RAN Architecture Evolution

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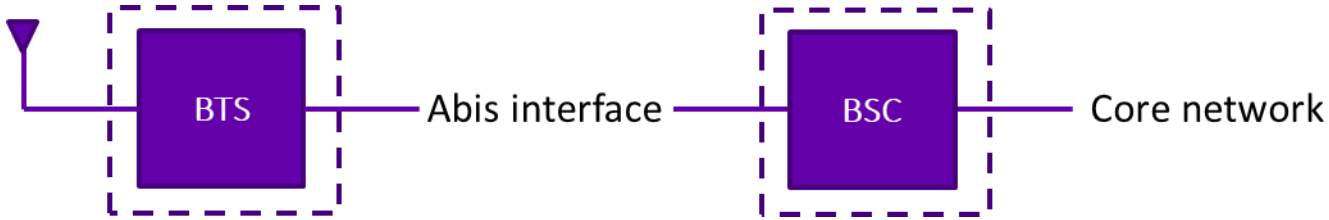
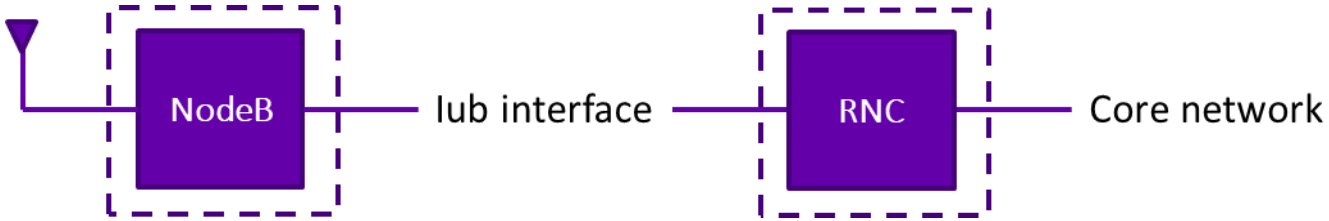
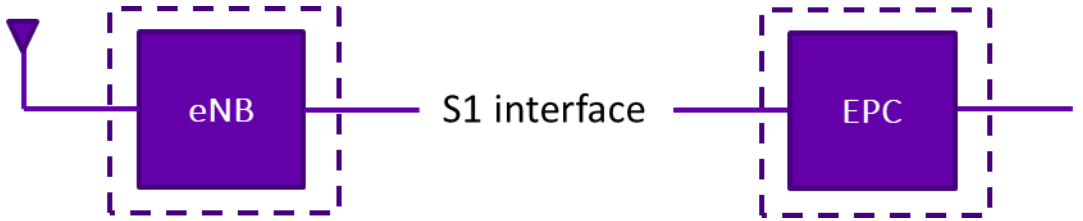
BT Group

