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

« 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

- WLAN
- LTE
- IOT

Unifier Gateway

IT

intranet

internet

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

b<>com *Unifier GW*
Pre-5G Architecture

- **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, ...)
- OAISIM 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)
Target Platforms & Deployment

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)
Next Steps

- Orchestration & Deployment
  - OSM (Open Source MANO) integration
  - ONAP survey

- 5G Architecture
  - AMF-SMF split based on MicroServices architecture

Common initiative with OAI Community?
Next Steps (1): AMF/SMF new architecture

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

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