5GCity

A DISTRIBUTED CLOUD & RADIO PLATFORM FOR **5G** NEUTRAL HOSTS

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Compute and network virtualization at the edge for 5G smart cities neutral host infrastructures

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Authorship and sponsorship

- **Teodora Sechkova**, Software Engineer at Virtual Open Systems.
- **Virtual Open Systems** is a high-tech software company active in open source virtualization solutions and custom services for complex mixed-criticality automotive systems, NFV infrastructures and consumer electronics.

5GCity H2020 project

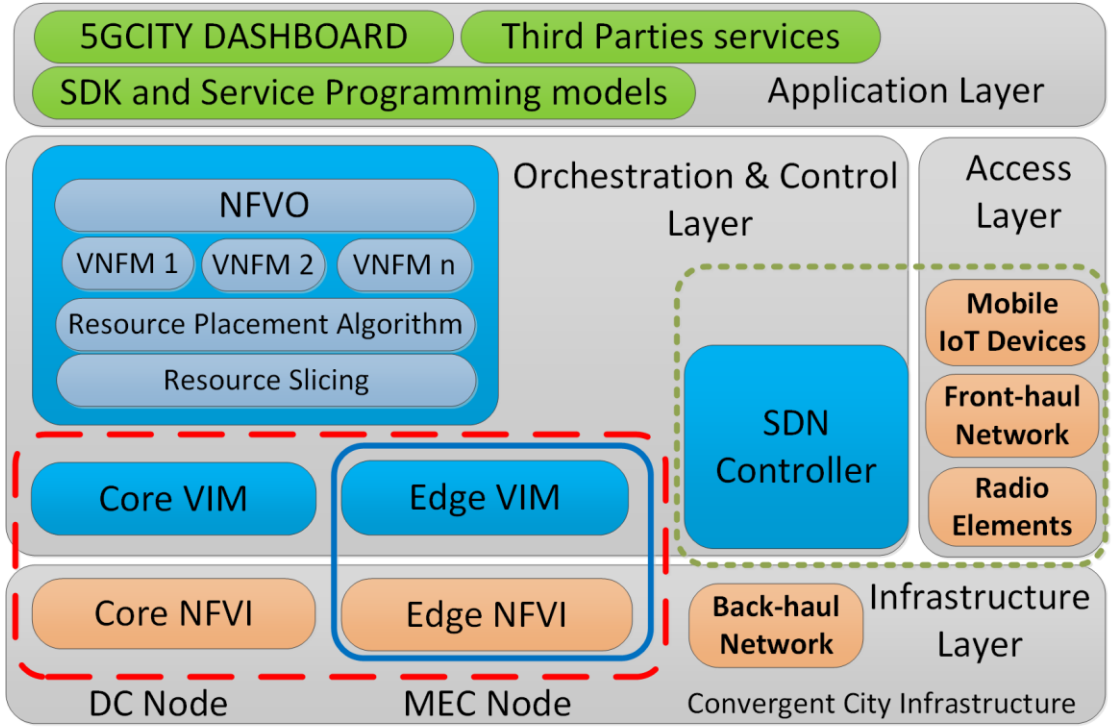
- **5GCity: Distributed Cloud & Radio Platform for 5G Neural Hosts**, funded by European Union's Horizon 2020 research and innovation programme
- **Vision:** design, develop, deploy and demonstrate, in operational conditions, a distributed cloud and radio platform for municipalities and infrastructure owners acting as 5G neutral hosts

In this work …

- We introduce the **security and virtualization enhancements developed by 5GCity project** for edge/far-edge, wireless, and multiples PoPs.
- Address the challenges of the **heterogeneity** of wireless, hardware, and software deployments, as well as the **security threats** inherited by the neutrality of city infrastructure.

