

# **Coordinated Control and Spectrum Management for 5G Heterogeneous Radio Access Networks**

## **Coordinating Heterogeneous Mobile Networks in 5G**

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# COHERENT Partners, Funding and Duration

- **COHERENT:** *Coordinated Control and Spectrum Management for 5G Heterogeneous Radio Access Networks*

## PARTNERS

VTT – Finland  
EURECOM – France  
CREATE-NET – Italy  
AALTO – finland  
SICS – Sweden  
EICT – Germany  
Thales – france  
CommAgility Limited – uk  
University of Duisburg-Essen - gErmany  
**OTE – Greece**  
4GCelleX – Israel  
Poznan University – PoLand  
INEA S.A. – PoLand  
Fairspectrum – Finland

Funding: **6.02M€** (h2020)

DURATION: **30 Months**  
(7/15 – 12/17)

**H2020 5G-PPP**  
Grant Agreement No. 671639

# Role of OTEGroup in COHERENT

**OTEGroup participates in:**

- The definition of use cases, system requirements and specifications.
- The definition of the COHERENT architecture.
- Information provision on actual mobile architectures and protocols, as well as on spectrum sharing and management.
- The evaluation and demonstration of the COHERENT innovations providing a test LTE network.
- Dissemination, standardization and techno-economics.

# Introduction

- **Motivation:** Innovations needed to deal with the control and coordination problem in large-scale HMNs in order to release the full potential of 5G networks.
- **Approach:** *build upon advanced network abstractions concepts to enable an efficient and scalable solution for network-wide coordination in HMNs.*
- **Goal:** *design a novel control framework for 5G heterogeneous radio networks, to enable operators to dynamically control network resources*
  - improve capacity
  - spectrum reuse efficiency
  - energy efficiency
  - user experience

