

OpenAirInterface 5G Core Network: A Cloud-Native 3GPP-Compliant 5G CN

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Outline

- Introduction of OpenAirInterface and 5G System
- Current Implementation Status of OAI 5G CN Components
- Roadmap

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What is OpenAirInterface?

- OpenAirInterface (OAI): Open-source software-based implementation of 3GPP Technologies
 - E-UTRAN (eNB, gNB, UE, nr-UE)
 - EPC (MME, S/P-GW, HSS)
 - 5GC (AMF, SMF, NRF, UPF, etc.)
- Objectives
 - Building a community of individual developers, academics and major industrials embracing open-source for 5G
 - Provide a reference implementation for 4G/5G 3GPP systems
 - Allow easy adoption of the software in other projects or products
- OpenAirInterface Software Alliance (OSA)
 - Launched in 2014 as an endowment fund (French “Fonds de Dotation”) to facilitate OAI adoption



Platforms for Advanced
Wireless Research

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
- License
 - 5G Core network license is OAI Public License v1.1
 - **Contribution is opened** to anyone who signs the license agreement
- Sponsors: Qualcomm, Facebook Connectivity, Interdigital
- Main contributors:
 - EURECOM, BUPT

Qualcomm

 facebook
connectivity

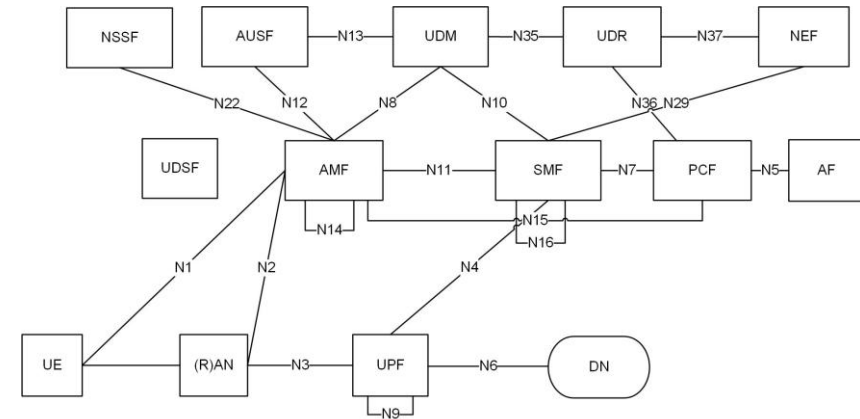
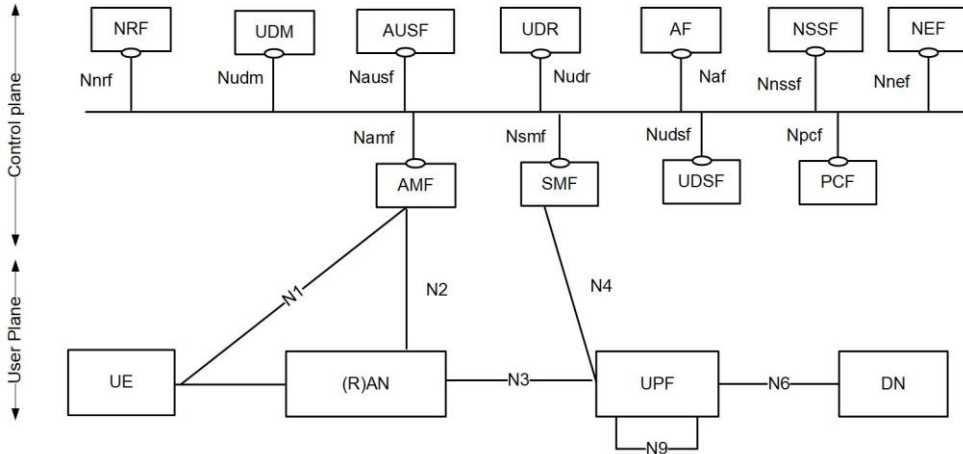