5GCity overview

- Overall Architecture
- Main concepts
  - Neutral Host
  - MEC
  - vRAN



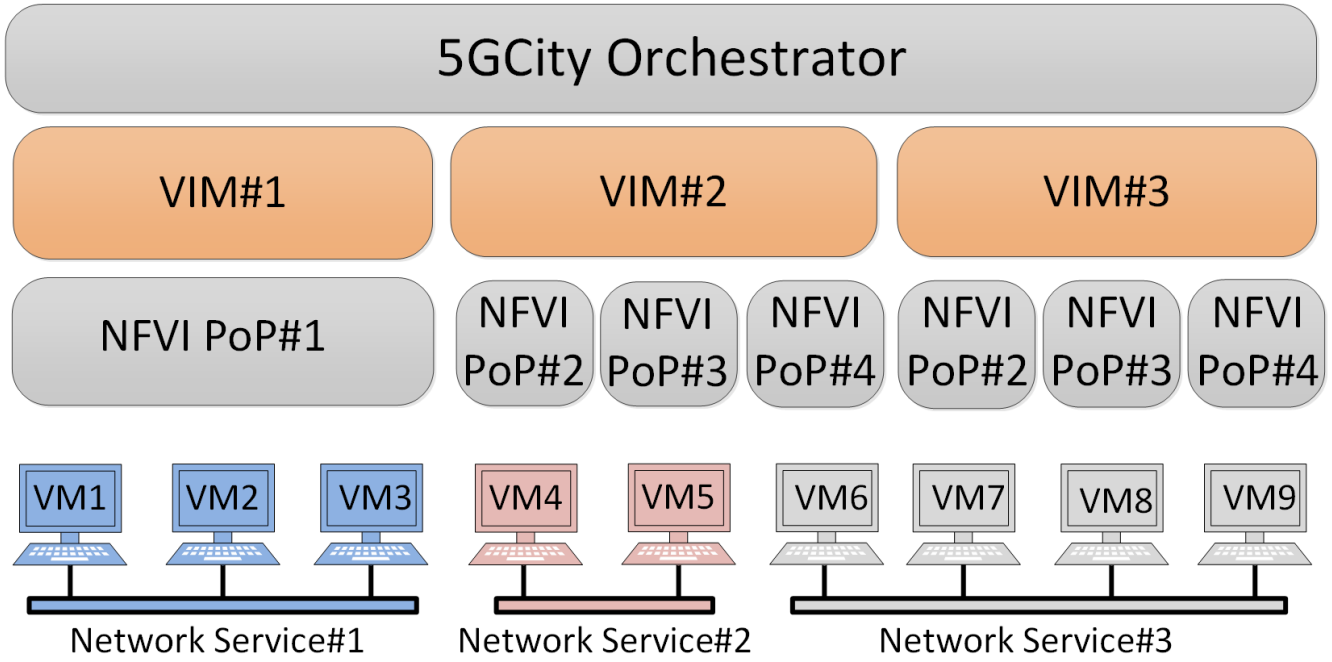
5Gcity virtualization components

The high number of heterogeneous solutions interconnected to build the city infrastructure represents a challenge for the **virtualization layer components***:*

- Multi-Points of Presence virtualization
- EdgeVIM and EdgeNFVI
- RAN Virtualization

Multi-PoP virtualization (1)

Different scenarios of deployment created by the Infrastructure heterogeneity, geographical constraints, traffic requirements etc.



Multi-PoP virtualization (2)

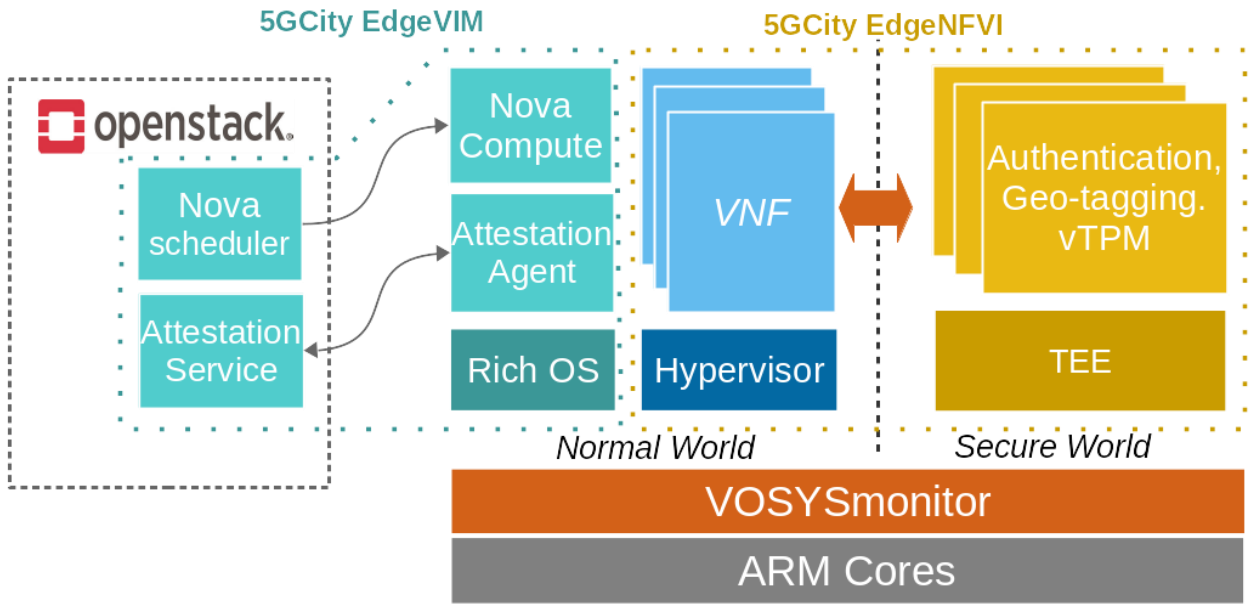
1) Single domain OpenStack deployment with single controller node collocated with the compute nodes – **Lab deployments and early stages of demos**
2) Single domain Open-Stack deployment with single controller Node and compute nodes at data center and at edge level – **Layer 3 (L3) Traffic routing**
3) Multi-domain OpenStack deployment - **Layer 2 (L2) cross-domain networking automation**