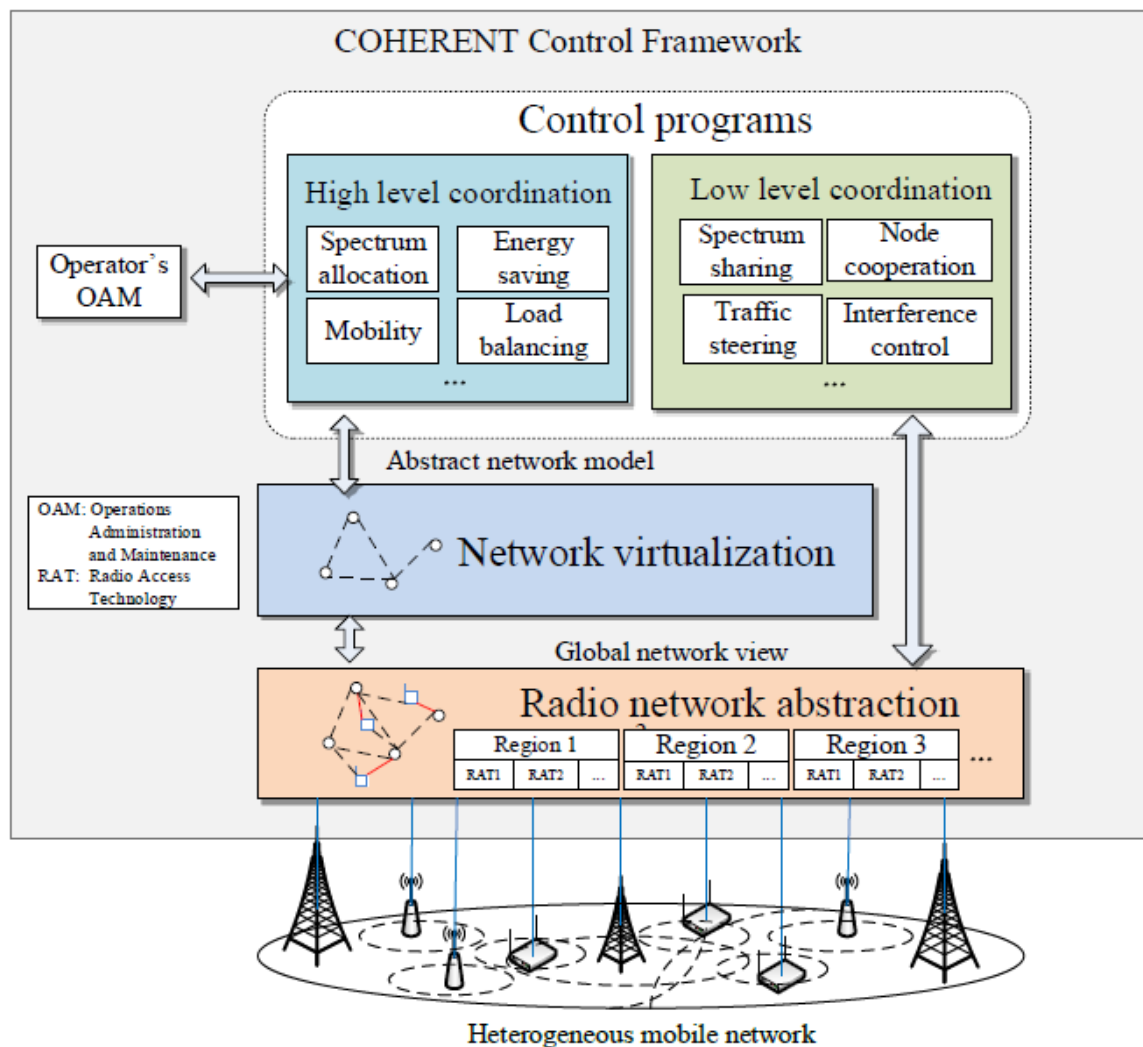
## ❖ 5G PPP interaction

# 5G Networks Innovations

## Three innovations in control and coordination of 5G networks:

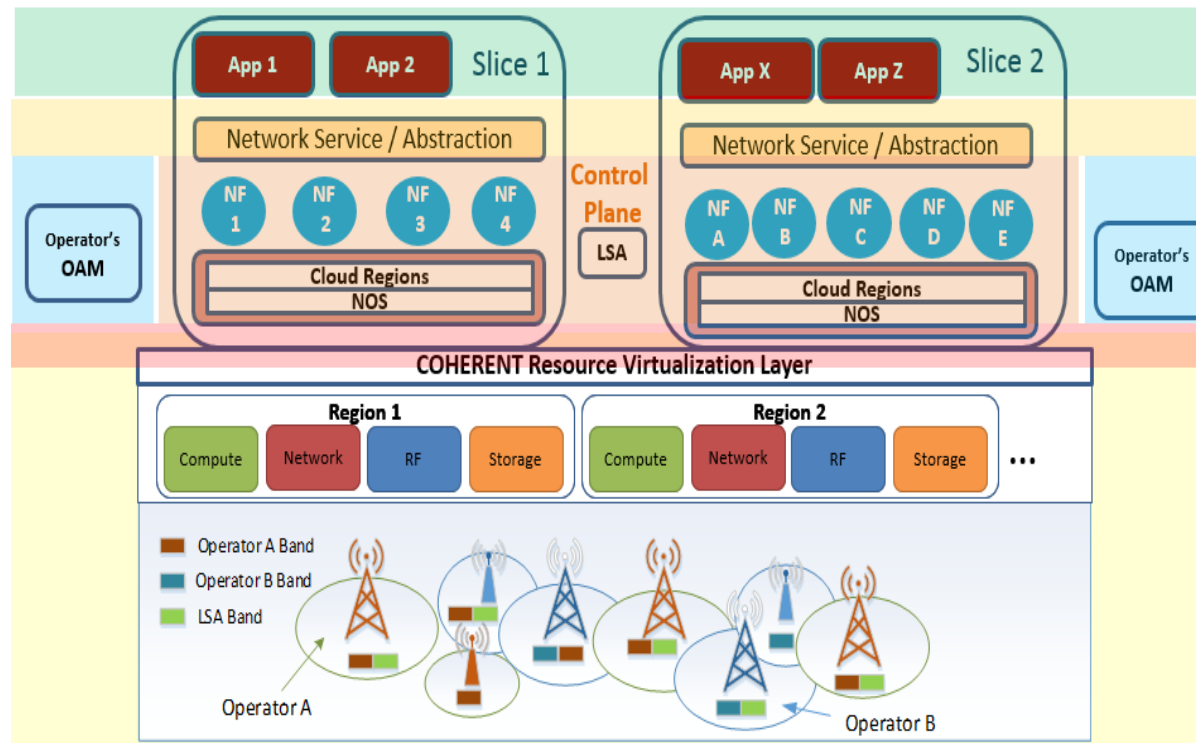
- **Physical and MAC layer modelling and abstraction**, to provide a simple network view of low-layer reality, and thus to enable a scalable and flexible control and coordination framework for complex resource coordination and spectrum management in 5G networks.
- **Programmable control based on the low-layer abstraction** with well-defined open interfaces and protocols to greatly simplify the management of HMN, to be verified by efficient resource coordination algorithms developed for identified 5G use cases.
- **Flexible and coordinated spectrum management** based on full awareness of spectrum usage through the COHERENT network abstractions.

