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# 5G NORMA:

## An adaptive mobile network architecture

EuCNC'16 Workshop on *Next Generation fronthaul/backhaul integrated transport networks*, 27 June 2016

Presented by Peter Rost, Nokia Bell Labs

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# Outline

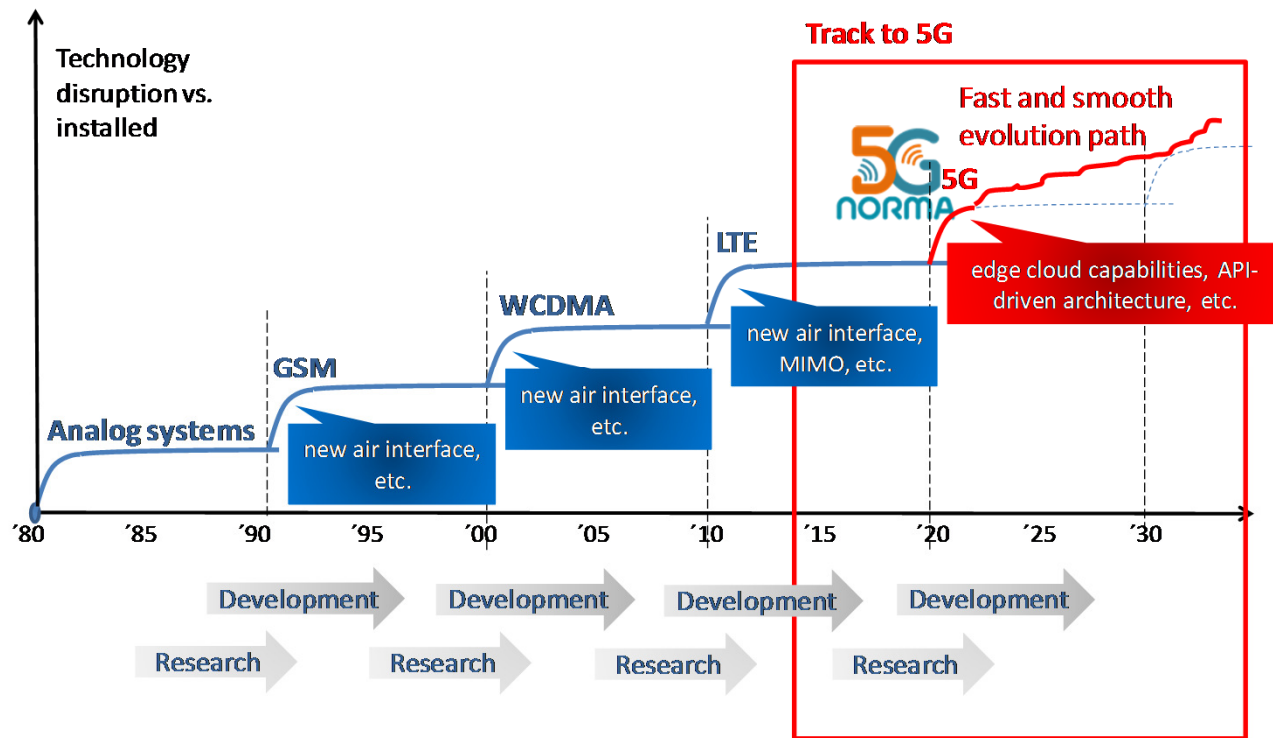
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- Motivation and objectives
- Architecture framework
- Impact on RAN and CN
- Software-define mobile network control









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## Motivation and objectives

# Motivation: It's time, again



# Motivation: It's the mix

|  |  |  |   |
|--|--|--|---|
| <b>Broadband access everywhere</b><br>50+ MBPS EVERYWHERE<br>     | <b>Broadband access in dense areas</b><br>PERVASIVE VIDEO<br> | <b>Higher user mobility</b><br>HIGH SPEED TRAIN<br>             | <b>Massive Internet of Things</b><br>SENSOR NETWORKS<br>   |
| <b>Extreme real-time communications</b><br>TACTILE INTERNET<br> | <b>Lifeline communications</b><br>NATURAL DISASTER<br>      | <b>Ultra-reliable communications</b><br>E-HEALTH SERVICES<br> | <b>Broadcast-like services</b><br>BROADCAST SERVICES<br> |

The focus of 5G NORMA is on enabling new 5G business.

