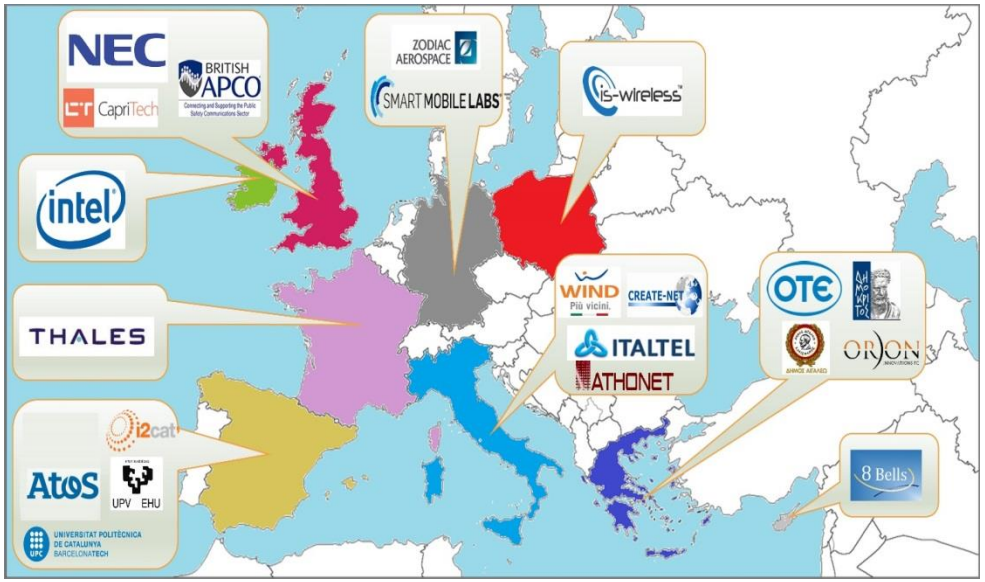
5G ESSENCE

(Embedded Network Services for 5G Experience)

Who we are…

- Research & Innovation Action (**RIA**)
- Proposal No.: **761594**
- **Topic:** ICT-07-2017
- **Duration: 30 months**
- **Overall budget (requested grant) of ~7.978 Million euro**
- **Consortium members: 21 partners from 9 EU member states**
- **Project Coordinator:** **OTE (Hellenic Telecoms S.A.)**
- **Project Manager:** **Dr. Ioannis Chochliouros (OTE)**
- **Technical Manager:** **Dr. Anastasios Kourtis (NCSRD)**

- **More information at:** *https://5g-ppp.eu/5G ESSENCE/*
- **Contact**: 5G ESSENCE-Contact@5g-ppp.eu



Two Network Operators: OTE and **WI3** are **nationwide network operators**, with strong orientation to innovation, and significant background in innovative SDN/NFV architectures. OTE and WI3 will support actions to identify market opportunities and dissemination of 5G ESSENCE outcomes.

Six Large industries: They will **lead the technology development so as to enhance their products** with the 5G ESSENCE innovative results.

NEC, INTEL, TCS and **ITL** are leading global players in the fields of broadband and mobile technologies and in particular of cloud computing and virtualised and SDN-enabled networks systems integration. **ATOS** is a global player in innovative IT and telco solutions.

ZII is a world leader in aerospace equipment and systems for commercial, regional, and business aircrafts, helicopters, and space applications.

Six SMEs: They will **exploit the momentum and the critical mass of the project to develop highly innovative products and services,** thus gaining a strong competitive advantage.

ISW is leading small cell developers/integrators, focused on the development of improved small cell systems and solutions.

SML is a Nokia Siemens Networks spin-off that develops special solutions for the new mobile radio standard LTE.

ATH is well established in the market of high performance Mobile Core Network providers.

ORION and **CPT** are emerging players in the NFV arena as developers of cutting-edge virtual network devices and security services.

8BELLS provides in-depth experience of telecommunication systems and techno-economic aspects and will contribute with a market analysis.

Three research centres (**NCSRD, i2CAT, FBK/CNET**) and **two universities** (**UPC, EHU**) with **long term experience in ICT sector and networking**.
Two organisations with end-users/representatives of vertical sectors (**BAPCO, MoE**).

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Essential Objectives

- **5G ESSENCE addresses** the **paradigms of Edge Cloud computing and Small Cell-as-a-Service (SCaaS)**, *by fuelling the drivers and removing barriers in the Small Cell (SC) market.*

  (The SC market is expected to grow rapidly up to 2020 and beyond, and also to play a "key-role" in the 5G ecosystem!).

