ONS Europe

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End-to-End 5G: a Telco perspective

Cecilia Corbi, Alessandro D'Alessandro

Technology Architectures and Innovation

TIM

Outline

ONS Europe – Antwerp, 23-25 September 2019

- ➤ **Telco Scenario**
- ➤ **TIM 5G approach**
- ➤ **TIM experience with ONAP**
- ➤ **Take away**

Telco Scenario

Over the past ten years **competition and the proliferation of over-the-top players** (data traffic exponential) has significantly impacted telco revenues with an increased decoupling of mobile revenue and network costs.
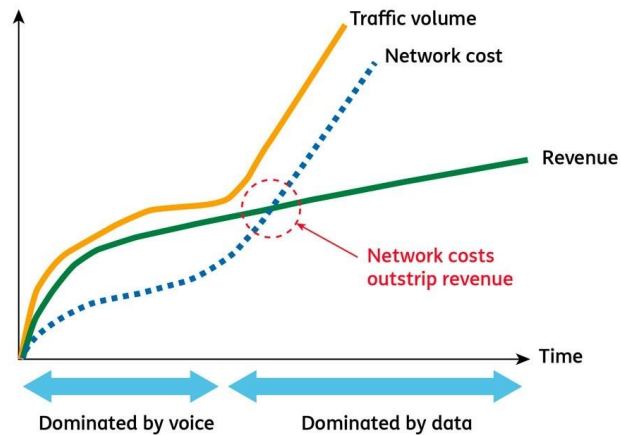
Source: Analysis Mason

Common Telco Objectives:
- **TCO reduction**
- To optimize **network infrastructure**
  - Orchestration automation & zero touch management
  - AI / Big data for predictive approach
- To improve **customer experience** and **reduce services time to market**

- 5G is the first mobile standard built natively to enable both human and non human use cases and capture its value.
- 5G opportunity to Telcos to introduce a wider deep technological transformation in their technical approach to infrastructure deployment and operations.
- Strategic priorities, not only technology, must drive transformation programs.

TIM 5G trials
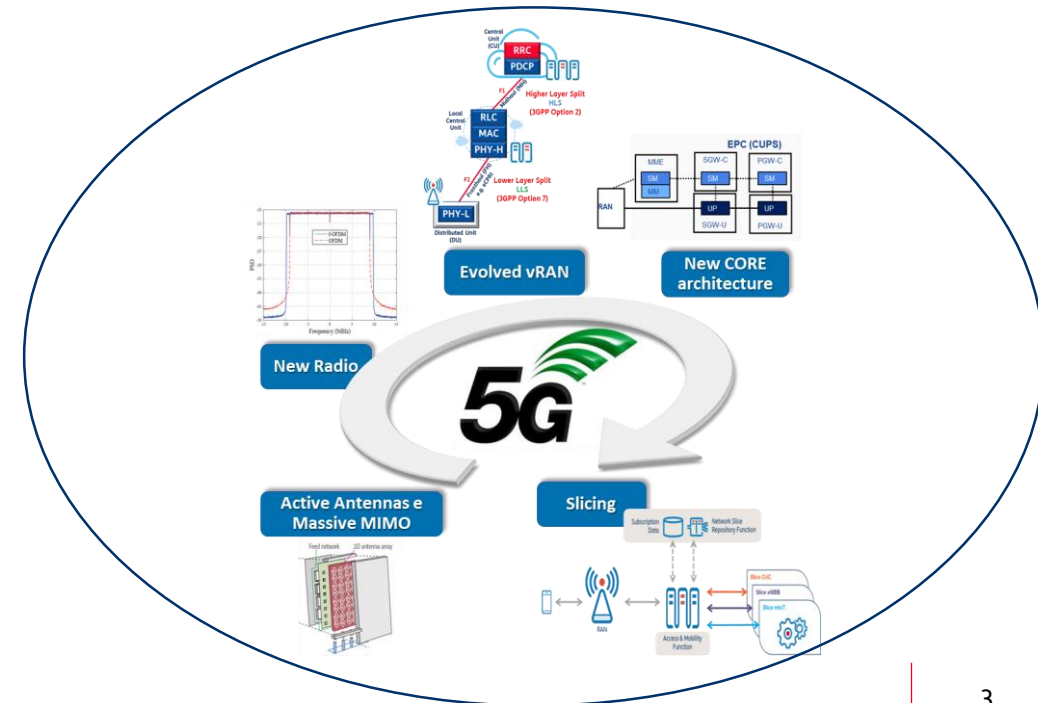
Operators' specific initiatives and trials

Bari and Matera Project: 3 Leaders, 55 partners (Universities and Research Centers; PA and public interest communities; Companies, Industries and Start-ups), 10 Business sectors, over 70 use cases (Industry 4.0, Health 5.0, Smart City, Digital Tourism, Smart Agriculture,..

