

Open RAN India 2024

# THE CRITICAL ROLE OF TESTING IN OPEN RAN SUCCESS



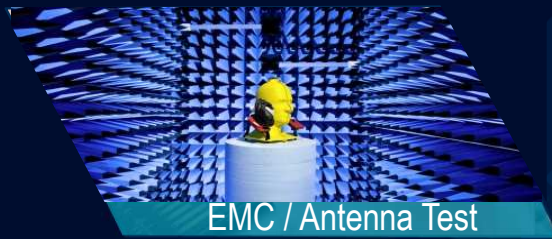
**Mahesh Basavaraju**  
Market Segment Manager  
Wireless Communications

**ROHDE & SCHWARZ**

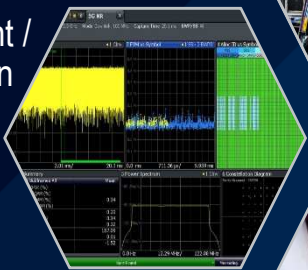
Make ideas real



# Innovative test solutions for the complete product lifecycle



Development /  
Characterization



Component  
Testing



Design Validation  
Testing



Regulatory and  
Conformance  
Testing



Service /  
Support



Production  
Test Solutions



# Infrastructure / RAN evolving into the next generation

- ◆ 3GPP and O-RAN FH Conformance
- ◆ Efficient production test
- ◆ Massive MIMO / Beamforming
- ◆ Over-the-air (OTA) tests
- ◆ New frequencies FR2-2, „FR3“
- ◆ Digital Design
- ◆ Energy Efficiency / „Net Zero“

Densification



AI/ML



Openness

Virtualization

Disaggregation



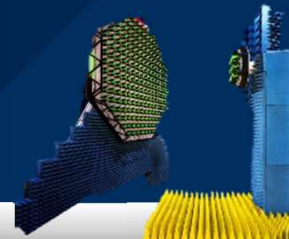
R&S®SMW/SGT/FSW



R&S®RTP



R&S®PVT360A



R&S®PWC200



R&S®ATS1800M

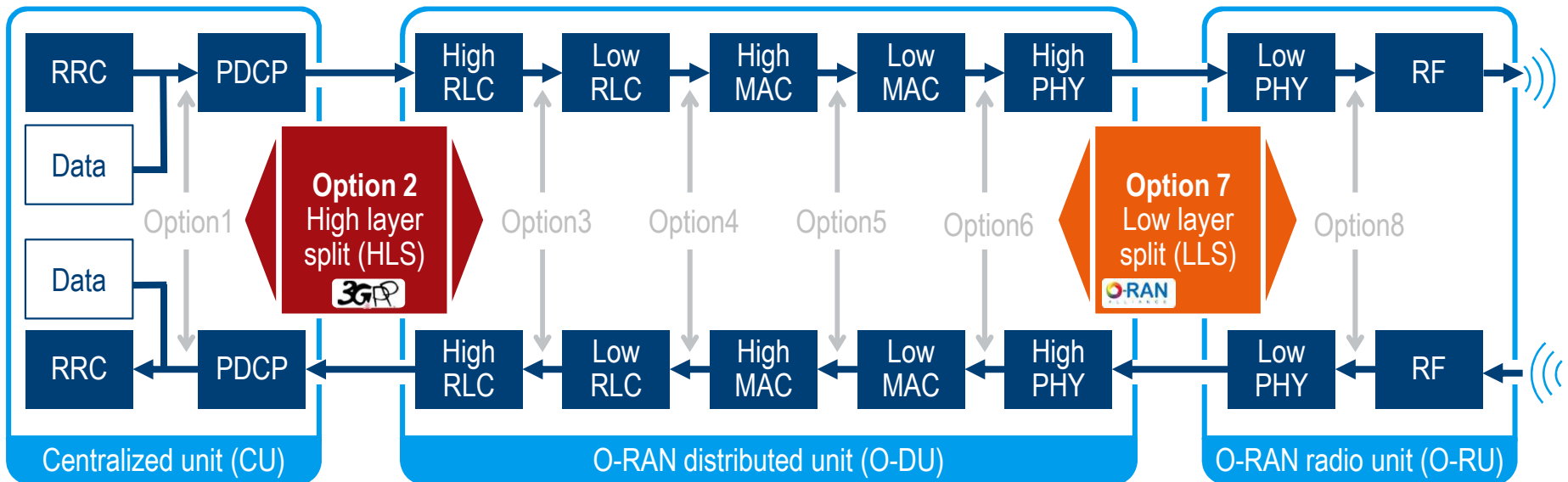


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# O-RAN INITIATIVE HLS AND LLS COMBINATION

