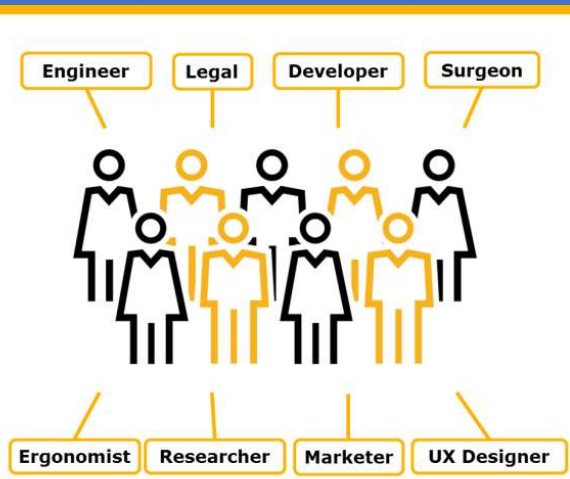
[tech that makes yours better]

O. Choisy

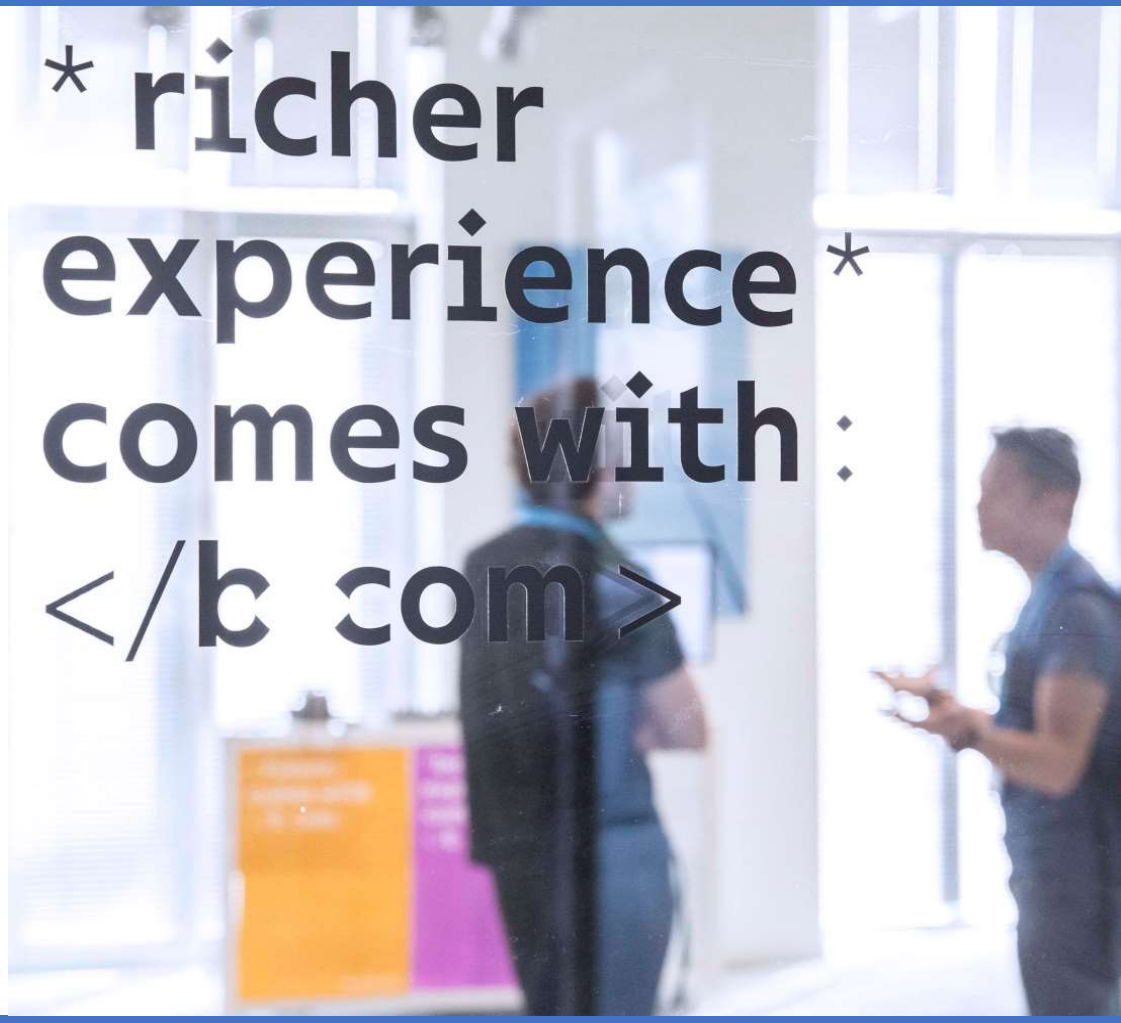
b<>com introduction

- **b<>com is a private French innovation center designed to boost innovation in digital technologies**
- **A unique co-investment model that provides knowledge, know-how and technology**
- **General philosophy**
  - know-how + speed = agility
  - skills x experiences = diversity
  - ISO 9001 + ISO 13485 = quality



