

# Proposed options for functional splits for CRAN and fronthaul

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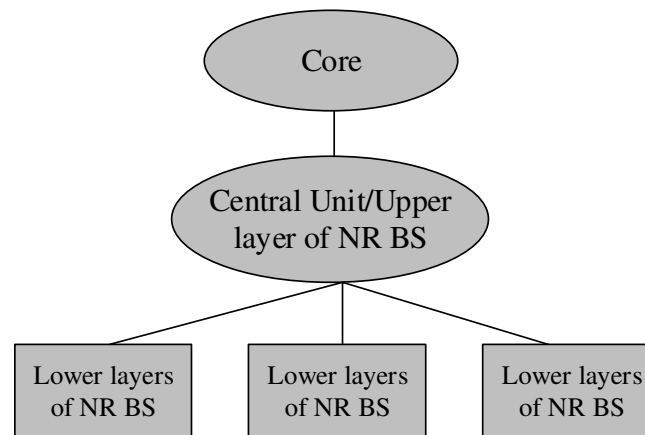
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# Previous Work on Functional Split for LTE based CRAN

The work on New Radio Access Technology related to Radio Access Architecture and interfaces was approved by RAN TSG in SID RP-160671.

In the scope of this SI is to address centralized deployment scenarios as indicated in the figure below [1].

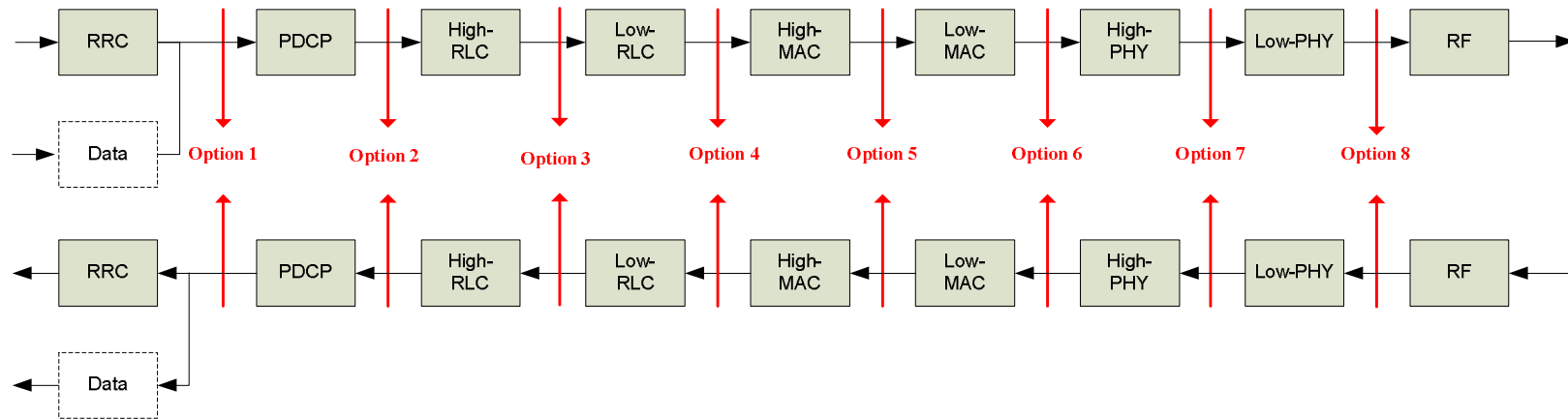


It was identified in [1] that The functional split between the Central Unit and lower layers of NR BS nodes may depend on the transport layer.

It was also agreed that both non co-sited deployment and co-sited deployment with LTE can be considered for this deployment scenario.

# Functional Split Options considered by 3GPP

Functional split between central and distributed unit in [1] are adopted from the Small Cell Forum document on virtualization functional splits and use cases [2]. These options are illustrated in the figure below [1].



List of these options with a brief description from [1] is shown in next slide.

# Preliminary Functional Split options based on [1]

## Option 1 (1A-like split)

- The function split in this option is similar as 1A architecture in DC. RRC is in the central unit. PDCP, RLC, MAC, physical layer and RF are in the distributed unit.

## Option 2 (3C-like split)

- The function split in this option is similar as 3C architecture in DC. RRC, PDCP are in the central unit. RLC, MAC, physical layer and RF are in the distributed unit.

## Option 3 (intra RLC split)

- Low RLC (partial function of RLC), MAC, physical layer and RF are in distributed unit. PDCP and high RLC (the other partial function of RLC) are in the central unit.

## Option 4 (RLC-MAC split)

- MAC, physical layer and RF are in distributed unit. PDCP and RLC are in the central unit.

## Option 5 (intra MAC split)

- RF, physical layer and some part the MAC layer (e.g. HARQ) are in the distributed unit. Upper layer is in the central unit.

## Option 6 (MAC-PHY split)

- Physical layer and RF are in the distributed unit. Upper layers are in the central unit.

## Option 7 (intra PHY split)

- Part of physical layer function and RF are in the distributed unit. Upper layers are in the central unit.

## Option 8 (PHY-RF split)

- RF functionality is in the distributed unit and upper layer are in the central unit.

# Preferred function split

Based on the analysis in [2], The functional split option 2 for which RRC, PDCP are in the central unit. RLC, MAC, physical layer and RF are in the distributed unit and option 5 for which Upper MAC and functions above are in the central unit. Low MAC, PHY and RF are in the distributed unit are considered the most prominent.

While the analysis in [2] consider only single cell with 2 antenna only, its argument is still valid when considering latency and jitter requirements.

From that point of view, option 2 is suitable for a non-ideal fronthaul which can support one-way latency of up to 30ms and jitter of <10ms. Option 2 advantage of option 1 is that in option 2 the distributed unit does not have to deal with the security keys.

Option 5 is also identified as suitable for sub-ideal fronthaul with one-way latency requirements of up to 6ms and jitter <2ms jitter. Key advantage of this option is facilitate central and remote scheduler.

# Flexible Functional Split

3GPP requirements in [1] is also to support flexible functional split in order to allow flexible hardware implementation and scalable cost effective solutions. It also allows management and coordination between features performance, load management, optimisation and enabling network slicing operation.



# proposal

NEC proposes that NGFI should take into consideration the optional functional split from [1] giving priorities to option 2 and 5.

It is also proposed that NGFI should allow for flexile functional split in its fronthaul solution.

# References

- [1] R3-161687, Draft TR 38.801 (v030) Study on New Radio Access Technology: Radio Access Architecture and Interfaces, NTT DOCOMO, INC (Rapporteur), 3GPP TSG RAN3, August 2016.
- [2] Small Cell Forum Document 159.07.02, Small cell virtualization functional splits and use cases, Small Cell Forum, January 2016.