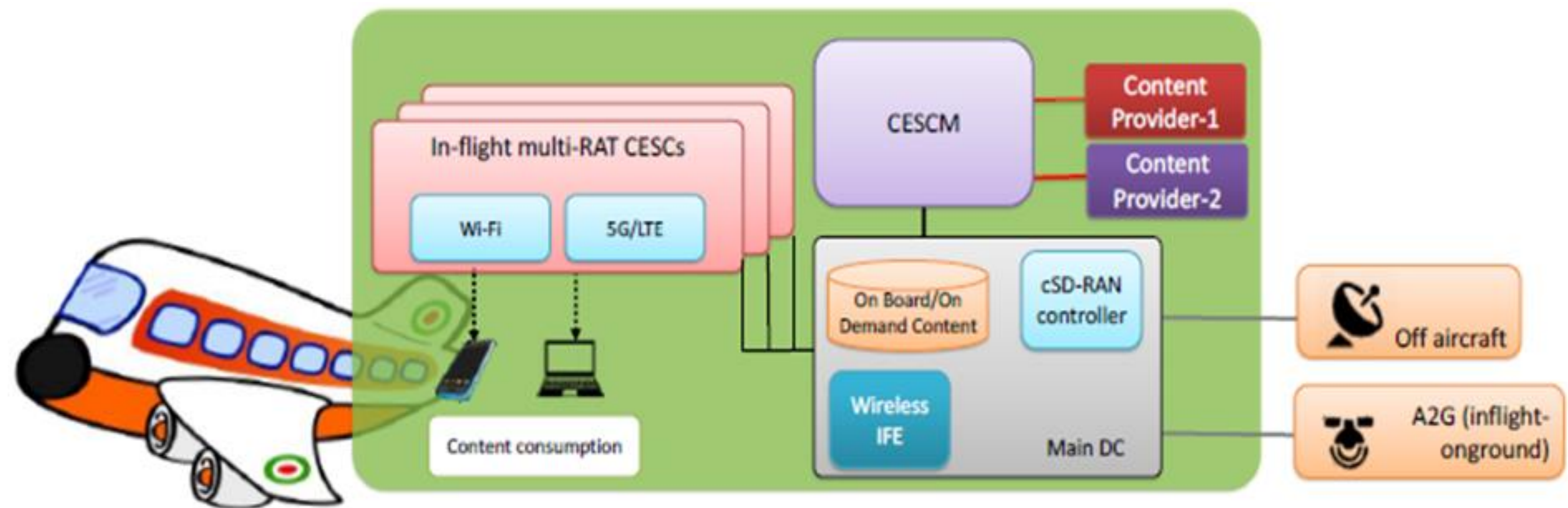


EU 5G-PPP Project

USE CASE #3: Next-Generation integrated in-flight connectivity and entertainment systems

5G ESSENCE will accommodate a range of use cases, in terms of reduced latency, increased network resilience, and less service creation time.

The unique architecture proposed in 5G ESSENCE which combines efficiently the virtualised and multi-tenant small cell (SC) networks with a multi-tier cloud edge infrastructure, is an **essential step** for integrating a pioneering integrated **In-Flight Entertainment and Connectivity (IFEC) system** that will jointly deliver the required communication and network infrastructure for the wireless IFEC (to both the embedded IFE devices and the wireless Bring-Your-Own-Device (BYODs)).

