



Mosaic5G[®] – Agile Network Service Delivery Platforms

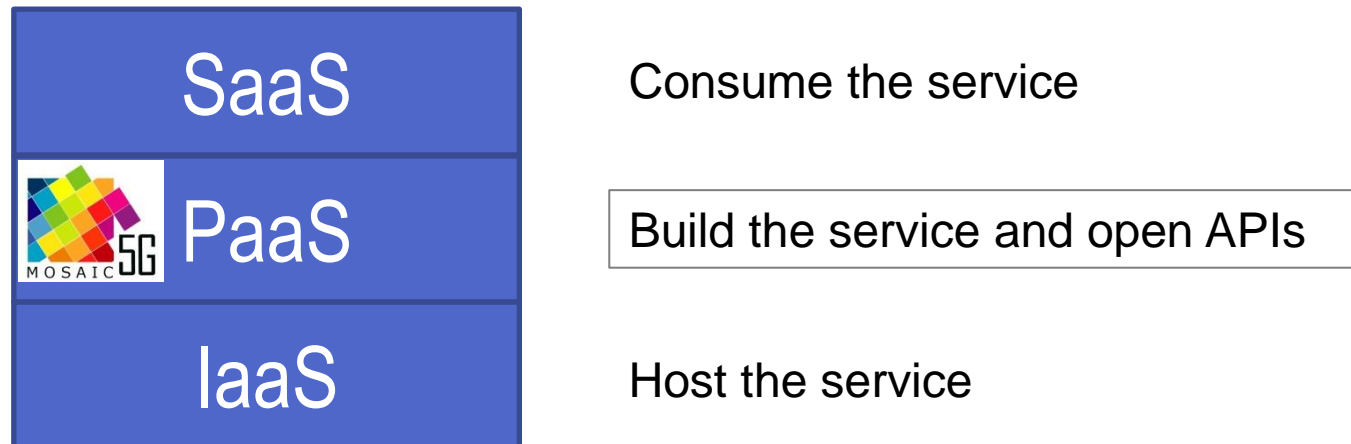
OAI Workshop, Nov. 7-8th 2017

Navid Nikaein

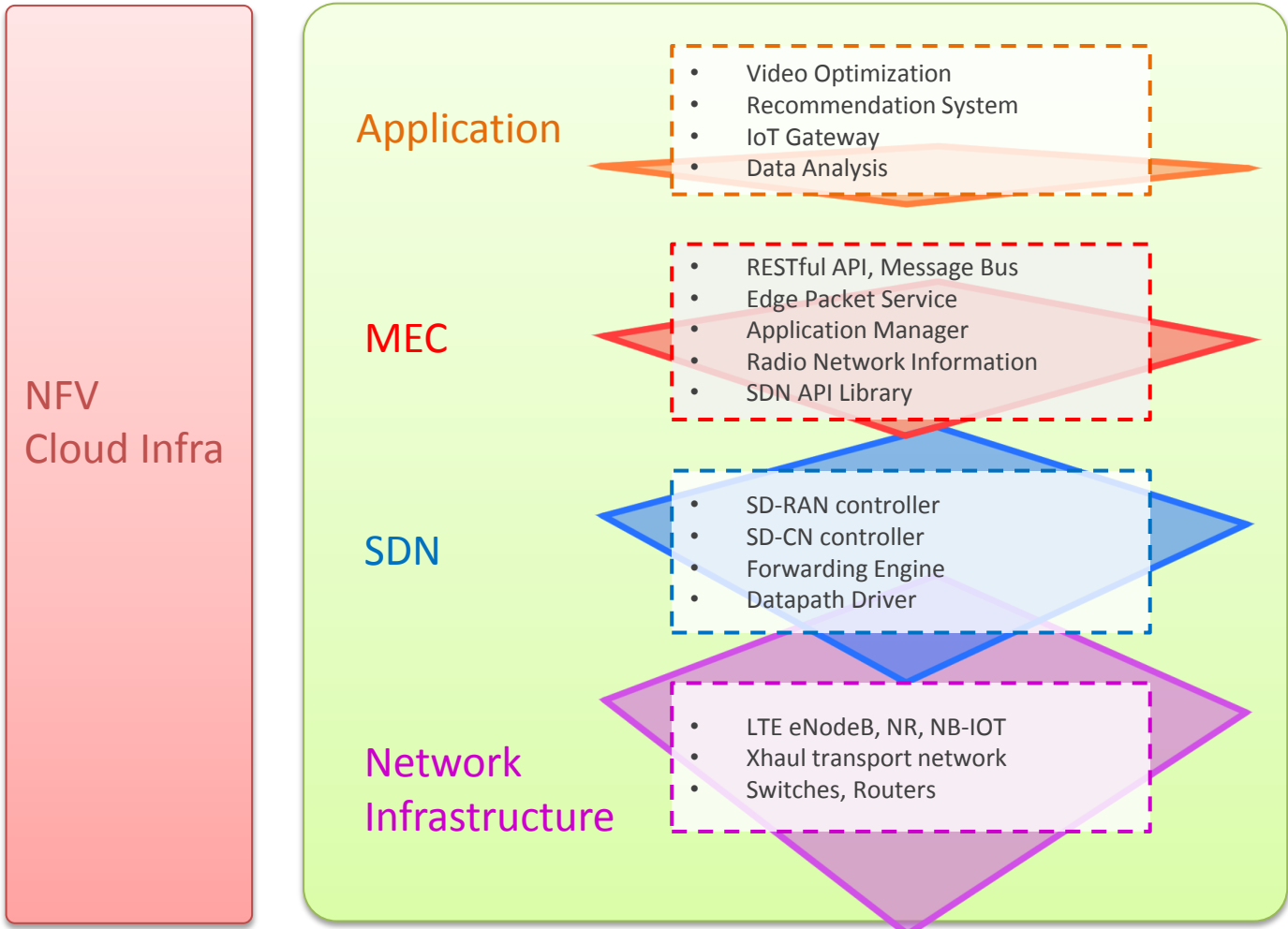
Communication System Department, Eurecom