- **5G ESSENCE provides** a **highly flexible and scalable platform**, able to support:
  - New business models & revenue streams, *by creating a neutral host market;*
  - reduction of operational costs, *by providing new opportunities for ownership, deployment, operation and amortisation*.

- **5G ESSENCE leverages and influences** **knowledge**, **SW modules** and **prototypes** *from various 5G-PPP Phase-1 projects*, ***"SESAME" being particularly relevant***.

Ambitious aims are targeted,
culminating with the prototyping and demonstration of 5G ESSENCE system
in three real-life use cases, *associated to* ***vertical industries***.

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Main Technical Challenges and Expected Conceptual Focus

- **Full specification of the critical architectural enhancements from 5G-PPP Phase-1 actions**, that are necessary to enable cloud-integrated multi-tenant small cell networking.
- **Definition of the baseline system architecture and interfaces** for the provisioning of a cloud-integrated multi-tenant SC network and of a programmable Radio Resources Management (RRM) controller, *both customisable on a per vertical basis*.
- **Development of the centralised SD-RAN (Software-defined Radio Access Network) controller** that will program the radio resources usage in a unified way for all CESCs (Cloud-Enabled Small Cells).
- **Exploitation of high-performance and efficient virtualisation techniques** for better resource utilisation, higher throughput and less delay at Network Services creation time.
- **Development of appropriate orchestrator enhancements**, for distributed service management.
- **Demonstration and evaluation** of the cloud-integrated multi-tenant small cell network, *via three real-life vertical industries*.
- **Conduct of a market analysis and establishment of new business models** via detailed techno-economic analysis & roadmapping towards exploitation/commercialisation by industrial partners.
- **Ensuring maximisation of 5G ESSENCE impact to the realisation of the 5G vision**, by establishing close liaison and interactive synergies with 5G-PPP Phase-1 & Phase-2 projects and the Association.
- **Pursuing extensive dissemination and communication activities**, as well as assessing the perceived impact from the stakeholders and the wider community.

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Innovation Framework, Impact and Market Perspectives

- **5G ESSENCE will accommodate a wide range of use cases**, *especially in terms of ameliorated latency, resilience, coverage, and bandwidth*.
  It provides E2E network and cloud infrastructure slices over the same physical infrastructure, *to fulfil vertical-specific requirements as well as mobile broadband services, in parallel*.
  5G ESSENCE introduces innovations in the fields of network softwarisation, virtualisation, and cognitive network management.

- **5G ESSENCE offers opportunities to venue owners,** *(e.g., municipalities, stadiums, site owners, and virtually anyone who manages a property and can install-and-run a local Small Cell network), to deploy a low cost infrastructure and to act as neutral host network and service provider.*

- **5G ESSENCE supports an enriched mobile users' experience**, *minimising service deployment time.*
- **5G ESSENCE enables network operators and infrastructure owners to open the radio network edge to third-party partners** *allowing them to rapidly deploy innovative applications and services.*

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Identification of 3 Main Real-Life Use Cases, *associated to Vertical Industries*

5G edge network acceleration for a stadium:

Demonstration of a combined 5G-*based* video production and video distribution for delivering benefits to media producers and mobile operators, who will be able to offer enriched event experience to their subscribers.

*The production/distribution of locally generated content through the 5G ESSENCE platform, coupled with value-added services and rich user context, **will enable secure, high-quality and resilient transmission**, in real-time and with minimal latency.*

Mission critical applications for public safety (PS):

Involvement of one -*or more*- PS communications providers, to use the resources offered by a dedicated platform for the delivery of communication services to PS organisations in a country/region.

The 5G ESSENCE platform can be owned by either a *mobile (potentially virtual) network operator* or by a *venue owner*.

The infrastructure owner will exploit system capabilities to provide the required network/cloud slicing capabilities with dedicated SLAs to different types of tenants, by prioritising the PS communications providers.

Next-Generation integrated in-flight connectivity and entertainment (IFEC) services:

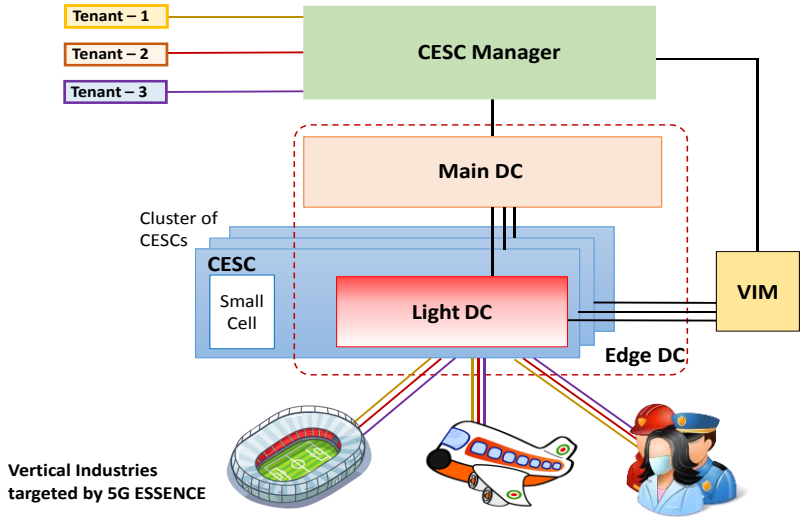
Testing and validation of the multi-tenancy enabled network solution for passenger connectivity and wireless broadband experience.