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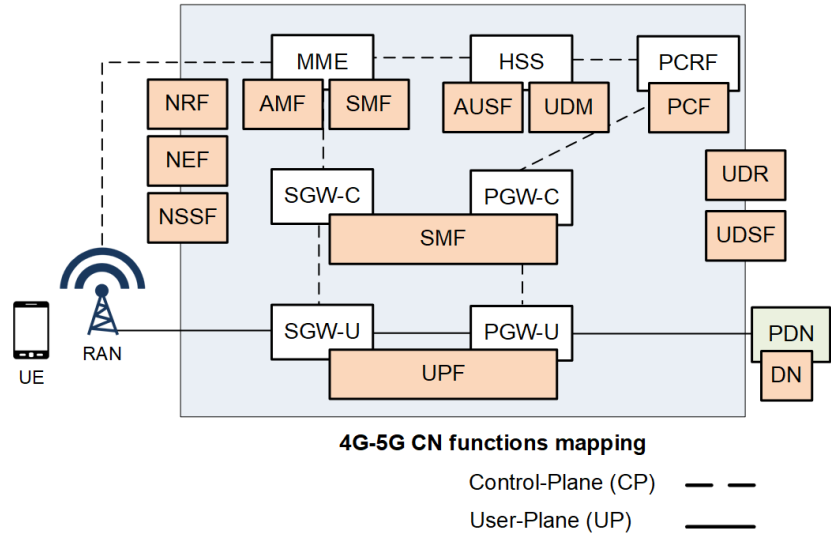
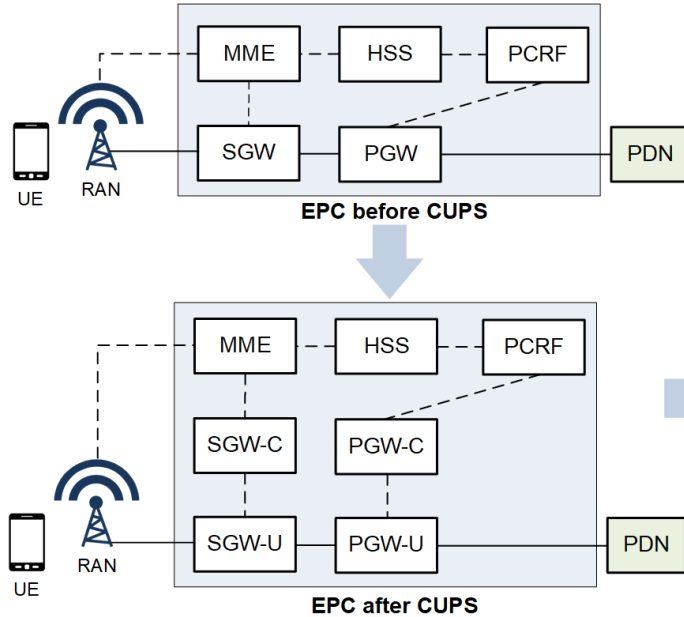
5G System Architecture

- 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 TS 23.501)

Core Network: From 4G to 5G Networks



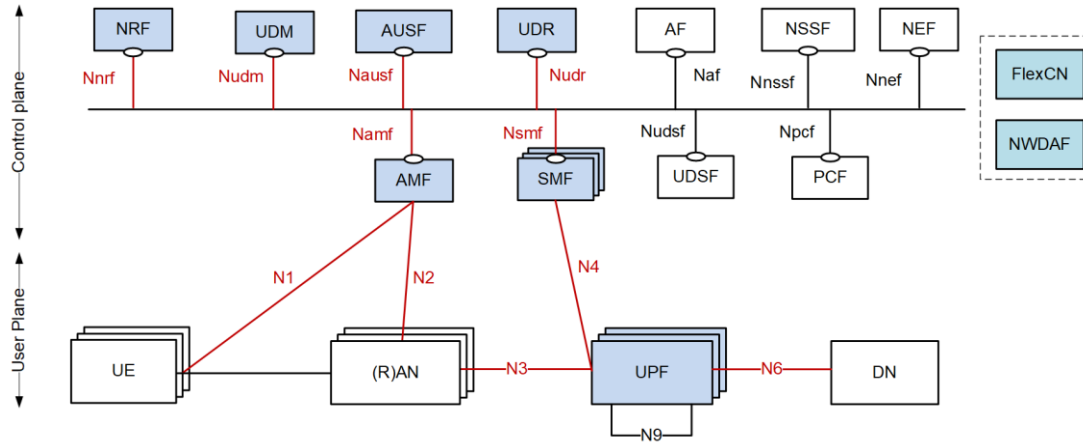
CUPS: Control and User Plane Separation
 SGW: Serving Gateway
 PCRF: Policy and Charging Rules Function

