

OpenAirInterface 5G Core Network: Status and Roadmap

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OAI Workshop, 08-09 Nov 2022 / San Diego, USA



Outline

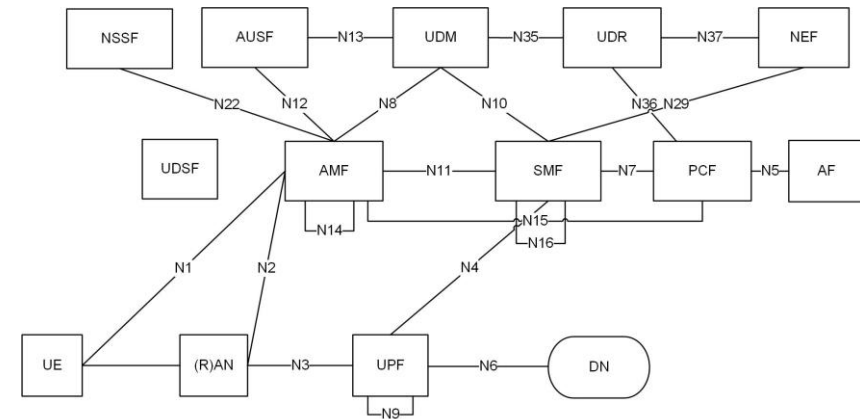
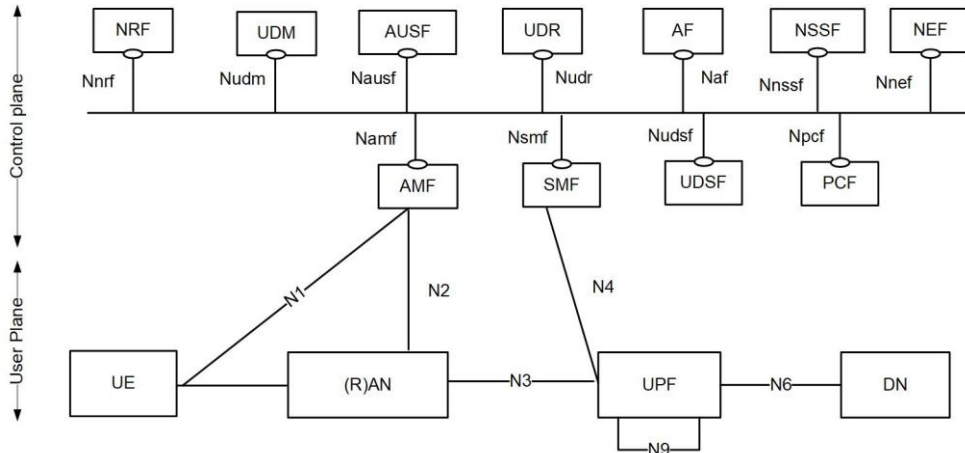
- Introduction of 5G System and OAI 5G CN project
- Current Implementation Status of OAI 5GC Components
- Roadmap
- OAI CN-related Activities

