

# OAI: where we are & where we go...

OAI Beijing Workshop  
2018 June 20<sup>th</sup> – 22<sup>nd</sup>

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**Contributors: Orange colleagues early adopters of OAI 😊  
(see slides below)**



# « From Secret Sauce to Open Source »

## Why Orange is present and active in OpenAirInterface Alliance ?

Ecosystem of RAN vendors becomes smaller and smaller and relies on 3 major suppliers, plus some smaller challengers

- Monolithic closed solutions, dedicated hardware, ...

“Software is eating the World” and RAN is on the menu!

- Virtualized RAN but still a vertical approach

SW can help to see new players entering the game ... provided open interfaces in the RAN are defined

RAN Open Source initiatives can also help to shake up the current ecosystem 😊

- 5G version of OpenAirInterface more than welcome !

# Plug'in: 5G wide open, by Orange

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# Plug'in

## What is Plug'in ?

Orange research platform to experiment 5G

On-demand and self-care experimentation/development field in which 5G components will be designed and tested.

### Objectives:

- Foundations of an experimental ("sandbox") IT/network platform
- Hosting a 5G prototype system (core, radio access, cloud)
- Pre-sketch of the prototype's operational cockpit (tools & design)

### “Wide open”

Based on open source tools and software (including OAI)

Open to 3<sup>rd</sup> parties: contribution, test ... expected from external partners

### Planned deployments by end of 2018

Demonstrate an E2E chain built thanks to Plug'in, featuring innovative concepts (opensource, prioritization, cockpit, reconfiguration ...) in complementarity to pre-5G deployment trials based on pre-commercial equipment

<https://hellofuture.orange.com/en/lets-design-5g-network-together-plugin-platform/>

# Example of internal work with OAI – 1/6



QUINTUNA RODRIGUEZ Veronica Karina IMT/OLN  
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## High-Performance Multi-RAT 5G Platform

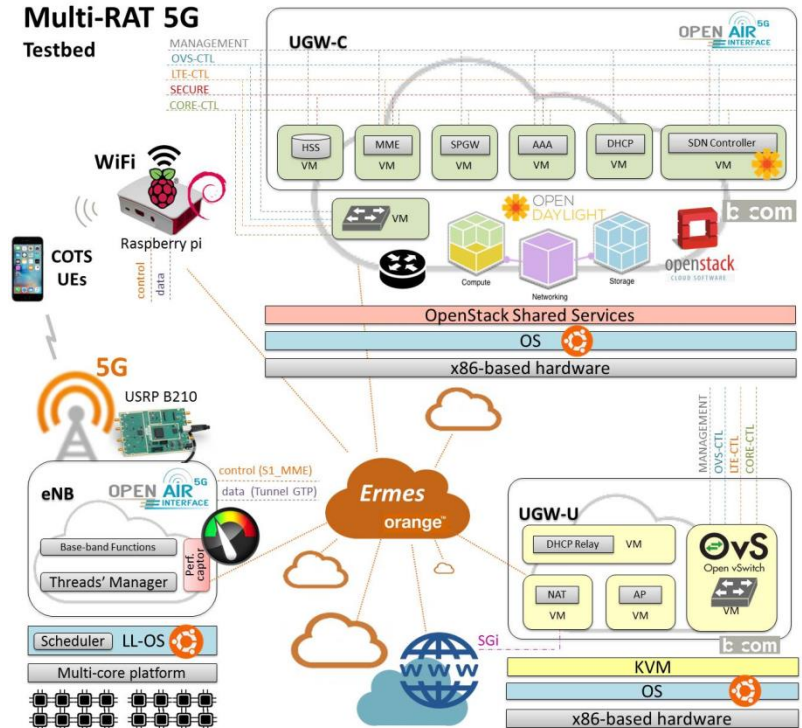
Core / Access networks based on OAI

WiFi access from a Raspberry Pi

Complete separation of user and control planes (b<com contribution)

### Orange contribution

- high performance eNodeB with parallel encoding / decoding functions (multi-threading in a multi-core server within a single process) + performance captor in the EnodeB



# Example of internal work with OAI – 2/6

DUFRENE Louis Adrien IMT/OLS  
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## Testbed for massive Machine-Type Communications (mMTC)

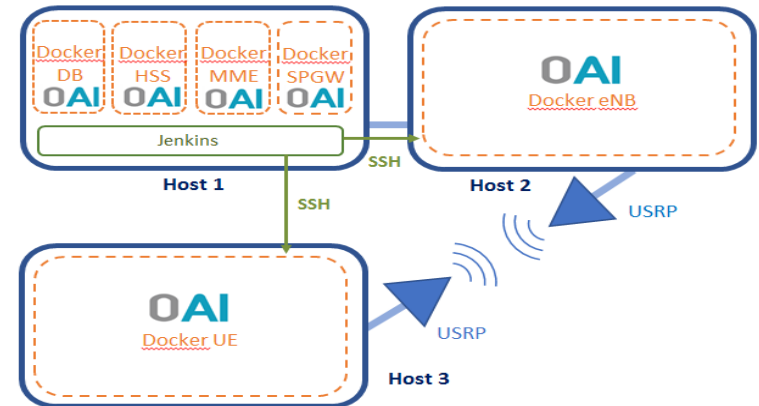
Set-up of a massive MTC testbed in order to assess performance of innovations in this areas such as NOMA, D2D, grant-free access ...

