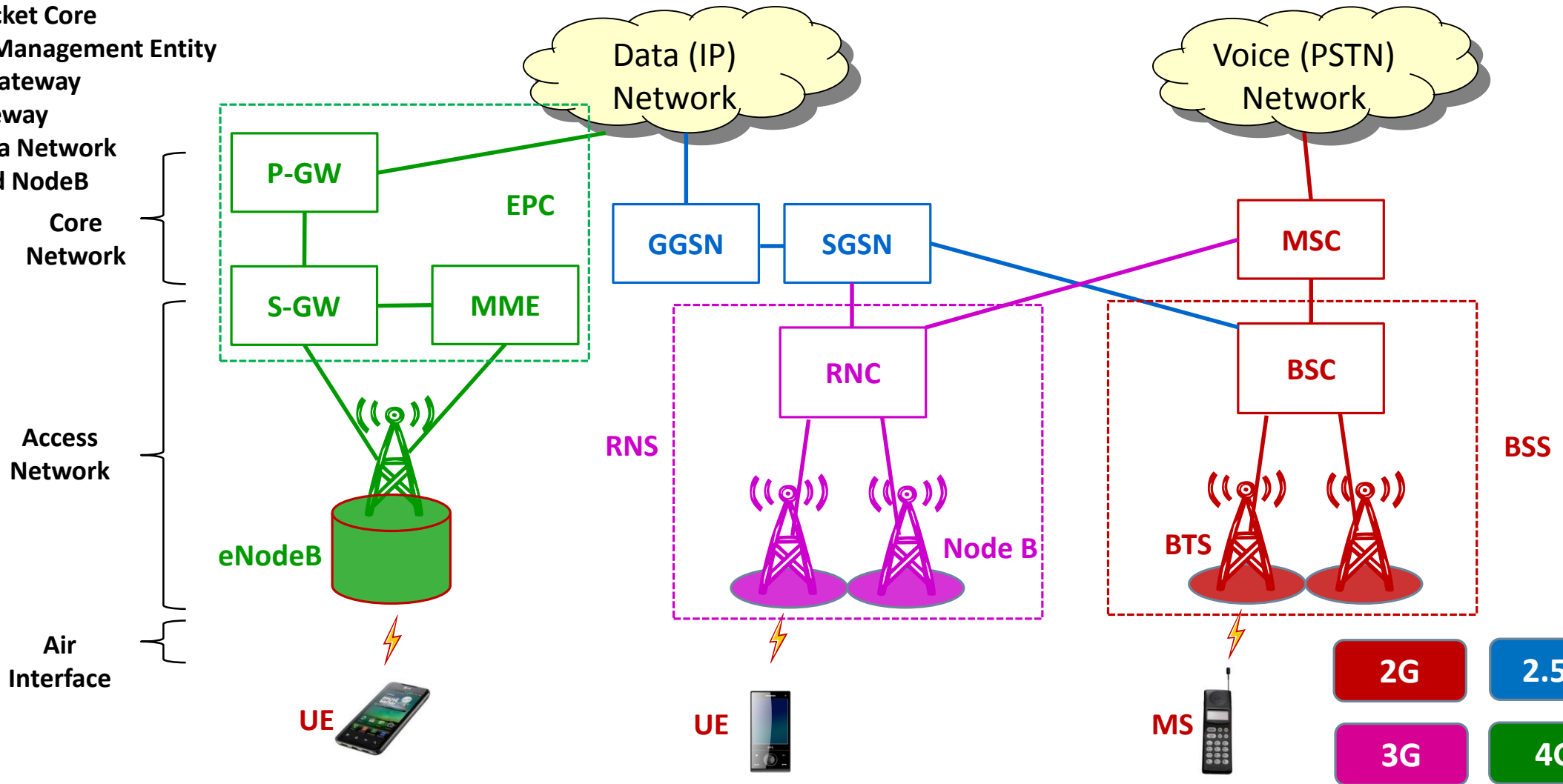


# Control and User Plane Separation of EPC nodes (CUPS)

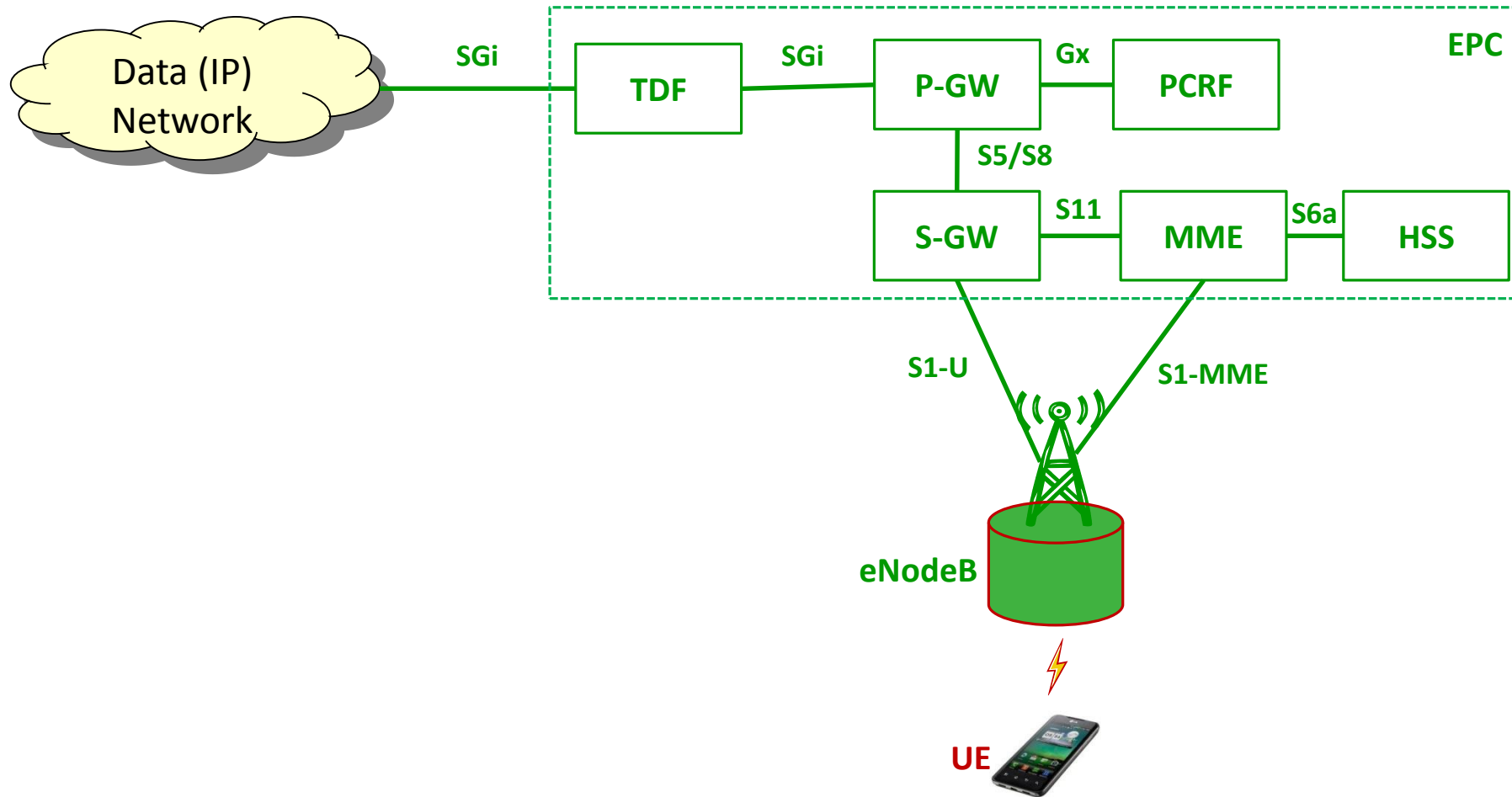
---

# The '4G' LTE Network Architecture

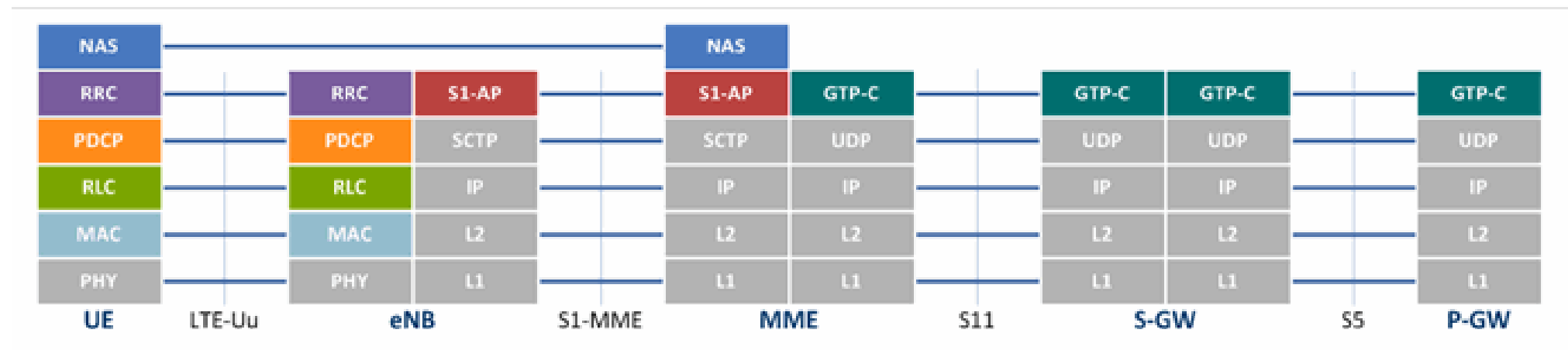
EPC = Evolved Packet Core  
 MME = Mobility Management Entity  
 S-GW = Serving Gateway  
 P-GW = PDN Gateway  
 PDN = Packet Data Network  
 eNodeB = evolved NodeB



