Ultra-reliable Drone Navigation and Remote Control Network Application

SUMMARY

Efficient drone control and localisation, however, remain challenging tasks, as drone communications should be characterised by stability, wide availability, low cost and ultra-reliability, even when the drone is out of sight. As modern drones are typically controlled via remote control, their applicability in real-life situations remains severely limited. In this UC, HHI will experiment with various methods for drone control in different situations, particularly focusing on network overload situations, when the data channels are used in major events or disasters.

A particularly efficient means of controlling drones via Bandwidth-optimised communication protocols in the mobile network will be deployed in the form of VNFs on top of the 5G-EPICENTRE infrastructure, facilitating a two-way communication where commands are transmitted to the device, which in turn responds with information about its position, altitude and battery status.

The mission drone will be using a 5G network slice in order to secure ultra-reliability and will be streaming Infrared (IR) and optical video streams of the site. The fire service is to receive a prioritised data link for the use of drones. Video and telemetry data should be able to be displayed on different devices at the same time.

CONTACT

For more information, do not hesitate to visit the website https://www.5gepicentre.eu/ and/or contact the 5G-EPICENTRE team.

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MICROSERVICES

The solution proposed may also be considered as two inter-related Network Applications, Full MCX Server Net-work Application and MCX Dispatcher Network Application. While the MCX Server Network Application en-compasses the main elements for MCX (MCPTT, MCVideo and MCData), such as Key Management Server (KMS), Configuration Management Server (CMS), etc., the MCX Dispatcher Network Application offers a way to create and provision campaigns, workgroups, etc.

Ultra-reliable drone navigation and remote control Network Application follows hybrid model where following NF are utilized:

- MAVLink Proxy (Micro Air Vehicle communication protocol).
- CC Link for the Command/Mission Control Centre.
- Live Video Server for the management of the video streams of the drone.

QGroundControl consumes the above mentioned network services and henceforth act as a network application for the use case and is utilized as a mission control operator. Additional clients of QGroundControl in the vertical domain can be installed which will receive the drone feeding from live video server deployed as NF. It is planned to containerise the Network Application along with its NFs under Kubernetes. To use the Vertical Applications, the following configuration is required:

- 1 VM with 4 CPU, 8GB RAM and 30GB hard disk.
- Bandwidth Uplink (UL) (drone to live video server): Approximately 20Mpbs per video stream.

In addition, a dedicated NF will be created, to measure latency and data rate in the context of the UC. This requires a Kubernetes environment that includes:

- Kubernetes Master + 2 Worker Nodes.
- VPN access.
- CNI (Flannel).
- Message Queuing Telemetry Transport (MQTT) message broker.
- LoadBalancer (metalLB).

A VM will be deployed, in which all the NFs with QGroundControl will be installed. Through this, one cannot only control the drone, but can also stream the live video either in telco domain or in client domain from drone. As a prerequisite, the VM must be connected to the 5GC in order to communicate with the drone over 5G.

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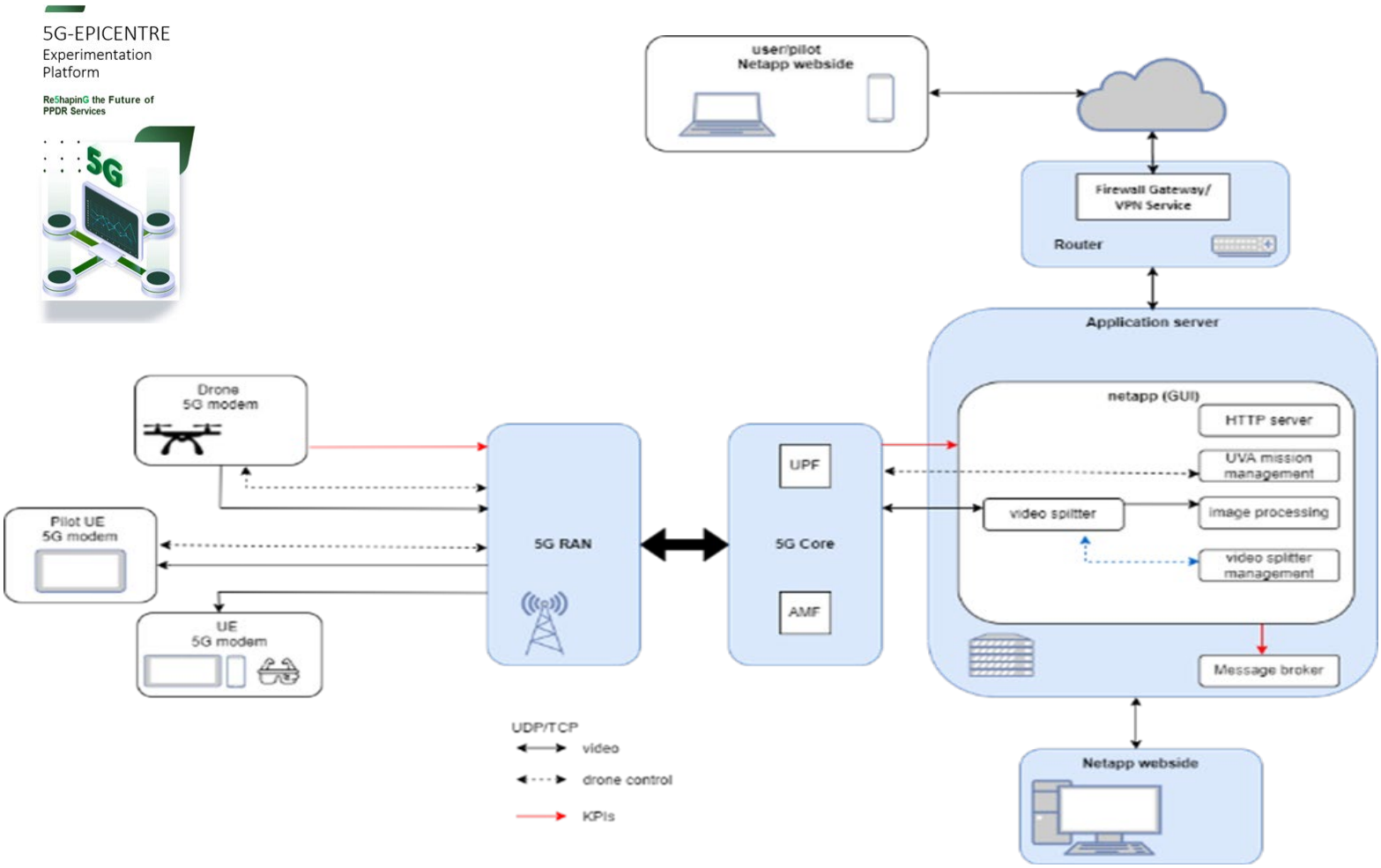
ARCHITECTURE

The following figure presents the vertical system's specific architecture.



5G-EPICENTRE UC3 vertical system under test - specific architecture

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