

How Open RAN will transform Mobile Networks

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How Open RAN will transform mobile networks?

OPEN AND VENDOR AGNOSTIC RAN PLATFORM

What is the issue with Legacy RAN?

- Monolithic RAN Architecture limits network SLA & Elasticity
- Vendors dependent roadmaps and features
- Vendor's lock-in & evolution limitations

Why Open RAN is future of RAN?

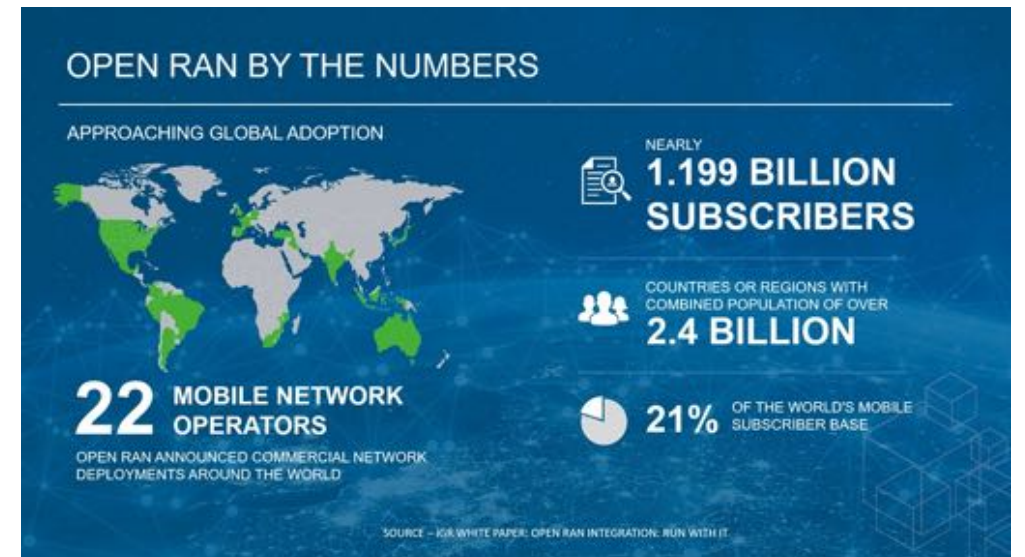
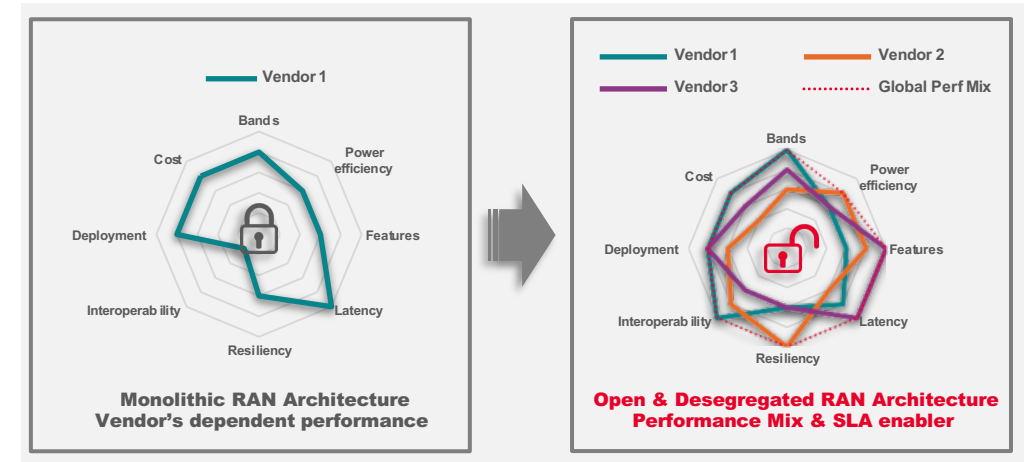
Unlocking capabilities and flexibilities

- ✓ Extended virtualization & desegregation capabilities
- ✓ Distributed & elastic RAN architecture
- ✓ Open Interfaces in RAN enable multivendor architecture
- ✓ Software driven functionality in RAN equipment
- ✓ Interoperability and backward compatibility of equipment
- ✓ Intelligent and automated resource management

When was the Open RAN inflection point?

