

# FUDGE-5G

The main objective of FUDGE-5G is to devise, assess and demonstrate a conceptually novel and forward-looking cloud-native, unified and secured service-based 5G architecture, solutions and systems for Non-Public Networks. FUDGE-5G will allow for extreme interoperability and customisation for verticals among wired and wireless access infrastructure, eSBA platform,

multi-vendor mobile 5GC, service orchestration and vertical applications.

Five vertical use cases will be used for validating the FUDGE-5G technology solutions. Each use case is associated with a vertical stakeholder, which will be involved both in the use case definition and in the field trials.

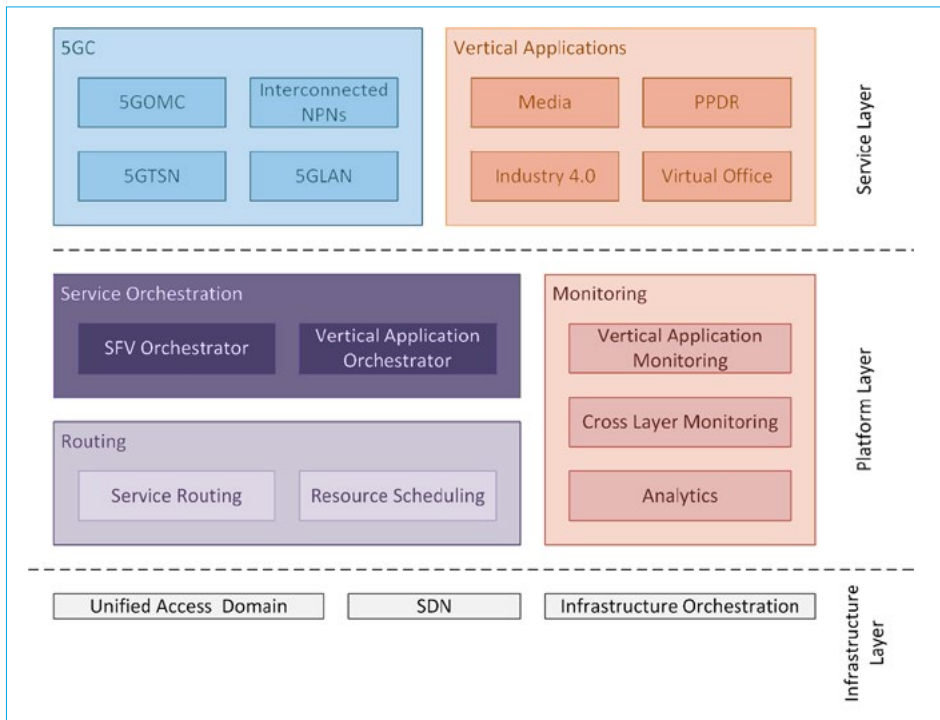


Fig. 48: FUDGE 5G - architecture

## Use Case 1 – Media Showroom and Remote Production

Multimedia delivery is a central pillar of global networking traffic and estimations predict that 85% of all traffic will be multimedia by 2022. The objective of this use case is to utilise a localised 5GLAN connectivity among many mobile users to facilitate the 5G multicast for opportunistic multimedia delivery for popular content, allowing the multimedia content to be delivered efficiently.

The project will showcase a massive video and audio streaming media showroom with interactive content where the mobile operator can optimise downlink traffic while performing media distribution on a highly dynamic basis. Each component can also change dynamically in terms of network location, effectively realising a dynamic mobile function offloading capability. This combined with QoS will enable remote content production scenarios.

### Use Case 2 – PPDR (Public Protection and Disaster Relief)

This use case will provide custom Mission Critical Services, such as Mission Critical Push-to-talk, Mission Critical Video and Mission Critical Data, albeit realised as service applications over a pure 5GLAN, each one having its own requirements in terms of performance and reliability.

Three scenarios will be showcased. In the first one, FUDGE-5G will enable rapid deployment of tactical bubbles using 5G NPNs. These tactical bubbles are autonomous networks that can be used by emergency teams in their operations, and they are usually deployed in vehicles.

In the second scenario, these tactical bubbles will be able to make opportunistic use of intermittent backhaul links to achieve higher processing power with the help of a remote cloud.

Finally, in the third scenario, the tactical bubbles will be able to coexist with public networks and use their resources. Public networks could provide both best effort connection and Mission Critical Services via a custom Network Slice.

### Use Case 3 – 5G Virtual Office

A 5G Virtual Office provides secure access to a specific set of corporate services without any restriction to the coverage range or proximity. This means that a 5G device can communicate with any other device that is member of the 5G Virtual Office, as long as there is 5G NPN coverage, both in private and public settings.

This use case will demonstrate the FUDGE-5G platform capabilities of deploying “all-Ethernet” NPNs with 5GLAN support for eHealth applications of a 5G Virtual Office in three major scenarios: Ward Remote Monitoring, Intra-Hospital Patient Monitoring and Ambulance Emergency Response.

The first scenario uses the NPN deployment to enable remote monitoring of ward patients using a set of bio sensors, allowing smart processing and analysis to trigger alarms in case abnormal values are detected as well as doctor to patient remote interaction. The second scenario aims to ensure uninterrupted monitoring with quality when patients are transported inside the

hospital, in contrast to what current technologies provide. Finally, the third scenario extends the hospital network towards ambulances and emergency response using a 5G NPN deployed over a public 5G network, ensuring security, privacy, isolation and connectivity at all times.

### Use Case 4 – Industry 4.0

FUDGE-5G will showcase an Industry 4.0 Campus Network with ultra-low time synchronisation requirements (5G-TSN). In the factory, a controller will interact with many sensors and actuator devices, located within a small area (up to 100 m<sup>2</sup>). A 5GLAN-type of service can be provided enhancing existing wireless and/or fixed LAN solutions deployed in the Industry 4.0 factory.

These applications have high performance requirements such as low latency, high reliability, and deterministic delivery of messages. 5G NPNs are perfect for them, because they allow organisations to use licensed spectrum, therefore bandwidth is guaranteed. NPNs also allow full control of the QoS and Network Slicing, a key feature to provide URLLC.

Replacing wired with wireless connections will be beneficial because it allows to cut costs, and in some cases, like hazardous environments, it might even be a requirement.

### Use Case 5 – Interconnected NPNs

This use case will focus on roaming among NPNs, a feature not officially supported by 3GPP technical specifications. The architecture will be based on the Eudroam network, allowing seamless connectivity while visiting other organisations. Users will always authenticate using the credentials of their home network. When the users try to access a visiting network, the petitions will be authorised by the home network. The resources users can use can be different whether the users are in their home network or in a visiting network.

To demonstrate its capabilities, three separate 5GLANs will be deployed (in Fraunhofer FOKUS site, in a Telenor site and at the UPV) and thanks to Interconnected NPNs use case, users from any network will have access to network resources.