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

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OTE CapriTech berlin BRITISH APCO Connecting and Supporting the Public Safety Communications Sector ORION INNOVATIONS PC i2cat

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Demokritos National Centre for Scientific Research

Network architecture transition

Networks of the past

EPC cabinet

databases

base station cabinet

base station tower

Networks of the future

MEC server (COTS) including:
vRAN, vEPC, possibly applications
Share among many base stations

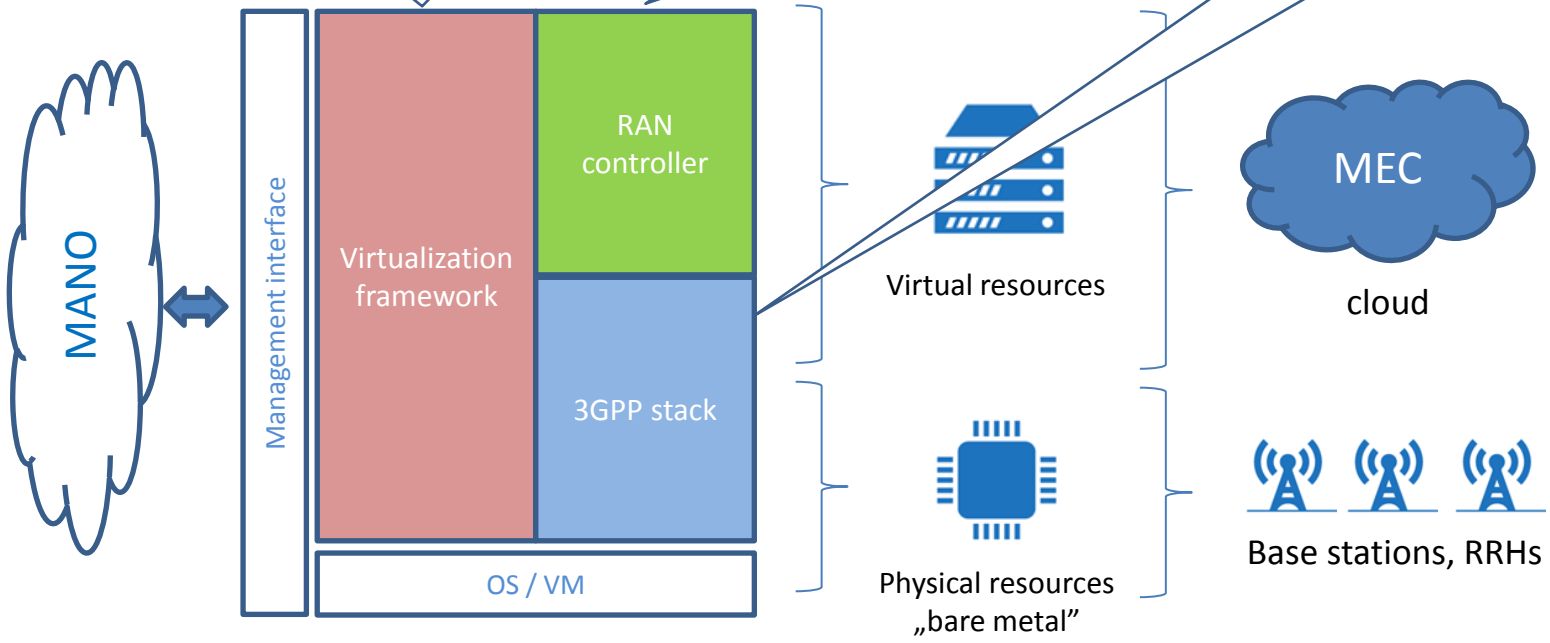
Small cell base stations:
RRH, DAS, femto, pico

