SIMNOVUS

# LabTool Kit

## For Academia

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# Product Overview

The LabTool Kit for Academia is an advanced simulation platform designed for telecom education, research, and innovation. It enables users to explore the complete 4G and 5G protocol stack, test new algorithms, and foster telecom-focused startups. This all-in-one toolkit provides hands-on learning opportunities, helping bridge the gap between theory and real-world telecom applications.

# Key Features

- **Multi RAT Support:** Supports 4G and 5G
- **Device and Network Emulation in one:** Simulates multiple types of devices and all the elements in a 4G and 5G network.
- **Protocol Stack Visibility:** Gain insights into all layers of 4G/5G communication.
- **Customizable Test Scenarios:** Create and modify testcases to validate new algorithms.
- **Startup Incubation Support:** Can be used as a "Lab as a Service" platform.
- **Industry-Relevant Training:** Hands-on learning for faculty and students.

# Applications

Use it for validating functional scenarios for the below use cases

- Academic research and teaching
- Telecom protocol development and testing
- Prototype validation for network devices
- Startup incubation and innovation labs ·
- Industry-aligned training and upskilling

# Technical Specifications

| Specification | Details |
|---|---|
| Supported Technologies | 4G LTE, 5G NR (SA & NSA), Nb-IoT, NTN |
| Supported Scenarios | • UE Registration and Deregistration<br>• Data traffic using UDP, TCP, Http, FTP<br>• Voice and Video (VoLTE/VoNR, ViLTE/ViNR)<br>• Handover scenarios<br>• Nb-IoT and NR based Non-Terrestrial Networks<br>• RedCap (Reduced Capability UEs)<br>• Network Slicing<br>• Unified Access Control<br>• And many more |
| Configuration | Web-based and text-based configuration |
| Statistics | Web-based dashboard with real-time analytics |
| Logging | Web-based and text-based logging to view messages at different layers |
| Integration Capabilities | API support for third-party applications |
| Product Platform | • Standard x86-based server running on General Purpose Processor<br>• Ubuntu OS |

# Product Variants

The requirements may vary, which is why we offer multiple variants tailored to meet your specific needs, based on the E-I-I Model.

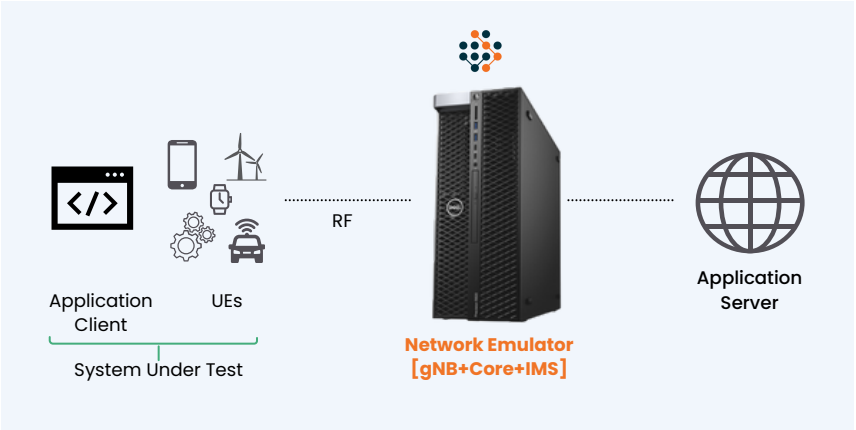
| Variant | Max Carrier BW | No of cells | Features Supported |
|---|---|---|---|
| LabtoolKit-Foundation | 50 MHz | 1 | All except handover |
| LabtoolKit-Ignite | 100 MHz | 1 | All except handover |
| LabtoolKit-Elevate | 50 MHz | 2 | All |

# SDR Variants

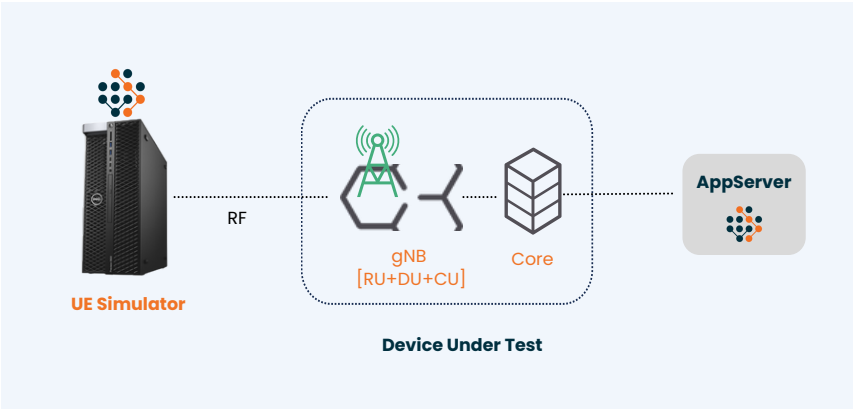
| Feature | 50 MHz | 100 MHz |
|---|---|---|
| Frequency Range | 500 MHz to 6.0 GHz | 300 MHz to 6.0 GHz |
| Max bandwidth | 50MHz | 100 MHz |
| Number of SMA ports | 5 (2 Tx, 2 Rx, 1 GPS) | 9 (4 Tx, 4 Rx, 1 GPS) |
| PCIe spec | PCIe gen2 x1, full height, short length | PCIe gen2 x8, full height, full length |

