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Automated Deployment of an IP Telephony Service on UAVs using OSM

Borja Nogales bdorado@pa.uc3m.es

Ivan Vidal ividal@it.uc3m.es

Victor Sanchez-Aguero victor.sanchez@imdea.org

Francisco Valera fvalera@it.uc3m.es

Luis F. Gonzalez luisfgon@it.uc3m.es

Arturo Azcorra arturo.azcorra@imdea.org



Team Members

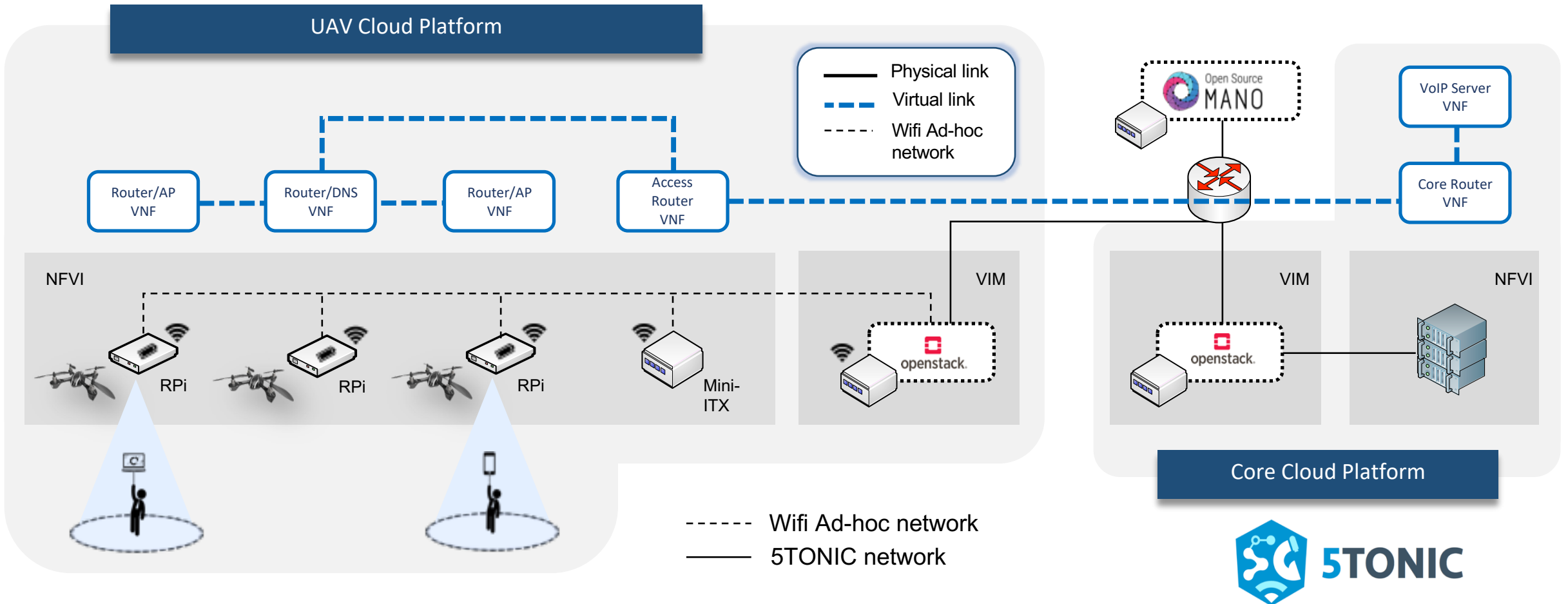
- Universidad Carlos III de Madrid
- IMDEA Networks Institute

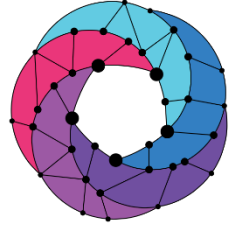


Key Takeaways

- The PoC demonstrates the practical feasibility of automating the deployment of telecommunication services over resource-constrained devices, particularly UAVs.
- OSM is intended to support the orchestration of network services over the resource-constrained UAVs.
- The procedure details the different steps to build a functional NFV environment, based on resource-constrained platforms, and deploys a functional IP telephony service.
- Single board computers (Raspberry Pi model 3B+) are onboarded on small-size drones, serving as compute nodes.
- The PoC is based on open-source technologies (OSM and OpenStack).
- Scripts to support the pre-configuration of the resource-constrained platforms are made available to facilitate the reproducibility of the experiment.
- The detailed procedure could potentially be adapted and used in other environments in which resource-constrained devices might be available.
- The PoC includes a flight procedure. If this is reproduced, the experimenter should be sure to follow the appropriate security measures and the corresponding regulatory statements.