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

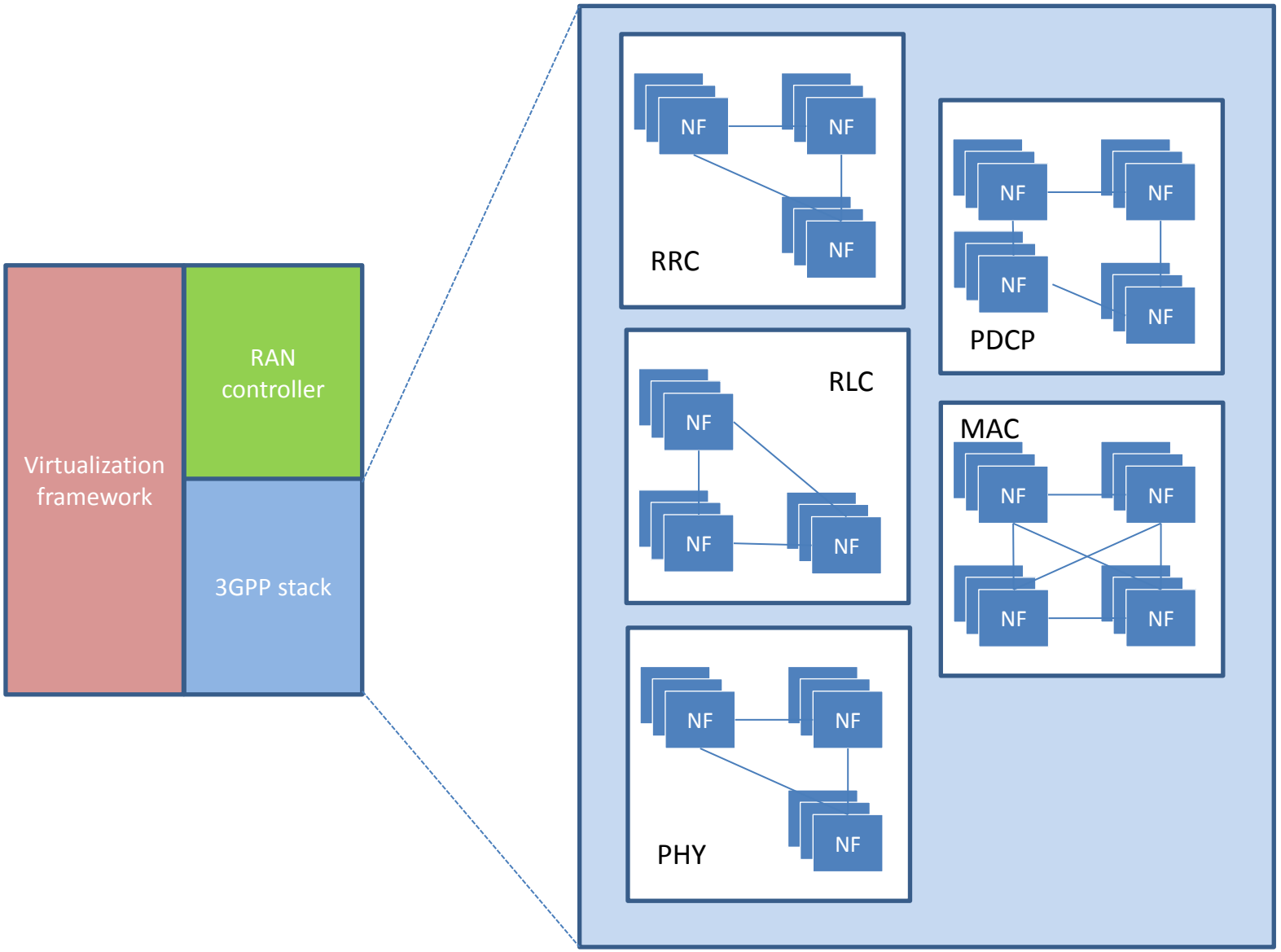
RAN controller
- Controls whole RAN
- Manages 3D radio resurces
- Enables support of various traffic types (e.g., IoT)
- Enables QoS guarantees
- Optimizes latency

