

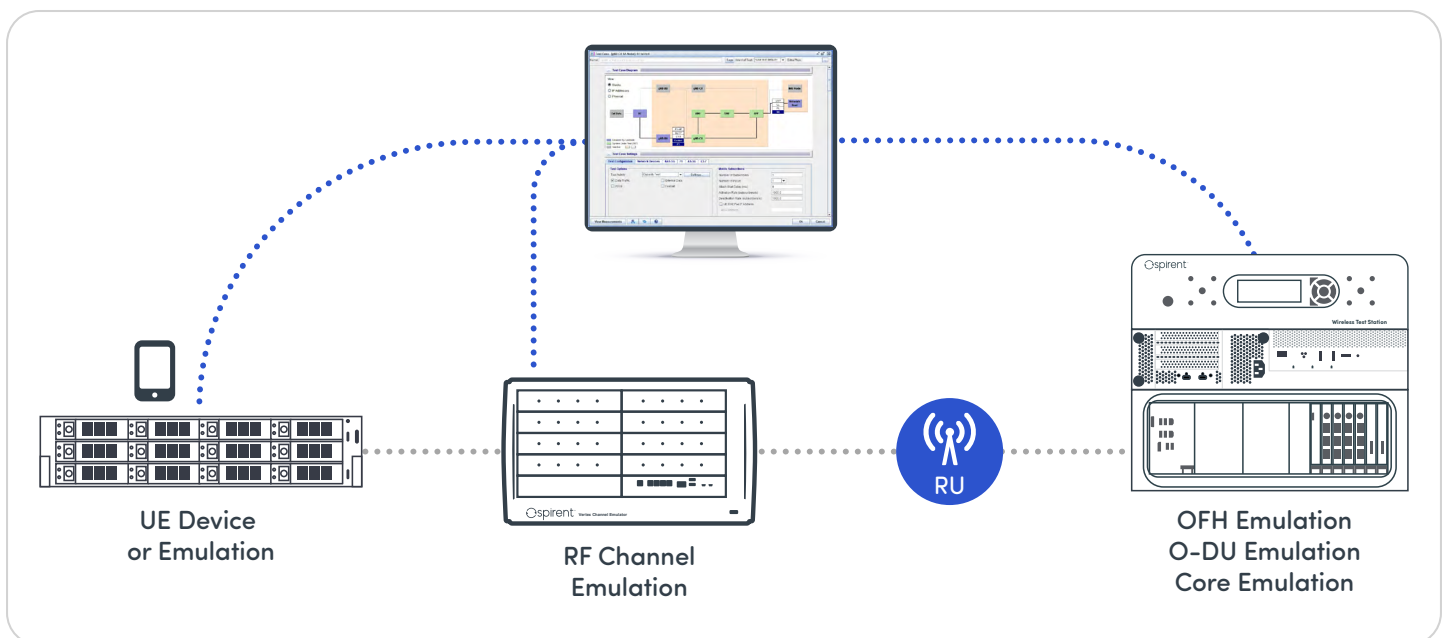
Spirent O-RAN O-RU Test Solution

O-RU Wraparound Performance Testing

Open RAN (O-RAN) architecture disaggregates and splits traditional RAN into CU (Centralized Unit), DU (Distributed Unit) and RU (Radio Unit), supporting standardized open and interoperable interfaces, and allowing key functions to run as virtualized software functions on vendor-neutral hardware. This avoids single-vendor dependency by opening the architecture to multiple suppliers.

However, lack of domain maturity coupled with an increasing push for momentum creates a perfect storm when it comes to O-RAN. There are major challenges yet to overcome: ensuring performance and robustness, interoperability, internal preparedness to deploy and manage O-RAN, new costs, and security, just to name a few.