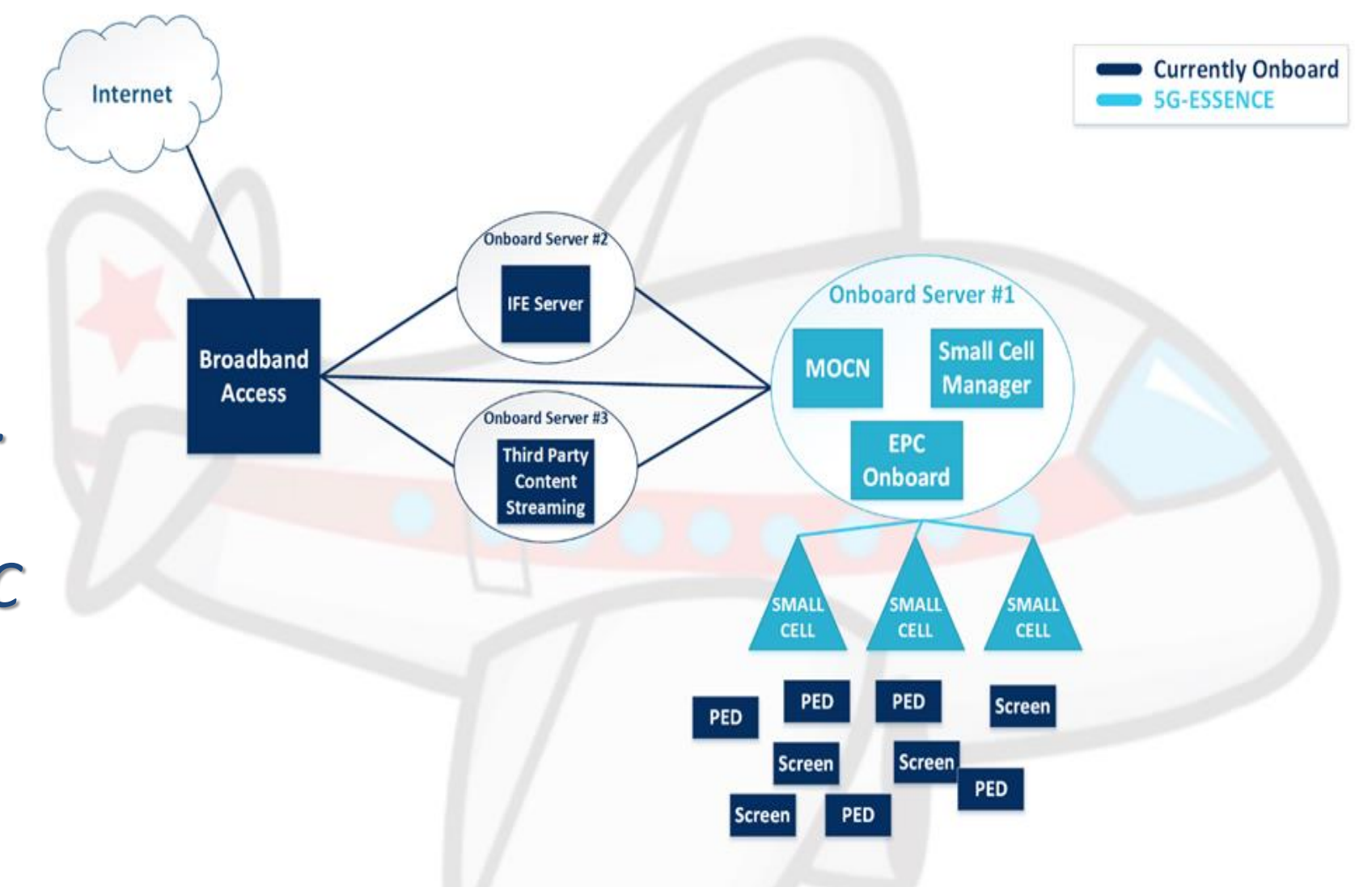


Actors involved

- ❑ **Small Cell Network Operator (SCNO):** Owner of the infrastructure deployed in the aircraft. It can be the airline flying the aircraft or a network operator/content provider, who is interested in providing its services on-board.
- ❑ **Virtual Small Cell Network Operator (VSCNO):** Users of the infrastructure available in the aircraft to provide services to the end-users.
- ❑ **End-Users (EU):** Users of the networking services provided by the VSCNO and SCNO (a.k.a. flight passengers).
- ❑ **Mobile Operators (MOs):** Actors responsible of “bringing” the network and communication services to the aircraft.
- ❑ **Service Provider (SP):** Companies providing some of the Virtual Network Functions to the SCNO.
- ❑ **Spectrum Owner (SO):** In the licensed spectrum case, the airline that leases the spectrum from an operator or a mobile operator that offers a service on-board (who provides the spectrum “for free” or for a charge).

