



METIS II

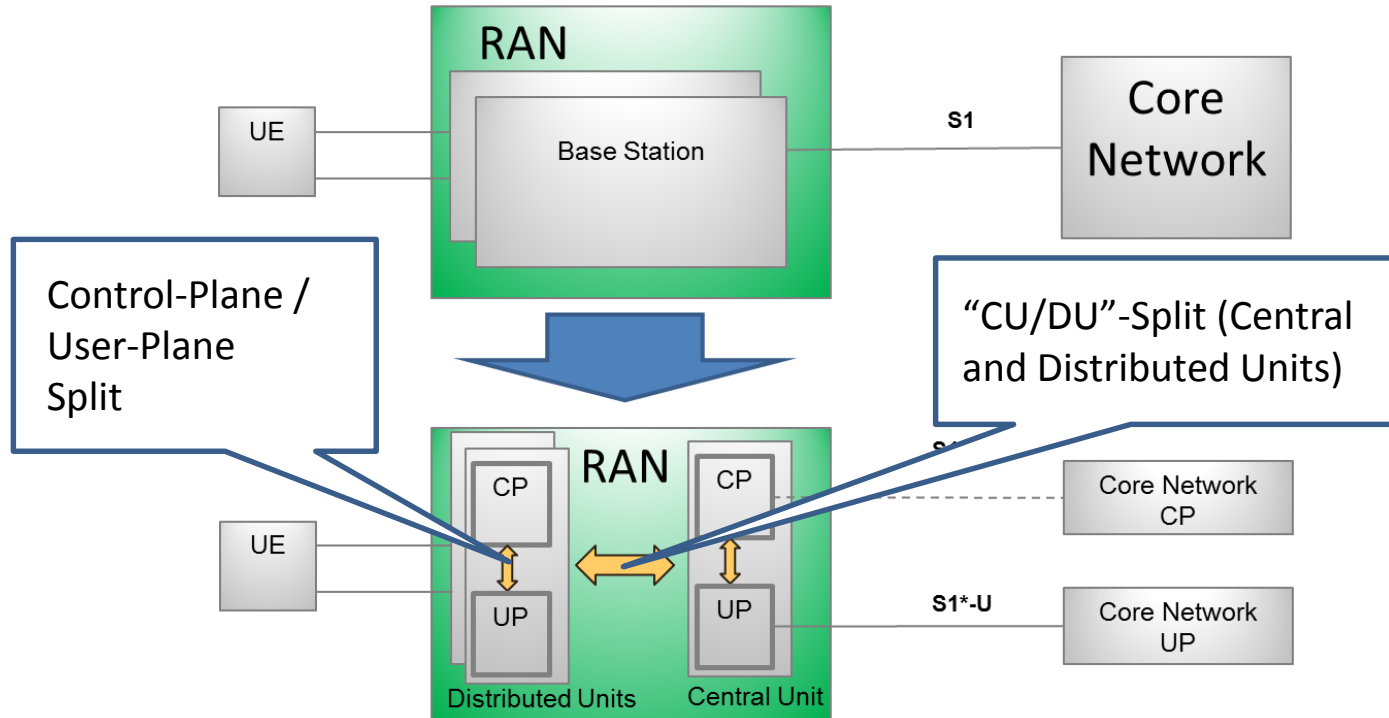
Split Options for 5G Radio Access Networks

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Technology Innovation
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Introduction