In 2019 - 2020 Open RAN solutions went from prototypes to R&D products in many vendors

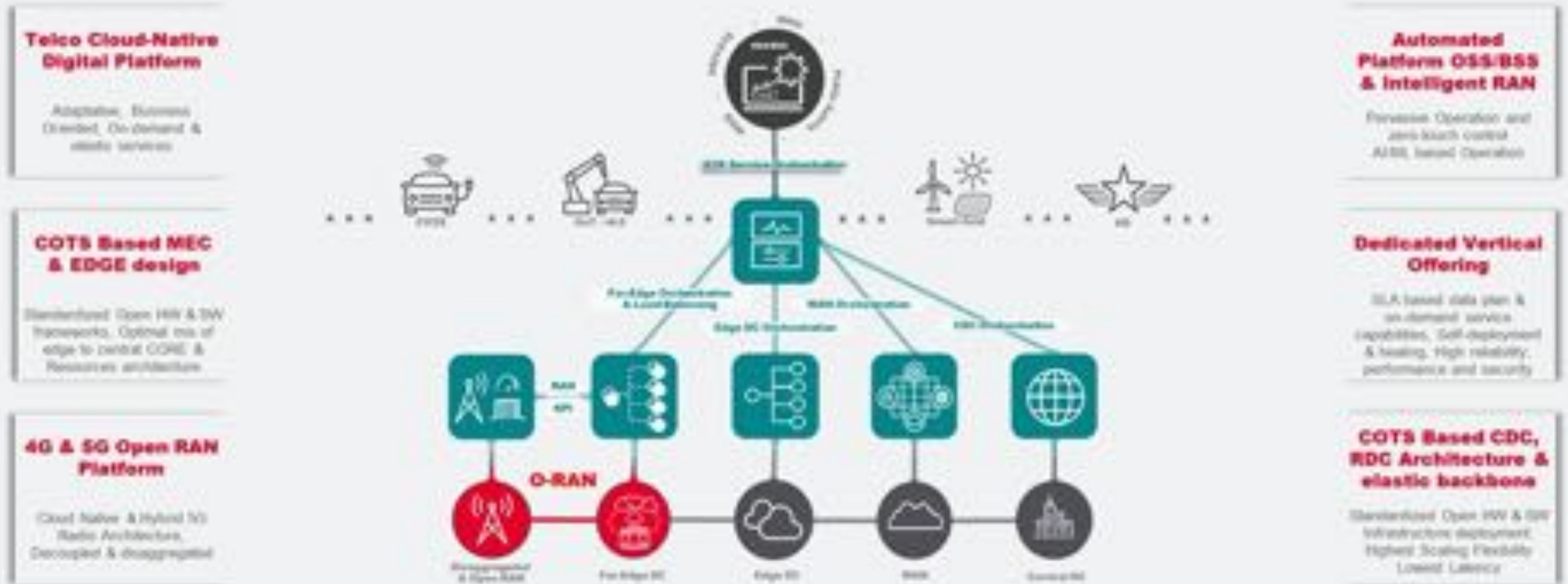
- ✓ Huge participation in the O-RAN/TIP 2020 Plugfest
- ✓ Vendor growth 2018 (55), 2019 (107), 2020 (200+)



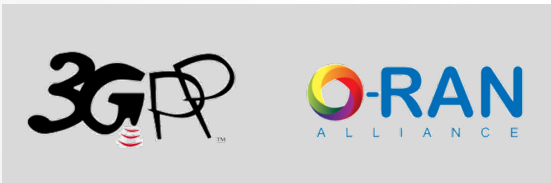
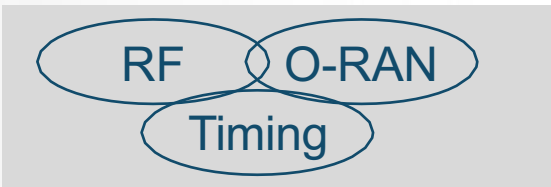
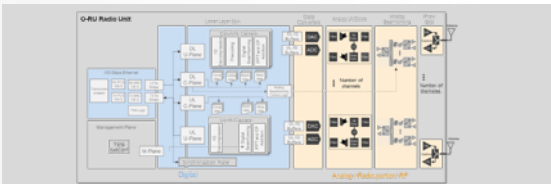
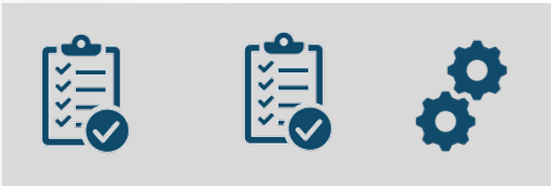
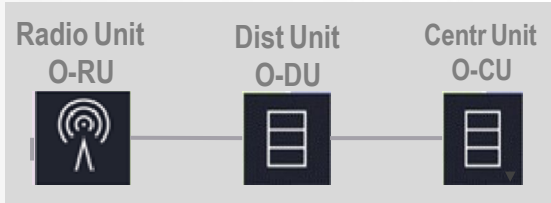
What is Open RAN?