Why Mosaic-5G.io?

- Need for a software-based 4G-5G service delivery platforms for telecom to
 - Increase network flexibility
 - Add/customize network intelligent through control apps
 - Experiment new use-cases and business applications



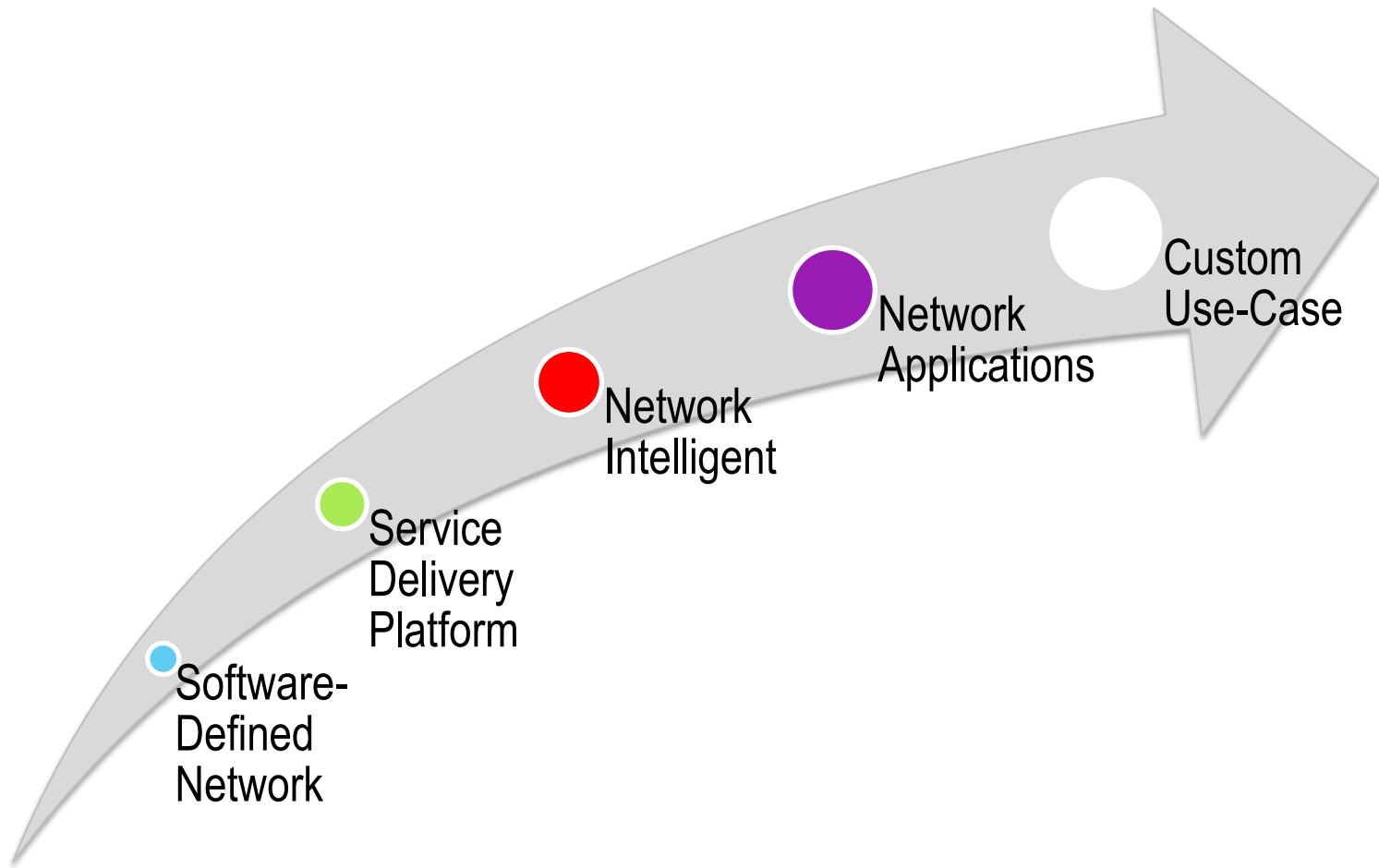
Technology Enablers



What is Mosaic5G.io?

- **Mosaic-5G.io** was formed to develop, promote, and share **an agile network service delivery** platforms
 - Transform today's static RAN and CN infrastructures into **extensible, software-based platforms as a service**
 - Explore new ideas and use-cases for 4G-5G R&D
 - Bridge the gap between communication, computing, and data analysis
- Founded by Eurecom in 2015.