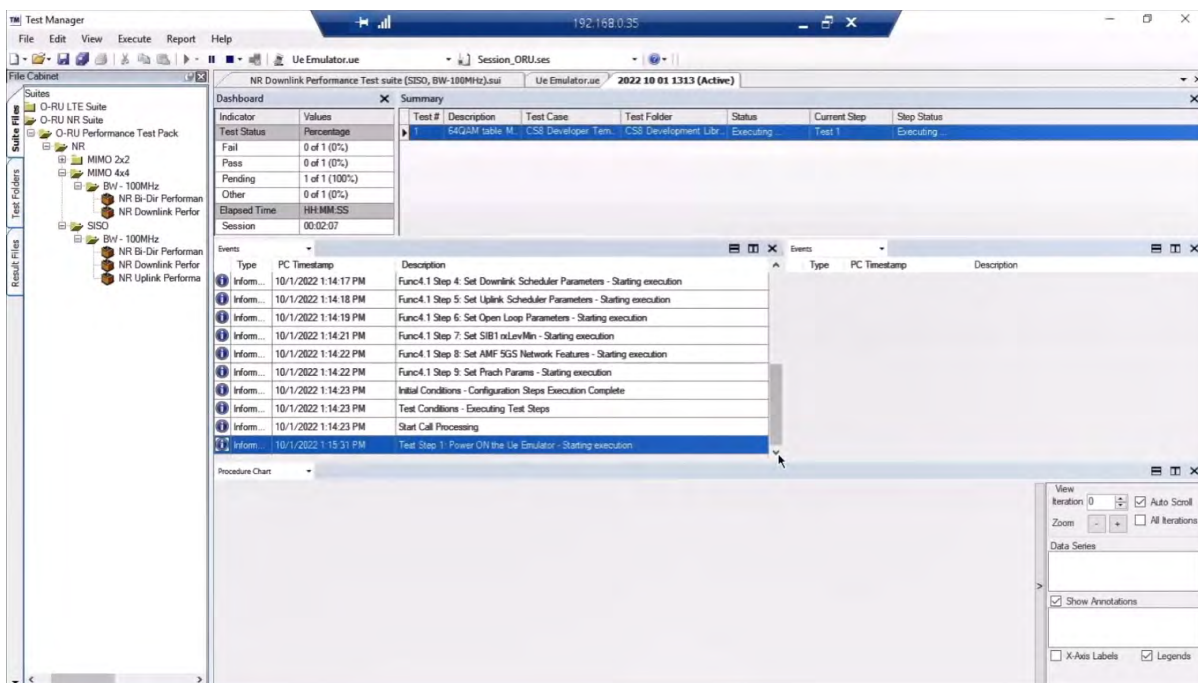
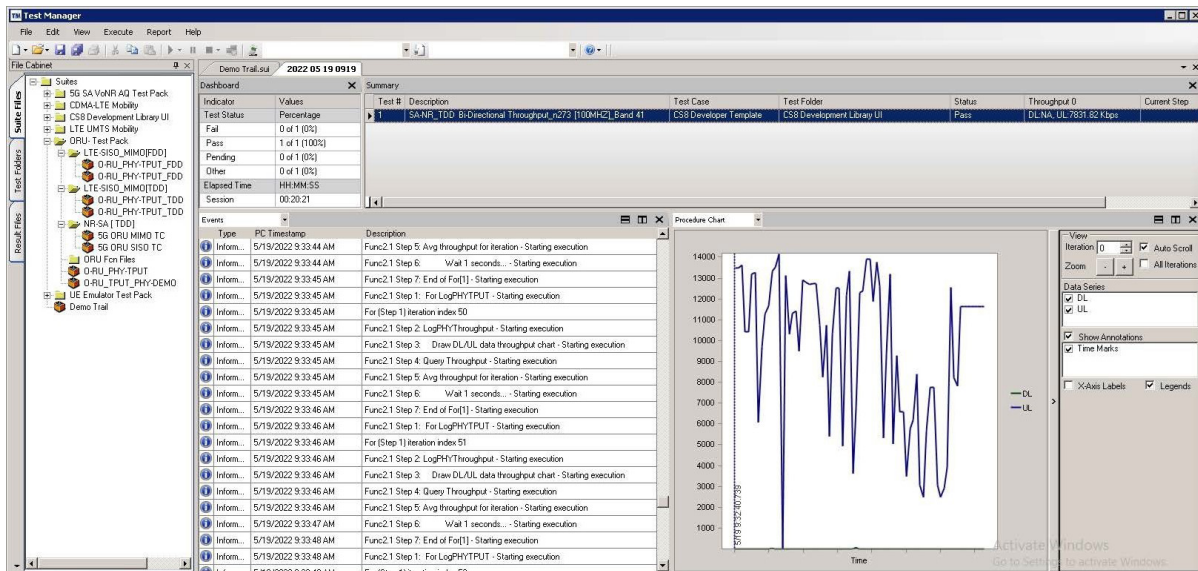
Among the challenges with the different components (RU, DU, CU), the RU is deemed to be the most challenging. Although the RU doesn't have intelligence about mobility, load balancing, etc., the RU needs to maintain high-performance real-time signal processing. The RU converts digital signals from the DU to radio signals to the devices. On the digital side, the RU needs to communicate with the DU via 7-2x protocol over the eCPRI interface and fully synchronize to a nanosecond level. On the radio side, the RU needs to have good RF quality to maximize the benefits from different advanced technologies, e.g., MIMO and beamforming. Sensitivity and dynamic range of the RU are other key RF metrics that provide broader high-quality cell coverage to the carriers. Lastly, since the RU is the only component that cannot be virtualized and the quantity needed in a network is huge, the majority of deployment costs for carriers is tied to the RU (over 70%).