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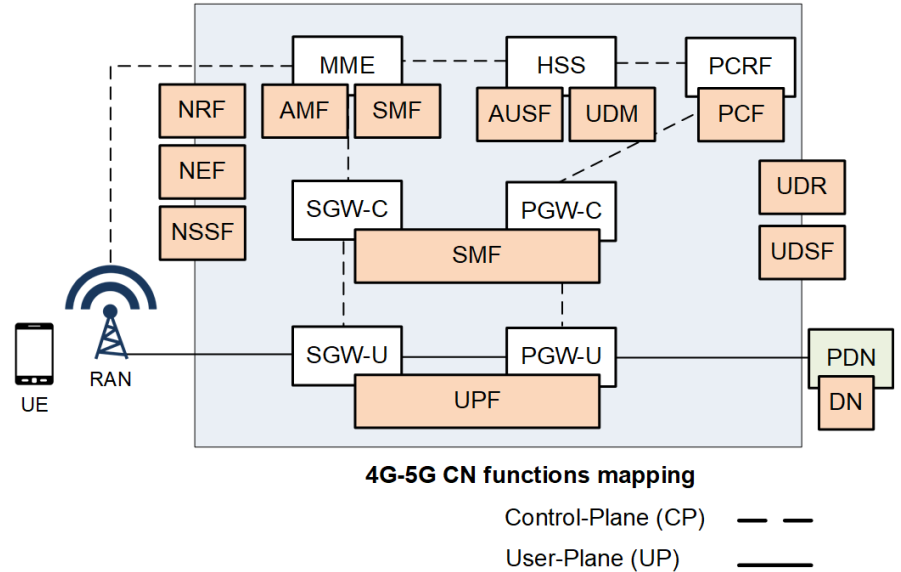
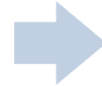
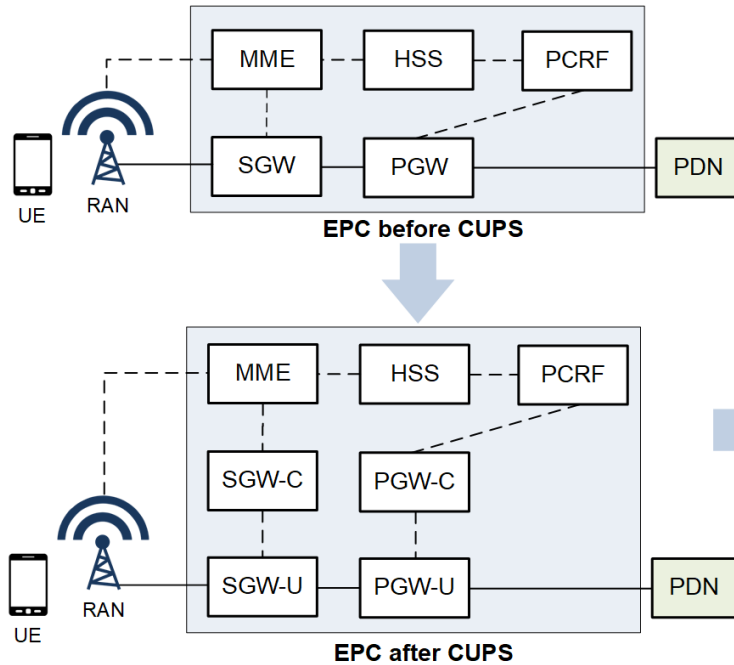
5G System Architecture