Objectives



Mosaic-5G Ecosystem



A Flexible & Programmable SD-RAN Platform



A Low Latency SDN-based MEC Platform



An event-driven juju-based service orchestrator core



A Flexible & Programmable SD-CN Platform

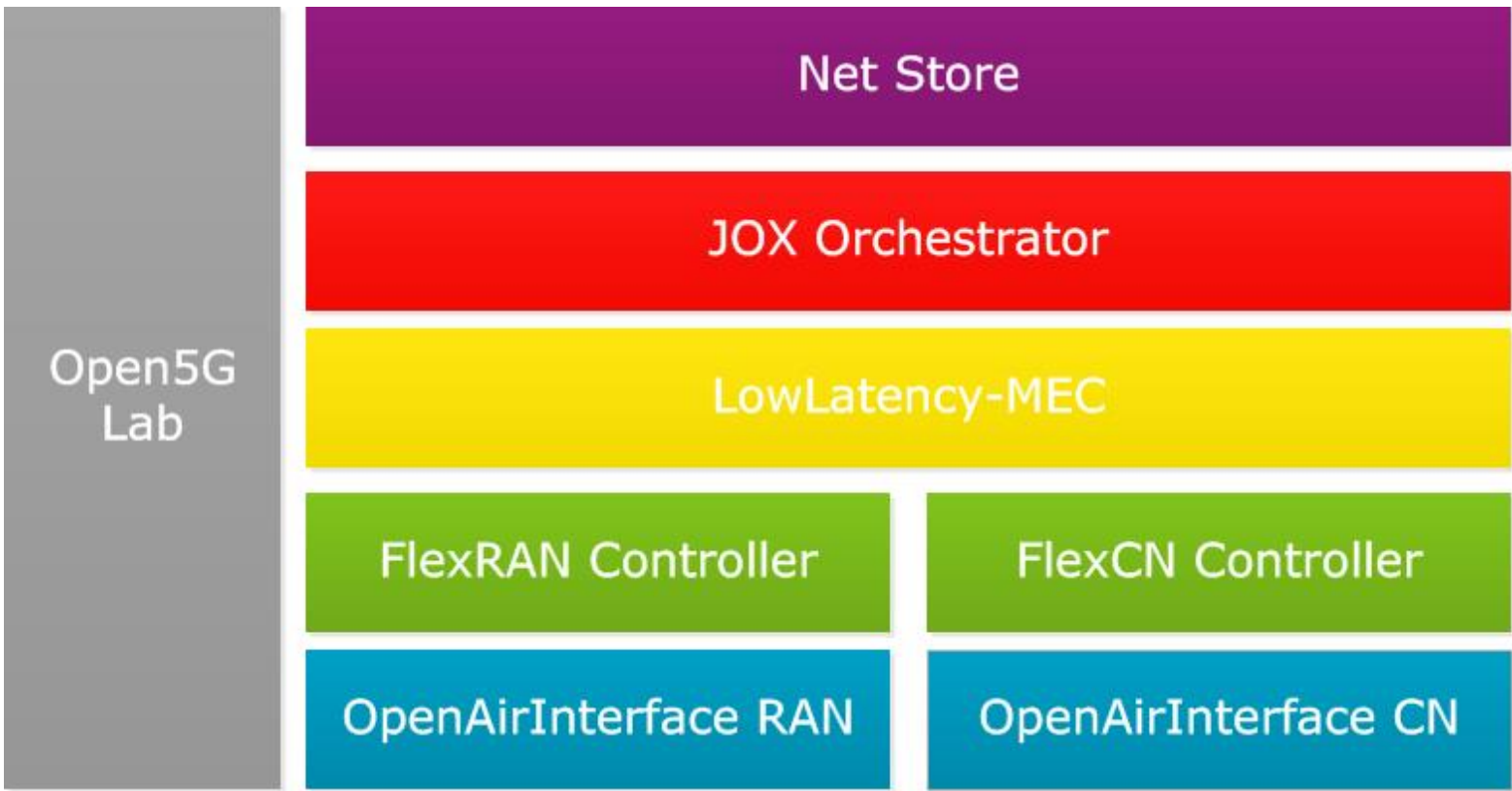


Network function & application distribution Repository



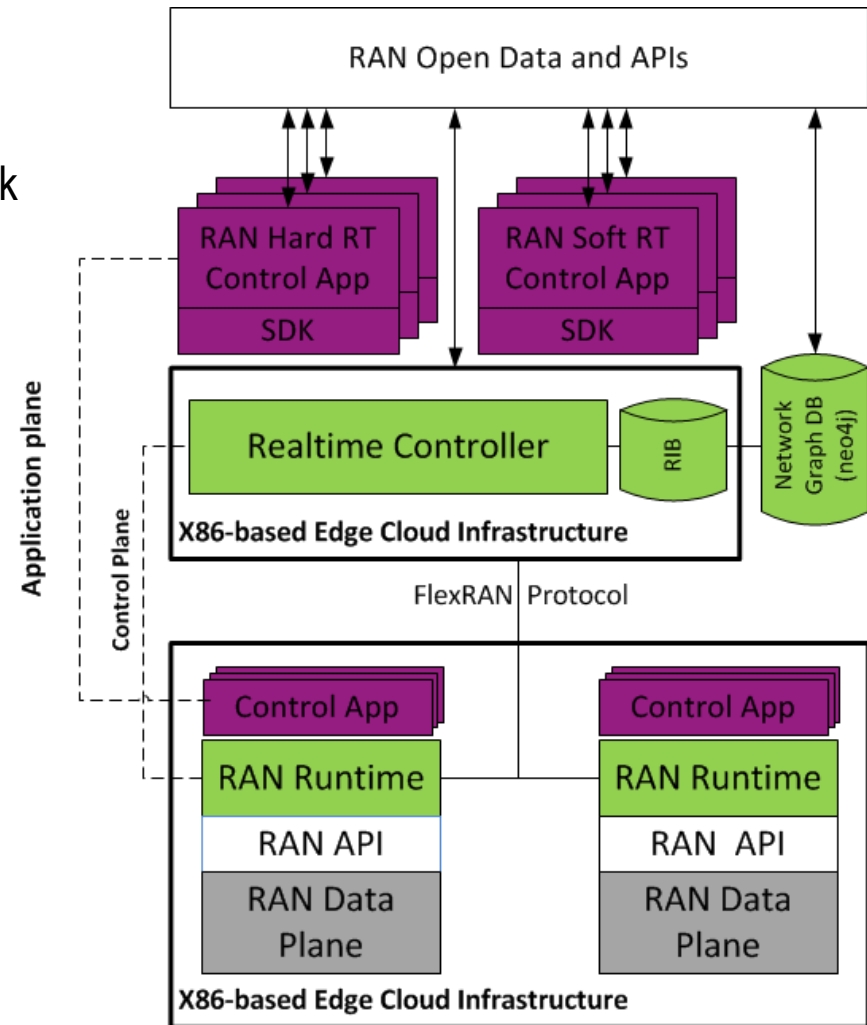
Remotely accessible experimentation testbed

