

OpenAirInterface 5G Core Network Project: Status and Roadmap

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Outline

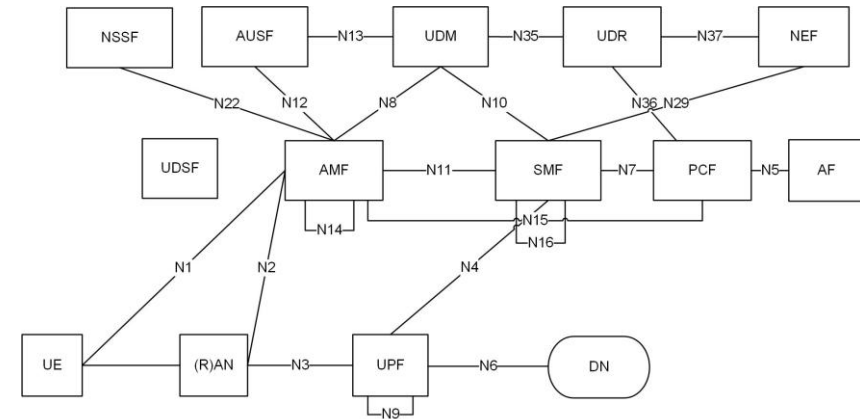
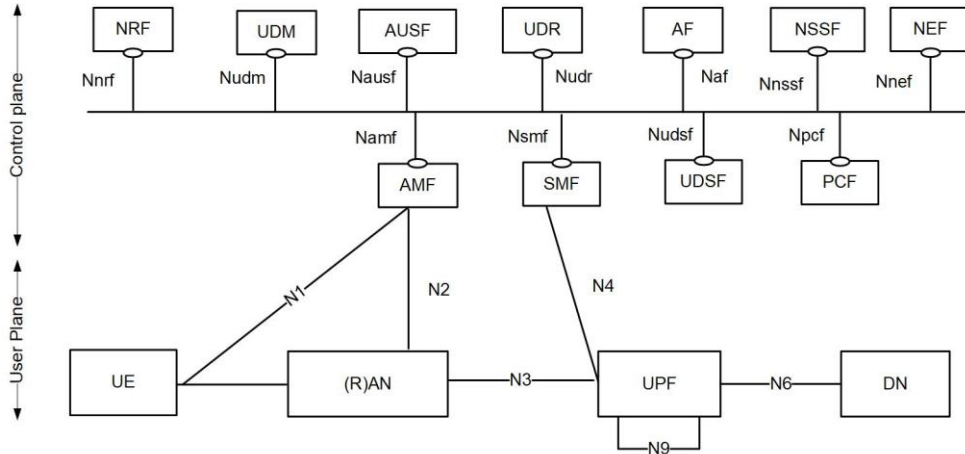
- Introduction of 5G System and OAI 5G CN project
- Current Implementation Status of 5GC Components
- Roadmap

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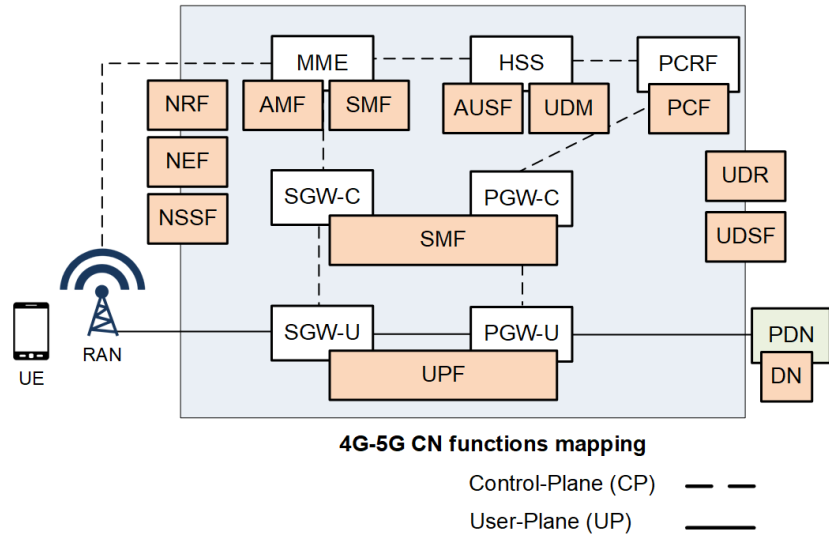
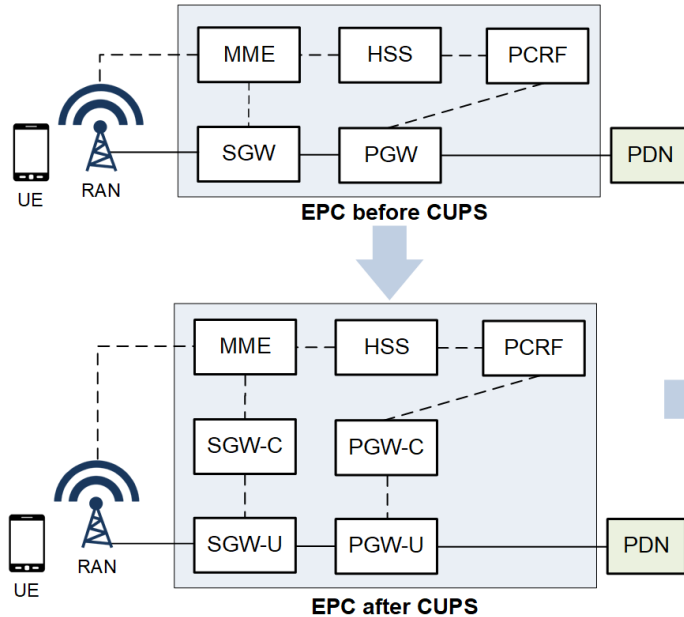
5G System Architecture