But 5G NORMA's innovations will also help to

- increase wireless capacity,
- support very high terminal densities,
- lower latency,
- improve cost efficiency,
- lower energy consumption.

# Motivation: NGMN Vision



“5G is an end-to-end ecosystem to enable a fully mobile and connected society. It empowers value creation towards customers and partners, through existing and emerging use cases, delivered with consistent experience, and enabled by sustainable business models.”

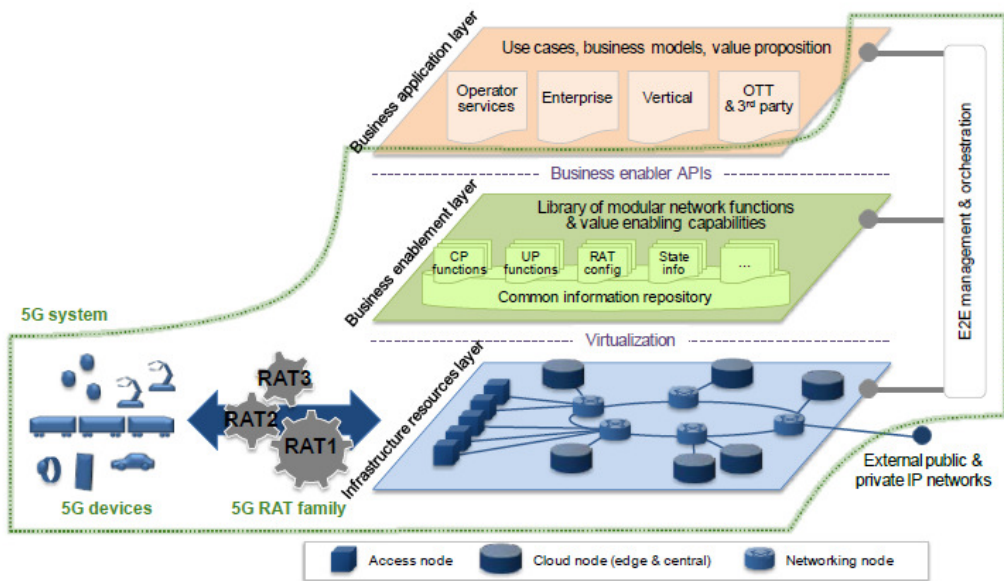


Figure 8: 5G Architecture

The NGMN White Paper has been endorsed by the following NGMN Board Members:

|  |                                       |   |   |
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A Deliverable by the NGMN Alliance

**NGMN 5G WHITE PAPER**

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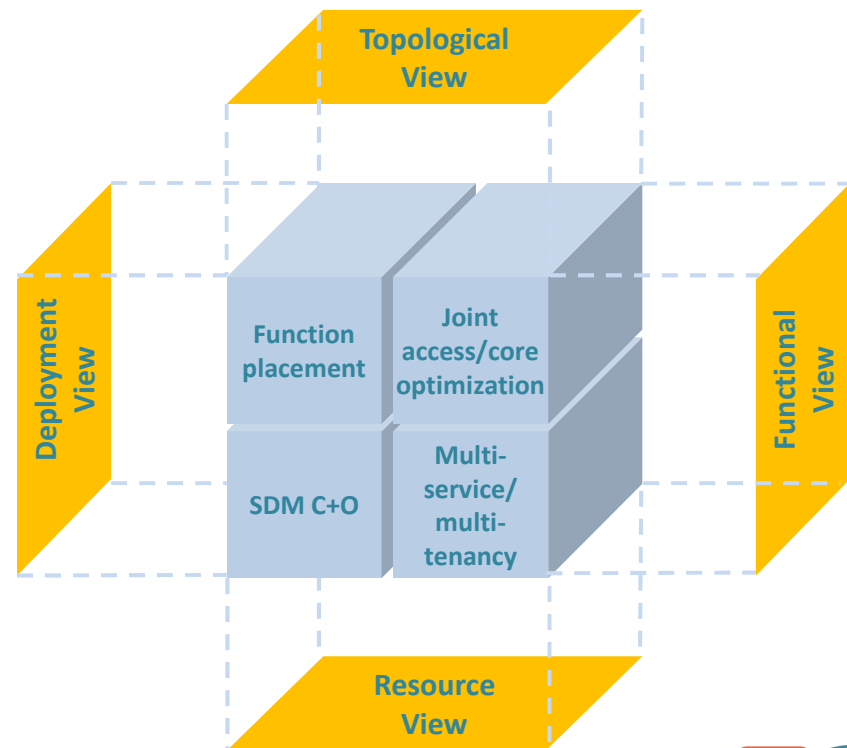
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## Architecture framework

