

# Newsletter

OAI 2024 SUMMER EDITION

OPEN AIR  
Interface

We are pleased to bring you the latest edition of our OAI Summer Newsletter, filled with updates, recent achievements, and upcoming events.

As we continue to move forward together, our community remains strong and dynamic, and we're excited to share these developments with you. For insights into OAI RAN, Core, and OAM, keep reading!

## New Members

### **Strategic Member:**



VIAVI Solutions

### **Associate Member:**



## **First OpenAirInterface South African Hands-On Workshop**



Thank you to everyone who joined us at the First OpenAirInterface South African Hands-on Workshop, held from July 2nd to July 4th at the Council for Scientific and Industrial Research (CSIR) in Pretoria. The three-day event offered practical sessions on OAI RAN, Core Network, and OAM, providing participants with valuable experience and insights from our experts. It was an opportunity to sharpen OAI code development skills and collaborate in a dynamic environment. Stay tuned for more events and opportunities to connect and learn within the OAI community.

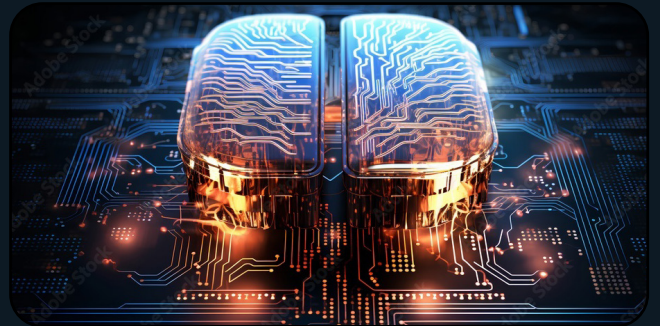


## **F1 Handover**

The OAI team and Allbesmart are currently nearing the completion of the initial handover support inside the gNB. In the first step, the handover of the F1 interface is about to be completed. This intra-CU handover allows a UE to be handed over across multiple DUs connected to a single CU, thereby confining the handover to the RAN. It will be possible to test this feature without any hardware support, using only OAI's RF simulator tool. In the second step, after completing the F1 handover, the OAI team, together with Firecell, will work on the integration of the N2 handover. In the N2 handover, the CU is not connected to all the DUs necessary to complete the handover and instead relies on communication via the AMF. The corresponding work has already been merged into the OAI 5GC. Together with the existing F1 handover support, the integration of the necessary procedures will be achieved soon. Xn handover is planned for later this year.

## **UE Improvements**

The recent efforts in the OAI UE project have primarily focused on achieving interoperability with third-party gNBs. We can now establish initial connections and handle traffic, with ongoing work to enhance the UE's performance and increase achievable traffic. To this end, we have also implemented power control procedures and automatic RX gain control. Furthermore, to improve connection handling and stability, ongoing efforts are directed at enhancing connection control (RRC reconfiguration, RRC re-establishment, MAC layer procedures such as buffer status reporting, etc.) and NAS UE procedures (multi-PDU session support, stability fixes, etc.).



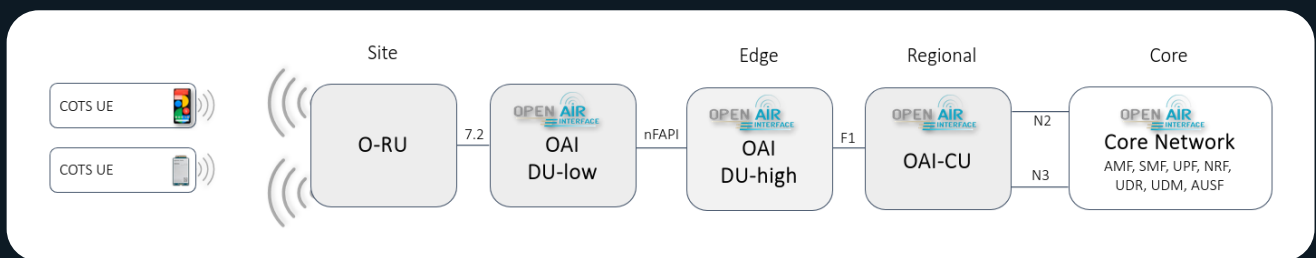
## **Support for Non-Terrestrial Networks**

