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Sophia Antipolis

MOSAIC 5G

OPEN AIR INTERFACE

Open5G testbed:

Live Cloud RAN deployment in SophiaCampus

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Communication Systems, Eurecom

IEEE 5G and Beyond Testbed Workshop, IEEE VTC 2017

Open5G Lab

Open5G Lab
(Campus SophiaTech)

Mosaic-5G Service Lab
(NFV, SDN, MEC, Cloud)

OpenAirInterface CN Lab

OpenAirInterface RAN Lab

Testbed Lab
- Small-Scale
- Controlled
- Indoor
- E2E

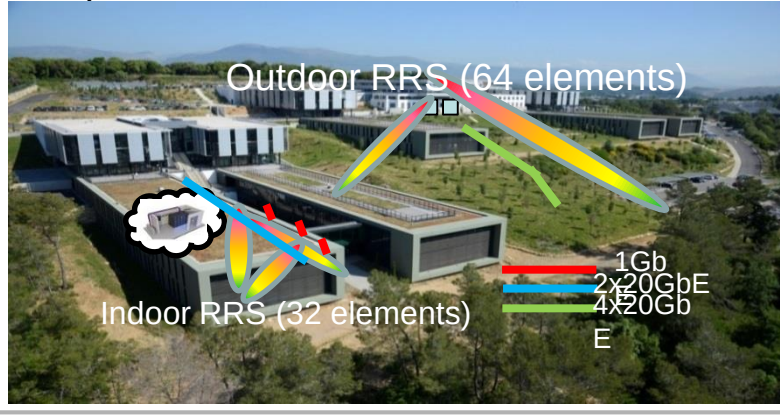
Living Lab
- Medium-Scale
- Indoor/Outdoor
- Realistic
- E2E

Open5G Lab

- **Ecosystem of open-source platforms and usecases for fast and open wireless innovations**
  - Common R&D and prototyping framework for proof-of-concept designs
- **Experimentally-driven network systems research**
- **Bring idea into life through experimentation and prototyping**
- **Forum of discussions from business innovation to communication network**
- **Technology transfer and collaboration with industry and academia**
- **Liaison with standardization bodies and 5G European/International initiative**

Open5G Lab

- **OpenAirInterface : SW/HW platforms**
  - 4G/5G RAN : subset of LTE Rel 10 and 14 (NB-IOT), 5G NR Access layer (2018)
    - UE, eNB, RRU, DU, and CU
  - 4G CN : subset of Rel 10
    - MME, x-GW (C and D-plane separation, OVS), HSS
- **Mosaic-5G : Software platforms**
  - FlexRAN and FlexCN: A Flexible & Programmable SD-RAN and SD-CN Platforms
  - LL-MEC: A Low Latency SDN-based MEC Platform
  - JoX: Juju-based service orchestration core
  - Net Store: Network control application distribution Repository
- **Open5G Lab: E2E Testbed**
  - Flexible small-to-medium scale experimentations
  - Controlled/lab (TRL4)
  - Uncontrolled/realistic (TRL-6-7)
  - End-to-end
  - Remotely accessible testbed
  - Indoor and outdoor, TDD and FDD,



