5G Topics Covered

5G RAN

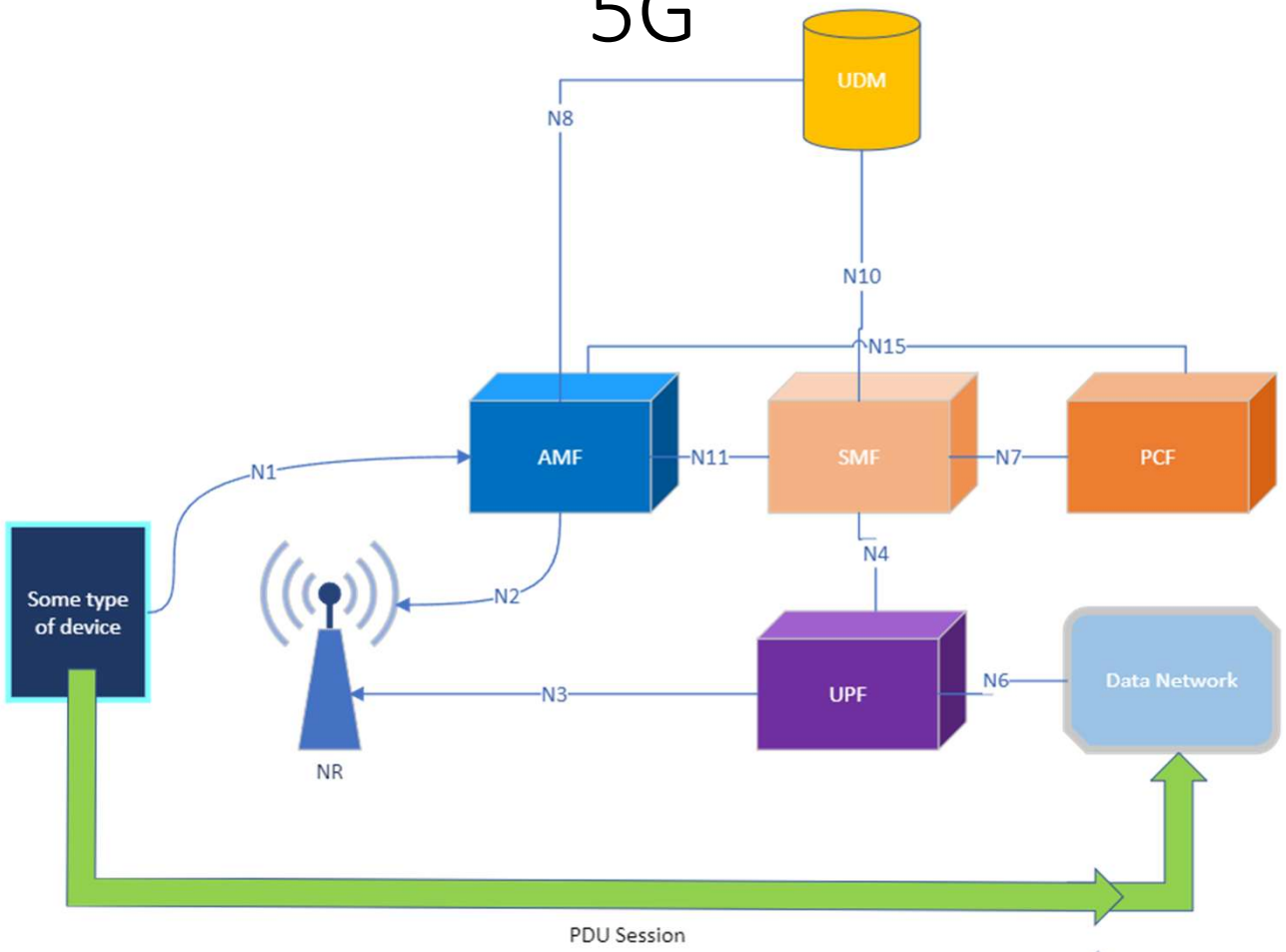
5G Core Network

- SBA
- Network Slicing
- CUPS
- Evolution of Elements

5G Deployment Types

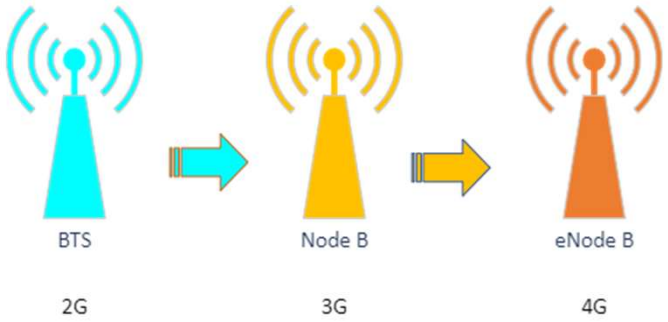
- Standalone
- Non-Standalone

5G

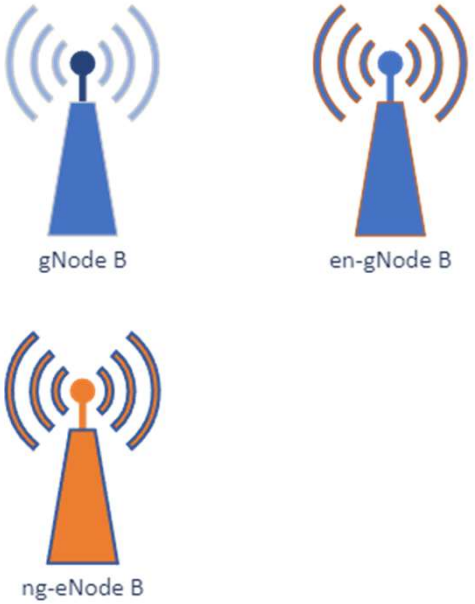

UDM
N8
N10
N15
AMF
N11
SMF
N7
PCF
N1
Some type of device
N2
N4
NR
N3
UPF
N6
Data Network
PDU Session

5G NR (New RAN | New Radio)

NR (New Radio)



5G



NR (New Radio)

gNode B: Next generation node B
en-gNode B: ENDC-gNode B – Eutran NR Dual Connected
ng-eNode B : Next generation eNode B. Supports NR Interfaces

More efficient, better speeds & throughput, consistent dense areas, utilizes spectrum better, lower latency, and support for many more devices outside of cell phones

