5G-Enhance Robot Autonomy

– 5G PPP Webinar: 5G Innovations for Verticals

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Aims

- User-centric paradigm of integrating vertical knowledge into the existing standardised 5G testing framework
- Improve Quality of Experience (QoE) of 5G enhanced autonomous robots
- Minimise robot developers' need for the comprehension of 5G when building autonomous robotic systems

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Key Challenges

- **Challenge One** is to optimise the QoE of 5G orchestrators for vertical applications
  - Intent recognition and E2E interpretability an inherited problem for orchestration systems, leading to possible creation of ineffective control policies
- **Challenge Two** is to optimise the testbeds towards Cloud Native (CN) approach for scalability, availability and feature velocity
  - 5G experimental facilities need to be adapted towards cloud native approach for an efficient service delivery on the enhanced robot autonomy
- **Challenge Three** is to extend 5G open environment and standard APIs of testbeds into robotic vertical sectors
  - How to prompt active engagement from all players, especially from robotic platform developers and end users.

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Objectives

- Objective 1: An intent-based networking paradigm for optimised QoE to support enhanced robot autonomy in real-world applications.
- Objective 2: A 5G-ERA middleware which enables cloud native resource provision over autonomous robots
- Objective 3: Standardised APIs by integrating ROS with OSM
- Objective 4: Showcase enhanced QoE on experimental facilities for vertical applications

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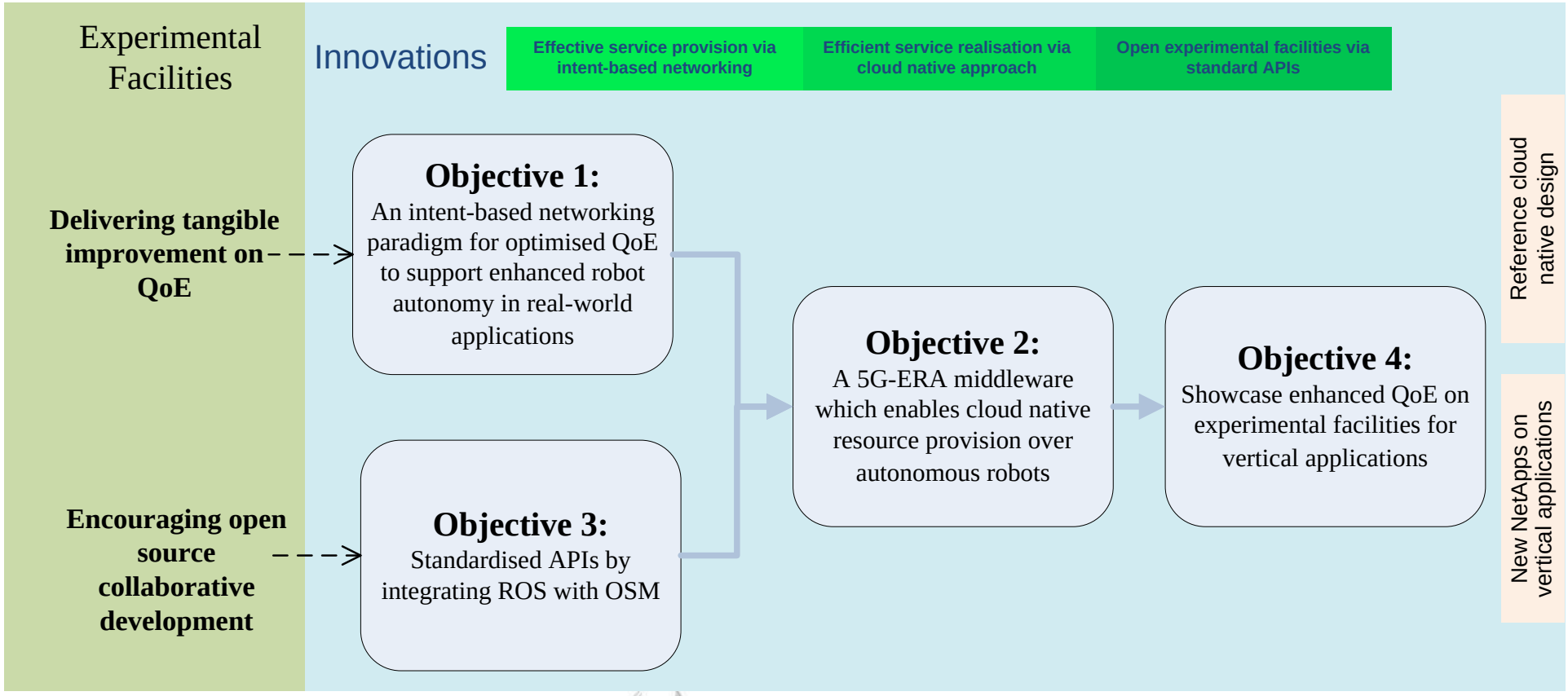
Project Approaches