# COHERENT Concept



# Architecture Design Aspects

- Planes (data, control, application)
- Two abstraction layers
  - infrastructure resource abstraction layer (underlying physical / MAC layer)
  - network service abstraction layer (service abstractions for the applications and services).



# Network Slicing & Resource Mapping

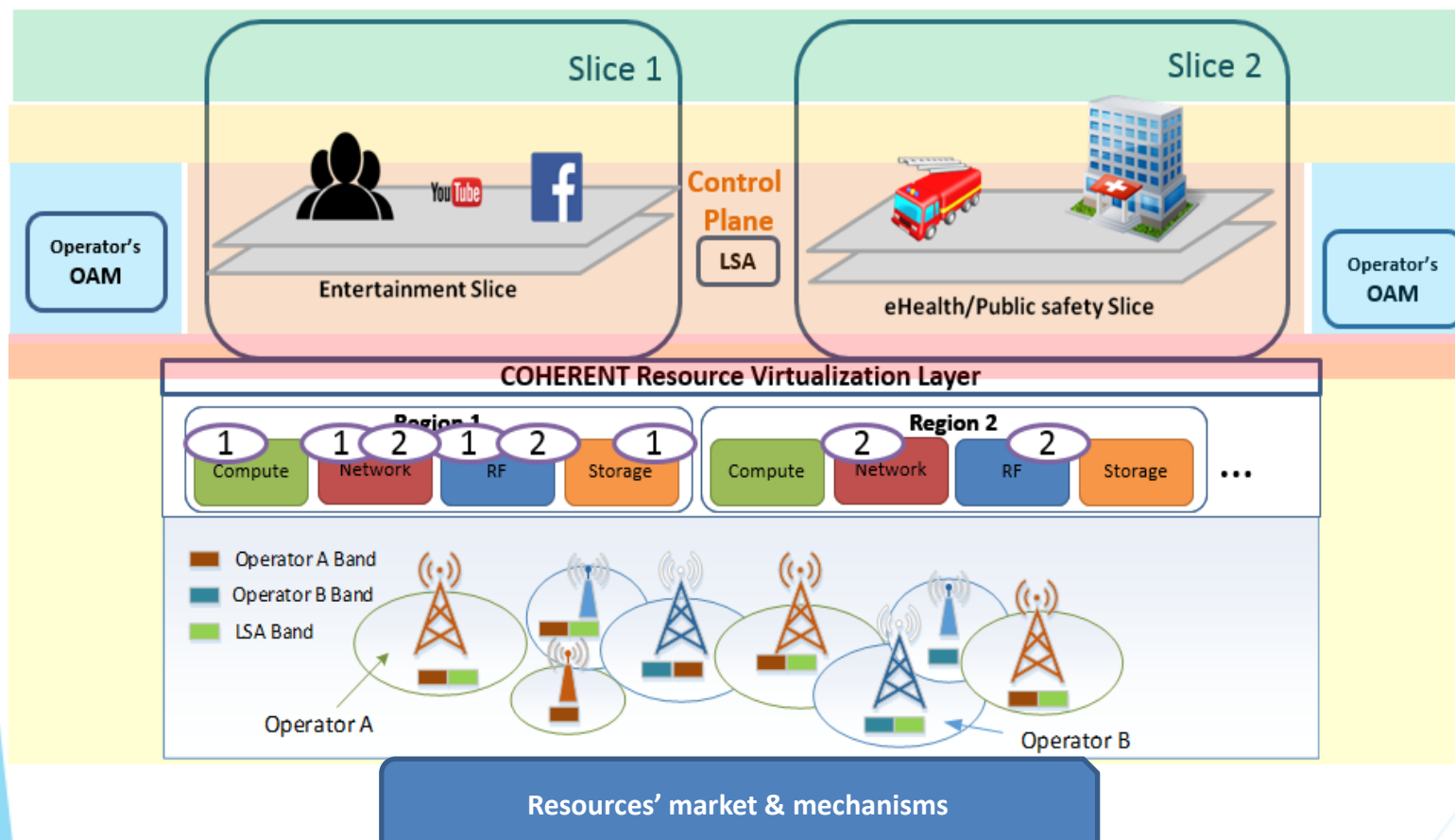
- **Network slice:** a partition of RAN with specific configurations used for particular use cases / business applications.
  - The collection of all network slices aggregated form the total network resources of an operator.
  - Slices can be spanned over a multitude of RATs / different operators.
  - Span all domains of the network:
    - *Different slices contain different network functions / configuration settings.*
    - *For each slice, network functions / storage resources located at network edges.*