All the above is controlled by a single User Interface (UI) with access to power automation capabilities via RESTful or Tcl APIs.

In this solution, in the upstream, Spirent emulates the DU, CU, and core for both 4G and 5G. All components are real-time, state machine-based to provide actual emulation of the DU, CU, and core in the live network. In the downstream, an UE emulator or any commercial device on the market can be used in the setup. All the components are fully automated by a single user experience to provide wraparound RU testing.

For advanced RU testing that fully evaluates and benchmarks different RUs' performance, an RF channel emulator can be added to create different scenarios to emulate real world conditions and fully test advanced technologies, such as MIMO and beamforming. With RF channel emulation, the test solution can emulate signals under fast fading, frequency drifting due to fast motion (e.g., high speed train), multipath, or different correlation between antennas or antenna elements. This testing solution eliminates the need for carriers to perform expensive, non-repeatable, and time-consuming drive testing in the live network.



The single UI/UX is one of the most powerful features of Spirent's O-RAN Test Solution, allowing unified control for all the network functions in an easy and intuitive visual interface

Features and Benefits

- Fully automated single GUI controls UE, RF channel emulator, RU (DUT), DU, CU, core (EPC/5GC)
- Real-time live network emulation for DU, CU, core, and UE
- Advanced O-RU Sensitivity Performance Testing for benchmarking O-RU performance
- Advanced O-RU Near-far Dynamic Range Testing
- Supports all 3GPP compliance tests
- Supports testing all applications in the system, e.g., VoNR, video conference, YouTube, FTP, media streaming, gaming
- O-RAN Alliance TIFG End-to-End Test Specification Section 4 functional testing
- O-RAN Alliance TIFG End-to-End Test Specification Section 5 performance testing
- Supports 7-2x over eCPRI interface between RU and DU emulator
- Time synchronization with PTP
- Clock synchronization with 10MHz and 1PPS with RU
- Supports 5G SA TDD/FSS
- Supports FR1 TDD bands and channels defined in 3GPP (n38, n39, n40, n41, n48, n50, n77, n78, n79, n90)
- Supports configurable subcarrier spacing (15kHz, 30kHz)
- Supports configurable bandwidth (10MHz to 100MHz)
- Supports configurable resource block (RB) allocation for uplink and downlink (1 to 273)
- Supports configurable modulation up to 256QAM for both uplink and downlink
- Supports configurable MIMO up to 4x4
- Includes predefined test cases for different configurations
- User-defined Pass/Fail criteria to satisfy different requirements
- Real-time data plotting for data performance
- Supports configurable test duration and number of iterations for regression testing
- Supports automation of multiple tests with different configurations
- Supports stability testing with different durations and conditions
- Supports the integration of lab automation tools
- Real-time display of over-the-air messages for both RAN and core
- Supports configurable PLMN, SIM cards, authentication, and encryption
- Supports packet error rate analysis for uplink and downlink
- Supports user plane with 10G line rate
- Support testing with multiple UEs