Contents

Traditional RAN architectures

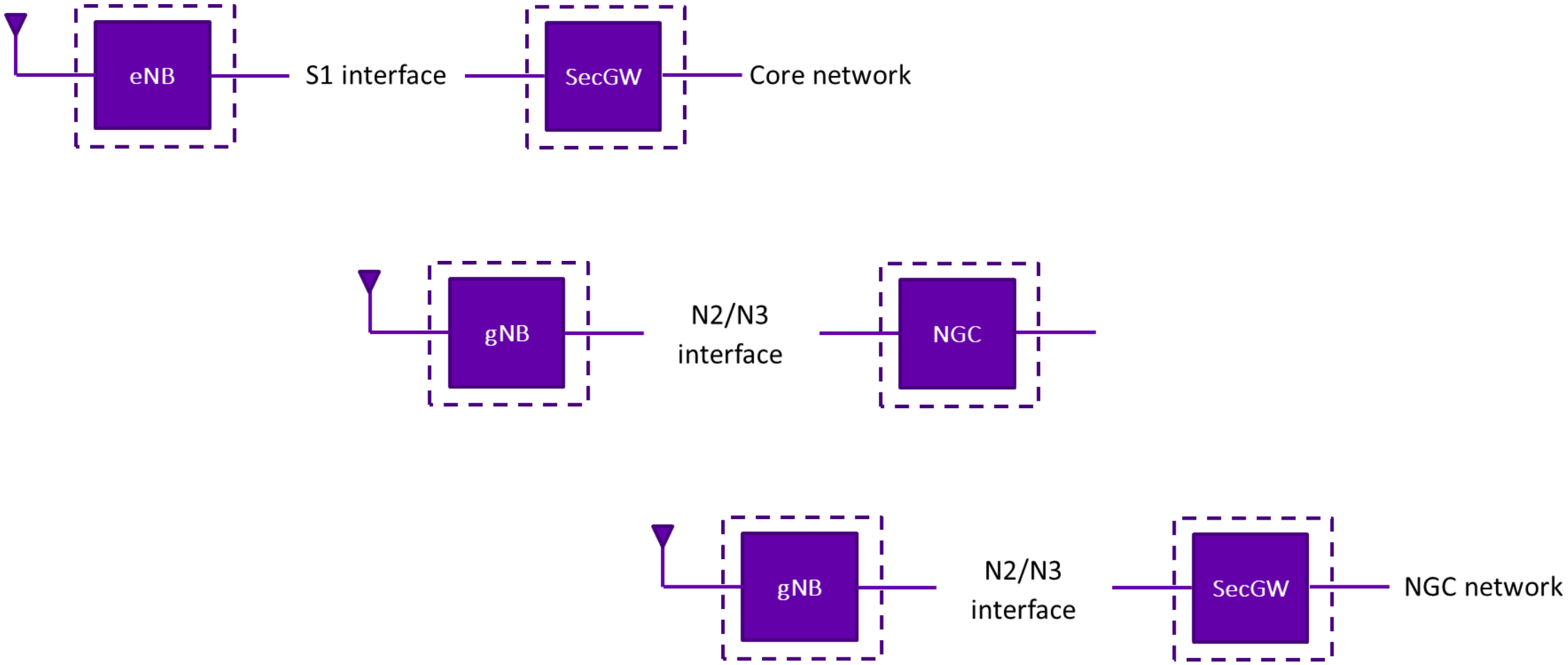






NOTE: IP Sec GW used between BTS and BSC with IP Abis implementation

Traditional RAN architectures



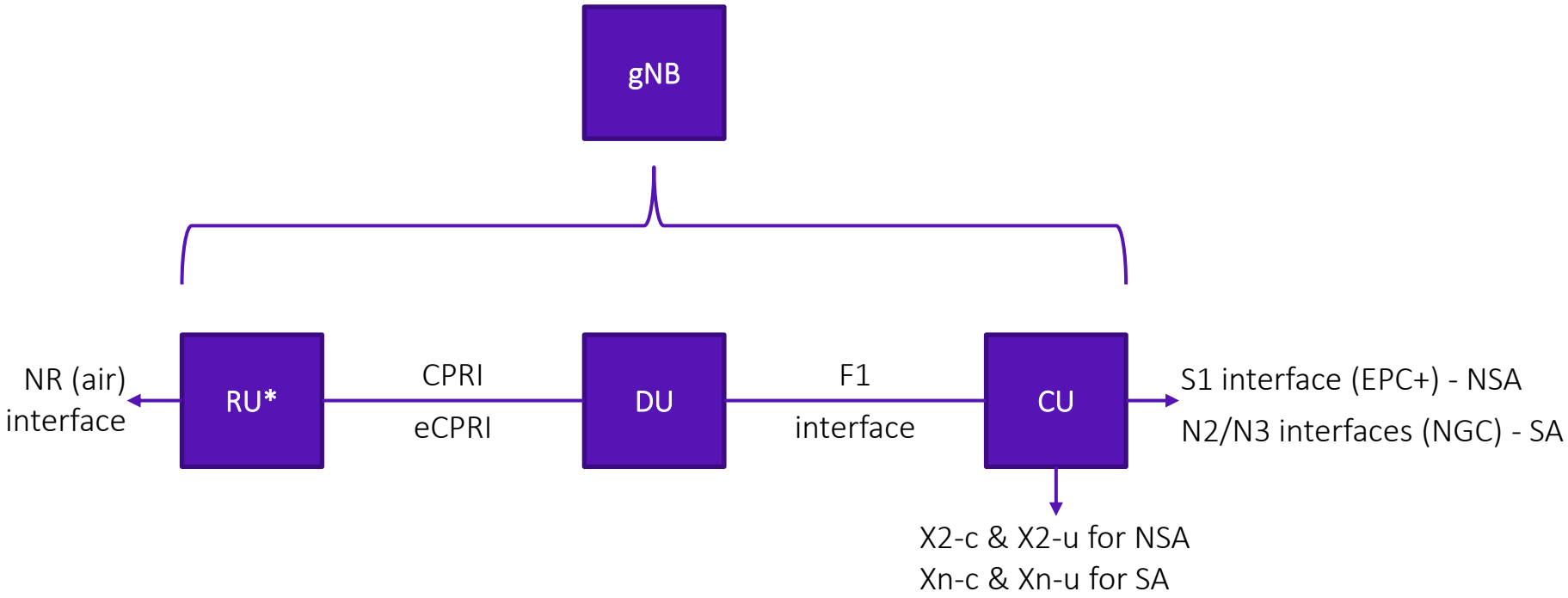
Delivering frequency synchronisation

- Early cellular networks benefitted from simple frequency synchronisation via the incoming HDB3 waveform of the E1 circuit - Abis & Iub interfaces