It makes all of these things happen by leveraging software to enhance features


gNode B

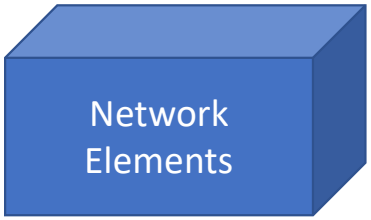

en-gNode B


ng-eNode B

5G Core Network

Core Network

4G



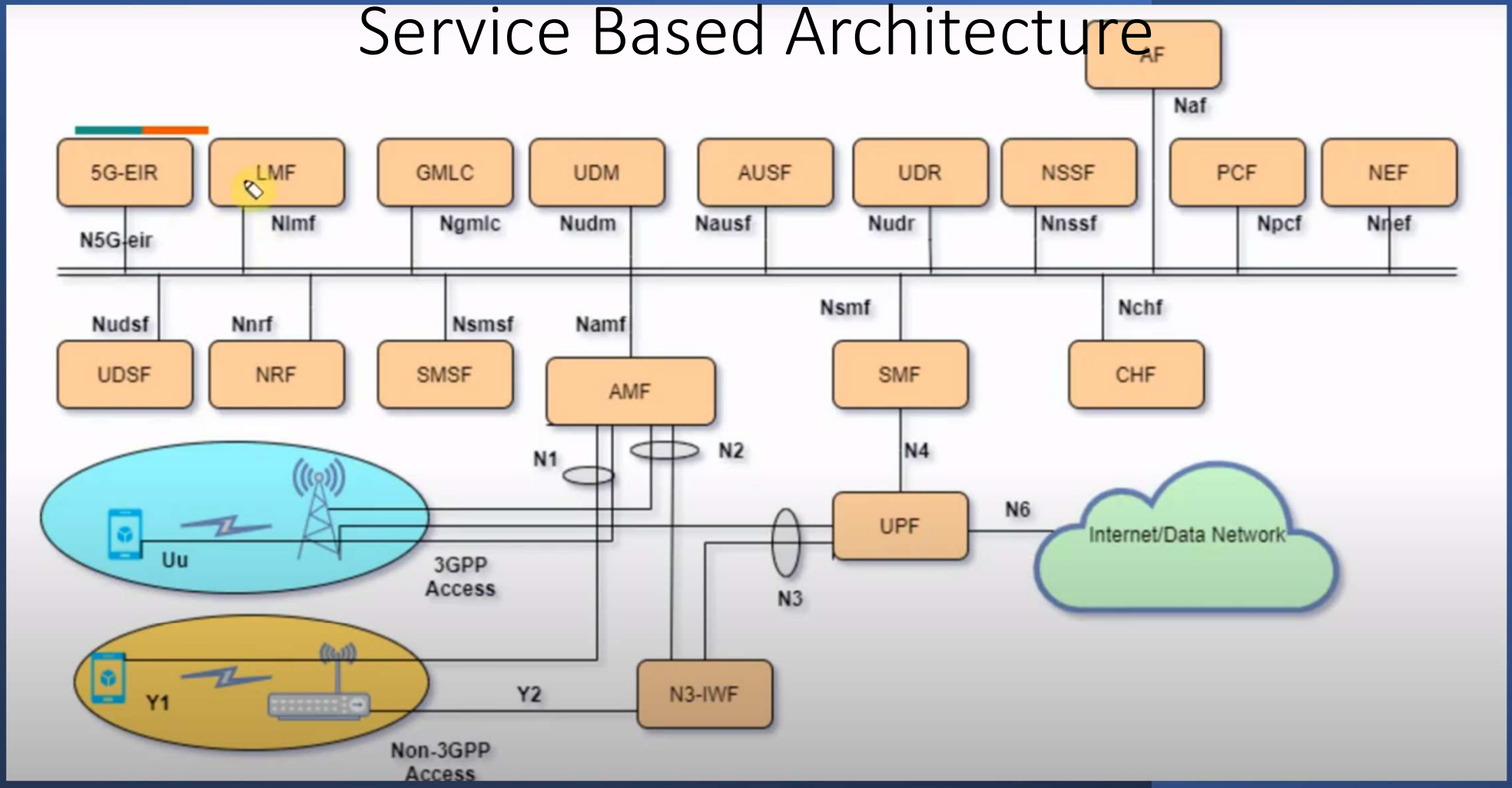
Hardware
Virtualized
Hybrid

5G



Software
Cloud infrastructure