5GCity EdgeVIM and EdgeNFVI (1)

- **Security Hardening** of the 5GCity Virtualized Infrastructure
  - Authenticated devices, geo/asset tagging and secure storage
- Challenges in smart cities environments:
  - Distributed architecture
  - Privacy issues related to the sensitive data used (cameras, mobility services, health, etc)

5GCity EdgeVIM and EdgeNFVI (2)

- **EdgeVIM** - based on OpenStack with added attestation capabilities
- **EdgeNFVI** - isolation at the hardware level by leveraging VOSYSmonitor and ARM TrustZone
- **Security Services**: running inside a Trusted Execution Environment

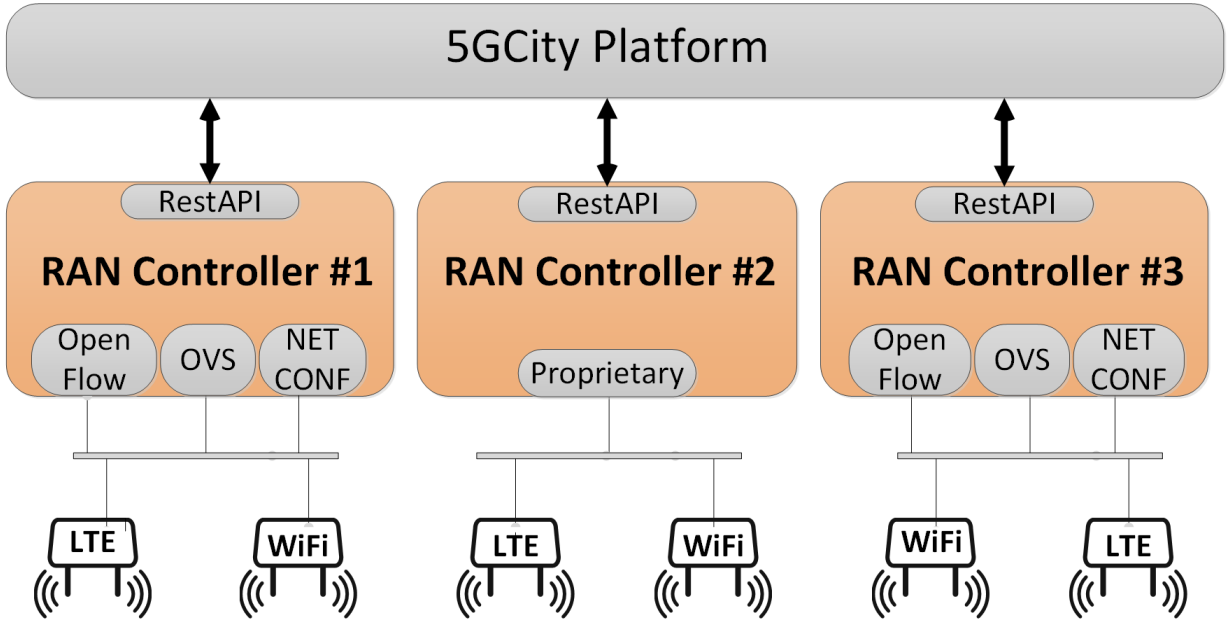


5GCity RAN Virtualization (1)

- **Why?** RAN elements need to be virtualized to allow the instantiation of multiple virtual networks over a single, shared physical infrastructure
- **How?** Sharing a physical wireless interface among a set of tenants or services and defining a configuration and management plane between the physical devices and the 5GCity platform

5GCity RAN Virtualization (2)

Infrastructure abstraction enables the support of different RAN controllers by 5GCity platform and the integration of the underlying RAN technologies.



Conclusion and future plans

- Functional and performance test already show good results of separate virtualization components.
- As part of the 5GCity schedule the proposed approach is being deployed in **Bristol, Barcelona, and Lucca**.
- A full validation will include the integration of multiple RAN controllers from different vendors, Multi-PoP scenarios and a demonstration of EdgeVIM capabilities against edge devices tampering and attacks.