Mosaic-5G Ecosystem



FlexRAN Platform

- RAN runtime
 - Abstraction and programmability of network functions
 - Extendable RAN APIs
 - Virtualized resources and state for a slice
- RAN realtime controller
 - Slice state and resources
 - C-plane SDK
- Slice control plane
 - Realtime and flexible RAN monitoring, configuration, control and programmability
 - Centralized and/or distributed control
- SB-IF interface
 - FlexRAN control protocol and controller

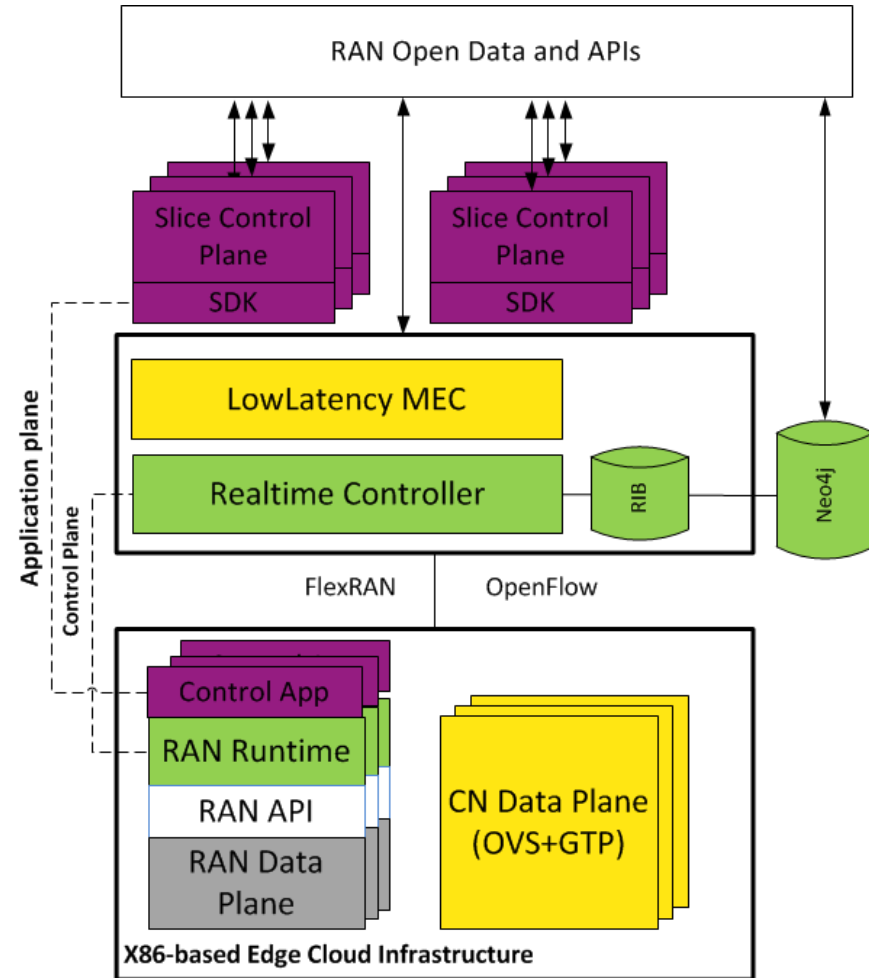


Supported FlexRAN API Calls

API	Target	Direction	Example	Applications
Configuration (synchronous)	eNB, UE, Slice	Controller → RAN	<ul style="list-style-type: none"> UL/DL cell bandwidth, Reconfigure DRB, RSRP/RSRQ/TA 	<ul style="list-style-type: none"> Monitoring, Reconfiguration, SON → cognition
Statistic, Measurement, Metering (Asynchronous)	List of eNB, UE, Slice	RAN → controller	<ul style="list-style-type: none"> CQI measurements, SINR measurements, UL/DL performance 	<ul style="list-style-type: none"> Monitoring, Optimization, SON → cognition
Commands (synchronous)	Agent	controller → RAN	<ul style="list-style-type: none"> Scheduling decisions, Admission control Handover initiation 	<ul style="list-style-type: none"> Hard Realtime Control, Soft realtime control SON → cognition
Event Trigger	Master	RAN → controller	<ul style="list-style-type: none"> TTI, UE attachment, Scheduling request, Slice created/destroyed 	<ul style="list-style-type: none"> Monitoring, Control actions
Control delegation	Agent	Cpntroller → RAN	<ul style="list-style-type: none"> Update DL/UL scheduling, Update HO algorithm 	<ul style="list-style-type: none"> Programmability, Multi-service