Service Based Architecture



Network Functions

All of these network functions

They communicate using API calls

Elements we'll cover use a P2P interface

Easy to add/remove functions

Easy to make other functions aware of changes

This makes adding new features & services simple

Managing the network easier

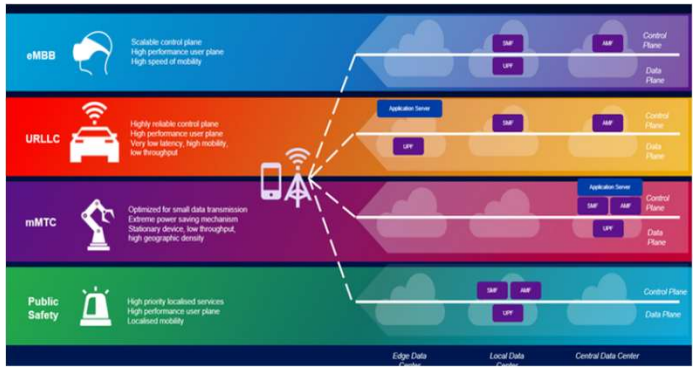
5G



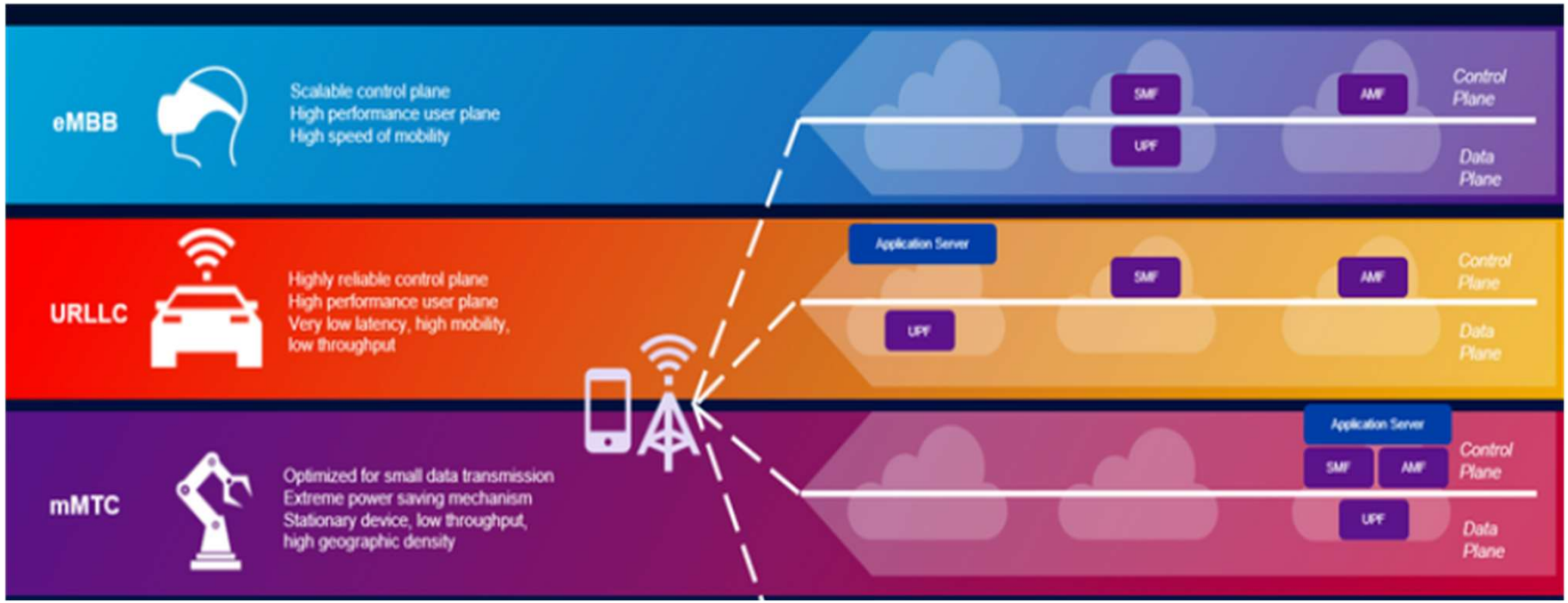
Software

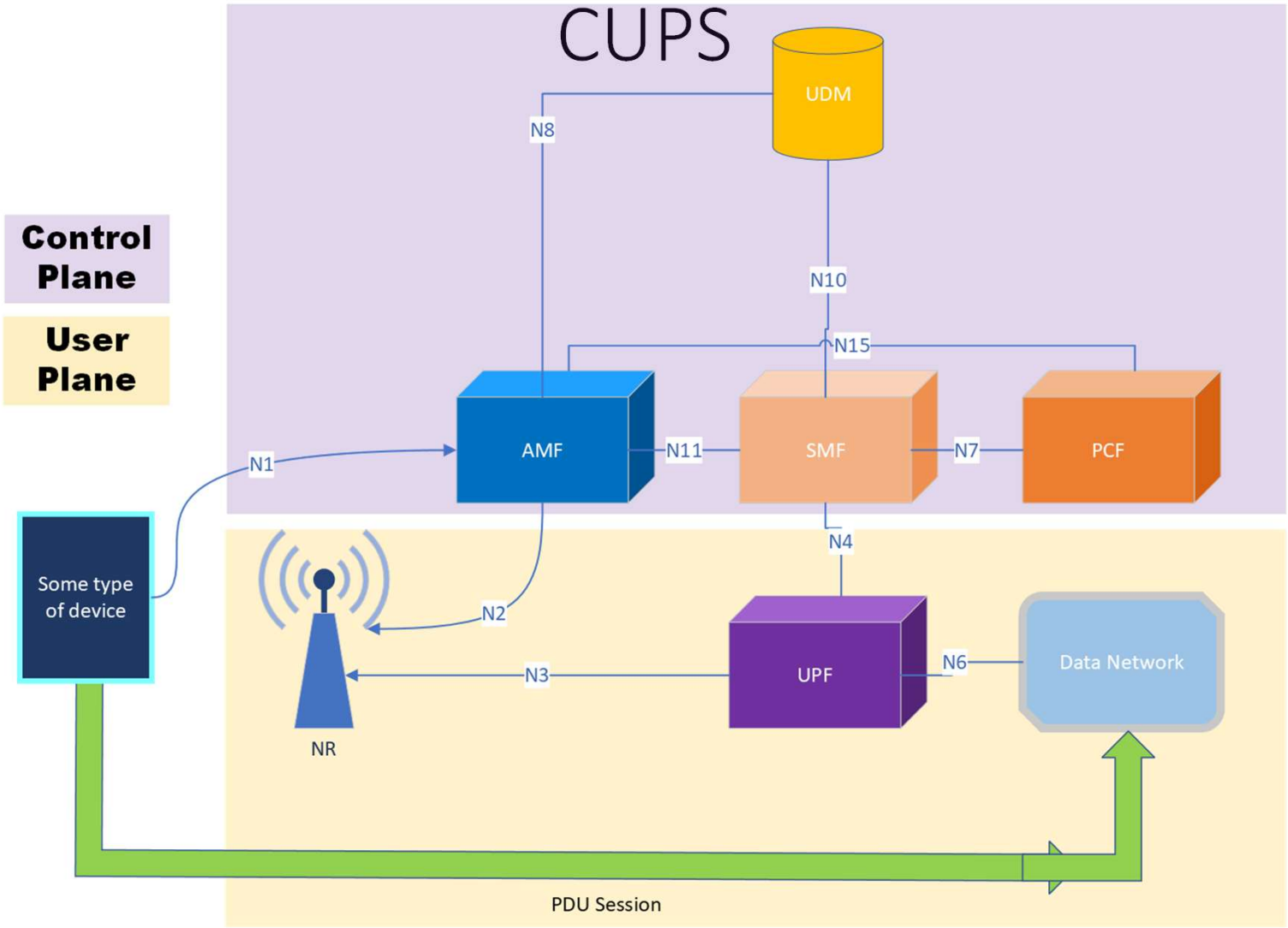
Network Slicing

Is taking network functions and creating different virtual connections based on the type of traffic that will be produced