PoC Scenario





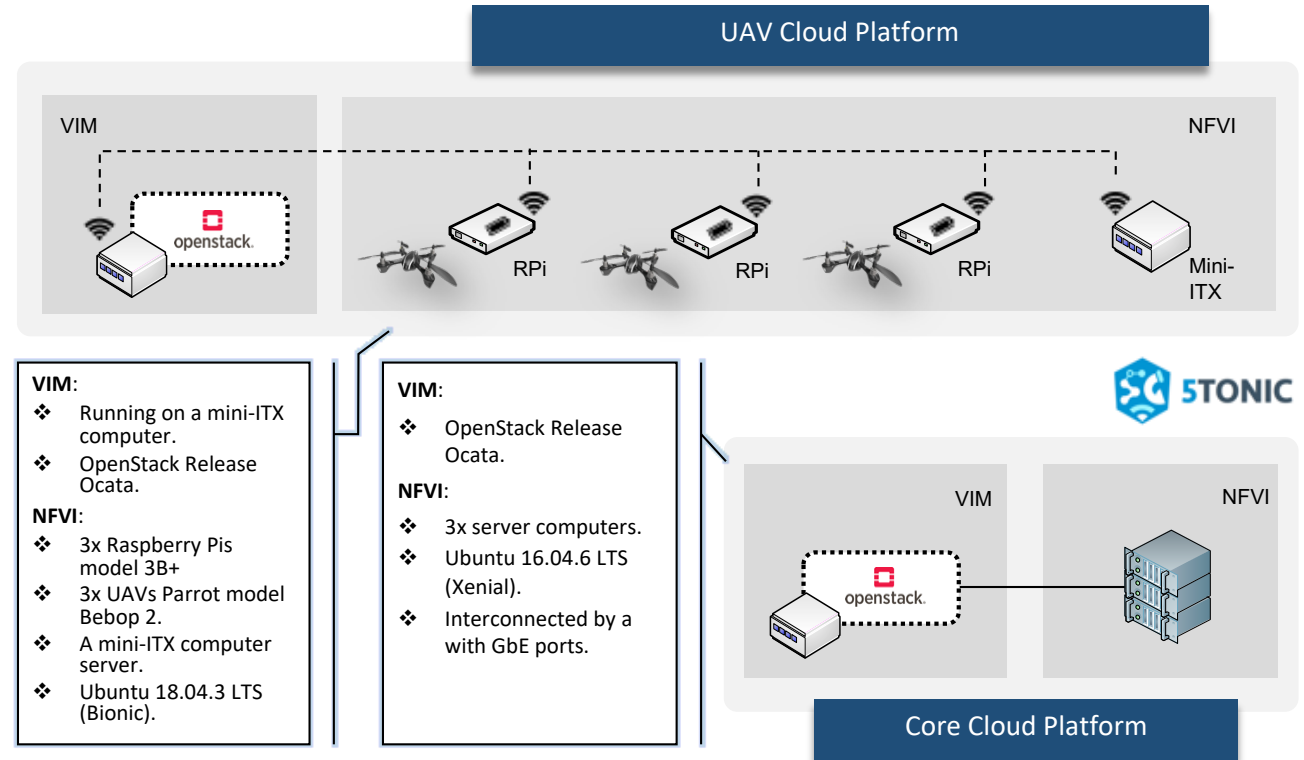
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- All the details available in: <http://tiny.cc/olxpjz>

Nogales, B., Vidal, I., Sanchez-Aguero, V., Valera, F., Gonzalez, L. F., Azcorra, A. Automated Deployment of an Internet Protocol Telephony Service on Unmanned Aerial Vehicles Using Network Functions Virtualization. J. Vis. Exp. (153), e60425, doi:10.3791/60425 (2019).

Testbed Setup

- Management and Orchestration software stack provided by OSM:
 - OSM Release FOUR, but subsequent releases might be used.
- Two independent cloud computing domains:
 - A core cloud platform, built by server computers.
 - A UAV cloud platform, comprising a set of RPis:
 - Each RPi is onboarded onto a UAV, enabling the transportation of computing, storage and networking resources.
 - Interconnection of the RPis through a Wi-Fi ad-hoc network
- Built and tested at 5TONIC, but it is reproducible in other environments