OPEN AND VENDOR AGNOSTIC RAN PLATFORM

Open RAN is a Key element of Telco Cloud deployment strategy



Migration towards Open Fronthaul Interfaces



- gNB disaggregation drives emerging needs for **unit testing** in isolation, and **peer emulation** (DU, RU)
- Transformation towards Open Protocols require **conformance** and **interoperability** and performance test
- New **Function Splits** change 5G Radio Unit complexity and require new test capabilities.
- Critical relationship between **RF, Timing, and Fronthaul Protocols**
- **FR1/FR2 3GPP** radio test requires O-RAN deterministic stimulus and analysis

What is O-RAN?

NEXT GENERATION OPEN RAN

These carriers formed an O-RAN Alliance in summer 2018

(<https://www.o-ran.org/>)

“O-RAN Alliance members and contributors have committed to evolving radio access networks around the world. Future RANs will be built on a foundation of virtualized network elements, white-box hardware and standardized interfaces that fully embrace O-RAN’s core principles of intelligence and openness. An ecosystem of innovative new products is already emerging that will form the underpinnings of the multi-vendor, interoperable, autonomous, RAN, envisioned by many in the past, but only now enabled by the global industry-wide vision, commitment and leadership of O-RAN Alliance members and contributors.”

Why O-RAN? They wanted a RAN network architecture that allowed them to rapidly deploy new services they expect to offer in 5G.



O-RAN Alliance Core Principles

Openness

- **Service Agility**
- **Cloud scale economics**
- **Allow smaller vendors & operators to introduce their own services**
- **Multi-vendor deployments**
- **Competitive and vibrant supplier ecosystem**

Intelligence & Automation

- **Increasing complexity, densification and more demanding applications**
- **Networks must be “*self-driving*”**
 - Leverage learning techniques
 - Automate Network Operation
 - Reduce OPEX
- **Deep learning techniques with embedded intelligence at every layer**
- ***Goal to optimize closed-loop operations***

O-RAN Background



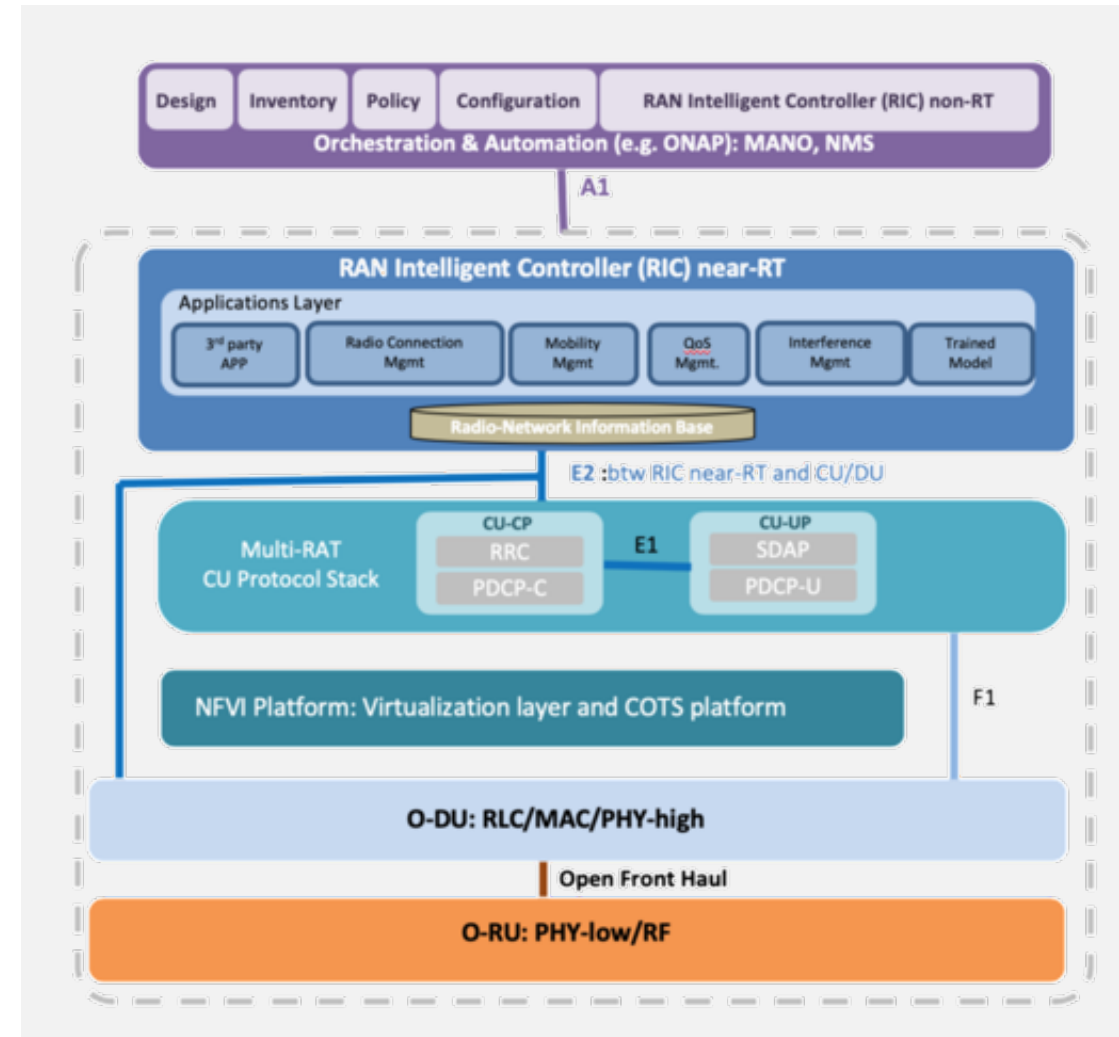
Founded in February 2018 by AT&T, China Mobile, Deutsche Telekom, NTT DOCOMO and Orange