3GPP stack
- Realizes standard base station protocol stack functions

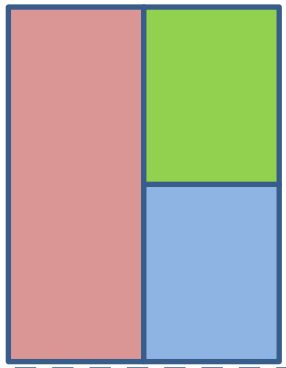


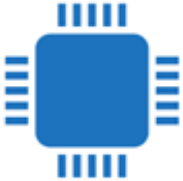
Fully software-defined and NFV-compatible RAN functionality ready to be deployed on physical (base station) or virtual (MEC servers) resources using proprietary technology

Example zoom-in: 3GPP stack



Example deployments

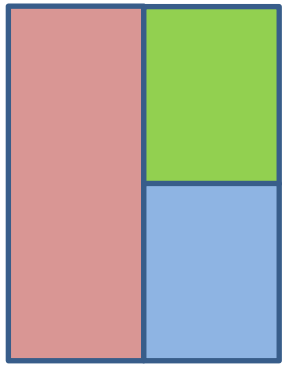




L1-L3

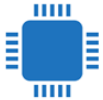
Base station

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



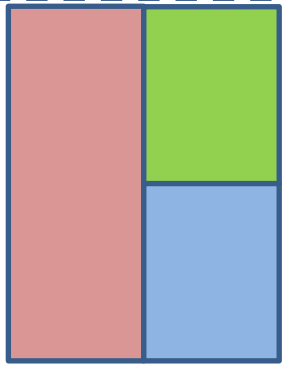
L2-L3

L1



RRH

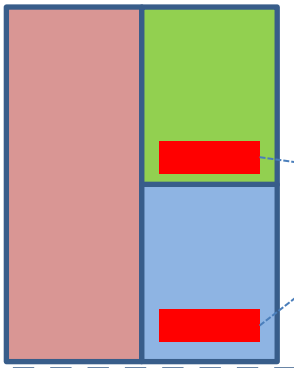
vRAN case: functions split into virtual part running on servers and physical on RRH



L1-L3

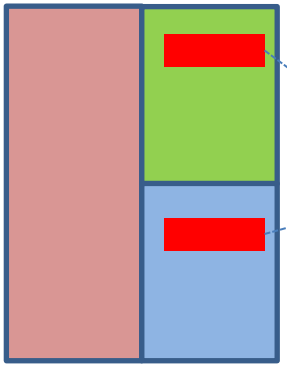
All-virtual case: our software provides virtualized functions for other base stations

Customization for verticals

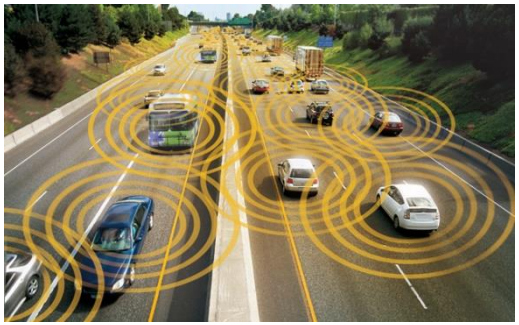


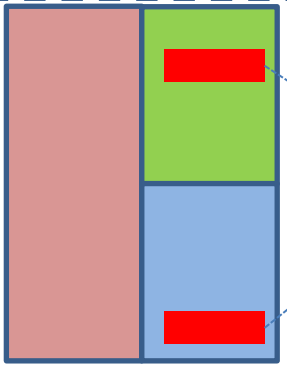
Public safety VNF add-ons:
- D2D mode
- Extra protection

PRC2090 HF/SSB manpack

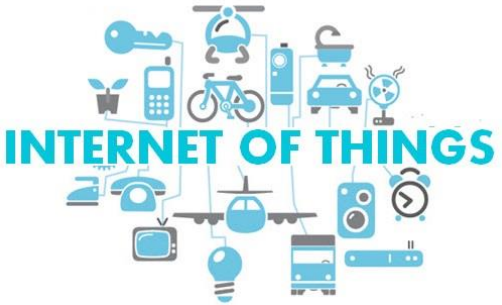


Automotive VNF add-ons:
- Latency reduction
- D2D mode





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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