2023 5G Challenge Update: All Nine Contestant Subsystems Pass Stage Two Wrap-around Emulation Testing

One of the main priorities at the National Telecommunications and Information Administration is to accelerate the adoption of an open 5G ecosystem through open interfaces, interoperable subsystems, secure networks, and modular multi-vendor solutions.

A main component of this work is to research and test whether an open 5G ecosystem can work in real-world scenarios. This is where the 2023 5G Challenge comes into play. The 5G Challenge is a research competition and collaboration between the U.S. Department of Defense (DoD) and NTIA's Institute for Telecommunication Sciences (ITS) in Boulder, Colorado.

The 2023 5G Challenge is offering a $7 million prize pool for participants who successfully integrate their radio access network (RAN) subsystems with multiple other RAN participant subsystems and outperform their peers.

The 2023 5G Challenge consists of multiple stages during which contestants are evaluated and prizes are awarded. During all phases of the competition the host lab ensures that contestant subsystems adhere to 3GPP standards and O-RAN ALLIANCE specifications and identify issues that would hinder multi-vendor integration.

Teams have progressed in testing since starting the challenge in late March. After the first nine weeks of host lab testing, the initial nine contestants have passed Stage Two wrap-around emulation testing.

Stage Two Testing

The fundamental idea of open RAN is to disaggregate the 5G network components, test individual interfaces, and enable true plug-and-play operation. To test whether components can work together the 2023 5G Challenge separates the contestants' radio units (RU) and central unit and distributed unit pair (CU+DU) subsystems.

During Stage Two, CableLabs, the 2023 5G Challenge host lab employed wrap-around emulation testing to evaluate contestants' RUs and CU+DU pairs.

RU development is complex and hardware-centric. By contrast, the CU+DU is primarily implemented with software.

RU development requires specialized expertise in antenna design, digital to analog conversion, analog to digital conversion, low noise amplifiers, and hardware synchronization. The CU and DU are tested together because they are typically deployed together—in a single location on the same server— while many RUs are deployed in the field, to serve different geographic locations.

Stage Two tests assessed RU conformance to the fronthaul technical standard and the Uu interface standard, which is the air interface between the mobile device and the RAN access node. The battery of Stage Two tests included such criteria as transport, handshake, alarm requests, fault management, delay management, and signal synchronization.

The following RU contestants passed Stage Two testing:

- Fujitsu Network Communications, Inc. in partnership with AT&T
- GXC
- LIONS Technology
- NewEdge, Inc.

- QCT/Benetel

Stage Two CU+DU testing considered interface conformance and functionality of the open fronthaul as well as the NG and Xn interface standards, which are used to support various RAN functions and operations in a 5G network. The battery of [Stage Two tests](#) included interface setup, interface integration, delay management, compression, and user equipment (UE) context management.

The following CU+DU contestants passed Stage Two testing:

- Capgemini Engineering
- GXC
- Mavenir Systems, Inc.
- Radisys Corporation

The 2023 5G Challenge test plans and a description of the host lab environment are available at https://5gchallenge.ntia.gov/resources.

During the next stage of the 5G Challenge, contestant pairs will proceed to end-to-end (E2E) integration testing, where they will work to demonstrate RU and CU+DU interoperability as paired contestants.

[Visit the 5G Challenge website for more information.](#)

About the Institute for Telecommunication Sciences: ITS, the Nation's Spectrum and Communications Lab, supports the Department of Defense FutureG & 5G Office through a combination of subject matter expertise in 5G and its research, development, test, and evaluation (RDT&E) laboratory in Boulder, including the Advanced Communications Test Site at the Table Mountain Field Site and Radio Quiet Zone.