- The move from TDM based transport to a Carrier Ethernet based IP transport network layer drove requirements for SyncE or frequency sync transport via IEEE 1588 PTP

- In some markets GPS was adopted as the sync solution for a cell site, in other markets GNSS was preferred, in some markets this was to be avoided at all cost…

RAN architecture evolution



* RU could be integrated within AAU (mMIMO) or standalone RU (RRU/RRH) with coaxial connections to passive antenna (typically 8T8R)

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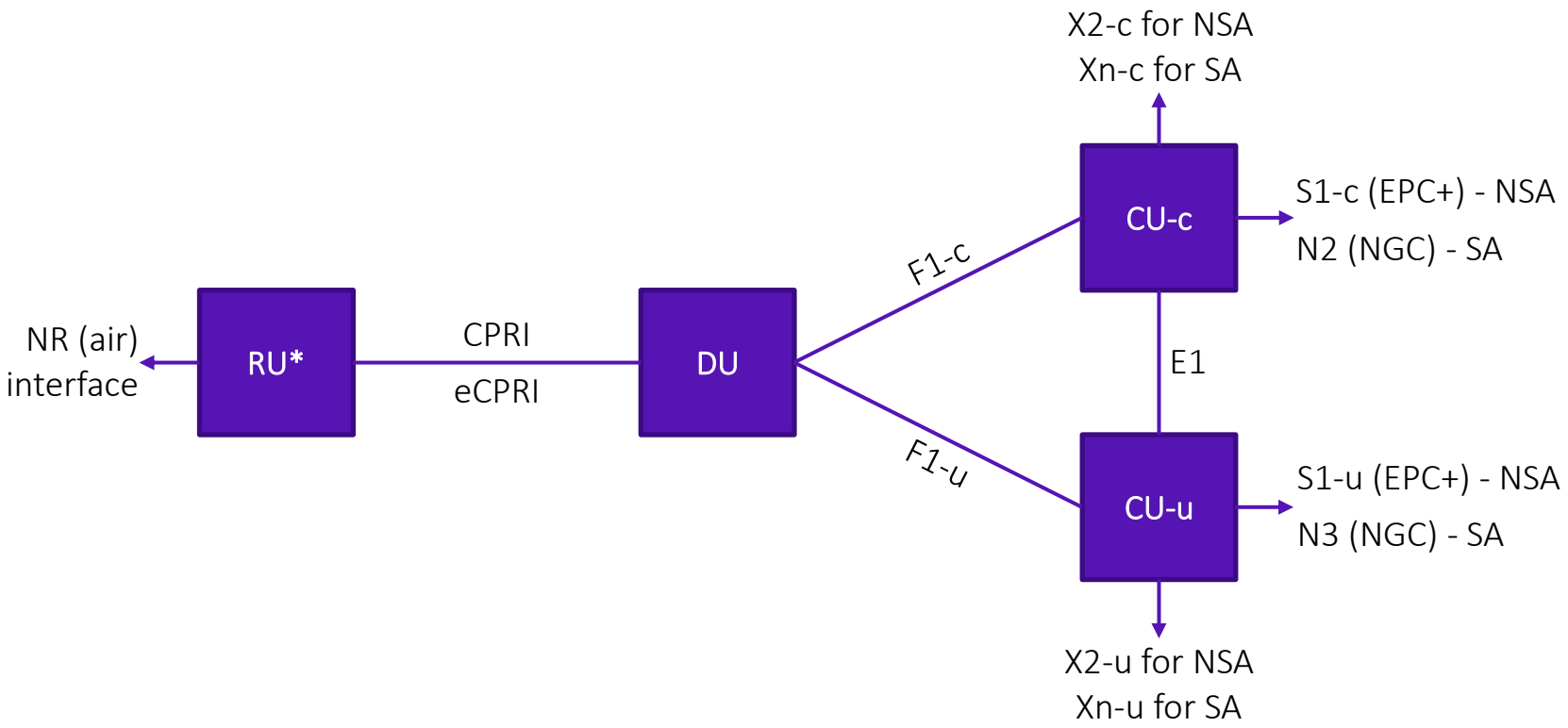

