

# 5G ESSENCE

Embedded Network Services for 5G Experiences

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# 5G ESSENCE: WHAT IT'S ALL ABOUT

The project proposes a highly flexible and scalable 5G small cell platform leveraging the paradigms of Edge Cloud computing and Small-Cell-as-a-Service

- ESSENCE builds on the **distributed and network-integrated cloud** inherited by 5G-PPP Phase-1 **SESAME project** that provides **processing power at the edge of the network**
- ESSENCE aims to **decouple the control and user planes** of the Radio Access Network (RAN)
- This enables us to **enjoy the benefits of Cloud-RAN while alleviating the enormous fronthaul latency restrictions.**
- The versatility of the architecture is enhanced by **high-performance virtualization** techniques focusing on data isolation, latency reduction and resource efficiency
- 5G ESSENCE will make it simpler for service and applications providers to host their services near the edge of the network for high performance and low latency without long and expensive backhaul.

# IMPACT ON SERVICE DEPLOYMENT

- Air-interface latency can be minimised independently of the service latency
- Having service functions close to the users is also necessary to reduce the **end-to-end latency** and also the overall **service creation time**.

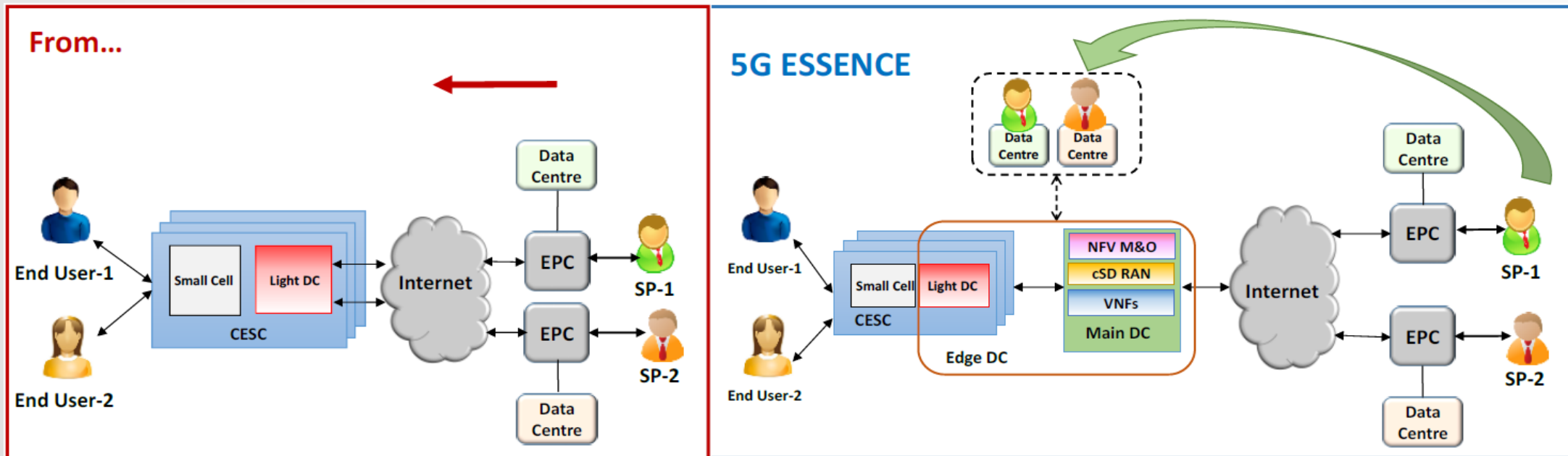


Fig.1 5G ESSENCE main concept

# 5G ESSENCE ARCHITECTURE

- Based on a two-tier approach
- Each **Cloud-Enabled Small Cell (CESC)** is able to host one or more service **Virtual Network Functions (VNFs)**, directly applying to the users of a specific operator.
- VNFs can be instantiated inside the **Main DC** and can be parts of a **Service Function Chaining** mechanism
- The Light DC can be used to implement **different functional splits** of the Small Cells as well as to support the **mobile edge applications** of the end users.
- Application for **targeted verticals**
  - Large crowds
  - In-flight entertainment
  - Emergency services (mission critical communications)