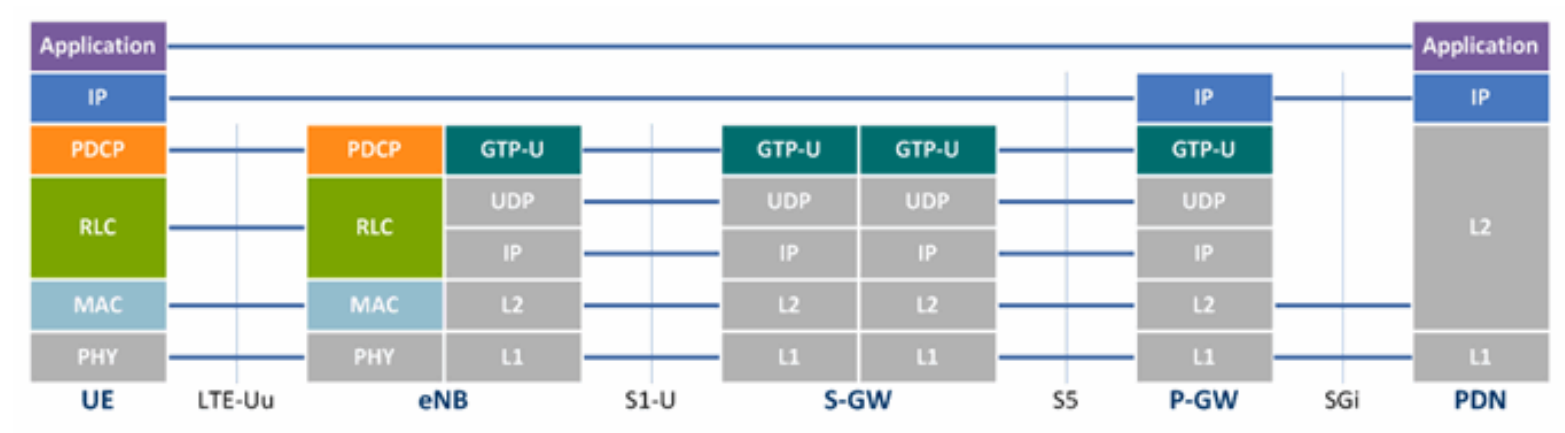
# EPC before CUPS



# Control & User Plane Protocol Stacks



**Control Plane Protocol Stacks**

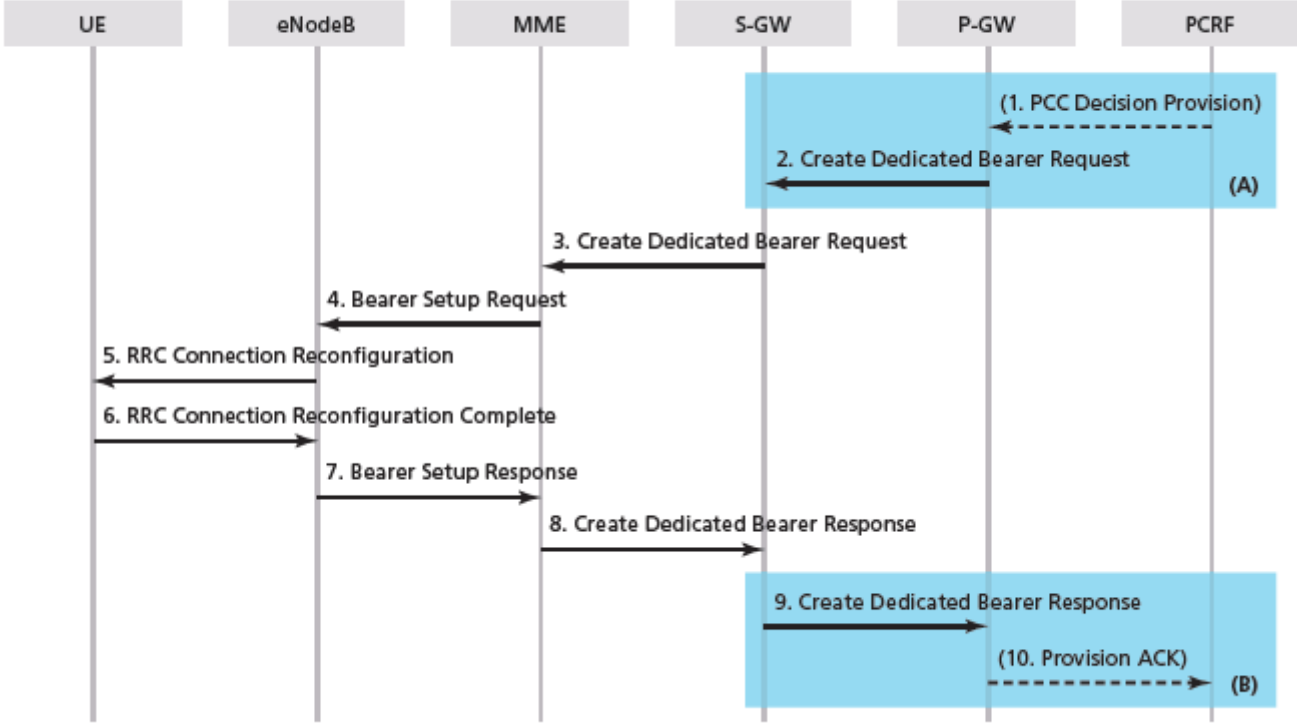