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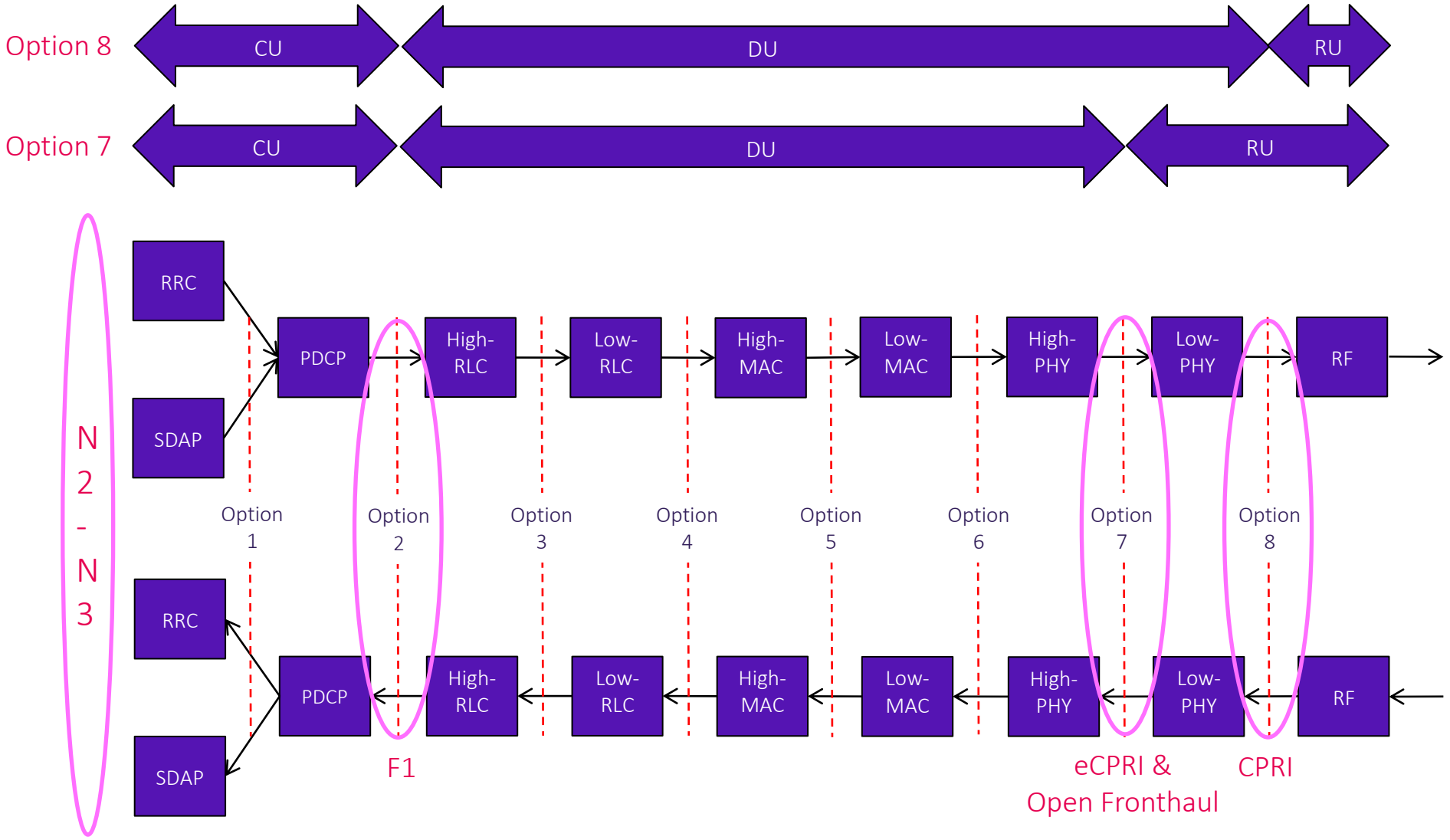