# Use Cases

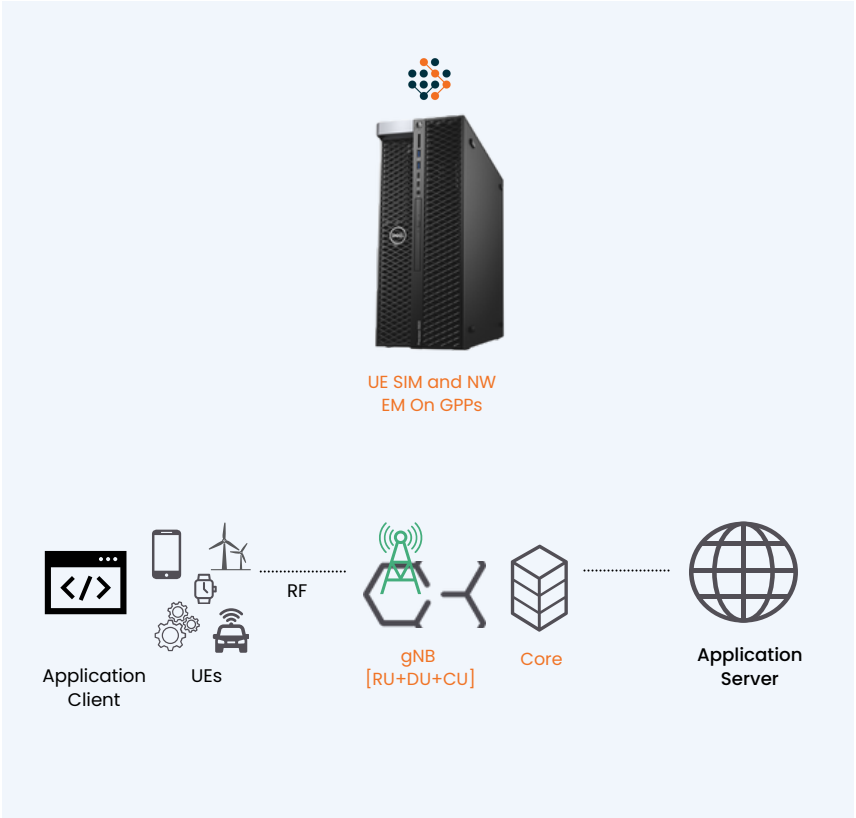
As a Network Emulator for Device testing