- 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

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


EURECOM
Sophia Antipolis

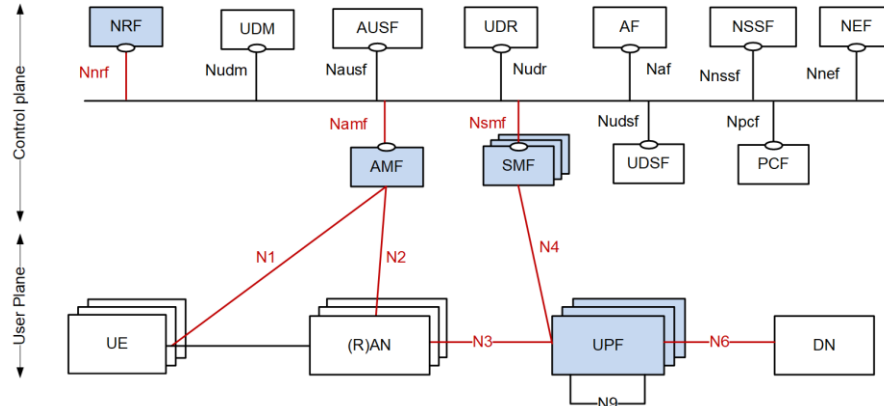
 北京邮电大学
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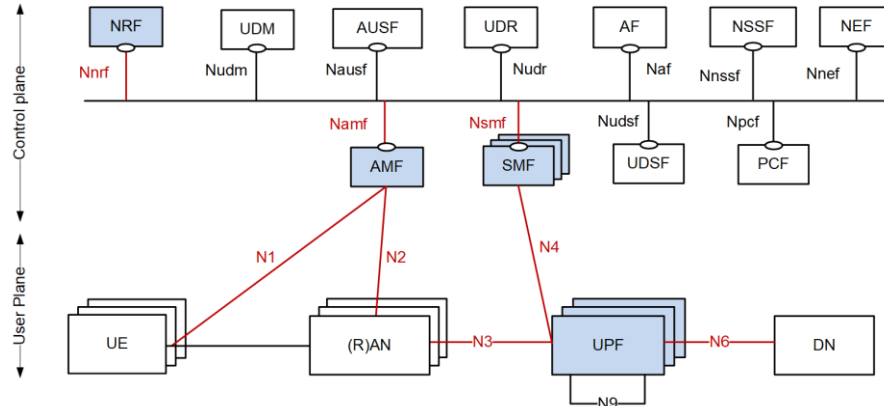
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OAI 5G CN – Current status (1)



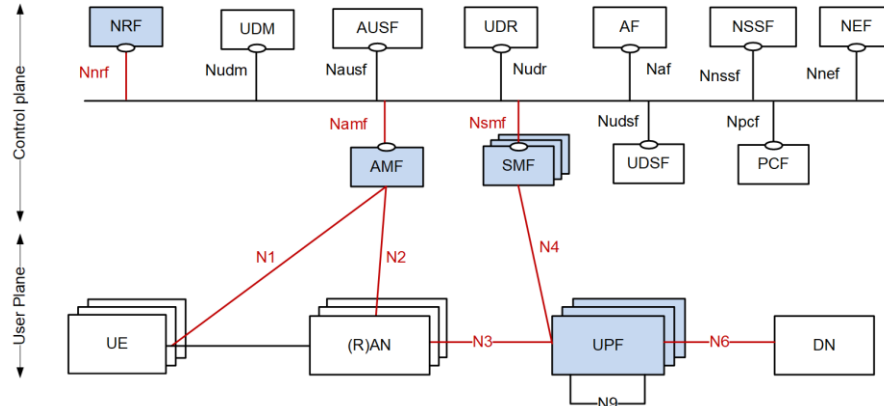
- A solid and functional 5GC with basic components AMF, SMF, NRF, UPF
 - Basic procedures (with multiple UEs/multiple PDU sessions)
 - Connection and registration procedures: UE registration/de-registration, service request
 - Session management procedures: PDU session establishment, modification, release
 - Additional features
 - NF registration, NF discovery: SMF selection (for AMF), UPF selection (for SMF)
 - Two UPF flavors:
 - SPGW-U (from 4G) with additional features for 5G
 - New UPF relying on VPP-Traveling (with DPDK support)