Torino 5G – agreement with the municipality

San Marino is the first 5G State in Europe
First 5G 3GPP standard antenna switched on, full coverage 5G NR coverage

Area: 61.2 sq km
Population: 33,000 ca

The Italian Ministry for Economic Development trials

Turin

San Marino

San Remo

Rome

Bari

Matera

TIM Press Release (July 2019)
5G Commercial Launch in Turin, Rome, Naples

# TIM 5G: A comprehensive Program

Industry Influencing

EU 5G Action Plan
- 3GPP
- ETSI
- IETF
- GSMA
- NGMN
- EATA

- Ericsson
- Huawei
- Juniper
- Qualcomm
- 5G for Italy
- +60 use case partners
- POLITO and other 8 Universities

Partnerships

- 5G Radio Lab
- 5G Core Slicing Lab
- FutureNet Lab
- IoT Open Lab
- Gigabit Services Lab
- Machine Learning Lab

Labs

- Torino 5G
- San Marino 5G
- Bari Matera 5G
- I4.0 Competence Centres
- EU H2020 (5GPPP) projects
- C-ROADS

Ecosystem

R&D → 5G Cities → 5G Frequency Bid → Commercial
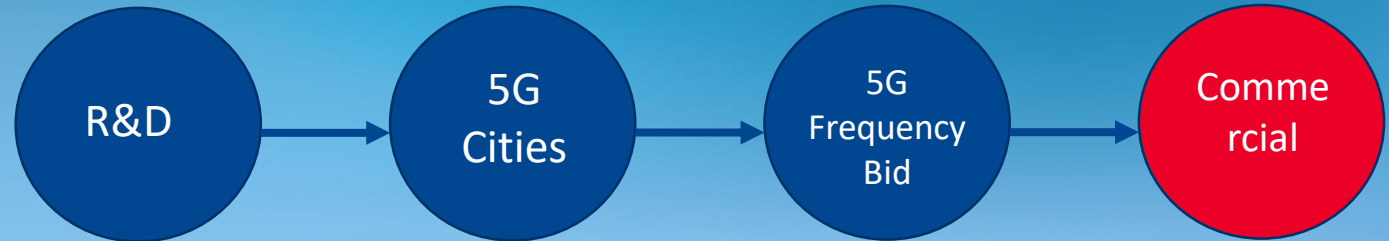
5G-EVE: 5G European Validation platform for Extensive trials


- *To form a unique **5G end-to-end facility**, to be offered to the vertical industries for pilots' execution (real field trials)*
- *To interconnect **four European sites** (Greece, Spain, France, Italy – TIM Turin site).*
- ***End-to-end 5G network solutions**: crucial for all the actors in the 5G value chain, starting from operators and vendors, but necessarily extending to vertical industries and SMEs.*
- *To offer **vertical industries a validation platform** to validate their network KPIs and their services.*
- *To provide **interworking facilities** "multi-x" slicing, unified management, E2E orchestration functionalities (cross domain and network segment/technology)*
- *eMBB, mMTC, URLLC services*
- *Compliant to 3GPP specifications*

