CoreSIM: Core Emulation Solution

For O-RAN/RAN testing

Make Radio Access Network Testing Easier

A 4G/5G core simulator, CoreSIM makes Radio Access Network testing easier by eliminating Core Network unwanted dependencies and allowing an easily controllable, repeatable test environment setup. RAN test efforts can thus be concentrated on the Device Under Test, speeding up 3GPP and O-RAN standards implementation.

Highly scalable, CoreSIM enables the setup of multiple independent test sessions. Realistic traffic mixes of data, voice, video, or application flows can be created using the built-in traffic generator.

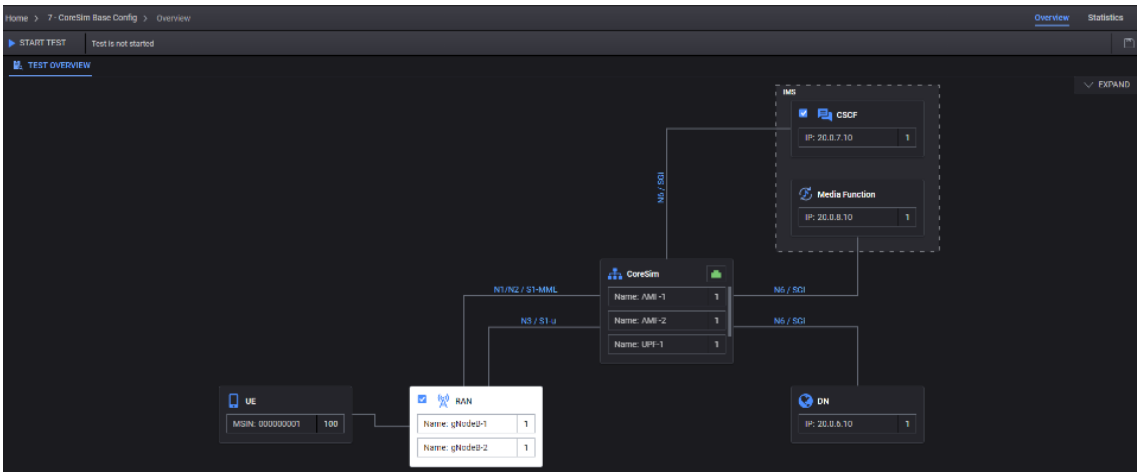

Figure 1. Keysight core emulation for LTE and 5G

Quality of experience metrics

Users have access to hundreds of comprehensive statistics in real-time during text execution with user-configurable views, or the data can be sent to an upstream server. All statistics are also available after the test completed, in CSV format for post-processing.

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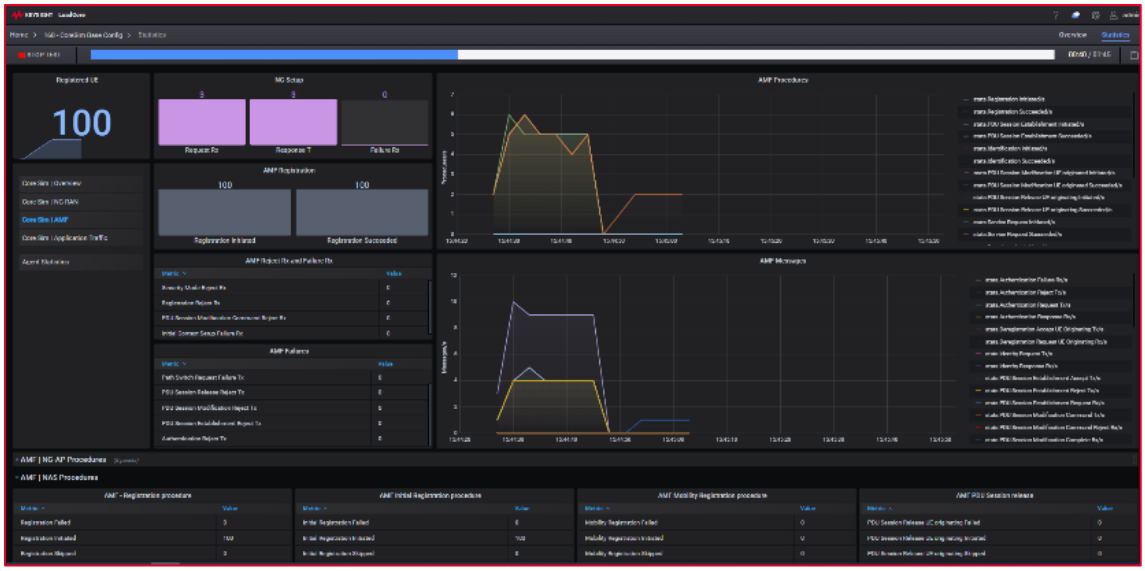