- Delivering tangible improvement on QoE
- Encouraging open source collaborative software development



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Vertical Requirements

- Robot Operating Systems (ROS) - Initially designed for PR2's use case for a centralised application
- But adopted in self-driving cars, drones, industrial arms, humanoid robots and more, they need to be deployed in:
  - Distributed environment
  - Non-ideal networks, ROS behaviours unpredicted due to delay of loose in connection
  - Single master structure, against distributed nature of the applications e.g teams of multiple robots deployed in cloud and edge environment
  - Lacks quality assurance required by production environment
  - Lacks clear patterns and supporting tools for features such as life cycle management and static configurations for deployment

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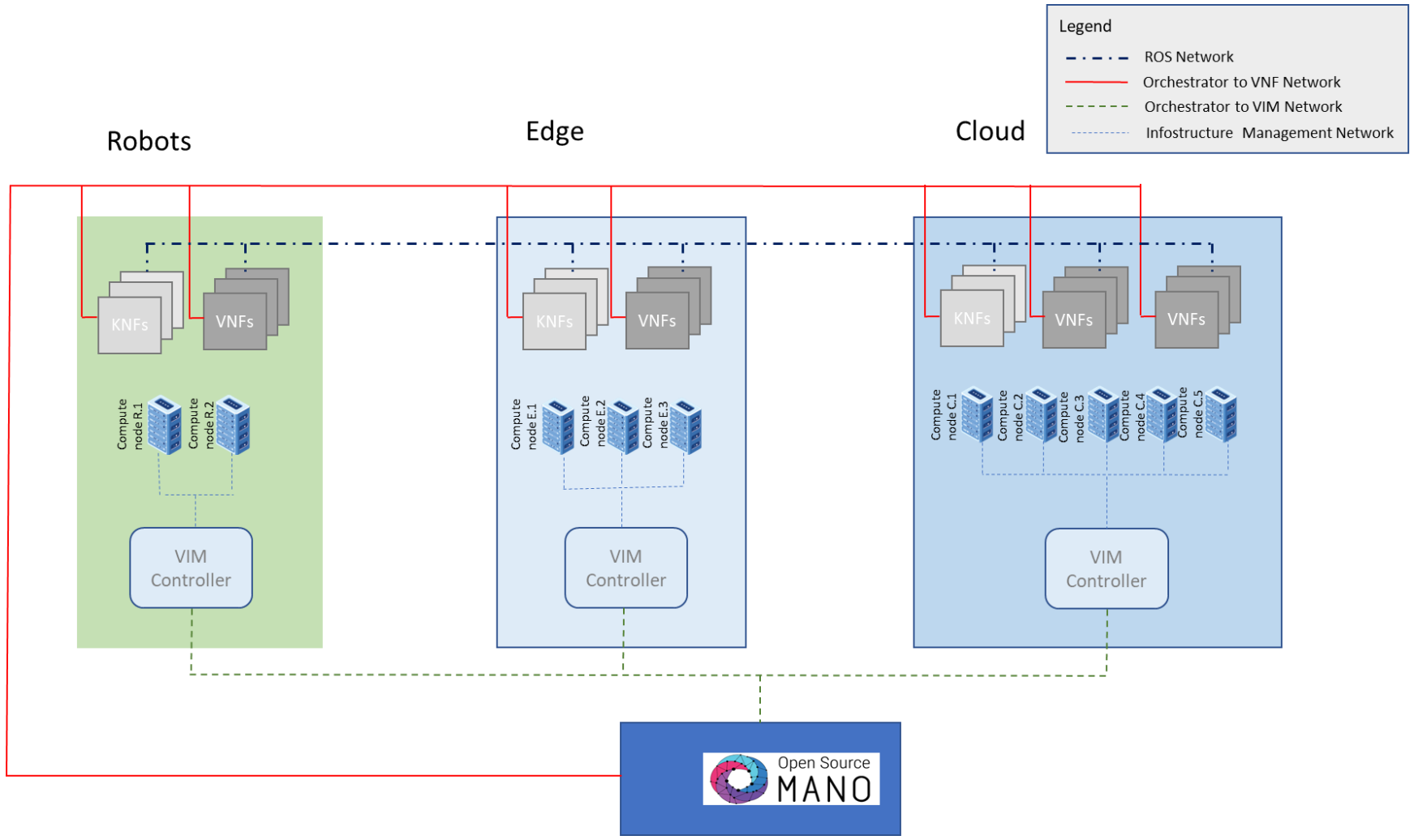
NetApps