Non-Terrestrial Network (NTN) support is an exciting new feature within 5G/NR in Release 17, enabling 5G services via satellites. This can complement existing terrestrial network deployments by increasing coverage in hard-to-reach areas. Within the context of a newly created working group at the OpenAirInterface Software Alliance, several partners, led by Fraunhofer IIS, have collaborated on implementing the corresponding Release 17 features. In recent months, we have merged work to enable the operation of the OAI gNB and nrUE in the context of a geostationary (GEO) satellite - a satellite that remains at a fixed distance and height above the Earth. For interested users, documentation has been added to facilitate initial testing using OAI's RF simulator tool; this can be extended to include commercially available channel emulators. All participants in this working group are currently collaborating to add new features, such as support for low-Earth orbit (LEO) satellites and the use of channel emulators in CI tests.



## (n)FAPI Improvements

In the last newsletter, we reported on the ongoing integration of the Nvidia Aerial Layer 1 Inline Accelerator (DU-low) with OAI Layer 2 and above (DU-high and CU), leveraging the Small Cell Forum (SCF) FAPI interface. Assuming a user has the necessary hardware (Nvidia A100 GPU and GX-6 NIC or converged A100X or AX800, as well as a Foxconn O-RU), a complete O-RAN-compatible, hardware-accelerated 5G system can be set up. This integration has been achieved, and Nvidia reached up to 1 Gbps in downlink, utilizing up to 4 spatial layers. Additionally, we are committed to further maintenance of the platform, with the Nvidia Aerial platform now integrated into the OAI CI system. Furthermore, we have also worked on an all-OAI nFAPI-based split gNB, utilizing the O-RAN 7.2 FHI, SCF nFAPI, and 3GPP F1 split. In an initial [demo](#) at the last O-RAN F2F Meeting in Incheon, we demonstrated up to 350 Mbps in a 2-layer configuration in downlink. We plan to integrate the nFAPI into OAI's main branch and improve the throughput towards the maximum achieved with the OAI L1 layer.



## OAI CORE NETWORK

### Support of Location Services with LMF and AMF

A central entity to support location services has been implemented. To compute the position of the UE, LMF receives the measurements and assistance information from the RAN (via the NR positioning protocol A (NRPPa)) and the UE (via the LTE Positioning Protocol (LPP)). We also updated AMF functionality to support location services management and to provide the transport for location services messages exchanged between RAN/UE and LMF.



## QoS Support for Data plane

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The OAI User Plane Function (UPF) has introduced enhanced support for Quality of Service (QoS) management, a critical feature in 5G architecture. This implementation includes a new execution mode called eBPF-XDP-TC, which integrates XDP and TC programs for efficient packet processing. QoS enforcement is carried out within the kernel's TC layer using HTB QDISC, where different queues are created via netlink APIs. These queues correspond to QoS rules received through PFCP requests, ensuring that packets are filtered according to Service Data Flow (SDF) filters and forwarded to their respective queues with specific rate and ceiling parameters. Additionally, the Session Management Function (SMF) plays a pivotal role by handling QoS information from both the User Data Management (UDM) for default QoS and the Policy Control Function (PCF) for additional QoS flows. The SMF communicates these rules to the User Equipment (UE) via NAS and the gNB via NGAP and installs them on the UPF via PFCP. The UPF enforces QoS by rate-limiting Session-AMBR values and guaranteeing bitrates ensuring robust data transmission quality. It is important to note that this feature is optional and must be activated through a configuration file. Due to its reliance on eBPF accelerations, QoS support is not applicable in Simple-Switch mode.