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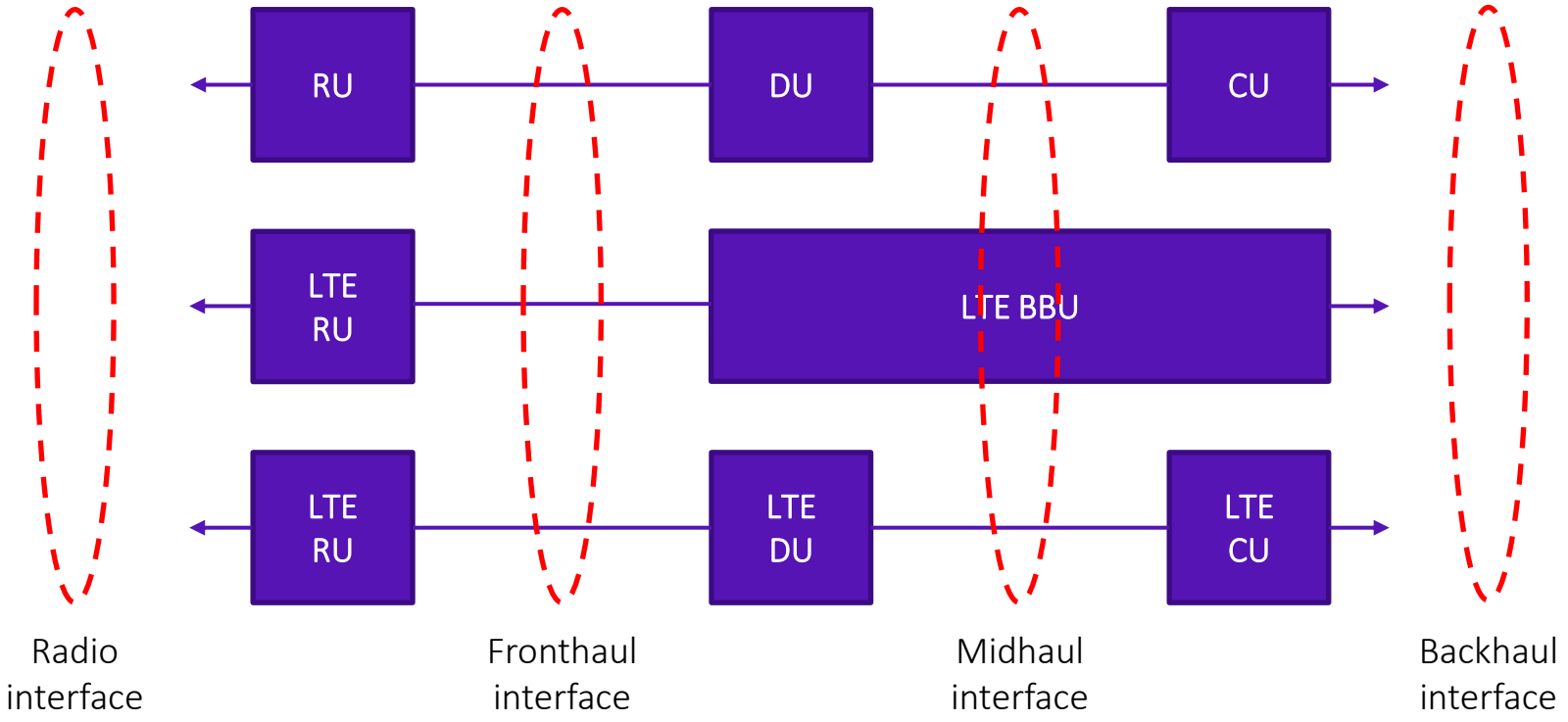
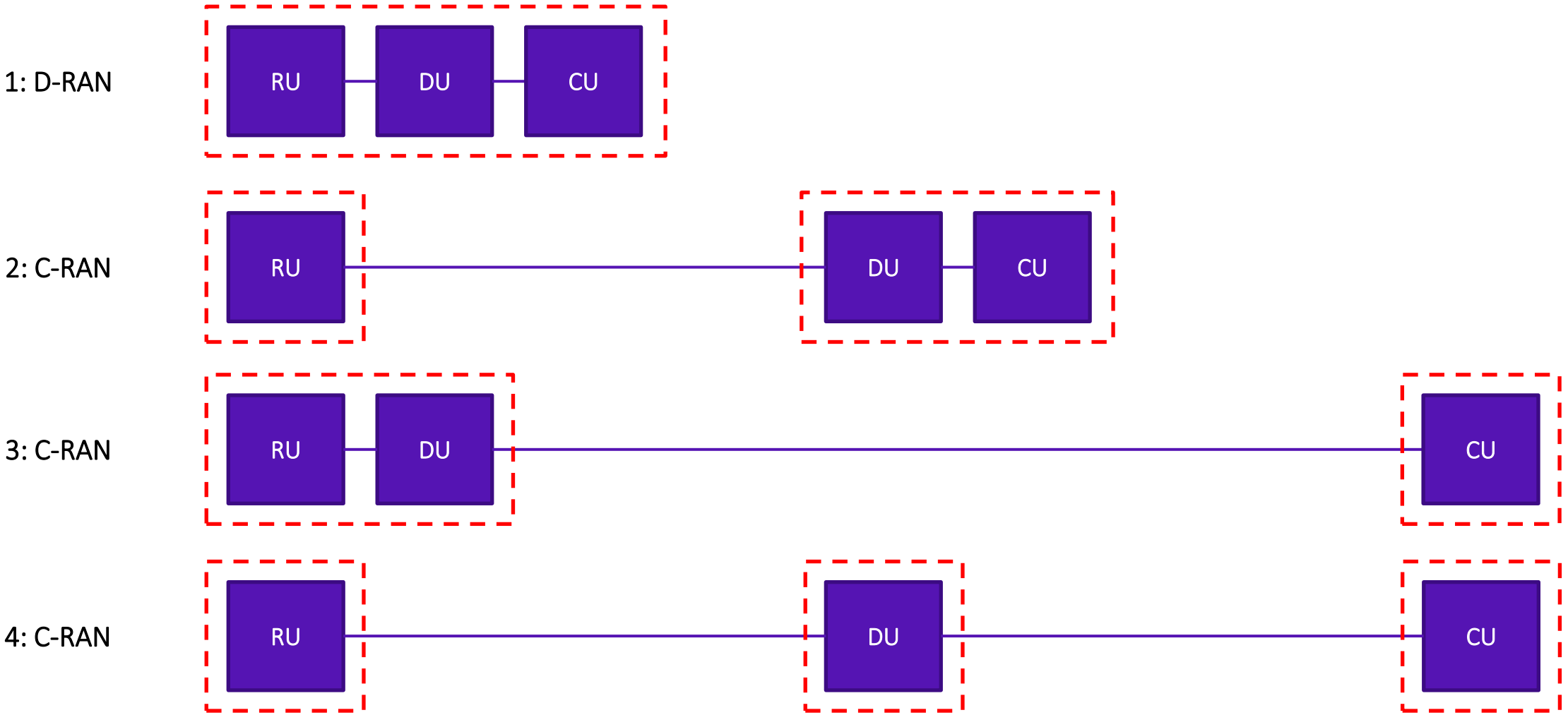


