O-CU-UP

O-CU-CP

Service Data Adaptation Protocol
Handles 5G user data by assigning it to the right radio bearer based on its priority and service requirements.
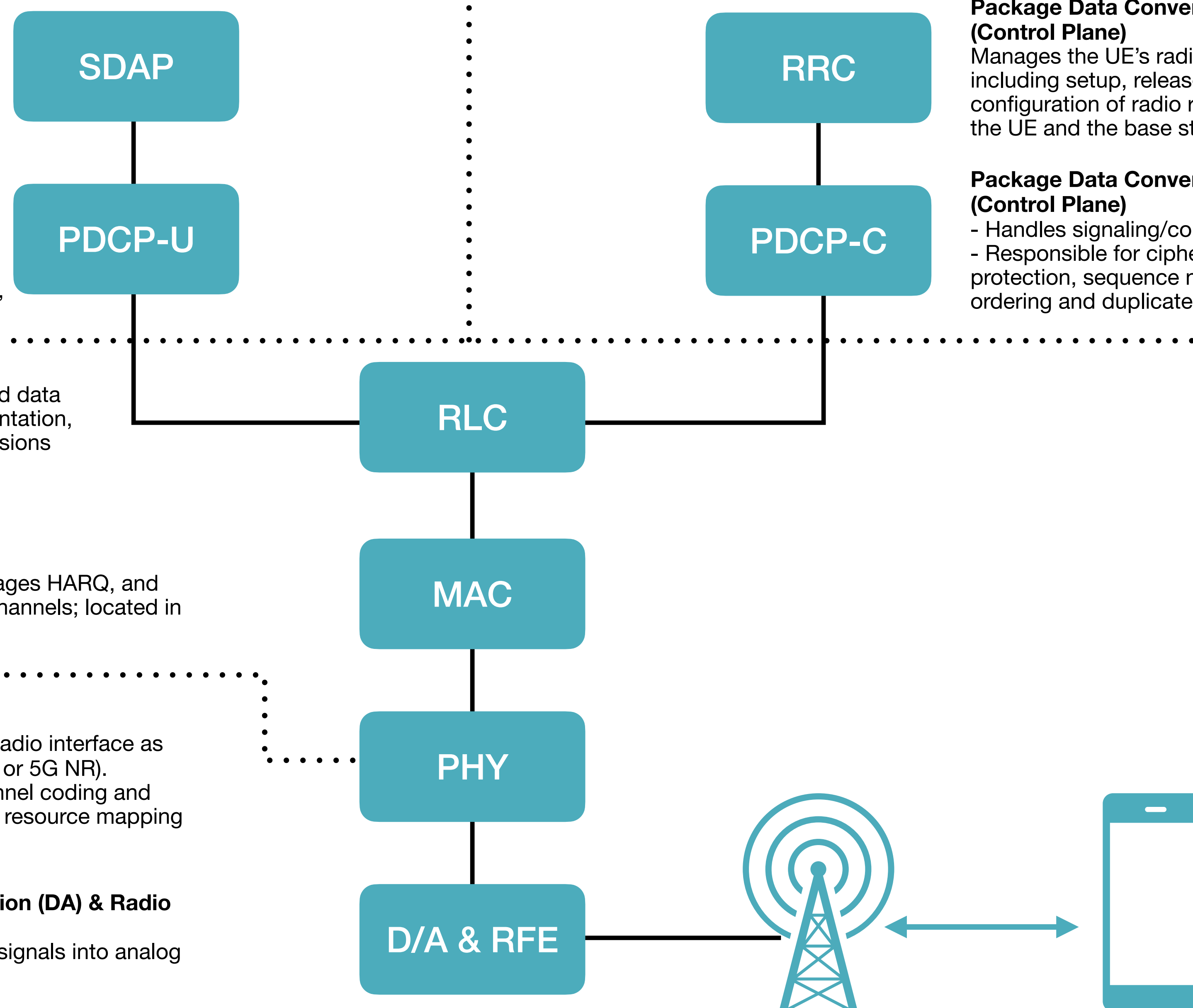
SDAP

Package Data Convergence (Control Plane)
Manages the UE's radio connection, including setup, release, mobility, and configuration of radio resources between the UE and the base station.

RRC

Package Data Convergence (User Plane)
- Handles user data traffic (e.g., Internet, apps, media)
- performs tasks such as header compression, ciphering, sequence numbering and reordering, and duplicate detection.

PDCP-U

Package Data Convergence (Control Plane)
- Handles signaling/controlling messages
- Responsible for ciphering and integrity protection, sequence numbering and ordering and duplicate detection

PDCP-C

O-DU

Radio Link Control
Ensures reliable and ordered data delivery by handling segmentation, reassembly, and retransmissions between PDCP and MAC.

RLC

Medium Access Control
Schedules resources, manages HARQ, and maps logical to transport channels; located in the O-DU in O-RAN.

MAC

O-RU

Physical Layer
- Implements the physical radio interface as defined by 3GPP (e.g., LTE or 5G NR).
- Handles modulation, channel coding and decoding, HARQ, MIMO or resource mapping

PHY

Digital-to Analog conversion (DA) & Radio Frequency Equipment
Converts digital baseband signals into analog RF signals

D/A & RFE

Scope: Standardized Radio Access technologies across generations (2G, 3G, 4G, 5G)

Responsibilities: Defines protocol stacks (PHY, MAC, RLC, PDCP, RRC, NAS, SDAP), interfaces (N2, N3, E1, F1), UE categories, QoS, signaling, and base station behavior (gNB/eNB) with the core network.

3GPP (3rd Generation Partnership Project)

O-RAN Alliance

- **Scope:** Specifies open, disaggregated RAN architectures and interfaces for multi-vendor interoperability.

- **Responsibilities:**
  - Defines functional splits (O-CU-CP, O-CU-UP, O-DU, O-RU).
  - Specifies E2, A1, and open fronthaul interfaces.
  - Defines Near-RT RIC and control loops.

Scope: Focuses on software-defined RAN controllers and orchestration.

Responsibilities:
- Provides software platforms to control and manage disaggregated RAN elements.
- Implements policy-driven automation, network slicing, and optimization.
- Interfaces with O-RAN components via standard interfaces.

ONF SD-RAN

Telecom Infra

Scope: Physical deployment of RAN components and networking infrastructure.

Responsibilities:
- Supply radio units (O-RU), antennas, fiber fronthaul/backhaul, and data centers.
- Ensure site installation, power, cooling, and maintenance.
- integrate O-RAN and 3GPP components into a working network.