Figure 2. Keysight CoreSIM statistics view

Advanced filtering functionality is embedded in the tool allowing users to easily investigate any abnormal behavior happening in the network.

5G NSA (Option 3x) and LTE RAN validation

In the non-standalone (NSA) network topology, or in case of LTE only RAN, the CoreSIM simulates MME and SGW components over S1-MME and S1-U interfaces.

It can be employed as a standalone tool or in combination with Keysight UeSIM, RuSIM or DuSIM emulators, for a complete wrap-around testing of LTE eNodeB, 5G gNodeB or O-RAN O-DU and O-CU components.

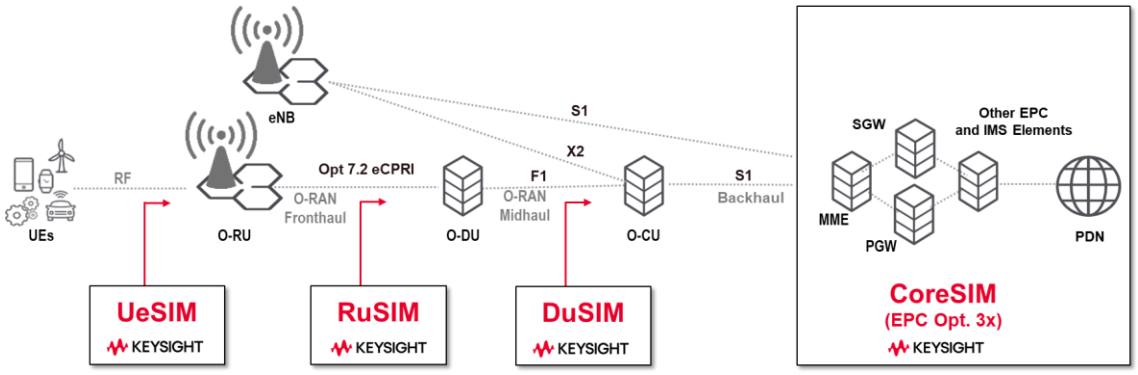

Figure 3. EPC Emulation for LTE and 5G NSA option 3x

5G SA RAN validation

In the 5G standalone (SA) topology, the CoreSIM simulates control plane traffic from the AMF over the N1 and N2 interfaces, and user plane traffic from the UPF over the N3 interface towards the NG-RAN.

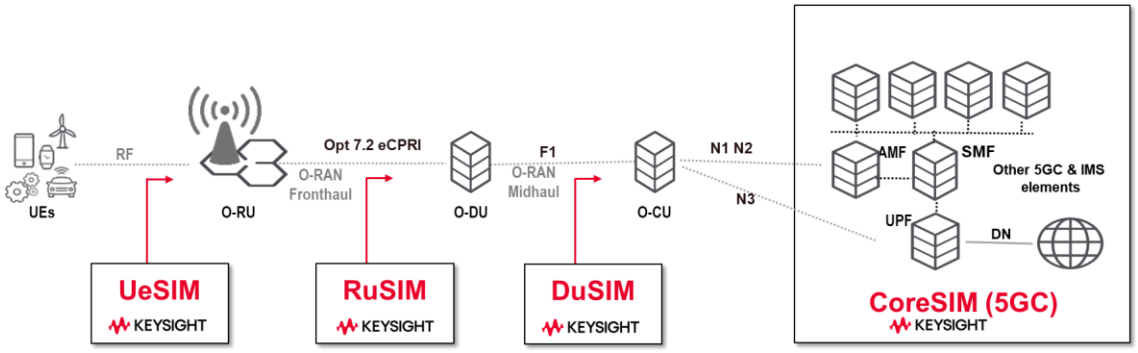

Figure 4. 5GC Core emulation for 5G SA

Full automation via REST APIs is available, CoreSIM allows users to create regressions for continuous validation of product quality. Complete RestAPI documentation available, including configuration samples, allowing users to easily integrate it into an existing automation platform or use Keysight's OpenTAP Automation platform.