**User Plane Protocol Stacks**

Source: [Netmanias](#)

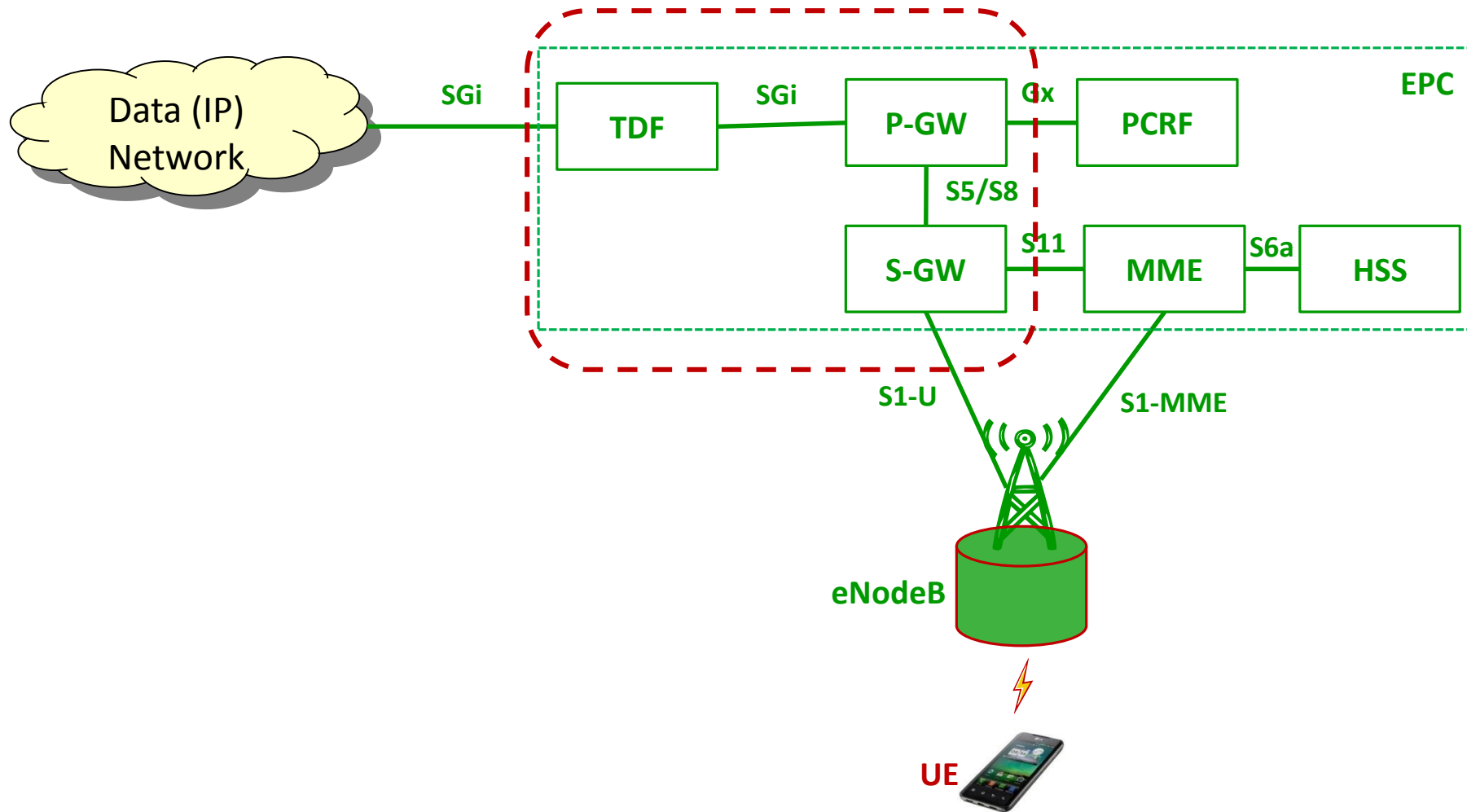
# Example Message Flow for Bearer Establishment

