

# b com

**/ Core Network evolution**  
from CUPS & SDN ePC to new 5G AMF/SMF/... /

Networks & Security

## Cloud Computing



- > Distributed Cloud
- > Orchestration software
- > Virtualisation, Containers, SDN
- > Optimization & Power efficiency

## Network Architecture



- > E2E Convergence & 5G architecture
- > SDN & Network OS
- > NFV & μservices
- > Network Slicing
- > Resilience & security

## Network Interfaces



- > 5G flexible radio and Multi-RAT
- > OFDM, OQAM-OFDM, IoT (LoRa, Sigfox, NB-IoT...)
- > Power efficiency
- > Geolocation

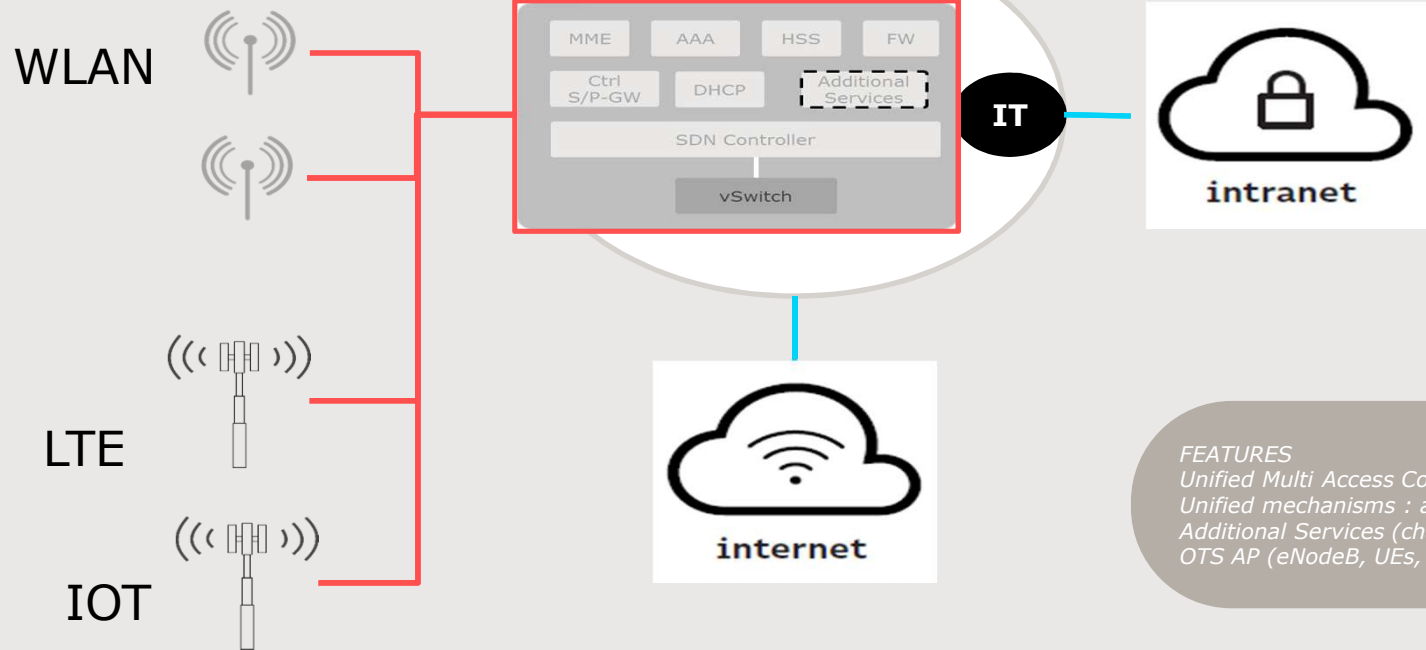
## Networks & security

*« Imagine and design smarter networks for a better user experience, wherever, whatever connection and device »*