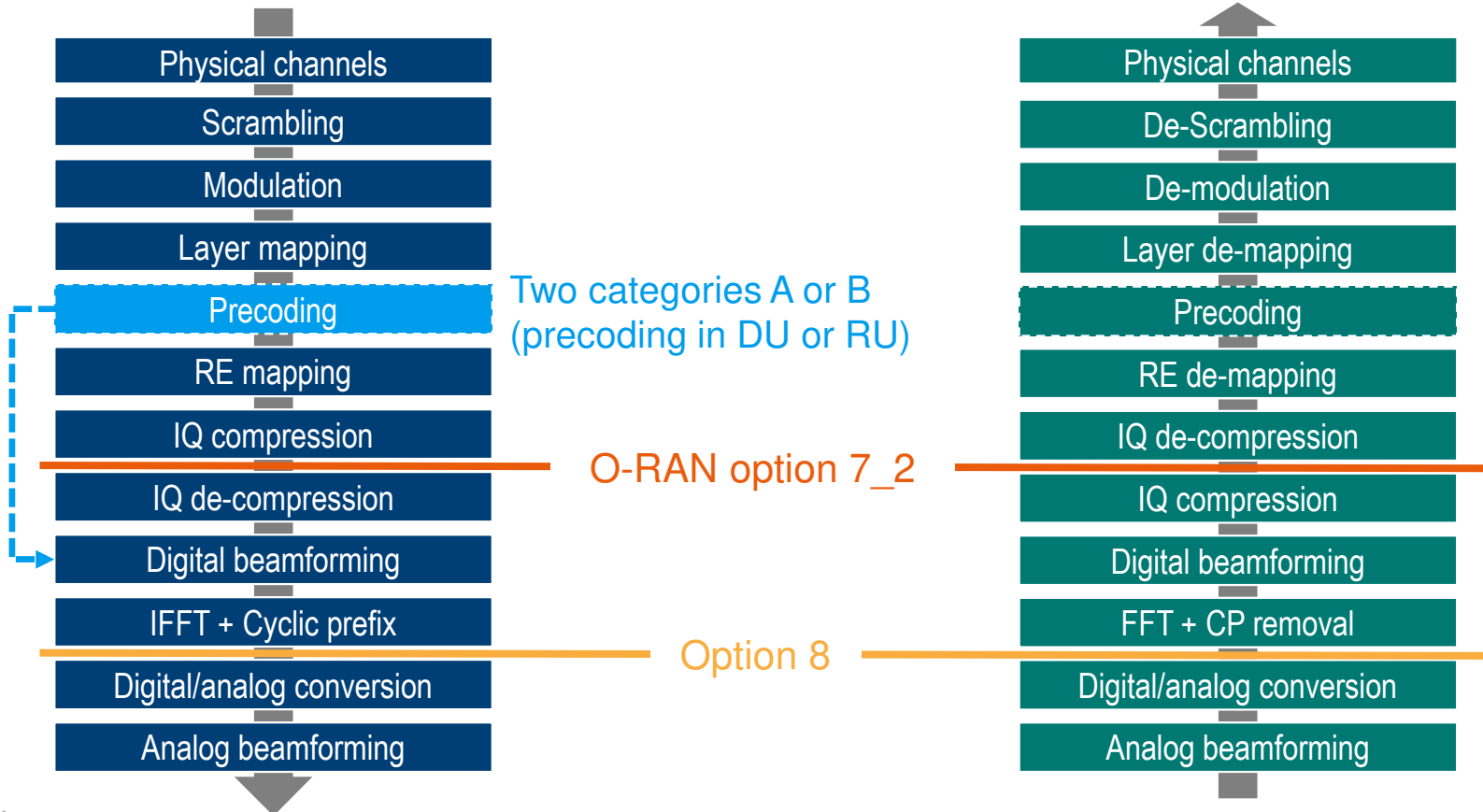


Double split option to bridge between centralization, data rate requirements and multi-radio coordination