Deployment Topology

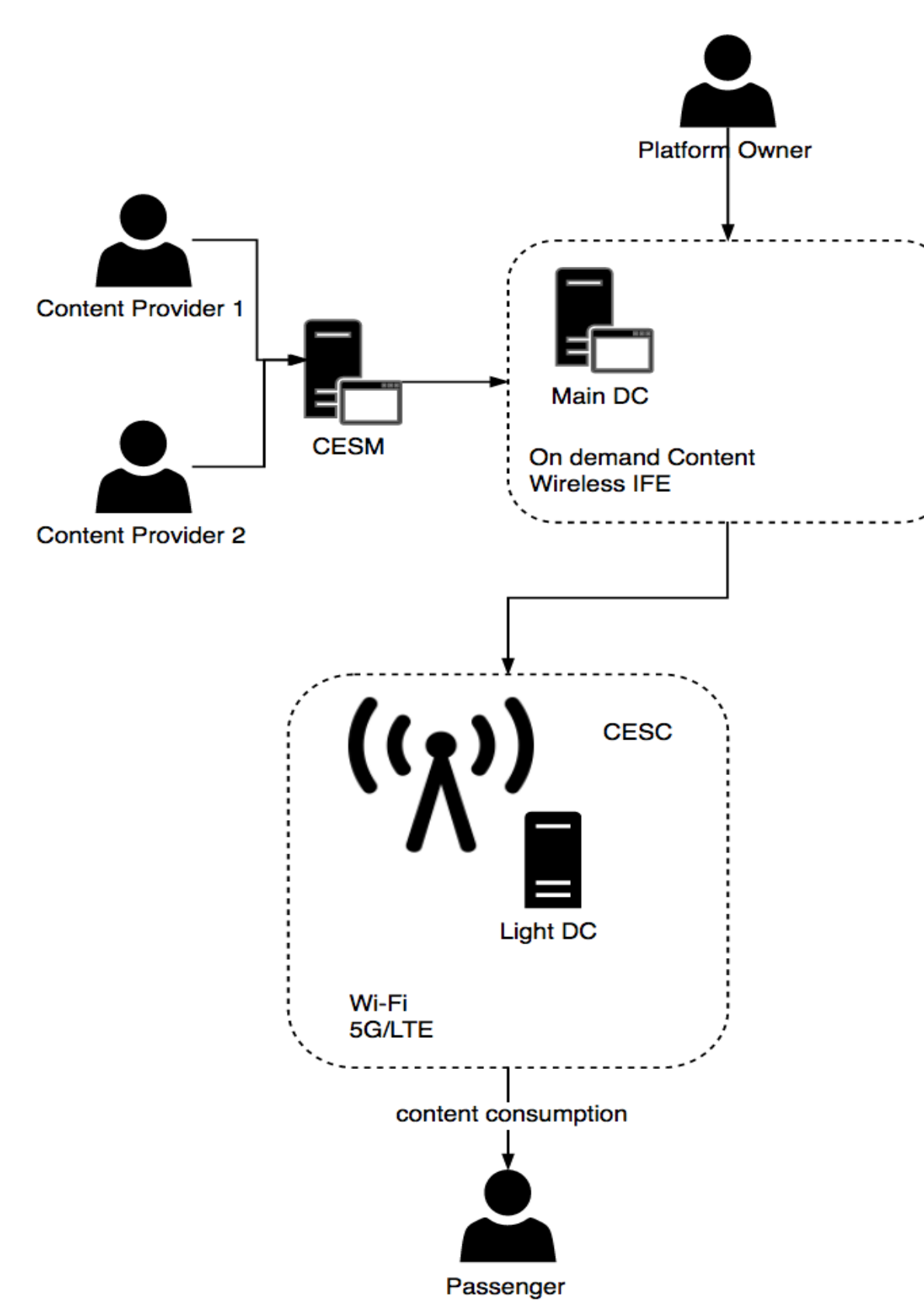
- The 5G ESSENCE IFEC demo tests and validates the multi-tenancy enabled network solution for passenger connectivity and wireless broadband experience.
- The multi-RAT CESC will be implemented as a set of integrated access points to be deployed on board.
- Afterwards, since IFE has to consider the explosive growth of multi-screen content consumption, the 5G ESSENCE CESC 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 CESC will rely on broadcast links in order to optimise the bandwidth usage.



Evaluation

- ❑ **Quality of Service:** The user-centric applications require features such as low delay, low latency, high data rates, etc., independently of the used radio access technology such as Wi-Fi and LTE. To support these QoS features, parameters that affect the end-users’ quality of service such as access and processing latencies, network load, etc., need to be monitored in the edge cloud for the considered radio access technologies.
- ❑ **Cloud Features:** Resources available at the edge cloud for network and service functions are severally constrained by the underlying hardware’s capabilities (compute, storage, and networking). Regardless of the eventual level of these constraints, lightweight management and control features will be needed together with cloud architectures that are tailored towards the resource constrained, potentially heterogeneous host machines.
- ❑ **Resource Utilization:** The radio and cloud infrastructure resources are integrated more closely at the edge requiring coherent resource management functions controlling both these domains. In this specific context, evaluations related to achievable capacity, spectral efficiency, radio resource management, resource slicing (cloud, radio), resource sharing and multi-tenancy can be considered.

Hardware architecture of the in-flight scenario



The Main DC (Data Centre) is responsible for providing remote connectivity to the system. The remote connectivity is achieved from a combination of air-to-ground communications and satellite networking.

The Main DC is used as the system’s storage for on demand content.

The Light DC acts as an interface for content consumption by the passengers and as a gateway to Wi-Fi or 5G network connectivity.

The Content Providers can use the interface of the CESM to manage their content and other aspects of their applications.

PROJECT CONSORTIUM



Project Info: Duration: 30 months ■ Start date: 01/06/2017 ■ Costs: 7.9 M€

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