LL-MEC Platform

- Application manager (mp1)
 - low-latency: CoreAPI, MBus
 - Elastic: RestAPI, MBus
- Platform (mp2)
 - Edge packet service
 - Multi OF libs, OVS
 - Static and dynamic rules
 - Radio network information
 - Real-time control and monitoring
 - Event manager
- Abstraction
 - Data plane APIs: OpenFlow protocol
 - C-plane Radio API: FlexRAN protocol

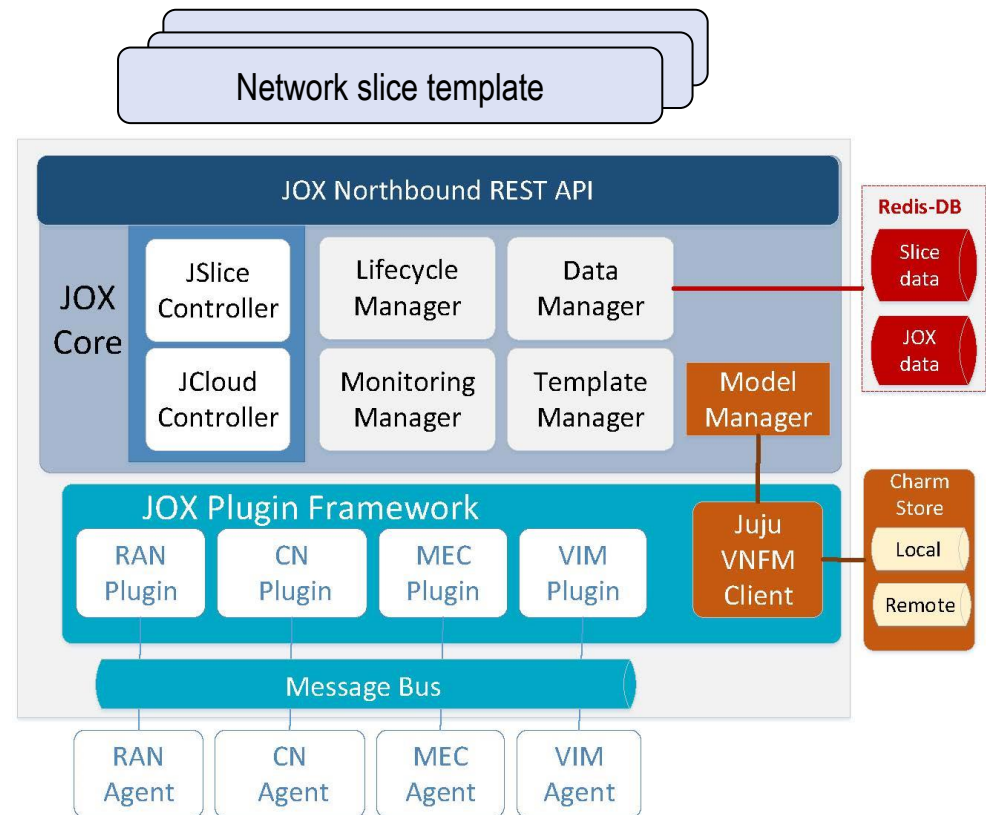


Supported LL-MEC APIs

API	Target	Direction	Example	Applications
Configuration (synchronous)	MME, X-GW	CN → LL-MEC	<ul style="list-style-type: none"> • UE IP • Bearer ID, TEIDs, • X-GW IPs 	<ul style="list-style-type: none"> • Monitoring, • Reconfiguration,
Statistic, Measurement, Metering (Asynchronous)	List of eNB, UE, Slice	OVS → LL-MEC	<ul style="list-style-type: none"> • byte_count, packet_count • direction, in_port • duration_sec • Priority, table_id 	<ul style="list-style-type: none"> • Monitoring, • Optimization,
Commands (synchronous)	OVS	LI-MEC → OVS	<ul style="list-style-type: none"> • Copy • Redirect 	<ul style="list-style-type: none"> • Analytics • Programmability

JoX Platform

- JoX Core
 - NB-IF for Slice templates
 - Slice controller
 - Distributed Slice DB
 - Interface to Juju VNFM
- Plugins frameworks
 - fast reaction to the underlying network and infrastructure Passthru
- Stores
 - Local store
 - Charm store