OAI 5G CN – Current status (2)



- 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 (and Quectel module)
 - With commercial gNBs (Amarisoft)/COTS UEs
 - With open-source RAN simulators (gNBSim, UERANSIM)

OAI 5G CN – Current status (3)

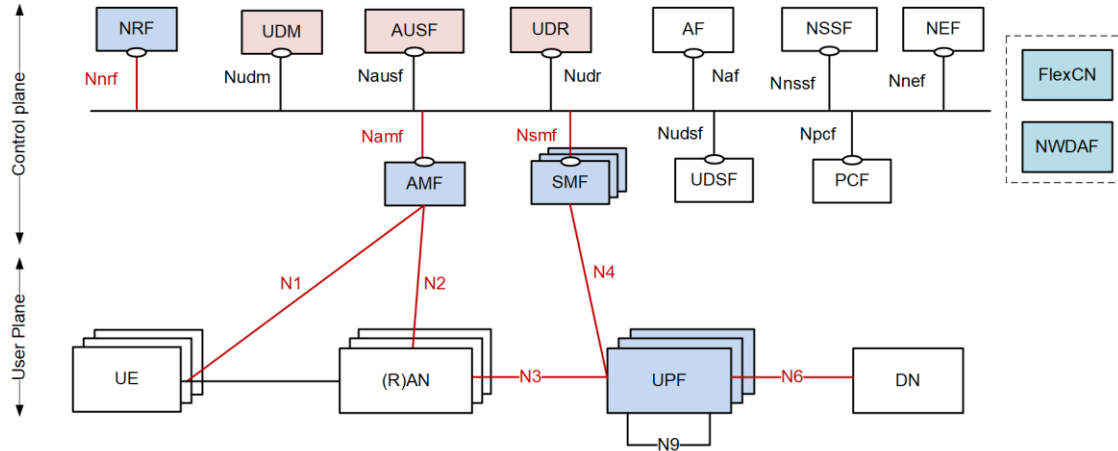


- Deployment, CI/CD
 - Traditional/classic deployment on Servers/Virtual machines
 - Automated deployment of NFs in Docker containers using Docker Compose
 - Cloud-native deployment using Helm Chart on OpenShift cluster

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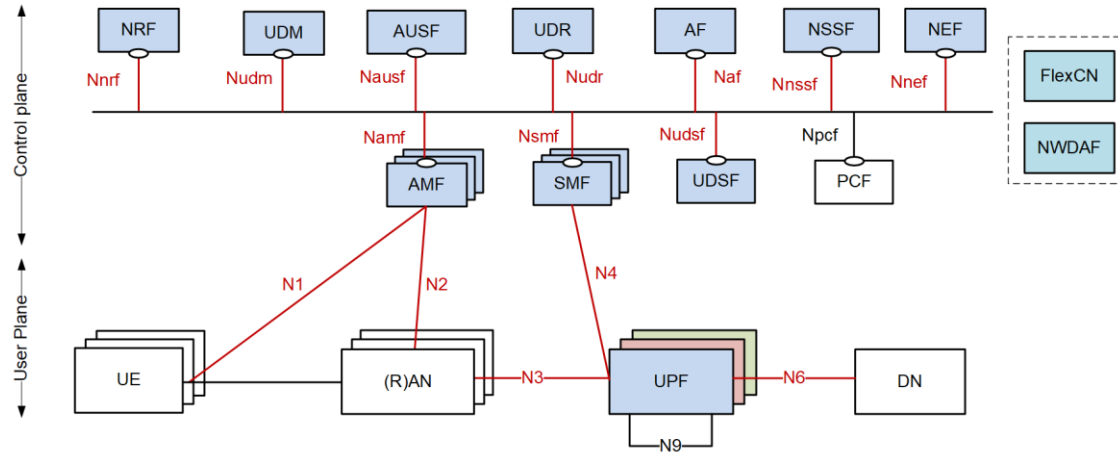
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Roadmap: On-going works (Q2 2021)