## Improve the Code Quality of 5G CN to Make it Stable and Robust

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Maintaining and improving code quality is one of the most important tasks of the OAI CN project. We continuously improve code quality to make it more stable and robust by relying on common sub-modules, simplifying the codebase, and regularly refactoring the code. Specifically, we now use the C++ Request (Lib CPR), a simple wrapper around libcurl, to simplify the HTTP client code. We have also started introducing unit tests and continue to test extensively with different RAN/UE simulators, commercial gNBs, COTS UEs, and professional testers. Additionally, various bug fixes have been implemented to ensure OAI CN works with a wider range of COTS UEs in different use cases, such as supporting multiple PDU sessions for service requests, adding connection retry mechanisms between NFs and NRF, etc.

**OAI OAM**

## FlexRIC News

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We are thrilled to announce some significant updates and accomplishments within our team. Our E2 agent supports disaggregated RAN, specifically DU/CU-UP/CU-CP configurations. Moreover, we've optimized and cleaned up the code for our E2 agent, ensuring improved performance and reliability. Additionally, we have expanded the RAN Control Service Model to include UE RRC State Change in REPORT Service and aperiodic subscriptions. Over the past three months, we hosted the Spring of Code event, where contributors had the unique opportunity to collaborate on the latest 5G and O-RAN features and receive an exclusive one-week training session from the OAI team. Participants focused on enhancing the KPM and RAN Control Service Models, driving innovation in our field.



## O-RAN Face-to-Face Meeting in Athens

In February, we showcased three demos at the O-RAN Face-to-Face Meeting in Athens. One of them is the «Concurrent SMO/non-RT RIC and nearRT-RIC for RAN Management and QoE Improvement». In this demo, we showcase RAN management and Quality-of-Experience (QoE) improvements through the O-RAN-defined interfaces O1 and E2. We deploy an end-to-end 5G cellular network based on OpenAirInterface with the Service Management Orchestrator (SMO), near-RT-RIC, OAI CU, OAI DU, and OAI 5GC. A user playing the online game Slither.io might be negatively impacted if the cell has a high load, making the game unresponsive. A custom QoE xApp over the nearRT-RIC observes the RAN packet delay through E2SM-KPM and uses RAN control (E2SM-RC) to improve the QoE of the game by segregating traffic in the RAN. If the O-DU cell load is high and while the user is not playing, the SMO receives an alarm notification in the ONAP orchestration. The administrator can reconfigure the cell bandwidth of the O-DU to provide better service to the user in the long term. Conversely, the SMO scales the bandwidth of the O-DU down when it is not needed. Furthermore, performance metrics are collected using the ONAP Data Collection Analytics and Events (DCAE) engine.



## Spring of Code

OAI recently created the «Spring of Code» event, bringing together coders, developers, and tech enthusiasts to collaborate and contribute to the OAI code. Participants were selected and received a week-long training on OAI 5G and O-RAN technology at EURECOM/OAI labs in the South of France. After that, they all worked on one of the three topics proposed (KPM, RC, and CCC) to propose the best contributions to the jury. We commend the winners of the Spring of Code: Tano Bischoff, Shrinish Donde, Khanh Toan Pham from Fraunhofer Heinrich Hertz Institute HHI, Theodoros Tsourdinis from the Sorbonne University/University of Thessaly, and Miguel Fuentes Gonzales from i2cat. Their dedication and hard work remind them that it is the deep interest and collective effort that drives success. The spirit of collaboration within the community is at the heart of why OpenAirInterface has such a following. We thank the sponsors of the project project SLICES-RI, EURECOM, and the OAI Team Instructors) who participated in and supported this initiative. We shall be repeating such initiatives in the future.



## OAI EVENTS

### **Canonical Workshop**

In May, the Canonical team met with the OAI team for a joint seminar at the OAI premises. We explored topics including the OAI Core, OAI UE, OAI RAN, OAI OAM, and CI/CD. We showcased demos and visited the lab. Additionally, we gained a deeper understanding of Canonical's planned contributions to OAI. It was a pleasure to host the Canonical team, and we look forward to strengthening our collaboration.