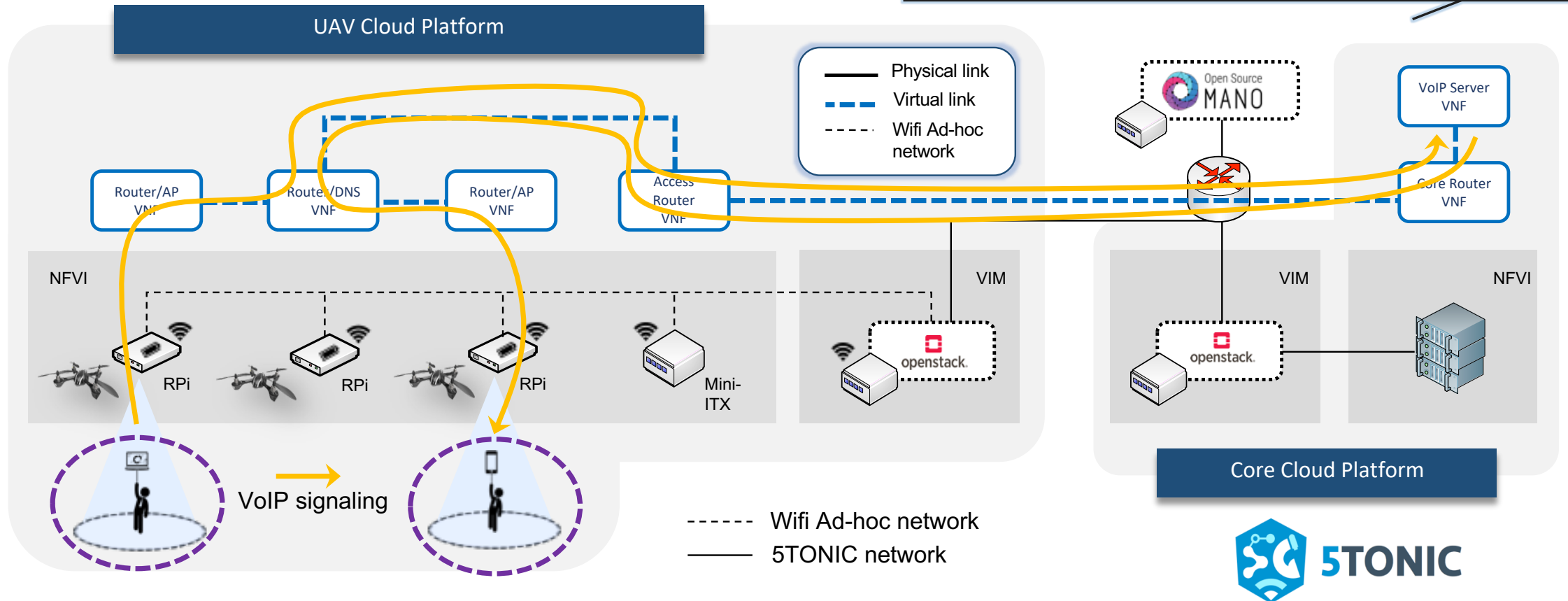


Network Service Description

- **IP telephony service**, to be provided to the users in the vicinity of the UAVs.
- Built up by the following components, which have been implemented as **VNFs**:
 - **Access Point VNF**: provides a Wi-Fi access point to end-user IP-phones.
 - **IP telephony server VNF**: responsible for managing the call signalling messages that are exchanged by the IP phones to establish and terminate a voice call.
 - **Domain Name System VNF**: supply a name resolution service, as needed in IP telephony services.
 - **Access Router VNF**: supports network routing functionalities to enable the exchange of traffic between the IP phones and the telecommunications operator domain.
 - **Core Router VNF**: provides network routing functionalities within the telecommunication operator domain.
- All the content needed to carry out the experiment is provided in the public experiment repository <http://vm-images.netcom.it.uc3m.es/JoVE/>

