Keysight Technologies
Propsim Channel Emulation
Mobile Ad-Hoc Network Testing

KEYSIGHT
TECHNOLOGIES

Unlocking Measurement Insights

Reliable Performance Testing of Critical Communication Systems using Propsim Channel Emulation MANET Solution

A Mobile Ad-hoc Network ("MANET") comprises radio nodes that dynamically self-organize into random network topologies. The network configuration does not rely on any fixed infrastructure, so it is well-suited to defense and public-safety applications. Given the nature of these applications, reliable system performance is critical, which means extensive and rigorous testing requirements.

Propsim MANET channel emulation solution from Keysight Technologies offers an accurate and efficient method for evaluating the end-to-end performance of radio systems under real-world radio propagation conditions. Developers of radio equipment can significantly reduce the need for costly field trials by testing the radio link and network performance in a laboratory environment. Easily troubleshoot and resolve performance issues with realistic modeling of operating conditions.

Achieve Efficient, Robust Network Performance with Systematic MANET Testing in Dynamically Changing Environments

Network-centric security operations require seamless communications between command centers, vehicles and dismounted troops to deliver voice and video streams as well as position data. When communicating on the move, users are exposed to potential issues relating to radio coverage gaps, continuously changing network conditions and security threats (e.g. jamming and sniffing).

Today's MANET systems use Software Defined Radios ("SDRs") and cognitive radio technologies to manage connectivity and networking. The performance of a MANET greatly depends on how the waveforms and distributed networking algorithms perform in a dynamically changing environment where radios are ultimately deployed.

Radio channel properties such as path loss, delays, power delay profiles, Doppler, interference from adjacent radios and jamming have a critical impact on how the MANET works in the field. A systematic testing approach from link level to radio groups and larger networks assures high- performing, efficient and robust network operation. Use various mobility scenarios and terrain types during testing to achieve a world-class MANET system.

Enhance Advanced Lab-Based Interoperability and Performance Testing of Mobile Ad-Hoc Networks

Propsim MANET channel emulation solution effectively verifies the performance of single radios and multi-radio operation in the network. As a lab-based tool, it offers the ability to accurately and repeatedly emulate propagation and interference conditions experienced by the radios in the field. Early issue detection and resolution offer substantial cost-savings in the development and testing phases.

Propsim real-world radio channel emulation in your lab

Propsim MANET channel emulation solution

- Ensure network reliability through realistic lab-based testing
- Achieve significant cost savings by minimizing the need for field trials
- Test key functionality of critical communications networks in hardware-in-the-loop test beds
- Quickly evaluate mission plans and what-if scenarios

Evaluate and Verify Radio Devices and Network Level Performance

Test from early development through product verification

Use Propsim MANET channel emulation solution to test and develop the wireless link and network level performance of radio devices and network functional features.

Test key functionality and connectivity

- Distance delay, path loss and multi-path impact for evaluating the radio link performance under different radio channel conditions in the field
- A selection of waveforms and mechanisms for avoiding detection and interception
- Network protocols and algorithms to manage adaptive connectivity and routing of data packets

Keysight's Propsim Channel Emulators help you exercise precise control over testing procedures and run fully repeatable test cycles for quick issue identification and resolution. The fully-automated test set-up enables continuous execution of regression and quality assurance tests. Incremental product verification throughout the development cycle using realistic field conditions helps reveal underlying issues at an earlier stage. This leads to cost savings and improved product quality.

Assure Interoperability and Operational Robustness for Networked Communications

Verifying the network's inter-networking capability, security, reliability and quality of service is a huge challenge for agencies responsible for providing radio equipment and networks to the armed forces. Modern IP packet-based radio systems contain functions to support mobility at different layers in the network (such as combat troop radios, tactical data links with airborne and satellite links). Because of the adaptive operation and the complexity of the system, accurate field testing is almost impossible.

Fortunately, almost all types of tests can be reliably executed in a lab environment. With Propsim MANET channel emulation solution, evaluate new radio systems and verify the interoperability with existing systems. Propsim MANET channel emulation solution offers a systematic verification process that significantly minimizes the need for field trials.