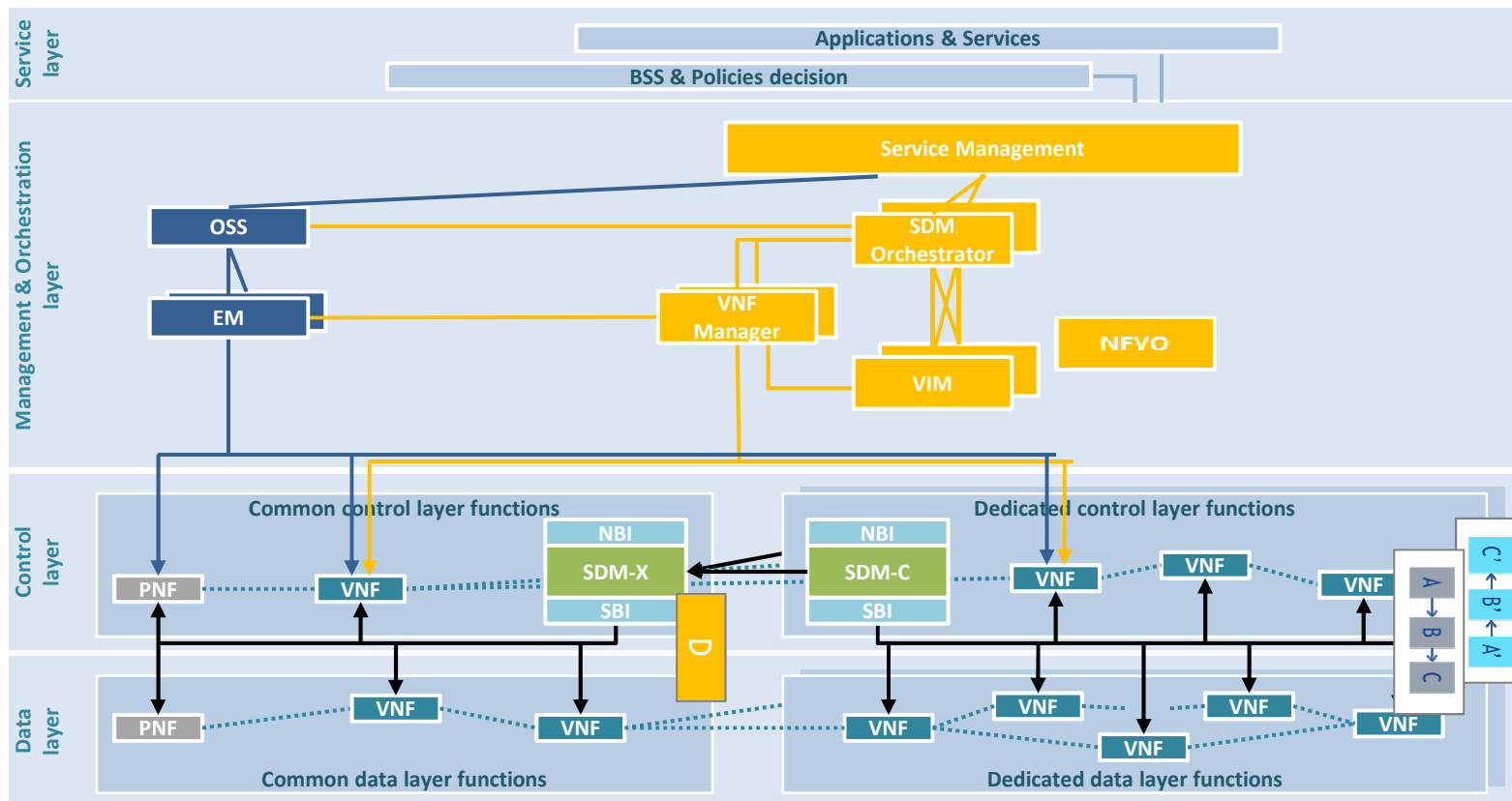
# 5G NORMA Architecture Innovations and Views