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

Outline

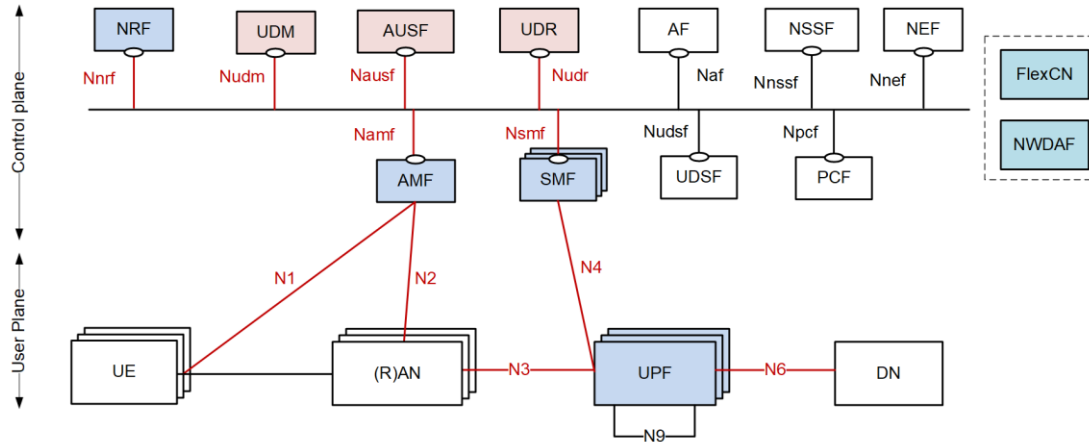
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OAI 5G CN – Current Status (1)



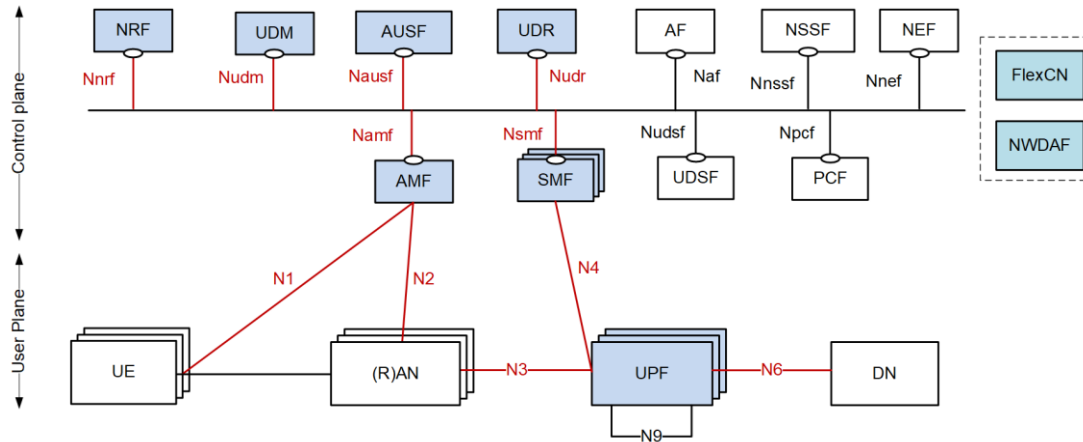
- A solid and functional 5GC
 - Basic procedures (with multiple UEs/multiple PDU sessions)
 - Connection and registration procedures: UE registration/de-registration, service request
 - Session management procedures: PDU session establishment, modification, release
 - Additional features
 - NF registration, NF discovery: SMF selection (for AMF), UPF selection (for SMF)
 - N2 handover, Paging, HTTP/2 (on-going), FQDN support

OAI 5G CN – Current Status (2)