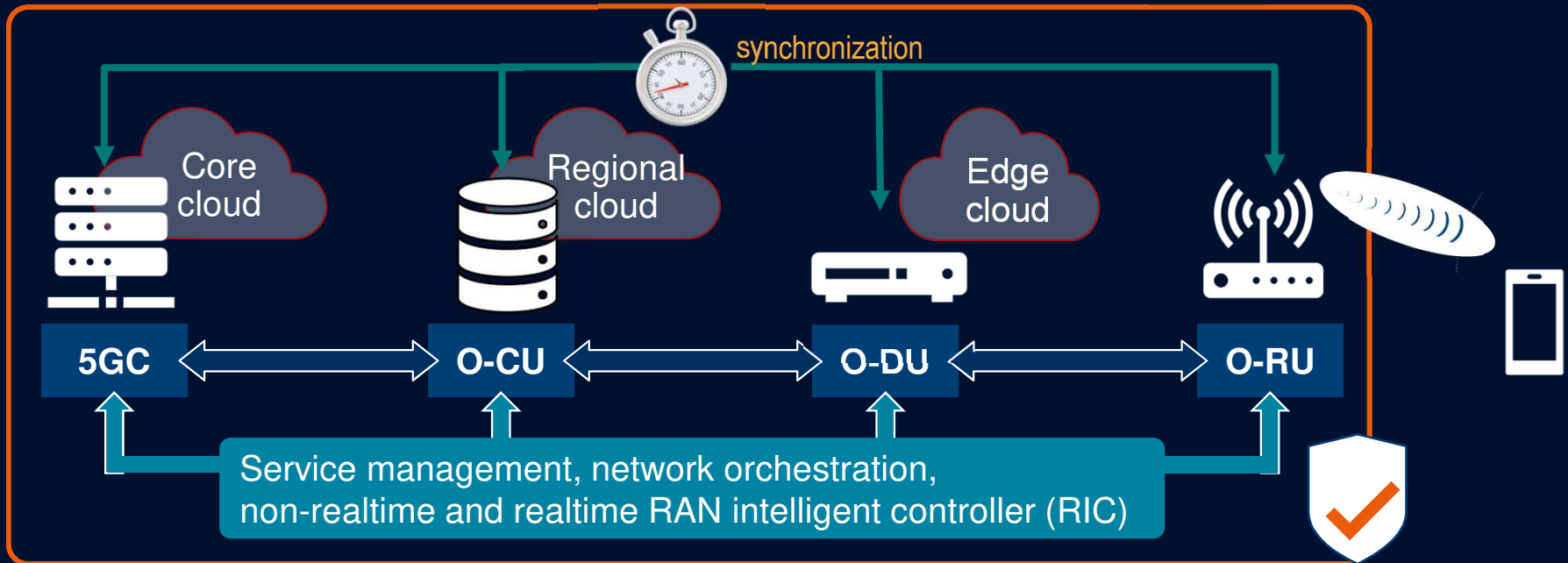
- ☺ RU complexity low + disaggregation, open but standardized interfaces => multi-vendors
- ☹ Requires additional standardization as complement to 3GPP + interoperability



# O-RAN INITIATIVE: LOWER LAYER SPLIT (LLS) DETAILS



# ORAN: HIGH LEVEL ARCHITECTURE



Open RAN is a cooperation between **radio technologies**, **transport network**, **cloud data storage**, **network management and RIC control**, **time synchronization** and **security**