Two splits envisioned in the 5G RAN



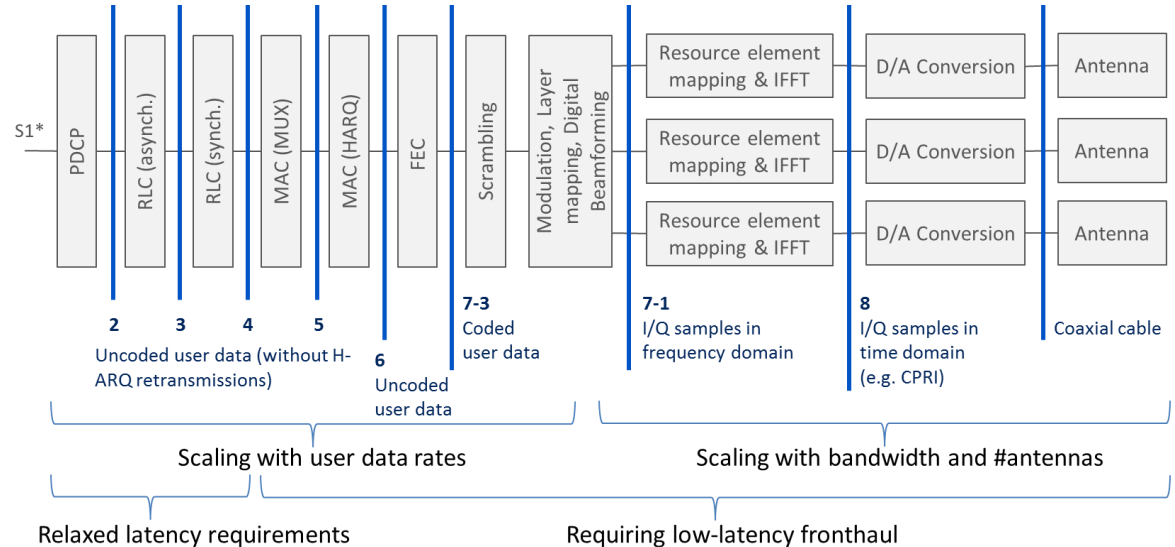


Central and Distributed Units

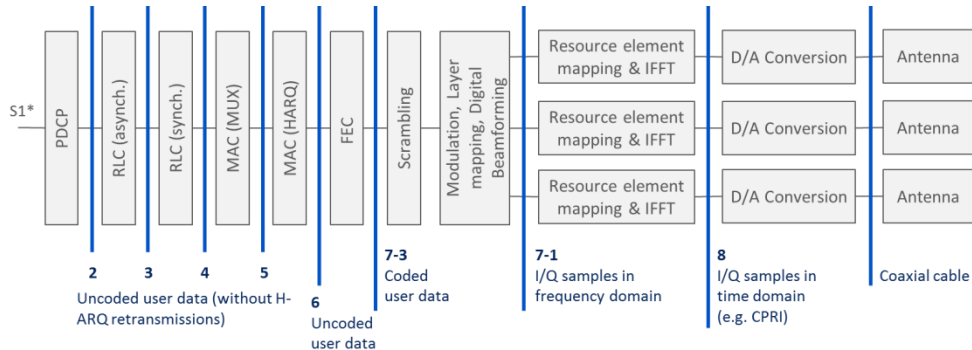
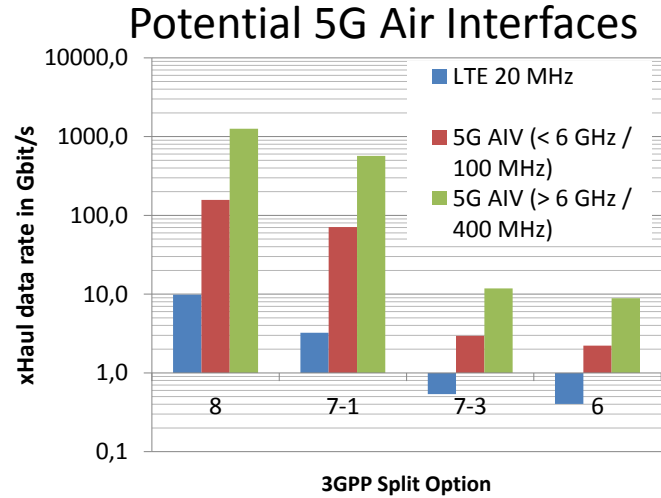
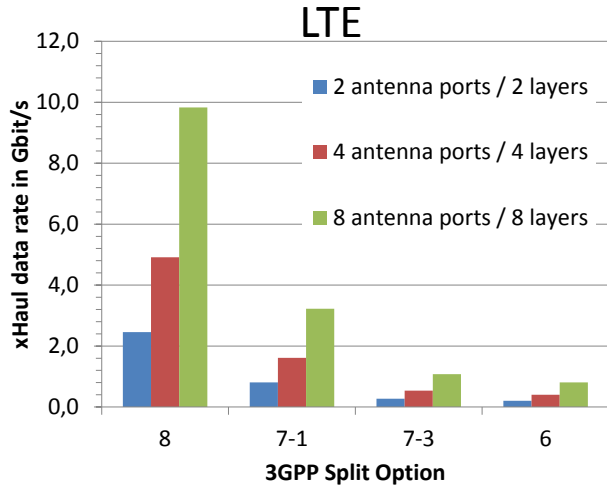
Central and Distributed Units

