Software-defined RAN for 5G and beyond – how flexible can it really be?

We are proud member of 5G Essence consortium

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Starting point: 5G Essence

- **Classification:** H2020 5G-PPP Phase 2 project
- **Scope:** The project addresses the paradigms of Edge Cloud computing and Small Cell as a Service by fueling the drivers and removing the barriers in the Small Cell market, forecasted to grow at an impressive pace up to 2020 and beyond and to play a key role in the 5G ecosystem.
- **Timeframe:** June 2017-December 2019
- **Partners**
Network architecture transition

Networks of the past

- EPC cabinet
- base station cabinet
- base station tower
- databases

Networks of the future

- MEC server (COTS) including: vRAN, vEPC, possibly applications
- Share among many base stations
- Small cell base stations: RRH, DAS, femto, pico
Software-defined RAN

Virtualization framework
- Enables virtual operation and RAN slicing – key technical change in 5G
- Allows for execution on any infrastructure
- Enables easy extensions and customizations
- Allows for various functionality mappings

RAN controller
- Controls whole RAN
- Manages 3D radio resources
- Enables support of various traffic types (e.g., IoT)
- Enables QoS guarantees
- Optimizes latency

3GPP stack
- Realizes standard base station protocol stack functions

Management interface

Virtualization framework
- Enables virtual operation and RAN slicing
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MANO

RAN controller
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Virtual resources

3GPP stack
- Realizes standard base station protocol stack functions

Virtualization framework

Physical resources „bare metal”

OS / VM

MEC cloud

Base stations, RRHs

Fully software-defined and NFV-compatible RAN functionality ready to be deployed on physical (base station) or virtual (MEC servers) resources using proprietary technology
Example zoom-in: 3GPP stack
Example deployments

Classical case: all functions mapped on physical processor sitting at the base station

vRAN case: functions split into virtual part running on servers and physical on RRH

All-virtual case: our software provides virtualized functions for other base stations
Customization for verticals

Public safety VNF add-ons:
- D2D mode
- Extra protection

Automotive VNF add-ons:
- Latency reduction
- D2D mode

IoT VNF add-ons:
- PHY signaling reduction
- NB IoT support
Open questions

• How flexible can SD-RAN be with regards to?
  - Functional split and NFV independence
  - Mapping on physical or virtual resources
  - Opening APIs within protocol stack
  - Core NFVs reusability for various verticals
  - Use of customized NFVs for various verticals

• What new players do we see in an open value (and processing) chain?
  - Role of telcos
  - Other roles: e.g., data center provider or service integrator
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