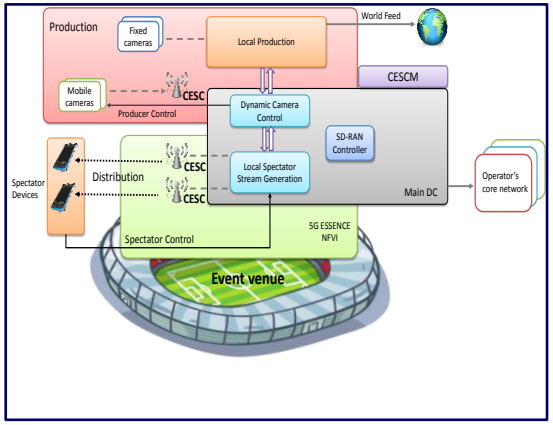
The multi-RAT CESCs will be implemented as a set of integrated access points to be deployed on-board.

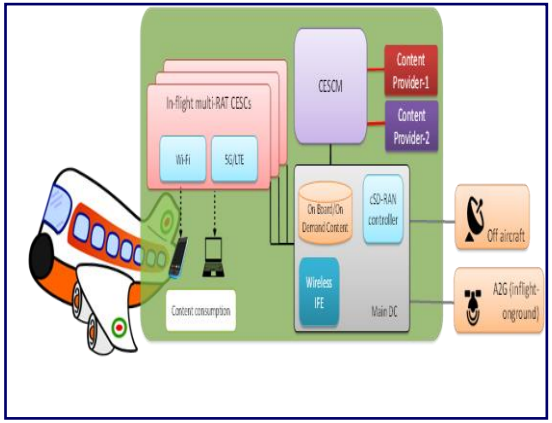
Then, since IFE has to consider the explosive growth of multi-screen content consumption, the 5G ESSENCE CESCs will stream on demand multi-screen video content (both from on-board 5G Edge DC servers and via satellite/air2ground links) to the wireless devices.

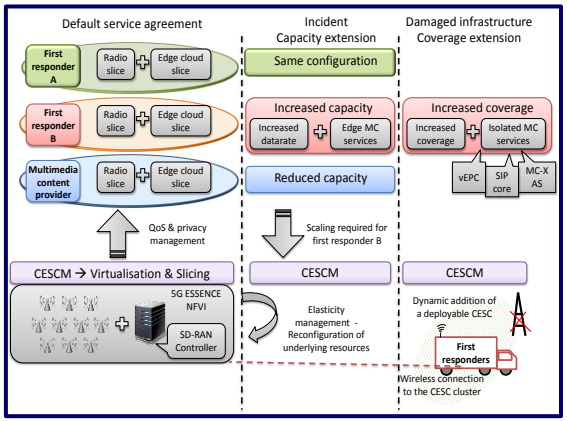
5G ESSENCE CESCs will rely on broadcast links to optimise the bandwidth usage.

Identification of 3 Main Real-Life Use Cases (cont.)