- › Centralization of parts of the processing in a central unit
- › Motivation: Simplified implementation of interference coordination, multi-connectivity, traffic-steering, ...
- › Several options to split the protocol stack, each with different demand on the underlying interface (xHaul)
- › Flexibility to implement centralization in different deployments

Split Options in the Protocol Stack



Examples for data rate requirements on the xHaul interface





Control-Plane / User-Plane Split



Control-Plane / User-Plane Split

- › Categorize network functions into Control-Plane (CP) and User-Plane (UP) functions
- › Define standardized interfaces for interaction between CP and UP

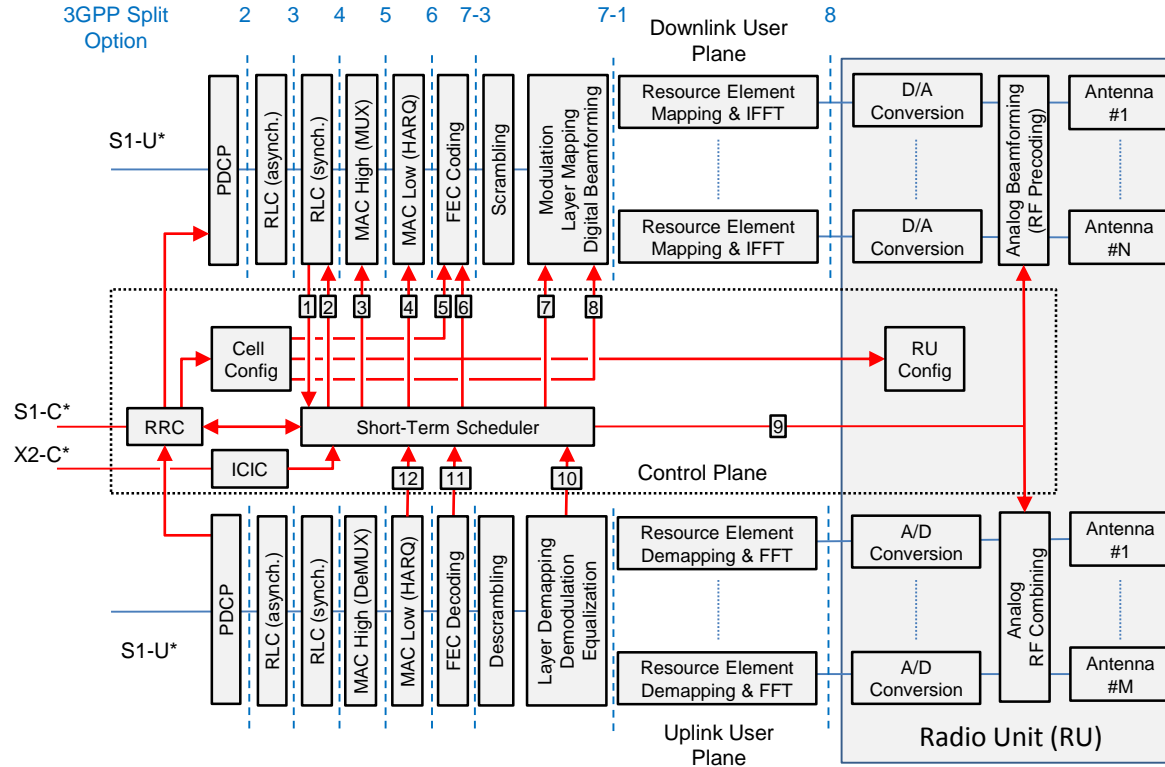
Pros

- › Consistent control over network elements from different vendors
- › Avoid replacement of UP in case CP is modified
- › More flexible network

Cons

- › Tight coupling of CP / UP → Full separation might be complex
- › Standardization for all interfaces is required
- › Additional effort in terms of testing

Interactions between CP and UP



- 1: DL Buffer Status
- 2: Payload Selection
- 3: Payload Selection, DL Resource Assignment, UL Grants
- 4: Retransmission Control
- 5: Broadcast Channel Information
- 6: Coding Scheme
- 7: Antenna Mapping, Precoder, Modulation Scheme
- 8: Reference Symbols, Synchronization Channels
- 9: Antenna Weights
- 10: Channel State Information (from UL Sounding)
- 11: Channel State Information (CQI Reporting), UL Scheduling Request
- 12: HARQ Status