- 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 5G CN Project Group

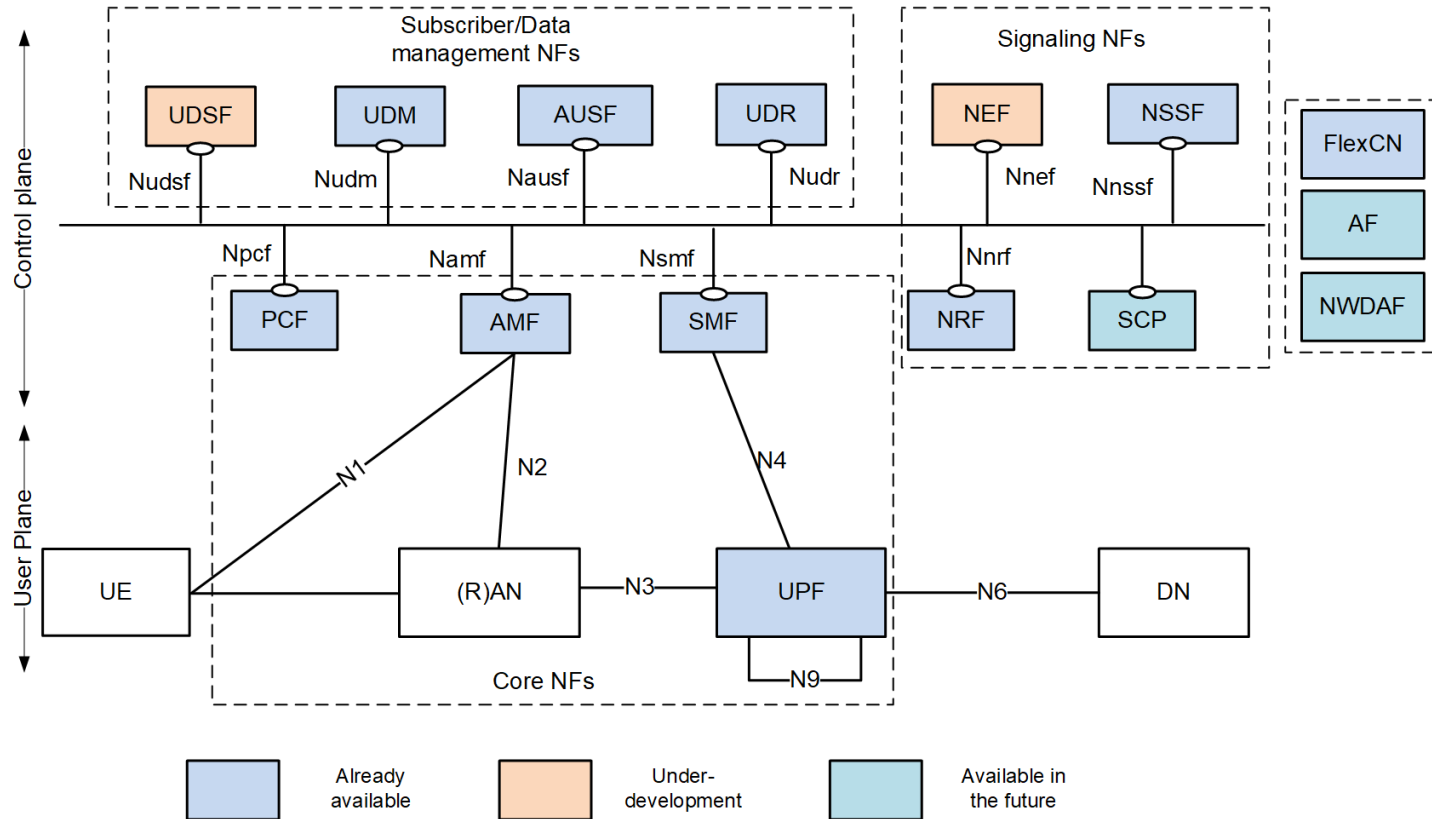
- Website: <https://openairinterface.org/oai-5g-core-network-project/>
- Develop a fully 3GPP compatible 5G CN stack (SA) as open source software for the OAI community
- Sponsors: **Qualcomm, Meta (Facebook) Connectivity, InterDigital**
- Main contributors:
 - **EURECOM/OSA, BUPT, KCL**



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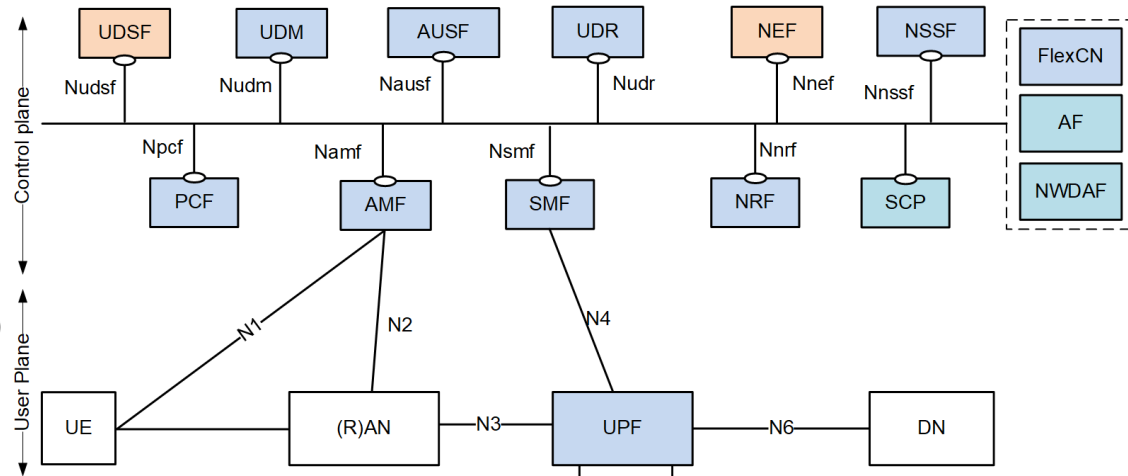
OAI 5G CN – Current Status (1): Release 1.5.0



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 (7 events), AMF (6 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
 - Support multiple UPFs in the same data path/Support UL Classifier