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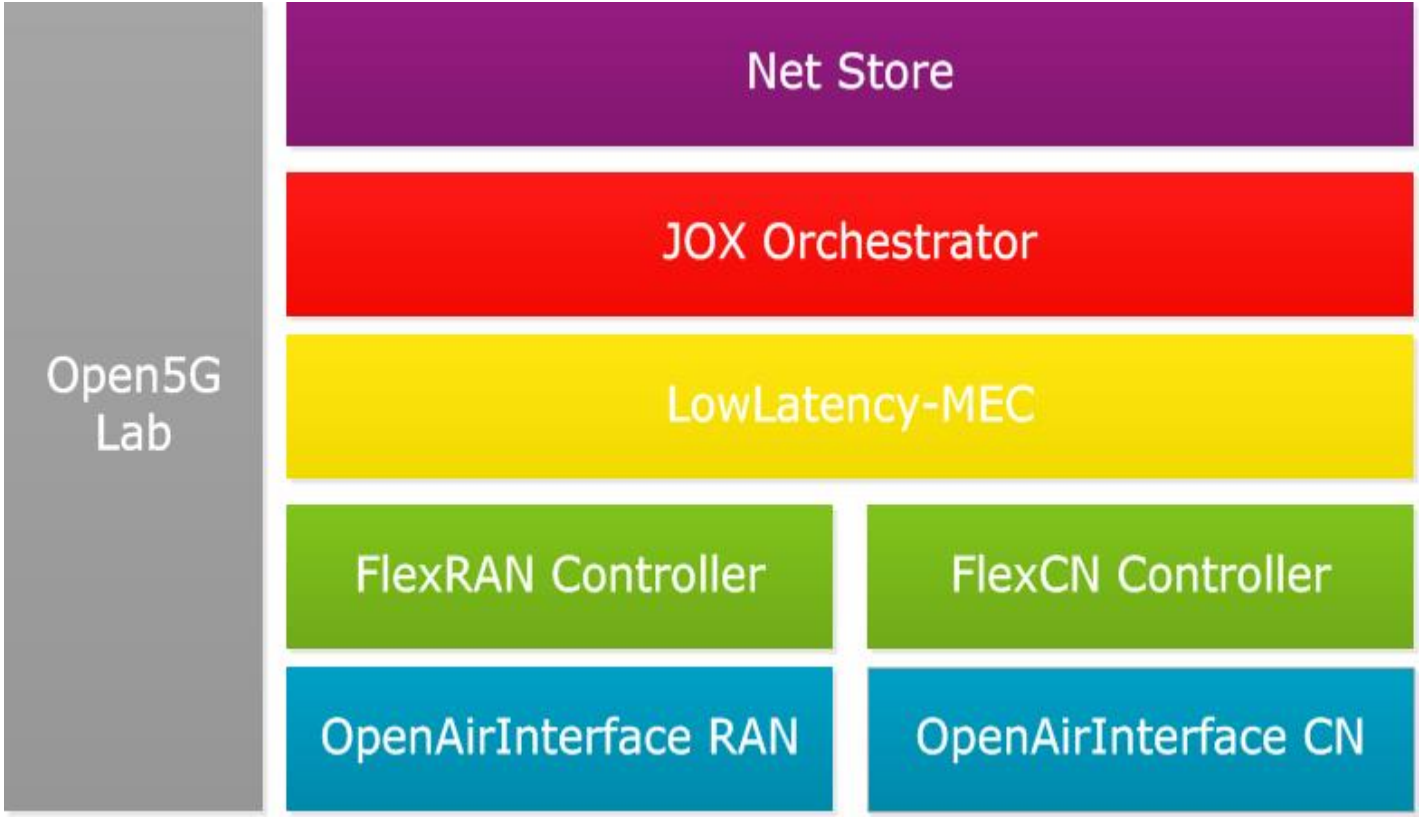
Open5G Lab Platforms