Key benefits

- Support for 5G Core emulation in both NSA (Option 3x) and SA wrap-around scenarios
- Support for 3GPP versions Rel15/Sept2019, Rel16/Sept2020 and Rel17/Dec2022
- Highly scalable to multiple independent test session with stateful protocol emulation.
- Support of realistic traffic mixes including up to tens of thousands of UEs per instance – using built-in traffic generator or IP passthrough option
- Support for security testing based on 3GPP SCAS and O-RAN security specifications
- Control plane impairment functionality available, allowing building negative testing scenarios
- IPSEC support for testing gNBs by simulating the Security GW (SeGW)
- 3GPP IPSEC support for voice traffic.
- Quality of Experience metrics: real-time statistics with user-configurable views and post-processing data in CSV format
- Full automation via OpenTAP platform. Integration with other systems using REST APIs. Complete documentation and samples available
- Keysight hardware optionally available for on-prem installation
- Can be used as a standalone test tool or in combination with other Keysight O-RAN test solutions.

Product capabilities

5GC control plane

- Simulation of AMF and UPF over N1, N2, N3 interfaces
- NR Registration/Deregistration procedures
- gNB to gNB handover procedures
- Multiple Data Network Names (DNN)
- Multiple associated QoS Flows
- Multiple PDU sessions
- Support for IPv4 and IPv6 transport and PDN connections
- Support of EPS Fallback
- Negative testing support using Impairment capability.
- Support for IPSEC authentication using certificates.
- 5G Public Warning System and ETWS support
- Untrusted WiFI Control Plane support
- 5G Location Services support for Rel. 16 and Rel.17 E-CID Measurement quantities
- Emergency registration

EPC control plane

- Simulation of MME, SGW and SeGW components over S1 interface
- Dual Connectivity Radio Connection Support
- Support for Network Slicing with dedicated core network (DCN) for UE Range
- Support of IDLE state, Paging and TAU procedures.
- Support for IPv4 and IPv6 transport connections.
- Support for IPv4, IPv6, and IPv4v6 (dual stack) PDN connections.
- S1- and X2-based handovers, including MME and MME/SGW relocation options.
- Option to configure authentication modes for UE ranges.
- Support for Home eNodeB and Small Cell testing
- Emergency attach procedure

User plane

- Generation of multiple types of traffic over the emulated networks triple play support
- Validation of multiple Access Point Names (APNs) and Data Network Names (DNNs)
- Traffic configuration on N6 interface towards a DN IP address of choice
- Configuration of QoS and traffic flow template (TFT) per L7 activity
- Full support for IMS Core simulation, exposing P-CSCF (coordinated Gm and Rx) and Media Function.
- Support for SIP over TLS
- Support for VoLTE/VoNR over 3GPP IPSec, including Rel17 authentication.
- VoNR - IPME/MSRP, Emergency/911
- Highly customizable SIP and SDP headers via dynamic variables
- Support for External FTP

Keysight Open RAN Simulators Cloud Edition

CoreSIM runs on top of the Keysight Open RAN Simulators infrastructure, a cloud-native platform which allows multiple Keysight products to run in parallel (CuSIM, DuSIM, CoreSIM and LoadCore). This test solution provides seamless integration on the same infrastructure as the Device Under Test (DUT), sharing the same look-and-feel and functionalities across all products. The Keysight Open RAN Simulators platform can accommodate any type of cloud – public or private – via the deployment of containers or complete Virtual Machines (VMs).