Covering all layers: Control and Data Layer, Management & Orchestration, and Service

- The “5 Innovations” of 5G NORMA
  1. Adaptive function (de)composition and flexible placement
  2. Joint optimization of access/core functions
  3. Software defined mobile network control and orchestration (SDM C+O)
  4. Multi-service and context-aware adaptation of network functions
  5. Mobile network multi-tenancy
- Different architectural views for clarity
  - each highlighting specific aspects of 5G NORMA architecture and innovations



# 5G NORMA Architecture Framework





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# Outline

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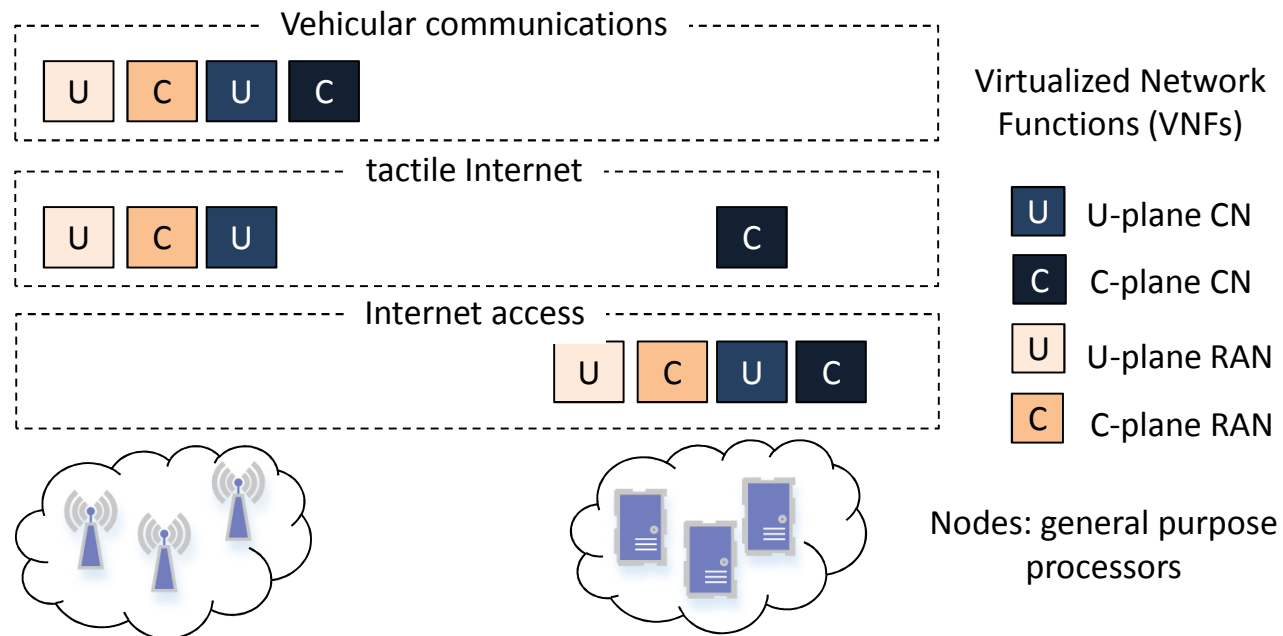
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## Impact on RAN and CN

