KEYSIGHT

Editorial Backgrounder

The Next Tier of Deployment, Evolving to 6G

Introduction

Global 5G deployments are accelerating and scaling digital transformation across sectors. 5G private networks are the primary focus of today's cellular industry. For applications such as industrial and medical, which demand latency and complete network control, 5G private networks can be optimized to meet specific needs. Meanwhile, 6G is on the horizon, presenting unique technological challenges that must be overcome.

Industry & Customer Challenges

1. Compelled by enhancements to the 5G standards, enterprises across many industries are moving to implement **wireless private networks** that accelerate digital transformation and enhance productivity, efficiency, and safety. Private and public 5G networks use the same technology, but technical challenges arise with different use models. Significant complexity also arises when deploying a solution that meets specific customer requirements. Extensive testing and validation are critical for successful private network design, implementation, and operation.

2. **6G** is a huge topic, but if we focus only on the private network facet of 6G, new challenges will be driven by a much larger set of use cases with more variety, such as spectrum, coverage, latency, and greater co-existence issues with other radio systems and bands. 6G means a fully programmable network. It will require even more sophisticated management of compute and radio resources to hold to any necessary key performance indicators (KPIs).

3. Industry wants to reduce **energy consumption** in today's mobile networks. It is expected that Open Radio Access Network (RAN) networks will gradually become more energy efficient than traditional RAN, benefiting from concepts such as cloudification, disaggregation, and native artificial intelligence (AI). A standardized approach is needed to evaluate, test, measure, and monitor the energy consumption of disaggregated multi-vendor open RAN.

Keysight Solutions

1. **5G Private Networks era**: private networks can come in the guise of anything from an independent, fully owned physical network to a private virtual slice or even a commercial public network. Keysight provides test solutions that facilitate private network infrastructure creation, implementation, and operation across all stages of the network lifecycle including "Build, Deploy, and Run" solutions.

2. **6G:** Keysight's R&D wideband sub-terahertz (THz) testbed features an arbitrary waveform generator (AWG) that generates a wideband intermediate frequency (IF), which is upconverted to H-band (220-330 GHz). The signal is downconverted to an IF and digitized with a UXR high-performance oscilloscope, and then demodulated and analyzed using PathWave Vector Signal Analysis (VSA) software.

3. **O-RAN Energy Savings** - Keysight's O-RAN Energy Savings test solution was used to demonstrate reduction in power consumption for a multi-vendor O-RAN system. That

system includes containerized O-DU and O-CU software, O-Cloud software, and hardware including state of the art processors with telemetry and power management features and accelerators using live network traffic profiles. **Collaborators:** Intel, Radisys, Vodafone, and Wind River

a. This test solution consists of O-RU emulator with embedded UEE capabilities (RuSIM), core emulator (CoreSIM) and test automation framework (PathWave Test Automation) for stateful emulation of the network digital twin to test the O-RAN system. Keysight's power analyzer (PA2203A IntegraVision) performed precise real-time measurements of the power consumption throughout the tests.

b. The company's Performance Benchmarking Solution (PBM) characterized the O-RAN system's energy consumption/savings profiles and performed closed-loop optimization of power savings parameters used in the O-RAN system modeled after energy savings rApps.

Key Features and Customer Benefits

1. **5G Private Networks era**: We help engineers validate network performance in demanding and novel use cases where the stakes are higher than for typical smartphone use including safety, revenue flow, and port logistics, as an example. We also help engineers model new systems, simulate behaviors under different stress conditions, and then measure and troubleshoot the actual network.

2. **6G:** At Keysight, we provide solutions to help engineers from the initial design stages - from modeling in software through the end stage of standards compliance. We work with the community of innovators to help define 6G standards.

3. **O-RAN Energy Savings:** Keysight has teamed up with Vodafone, Wind River, Intel, and other industry leaders to tackle O-RAN energy consumption. Using our combined assets, we reduced power needs by as much as 12% during a test at the recent Global PlugFest Spring 2022 event organized by the O-RAN Alliance.

Additional Information

Link to press relevant press releases, case studies and/or product areas on Keysight.com.

2022-06-30
Keysight’s Participation in O-RAN Global PlugFest Spring 2022 Enables Ecosystem to Speed Open RAN Technology Development and Specifications Maturity

2022-06-02
Keysight Test Solutions Selected by NTU Singapore to Advance 6G Technology Based on Terahertz Frequencies

2022-04-26
Keysight Technologies Delivers High Performance Vector Signal Generator for Wideband Multichannel mmWave Applications

2022-03-09
Keysight's Roger Nichols Appointed to Technological Advisory Council for Federal Communications Commission

2022-03-08
Keysight Technologies First to Receive FCC Spectrum Horizons License for Developing 6G Technology in Sub-Terahertz

2022-02-15
Keysight, Samsung Sign Memorandum of Understanding to Advance Research and Development of 6G Technology

2022-02-07
Keysight Helps LG Electronics to Demonstrate 6G Radio Frequency Front-End Module at 2021 Korea Science and Technology Exhibition

Keysight.com Links

- Private Network Solutions | Keysight
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