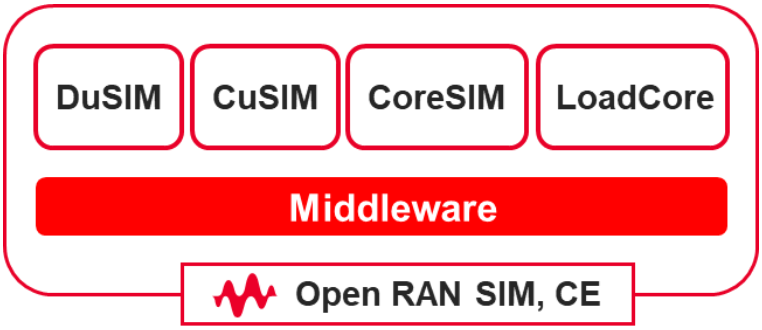

Figure 5. Keysight Open RAM Simulators Cloud Edition

One user interface for the different O-RAN and core testing needs

The Keysight Open RAN Simulators user interface is common across the different products of the Keysight O-RAN testing portfolio, both virtual and hardware-based, enabling end-to-end testing from a single common user interface.

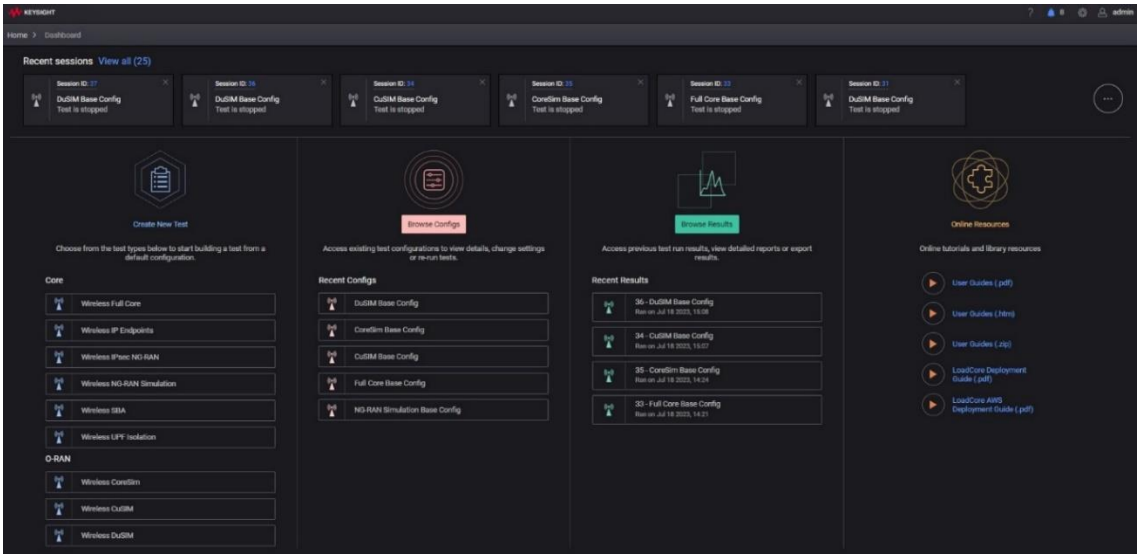

Figure 6. Keysight Open RAM Simulators Cloud Edition

CoreSIM components are software-based and optimized for stateful protocol emulation in virtual environments, adapting to your infrastructure and easily scaling to follow your testing needs.

Specialized Keysight hardware is available on demand.

Model	Description
P88109H 	**ORAN Server, runs Ubuntu OS** • 56c Xeon 6238R processor • 128 GB RAM (3200MHz) • 2 x HDD: 4TB + 2TB • 2 x Power Supply
Network Interface Cards	**Network Interface Cards** • 4 x 10GbE X710 T4 • 2 x 100GBE-SFP MCX516A-CCAT • 2 x 10BGE-SFP Intel 520 • 2 x 25 GBE Intel XXV710 • 2 x 10GBE-SFP Intel 520
Size and weight	• **Size:** 43.7 cm width (19” rack mounted) 8.89 cm height (2U rack mounted) 45 cm depth • **Weight:** 14 Kg.