TIM 5G Digital Business Platform
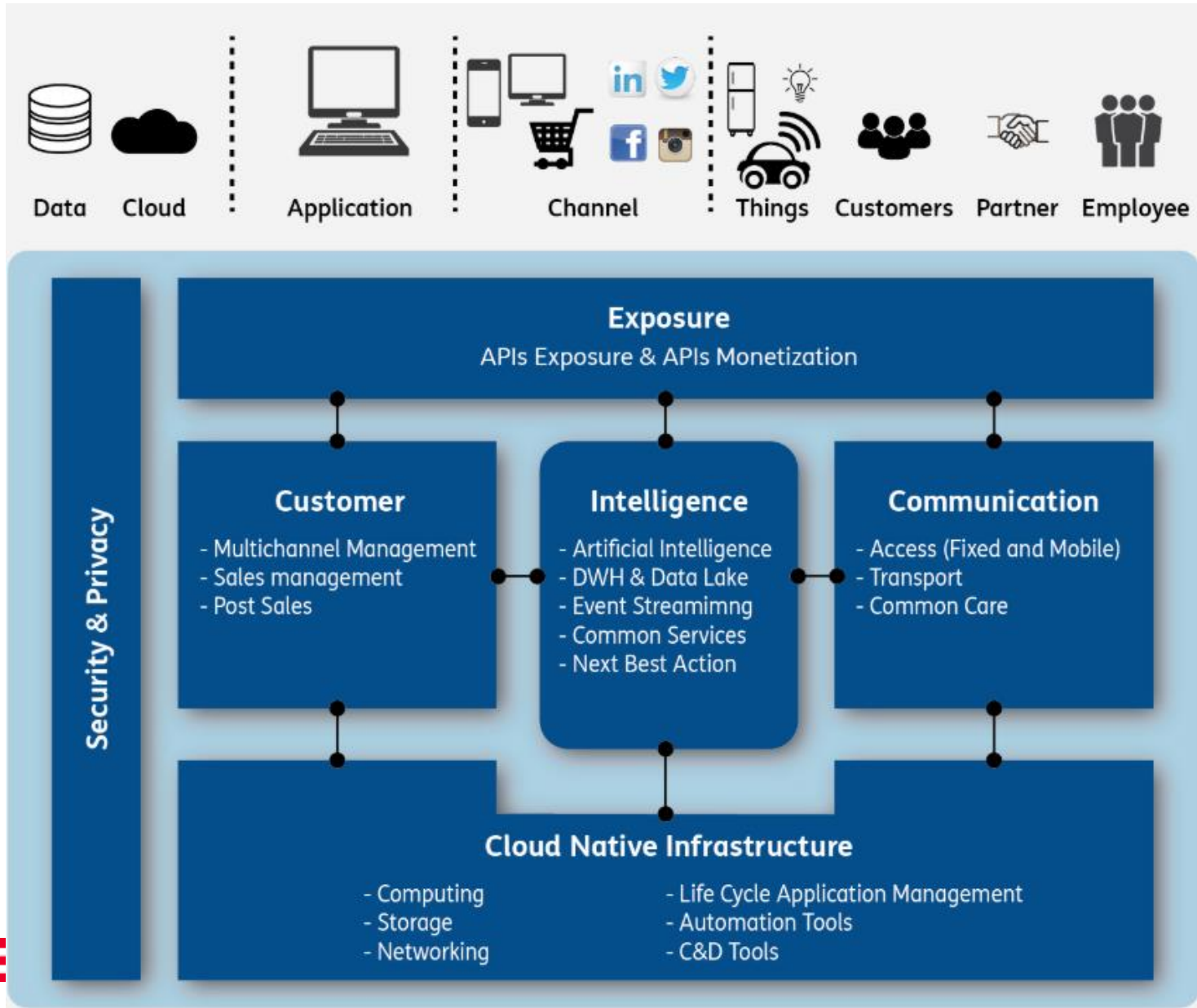
SPs needs to explore new business approaches and rethink how to stay relevant in their markets

TIM's *5G Digital Business Platform*: A technological effort and approach towards a platform based business model, based on state of the art microservices architecture, extensive API development for both internal and external developers and partners that will leverage 5G deployment

To enable an open and heterogeneous ecosystem to create value

5G Use Cases to drive SPs digital transformation

Network capabilities (slices, ultra-reliability, massive connections) on-the-shelf for Marketing and ecosystem partners to compose dynamic, real-time, contextualized offerings

Video Monitoring (Public Safety)

Video and Virtual Reality Anytime, Anywhere

Connected Everything

Autonomous Driving

Remote Control

Personalized Connectivity

- 5G deployments imply that Network services, functions, and slices to be orchestrated in parallel
- 5G end-to-end orchestration solution (across multiple technology domains) require service design, support of physical network functions, slice orchestration

Standard & Open Source as main drivers for Digital transformation

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Standard Bodies, Open Source Communities

TIM participation in main relevant SDOs and some OS projects

Focus on 5G, network control evolution, Cloud Native, E2E orchestration, OSS evolution