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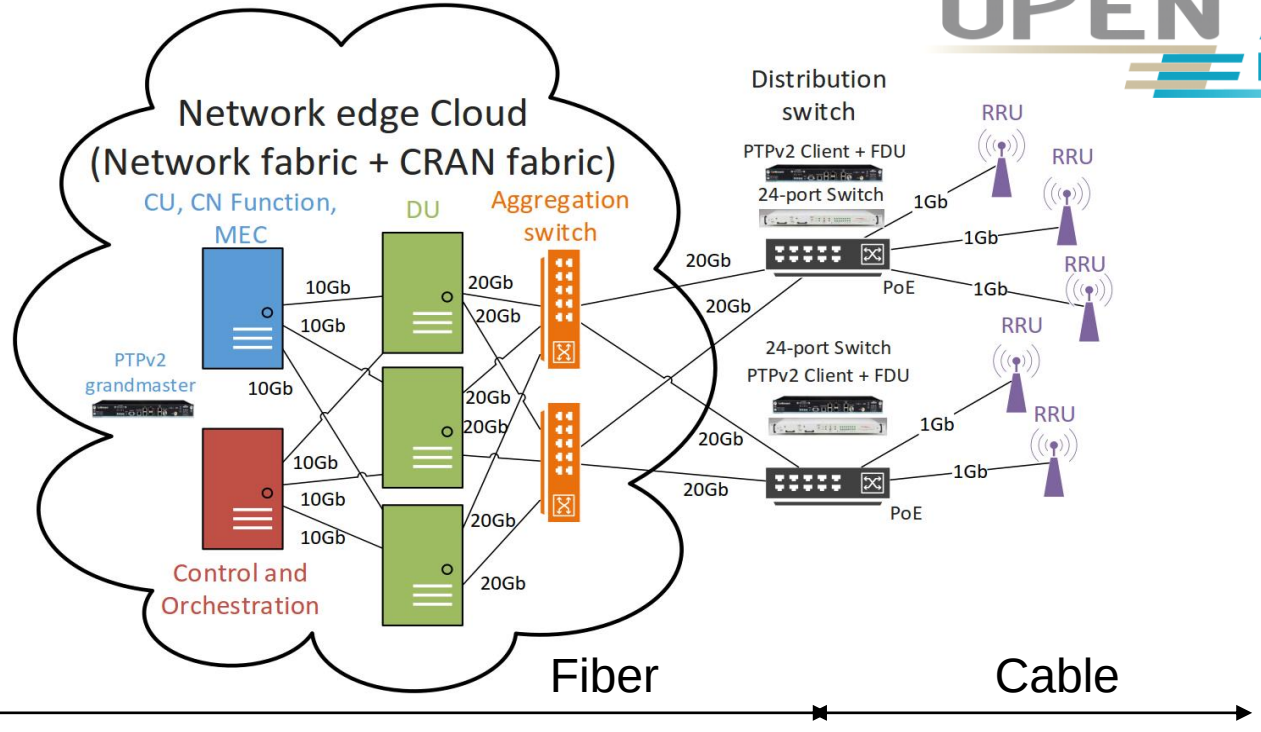
TESTBED

Open5G Lab : Testbed Setup

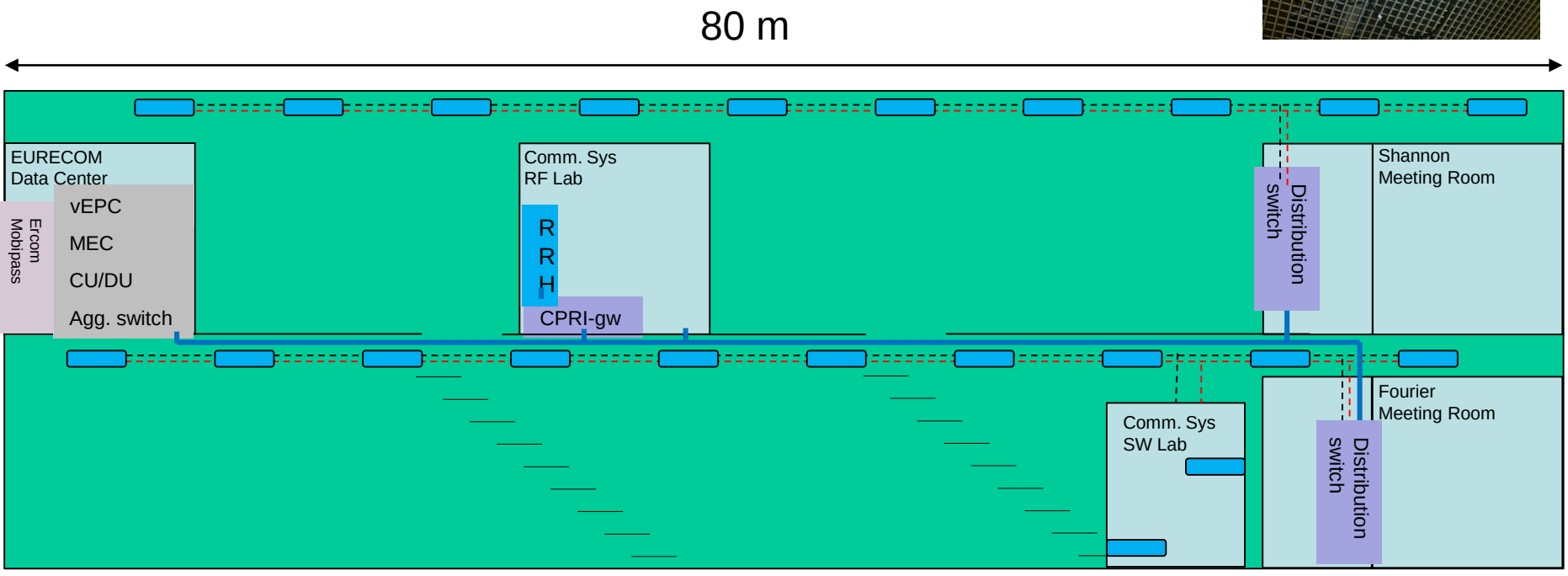
- **Realistic 5G experimentation with 3-tier RAN architecture, namely CU, DU, and RRU**
  - Only TDD: Band 38 (2.6 GHz) (license)



