

About the Institute for the Wireless Internet of Things



Researchers and students at the Institute for the Wireless Internet of Things envision a future in which people and their environment are wirelessly connected by a continuum of AI-powered devices and networks, from driverless cars and search-and-rescue drone swarms to implantable medical devices and smart cities. The institute is home to world-leading expertise, facilities, and technologies dedicated to making wireless communications exponentially faster, more energy efficient, and more secure.

Contact us

Colosseum is owned and operated by the Institute for the Wireless Internet of Things (WIoT) at Northeastern University, and housed at Northeastern's Innovation Campus in Burlington, MA

**For information about availability,
capabilities, and pricing**

**Please contact
colosseum@northeastern.edu**

Our research priorities:

- 5G and 6G wireless systems
- Artificial intelligence and machine learning for wireless systems
- Space Internet
- Smart and connected implantable medical devices
- Smart cities, oceans, and ports
- Unmanned aerial vehicles for civil and national defense

Our interdisciplinary expertise includes:

- Communication and networking
- Sensors, IoT devices, and energy harvesting
- Data analytics and machine learning
- mmWave and TeraHertz



*"The World's Largest
NextG Wireless Emulator"*



**Institute for the Wireless
Internet of Things**
at Northeastern University

About Colosseum

Colosseum is the world's largest radio frequency networked emulator

Originally developed to support DARPA's Collaborative Spectrum Challenge (SC2) through an investment of over \$20M, Colosseum is available to industry, universities and others in the research community. Colosseum @Northeastern is supported by a \$6M grant from the National Science Foundation and is part of the Platforms for Advanced Wireless Research (PAWR) program.

Colosseum provides the fidelity of hardware channel emulators, the flexibility of cloud-based emulators, and the scale of network simulators. It can emulate wireless applications and signals (with granularity at the RF signal level) traversing space and reflecting off multiple objects and obstacles as they travel from transmitters to receivers. With over 65,000+ channels emulated at the same time, Colosseum can create virtual worlds modeling radios operating in open fields, downtown, shopping mall, or a desert, by generating more than 52 terabytes of data per second.



**Platforms for Advanced
Wireless Research**

Specifications

Hardware highlights:

- 256 Software Defined Radios USRPs X310
- 900 TB of Network Attached Storage (NAS)
- 171 high-performance servers
- 19 clock distribution systems
- Software-based traffic generation solutions hosted on a pool of dedicated servers
- Full-mesh networking capability

Capabilities and available libraries include:

- Full protocol stacks for LTE, 5G, WiFi, custom waveforms
- Compatible with GNU Radio and Matlab
- Full Virtualization through LXC containers
- AI/ML models, software pipelines, datasets
- Massive computational capabilities for ML-based training and inference
- Spectrum sharing
- Traffic generation
- Multiple RF scenarios available
- Spectrum sharing and coexistence
- ORAN, network slicing, virtualization
- Development of xApps and rApps
- mmWave, Massive MIMO, and smart antenna systems
- Security and Privacy in wireless systems

Operations

Expert consultants:

Experienced professional researchers at the Institute for the Wireless Internet of Things are available to provide consulting services to execute complex projects on Colosseum:

- Update existing channel models, scenarios, containers
- Create custom scenarios based on models or measurements
- Protocol Stack development and testing (LTE, 5G, 6G, IoT)
- Measurement campaigns
- Interoperability testing
- Creation of datasets
- Algorithm and xApp development
- ML in wireless systems (e.g., modulation and waveform recognition)
- Deep reinforcement learning
- Mobility models
- Conduct experiments
- Bring your own hardware
- Spectrum Sharing
- Visualize the impact of decisions, actions, effects on spectrum and performance
- 5G, 6G, IoT custom research projects

