

# IEEE ICC 2019 Workshop: 5G-Trials – From 5G Experiments to Business Validation

Panel II

## Challenges in 5G Trials

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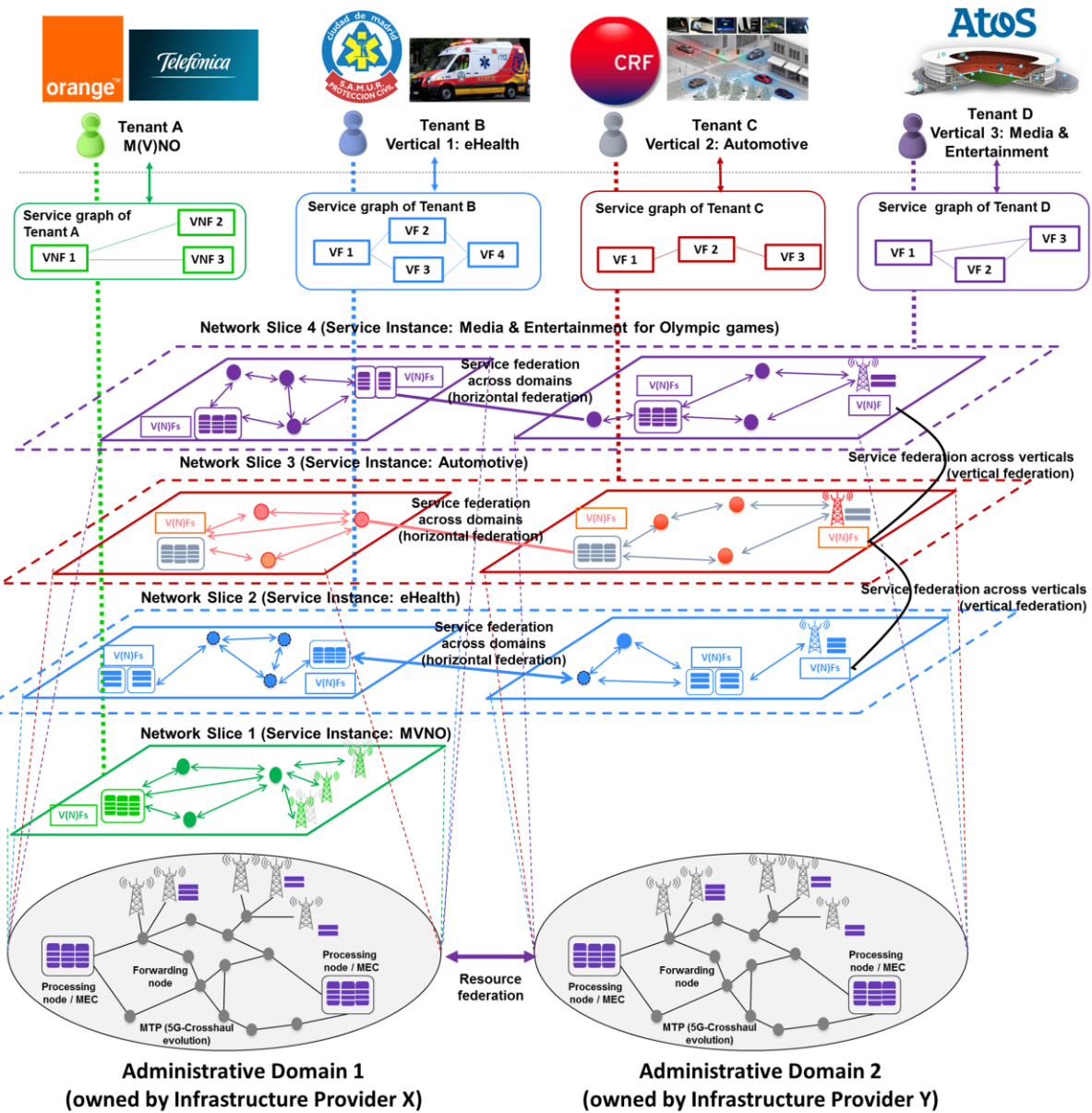
**Vision:** Mobile Transport Networks shall transform from today's rigid interconnection solutions into an **SDN/NFV-based 5G Mobile Transport and Computing Platform supporting diverse Vertical Industries**

**Technical Approach:** bring "**Network Slicing**" into mobile transport networks by provisioning and managing slices tailored to the needs of verticals