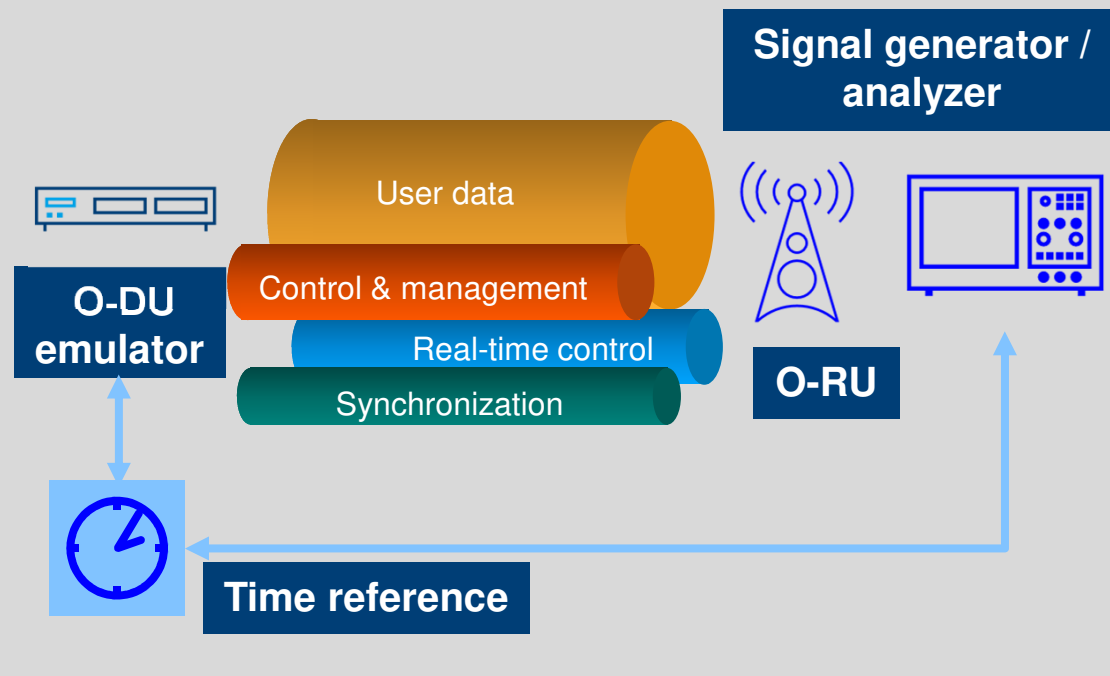
# O-RAN TESTING CHALLENGES

- ▶ **Specification and Standardization – Vendors implementing with own “flavor”.**
  - To ensure a network ecosystem that supports diverse and compatible devices with plug-and-play functionality, ongoing standardization efforts are essential.
- ▶ **O-RU connection to O-DU – Definition of configuration parameters.**
  - To enable a seamless setup, the O-RU should automatically obtain the configuration parameters from the O-DU by using AI/ML-based smart self-configuration.
- ▶ **System Integration and testing – Complexity of the testing; More SW/virtualized world (CI/CD/CT).**
  - Interoperability testing is an ongoing process requiring continuous effort and coordination among vendors ( e.g. plugfest organized at OTIC labs).
  - **Automation is fundamental to build/maintain multi-vendor network**
- ▶ **Energy Efficiency testing – how to test the network component EE?**
  - System level testing is quite straightforward, but how to measure single unit ( like O-RU) EE due to disaggregation?
  - How to test that RIC is doing right decisions ( e.g. using different sleep modes)?

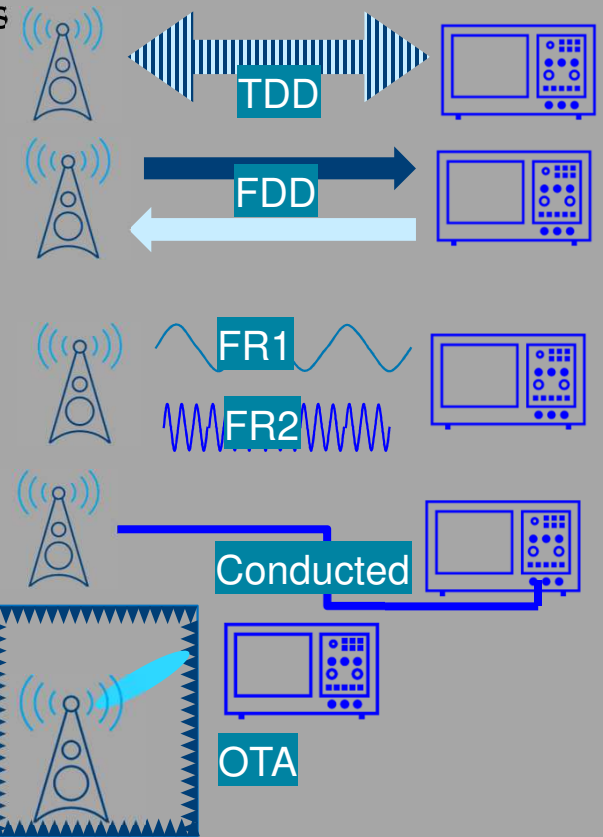


# O-RAN FRONTHAUL INTERFACE – TRANSPORT PROTOCOLS

O-RAN fronthaul conformance testing: We use the **air interface** to verify that the **user plane** data is mapped according to the **real-time control plane** scheduling commands