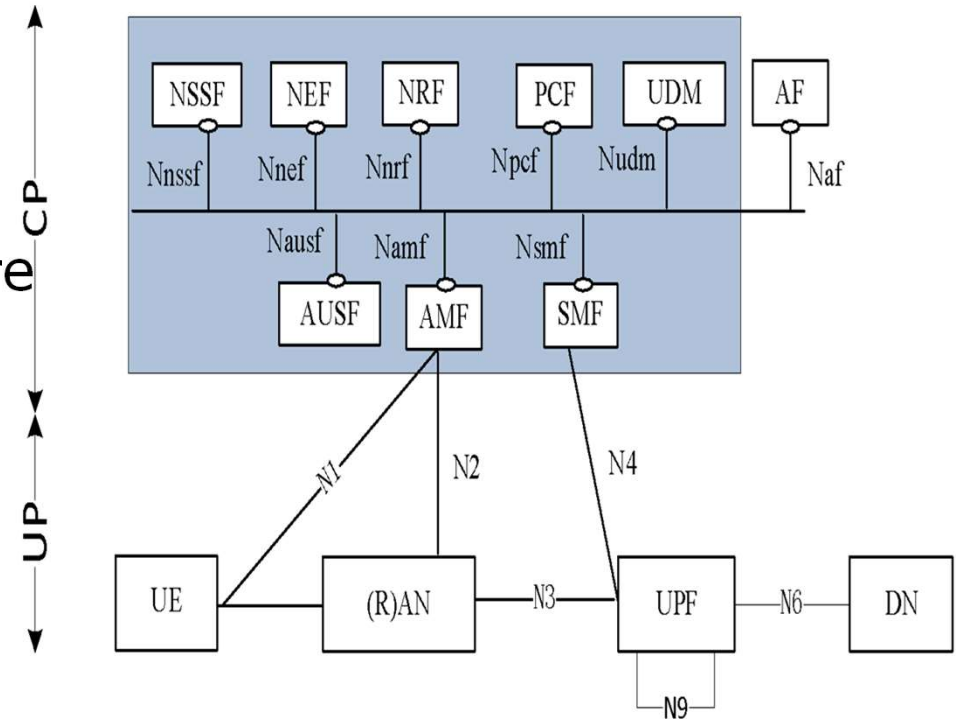
- **2012** year of creation
- **7000** m² scientific campus
- **250** people (25 PhD students)
- **14** nationalities
- **35** shareholders
- **15** technological solutions
- **200** papers & reports
- **10** European projects
- **66** transferred technologies
- **4** sites

https://b-com.com/en#catalogue



3GPP 5G-Core Service Based Architecture

- **Internal Communication between Core Network Functions**
  - SBA, Service Based Architecture
  - SBI, Service Based Interfaces
- **External Communications (RAN, SGI, ...)**
  - N1, N2, N4 interface



- **From SOA to SBA**
  - Access & Contract Coupling
- **Light-weighted service based interface**
- **Not monolithic**
  - more granular, decoupled, openness
  - “A service is an atomized capability in a 5G network, with the characteristics of high-cohesion, loose-coupling, and independent management from other services (NGMN)”
- **Techno (web services)**
  - REST API, Yaml
  - HTTP/2 Protocol

Road to CNFs

- **General Industry move from Virtual Machine to Container**
  - For applications
  - For datacenters

  Benefits are to reduce infrastructure cost & improve deployment updates.
  Kubernetes is the defacto standard for deploying container applications.
  (drawbacks exists : maturity, security, network)

- **Telecom operator goes this way**
  - Kubernetes Telecom Group in kubecon 2019

From VNFs to CNFs on going move

For all applications, Cloud means :

- Deploy services over the internet. Adoption of Cloud infrastructure
- More Elasticity(dynamicity), easy to deploy, Faster to deploy and update

