

Automated Deployment of an IP Telephony Service on Unmanned Aerial Vehicles using Network Functions Virtualization

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Abstract – The Network Function Virtualization (NFV) paradigm has currently consolidated as one of the key enabling technologies in the development of the 5th Generation of mobile networks. This technology aims at alleviating the hardware dependencies in the provision of network functions and services, using virtualization techniques that allow the softwarization of those functionalities over an abstraction layer. In this context, there is an increasing research interest in exploring the potential of unmanned aerial vehicles, or UAVs, to offer a flexible platform capable of enabling cost-effective NFV operations over delimited geographic areas.

To demonstrate the practical feasibility of utilizing NFV technologies in UAV platforms, we present a protocol to set up a functional NFV environment, based on open-source technologies, in which a set of small UAVs supply the computational resources that support the deployment of moderately complex network services. Then the protocol details the different steps needed to support the automated deployment of an IP telephony service over a network of interconnected UAVs, leveraging the capacities of the configured NFV environment. Our experimentation results demonstrate the proper operation of the service after its deployment. We want to highlight that, although the protocol focuses on a specific type of network service (i.e., IP telephony), the described steps may serve as a general guide to deploy other type of network services. On the other hand, the protocol description considers concrete equipment and software to set up the NFV environment (e.g., specific single board computers and open source software). The utilization of other hardware and software platforms may be feasible, although the specific configuration aspect of the NFV environment and the service deployment may present variations with respect to those described in the protocol.

Keywords: Unmanned Aerial Vehicles (UAVs), Network Functions Virtualization (NFV), Management and Orchestration (MANO), Cloud computing platform, Virtual Network Function (VNF), IP telephony service, open source, 5G.

The authors also want to state that:

1. The paper is novel and has not previously been published, completely or in part, in another journal.

2. The paper has not been submitted for publication anywhere else, and it will not be submitted to a different journal until a decision has been made by *Jove*.
3. The authors declare that there is no conflict of interest regarding the publication of this paper.