Our approach to Open Source Strategy

- Participating to collaborative innovation and research open environment
- Accelerating transformation
- Consumer and/or Promoter Role (Use Cases definition)
- Exploiting open platform as PoCs for trials, enabling interoperability and new services evolution
- Working on Open Platform and Community Lab as a way to validate Standards specifications
- Pursuing collaboration in the different international organization (SDOs, Fora, Open Communities) to build together the optimum ecosystem
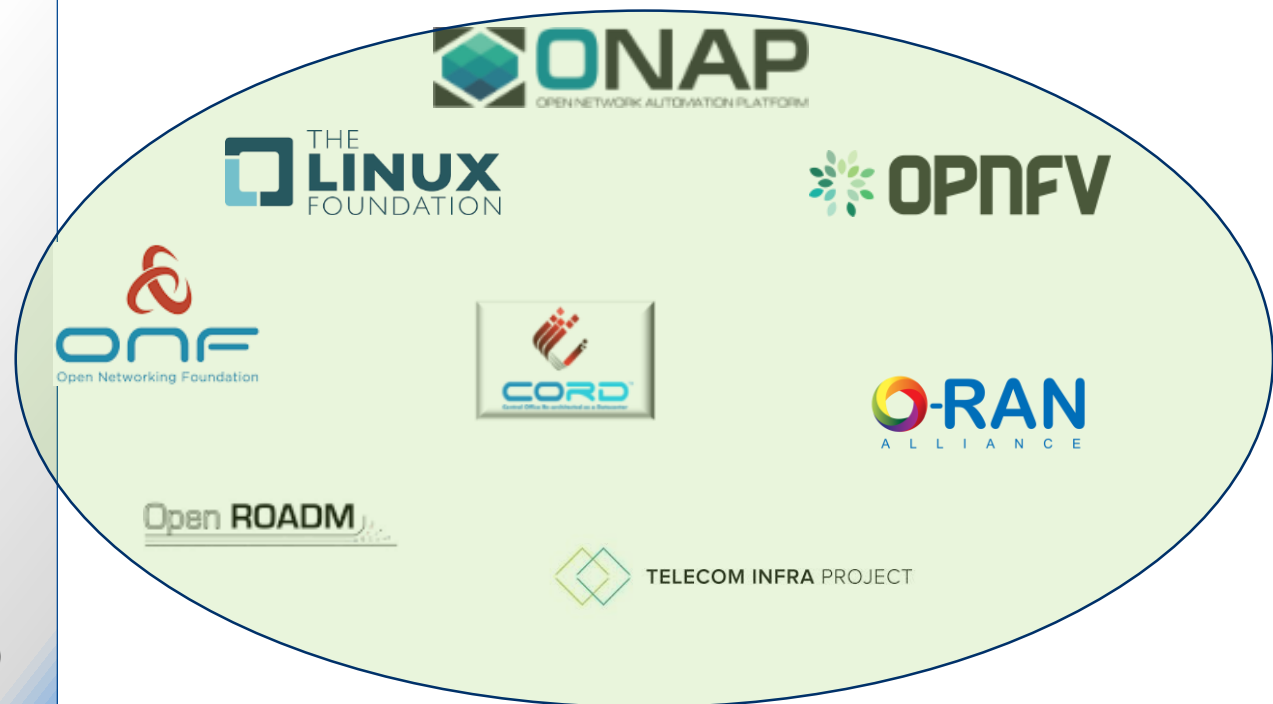
- We joined LFN in January 2018
- Started an innovation project in 2018 on orchestration solutions
- ONAP is being tested in our lab

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TIM's experience with ONAP: lab activities

Started a project in 2018 to gain know-how about orchestration solutions getting hands-on a platform

- Selected ONAP as a platform for experimental works (Rel. A)
- PoC #1: a network service based on an EVPL connecting two E-CORD nodes across an optical network
- PoC #2: a SaaS service based on an EVPL service between a customer CPE and a VNF instantiated into a data center

Started an innovation project in 2019 to gain an in depth know-how about ONAP framework posing the base for exploiting ONAP orchestrator for 5G use cases (Rel. C and Rel. D).

- Constraints: Exploit already available ONAP code
- Chosen use cases (*): ONAP vLB/vDNS use case and TIM Flex Communication Service

(*) 5G momentum is shortly to come and it would have been the most interesting business area to practice ONAP capabilities on. Anyway most of ONAP 5G features are going to be released, starting from rel. F. That brought us to design a service covering available features that could be later on exploited for 5G use cases (e.g. zero touch provisioning, closed loop, service chaining, hybrid cloud, etc.)