### Hardware side:

- Addition of a front-end in front-of B210 board in order to improve radio isolation between Tx and Rx for Full Duplex FDD transmissions (LTE-M context)

### Software side:

- Dockerized version of OAI allowing successive containerized experiments to be conducted. A Jenkins (web-based) user interface controls the scheduling and launching of experiments.



# Example of internal work with OAI – 3/6

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## Implementation of QoS mechanisms

Use case: 5G network handling two slices with different QoS requirements e.g.

- Slice 1: eMBB service
- Slice 2: Low Latency service

Prioritization considered on:

- Layer 3 (PDCP/IP)
- Both layer 2 and layer 3 scheduling and resource allocation

Implementation based on

- OAI code for RAN virtualization
- Flex RAN controllers

Integration of additional probes in OAI for feedback extraction

- Information related to slice status, resource allocation
- RAN nodes involved along with CORE network nodes

# Example of internal work with OAI – 4/6

GOURHANT Yvon IMT/OLN  
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## Implementation of LTE-m coverage extension mechanisms

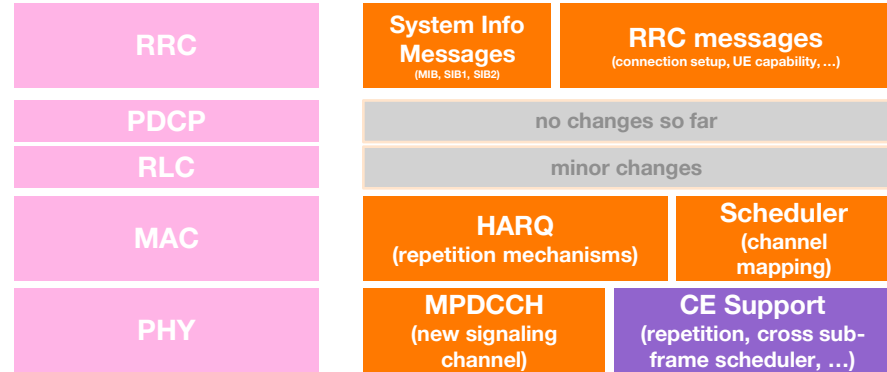
Orange contribution to LTE-M implementation in OAI on the eNodeB side in collaboration with Eurecom → Uses today commercial UE but would benefit from OAI community on UE.

A field test trial over-the-air on top of a real tower (70m high) is targeted by Nov. 2018 (high transmission range, CPRI, low frequencies)

It is a first step towards Orange target, named **Extreme Coverage**, that aims to provide wireless “DSL-like” experience in low dense areas, e.g., emerging countries, in order to reduce the number of costly radio sites

Next steps are eMTC features (5MHz bandwidth, advanced support for VoLTE) and service continuity between LTE and LTE-M on the same UE

Eurecom  
inside



# Example of internal work with OAI – 5/6

Eurecom,  
TCL, Syrtem  
inside

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## French MASS START collaborative project

French initiative aiming at developing an OAI 5G NR platform operating in cm-waves (with massive MIMO inside) – mid 2017 to mid 2020

- First building blocks showcased by TCL @MWC 2018

Contributions from Orange on beamforming algorithms and antennas design.



# Example of internal work with OAI – 6/6

Eurecom,  
b<>com,  
Nokia inside

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European 5G-EVE collaborative project “5G European Validation platform for Extensive trials”

European ICT 17 call project (5G PPP – Phase 3) “5G end to end facility” : prepare a testbed for further verticals’ trials

- Kick-off: July 2018 (3 years)

Part of the French cluster will be based on OAI

- Hybrid 5G site facility that combines Open Source with proprietary equipment
  - Need to define common interfaces for interworking purpose
  - Implementation, test and validation of functional splits

# How we work with OAI

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**Git repository on the OrangeForge internal Gitlab: "oai-orange"**

**Registered Orange colleagues are allowed to push their own branch to this repository**

**No upstream propagation towards Eurecom repository**

**Objective is to share internally what Orange colleagues are doing with OAI**

**“Master” and “Develop” branches are protected and updated with latest official version from Eurecom repo.**

**Kind of internal playground to generate interest within Orange**

**On a case by case basis, contributions to public code will be done.**

# Never too early for Christmas list 😊

## Orange is one of the founding members of O-RAN Alliance

O-RAN stands for Open RAN

Key principles:

- Leading the industry towards open, interoperable interfaces, RAN virtualization, and big data enabled RAN intelligence.
- Maximizing the use of common-off-the-shelf hardware and merchant silicon and minimizing proprietary hardware.
- Specifying APIs and interfaces, driving standards to adopt them as appropriate, and exploring open source where appropriate.

## O-RAN and OAI could efficiently cooperate provided

OAI implements 5G RAN functional splits as specified by 3GPP

OAI Alliance provides pieces of code to O-RAN Alliance in a fully multi-providers 5G RAN implementation to demonstrate these open interfaces

**A win-win cooperation for the mutual success of OAI Alliance and O-RAN Alliance!**

**#Generation5G**