Testcases classified into:





# Base Station Testing

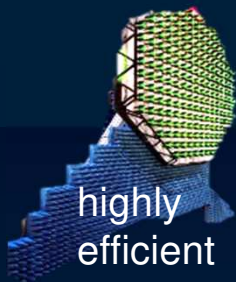
3GPP TS 38.141-1 v17.5.0 (2022-03)  
Technical Specification

3rd Generation Partnership Project;  
Technical Specification Group Radio Access Network;  
NR;  
Base Station (BS) conformance testing  
Part 1: Conducted conformance testing  
(Release 17)

3GPP TS 38.141-2 v18.0.0 (2022-12)  
Technical Specification

3rd Generation Partnership Project;  
Technical Specification Group Radio Access Network;  
NR;  
Base Station (BS) conformance testing  
Part 2: Radiated conformance testing  
(Release 18)

**Market Leader**



highly efficient

Conducted

OTA

Base Station

RF Unit

Baseband

Antenna

Vendor specific Control



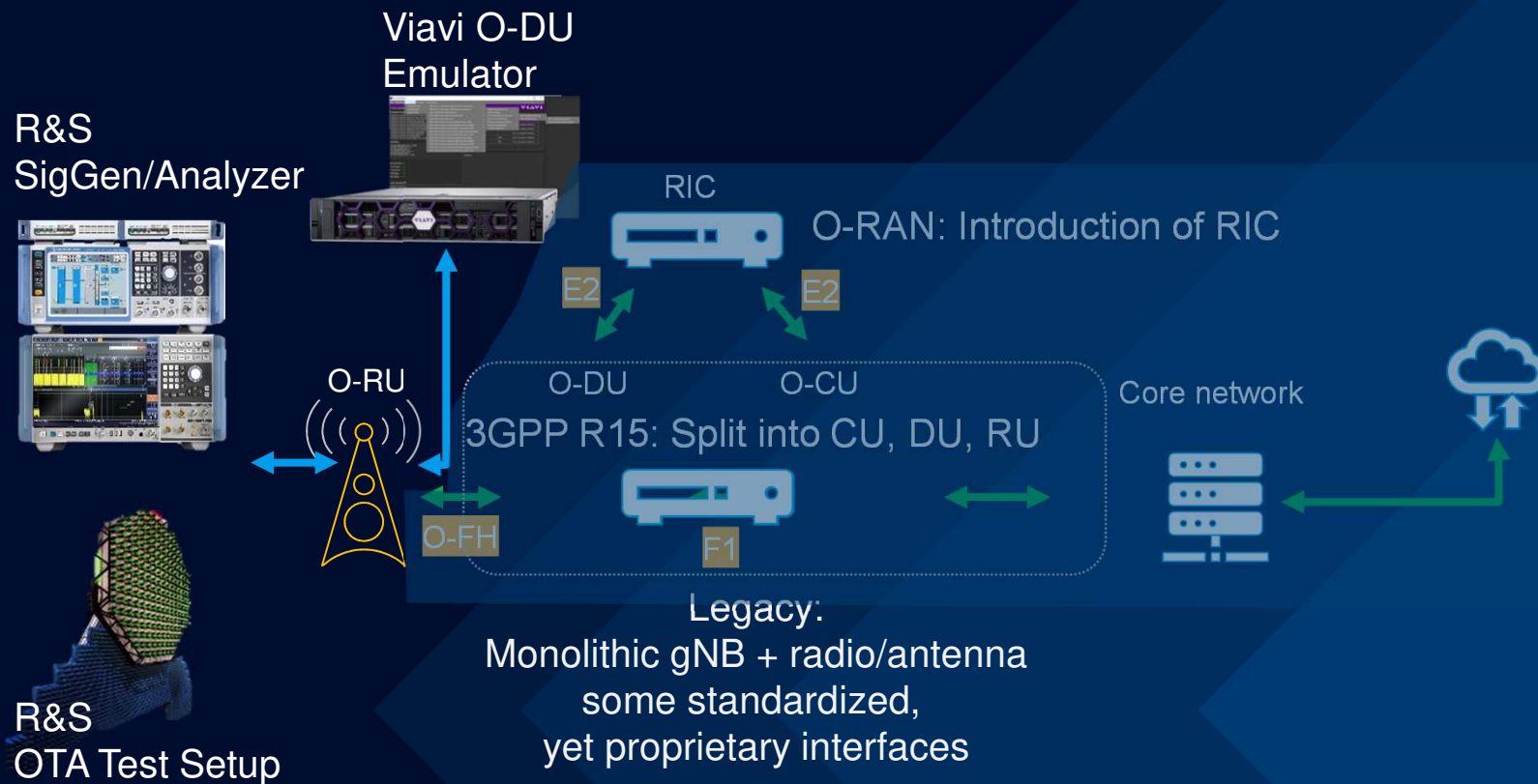
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► Ultimate 5G connectivity

