OpenAirInterface RAN Project
OAI Working Practices, Development Process, and Roadmap

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Outline

Highlights of new features, current KPIs

O-RAN and OAI

Roadmap and Releases

CI/CD
New features (gNB) in 2023

- UL 2x2 MIMO
- FR2 Basic SA with OAI UE
- Support for Nvidia Aerial SDK L1 Offload
- 3GPP F1 and E1: work on internal data organization to use F1 and E1 logic
  - Multiple reconfigurations
  - Reestablishments
  - Multiple DUs and CU-UPs
- 7.2 through OSC FHI library, E release
- Merge of E2 agent with KPM v2.03/v3.0 and RC v1.00
New features (UE) in 2023

- UL/DL 2x2 MIMO
- Ongoing testing with 3rd-party gNB
- Implementation of Sidelink
- Reconfiguration with sync and measurements
- Improvements in multi-threading
- Improved testing through IQPlayer

Code cleanup:
- MAC/PHY separation (UE “FAPI”)
- PUCCH handling
- Reserved MCS for retransmission
- Search space/CORESET handling
- RRC State handling
- BWP handling
Nvidia Aerial Research Cloud (ARC)

- Nvidia Aerial is an inline L1 accelerator running on GPU (A100) and smart NIC (CX6) or converged accelerator (A100X or AX800)
- DU-high (Layer 2), CU, and core from OpenAirInterface
- Interface realized using 5G FAPI defined by Small Cell Forum (Traces can be analyzed in Wireshark)
- March 2023: initial release, early adopters (e.g. Northeastern)
- Nov 2023: Aerial 23-2 integration into develop
OAI gNB performance (Oct. 2023)

**gNB – Max Downlink Throughput**, Band n41, TDD: DDDFU

<table>
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<tr>
<th>DL</th>
<th>Bandwidth (MHz)/Number of PRBs @ 30kHz</th>
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<td>Layers 2</td>
<td>143</td>
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<td>Layers 4</td>
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**gNB – Max Uplink Throughput**, Band n41, TDD: DDFUU

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(Measurements in AllBeSmart lab, gNB/N310+-tune-offset, UE/Quectel RM500Q-GL)
OpenAirInterface and O-RAN I

- **O1**
  - Integration with ONAP-based SMO (see demo)

- **E2**: multiple options
  - FlexRIC
  - O-RAN RIC (see demo)

- **F1-C and F1-U**
  - Interop.: OAI DU with Accelleran CU
  - Multiple DUs per CU

- **E1**
  - Multiple OAI CU-UPs per OAI CU-CP
OpenAirInterface and O-RAN II

- **5G FAPI**
  - today all* L1 procedures compliant with SCF 5G FAPI 222.10.02
  - Interop.: Nvidia Aerial SDK
  - 5G nFAPI

- **Fronthaul**
  - UHD with USRP (split 8)
  - eCPRI with AW2S (split 8)
  - O-RAN 7.2 CUS-plane (with OSC xRAN lib E, LiteOn)
  - Interop.: other RRUs (Benetel, Foxconn, Mavenir) ongoing
Roadmap

Q4 2023
- O-RAN 7.2 Fronthaul (Rel. E)
- F1 Handover
- LDPC enc/dec offload on T2
- Multiple-DUs and CU-UPs
- Multiple RUs per DU
- OAI UE Initial Access with 3rd Party gNB
- FR2 Basic SA with OAI UE
- FR2 Basic NSA Interop with COTS UE

Q1 2024
- Support for O-RAN 7.2 FH Releases F
- OAI UE Interoperability with 3rd Party gNB
- DL MIMO: 4 Layers
- QoS Aware Scheduler
- Sidelink
- NRPP Support in gNB
- 2-step RACH
Roadmap

Q2 2024

- Beamforming Procedures for FR2 (NSA and SA)
- Xn Handover Procedures
- Support for short-data Transmission (Rel.17)
- Support of 5G RAN Slicing

Q3 2024

- Multi-UE Bandwith Part Handling
Release process

Release v2.0
- First official 5G release
- Branch master updated: 5G SA, NSA for gNB, UE

Release v2.1
- F1 handover
- O-RAN 7.2 FHI, E release
- Nvidia Aerial support

Release v2.2
- MIMO 4x4 DL
- 7.2 FH F release
- Sidelink support

⇒ Releases planned every 3-4 months
CI/CD: Review and Workflow

Human Part

- Contributor has to sign CLA
- Senior OAI developer “volunteers” for review
- Every week: 30min slot in dev meeting to discuss merge status
- Public access to any build/test logs
- Documentation: doc/TESTBenches.md

Automated Part

- Apply label in MR (Doc, Build, 4G, 5G)
- Jenkins pipeline is triggered
  - Container image build
  - Static analysis
  - Testing (next slide)
- No automatic acceptance of MRs: integration branch
- Images on docker hub published by oaisoftwarealliance.org
CI/CD: Review and Workflow
CI/CD: Review and Workflow
CI/CD: Status and Roadmap

Current tests in CI

- Build: x86/ARM
- USRP-based, COTS UE (4G/5G)
- AW2S-based with up to 10 UEs (5G)
- OAI-UE with OAI gNB OTA (4G, 5G)
- RFsim (5G: TDD/FDD, E1+F1, …)
- Physical simulators
- 4G/5G L2sim

Future

- Using sanitizers in CI
- More UEs
- O-RAN 7.2 FH
- Aerial Inline Accellerator, other accelerators
- UE tests with 3rd-party gNB
Thank you for your attention.
Do you have questions? → Q&A

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ORAN 7.2 fronthaul split using OSC fronthaul interface library (FHI, E release)
AMD T2 Lookaside Accelerator card
3GPP F1 midhaul split between OAI O-CU/O-DU
LITEON O-RU at n78 (3.7 GHz), 100MHz BW, TDD 2.5ms DDDSU