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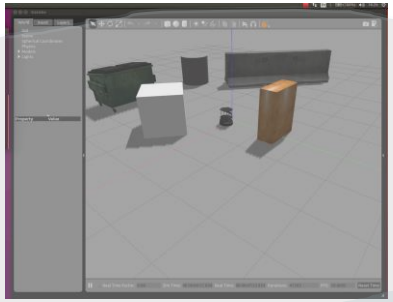
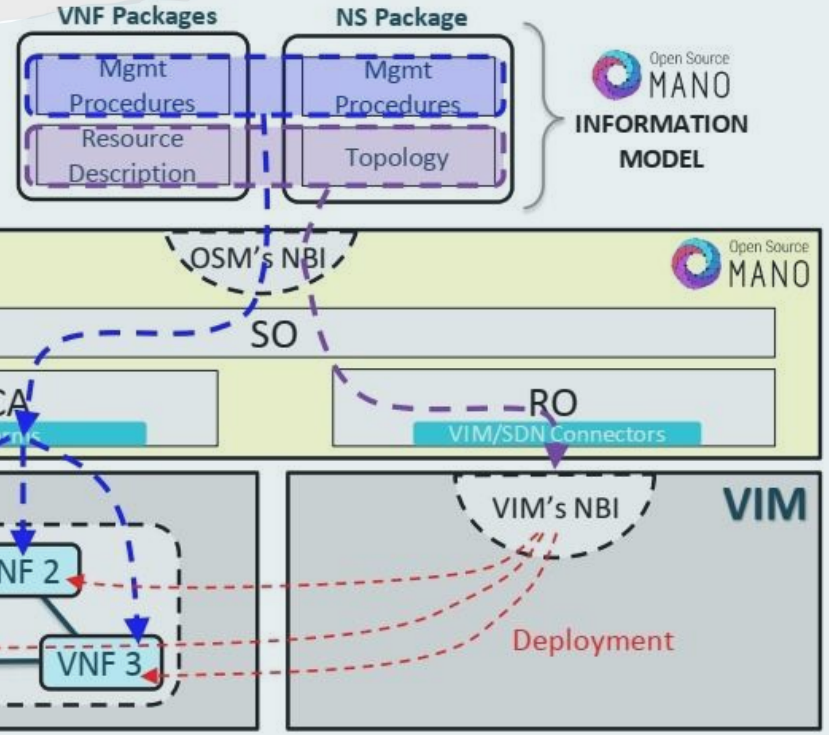
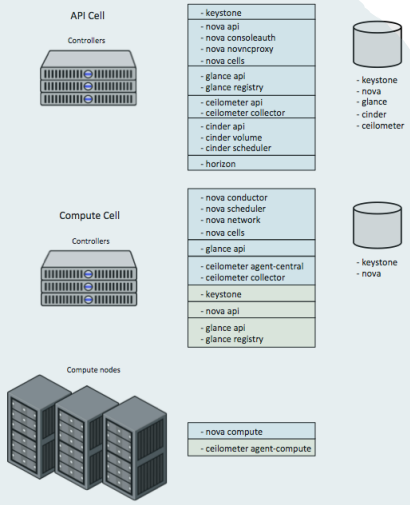
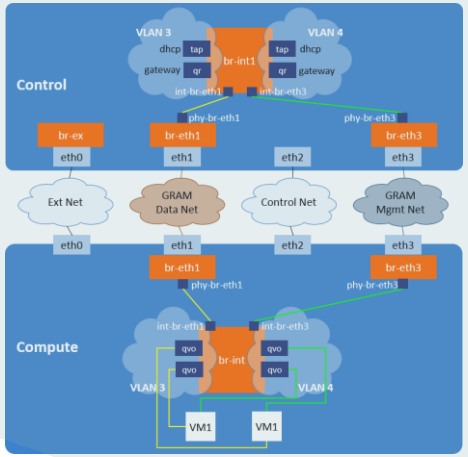
A Simple Scenario