Research and develop new technologies

Work with SDR and cognitive radio technologies to improve coverage, spectrum utilization efficiency, network level capacity and security for industrial, commercial as well as defense applications. Propsim Channel Emulators are widely used in R&D labs and for applied research around the world. In addition to supporting MANET testing, Propsim channel emulators are fully compatible with the latest commercial technologies, including WLAN and LTE. This makes Propsim ideal for developing new technologies and solutions for proprietary and professional radio systems.

Complex scenarios are easy to create using Propsim's comprehensive test scenario creation tools. Accurately control propagation, mobility and antenna technology-related parameters. Propsim is the only radio channel emulator that enables virtual drive testing by using antenna arrays with user-imported radiation patterns in a 3D propagation environment. Significantly reduce research and development cycles by focusing on actual development work using ready-made and industry-proven evaluation methods instead of spending time developing relevant evaluation methods.
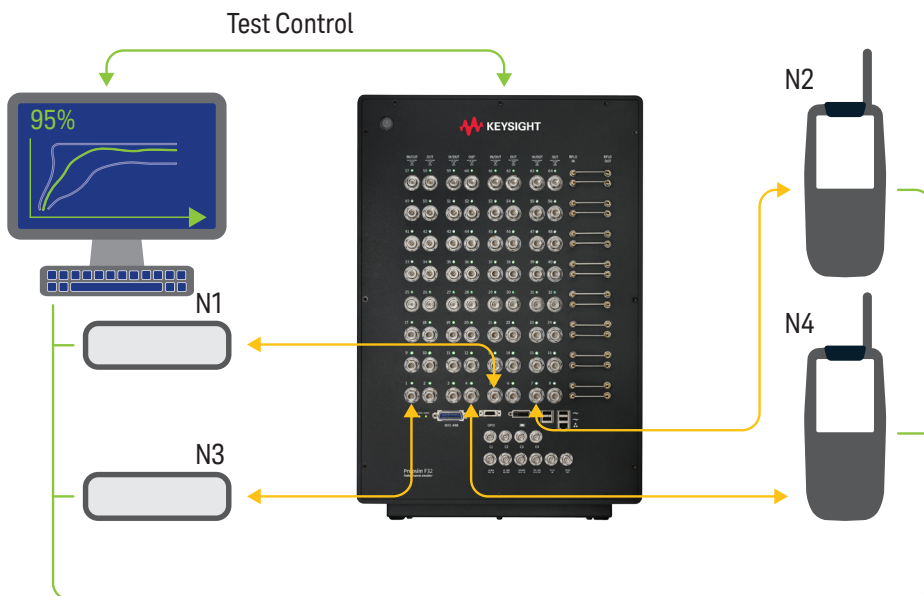
Propsim MANET channel emulation lab setup

Create a virtual field environment in the lab

Propsim MANET channel emulation solution creates a virtual (RF) field environment in the laboratory, enabling you to verify complete products, from end-to-end.

Radio locations and movement are defined in the Propsim test scenario file that controls the time-varying dynamic link conditions such as network topology, path loss, multi-path, Doppler and propagation delay, during the test run. The LAN interface also allows run-time control of link conditions from an external PC. Propsim MANET channel emulation solution connects radios in different arbitrary mesh and MIMO (Multiple Input Multiple Output) network topologies, enabling you to test different routing algorithms, transmit protocols (unicast, multicast and broadcast) and recovery mechanisms.
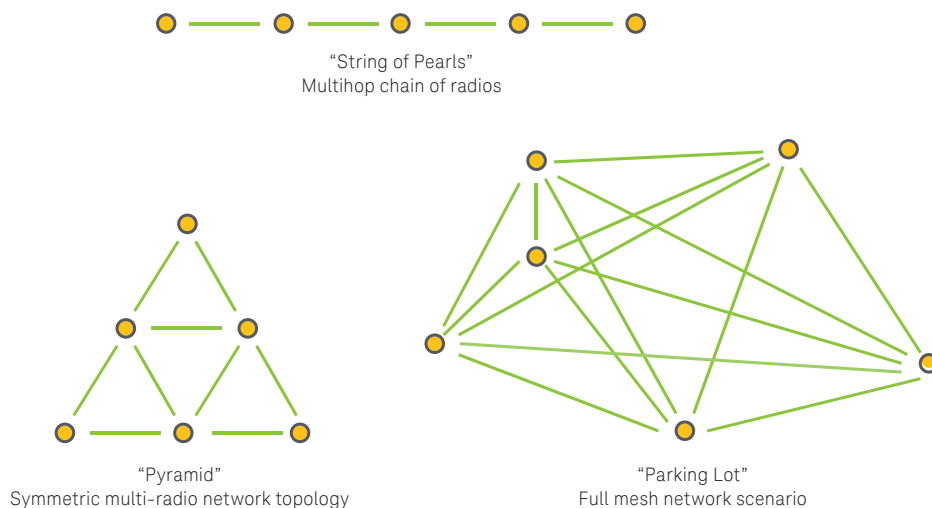
You can either choose a selection of ready-made test scenarios, engage Keysight to create customized test scenarios, use the in-built test scenario tool or use third party software applications to create required test scenarios. Propsim runs arbitrary channel profiles for each emulated channel and MANET link. The process of converting software simulations to hardware-in-the-loop tests is quick and enables you to perform trials in various simulated environments in different phases of the development cycle.