➔ Adopt DevOps Process & Tools intensively for implementation and deployment

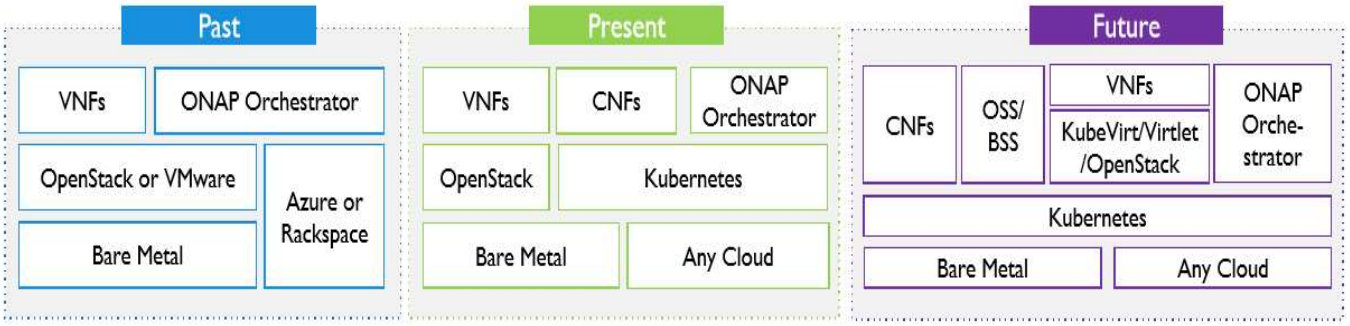
➔ Orchestration

➔ VNF to CNF

https://www.cncf.io/blog/2018/03/08/introducing-the-cloud-native-landscape-2-0-interactive-edition/

CLOUD NATIVE COMPUTING FOUNDATION

Evolving from VNFs to CNFs



From https://static.sched.com/hosted_files/kccnceu19/44/CNCF%20Telecom%20User%20Group%20Kickoff.pdf

For CNCF Telecom User Group (TUG)

- **Best practice for gold CNFs functions**
  - Stateless
  - Security (unprivileged)
  - Scaling
  - Configuration & lifecycle (installation) ➔ the ZeroConf objective
- **Observability**
  - Monitoring
  - Debugging
  - Tracing
  - Logging

As regular software but as highly disaggregated, mandatory requirement to keep control

From https://static.sched.com/hosted_files/kccnceu19/44/CNCF%20Telecom%20User%20Group%20Kickoff.pdf

- **Micro Services architecture and development framework is tightly coupled to Cloudification**
  - Scalable per definition
  - Auto-repair per definition (High Availability)

  Each micro service can be scaled/replicated driven by orchestration
  - Smaller so fast deployment

Core characteristics is stateless application.

5GCore SBA & MicroServices

- **On going activities at ETSI and 3GPP**
  - From VNF to CNF
  - MANO adapted to CNF
    > Orchestration to be adapted to containers
  - NRF (service registry) mandatory ?
  - …

- **GAP between VNFs and CNFs impacts ?**
  - Description of CNFs (network interfaces, scalability –flavors, …)
  - Hybrid deployment mixed technologies (infrastructure, VNF/CNF)
  - ..

- **Mapping from AMF radio interfaces to stateless SBA architecture definition of AMF**
- **Persistency Network functions (UDM/UDR) integration**
- **Which Granularity to implement from one NF several Microservices ?**

  (per interface, per function, others, …)
  - Too many micro services introduces too many interfaces (complexity, performance)
  - Keep each micro-service stateless (more effort)

b<>com activities & target

- **Opensource ambition (OSA)**
- **“Near” Product Maturity**
- **Full Platform operational for « live » experimentation**
  - Devops for continuous integration
  - automated configuration and deployment

- **Strong involvement in 5G-Core implementation with OpenAirSoftware Alliance to implement a 5G-Core software**
  - using micro services approach
  - Ready to be deployed onto Kubernetes

- **Currently focus on NRF and AMF**
  - NRF first implementation available : move to openair-cn git in progress
  - AMF Micro services based development on going (reusing libs with 5G-CN community)

    (Also involved in nb-iot implementation, RAN part)

(refer to Tuesday workshop presentation)