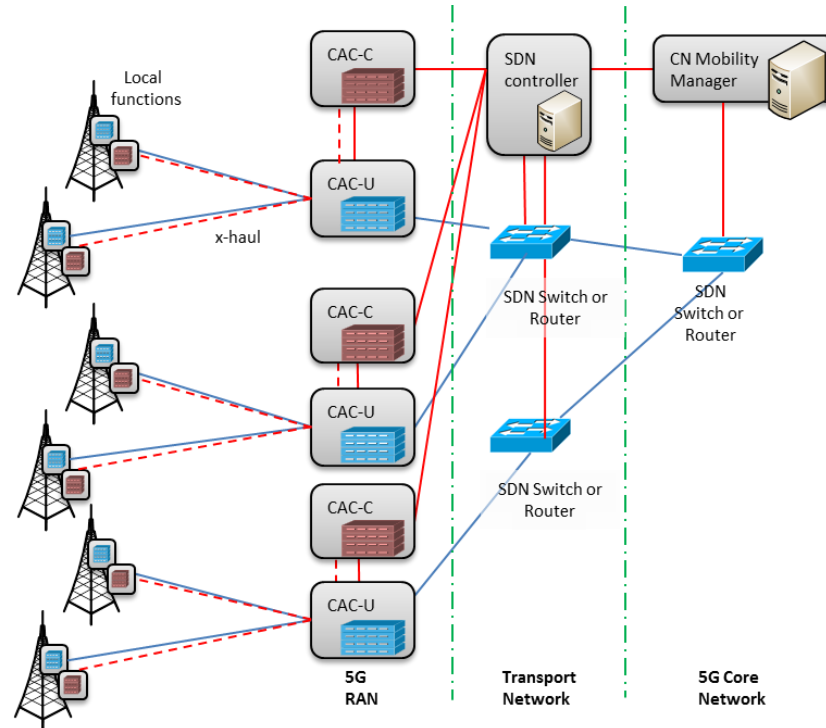


Overall Network Architecture

Proposed Overall Network Architecture

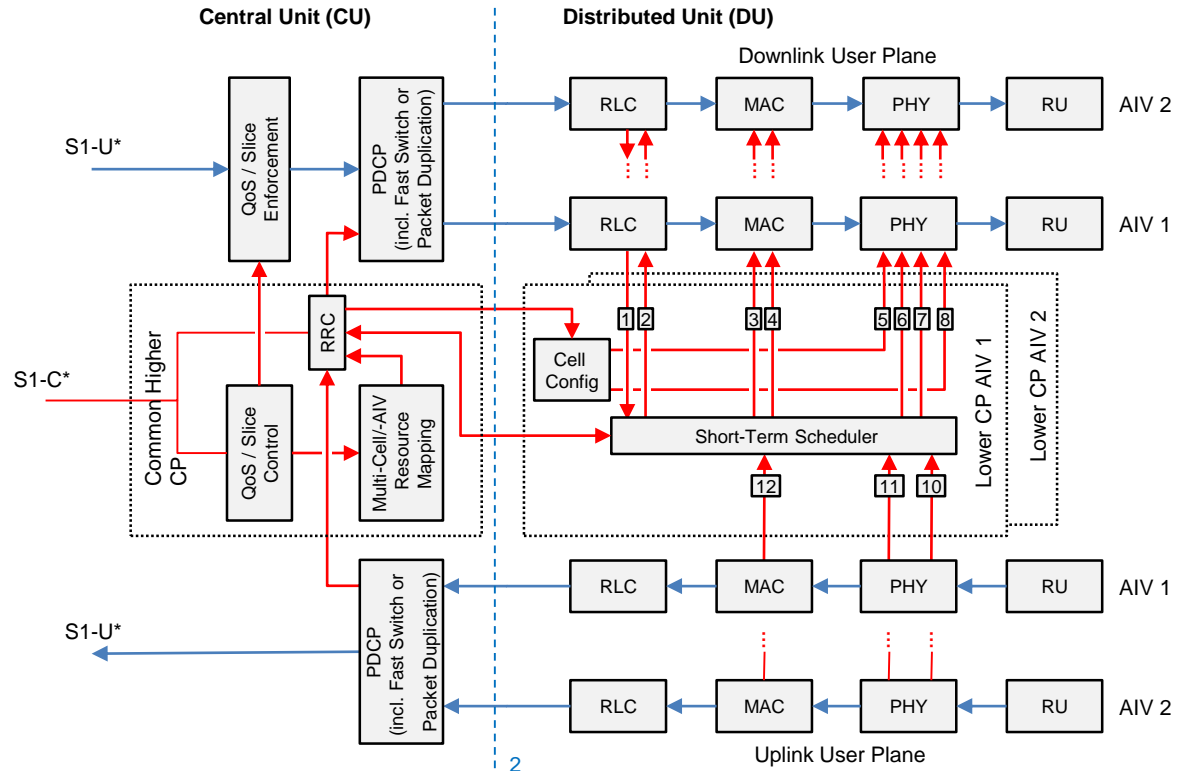


- › Forwarding of data in the transport network through based on SDN
 - Implements CP/UP split
- › Central Access Controller (CAC) is the centralized network element in Radio Access Network
 - Separated into CP and UP part
- › xHaul-Interface to the radio sites
 - Flexible adaptation depending on the network deployment



Use Case: Multi-Connectivity

- › Multi-Connectivity is important in 5G, especially for:
 - mmWave Radio
 - Ultra-Reliable Communication
- › Figure shows potential implementation based on CU / DU split option 2
- › Additional CP functions for:
 - Traffic Steering (Multi-Cell / Multi-AIV Resource Mapping)
 - Quality of Service
 - Network Slicing





Summary and Conclusions



Summary and Conclusions

- › Two split options under discussion for 5G
 - Central and distributed unit (“CU/DU split”)
 - Control-Plane / User-Plane split
- › CU/DU split
 - Important for multi-connectivity, interference coordination, traffic-steering
 - Split at lower layers can lead to extremely high data rates on the interface
- › Control-Plane / User-Plane split
 - Important for flexible future networks and consistent control functions
 - Tight coupling in the RAN make full separation complex



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Thank You

<https://metis-ii.5g-ppp.eu/>