Technical Specifications

- 3GPP TS 24.301 Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3
- 3GPP TS 24.501 Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3
- 3GPP TS 29.281 General Packet Radio System (GPRS) Tunneling Protocol User Plane (GTPv1-U)
- 3GPP TS 36.331 Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) protocol specification
- 3GPP TS 36.413 Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)
- 3GPP TS 37.340 NR; Multi-connectivity; Overall description; Stage-2
- 3GPP TS 38.323 Packet Data Convergence Protocol (PDCP) Specification 3GPP TS 38.331 Radio Resource Control (RRC) protocol specification 3GPP TS 38.401 NG-RAN; Architecture description
- 3GPP TS 38.413 NG-RAN; NG Application Protocol (NGAP)
- O-RAN.WG4.CUS.0-v01.00
- O-RAN.TIFG.E2E-Test.0-v03.00

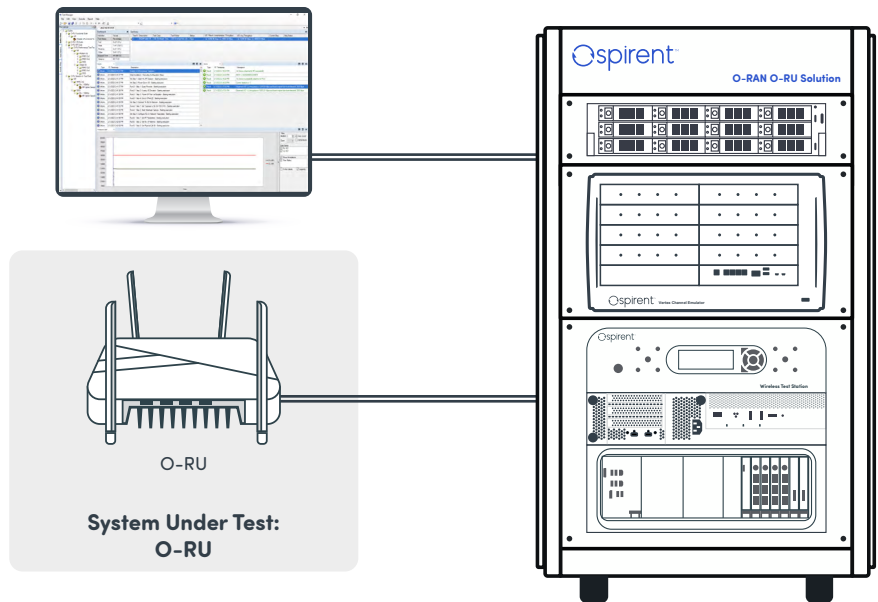
About Spirent

Spirent Communications (LSE: SPT) is a global leader with deep expertise and decades of experience in testing, assurance, analytics and security, serving developers, service providers, and enterprise networks. We help bring clarity to increasingly complex technological and business challenges. Spirent's customers have made a promise to their customers to deliver superior performance. Spirent assures that those promises are fulfilled.

For more information visit:
www.spirent.com

Ordering Information

Part Number	Description
ORAN-RU-LTE-001	Basic bundle for O-RAN LTE O-RU Testing (INC 64 UES, WTS and Automation Test Packs)
ORAN-RU-LTE-101	Medium bundle for O-RAN LTE O-RU Testing (INC 64 UES, WTS, Basic Vertex and Automation Test Packs)
ORAN-RU-LTE-201	High bundle for O-RAN LTE O-RU Testing (INC 64 UES, WTS, ADV Vertex and Automation Test Packs)
ORAN-RU-NR-001	Basic bundle for O-RAN NR O-RU Testing (INC 64 UES, NR DU and Automation Test Packs)
ORAN-RU-NR-101	Medium bundle for O-RAN NR O-RU Testing (INC 64 UES, NR DU, Basic Vertex and Automation Test Packs)
ORAN-RU-NR-201	High bundle for O-RAN NR O-RU Testing (INC 64 UES, NR DU, ADV Vertex and Automation Test Packs)
ORAN-RU-LTENR-001	Basic bundle for O-RAN LTE And NR O-RU TESTING (INC 64 UES, WTS, NR DU and Automation Test Packs)
ORAN-RU-LTENR-101	Medium bundle for O-RAN LTE and NR O-RU Testing (INC 64 UES,WTS, NR DU, Basic Vertex and Automation Test Packs)
ORAN-RU-LTENR-201	High bundle for O-RAN LTE and NR O-RU Testing (INC 64 UES, WTS, NR DU, ADV Vertex and Automation Test Packs)



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