Members

- 27 Global Mobile Telecom Operators
- 200+ Supply chain contributors 100% YoY Growth past two years

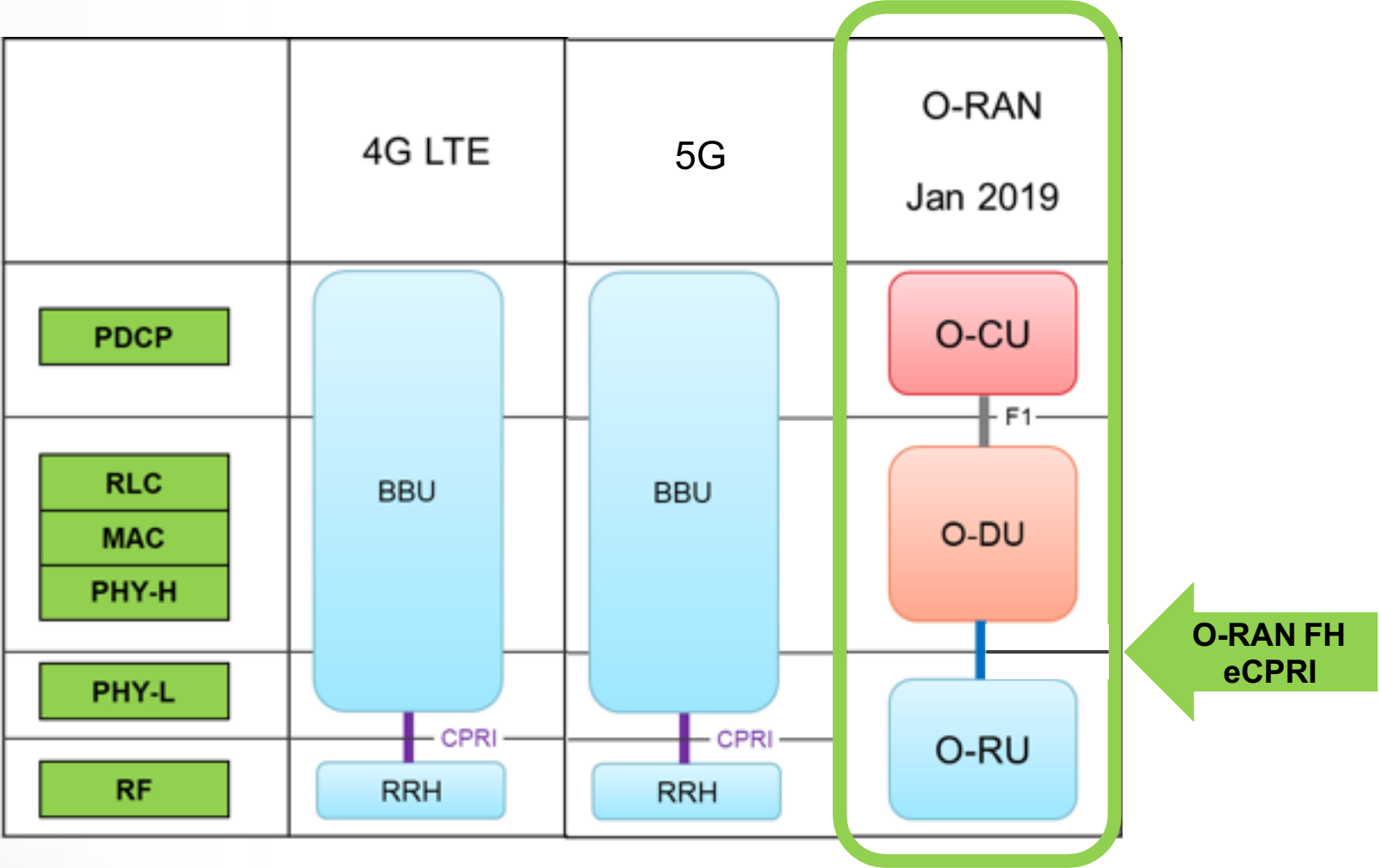
Keysight - O-RAN member since the inception