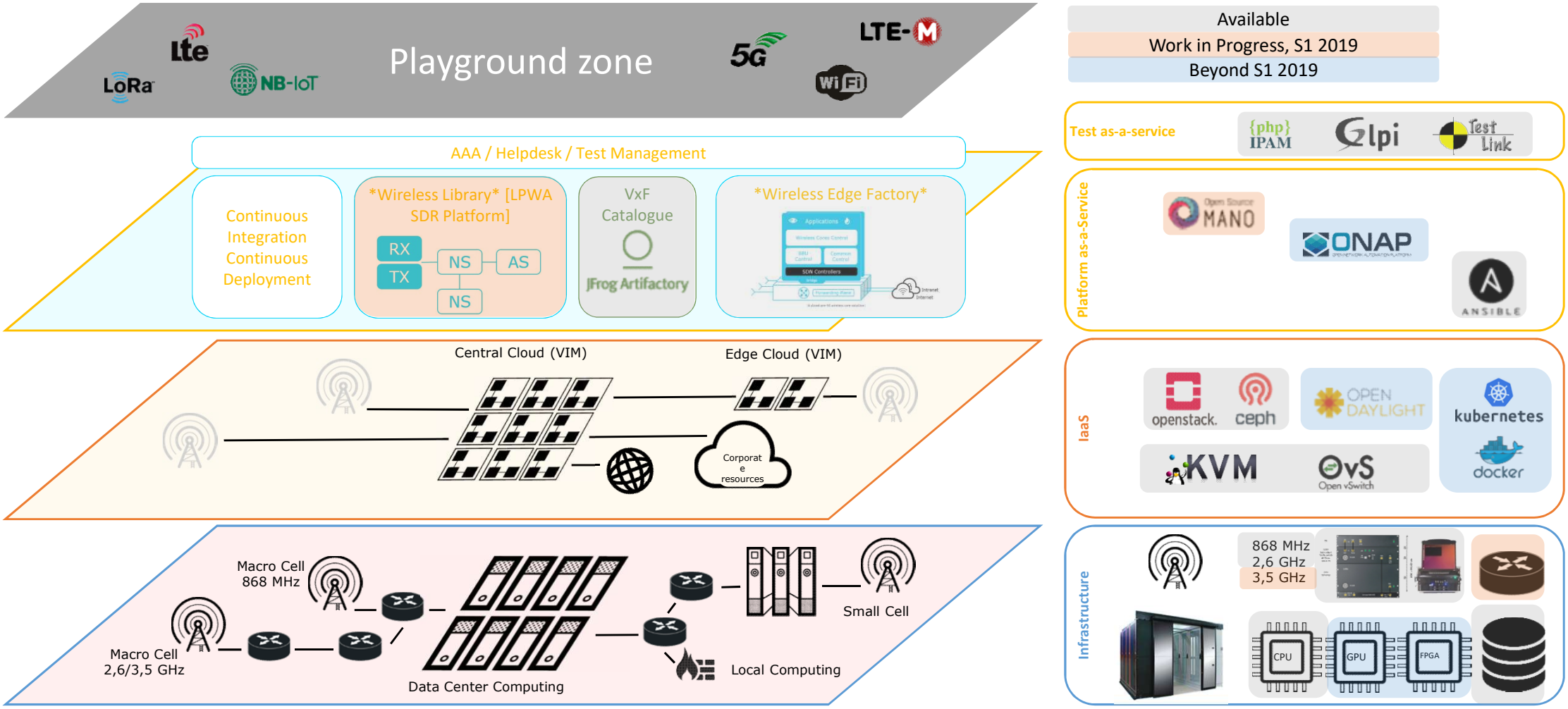
Wireless Edge Factory* A Connectivity Enabler for Private Networks

Security
EAP-AKA, EPS-AKA
Integrated stateful FW
Verticals Isolation
Built-in Resiliency

Smart
Intelligent Functions
Distribution & Routing
E2E QoS management

Satisfaction
Compatible to COTS Aps, eNodeBs, IoT GWs
Supported by b<>com Researchers / Engineers

Simplicity
Easy Service Deployment & provisioning
Simple Dashboards


Playground zone
LoRa
Lte
NB-IoT
5G
LTE-M
WiFi
AAA / Helpdesk / Test Management
Continuous Integration Continuous Deployment
Wireless Library [LPWA SDR Platform]
RX
TX
NS
AS
NS
VxF Catalogue
JFrog Artifactory
Wireless Edge Factory
Central Cloud (VIM)
Edge Cloud (VIM)
Corporate resources
Macro Cell 868 MHz
Macro Cell 2,6/3,5 GHz
Data Center Computing
Small Cell
Local Computing
Available
Work in Progress, S1 2019
Beyond S1 2019
Test as-a-service
{php} IPAM
Glpi
Test Link
Platform as-a-Service
Open Source MANO
ONAP
ANSIBLE
IaaS
openstack.
ceph
OPEN DAYLIGHT
kubernetes
docker
KVM
OvS Open vSwitch
Infrastructure
868 MHz
2,6 GHz
3,5 GHz
CPU
GPU
FPGA

- **Platform deployed with official France 4G License for experimentation**
- **Experimental platform to implement use cases providing connectivity (LTE, Wi-Fi, IOT) and datacenter resources to host applications**
- **Able to manage multi sites (thanks to CUPS design) : multi RAN/datapath and centralized control plane hosted in cloud datacentre**
- **This Platform may be used by partners to evaluate use cases (service offer)**

- **Additional Architectures to merge MEC-like edge applications implementing also Micro Services**
- **Programmable services chaining and slicing from edge to core**
- **Accelerated UPF**

Merci / Thanks

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