OAI Playground: synchronization

- **PTPv2**
  - grandmaster in CU/DU
  - clients in distribution switches to regenerate 10 MHz (PPS if needed) from GPS source behind CU/DU
- **Distribution of 10 MHz/PPS to RRU**
- **Frame synch**
  - Over-the-air between RRU (TDD)
  - via PPS distribution
- **Note: in a commercial solution, PTPv2 would go all the way to the RRU and clock synchronization would be rederived in each RRU**
  - No off-the-shelf solution for everyday users

Open5G Lab: Indoor Testbed Segment



RRU

Synchronization Signal

1Gb Eth+PoE

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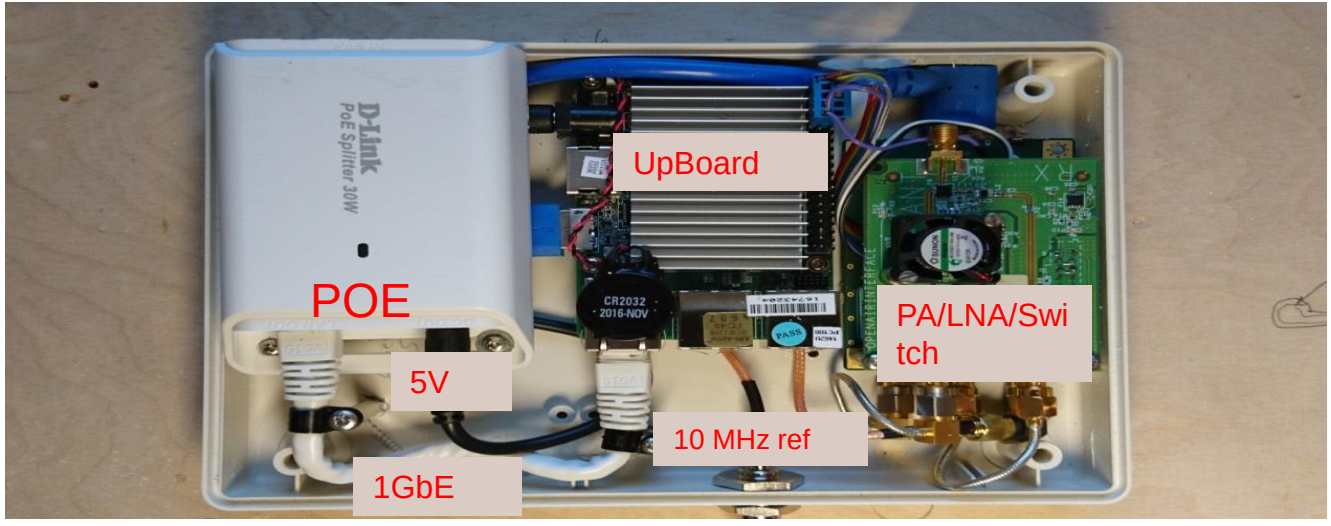
Open5G Lab: Indoor Testbed Segment
Low-cost Remote Radio Unit