- 1st Test and Measurement company to join
 - (member of X-RAN since 2018)
- Focused on conformance, interoperability, & performance testing solutions



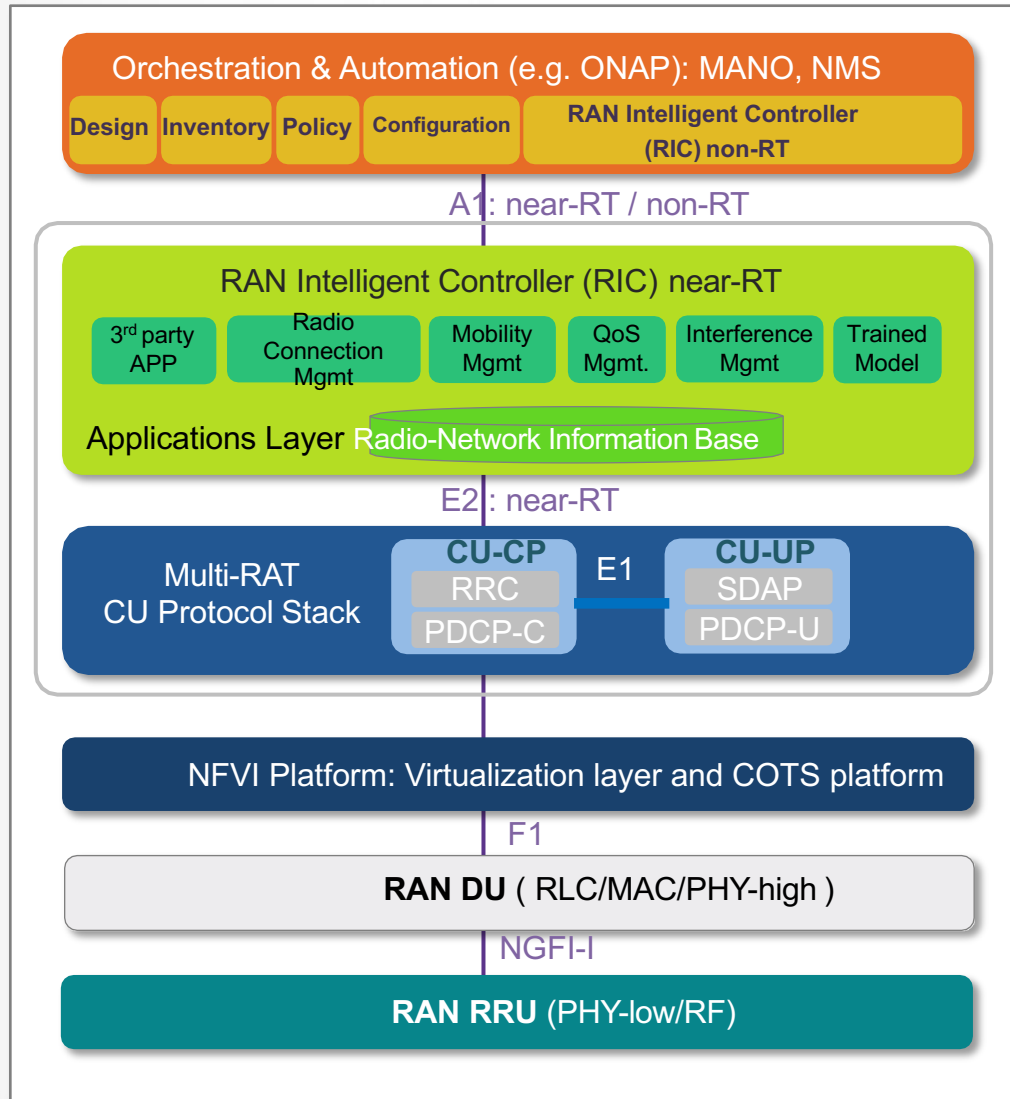
RAN Terminology

NEW TERMINOLOGY & NEW SPLITS FOR O-RAN

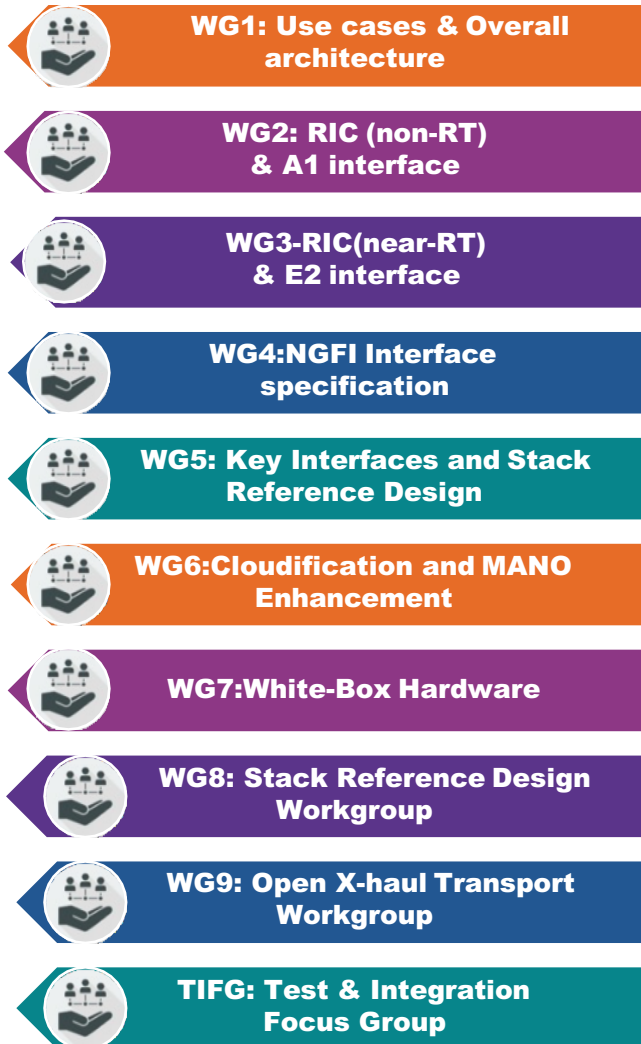


“One Vendor” “One Vendor” Can be Multiple Vendors

O-RAN overall architecture



O-RAN Working & Focus Groups



Embedded Intelligence

Open interface

Virtualization

Reference design & Whitebox

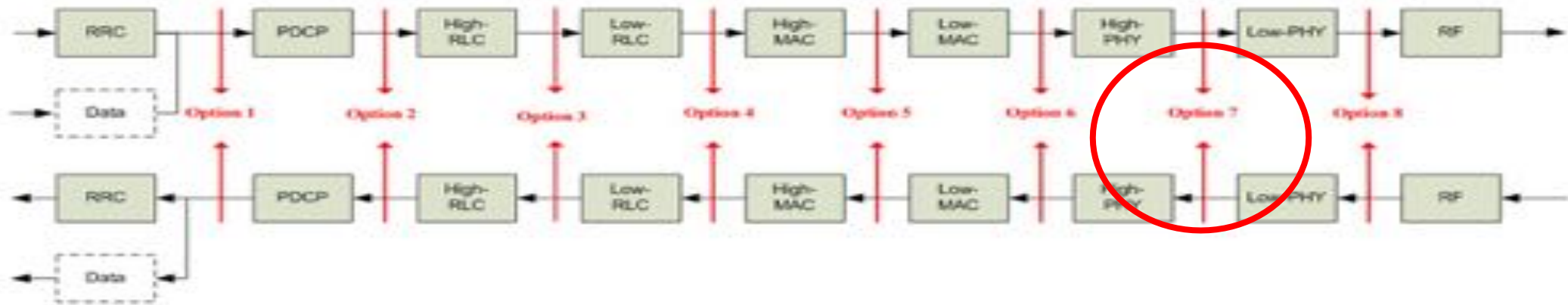