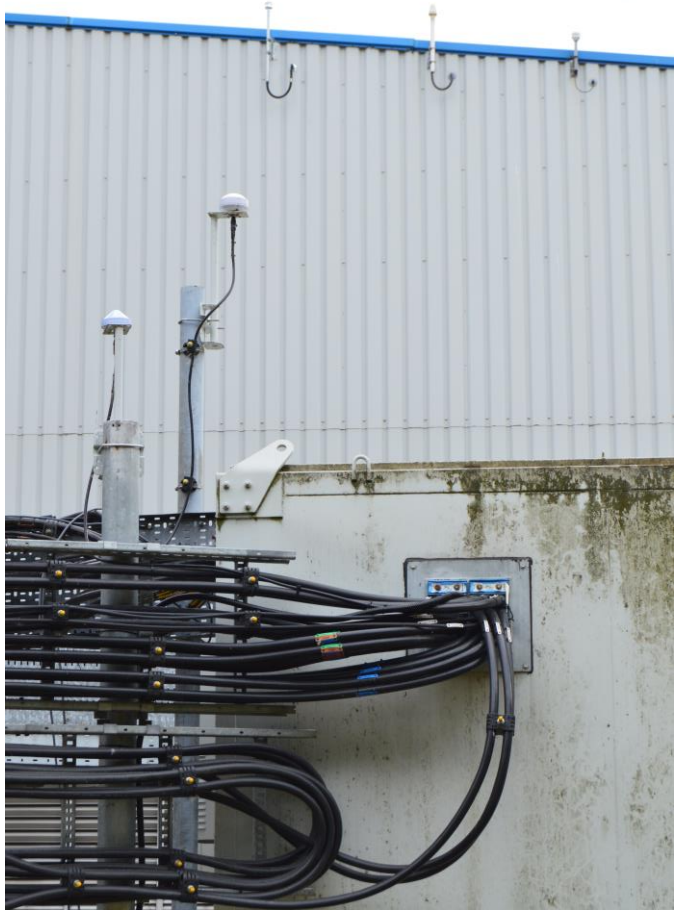
RAN architecture evolution



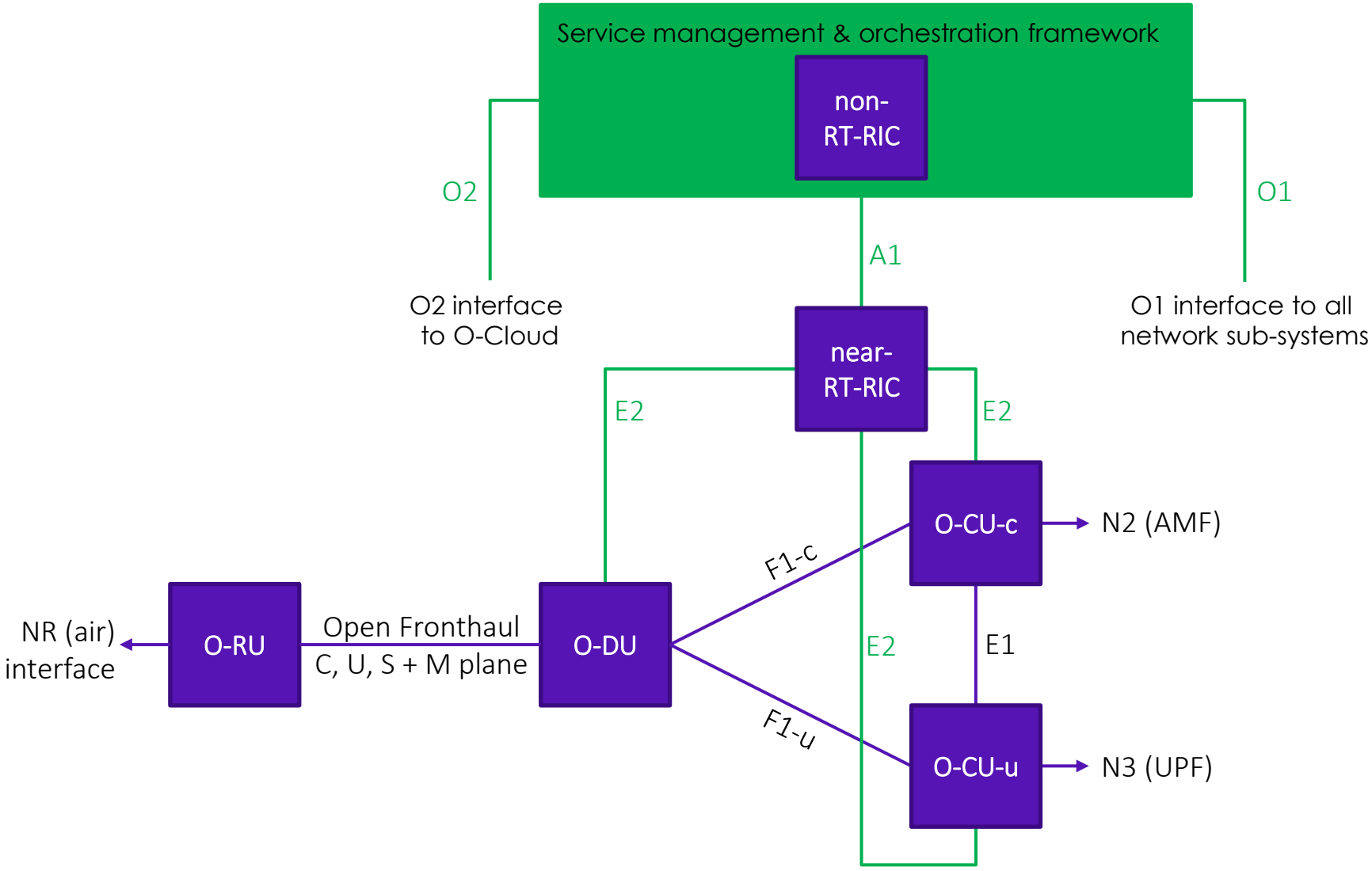
Note: If decomposed, CU-c & CU-u could be deployed to different locations

Evolving synchronisation requirements

- TDD has been around for a long time however 5G NR in band n78 has resulted in the requirements for time of day/phase synchronisation becoming main-stream in many markets
- The now age old debate between local GPS/GNSS and network based synchronisation and time has done the rounds yet again…
- The answer in many cases is network based sync/time where you can and GNSS where you have to, in many practical deployments sites will have local GNSS and network based sync/time feeds
- As mobile network coverage extends and ever higher service availability is realised, a new form of backhaul becomes increasingly common - satellite communications via GEO satellites today and LEO in the future…