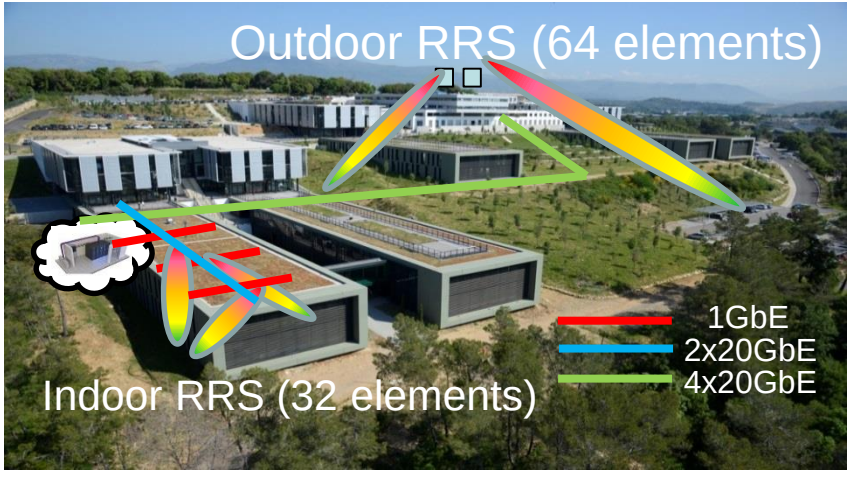


- **SISO (20 MHz, 1GbE Fronthaul)**
  - UPBoard (100$)
  - USRPB200-mini (500$ in quantities)
  - PA/LNA/Switch (100$)
  - PoE+ module (50$) => 750$

- **2x2 (20 MHz, 2 GbE Fronthaul)**
  - UpBoard2 (200$)
  - LimeSDR (~300$ in quantities)
  - PA/LNA/Switch (200$)
  - PoE+ modules (100$) => 800$

Open5G Lab: Outdoor Testbed Segment

- **Outdoor segment planned for 2018**
- **Collaboration around OAI technologies on SophiaTech Campus to extend the coverage**
- **Various showcase including**
  - RAN and CN examples
    - New architectures and UCS
    - Antenna processing
    - Indoor-outdoor coordination
  - SDN, MEC, and NFV examples
    - Network (RAN/CN) slicing
    - RAN/CN Orchestration
    - Edge services and Multi-tenancy
  - New business case
    - Recommendation service
    - Network applications
- **Optical/wireless technologies**
- **2.6/3.5 GHz TDD**
- **xMBB, uRLLC, and eMTC**
- **802.11 convergence**



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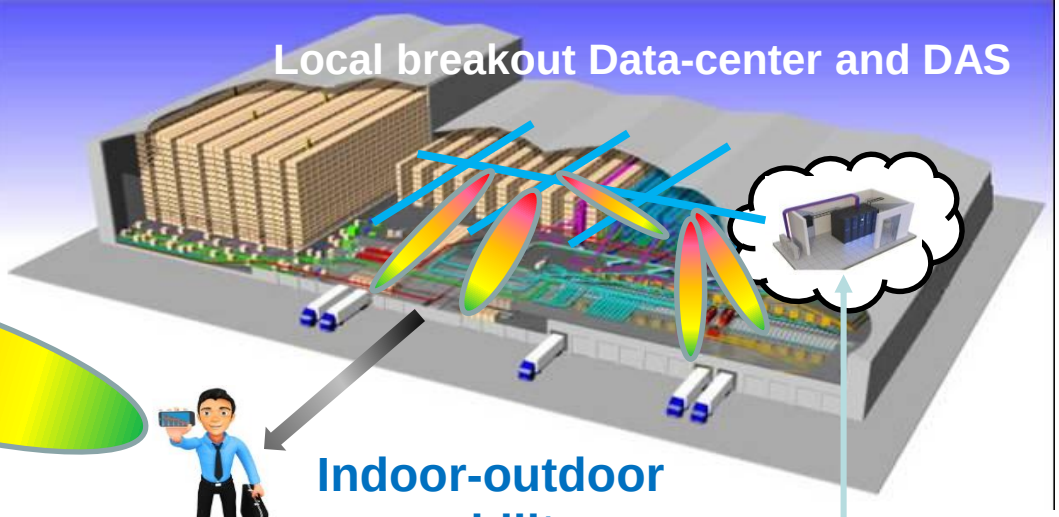
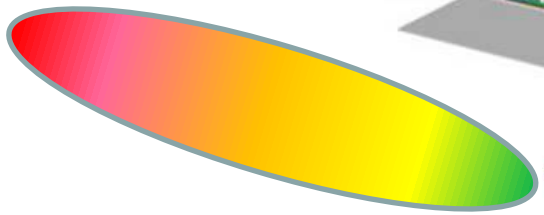
CLOUD RAN SLICING SCENARIO

