5G CHALLENGE

Host Lab Specifications

5G Challenge Preliminary Event: RAN Subsystem Interoperability

Version 1.0

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Document History

Version	Date	Changes
1.0	4/6/2022	Initial Release

Table of Contents

1   Introduction

This document supplements the 5G Challenge Preliminary Event: RAN Subsystem Interoperability rules document. This document contains additional details on the host lab's 5G systems, emulation, and testing capabilities.

2   Host Lab Specifications

The host lab will provide an emulated 5G system based on test equipment, multiple standalone (SA) 5G systems, and test equipment that measures performance. This section contains details on the host lab's SA 5G system emulation capabilities, testing capacity and capabilities, test equipment available, and the SA 5G systems available for integration, interoperability, and performance testing.

2.1   SA 5G System Emulation Capabilities and Equipment

The host lab will provide the test equipment to emulate a baseline system and support the emulated environment. The host lab will verify interoperability and measure performance metrics of submitted designs.

The host lab has the following test equipment:

- Viavi Tera VM gNB emulator
  - ▸ O-DU simulator for O-CU testing: A software-based test tool housed on x86 hardware - compliant against 3GPP Rel 15 F1 application protocol. For O-CU testing purposes, O-DU simulator
    - Supports O-CU functional, performance, and capacity testing
    - Emulates two (2) DU nodes at F1 interface towards CU, and delivers realistic traffic from large number of UEs, i.e., 10k transactions per second (TPS),
    - Works with TeraVM Core Emulator to enable wraparound O-CU testing
    - Model #: TeraVM O-CU Test DU Sim
    - Software release/date: v2.47 / Feb 2022
    - Capacity: F1-U 10Gbps; F1-C 10k transactions per second (TPS)
  - ▸ O-DU emulator for O-RU testing: The O-RAN DU emulator implements required O-DU portions of the eNB/gNB functions as defined by split option 7-2x. More specifically, it implements the O-DU side of the M-plane and C/U-plane functionality necessary to configure the interface with the O-RU under test and exchange I/Q data over the U-plane. It supports both Category A and Category B O-RUs.
    - Model #: TM500 O-RU Tester
    - Software release/date: NRA 1.4.0 / Jan 2022
    - Capacity: O-RAN Open Front-Haul 10Gbps/25Gbps
- Viavi TM500 UE emulator: Reproduces 128 eMBB UE in a realistic mobile environment. Features supported:
  - ▸ 5G NR eMBB 100MHz - 2TRx - TDD
  - ▸ 5G NR eMBB 20MHz - 2TRx - FDD

‣ 5G NR DL 1 CC - 4Rx 100MHz
‣ 5G NR DL 2 CC CA - 2Rx 100MHz
‣ 5G NR 128 eMBB UE - 2Tx 2Rx
‣ 5G NR FRAME STR 30kHz - 14SYM .5ms SLOT
‣ 5G NR FRAME STR 15KHz - FDD
‣ 5G NR 256 QAM DL - 2Rx 4Rx 100MHz
‣ 5G NR 256 QAM UL - 2Tx 100MHz 30kHz
‣ 5G NR eMBB UE; K1 and K2 equals 2 and 3; 30kHz SCS 2x2
‣ 5G NR MOBILITY MODEL HARQ CQI MTS
‣ 5G NR FAST FADING 100MHz 2TRx MTS
‣ 5G NR O-RAN FH OPT 7-2 SW - 4 LAYERS 1RU
‣ 5G NR O-RAN FH OPT 7-2 SW - 2RU
‣ 5G NR L3 STANDALONE
‣ Model #: TK5000/E500
‣ Software release/date: NLA 5.13.1 / Feb 2022
‣ Capacity: 128 eMBB UE

- Tera VM Core emulator: A software-based test tool housed on x86 hardware, capable of testing 3GPP Rel 15 N2, N3 interfaces.
  ‣ Model #: TVM6000
  ‣ Software release/date: v2.47 / Feb 2022
  ‣ Capacity: N3: 10Gbps, N2: 10k TPS
- Qualcomm QXDM diagnostic monitor: QXDM is used to capture and monitor UE diagnostic logs, messages, and events. It includes the QCAT analysis toolkit.
  ‣ Model #: QXDM
  ‣ Software release/date: v5.1.340.2 (Feb 2022)
  ‣ Capacity: two (2) individual user licenses
  ‣ License: one (1) per user
- Qualcomm QCAT analysis tool: QCAT is used to analyze UE diagnostic logs, messages, and events.
  ‣ Model #: QCAT
  ‣ Software release/date: v06.30.111.03 (Feb 2022)
  ‣ Capacity: two (2) individual user licenses
  ‣ License: one (1) per user
- Traffic generators iPERF: iPerf is a tool for active measurements of the maximum achievable bandwidth on IP networks. For each test it reports the bandwidth, loss, and other parameters.
  ‣ Model #: iPERF2
  ‣ Software release/date: 3.1.3
  ‣ Capacity: 1Gbps
  ‣ Supports: IPv4 or IPv6
  ‣ Latency and timing error measurement capabilities
- Calnex ParagonX: Time error measurement for PTP. One-port or two-port (Ethernet or SFP+)
  ‣ Model #: Paragon-X

- ‣ Software release/date: X.10.40.18 / Oct. 28, 2019
- ‣ Capacity: 1
- ‣ License: 1
- Calnex Sentinel: NR over-the-air time error measurement up to 6 GHz, PTP, NTP, Sync-E time error measurement
  - ‣ Model #: Sentinel
  - ‣ Software release/date: 2.15.1.0 / Jan. 10, 2022
  - ‣ Capacity: 1
  - ‣ License: 1

2.2 Baseline SA 5G Systems

The host lab has two (2) SA 5G cores:

- Primary: MAVENIR™ core based on Intel COTS hardware
- Secondary: open5Gs https://open5gs.org/ https://github.com/open5gs/open5gs

The host lab also has a traditional single vendor 5G RAN system provided by Nokia®. The host lab also has two (2) virtualized Radio Access Networks (vRAN) consisting of CU, DU, and RU in each case:

- Primary: MAVENIR CU, DU, and RU
- Secondary: Accelleran™ CU, Benetel™ RU, and Phluido™/EffNet™ DU