Net Store

- Network function & control application distribution Repository to recompose the network service across a reusable modules
 - OAI Charms
 - Network Service templates
 - Juju bundles
 - JoX templates
 - SDKS
 - FlexRAN, LL-MEC, and JoX
 - Control network applications
 - Monitoring apps
 - FlexRAN RAN sharing apps (RRM+SMA)
 - LL-MEC video optimizer app (local breakout+update of video transcoding)
 - Performance predictions app (RRM_KPI)

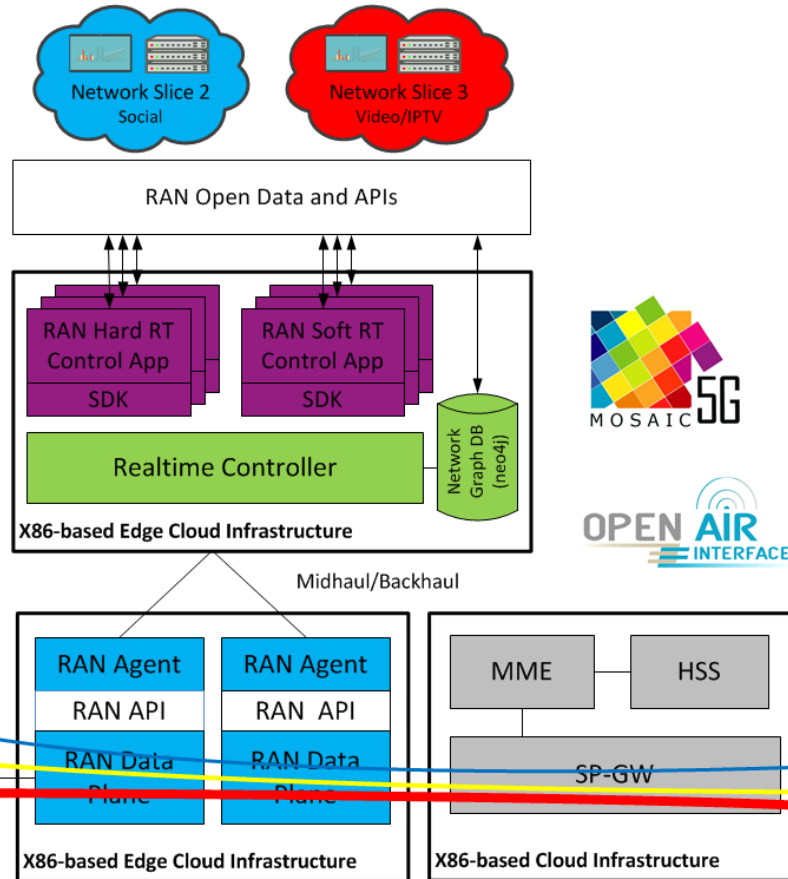
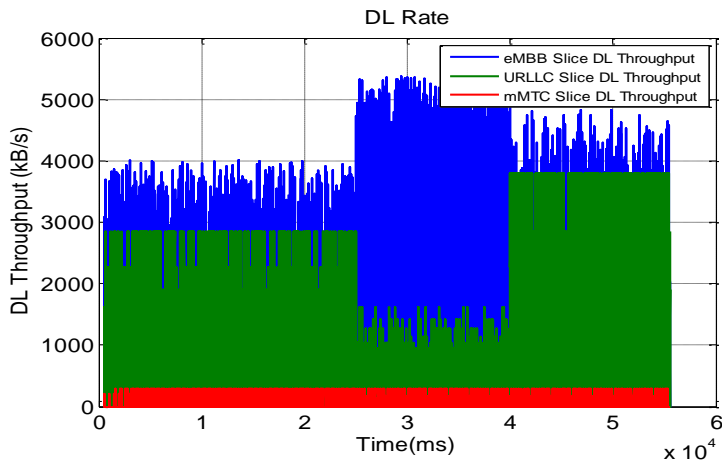
License models

- Mosaic5G Platforms' licenses
 - FlexRAN and FlexCN
 - FlexRAN Controller : MIT → OSA license
 - FlexCN controller : Apache v2.0 or OSA license
 - LL-MEC: Apache v2.0 or OSA license
 - JoX: Apache v2.0 or OSA license
 - Store: Apache v2.0 or OSA license
- Contributors
 - Recommend OSI compatible license