Deployment Example

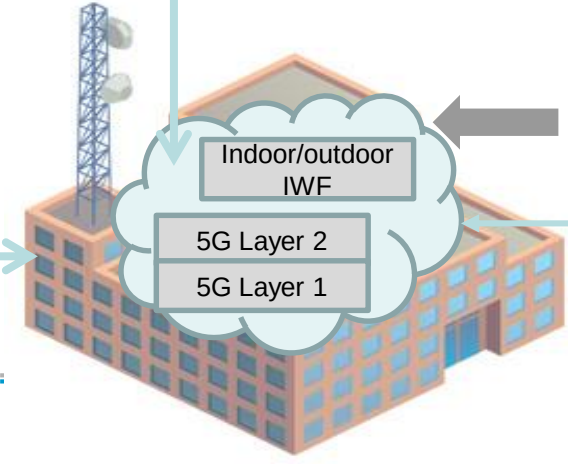




Indoor-outdoor mobility

Outdoor Layer 1 fronthaul
(high-speed, low latency)

Indoor Layer 2 fronthaul
Public network
(medium speed, medium latency)



Radio cloud
Central office with Indoor/outdoor IWF

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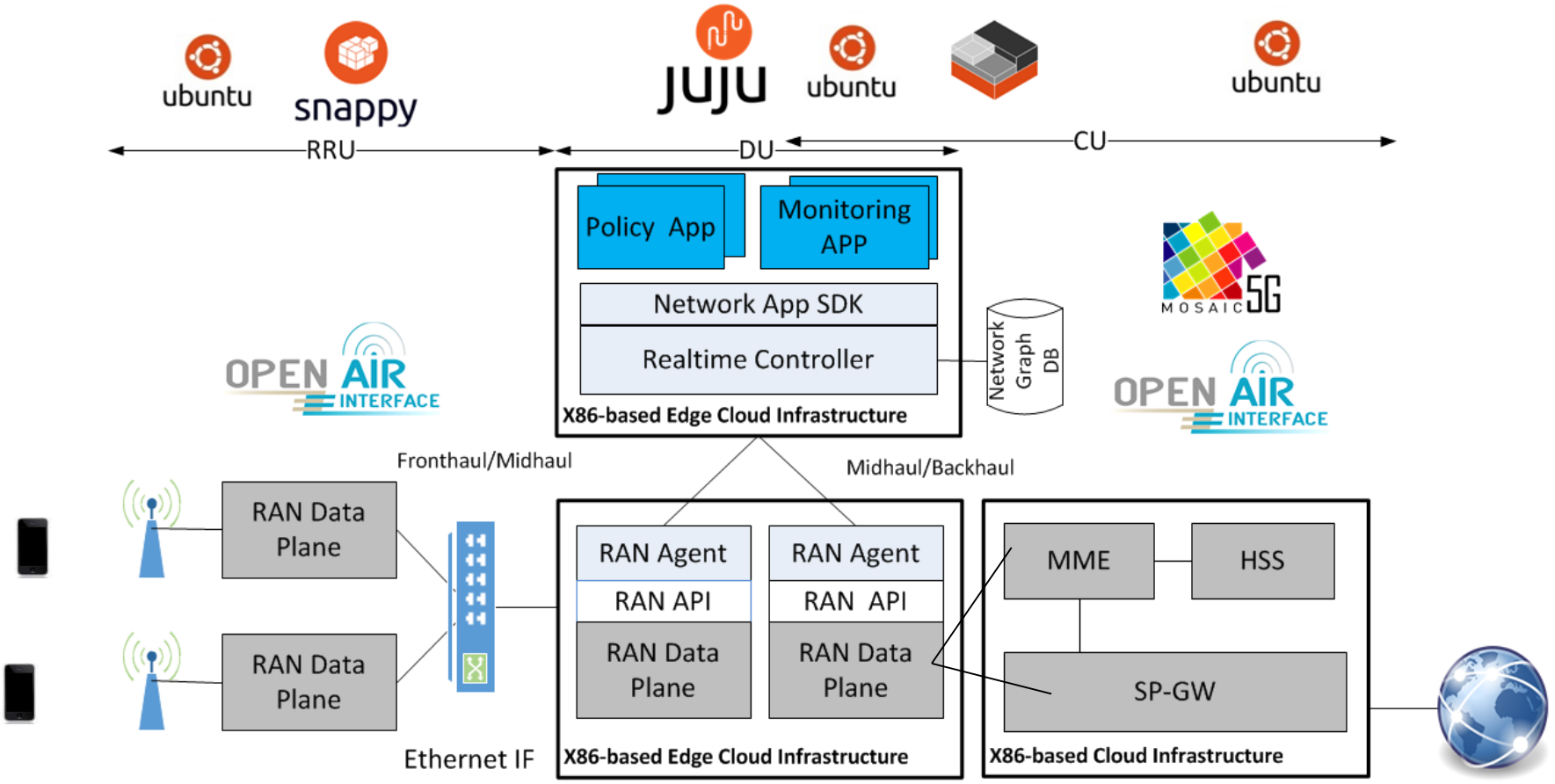
Deployment Example



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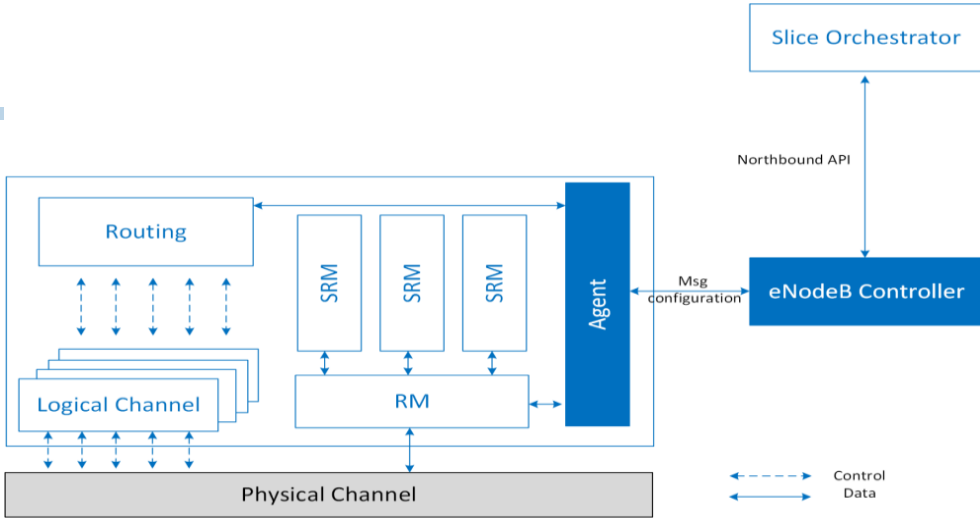
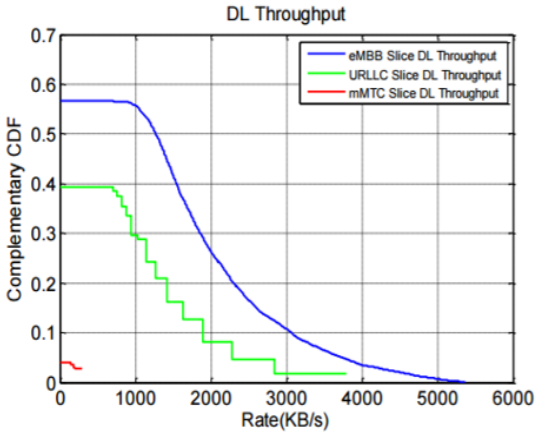
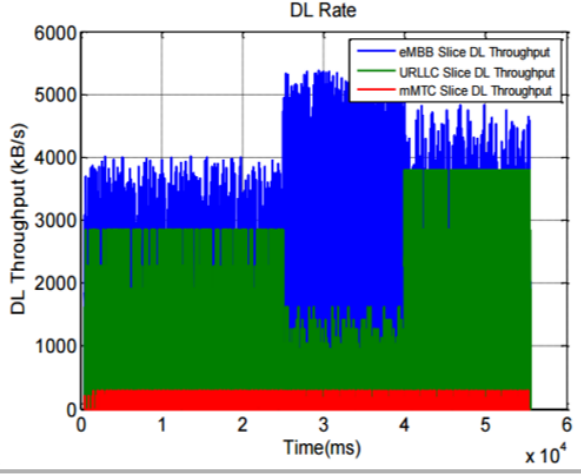
RAN slicing