Standardization & Open Source

Functional Splits

Based on 3GPP 38.801

Executed centrally – CU
Low Bandwidth
High Latency Tolerance
Poor Antenna Coordination

Executed at cell site – DU
High Bandwidth
Low Latency Tolerance
Good Antenna Coordination



Layer 3 Functions

Layer 2 Functions

Layer 1 Functions

O-CU

O-DU

O-RU

- **O-RAN uses Split 7.2 for the Front Haul**
- **A set of full radio protocol stack functional splits between distributed units (DUs) and Centralised Units (CUs)**
- **Main purpose is to lower bit-rates on fronthaul interfaces**

Open Ran and O-RAN

SIMILARITIES AND DIFFERENCES

Similarities

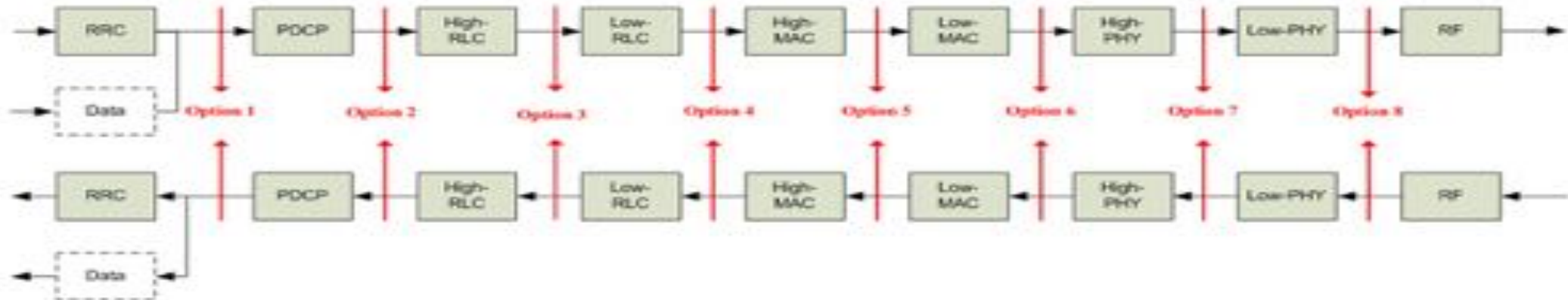
- Both desire to have an open RAN to drive a multivendor ecosystem

Differences

- O-RAN supports Split 7.2 with well defined open interfaces
- Open RAN can be Split 6,7,8 as long as it is not proprietary
 - Thus far Split 6 nFAPI is standardized
 - Split 8 CPRI is Proprietary – not fully defined

Executed centrally – CU
Low Bandwidth
High Latency Tolerance
Poor Antenna Coordination