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TIM's experience with ONAP: evaluation from ONAP community
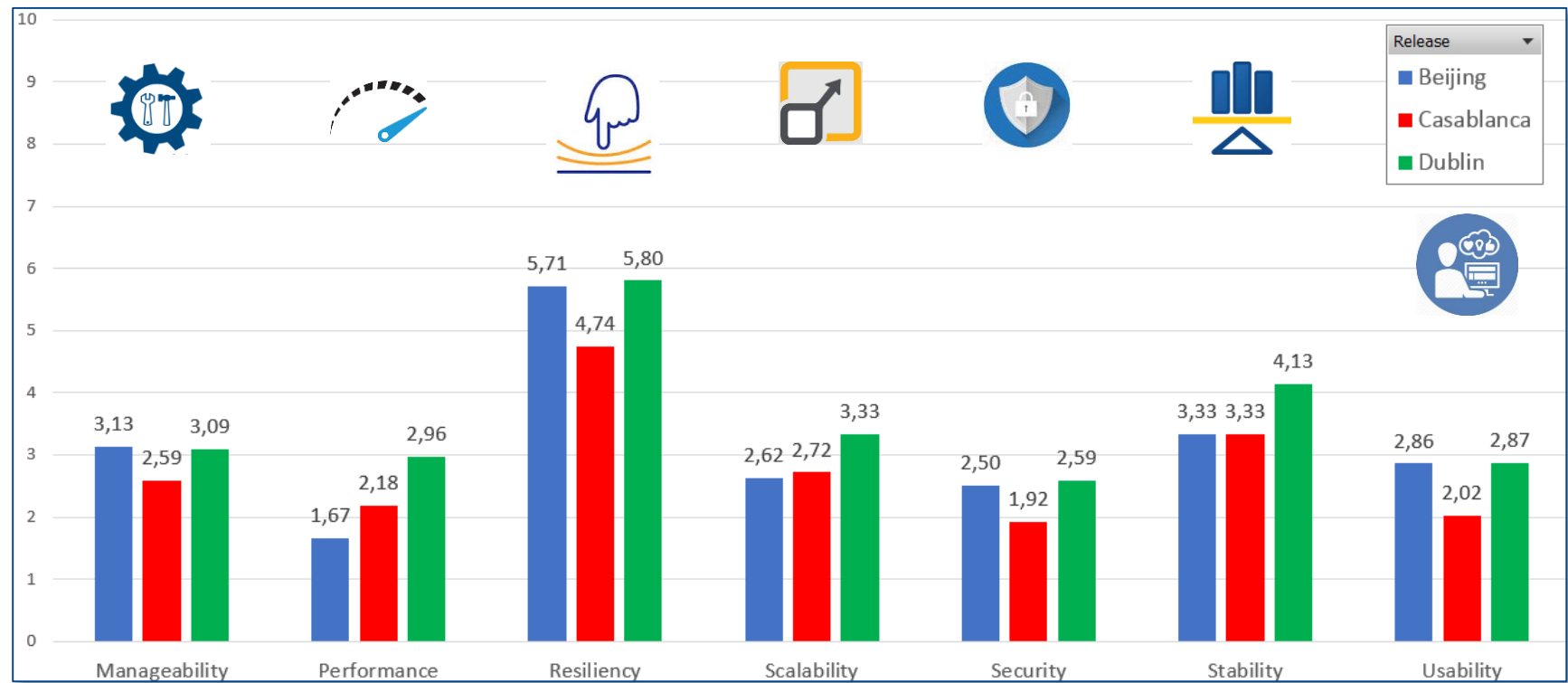
ONAP maturity level shows increasing trend

Maturity level for each area is the arithmetic average of all projects evaluation value

Amsterdam evaluation is not available

Beijing evaluation is not comparable to other releases because of the lower number of evaluated projects (see table)

Area	Beijing	Casablanca	Dublin
Manageability	16	27	27
Performance	10	26	27
Resiliency	14	26	27
Scalability	14	27	26
Security	9	26	27
Stability	7	24	25
Usability	14	26	27

TIM's experience with ONAP: perceived maturity (1/3)