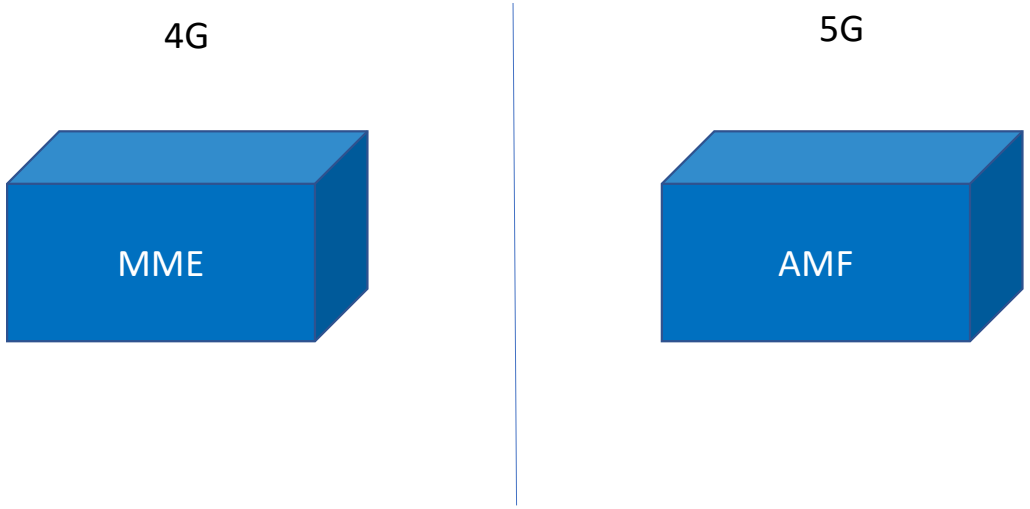
Network Slicing




CUPS
Control Plane
User Plane
UDM
N8
N10
N15
AMF
N11
SMF
N7
PCF
N1
N4
Some type of device
N2
N3
UPF
N6
Data Network
NR
PDU Session

5G Core Functions

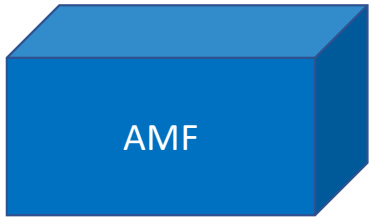
AMF – Access and Mobility Management Function