Executed at cell site – DU
High Bandwidth
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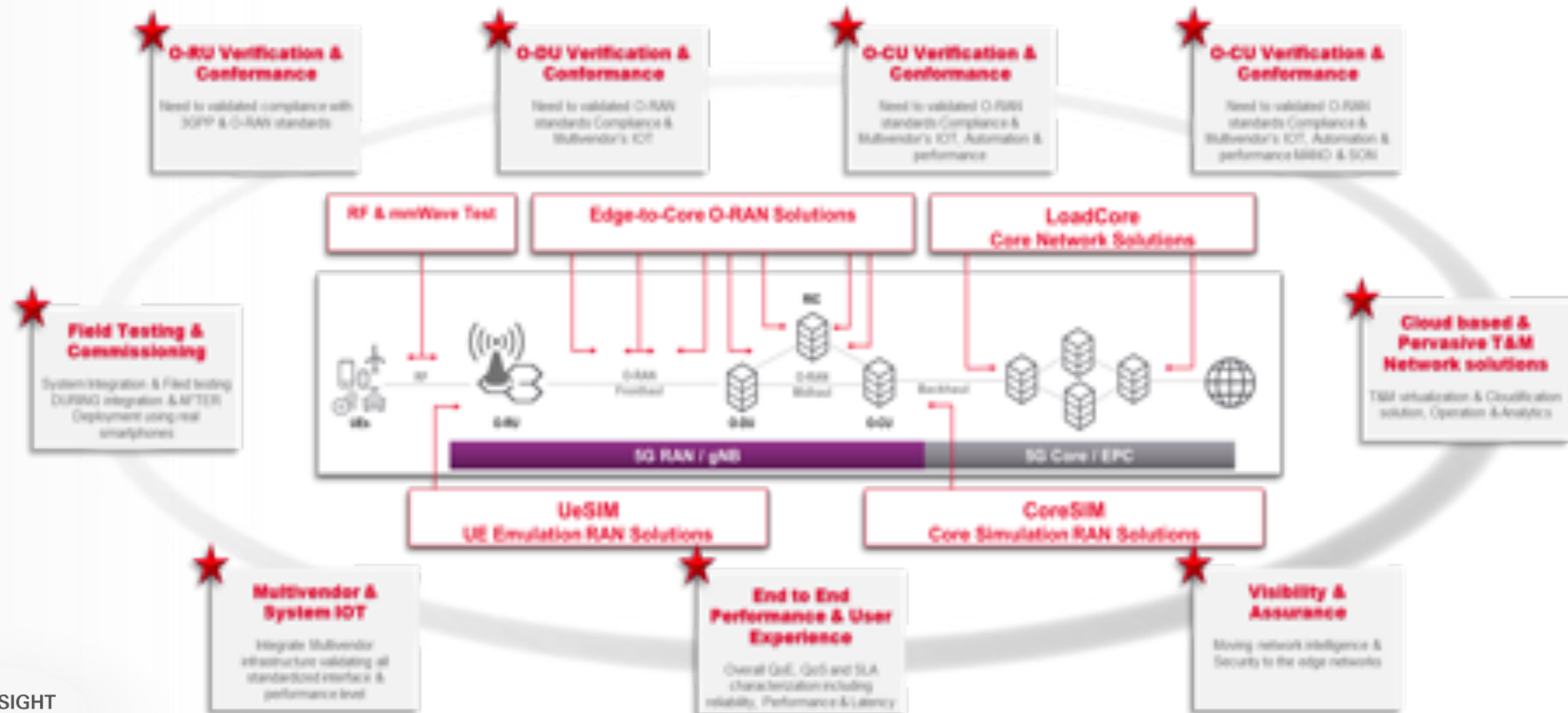


Challenges Keysight sees in O-RAN

HELPING TO DELIVER ON THE PROMISE OF AN OPEN RAN

www.keysight.com/find/ORAN

Keysight Enabling O-RAN Multi-domain & End to End testing



O-RAN Market Update

AMARKET EXPLOSION

Operators

- 2018 - 19
- 2019 - 22
- 2020 YTD – 27

Contributors

- 2018 - 55
- 2019 - 107
- 2020 YTD – 200+

Classic NEMs

- E///, Nokia, Samsung, NEC, Fujitsu, ZTE
 - Not Huawei
 - Some with Dual Portfolios Classic and O-RAN

O-RUs – > 10 new radio vendors

- Dell and HP 5G Labs announced
- Stack Vendor – Altran, Radisys, ...
- Accelerators – Nvidia, Xilinx, Intel

Geopolitical view

- Made in USA
- Made in India
- Limiting Huawei in certain regions

O-RAN Plugfests

- 2019 – 1 venue – Beijing
- 2020 – 4/5 venues

Open RAN TIP – 2G/3G/4G focus

O-RAN is 5G NR and LTE Brownfield

O-RAN Test Integration Focus Group - TIFG

O-RAN TEST INTEGRATION CENTER (OTIC)

What is it?

- The ONLY entity to certify a piece of network gear is O-RAN compliant
- Performs Conformance, Interoperability, and Performance tests on O-RAN Subsystems
- Issues Formal O-RAN Certifications and Badges

Who can be an OTIC?

- HOST must be an O-RAN member (i.e. mobile operator, non-vendor O-RAN contributor, third party authorized test laboratory)
- Guarantees
 - ✓ the credibility, confidentiality, openness and vendor-independence of OTIC.
 - ✓ the agreed test procedures are executed

When will the OTICs form?

- Process starting now
- First OTICs expected ~ April 2021