Accurate and Precise End-to-End Product Verification

Propsim uniquely supports testing of radio links and networks under MIMO and mesh network topologies. Properties such as radio channel model, delay spread, Doppler and dynamic behavior can be independently controlled for each link.

The Propsim F32 offers the highest emulation capacity for multi-RAT and heterogeneous network environments. Test up to 32 RF and 128 MIMO channels in a single unit, which supports testing with 11 nodes in full mesh topology or up to 32 nodes in a chain of radios.

"String of Pearls"
Multihop chain of radios

"Pyramid"
Symmetric multi-radio network topology

"Parking Lot"
Full mesh network scenario

Typical test scenario topologies

Obtain Unrivaled Technical Performance and Integrated Radio Channel Experience in a Single Unit

RF performance

– Baseline from 30 MHz to 2.7 GHz, or 350 MHz to 6 GHz
– Bandwidth of 40 MHz; supports multiple simultaneous bands
– Superior signal quality
  – Typical EVM -45 dBm
  – Usable with high-order modulations such as 256 QAM

Channel emulation

– Up to 32 RF channels and 128 independent links within a single Propsim F32 unit, which supports testing with eleven nodes in full mesh topology or up to 32 nodes in a chain
– Multi-unit configurations are supported
– Support of arbitrary network topologies
– Capability to emulate dynamically evolving radio links and networks

Advanced modeling tools, model library and ready-made test scenarios

– Propsim can be configured with advanced scenario tools
– Industry standard channel models are included in the model library
– Ready-made test scenario pack available for tactical radio and MANET testing

Compatibility and scalability

– Multiple Propsim units can be accurately synchronized to create larger networks
– Independent of user signals; can be used with proprietary waveforms
– Open file interface allows you to import user-specific scenarios generated with MATLAB or proprietary software tools

Propsim F32

Propsim FS8

Propsim Configurations and Optional Items

Select the Propsim MANET channel emulation solution that best fits your measurement needs: available in two baseline form factors with configuration options and a wide range of optional software tools and accessories.

Propsim F32

– Up to 32 RF channels and 128 independent fading channels
– Up to six unit synchronization supported

Propsim FS8

– Up to 8 RF channels and 32 independent fading channels
– Up to six unit synchronization supported

Configuration options

– VHF band option 30 to 350 MHz
– Shadowing option for path loss modeling and extended dynamic range
– Interference and SNR generation
– Geometric channel modeling tool (GCM)
– WLAN tool
– MANET test scenario pack

Please contact Keysight sales to learn more about our wide range of optional software tools and accessories for research and product development.

Easy Control of Complex Parameters

Ease of use is provided through simple control of complex parameters and user inter-face-driven modeling tools. Propsim's versatile system architecture supports arbitrary programmable network topologies. This, in combination with superior RF performance and high signal dynamic range, leads to highly repeatable results.

Keysight's channel emulators offer the excellent noise and EVM performance required for applications that are particularly phase sensitive such as high data rate links, beamforming and ranging applications. Propsim's superior emulation accuracy and quick test execution leads to more reliable and faster assessment of device and network performance.

Evolving

Our unique combination of hardware, software, support, and people can help you reach your next breakthrough. We are unlocking the future of technology.

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