- Two 5GC modes
 - Minimal 5GC with AMF, SMF, NRF and UPF
 - Basic 5GC with AMF, SMF, UDM, AUSF, UDR, NRF and UPF
- Three UPF flavors:
 - SPGW-U (from 4G) with additional features for 5G
 - VPP-UPF (relying on VPP-Travelling, with DPDK support)
 - Production grade UPF (Kaloom)

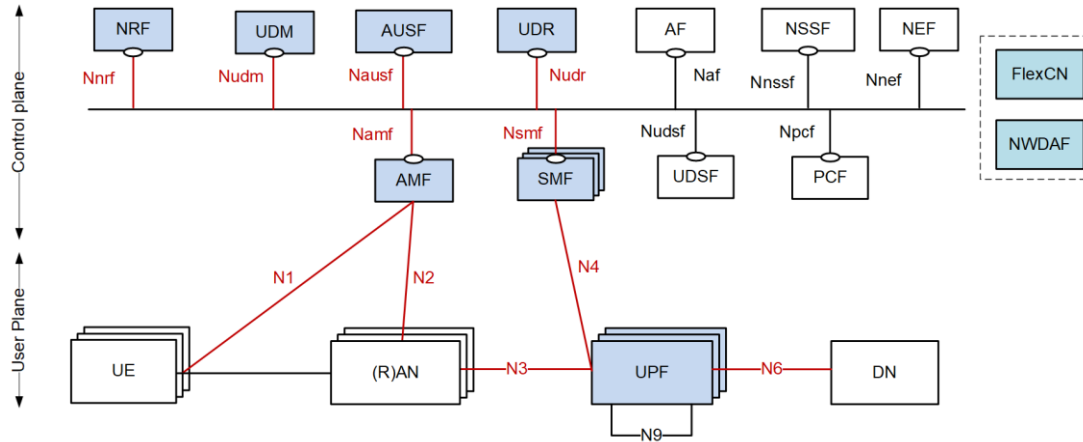
OAI 5G CN – Current Status (3)



Validation, CI/CD

- With a professional tester (dsTest, Developing Solutions): Functional, stability, reliability and performance tests (number of supported UEs/sessions, throughput, packet loss):
 - Testing AMF, SMF and UPF with simulated gNB/UE
 - Bracket test for AMF, SMF (e.g., testing AMF with simulated SMF/UPF/gNB/UE)
- With OAI gNB/OAI UE (+ Quectel/SIMcom modules)
- With commercial gNBs (Amarisoft/Baicell) /COTS UEs
- With open-source RAN simulators (gNBSim, UERANSIM)

OAI 5G CN – Current Status (4)