NF: Network Function, FQDN: Fully Qualified Domain Name

OAI 5G CN – Current Status (3)

▪ Different flavors

▪ Three 5GC modes

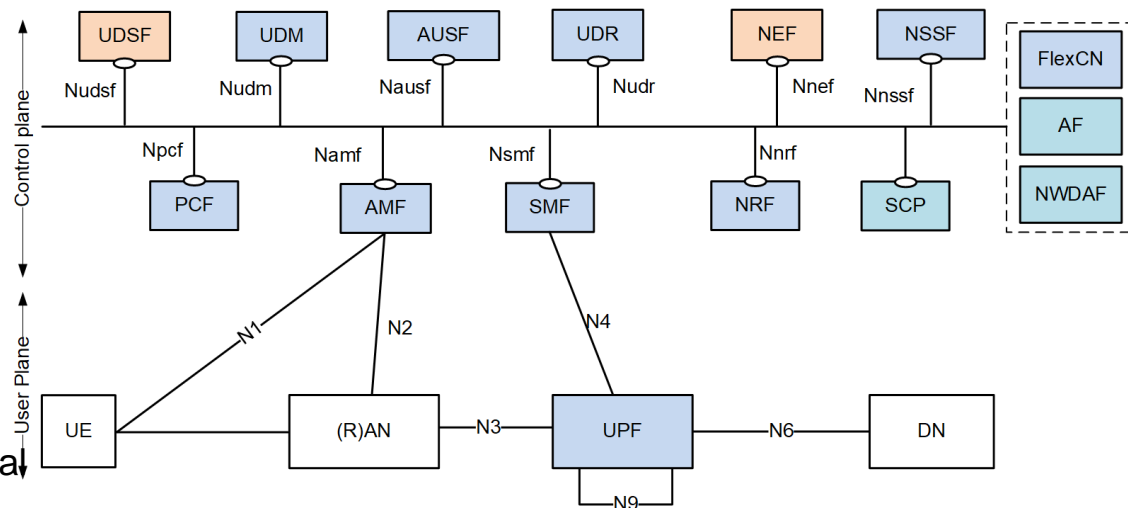
- Minimalist 5GC with AMF, SMF, UPF (and NRF)
- Basic 5GC with AMF, SMF, NRF, UPF, UDM, AUSF and UDR
- Full 5GC with AMF, SMF, NRF, UPF, UDM, AUSF, UDR, PCF, NSSF and NEF

▪ Three UPF flavors:

- SPGW-U (from 4G) with additional features for 5G
- VPP-UPF (relying on VPP-Traveling, with DPDK support)
- P4-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)



DPDK: Data Plane Development Kit
VPP: Vector Packet Processing

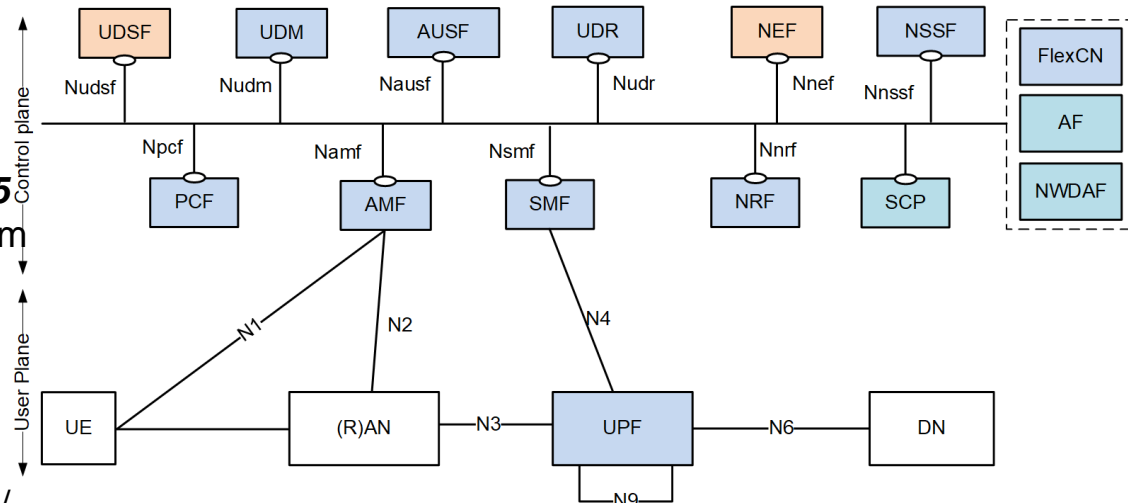
OAI 5G CN – Current Status (4)