# From classical RAN to disaggregation – O-RU Testing



R&S Contribution to O-RAN Testing Activities Worldwide

# O-RAN PLUGFEST ACTIVITIES



## US

Fall'21: Winlab Rutgers, NJ  
Spring / Fall'22: Univ of New Hampshire (IoL)



## Germany

Fall'22 @ i14yLab: FDD/TDD 8TRX O-RU ANALOG DEVICES  
Spring'23@i14yLab **Benetel**  
Fall'23 @i14yLab On-Going

## France

Fall'22@Orange Lab

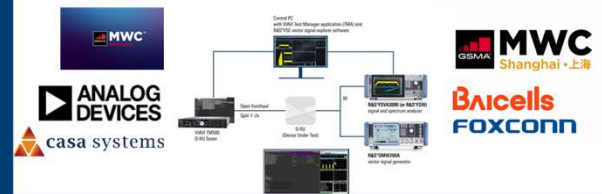
## Japan

Fall'23@YRP

## Taiwan **FOXCONN**

Spring'22 and Spring'23 @Auray Lab

### MWC23 DEMONSTRATIONS



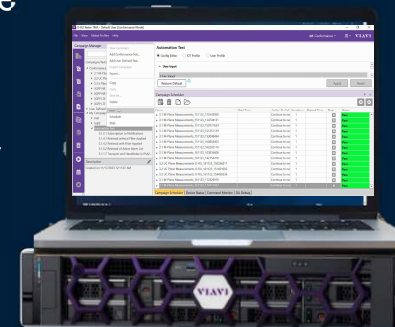
# EMERGING NETWORKS: NETWORK ENERGY SAVING ENABLED WITH POWERFUL T&M SOLUTIONS

A fully automated test solution to accurately measure and gauge the **Network Energy Savings (NES)** of the **O-RU** or energy consumption of a **subsystem** within the Radio Unit.

- The **VIAMI TM500 O-RU Tester** offers energy efficiency focused O-DU emulation test scripts.
- The **R&S®RT06 Oscilloscope** monitors the dynamic power consumption of the O-RU versus its broadcasting activities.
- The **R&S®NGT Power Supply** powers the O-RU and monitors voltage and current statistics over time.

VIAMI TMA  
O-RU Test Manager

R&S®NGT3600  
Power Supply



VIAMI TM500  
O-RU Tester

R&S®RT06  
Oscilloscope

ROHDE & SCHWARZ



VIAMI

VIAMI Solutions



# The R&S®PVT360A performance vector tester

## Minimal footprint, ultimate performance



### COMPACT

Two generators & two analyzers in one instruments

### EFFICIENT

Multi DUT testing  
Simultaneous measurements and harmonized communication between generator and analyzer

### FAST

Outstanding speed  
Sequential measurements without reconnection

### ULTIMATE PERFORMANCE

Great midrange RF performance (e.g. EVM)  
Ideal for DVT and PVT stages

### FLEXIBLE

Covering entire 5G NR FR1 range – up to 8 GHz / 500 MHz BW  
Flexible and extensive SW solutions  
Ideal for small & macro cell radio equipment and RF component testing



# EMERGING NETWORKS O-RU CONFORMANCE AND REGRESSION TESTING

- ▶ The fully integrated R&S PVT360A and VIAVI Solution is the most comprehensive and cost optimized, fully automated solution addressing the **O-RU regression testing, design validation and mass production** test stages.
  - PVT360 offers minimal footprint and high performance as required for O-RU Production testing.