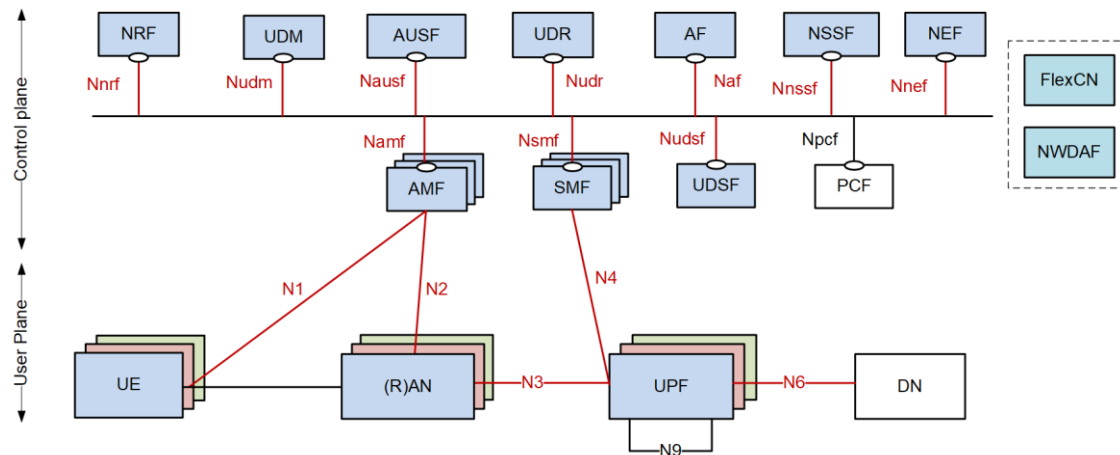
- Add new procedures/functionalities (N2 handover, Paging, HTTP/2, FQDN support)
- Implement UDM, AUSF, UDR (Rel-16) and integrate with existing components
 - Two modes: with and without UDM/AUSF/UDR
- Session Management Event Exposure Service for SMF (to support FlexCN (Mosaic5G), NWDAF)

Roadmap: Next steps (Q3 2021 onwards)



- Introduce more features e.g., Event Exposure services for AMF/UDM (Q3 2021), Session and Service continuity (Q1 2022), Redundant transmission for supporting URLLC, Uplink Classifier (Q1/Q2 2022), Support of different PDU session types (Q1/Q2 2022)
- Test/Integrate with Kaloom's standalone UPF (Q3 2021)
- Implement the other components: NSSF (Q3 2021), NEF, UDSF, AF, NWDAF (Q4 2021)
- Fully support network slicing feature (Q4 2021)
- Support micro-services architecture (with stateless NFs, Q1/Q2 2022)

Roadmap: Now-Next-Later ...

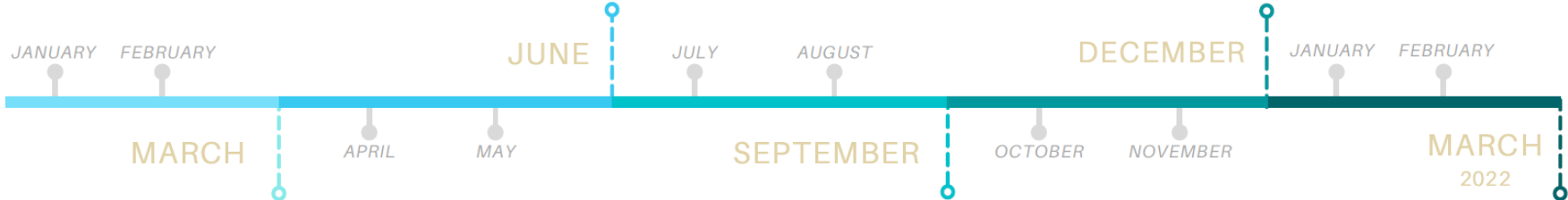


- Integration/Validation
 - Add more scenarios with dsTest (functional, performance, and bracket tests)
 - Intensively test all the components with dsTest, OAI gNB, open-source RAN simulators, and different commercial gNBs, OAI UE, COTS UEs

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



- Validate REL-16 AMF, SMF, UPF call flow
- NRF Integration
- Automated deployment support (Docker-compose)
- Interoperability test with commercial gNBs and COTS UE
- Multiple UPF support
- Test and benchmarking Traveling UPG

- Event exposure for AMF/SMF/UDM (NWDAF and FlexCN)
- Timer handling (SMF/AMF)
- Test with production grade commercial UPF solutions
- NSSF with basic functionalities

- Redundant transmission support for URLLC
- Uplink classifier (UL-CL)
- Mobility support

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