EXAMPLE UCS

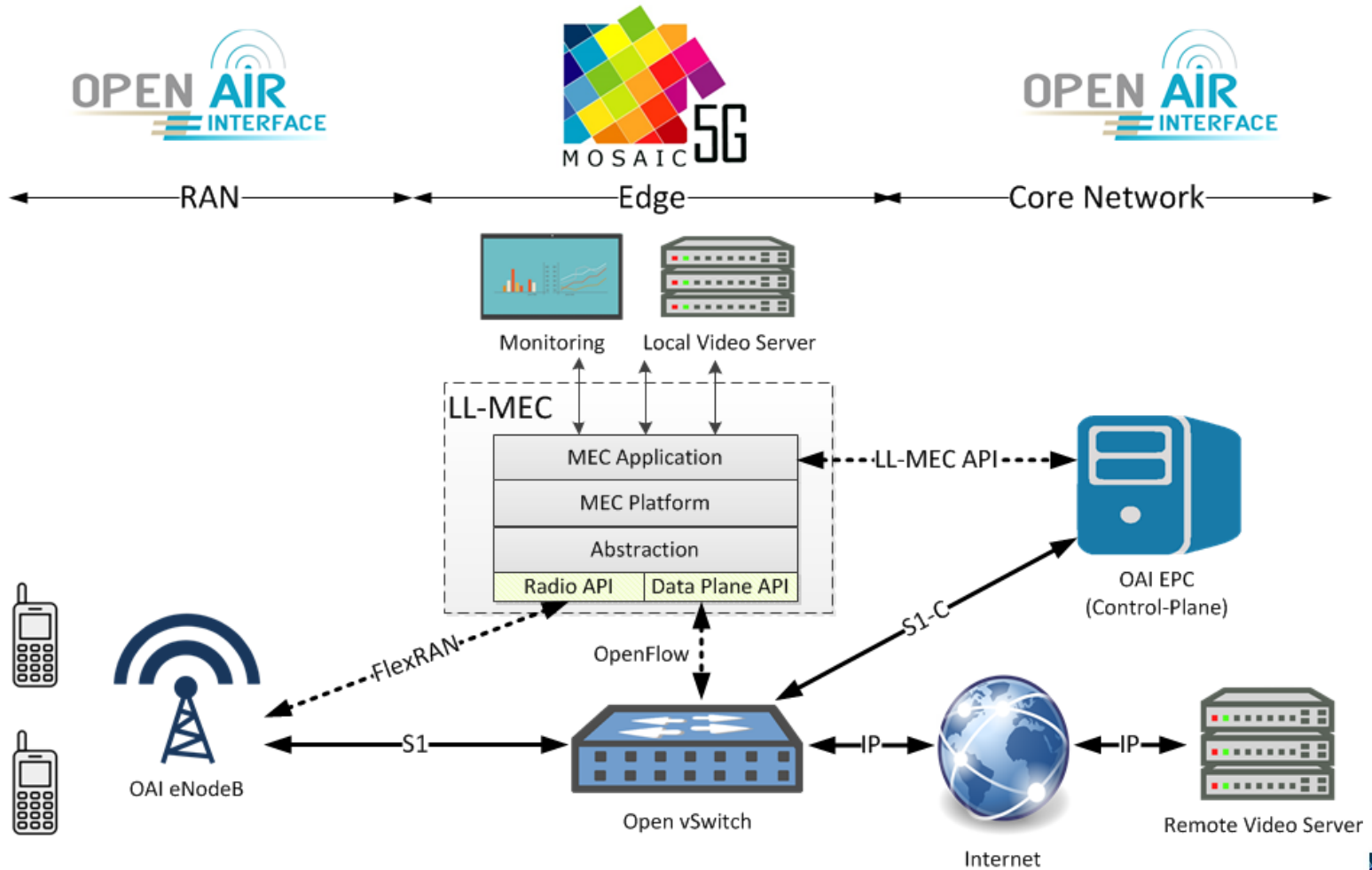
RAN Sharing Demo

@MWC, ITU, MobiCom, EUCNC



Video Optimization Demo

@ETSI, MWC, MEC Congress, MobiCom



Success Stories



MWC 2016, 2017



ITU, FG-13, 2016, 2017



ETSI 2016, 2017



European Conference on Networks and Communications | Ou

EUCNS 2015, 2016, 2017



OPNFV 2016



Mobicom 2014, 2016, 2017

Info

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