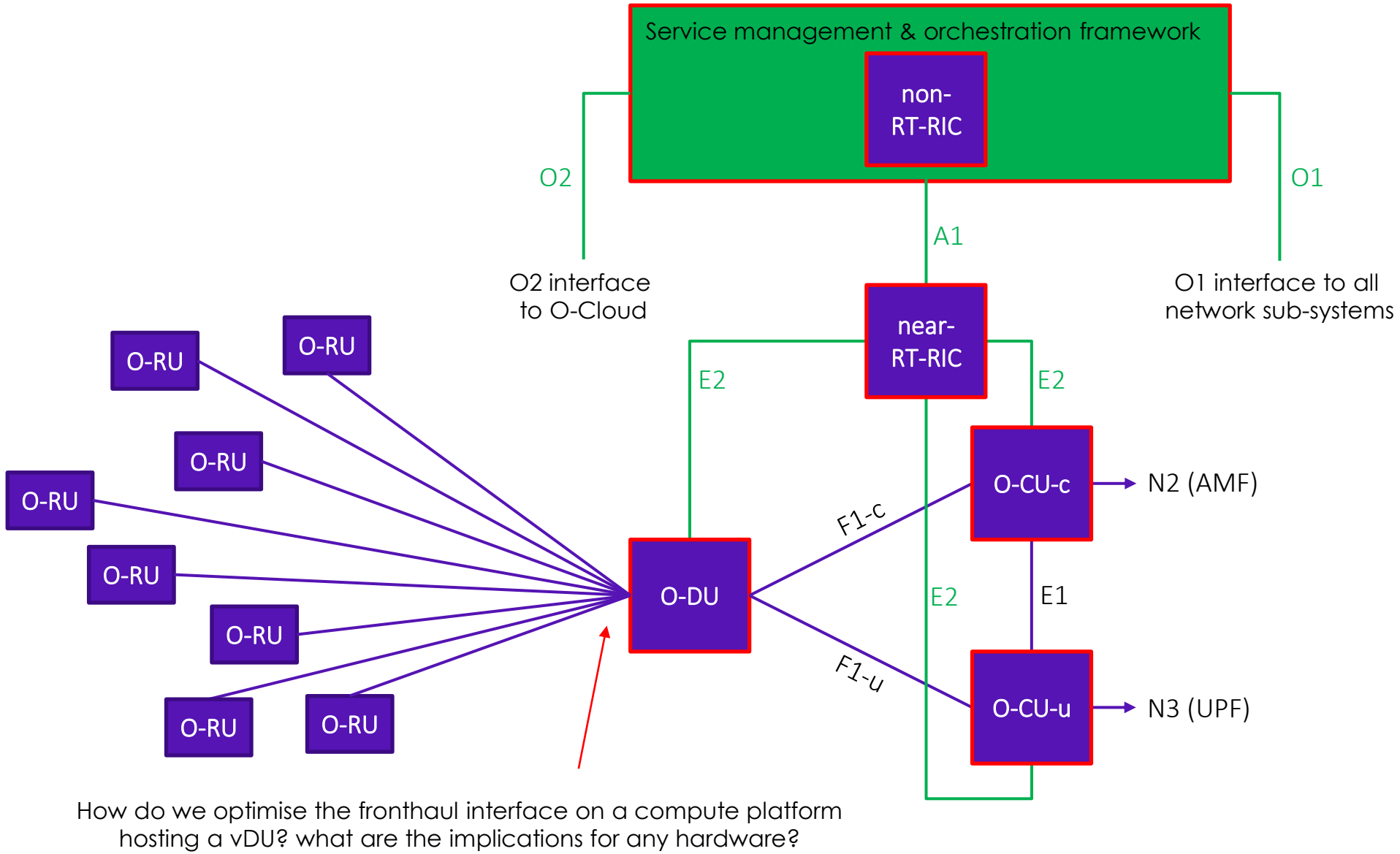


OpenRAN architecture



OpenRAN architecture

COTS compute platform(s) X86, ARM, RISC-V?



How do we optimise the fronthaul interface on a compute platform hosting a vDU? what are the implications for any hardware?

Summary

- There are more RAN implementation architectures/options available to network architects, designers and planners then ever before…
- RAN architecture evolution + other initiatives such as Open RAN, will fundamentally change the way mobile networks are engineered in the future
- Frequency and time/phase sync are fundamental requirements of the RAN
- Terrestrial sources of time are required to compliment GNSS derived time
- Open RAN will expose detailed sync engineering to the MNO/SI…