DuSIM: O-DU Emulation Solution for O-CU Testing over F1 Interface

Capturing the Promises of Dis-aggregated 5G RAN

With O-RAN dis-aggregated architecture, three distinct components emerge, the radio unit (O-RU), the distributed unit (O-DU), and the centralized unit (O-CU). O-RAN open interfaces facilitate multi-vendor networks deployments, enabling a more competitive supplier system, thus introducing a strong demand for conformance, interoperability, and performance testing for all these components.

Keysight helps network equipment manufacturers, as well as mobile operators, in simplifying the interoperability challenges among multiple vendors to test the split architecture.

Keysight’s DuSIM is a O-DU emulator to validate O-RAN O-CU functionality, performance and conformance over the Higher-Layer Split midhaul interface (F1 interface).

Highly scalable, DuSIM can emulate hundreds O-DUs and is targeted to O-CU vendors who want to test the scalability of their architectures. This virtual solution (with Keysight specialized hardware optionally available) supports CU-UP/CU-CP split and both NSA and SA topologies. O-CU wrap-around testing is also possible using CoreSIM, Keysight core emulation option.

Full automation via Tcl, Python, and REST APIs is available, allowing users to create regressions for continuous validation of product quality.

Validate O-RAN CU functionality, performance and conformance over the midhaul interface

- Highly scalable to hundreds O-DUs and thousands UEs
- Throughput up to 16 Gbit/s per instance (with recommended hardware)
- Virtual solution (Keysight HW optionally available)
- NSA/SA topologies
- IPSEC over C-plane
- IPv6 support
O-CU Validation in NSA Mode

In the non-standalone (NSA) network topology, the DuSIM emulates both the F1 interface and eNodeB X2 interface for the LTE Anchor. ENodeB S1 interface is also provided when Device Under Test includes the EPC.

O-CU Validation in SA Mode

In the standalone (SA) network topology, the DuSIM simulates signaling and traffic flowing over the F1 interface between a simulated O-DU and the O-CU under test.
O-CU Wrap-Around Validation

Whenever the 5G Core or the EPC are not available, O-CU complete wrap-around testing is possible by including Keysight CoreSIM component into the simulation, both in NSA and in SA topology options.

Figure 3. O-CU wrap-around testing - NSA option.

Figure 4. O-CU wrap-around testing - SA option.
One User Interface for the different O-RAN testing needs

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

Software Only Test Solution with optional Hardware

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

Comprehensive platform support including standalone hypervisors (VMware ESXi and KVM) and OpenStack-based private clouds.

Specialized Keysight hardware is available on demand.
Product Capabilities

Control Plane

- Support of Non-Standalone and Standalone configuration procedures
- Simulation of thousands of sessions across multiple coordinated emulated O-DUs
- UE signaling procedures: Register/ Deregister/ Authentication/ Session Establishment and Release
- Validation of PDU Sessions establishment, uplink and downlink flows, deletion and modification of the sessions
- MeNB and SgNB procedures over X2AP
- eNB S1AP procedures
- Option to configure single or multiple PDU sessions per UE, with single or multiple DNNs
- Test any mix of IPv4 and IPv6 for control and user planes
- IPsec support for Control Plane
- Ability to configure and execute control-plane-only traffic models
- Topology-driven User Interface

User Plane

- Multiple activities per UE, with distinct Layer 7 (L7) protocol and data rate profile; Mapping of multiple L7 activities to distinct UE ranges, with individual traffic profile and mix
- Validation of multiple access point names (APNs) and data network names (DNNs)
- Configuration of QoS and traffic flow template (TFT) per L7 activity; Pre-built, editable TFTs
- Distinct objective configuration for each L7 activity: Simulated users, Throughput, Connections/second, Connection Attempts/second, and Concurrent connections
- Ciphering/Deciphering and Integrity protection/verification (NEA0 Null, 128-NEA1 Snow, 128-NEA2 AES, 128-NEA3 ZUC)
## Specifications

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Optional Hardware

X100-5G

- 2U appliance
- 2x CPU (Intel ES-2699V4, 22C, 2.4Ghz, 55Mb Cache)
- 128 GB RAM (2400-DDR4)
- 480 GB SSD
- Runs Ubuntu OS
- 4 PCI Express Slots

25GE NIC

- Dual SPF28 connectors
- Low-profile, short length standard form factor
- PCI-E 3.0 x8
- Mellanox ConnectX®-4 Lx EN Ethernet Controller
- Asset management features with thermal sensor
- Hardware offloads for VXLAN, NVGRE, and GENEVE encapsulated traffic
- Low-latency RDMA over converged Ethernet (RoCE)
- PCI-SIG SR-IOV compliant
- Jumbo frames support up to 9.6KB
- PXE support
- Erasure coding offload
- NC-SI for IPMI support
- RoHS compliant 6/6

10GE NIC

- Dual SFP+ connectors
- Low-profile standard form factor
- PCI Express 2.0 (up to 5GT/s)
- Intel® QuickData technology
- VMDq, next-generation VMDq, and PC-SIG SR-IOV for virtualized environments
- Load balancing on multiple CPUs
- iSCSI remote boot support
- FCoE
- Support for most network operating systems (NOSs)
- Support both DAC twin axial and LC fiber-optic SR cables
- RoHS compliant 6/6
Ordering Information

**P88688A - DuSIM - O-DU Emulation over F1 NSA/SA & L4-L7 Traffic Generation**
Includes: Support for both NSA and SA; F1 Interface; LTE Anchor on X2 interface; up to 32x DUs; Up to 16K UEs, Throughput enabled up to 20 Gbps (total UL+DL); L4-7 Appl. Traffic Generator.

**P88689A - DuSIM Performance Enabler**
Requires P88688A. Includes additional 32x DUs; additional 16K UEs; additional 20 Gbps Throughput (total UL+DL).

**P8800P3 - DuSIM and CoreSIM Lite**
Includes DuSIM and CoreSIM Lite (limited to 8 gNB/eNB), supporting O-DU Emulation over F1 NSA/SA, Core Network Emulation over S1/N1/N2/N3 and L4-L7 Traffic Generator/Termination.

**P8800H1-FG - X100 5G Appliance**
Optional X100 5G Server (960-0529)

**P8800H2-FG - 25GE NIC 2-ports**
Optional 25GE NIC (960-0528)

**P8800H3-FG - 10GE NIC 2-ports**
Optional 10GE NIC (960-0999)

Learn more at: [www.keysight.com](http://www.keysight.com)

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