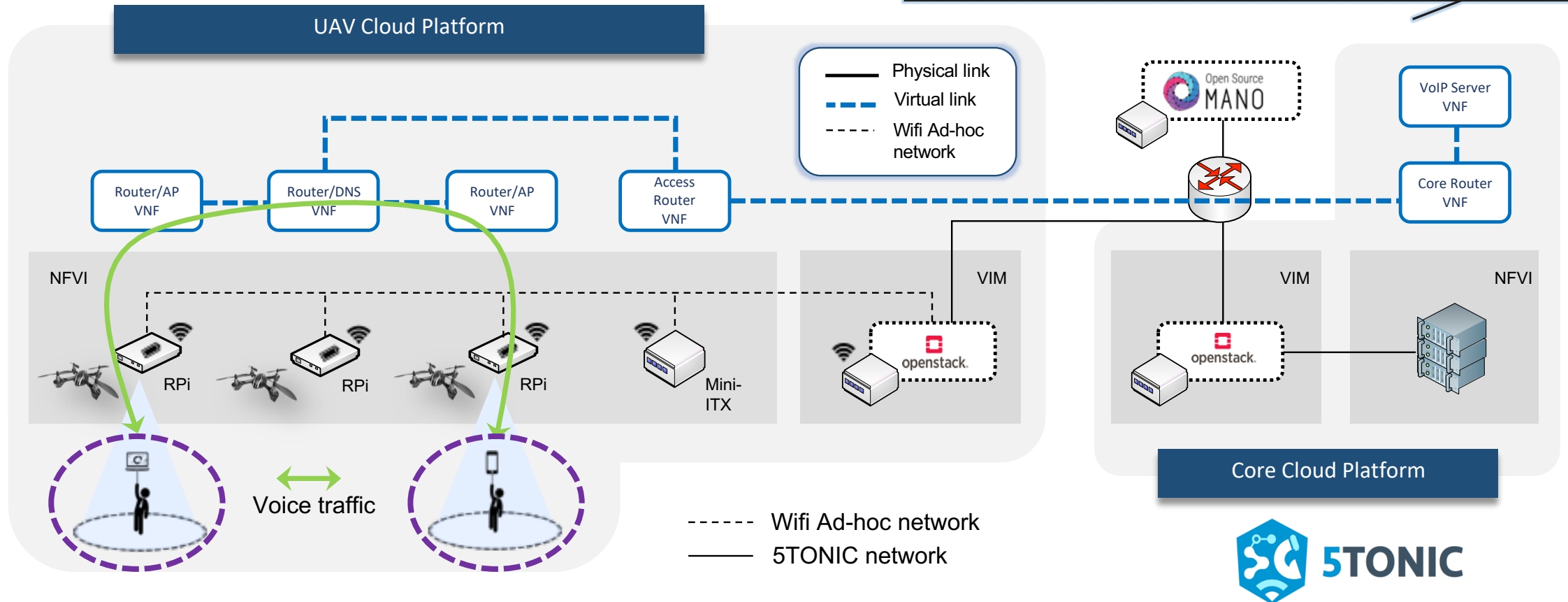
Call Establishment

Once OSM completes the network service deployment, two end-users can establish a call through the VoIP server deployed in the core-cloud platform at 5TONIC.