# Flexible function allocation: Opportunities

- Flexible placement of network functions



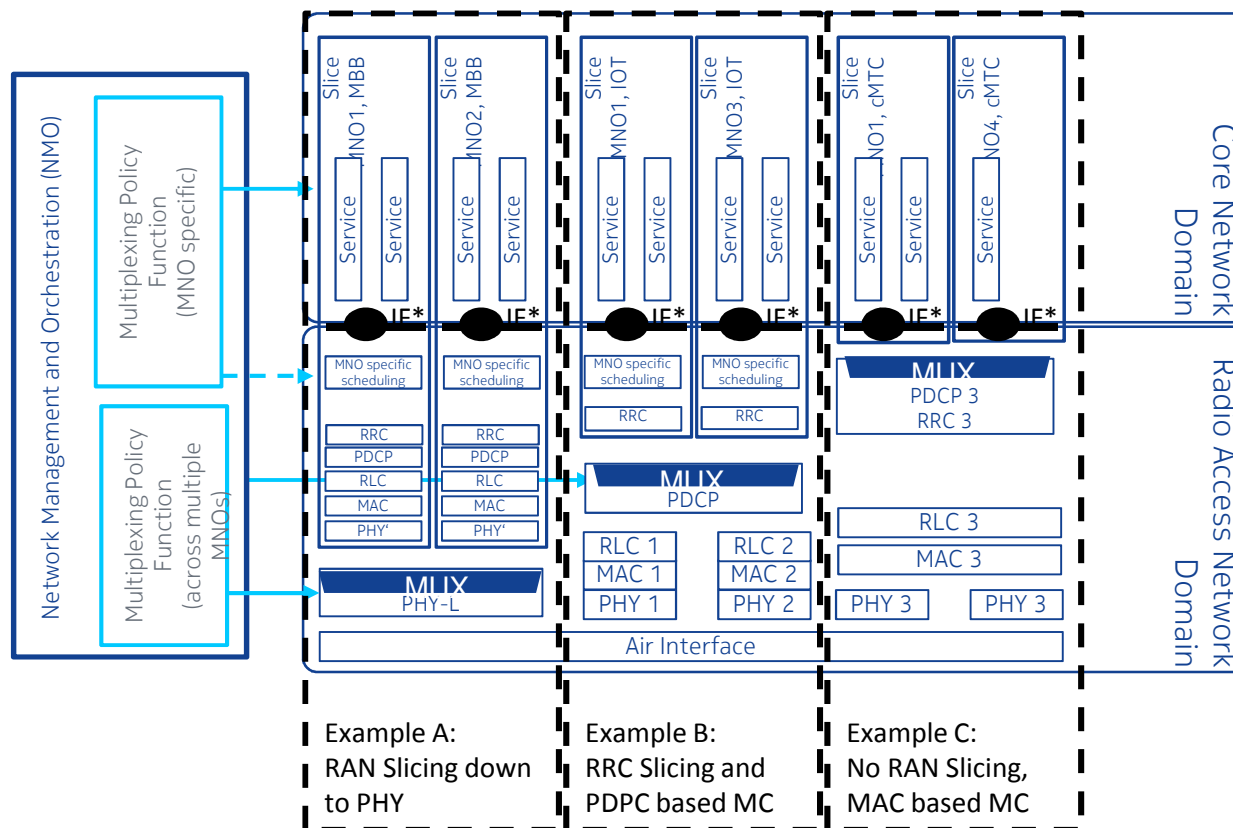
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# Flexible function allocation: Interfacing

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- Flexible CN/RAN split
  - As a result of the flexible network allocation, CN and RAN functions no longer (necessarily) reside in different nodes
  - The borderline between CN/RAN is blurred
  - CN and RAN functions may be co-located in the edge cloud or in the network cloud
- CN/RAN interface
  - The optimal CN/RAN interface may depend on the function allocation
  - If CN and RAN reside in the same locations, we can benefit from exchanging large amount of data at low latencies
  - If CN and RAN reside in different locations, the interface needs to be adapted to throughput/latency constraints
  - Even when co-located, different functionality can be provided depending on the location of both functions