Validation, CI/CD with

- Professional tester (dsTest/ng4T): Functional, stability, reliability (and performance) tests
- OAI gNB/OAI UE, COTS UEs (**Rel 15** and **Rel 16** UEs e.g., Quectel/ SIMcom modules, Huawei P40/P40 Pro, Pixel 5, One Plus 8), Amarisoft UE
- Open-source RAN simulators (gNBSim, UERANSIM, My5g-RANTester)
- Commercial gNBs (Amarisoft/Baicell)/ COTS UEs

Stabilize 5GCN and add user-friendly functionalities

- Reduce image size, reduce CPU utilization footprint
- Code cleanup for NGAP/NAS libraries
- Provide customize APIs for User provisioning
- Provide customize APIs for configuring AMF/SMF on the fly (e.g., get/update configuration information)



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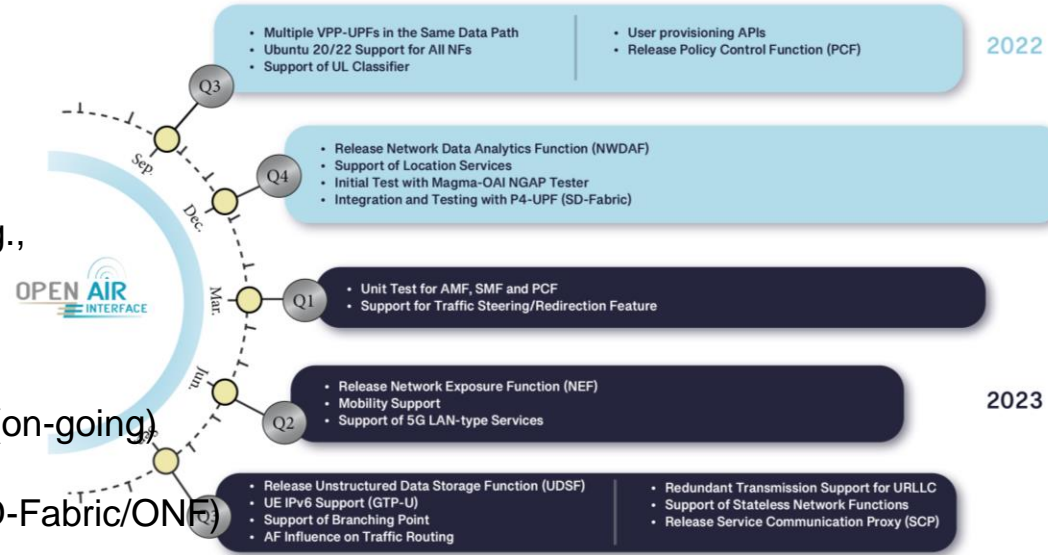
OAI 5G CN – Roadmap

■ Q2-Q3 2022:

- Release PCF (with basic functionalities)
- Multiple UPFs in the same data path:
Support of UL-Classifier
- Customize APIs for User provisioning
- Customize APIs for configuring NFs (e.g., AMF/SMF)
- Support Ubuntu 20.04/22.04

■ Q4 2022 - :

- Support of location service procedures (on-going)
- Support of Traffic Steering/Redirection
- Integration and testing with P4-UPF (SD-Fabric/ONF)
- Add Unit Test for NFs
- Support of Mobility
- IPv6 support (GTP-U for N4)
- Support of 5G LAN-type Services
- Redundant Transmission support (for URLLC)
- New entities: UDSF (for stateless NFs), NWDAF, NEF, SCP, LMF



<https://openairinterface.org/oai-5g-core-network-project/>

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OAI CN-Related Activities

- Magma testing: 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
- Orchestrating OAI CN with Magma Orchestrator: Bringing a 3GPP-compliant core to Magma ecosystem (Demo from Rohan KHARADE)
- OAI CN with Aether (ONF)

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!