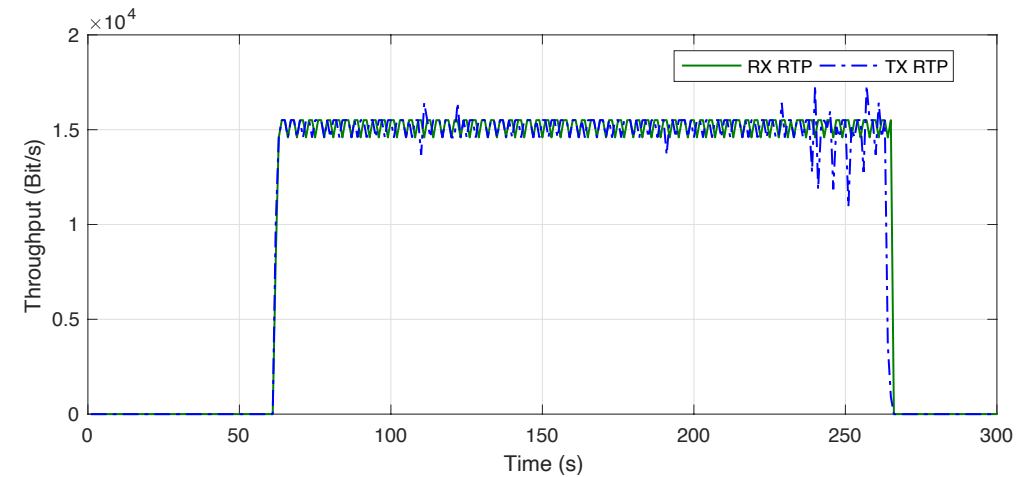
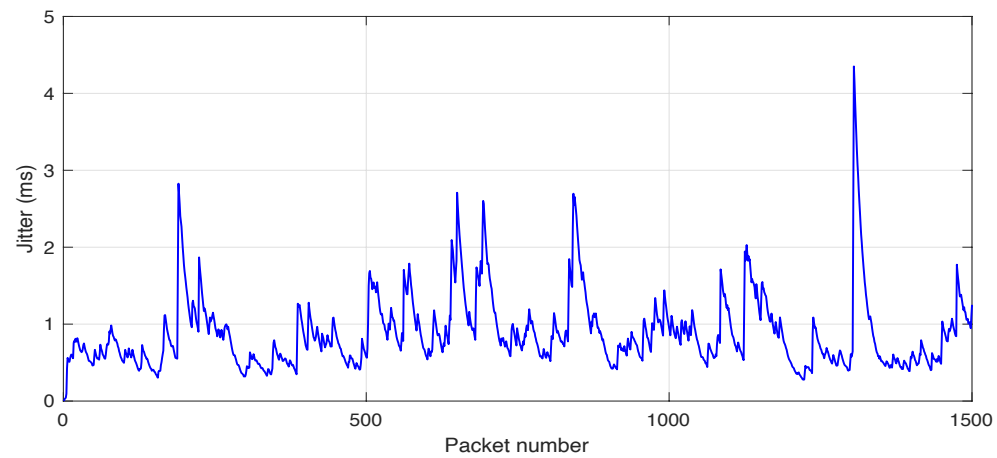
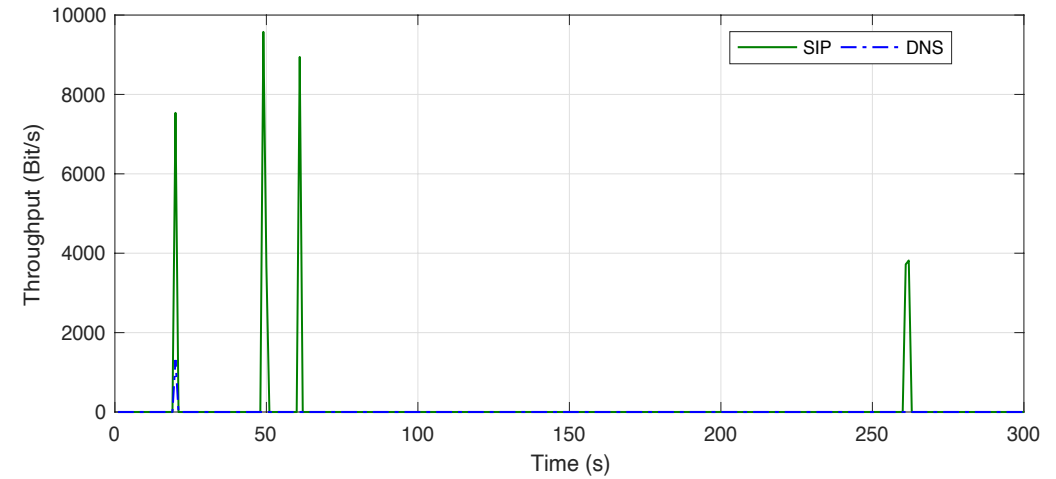
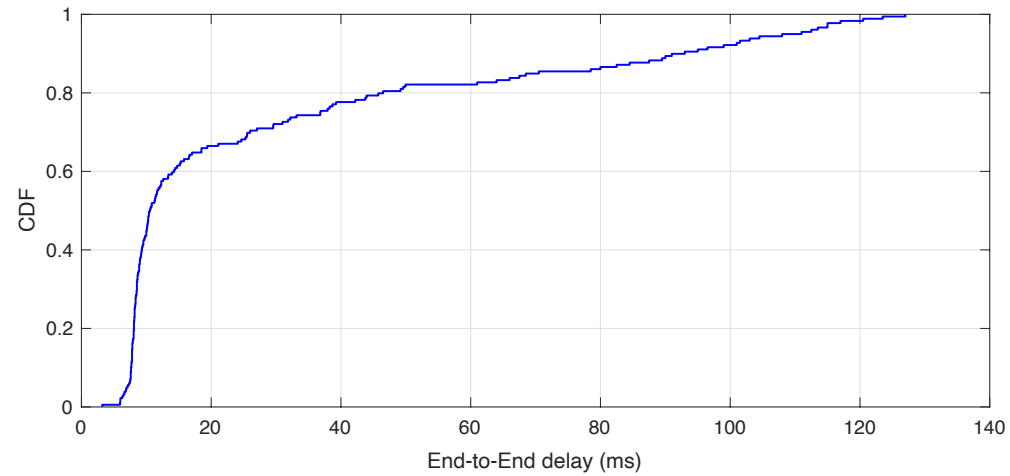


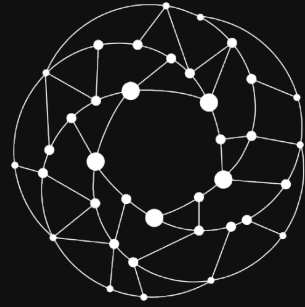
Voice Communication

Right after the call has been established, both user can maintain an interactive communication, where voice is directly exchanged through the VNFs deployed over the UAVs.



Performance Results





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Thanks!