Weekly Learning Report
5G NR Layer 2 and Layer 3 Protocols

Internship Technical Summary

January 19, 2026

Overview

This report summarizes the key technical concepts learned during the past week of the internship. The focus was on understanding the functionality and interaction of 5G NR Layer 2 and Layer 3 protocols, particularly SDAP, PDCP, RLC, MAC, Advanced MAC procedures, and RRC. The learning emphasized practical reasoning behind protocol design choices rather than specification-level depth.

1 SDAP Layer

This week, I learned how SDAP enables QoS handling between the 5G Core and the radio access network.

- Understood QoS Flow to DRB mapping using QFI.
- Learned the purpose of Reflective QoS in simplifying uplink QoS handling.
- Observed how SDAP header usage can be optimized to reduce overhead.

2 PDCP Layer

The PDCP layer learning focused on security, packet ordering, and mobility support.

- Learned how ciphering and integrity protection are applied using PDCP COUNT.
- Understood PDCP sequence numbering and reordering mechanisms.
- Studied duplicate detection and data forwarding during handover.
- Gained a basic understanding of ROHC and its benefit for VoIP traffic.

3 RLC Layer

A major part of the learning involved understanding why multiple RLC modes exist.

- Learned differences between RLC TM, UM, and AM.
- Understood segmentation, reassembly, and sequence numbering.
- Studied ARQ operation in RLC AM using polling and status reports.
- Learned the role of key timers such as t-Reassembly and t-PollRetransmit.

4 MAC Layer

The MAC layer learning focused on scheduling and uplink resource management.

- Understood the role of the MAC scheduler in balancing throughput and QoS.
- Learned Logical Channel Prioritization using priority and PBR.
- Studied Buffer Status Reports (BSR) and their triggering conditions.
- Learned how Power Headroom Reports (PHR) influence uplink scheduling.

5 Advanced MAC Procedures

Advanced MAC concepts were studied mainly from a power efficiency and latency perspective.

- Learned DRX operation and its impact on UE power saving and latency.
- Understood the purpose of Semi-Persistent Scheduling for periodic traffic.
- Studied HARQ retransmissions and basic carrier aggregation concepts.

6 RRC Layer

The RRC layer learning focused on connection management and mobility.

- Learned RRC states: IDLE, CONNECTED, and INACTIVE.
- Understood how RRC_INACTIVE reduces signaling overhead.
- Studied basic measurement reporting and handover triggering.

Conclusion

During this week, I gained a concise and structured understanding of how 5G NR Layer 2 and Layer 3 protocols work together to provide QoS, security, reliability, power efficiency, and mobility. This learning helped me connect protocol concepts with practical system behavior, forming a strong foundation for further work in 5G protocol implementation and analysis.