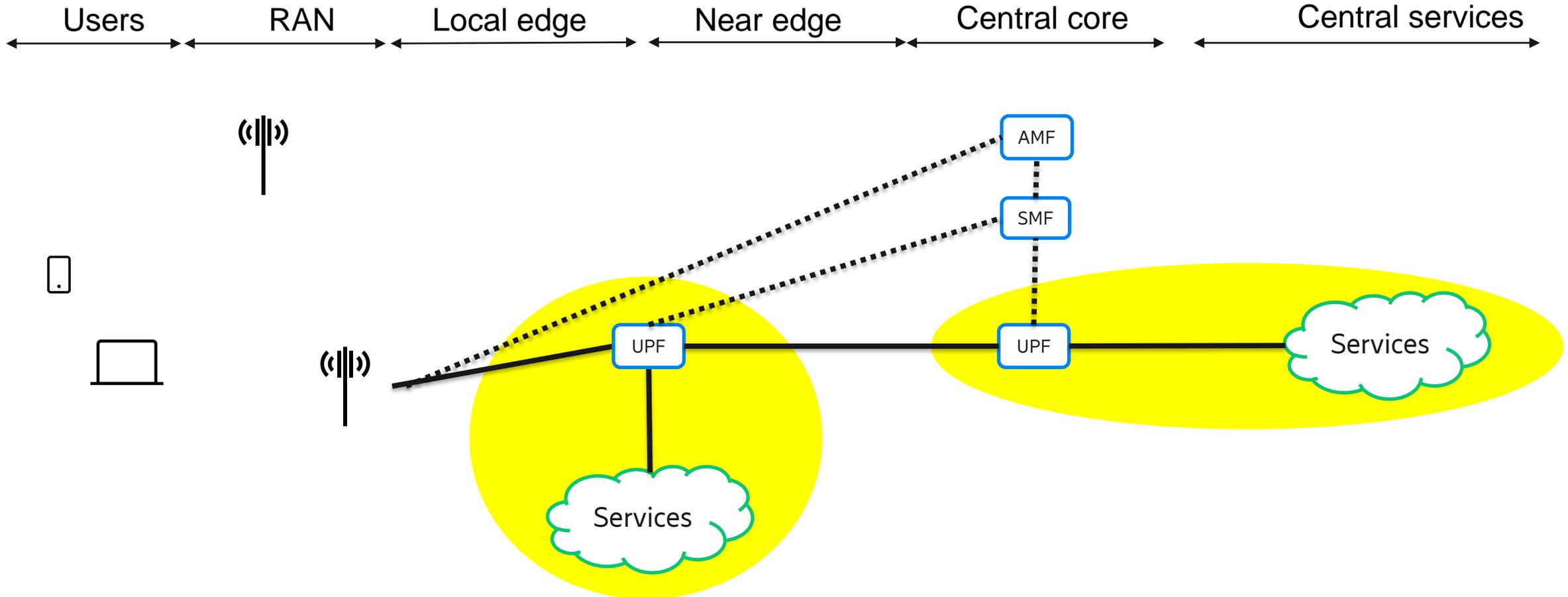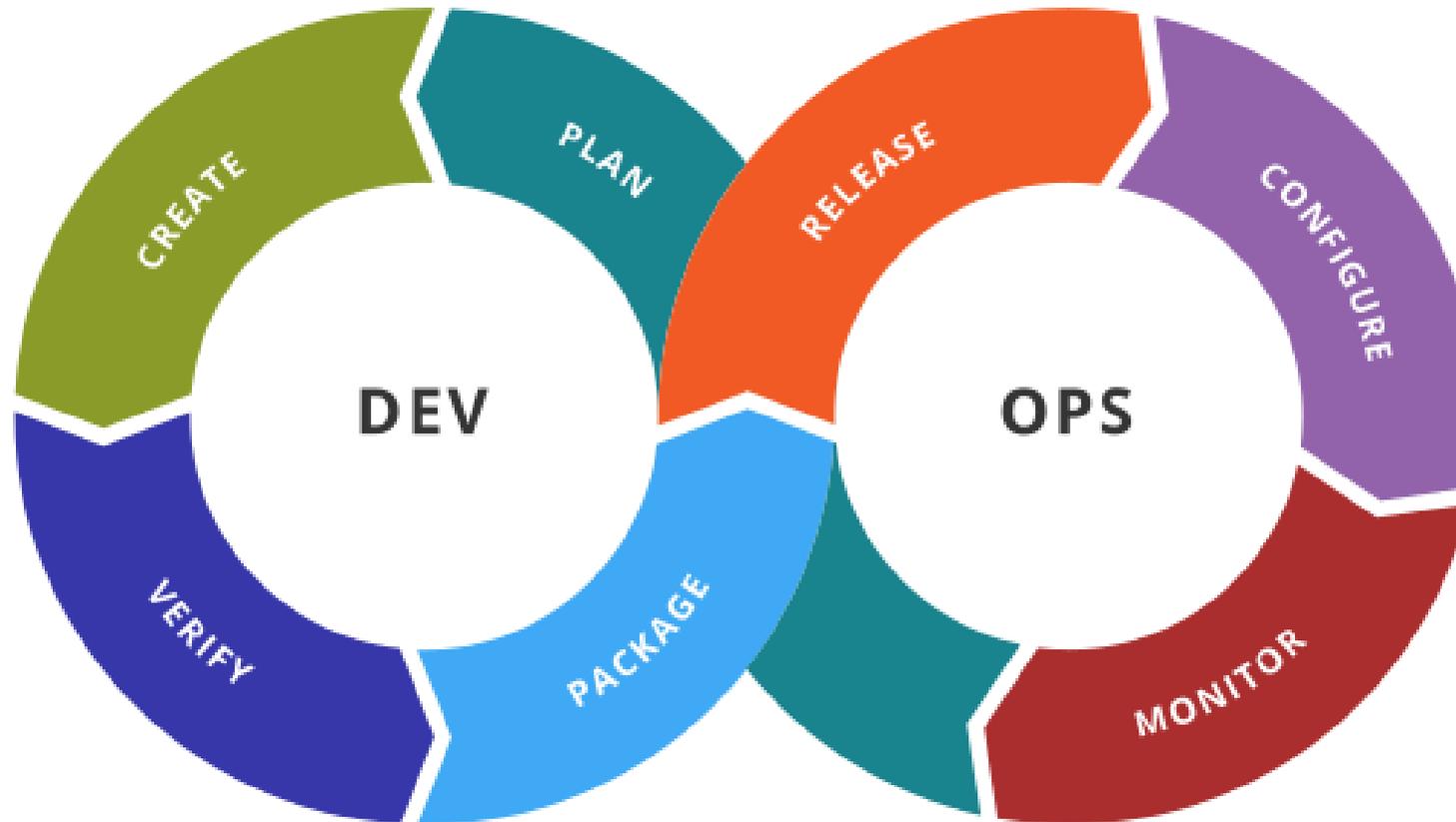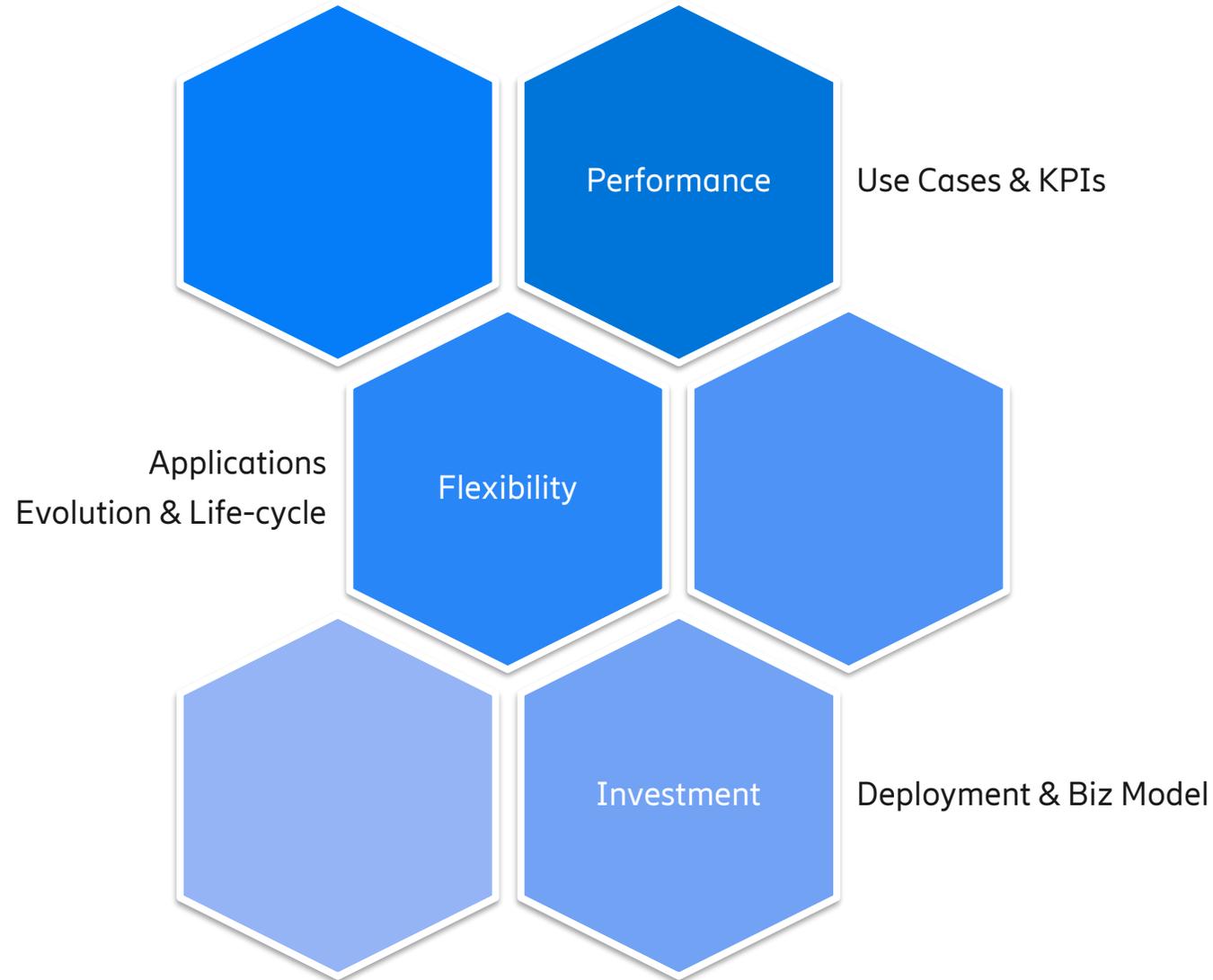|	Local Edge	Near Edge	Central office
	Units of Kilometers	Tens of kilometers	Hundreds of kilometers
URLLC	Performance: Optimal Investment: Very High Efficiency: High	Performance: Limited Investment: High Efficiency: Very High	Performance: - Investment: - Efficiency: -
eMBB	Performance: Optimal Investment: Very High Efficiency: Low	Performance: Optimal Investment: High Efficiency: Very High	Performance: Limited Investment: Low Efficiency: High

