OpenAirInterface 5G
Core Network:
Status and Roadmap

Tien Thinh NGUYEN, Lionel GAUTHIER,
Sagar ARORA, Rohan KHARADE, Raphaël
DEFOSSEUX, Stefan SPETTEL

OAI Workshop, 12-13 July 2022 / Paris, France
Outline

• Introduction of 5G System and OAI 5G CN project
• Current Implementation Status of OAI 5GC Components
• Roadmap
Outline

• Introduction of 5G System and OAI 5G CN project
  • Current Implementation Status of OAI 5GC Components
  • Roadmap
5G System Architecture

- Access and Mobility Management Function (AMF)
- Session Management Function (SMF)
- User plane function (UPF)
- Policy Control Function (PCF)
- Authentication Server Function (AUSF)
- Unified Data Management (UDM)

- Network Exposure function (NEF)
- NF Repository function (NRF)
- Network Slice Selection Function (NSSF)
- Unified Data Repository (UDR)
- Unstructured Data Storage Function (UDSF)
- Application Function (AF)

5G System Architecture (source: 3GPP TS23.501)
Core Network: From 4G to 5G Networks

CUPS: Control and User Plane Separation
SGW: Serving Gateway
PCRF: Policy and Charging Rules Function

MME: Mobility Management Entity
HSS: Home Subscriber Server
PGW: Packet Data Network (PDN) Gateway

OAI Workshop Paris, July 2022
OAI 5G CN Project Group

- Website: [https://openairinterface.org/oai-5g-core-network-project/](https://openairinterface.org/oai-5g-core-network-project/)
- Develop a fully 3GPP compatible 5G CN stack (SA) as open source software for the OAI community
- Sponsors: Qualcomm, Facebook (Meta) Connectivity, InterDigital
- Main contributors:
  - EURECOM/OSA, BUPT, KCL
Outline

• Introduction of 5G System and OAI 5G CN project
• Current Implementation Status of OAI 5GC Components
• Roadmap
OAI 5G CN – Current Status (2)

- **Solid and functional 5GC**
  - Basic procedures (with multiple UEs/PDU sessions): connection and registration procedures (UE registration/de-registration, service request), session management procedures (PDU session establishment, modification, release)
  - Additional features:
    - NF registration, NF discovery (e.g., to discover and select SMF, UPF)
    - Support N2 handover, Paging, HTTP/2, and FQDN
    - Event exposure services for SMF (6 events), AMF (2 events), UDM/UDR (on-going)
    - Basic support for Private 5G network (Static UE IP address allocation, non-NATed IP traffic between UE and DN)
    - Support Network slicing with NSSF and multiple AMFs

NF: Network Function, FQDN: Fully Qualified Domain Name
OAI 5G CN – Current Status (3)

- **Different flavors**
  - Three 5GC modes
    - Minimalist 5GC with AMF, SMF, UPF (and NRF)
    - Basic 5GC with AMF, SMF, NRF, UPF, UDM, AUSF, and UDR
    - Full 5GC with AMF, SMF, NRF, UPF, UDM, AUSF, UDR, NSSF, and NEF
  - Three UPF flavors:
    - SPGW-U (from 4G) with additional features for 5G
    - VPP-UPF (relying on VPP-Travelping, with DPDK support)
    - Production grade UPF (SD Fabric, on-going)

- **Deployment options**
  - Traditional/classic deployment on Servers/Virtual machines
  - Automated deployment of NFs in Docker containers using Docker-Compose
  - Cloud-native deployment using Helm Chart (on OpenShift cluster)
Validation, CI/CD with
- Professional tester (dsTest/ng4T): Functional, stability, reliability (and performance) tests
- OAI gNB/ OAI UE, COTS UEs (Quectel/ SIMcom modules, Huawei P40/P40 Pro, Pixel 5, One Plus 8), Amarisoft UE
- Open-source RAN simulators (gNBSim, UERANSIM)
- Commercial gNBs (Amarisoft/Baicell)/COTS UEs

Stabilize 5GCN and add user-friendly functionalities
- Reduce image size, reduce CPU utilization footprint
- Provide customize APIs for User provisioning
- Provide customize APIs for configuring AMF/SMF on the fly
  - Get/Update AMF/SMF configuration information
Outline

• Introduction of 5G System and OAI 5G CN project
• Current Implementation Status of OAI 5GC Components
• Roadmap
OAI 5G CN – Roadmap

**Q2-Q3 2022 (On-going):**
- Release NEF
- Multiple UPFs in the same data path (support N6/N9/N19 interfaces):
  - Support of Branching Point/UL-Classifier
- Test and integrate with FlexCN
- Support of location service procedures (in AMF)
- Ubuntu 20.04 support for all NFs
- PCF (with basic functionalities)

**Q4 2022 -:**
- IPv6 support (GTP-U for N4)
- Add UDSF and support micro-services architecture (with stateless NFs)
- Redundant transmission support (for URLLC)
- Support of 5G LAN-type Services
- Support mobility
- New entities: NWDAF, SCP, LMF
Magma Testing Activities

- **OAI takes the charge of:**
  - Magma Continuous Integration (CI) pipelines/workflows and release cycle
    - Maintaining and extending CI/CD framework
  - 4G/5G NSA testing
    - Fixing issues with current testing scenarios (LTE Integration tests)
    - Adding new testing scenarios for Federated Integration tests (with 3GPP components e.g., HSS, PCRF and OCS)
  - 5G SA testing
    - Implementing a new open-source 5G SA CN tester
Useful links

• Project website:
  - https://openairinterface.org/oai-5g-core-network-project/

• Git repositories
  - Federation of the OpenAir CN 5G repositories: https://gitlab.eurecom.fr/oai/cn5g/oai-cn5g-fed
  - 5GC network functions: https://gitlab.eurecom.fr/oai/cn5g

• Videos:
  - OAI 5G Core testing with commercial gNB and COTS UE: https://www.youtube.com/watch?v=N5wuhh-1dxk&t=5s
  - OAI 5G Core Network Deployment: https://www.youtube.com/watch?v=ENQiwI2EYI8
Thank you for your attention!
Q&A!