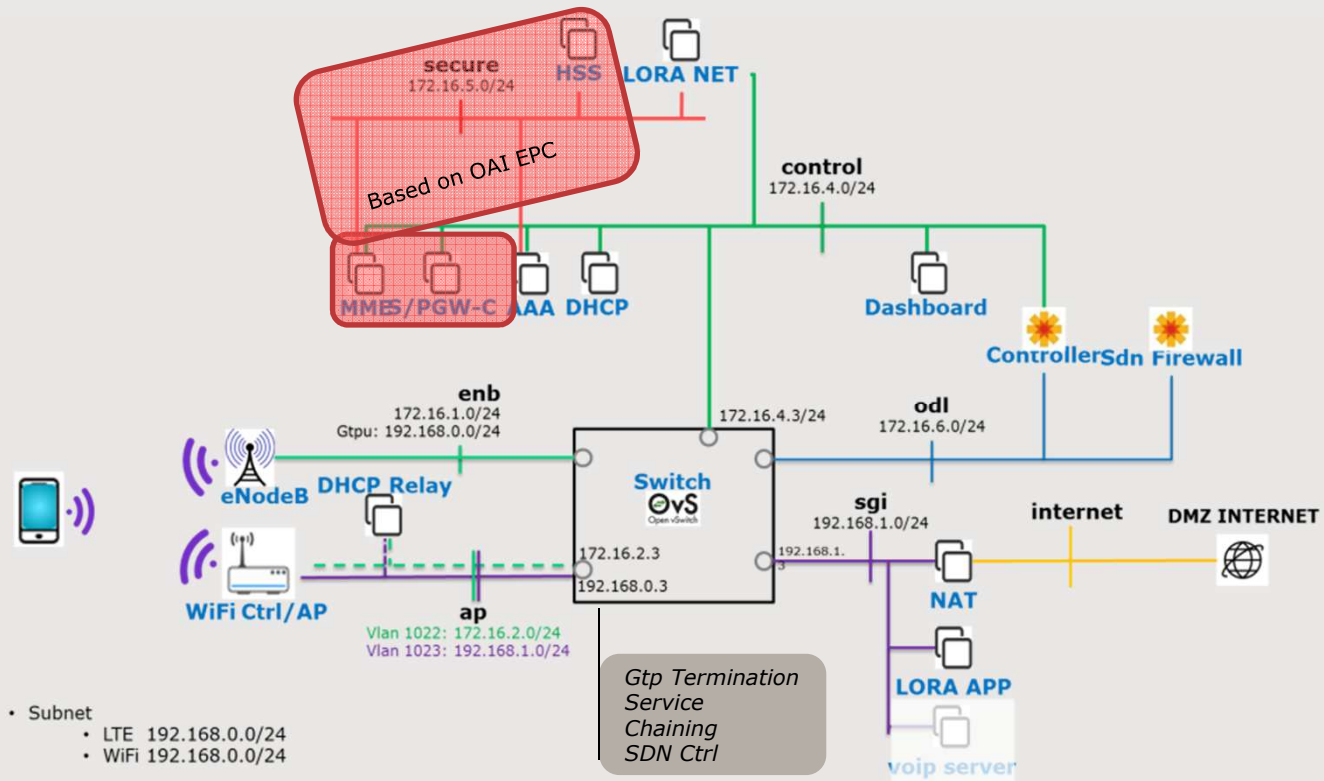
# cloudification  
# 5G  
# IoT  
# security

- > Based on OAI Core Network software, b<>com has developed a set of VNFs providing unified access for 4G and Wi-Fi with strong authentications.
- > This **\*Unifier GW\*** is developed introducing different concepts from 5G (CUPS, multi-access, orchestration, ...)
  - ◆ Current status and the on going work.
  - ◆ Our usage and requirements from OAI-CN
  - ◆ Our coming activities towards a 5G architecture (slicing, AMF split, microservices, ...)

Access Pooling



**FEATURES**  
Unified Multi Access Core Management  
Unified mechanisms : authent, dhcp, nat, ...  
Additional Services (chaining) : firewall, ...  
OTS AP (eNodeB, UEs, Wi-Fi AP) compatible