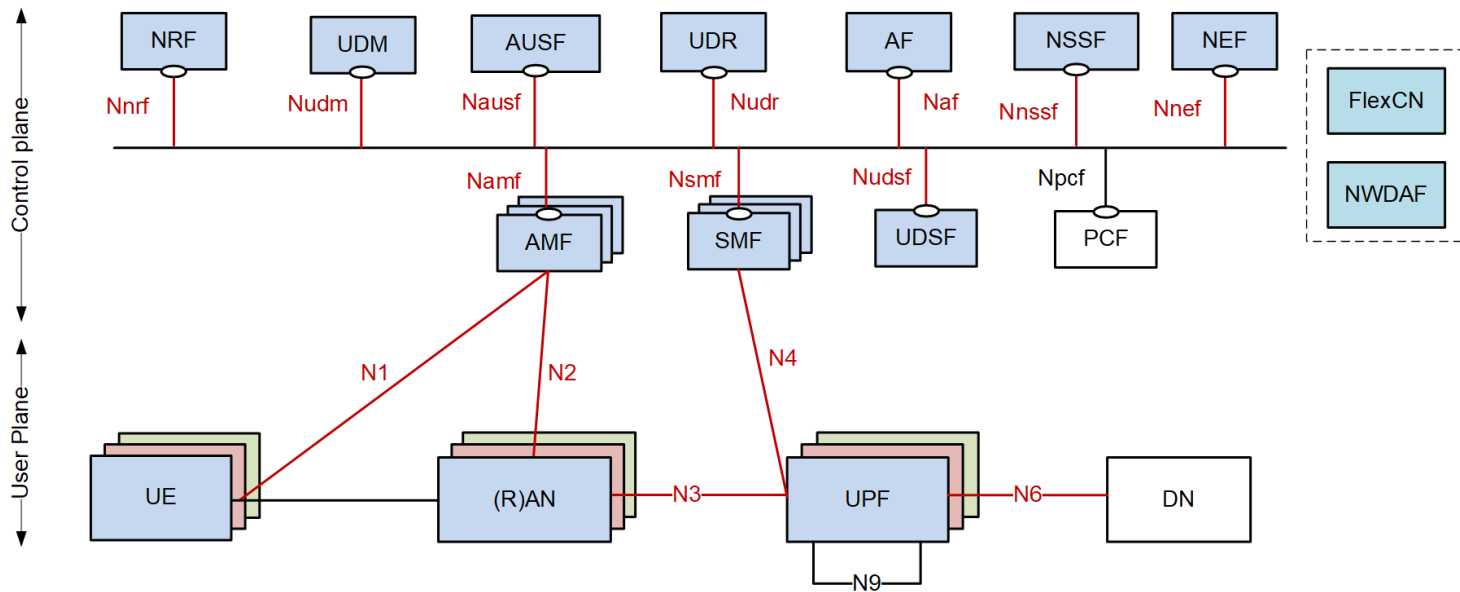
Deployment, CI/CD

- 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

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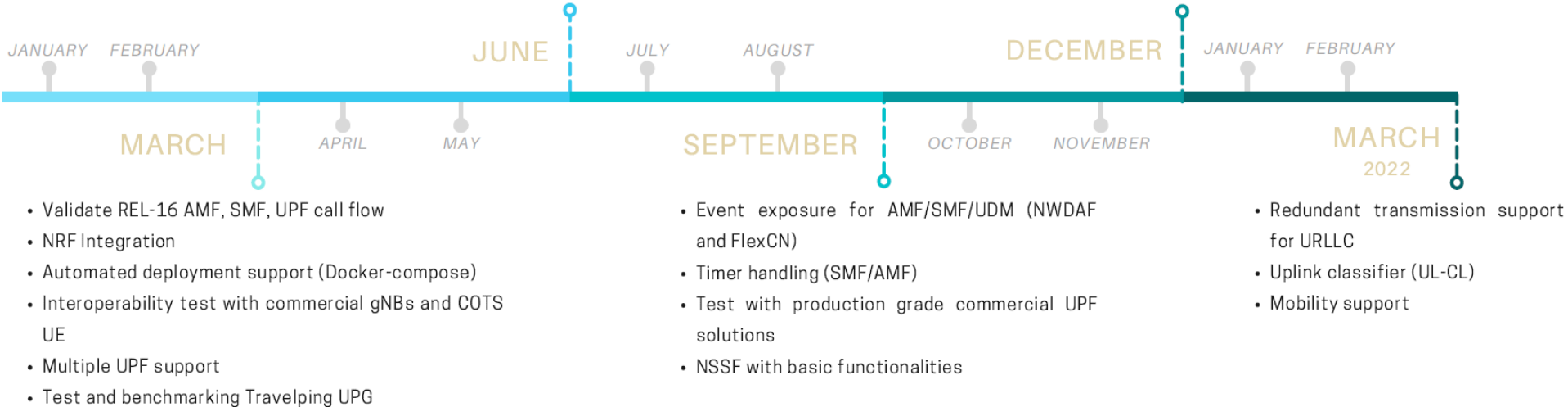
Roadmap: OAI 5GC Components



OAI CN 5G Project: Timeline

- Cloud native deployment
- Feature support N2 handover, paging, HTTP/2
- Integrating new network elements REL-16 UDM, AUSF, UDR
- Test with OAI gNB and UE
- Support for FQDN
- Compatibility test with opensource RAN simulators

- NEF, UDSF, NWDAF integration



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>
- Mailing lists: <https://gitlab.eurecom.fr/oai/openairinterface5g/-/wikis/MailingList>
 - openaircn-user/ openaircn-devel for the users/developers of OAI CN

Thank you for your attention!

Q&A!