- Enable **Vertical Industries** to meet their service requirements within **customized network slices**



# 5G-TRANSFORMER: Network Slicing



**5G-Transformer users**  
 Mobile (Virtual) Network Operators  
 Vertical Industries

**Vertical Slicer (VS)**  
 Logical entry point for verticals to support service creation and management, mapping on network slices

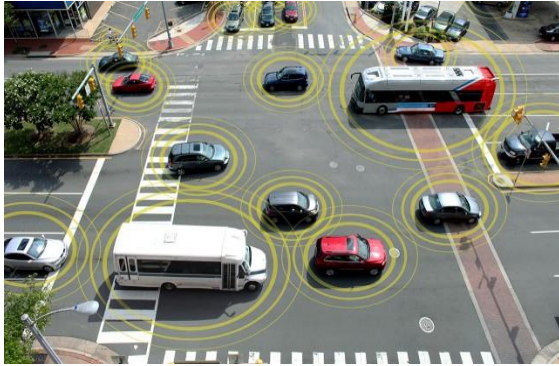
**Service Orchestrator (SO)**  
 Network services LCM  
 Multi-domain orchestrate of services & resources  
 • Function placement  
 • Resource allocation

**Mobile Transport and Computing Platform for Verticals (MTP)**  
 Sharing the 5G mobile transport and computing infrastructure among all vertical services

# Vertical Service Use Case PoCs

## Automotive

*Extended Virtual Sensing*



## Entertainment

*On-site Fan experience/  
Ultra high fidelity Media*



## E-Industry

*Cloud Robotics for  
Industrial automation*



## MNO/MVNO

*5G - Network as a Service*



## E-Health

*Heart Attack Emergency*



**Clustering into 3 main categories:**

- eMBB
- Mission Critical Services
- Massive IoT

# Platform Deployment across 4 Testbeds in 3 Countries

The image illustrates the deployment of a platform across four testbeds in three countries. The background is a map of Europe with four testbed locations marked: Nantes, Toulouse, Marseille, and Palermo. The map is overlaid with various technical diagrams and images.

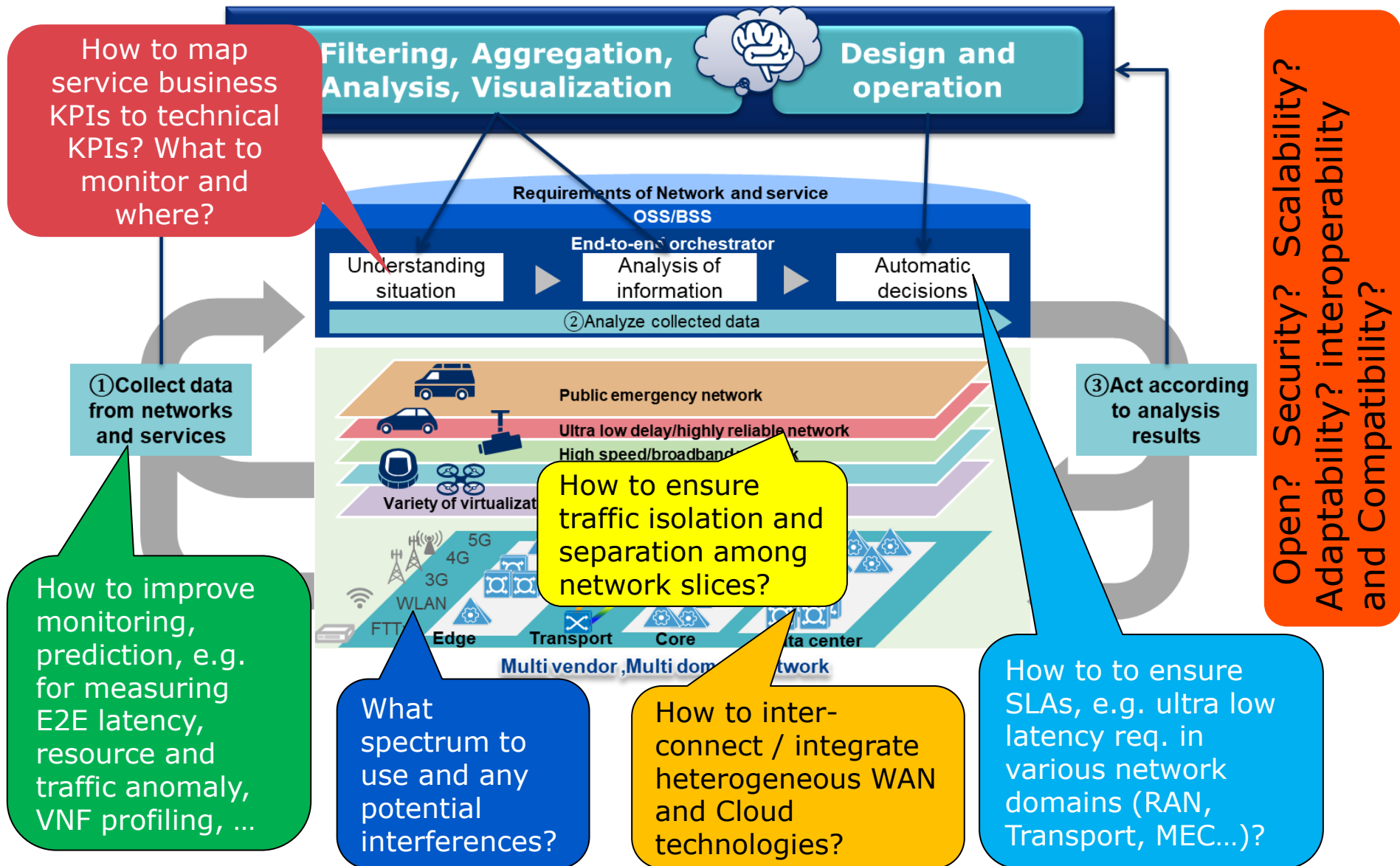
Key components and diagrams include:

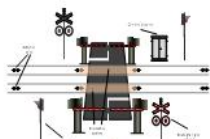
- Mobile Edge Platform Manager:** A central architecture diagram showing the Mobile Edge Platform Manager (MEP) connected to the Mobile Orchestrator (MO) and Mobile Edge Platform (MEP). The MEP includes MEC Service Registry, MEC Service Discovery, MEC Service INES, and MEC Service Traffic Control. It is connected to eNodeBs, S1-MME, S1-MB, S1-MB-C, S1-MB-U, S1-MB-V, S1-MB-W, S1-MB-X, S1-MB-Y, S1-MB-Z, S1-MB-AA, S1-MB-AB, S1-MB-AC, S1-MB-AD, S1-MB-AE, S1-MB-AF, S1-MB-AG, S1-MB-AH, S1-MB-AI, S1-MB-AJ, S1-MB-AK, S1-MB-AL, S1-MB-AM, S1-MB-AN, S1-MB-AO, S1-MB-AP, S1-MB-AQ, S1-MB-AR, S1-MB-AS, S1-MB-AT, S1-MB-AU, S1-MB-AV, S1-MB-AW, S1-MB-AX, S1-MB-AY, S1-MB-AZ, S1-MB-BA, S1-MB-BB, S1-MB-BC, S1-MB-BD, S1-MB-BE, S1-MB-BF, S1-MB-BG, S1-MB-BH, S1-MB-BI, S1-MB-BJ, S1-MB-BK, S1-MB-BL, S1-MB-BM, S1-MB-BN, S1-MB-BO, S1-MB-BP, S1-MB-BQ, S1-MB-BR, S1-MB-BS, S1-MB-BT, S1-MB-BU, S1-MB-BV, S1-MB-BW, S1-MB-BX, S1-MB-BY, S1-MB-BZ, S1-MB-CA, S1-MB-CB, S1-MB-CC, S1-MB-CD, S1-MB-CE, S1-MB-CF, S1-MB-CG, S1-MB-CH, S1-MB-CI, S1-MB-CJ, S1-MB-CK, S1-MB-CL, S1-MB-CM, S1-MB-CN, S1-MB-CP, S1-MB-CQ, S1-MB-CR, S1-MB-CS, S1-MB-CT, S1-MB-CU, S1-MB-CV, S1-MB-CW, S1-MB-CX, S1-MB-CY, S1-MB-CZ, S1-MB-DA, S1-MB-DB, S1-MB-DC, S1-MB-DD, S1-MB-DE, S1-MB-DF, S1-MB-DG, S1-MB-DH, S1-MB-DI, S1-MB-DJ, S1-MB-DK, S1-MB-DM, 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- Vertical Service:** A diagram showing the interaction between the Access Network, NFV/SDN Infrastructure A and B, and the Cloud. It includes components like LTE-A, MEC, SD-WAN, and OpenStack.
- NFV Orchestrator:** A diagram showing the orchestration of the Wireless domain (WIM), Transport SDN Orchestration (VIM), and Core Cloud Orchestration (VIM). It includes components like SDN Controller, OpenStack, and OVS.
- SDN-based Network:** A diagram showing the network architecture with an Aggregation Node, Reconfigurable ODN, MAC Control, and SDN Controller. It includes components like OLT, ODU, and IP/MPLS routers.