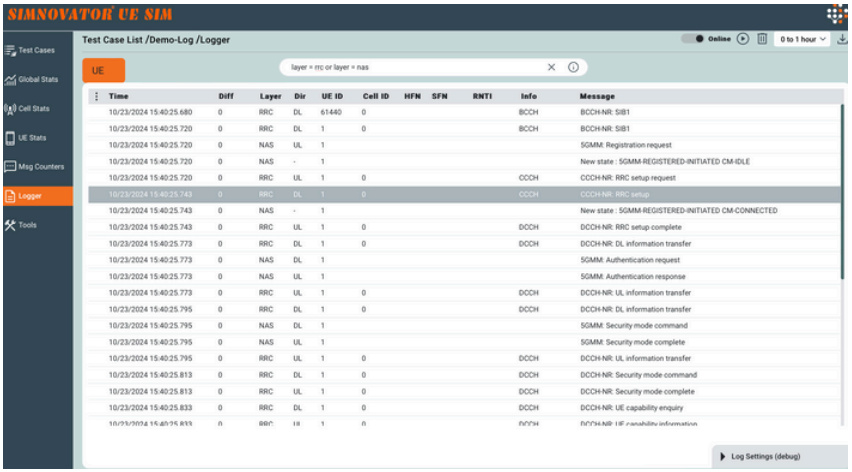

As a UE Simulator for RAN Validation

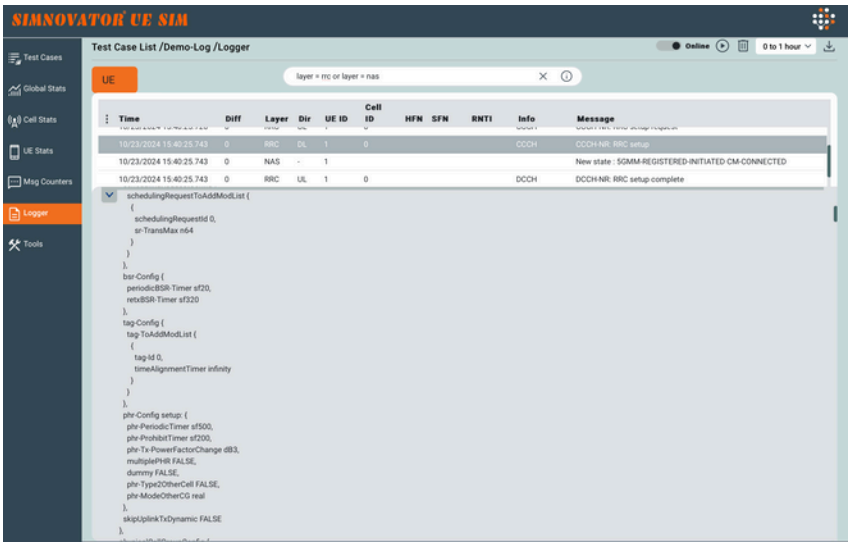


As both UE Simulator and Network Emulator for educational and research purposes.



# Logging


SIMNOVATOR UE SIM
Test Case List /Demo-Log /Logger
Online
0 to 1 hour
UE
layer = rrc or layer = nas
Test Cases
Global Stats
Cell Stats
UE Stats
Msg Counters
Logger
Tools
Time Diff Layer Dir UE ID Cell ID HFN SFN RNTI Info Message
10/23/2024 15:40:25.680 0 RRC DL 61440 0 BCCH BCCH-NR: SIB1
10/23/2024 15:40:25.720 0 RRC DL 1 0 BCCH BCCH-NR: SIB1
10/23/2024 15:40:25.720 0 NAS UL 1 5GMM: Registration request
10/23/2024 15:40:25.720 0 NAS - 1 New state : 5GMM-REGISTERED-INITIATED CM-IDLE
10/23/2024 15:40:25.720 0 RRC UL 1 0 CCCH CCCH-NR: RRC setup request
10/23/2024 15:40:25.743 0 RRC DL 1 0 CCCH CCCH-NR: RRC setup
10/23/2024 15:40:25.743 0 NAS - 1 New state : 5GMM-REGISTERED-INITIATED CM-CONNECTED
10/23/2024 15:40:25.743 0 RRC UL 1 0 DCCH DCCH-NR: RRC setup complete
10/23/2024 15:40:25.773 0 RRC DL 1 0 DCCH DCCH-NR: DL information transfer
10/23/2024 15:40:25.773 0 NAS DL 1 5GMM: Authentication request
10/23/2024 15:40:25.773 0 NAS UL 1 5GMM: Authentication response
10/23/2024 15:40:25.773 0 RRC UL 1 0 DCCH DCCH-NR: UL information transfer
10/23/2024 15:40:25.795 0 RRC DL 1 0 DCCH DCCH-NR: DL information transfer
10/23/2024 15:40:25.795 0 NAS DL 1 5GMM: Security mode command
10/23/2024 15:40:25.795 0 NAS UL 1 5GMM: Security mode complete
10/23/2024 15:40:25.795 0 RRC UL 1 0 DCCH DCCH-NR: UL information transfer
10/23/2024 15:40:25.813 0 RRC DL 1 0 DCCH DCCH-NR: Security mode command
10/23/2024 15:40:25.813 0 RRC UL 1 0 DCCH DCCH-NR: Security mode complete
10/23/2024 15:40:25.833 0 RRC DL 1 0 DCCH DCCH-NR: UE capability enquiry
Log Settings (debug)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10/23/2024 15:40:25.743 0 RRC DL 1 0 CCCH CCCH-NR: RRC setup
10/23/2024 15:40:25.743 0 NAS - 1 New state : 5GMM-REGISTERED-INITIATED CM-CONNECTED
10/23/2024 15:40:25.743 0 RRC UL 1 0 DCCH DCCH-NR: RRC setup complete
schedulingRequestToAddModList (
(
schedulingRequestId 0,
sr-TransMax n64
)
)
),
bsr-Config (
periodicBSR-Timer sf20,
retxBSR-Timer sf320
),
tag-Config (
tag-ToAddModList (
(
tag-Id 0,
timeAlignmentTimer infinity
)
)
),
phr-Config setup: (
phr-PeriodicTimer sf500,
phr-ProhibitTimer sf200,
phr-Tx-PowerFactorChange dB3,
multiplePHR FALSE,
dummy FALSE,
phr-Type2OtherCell FALSE,
phr-ModeOtherCG real
),
skipUplinkTxDynamic FALSE
),

# Extensions Available

- **NTN Package:** Enhances the toolkit with Non-Terrestrial Network (NTN) capabilities, enabling simulation and testing of satellite-based 5G communications.
- **Training Modules:** Comprehensive training programs designed to upskill faculty and students on 5G fundamentals and network component validation.

# Contact Us

Learn what our products can do for you, ask questions, and get started with Simnovus.

simnovus.com/contact-us