## COHERENT controllers:

- coordinate the mapping of the infrastructure resources for network slices,
- manage the shared infrastructure resources and functions among multiple network slices.

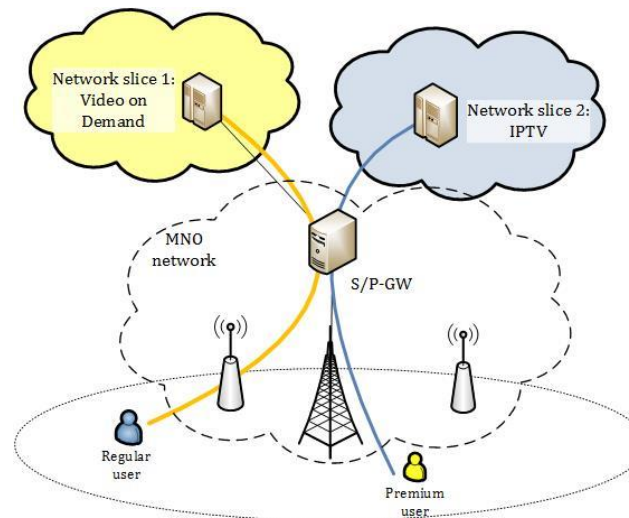


# Network Slicing & Resource Mapping (cont.)



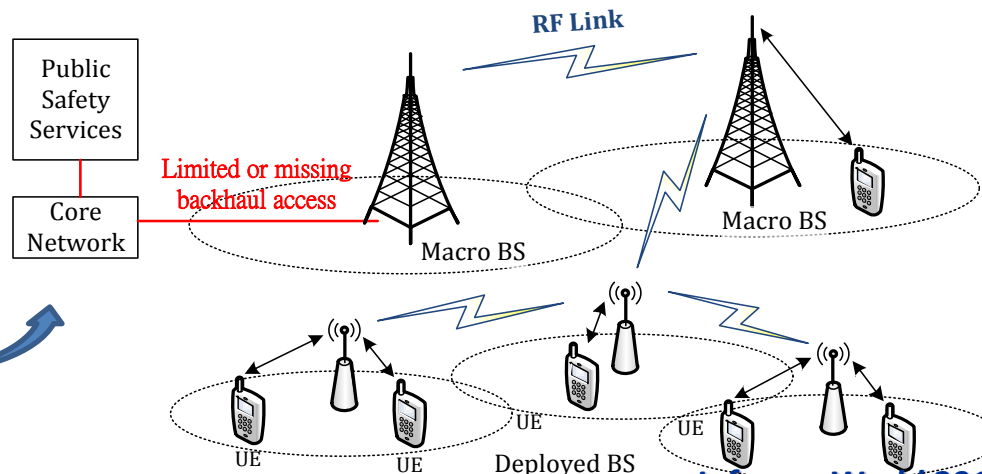
# COHERENT Scenarios

- Network cooperation
- Spectrum management
- Critical communications
- Network slicing



Service differentiation

Deploy wireless PMR mesh networks to re-establish a network for critical communications.



**Thank you!**