Architectural point of view

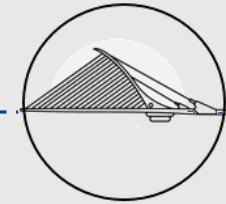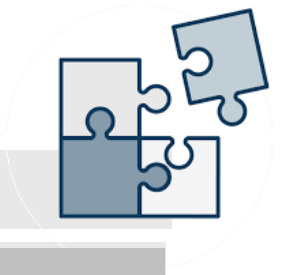| Rel. Amsterdam	Rel. Casablanca	Rel. Dublin
➢ Imperative approach orchestration ➢ Poor scalability due to lack of edge orchestration ➢ Unstable functional components ➢ Poor components integration	➢ Imperative approach orchestration ➢ New introduced components have several bugs	➢ Imperative approach orchestration ➢ Lack of a well structured and full featured Service layer ➢ Lack of multi-domain orchestration architecture
	➢ Proposed new projects to cover edge orchestration ➢ Functional components scalability is stable ➢ Some progresses to hardware aware management and placement optimization ➢ Lots of new componets are introduces such as: CLAMP,Policy and DCAE ➢ Better components integration	➢ Better alignment with ETSI and MEF standards ➢ Dedicated NFS server ➢ New shared databases architecture based on MariaDB Galera covering most of functional modules

TIM's experience with ONAP: perceived maturity (2/3)

Functional point of view

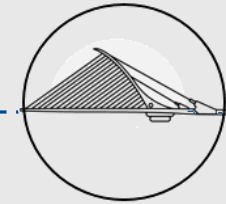| Rel. Amsterdam	Rel. Casablanca	Rel. Dublin
➤ Only basic functionalities ➤ Lack of closed loop and real VNF LCM	➤ No integrated tool for network services design	➤ Lack of functionalities to cover broad range of Telco services ➤ Integration of tools for service design need to be further improved

	➤ Improvement in the following components:
	  ➤ CLAMP
	  ➤ Policy
	  ➤ DCAE
	➤ Introduced new set of API (Generic-Resource) needed fo VNF LCM
	➤ Simplified service instantiation by introducing VID GUI
		➤ Simplified provisioning by one click instantiation for deployment configuration and activation
		➤ The functionalities introduced in casablanca such as CLAMP, Policy and DCAE are stable.
		➤ Autogeneration of IP addresses and names via Policy

PROBLEM

IMPROVEMENT

TIM's experience with ONAP: perceived maturity (3/3)

Operational point of view

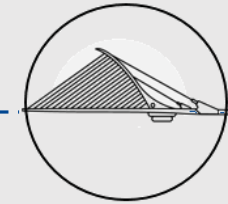| Rel. Amsterdam	Rel. Casablanca	Rel. Dublin
PROBLEM		
➤ Unstable platform ➤ Poor hard platform maintenance ➤ Service creation not suited for production ➤ Many hand made settings in post installation phase	➤ Service design & creation not yet production ready	➤ Scattered data through different DB Improvement required in audit information discrepancy between the model intent and the reality of VNF orchestrations
IMPROVEMENT		
	➤ Platform installation and maintenance completely re-designed now simplified, faster, ripetibile; ➤ Platform is stable (no crash over 2 months) ➤ Beta tool for backup/restore (but immature)	➤ Very stable platform (no crash since installation) ➤ Increased automation in ONAP deployment (RKE) ➤ HA infrastructure installation available that bring reliability of ONAP

TIM's experience with ONAP: overall perceived value

ONAP trends	TIM perceived value
ONAP is becoming more and more the reference automation platform	Used internally as a benchmark
Software implementation progresses in the last year and an half have been significative	Used internally for evaluating providers' orchestration products progresses
Architecture is being enriched with new flavours to cover different SPs needs (single layer orchestrator, hierarchical orchestrator, multi-domain orchestrator)	Enabler for different architectural models to be investigated and compared with internal plans
Alignment with main standards is progressing well (ETSI NFV, TM Forum, MEF, OASIS TOSCA, 3GPP SA5)	The platform itself may become a de facto standard for service/resource orchestration

Key take aways

- The whole telecommunications landscape is drastically changing. Responding to this rapidly evolving business environment becomes a matter of sustainability: Programmability, Automation and Orchestration are key components of enabling a 5G business platform model.

- Telco Open Communities facilitate open ecosystem, innovation, community lab, acceleration and collaborative research for Service Providers purposes.

- Service Providers Use Cases are a concrete benchmark for testing and evaluating Open Source Solutions in Lab

- Standard interfaces compliance is still a must to guarantee pervasive interoperability in large scale multi-domain, multi-vendor deployments

- Blending the strengths of Open Source and Open Standards is definitely the way forward to funnel this wave of innovation into true carried grade solutions

- Cross-organisation (SDOs, Fora, Open Communities) cooperation is essential to reduce fragmentation and dispersion and to build a robust and long-term sustainable ecosystem

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