# Example: RAN Slicing



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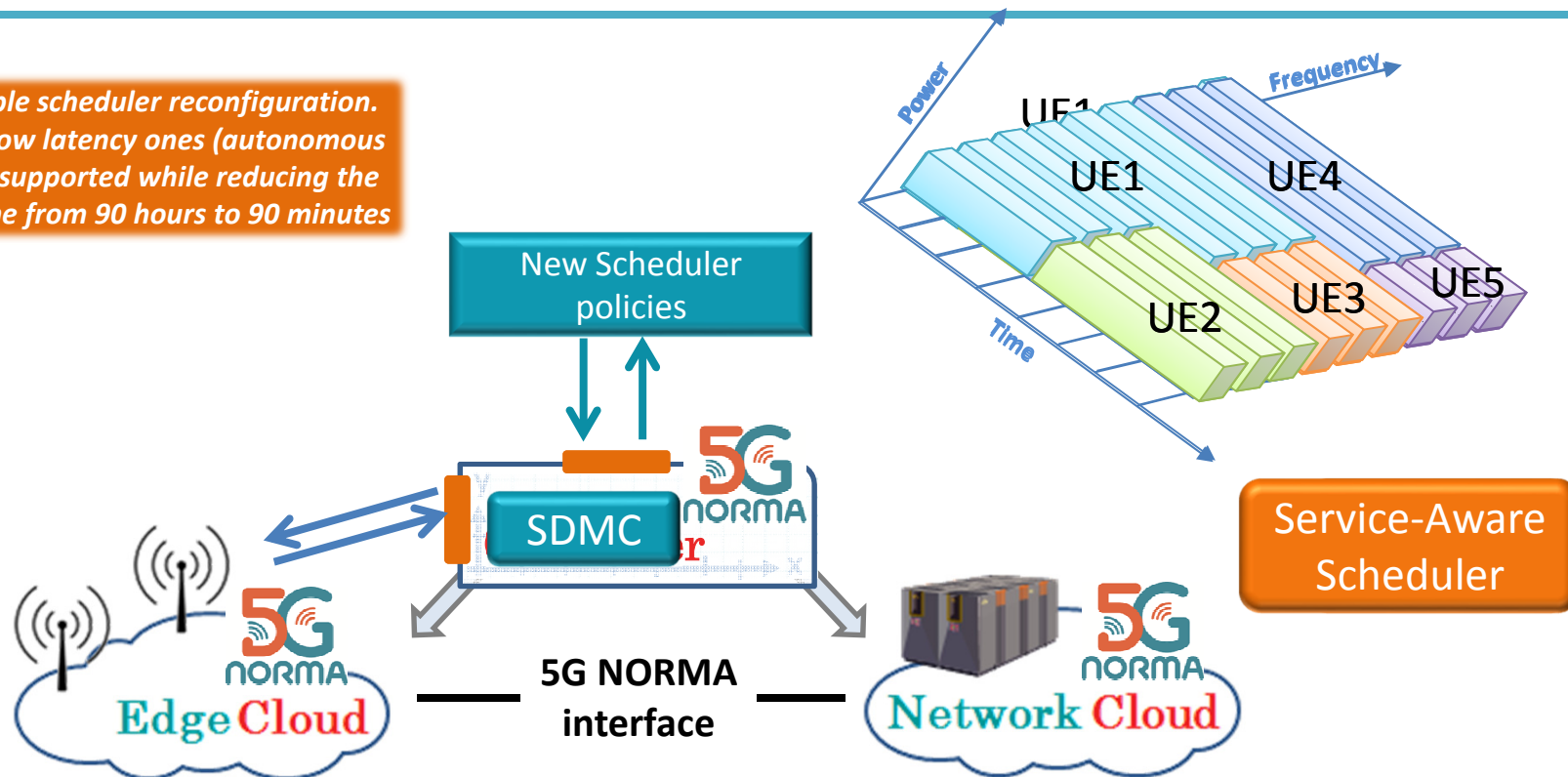
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## Software-defined mobile network control