Viavi's O-TMA  
Application Test Manager



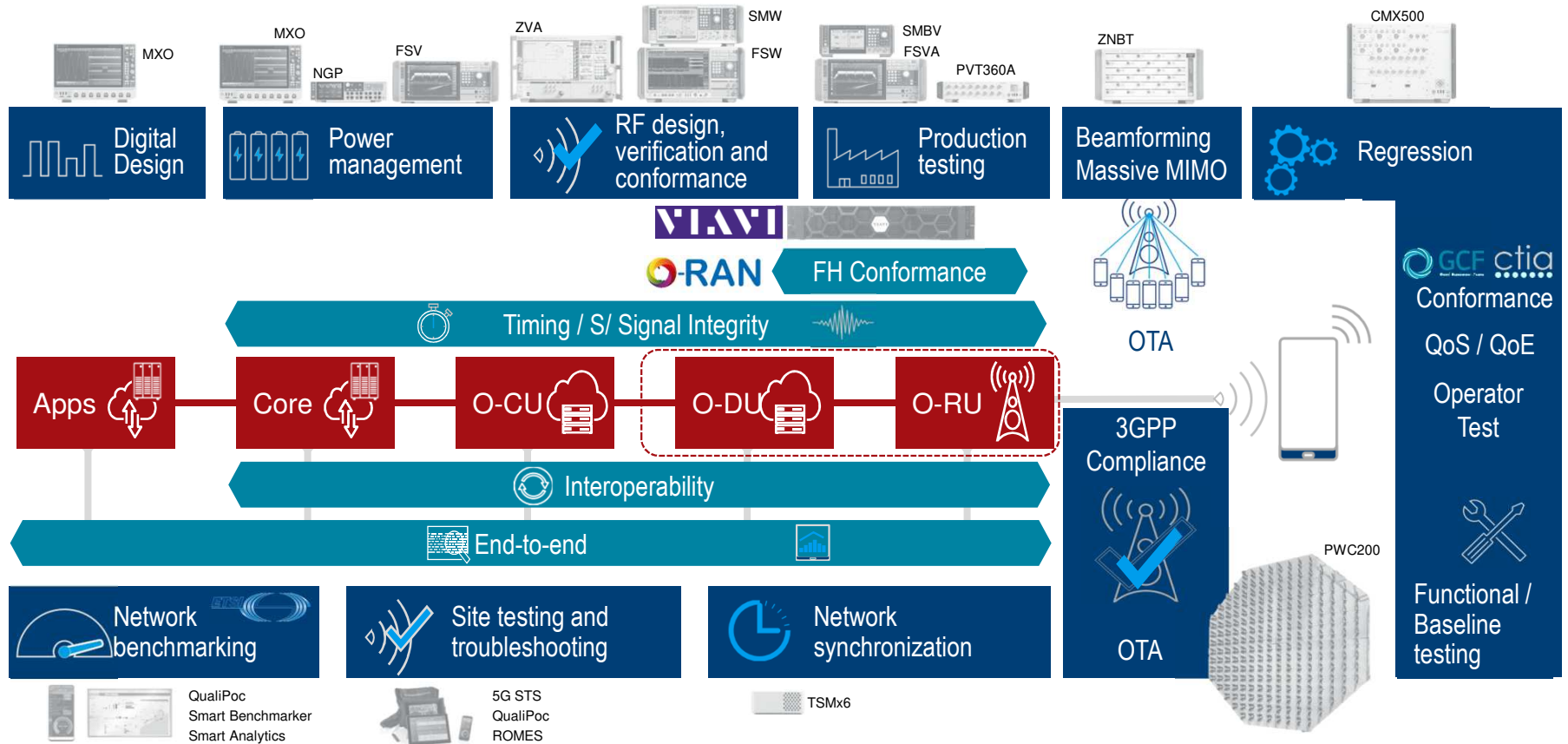
R&S PVT360A



Viavi TM500 O-RU tester

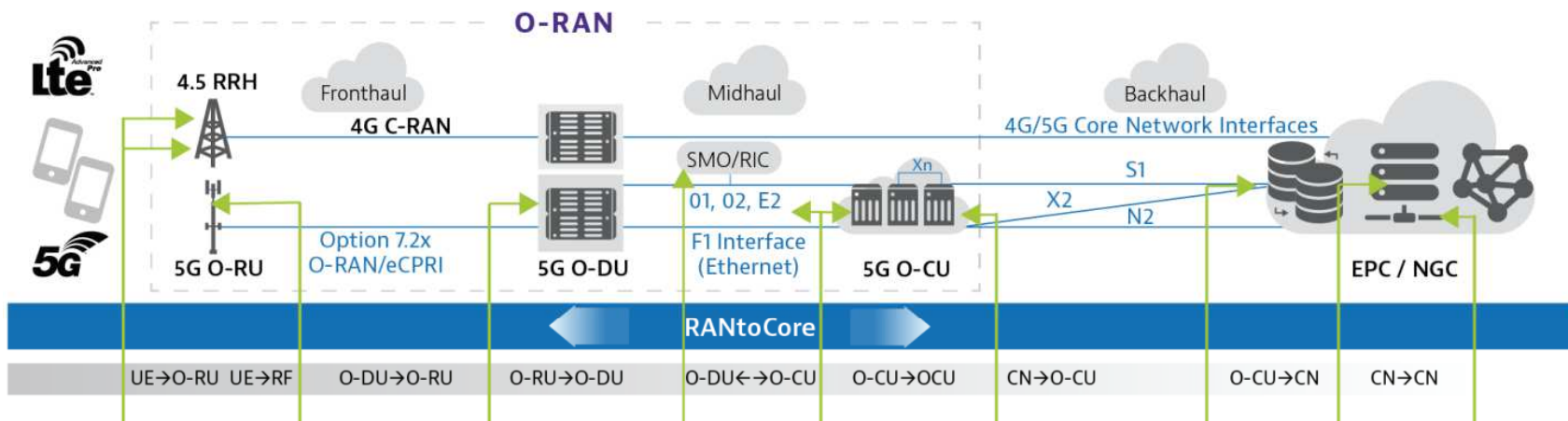
R&S and Viavi Solutions for O-RAN Lab Testing

# SOLUTIONS FOR O-RAN TESTING

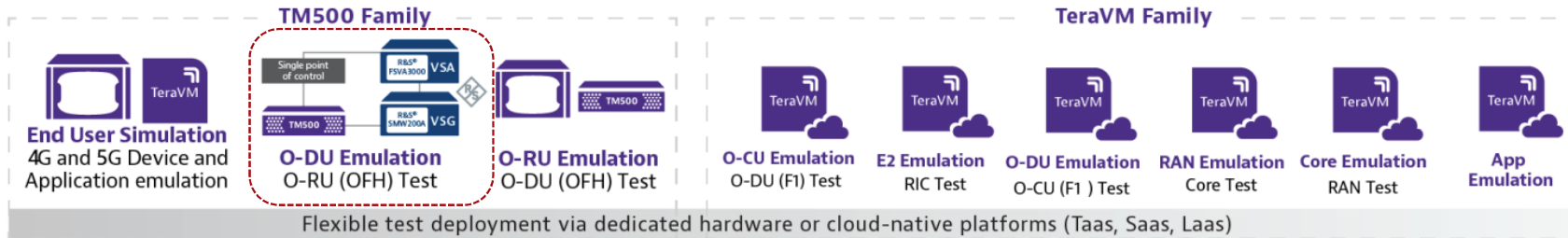


# VIAVI PORTFOLIO / COOPERATION WITH R&S

**FUNCTIONAL / PERFORMANCE / CAPACITY TESTING / TROUBLESHOOTING & ASSURANCE**



Complete set of Network Test Solutions & Services for 4G/5G, Open RAN and Cloud Networks





**TEST. MEASURE. INNOVATE**

**THANK YOU  
VERY MUCH**

**ROHDE & SCHWARZ**

Make ideas real