> CUPS

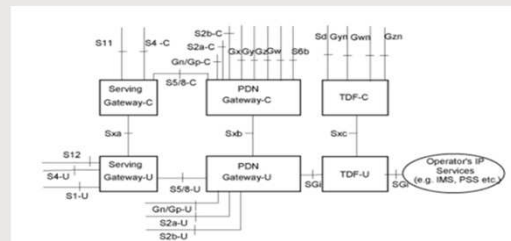
R14 Specification, June 2017

- ◆ Archi with SDN logic SDN Controller (ODL)
- ◆ Packet Forwarding Control Protocol (PFCP), interfaces Sxa, Sxb (GTP, & Diameter capabilities in addition to the logic of openflow)
- ◆ *Error restoration Procedures*
- ◆ Qos
- ◆ Scalability

> Multi Access Techno Aggregated

> Slicing

> Orchestration



In b<>com **\*Unifier GW\***

- ◆ SDN Logic implemented in S-PGW using ODL & Openflow
- ◆ **Not implemented**
- ◆ **Not implemented**
- ◆ **Not implemented**
- ◆ Multi OVS implementation on going
  - Vertical (1 OVS for several eNodeB, multiple OVS-eNodeB groups),
  - Horizontal (multiple OVS for multi S-PGW-U)
- ◆ WiFi, 4G LTE, LoRa
- ◆ *Slicing in OVS and Openstack on going*
- ◆ *Heat Openstack done. OSM model on going*

- > Use of EPC (OAI-CN, OAI-SIM)
  - ◆ Bug fixes proposal
  - ◆ Features (Hand Over, SDN, Swx Interface, ...)
  - ◆ OAI-SIM multi UE for scalability tests
- > Expected evolution
  - ◆ ZeroConf installation, direct installer (*implemented internally*)
  - ◆ Scalability & Stability
  - ◆ Missing features from 4G : handover (*implementation on going*) , PCRF, ...
  - ◆ Common project development groups (per feature)

> Current Target Platforms :

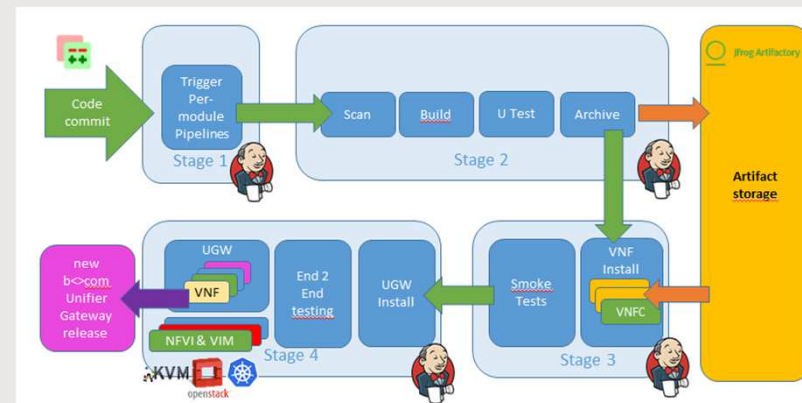
- ◆ Physical Network Function (pre installed system with a x86 host hosting several VMs)
- ◆ VNFs (VMs)
  - Deployed on top of KVM
  - Deployed on an OpenStack Infrastructure

> Deployment is automated

- ◆ Based on our internal continuous Integration/Continuous Delivery mechanism
- ◆ Relying on Ansible playbooks
- ◆ Objective is to have the most complete automated deployment (**zeroconf**)