- **Performance** is related to the feasibility to meet the expectation levels for the type of 5G Service supported, with major focus on latency constrains: 1 ms URLLC; 4ms eMBB.

- **Investment** is related to the involved CAPEX and OPEX for the considered deployment models, for both the Communication Service Provider and the Vertical/Enterprise.

- **Efficiency** is related to the comparative usage of resources (HW, links, bandwidth,energy consumption, etc.,) at the service of the expected level of performance.

Source: 5G-PPP TMV Whitepaper *"Understanding the Numbers. Contextualization and Impact Factors of 5G Performance Results"*
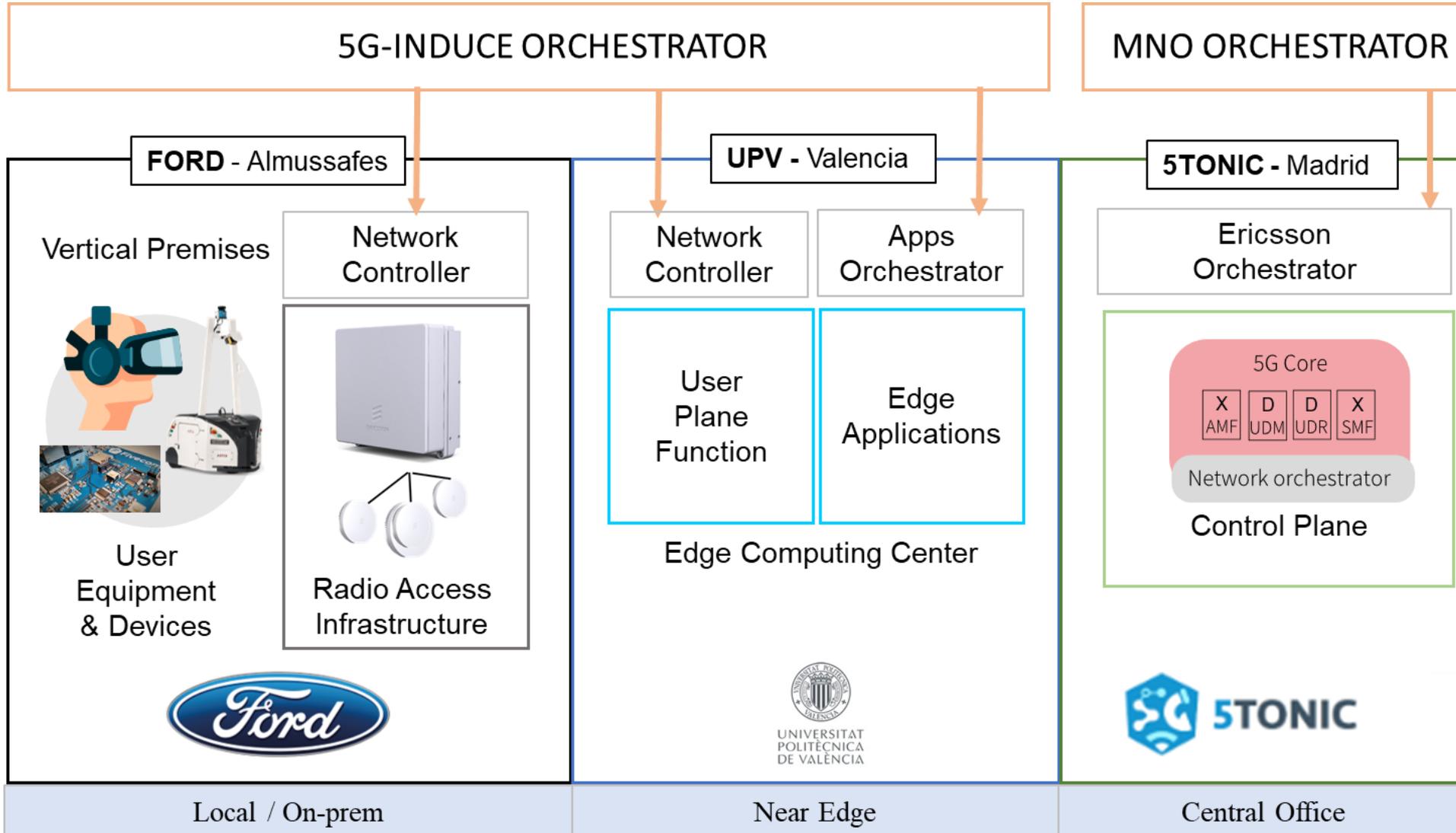
And not to forget:
The application developers viewpoint

Dealing with NPN: Putting it all together

Performance — Use Cases & KPIs

Applications
Evolution & Life-cycle — **Flexibility**

Investment — Deployment & Biz Model

Creating+Validating Architectures for NPN

Invitation

- Unlocking 5G NPN concepts and architectures into e2e solutions for its technical and business validation is our day-to-day work in 5G-PPP projects like **5G-Induce**

- We hope you found our experience and shared learnings useful. Please stay tuned to our progress at https://www.5g-induce.eu/

- If you are interested in contributing with your viewpoint, experience and insight to the next 5G-PPP whitepaper on I4.0, please contact me at manuel.lorenzo@ericsson.com

Ericsson in Spain
Imagine what's
possible with another 100 years