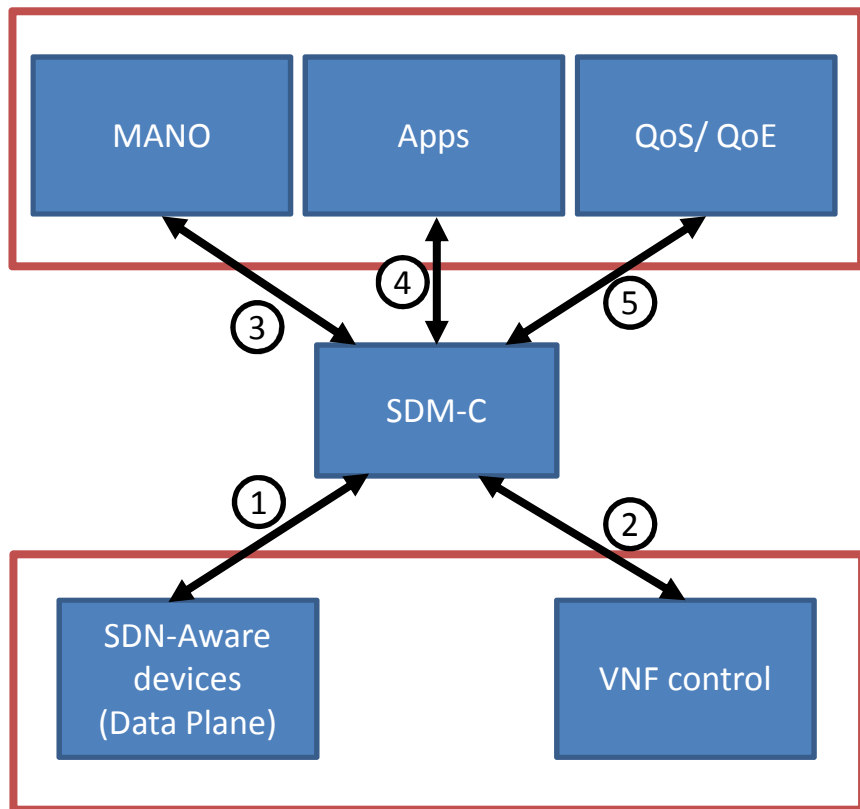
# SDMC: Flexible Service Creation



*SDMC allows flexible scheduler reconfiguration. New services, like low latency ones (autonomous driving) are easily supported while reducing the service creation time from 90 hours to 90 minutes*

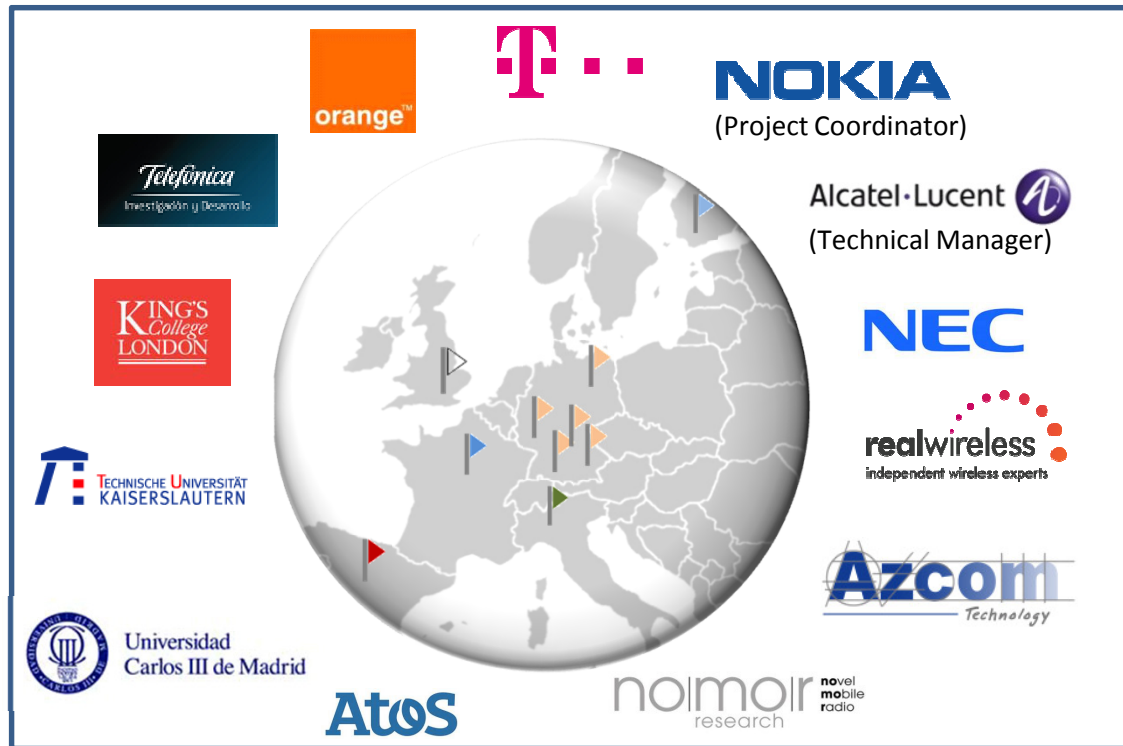


# SDM-C Interfaces



- ① Resource pool management
- ② Resource requests
- ③ Service requirements extraction
- ④ Mobility information feed
- ⑤ Mobility-driven orchestration

# 5G NORMA Consortium



## **5G NORMA in a nutshell**

EU funded R&D project within 5GPPP Initiative, aiming on building consensus on E2E mobile network architecture and rapid implementation

Duration: Jul'15 – Dec'17 (30 months)

Project Mgmt: Peter Rost, Nokia

Technical Mgmt: Mark Doll, Nokia

Connect to 5G NORMA

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