### **Linux Foundation MoU with OAI**

We are thrilled to announce that LF Networking and OpenAirInterface have signed a Memorandum of Understanding (MoU), marking a significant step toward open-source collaboration in next-generation networking. This partnership provides LF Networking and OpenAirInterface communities a dynamic hub for showcasing AI advancements in networking and cloud-native automation. By joining forces, we will drive innovation through open source and shape the future of telecommunications. More information about the collaboration is available [here](#).

### **O-RAN Global PlugFest Spring 2024**

For the O-RAN Global PlugFest Spring 2024, we presented the «End-to-End connectivity testing with OAI L2+, Nvidia Aerial L1 and Foxconn O-RU, and COTS UE» use case we are working on with our strategic partner NVIDIA. At the end of the PlugFest, we have successfully achieved full end-to-end traffic using OAI L2+ and NVIDIA L1 with COTS UE, delivering a throughput of approximately 350 Mbps DL and 50 Mbps UL in the DDDSU scenario.

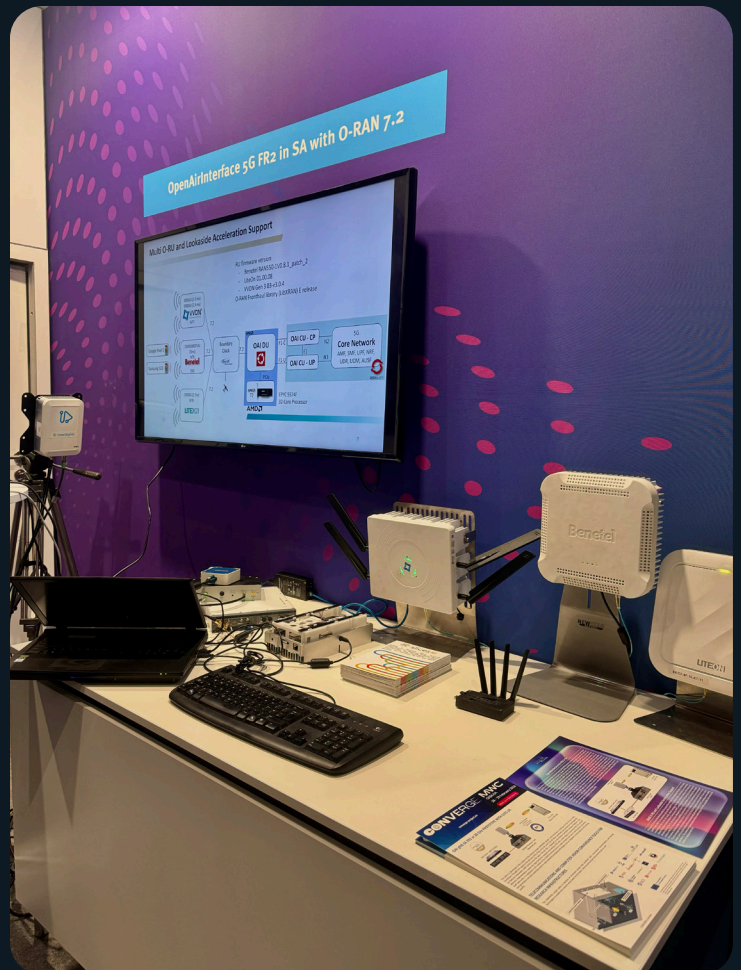


## Mobile World Congress (MWC) Barcelona 2024

From the 26th of February to the 29th of February, OpenAirInterface was present at the Mobile World Congress (MWC) in Barcelona. During the event, we showcased five demos leveraging the latest OAI developments:

- OpenAirInterface 5G FR2 in SA
- Multi O-RU and Lookaside Acceleration Support
- Cloud-native Intent-driven Automation via Nephio
- Combining Network Data Analytics Function with Machine Learning for Abnormal Traffic Detection in beyond 5G
- Concurrent SMO/non-RT RIC and nearRT-RIC for RAN Management and QoE Improvement

We thank everyone who passed by the EURECOM stand and took a look at the OAI demos. We would also like to say special thanks to all of our partners and community members who put up demos leveraging OAI at MWC: Accelercomm, Advalio, Fraunhofer IIS, HCLTech, and Tiami Networks to name a few.