Other elements include:

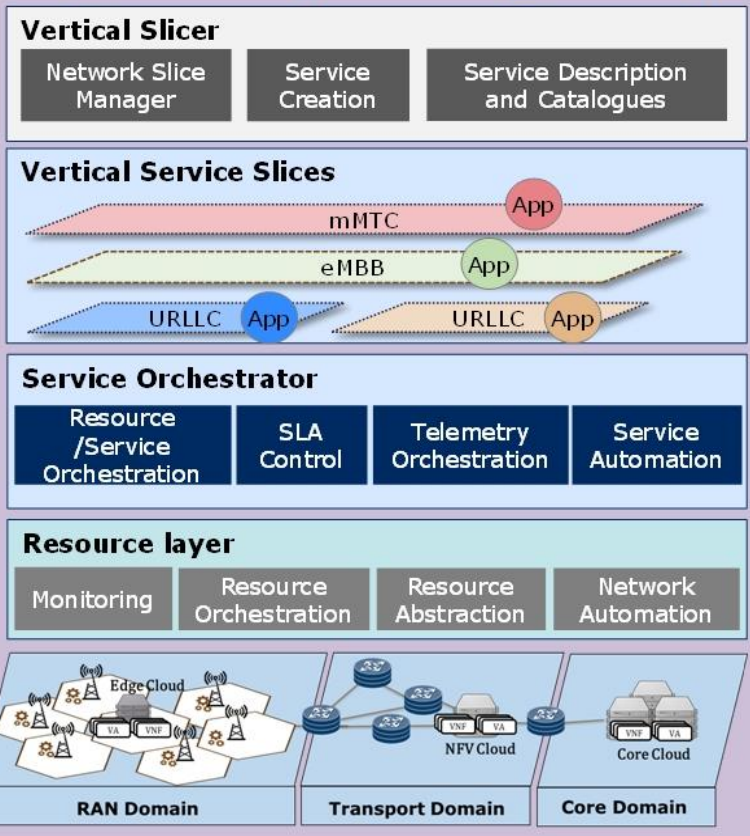
- Images of a stadium (Nantes), a medical ambulance (Toulouse), a 5G tower (Marseille), and a smart city street scene (Palermo).
- Maps of Europe showing the locations of the testbeds: Nantes, Toulouse, Marseille, and Palermo.

# There are still many challenges in 5G trials...





5G GROWTH



## Technical Innovations

1. Automated vertical support
2. Closed-loop automation and SLA control for automated vertical service lifecycle management
3. AI-based E2E network slicing
4. Telemetry monitoring, analytics and orchestration



**(ICT 19–2019: Advanced 5G validation trials across multiple vertical industries)****Objectives:**

- The main objective is the technical and business validation of 5G technologies from the verticals' points of view, by performing field-trials on 4 vertical sites
- Leverage on the results of 5G-PPP Phase 2 projects, 5G-TRANSFORMER and 5G-MONARCH
- Two ICT-17-2018 5G End-to-End platforms, 5G EVE and 5G-VINNI, are selected for the *Trials* to demonstrate the 5Growth specific vertical use cases.

**Pilots**

- 4 pilots across 4 verticals from Industry 4.0, Energy and transportation
- 9 use cases use cases will be field-trialed on 4 vertical-owned sites (in Spain, Italy, Portugal) in close collaboration with the vendors (Ericsson, Interdigital, NEC, Nokia) and the operators (Altice, Telecom Italia, Telefonica)

**Consortium**

- Verticals: Innovalia, EFACEC, Comau,
- Operators: Telecom Italia, Telefonica, Telecom Portugal
- Vendors: NEC, ERICSSON Spain/Italy, NOKIA Bell Labs, IDCC
- SMEs: NXW, Mirantis, Altice Labs
- Research Centers: IMDEA, CTTC, TELCA
- Universities: POLITO, SSSA, UC3M, NUKA

**Project duration of 30 months, starting from June 2019**

# Thank you for your attention



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