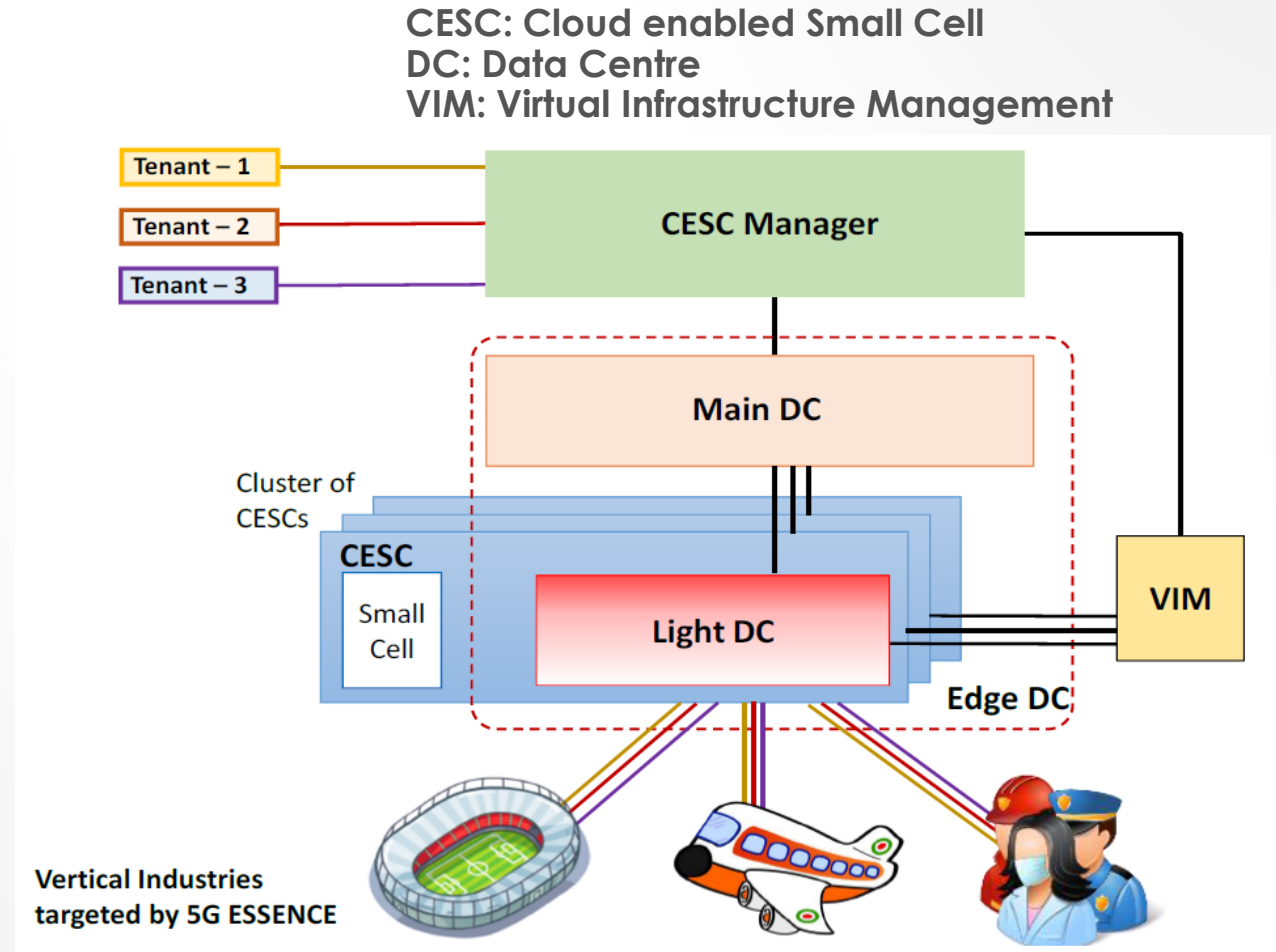


Fig.2 5G ESSENCE high level architecture

# 5G EDGE NETWORK ACCELERATION DURING A STADIUM EVENT

- Large crowd creating a burst in network traffic
- Benefits for media producers and mobile operators:
  - Operators can optimise operations by deploying key functionalities at the edge (i.e., evolved Multimedia Broadcast Multicast Services (eMBMS) together with multitenancy support from small cells).
  - Fans can enjoy a highly interactive experience
- It leverages the benefits of small cell virtualisation and radio resource abstraction
- It becomes possible to **ease the coverage and capacity pressure** on the multimedia infrastructure, and also to **increase security** since content will remain locally.

# NEXT-GENERATION INTEGRATED IN-FLIGHT CONNECTIVITY AND ENTERTAINMENT SYSTEMS

- 5G ESSENCE targets to integrate with a pioneering integrated **In-Flight Entertainment and Connectivity (IFEC)** system
- The **multi-RAT CESC**s will be implemented as a set of **integrated access points** to be deployed on-board
- This will deliver the required communication and network infrastructure for both the **embedded IFE devices** and the **wireless Bring-Your-Own-Device (BYOD)** scenario.

# MISSION CRITICAL APPLICATIONS FOR PUBLIC SAFETY

- 5G ESSENCE common orchestration of radio, network and cloud resources is expected to significantly contribute to the fulfilment of the **requirements of the PS sector**
- The project will bring new tools to share both radio and edge computing capabilities in localized/temporary network deployments between PS and commercial users.
- The challenge consists on allocating radio, network and cloud resources to the critical actors (e.g., the first responders), who **by nature require prioritized and high quality services**.
- For an allocation like this **E2E network slicing** will be applied



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# 5G ESSENCE MEASURABLE OBJECTIVES

1. To specify the **critical architectural enhancements** from 5G-PPP Phase-1 that are needed to fully enable **cloud-integrated multi-tenant small cell networking**
2. To define the **baseline system architecture and interfaces** for the provisioning of a cloud-integrated multi-tenant small cell network and a programmable Radio Resource Management (RRM) controller, both **customisable per-vertical**
3. To develop the **centralised SD-RAN controller** that will program the radio resources usage in a unified way for all CESCes