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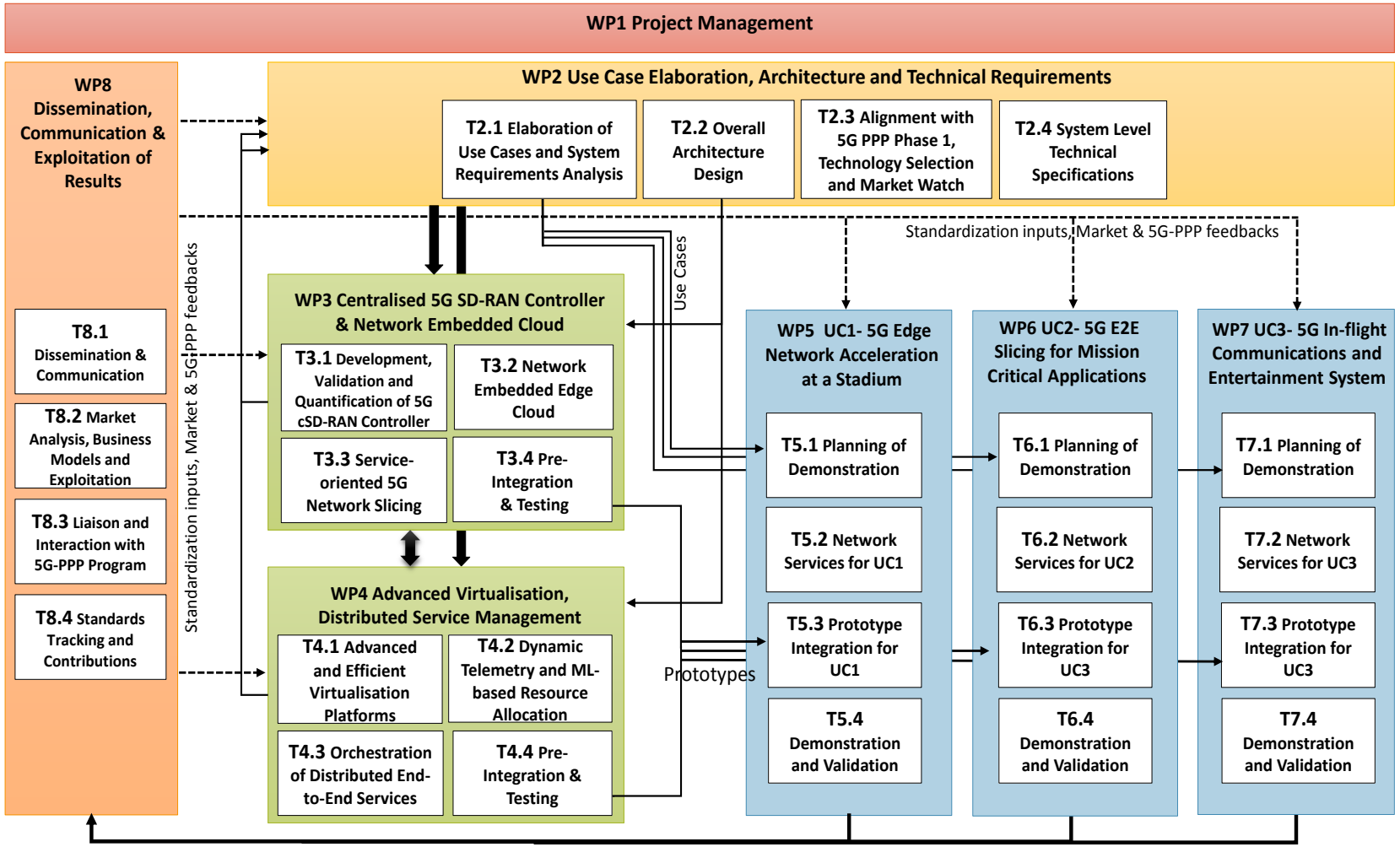
Work Structure



Relevance and Impact on 5G-PPP KPIs

	Performance KPIs	
P1	Providing 1000 times higher wireless area capacity and more varied service capabilities compared to 2010.	N.A.
P2	Saving up to 90% of energy per service provided.	Med.
P3	Reducing the average service creation time cycle from 90 hours to 90 minutes.	High
P4	Creating a secure, reliable and dependable Internet with a "zero perceived" downtime for services provision.	T.B.D.
P5	Facilitating very dense deployments of wireless communication links to connect over 7 trillion wireless devices serving over 7 billion people.	N.A.
P6	Enabling advanced user controlled privacy.	N.A.

	Business-related KPIs	
B1	Leverage effect of EU research and innovation funding in terms of private investment in R&D for 5G systems in the order of 5 to 10 times;	Low
B2	Target SME participation under this initiative commensurate with an allocation of 20% of the total public funding;	High
B3	Reach a global market share for 5G equipment & services delivered by European headquartered ICT companies at, or above, the reported 2011 level of 43% global market share in communication infrastructure.	T.B.D.

	Societal KPIs	
S1	Enabling advanced User controlled privacy;	N.A.
S2	Reduction of energy consumption per service up to 90% (as compared to 2010);	Med.
S3	European availability of a competitive industrial offer for 5G systems and technologies;	Med.
S4	Stimulation of new economically-viable services of high societal value like U-HDTV and M2M applications;	N.A.
S5	Establishment and availability of 5G skills development curricula (in partnership with the EIT).	N.A.

Relevance and Impact on 5G-PPP Working Groups

Pre-Standardization WG	T.B.D.
Spectrum WG	N.A.
5G Architecture WG	**Medium**
SDN / NDF WG	**High**
NetMgmt & QoS WG	**Medium**
Vision and Societal Challenges WG	T.B.D.
Security WG	
SME WG	Medium
Trials WG	**High**

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For further information:

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