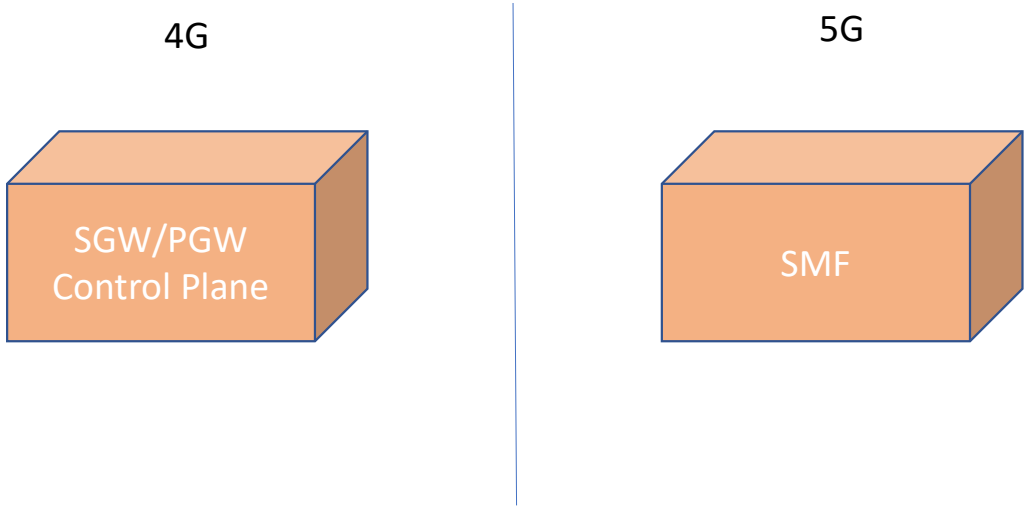
AMF

Registration, Connection, & Reachability management

Access Authentication & Authorization



SMF – Session Management Function



SMF

Establishes, Modifies, & Releases Sessions

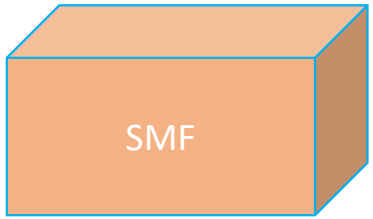
Allocates IP addresses

Selects UPF

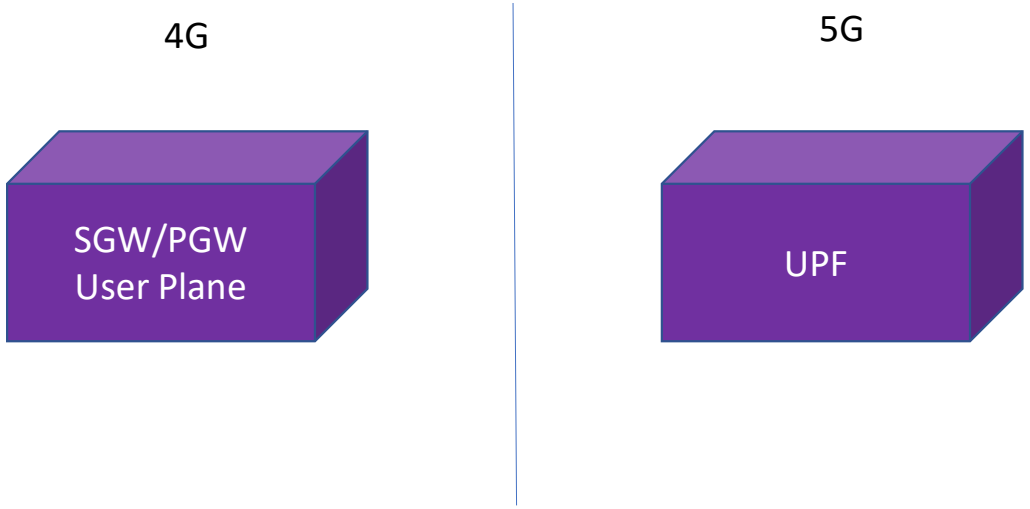
Ensures UPF traffic is routed properly

Has charging interfaces

Downlink Data Notification



UPF – User Plane Function



UPF

Connects PDU Sessions to DN

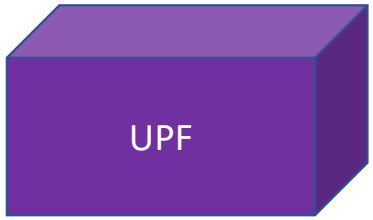
Packet routing, forwarding, & inspection

QoS handling

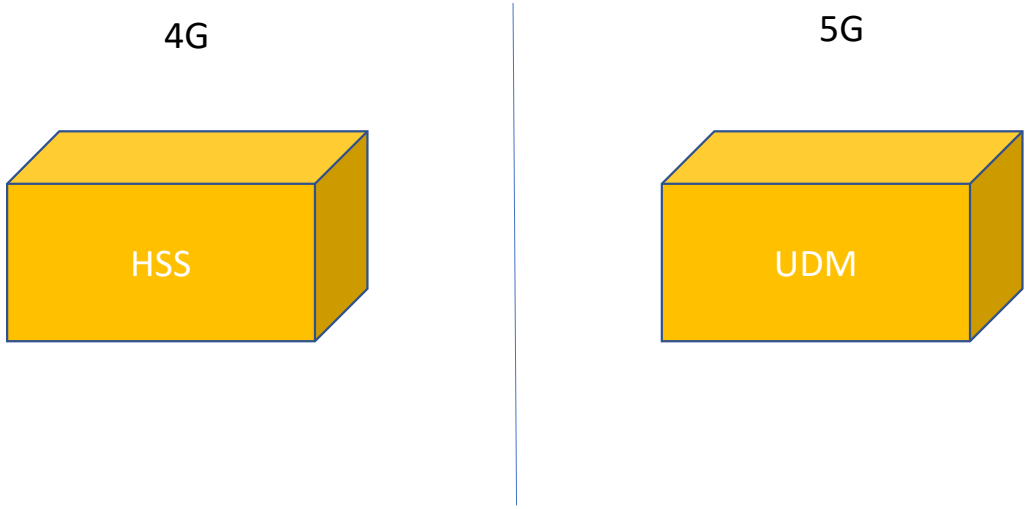
Policy enforcement

Uplink traffic verification

Triggers downlink packet buffers and notifications



UDM – Unified Data Management



UDM

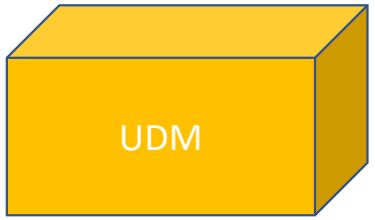
Subscription management

Handles user identification

Access authorization

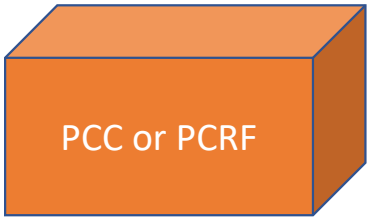
This is the front end. Actual data is stored in a UDR (Unified Data Repository)