- **Slice resource management**
  - eMBB, MTC and URLLC services
- **OpenAirInterface**
  - 1xeNB, 5xUEs, 3xSlices
- **Mosaic-5G FlexRAN controller and SDK**







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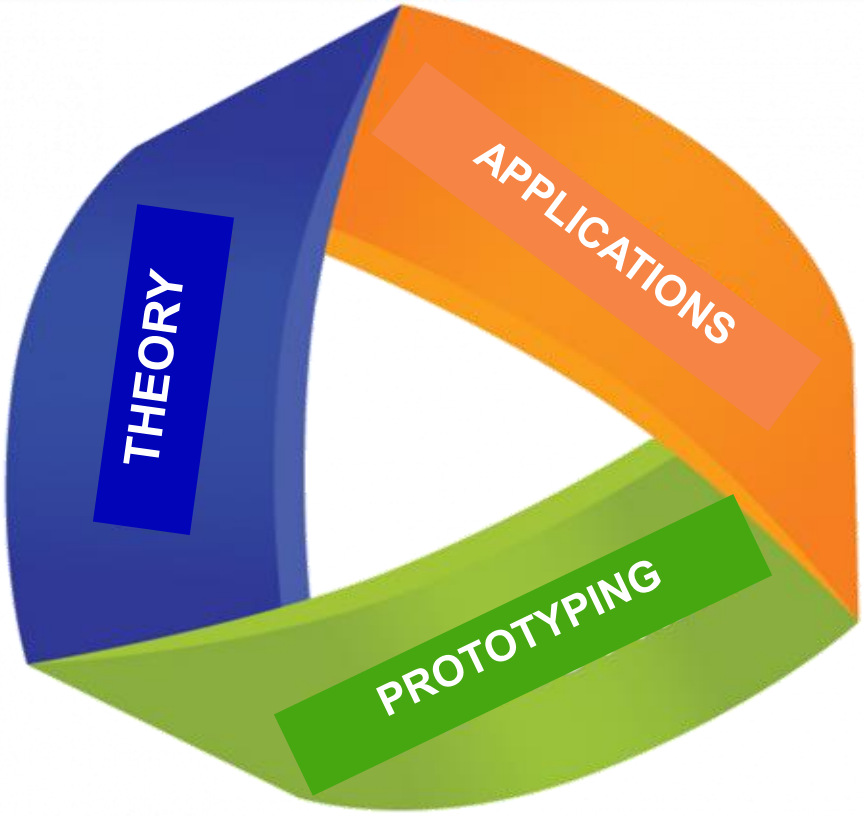
Conclusion



Contact Information

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