- More information [here](#)
- MWC video [here](#)



## NTN Working Group Meeting

In April, we had the pleasure of hosting the OAI Non-Terrestrial Network (NTN) Working Group Meeting at EURECOM in the South of France. This event marked the beginning of our roadmap for NTN developments within OpenAirInterface. We thank all the participants who contributed to making the meeting a success. A special thank you goes to Fraunhofer IIS and Lasting Software for showcasing their impressive NTN demo.



## OAI & VIAVI Training

In May, OAI co-hosted a highly successful training event with VIAVI, Northeastern University's WIoT Open6G Center, and the UNH InterOperability Lab. We were excited to see such strong engagement from in-person and virtual participants. The hands-on sessions offered valuable insights into network testing, interoperability, and the OpenAirInterface Project. Participants explored OAI Fronthaul testing using the VIAVI TM500 tester and were introduced to the OAI CU/DU and Core Network.

## Linux Foundation One Summit

In May, we participated in the Linux Foundation One Summit 2024 from April 29th to May 1st in San Jose (USA). More than participating, our Solution Architect, Sagar Arora showcased a live deployment of OAI O-RAN NFs via Nephio deployed on Red Hat Openshift, alongside Alexis de Talhouët from Red Hat and Sana Tariq, Ph.D. from Telus Canada. Click here to watch the [recording](#).

### Key Highlights:

- Live O-RAN deployment demo
- Nephio integration with OpenShift and Argo CD
- Intent-based deployment strategies

**ONE  
SUMMIT**

**May 1<sup>st</sup> – 3:40 pm PDT | San Jose, CA**

**Sagar Arora: O-RAN-SC Workshop @ ONE Summit 2024**

Lifecycle Management of OAI O-RAN Network Functions via Nephio



**Sagar Arora** - Solution Architect, OpenAirInterface  
**Alexis de Talhouët** - Telco Solutions Architect, Red Hat  
**Sana Tariq** - Principal Architect, Telus Canada

Learn more at  
[events.linuxfoundation.org/one-summit-north-america/add-on-programming/#o-ran-sc-workshop](https://events.linuxfoundation.org/one-summit-north-america/add-on-programming/#o-ran-sc-workshop)



## **O-RAN Face-to-Face Meeting in Korea**

In June, we presented two demos at the O-RAN Face-to-Face meeting in Korea.

1. OAI FAPI Split and Integration of OSC O-DU High in the OAI RAN Stack: We are working with Radisys to integrate OSC's O-DU-high with OAI's O-DU-low and OAI-CU, aiming to create a fully open-source RAN stack. The demo showcased the integration of SmallCell-Forum nFAPI in OpenAirInterface 5G RAN, achieving up to 300 Mbps DL and 50 Mbps UL with 100MHz bandwidth. The goal is to replace OAI-DU-high with OSC O-DU-high, connecting to a commercial O-RU and multiple COTS UEs.
2. Diversified O-RAN Showcase: This demo featured:
  - Network Function Orchestration via Nephio: Orchestrating OAI O-RAN and 5G Core Network Functions across two sites using Nephio, a step toward a disaggregated SMO architecture.
  - Containerized Developer Environment for OAI O-DU: A simple, containerized environment for OAI O-DU development with an AMD T2 Accelerator card.

These demos emphasize our commitment to advancing O-RAN technology through collaboration and innovation.

## **OpenAirInterface 10th Anniversary Workshop**

The OpenAirInterface Software Alliance invites you to the OAI 10th Anniversary Workshop, hosted by EURECOM, on September 12-13, 2024, in Biot, France. Over the past decade, our community has advanced 4G and 5G software, reaching tens of thousands globally. This milestone event will celebrate our achievements, explore future challenges, and showcase the progress of OAI initiatives. Join us for two days of networking, insightful talks, captivating keynotes, and interactive demos highlighting OAI's latest developments and future directions.



• **More information [here](#)**