5G

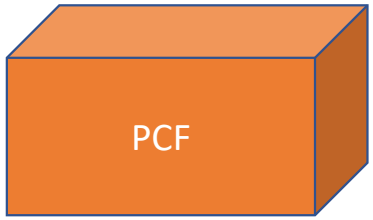


PCF – Policy Control Function

4G



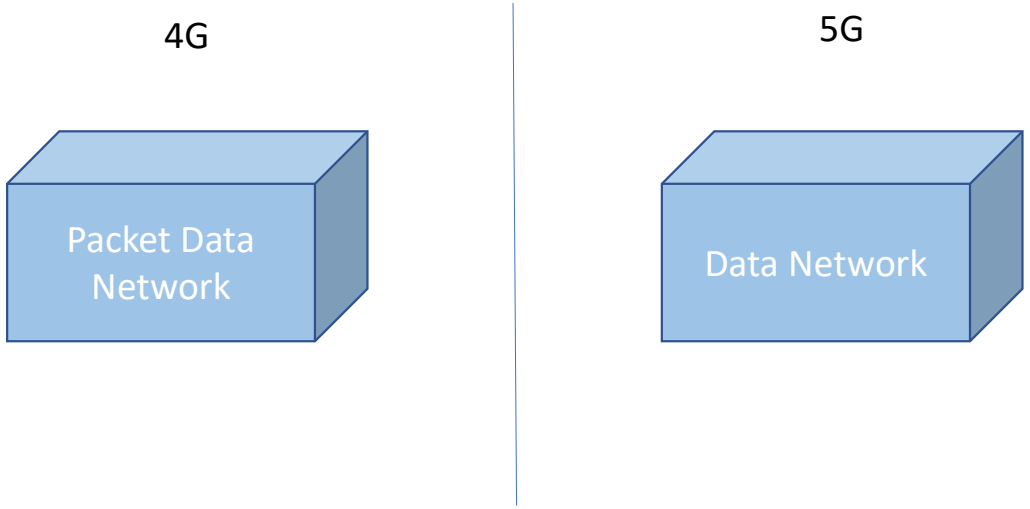
5G



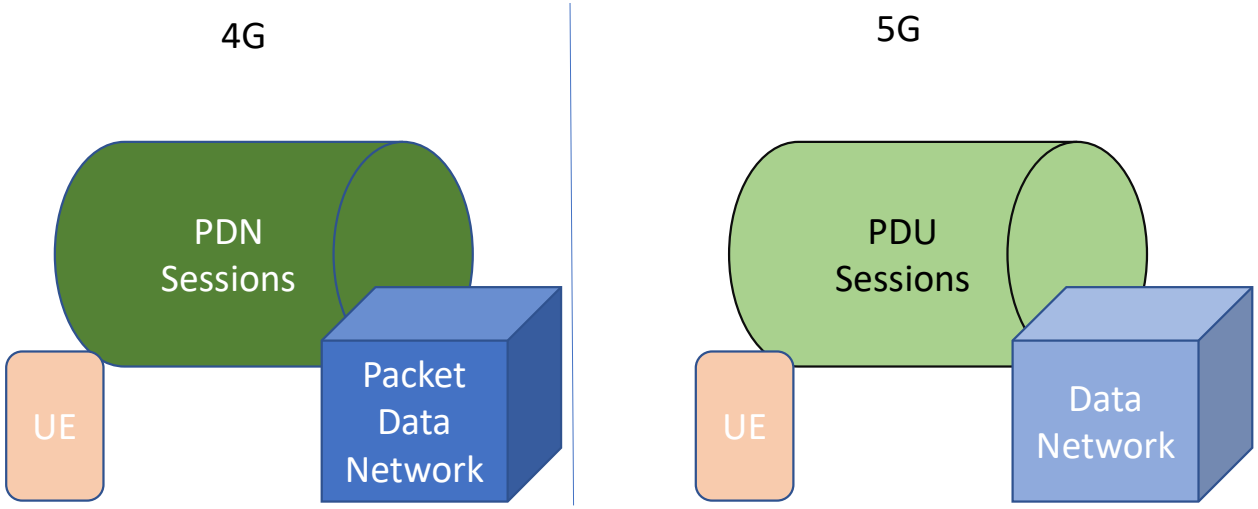
Plays a major part in network slicing

Responsible for creating policies

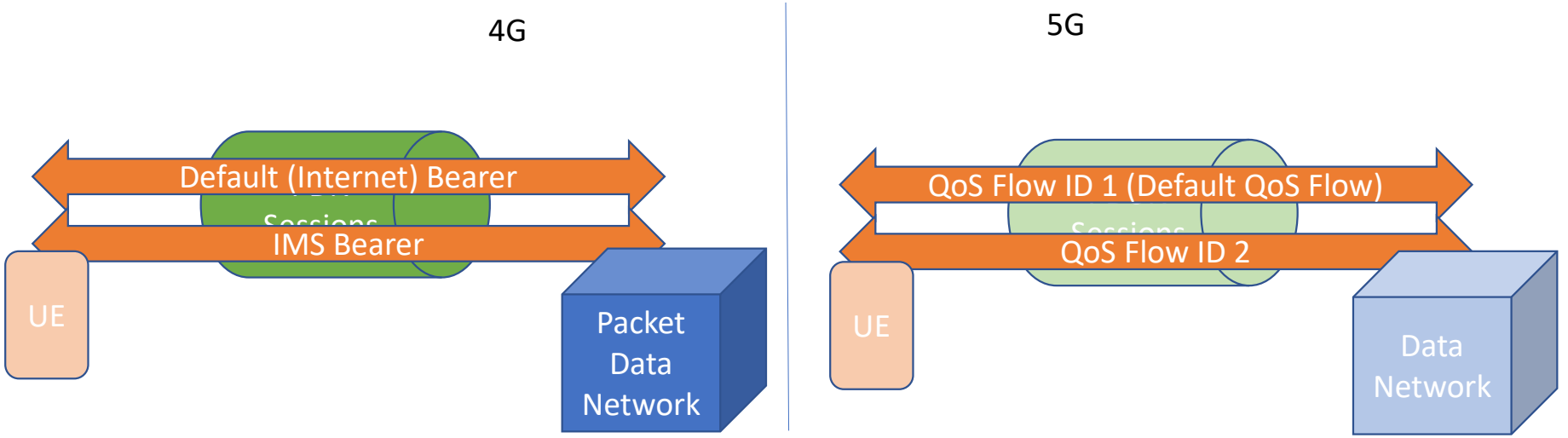
Data Network



PDU Sessions



QoS Flows


4G
Default (Internet) Bearer
IMS Bearer
UE
Packet Data Network
5G
QoS Flow ID 1 (Default QoS Flow)
QoS Flow ID 2
UE
Data Network

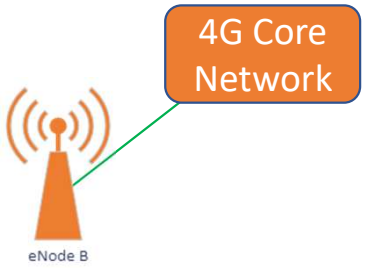
5G Deployment Types