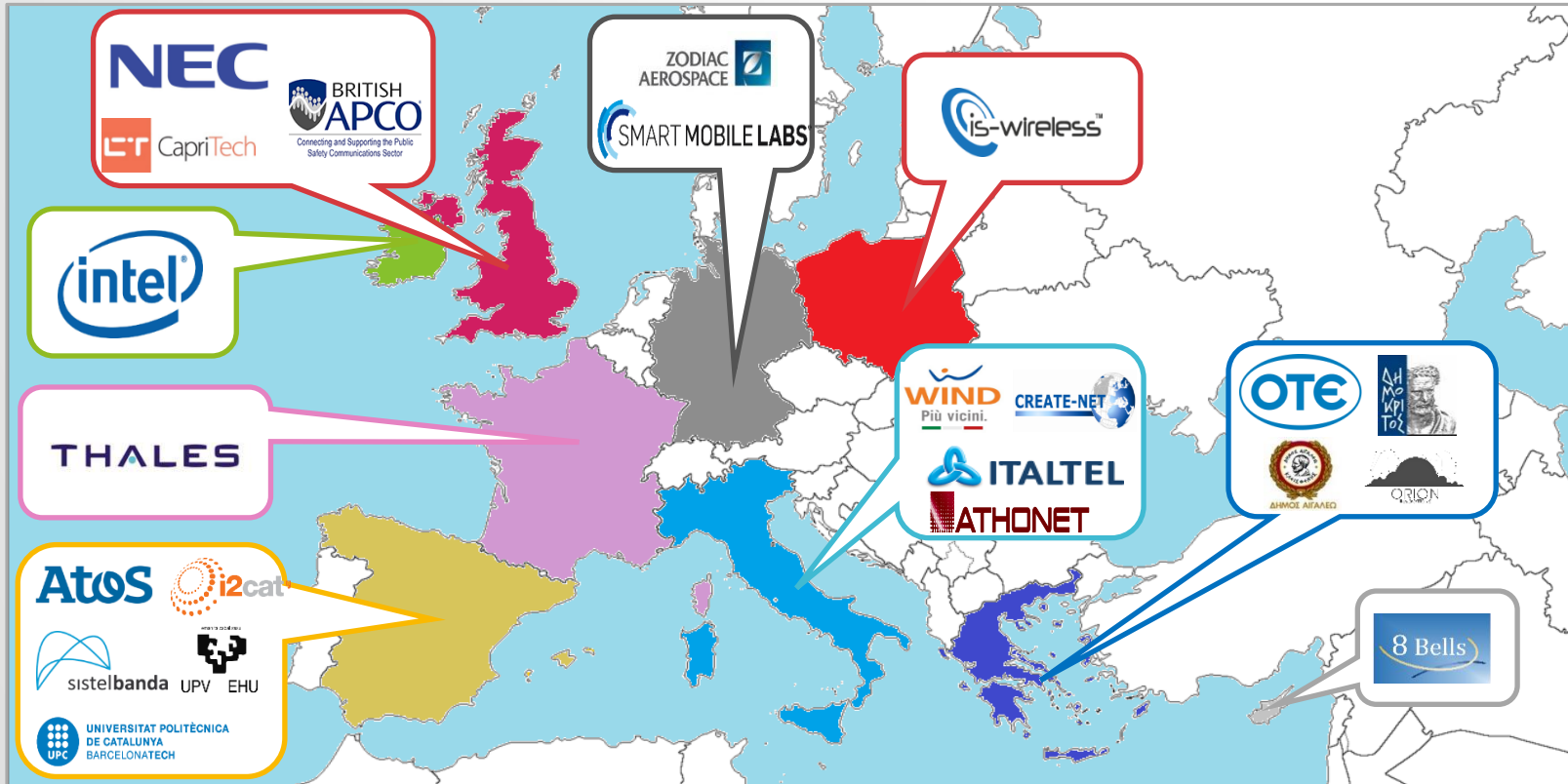
# 5G ESSENCE MEASURABLE OBJECTIVES (cont.)

4. To exploit **high-performance and efficient virtualization techniques** for better resource utilization, higher throughput and less delay at Network Services creation time
5. To develop the **orchestrator enhancements for distributed service management**
6. To demonstrate and evaluate the cloud-integrated multi-tenant small cell network via **three real-life vertical industries**
7. To conduct a market analysis and to establish new business models through a detailed **roadmapping towards exploitation and commercialization**

# KEY IMPACTS

- The **two tier approach** of the 5G ESSENCE architecture will be particularly suitable for achieving **high resource utilization efficiency** and **high capacity**
- The open architecture adopted by 5G ESSENCE **allows to scale up/down the services** and gives the opportunity to network operators and Communication Service Providers (CSPs) to explore the optimum assembly of NFV modules in a way that can be exploited in **reducing service creation time**.
- **Multi-tenancy** and flexible cloud-network integration, with highly-predictable and flexible performance characteristics
- **CAPEX/OPEX** cost reduction through novel business models based on shared resources.

# 5G ESSENCE CONSORTIUM



- 22 Partners around Europe
- Coordinated by OTE
- Industries / SMEs / Academia
- Starts: June 1<sup>st</sup> 2017  
Duration 30m
- Budget €7.978.273

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