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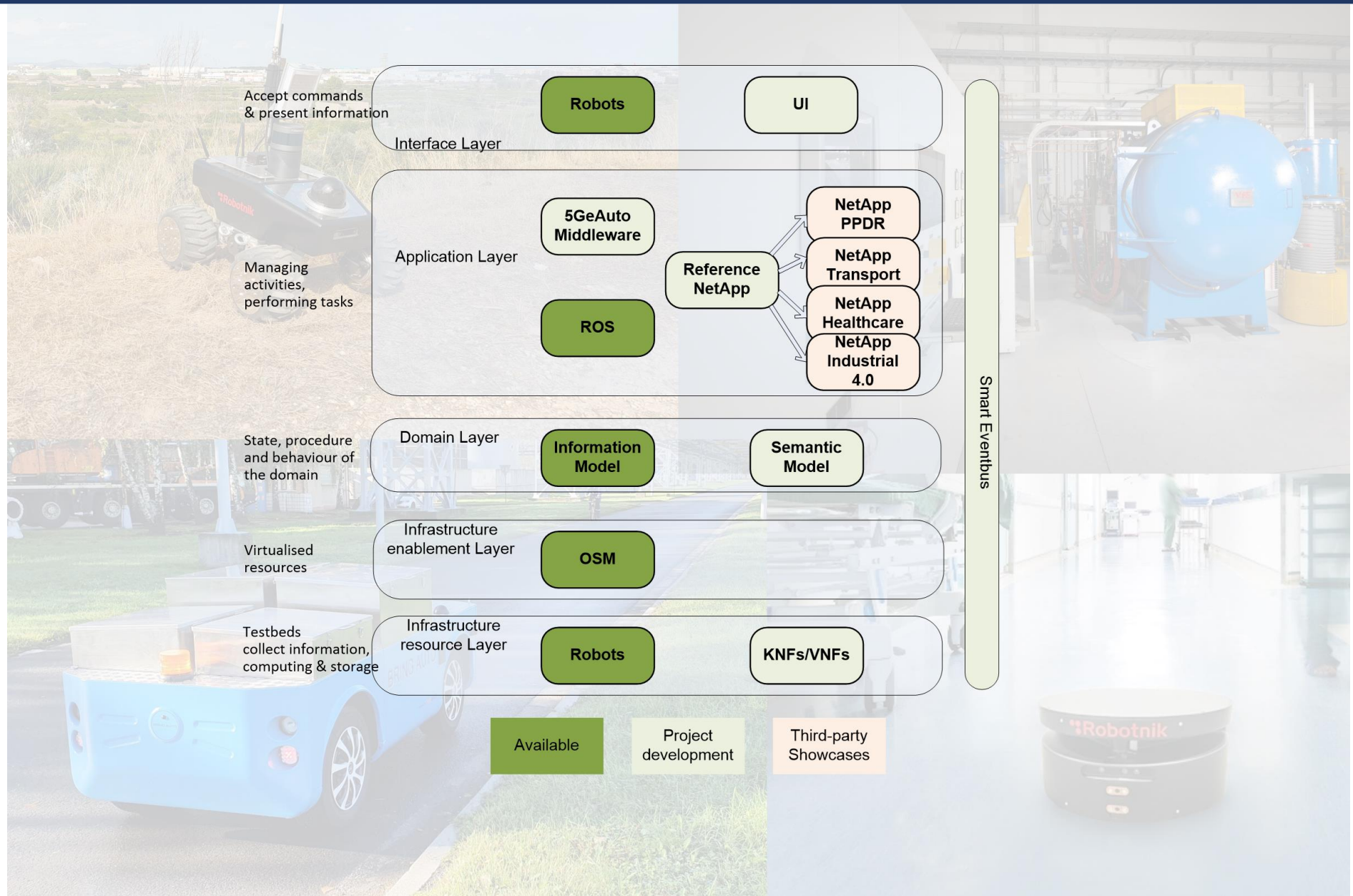
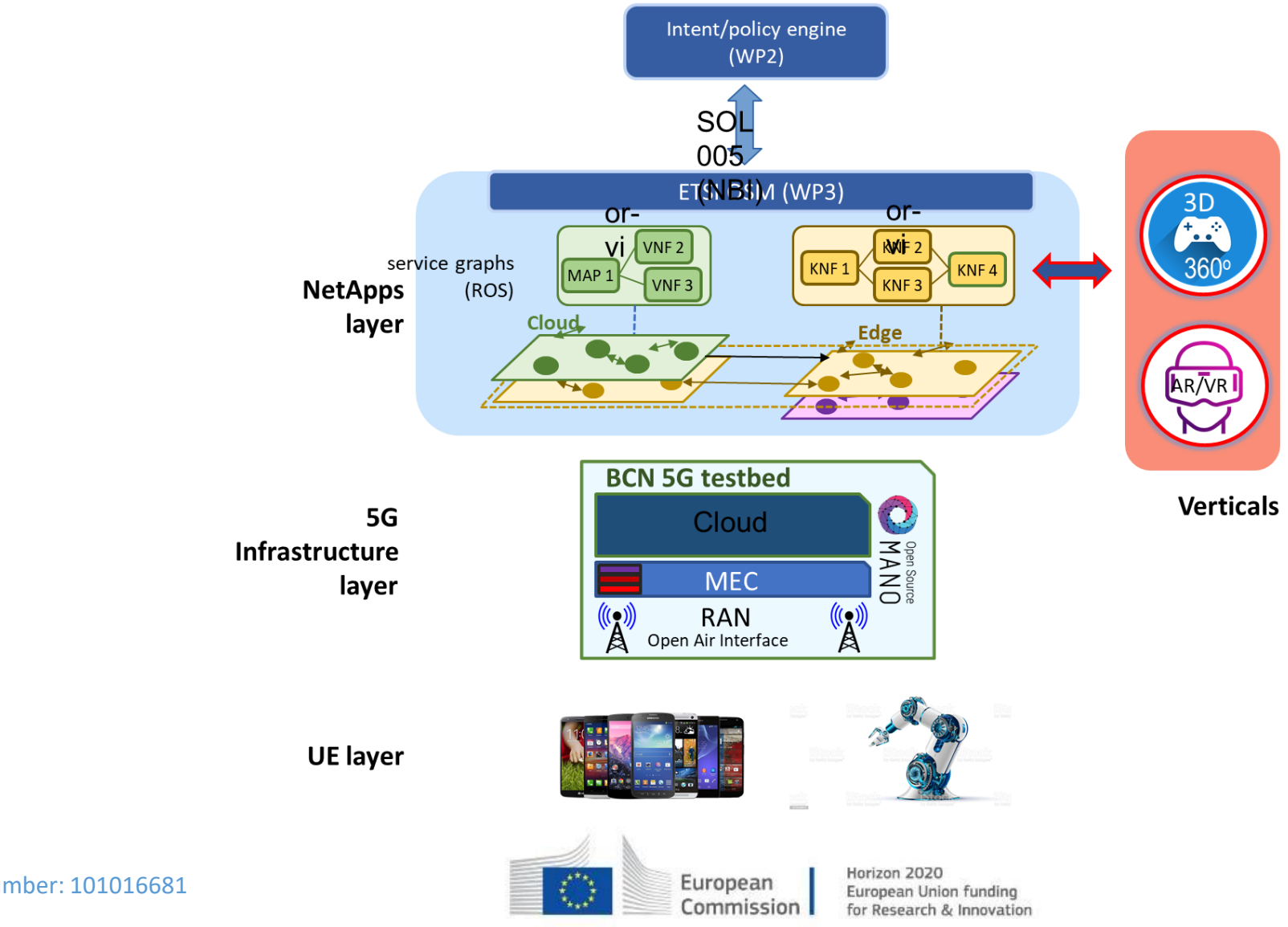
Software Architecture



Networking Architecture



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Use Cases

Use Case 1: Public Protection and Disaster Relief (PPDR)

Use Case 2: 5G enhanced semi-autonomous transport

Use Case 3: 5G enhanced healthcare robots

Use Case 4: 5G-remote assistance for manufacturing process

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Consortium

Robotnik

iq

eBOS

HAL robotics

COGNITECHNA

BRING AUTO

WINGS ICT SOLUTIONS

University of Bedfordshire

BRNO UNIVERSITY OF TECHNOLOGY

OTE

TWI

Orchestrating a brighter world NEC

GALTEK

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Q&A

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