Standalone (SA)

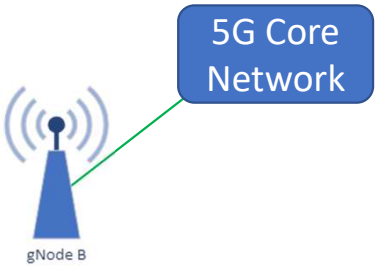
Non-Standalone (NSA)

5G Deployment Types

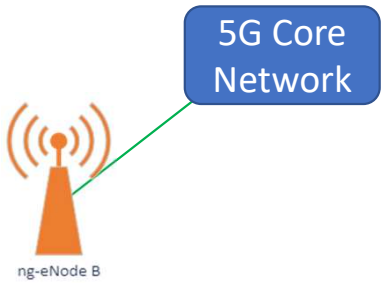
Standalone (SA)



Option 1: eNB to EPC



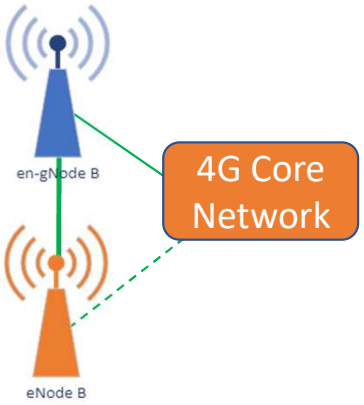
Option 2: gNB to 5GC



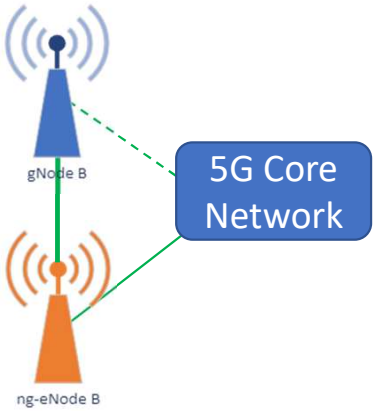
Option 5: ng-eNB to 5GC

5G Deployment Types

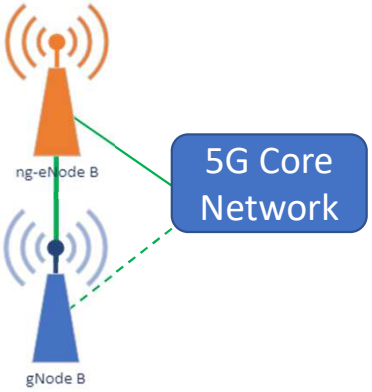
Non-Standalone (NSA)



Option 3:
en-gNB & eNB to EPC



Option 4:
gNB & ng-eNB to 5GC



Option 7:
ng-eNB & gNB to 5GC

5G Deployment Path Example