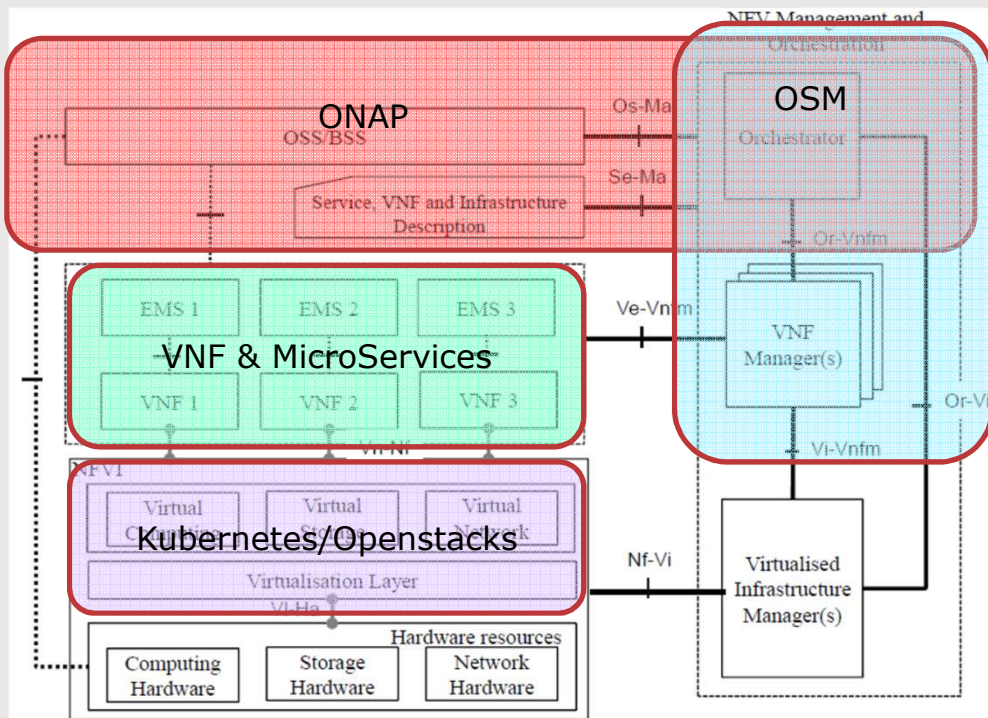
> Next Step(s)

- ◆ Deployment with OSM; target one Openstack, single or multi-tenant (multi openstack candidate)



Jenkins,  
Ansible,  
Artifactory,  
Cucumber,  
HOT files,  
..

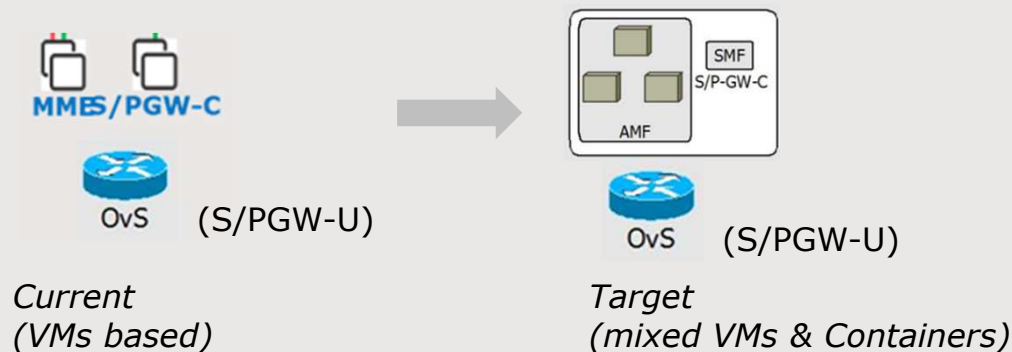




- > Orchestration & Deployment
  - ◆ OSM (Open Source MANO) integration
  - ◆ ONAP survey
- > 5G Architecture
  - ◆ AMF-SMF split based on MicroServices architecture

Common initiative with OAI Community ?

Our first objective is to restructure MME toward the AMF function but implementing MicroServices patterns (in a second step, our S/PGW-C will be moved the same way to SMF)



AMF split in different 'microservice' functions : various approaches (per message, per interface, per function), put in place distributed stateless functions, introduce new interfaces

- > Some challenges for EPC 5G Architecture
  - Topics of interest for our developments
    - ◆ Hybrid deployment and Orchestration (with VMs, containers, ...)
    - ◆ Anywhere Deployment : multi VIM (Cloud Federation), MEC, ...
    - ◆ Data-path management, performance and location (in-out VIMs)
    - ◆ Slicing definition, implementation and Management
    - ◆ Compatibility with existing 4G APs
    - ◆ Security

- > Other Features we want to investigate starting 2018 (to be managed tightly with CUPS architecture)
  - ◆ Slicing
  - ◆ Scalability (stability)
    - Number of Ues managed
    - Multi VMs, Multi containers
    - Multi OVS
  - ◆ High Availability
    - based on VIMs capabilities (?)
  - ◆ Services Chaining (embedded in \*Unifier GW\*)
  - ◆ Monitoring
  - ◆ QOS

**Merci / Thanks**

**/ olivier.choisy@b-com.com /**

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