PDCP (Packet Data Convergence Protocol):

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Function:

PDCP operates in the Radio Protocol Stack above the RLC (Radio Link Control) layer and below the RRC (Radio Resource Control) layer. Its primary functions include:

Header Compression: PDCP compresses the headers of IP packets to reduce the overhead in the radio interface. This helps in optimizing the use of radio resources and improving throughput.

Ciphering: PDCP provides encryption and decryption services to ensure the confidentiality and integrity of user data transmitted over the radio interface. It uses algorithms like AES (Advanced Encryption Standard) for encryption.

Duplicate Detection and Removal: PDCP detects and eliminates duplicate packets, which can occur due to retransmissions in the lower layers or due to handovers in the network.

Radio Bearer Control: PDCP manages the establishment, maintenance, and release of radio bearers (RBs) that carry user data between the UE (User Equipment) and the eNodeB (Evolved Node B, which is the LTE base station).

Entities:

UE (User Equipment): The mobile device that communicates with the LTE network.

eNodeB (Evolved Node B): The LTE base station that connects the UE to the LTE core network.

PDCP Entity: Exists in both the UE and the eNodeB. In the UE, it handles compression and decompression of IP headers, ciphering/deciphering, and duplicate removal. In the eNodeB, it performs similar functions for data received from the UE.

SDAP (Service Data Adaptation Protocol):

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Function:

SDAP resides above the PDCP layer and below the RRC layer. Its main functions include:

QoS (Quality of Service) Flow Handling: SDAP manages QoS flows for different services (like voice, video, or data) by mapping IP flows to bearers with specific QoS requirements.

QoS Flow Identity Handling: SDAP assigns and identifies individual QoS flows within the LTE protocol stack. Each QoS flow corresponds to a specific IP flow and has particular QoS characteristics.

PDU Session Management: SDAP manages PDU (Protocol Data Unit) sessions, which are logical connections between the UE and the core network. It ensures that data packets belonging to the same session are properly handled and delivered.

Data Buffering: SDAP may perform data buffering to manage congestion and ensure smooth delivery of data, especially during peak traffic periods or in case of network issues.

Entities:

UE (User Equipment): The mobile device that sends and receives data packets in the LTE network.

eNodeB (Evolved Node B): The LTE base station that connects the UE to the LTE core network.

SDAP Entity: Exists in both the UE and the eNodeB. In the UE, it handles QoS flow mapping, PDU session management, and data buffering. In the eNodeB, it performs corresponding functions for data received from the UE.