Figure 9. An example message flow for a LTE/SAE bearer establishment

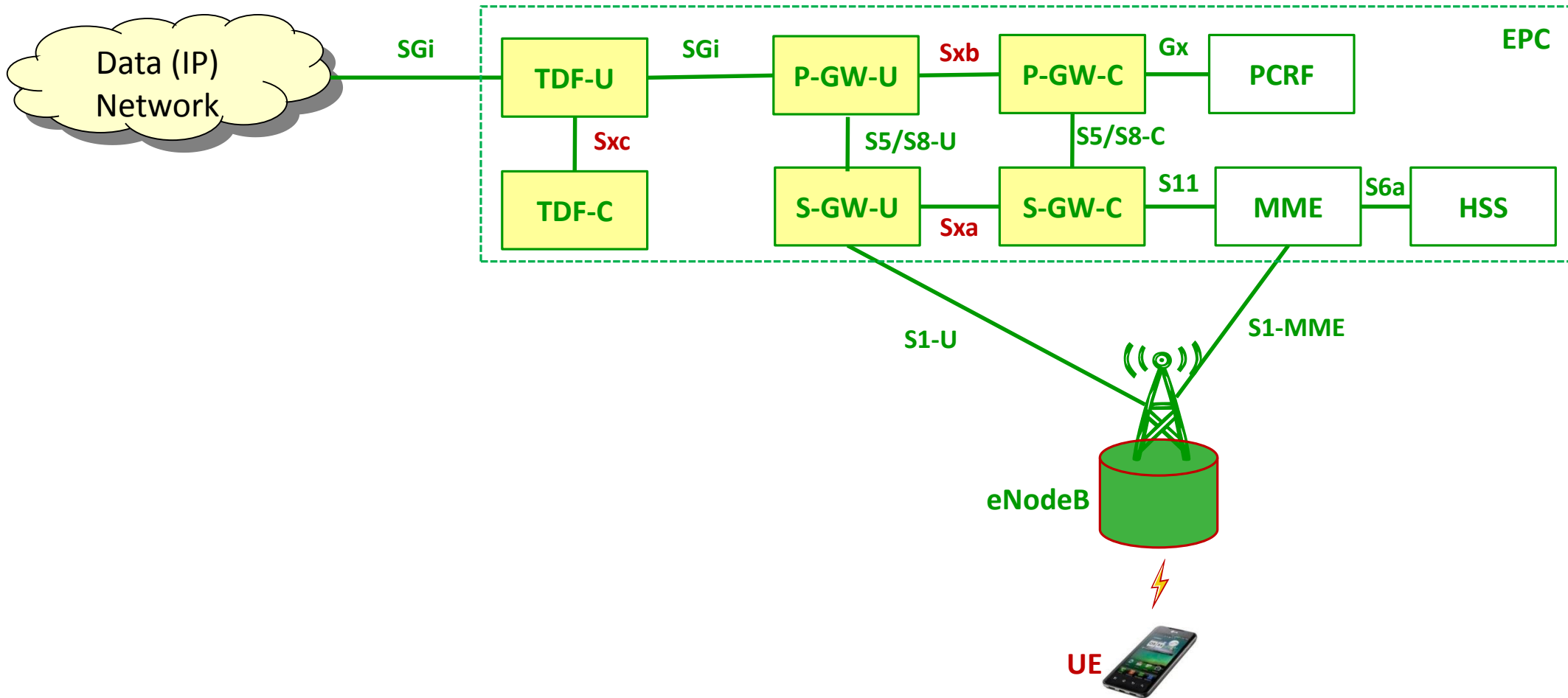


Source: Alcatel-Lucent Whitepaper

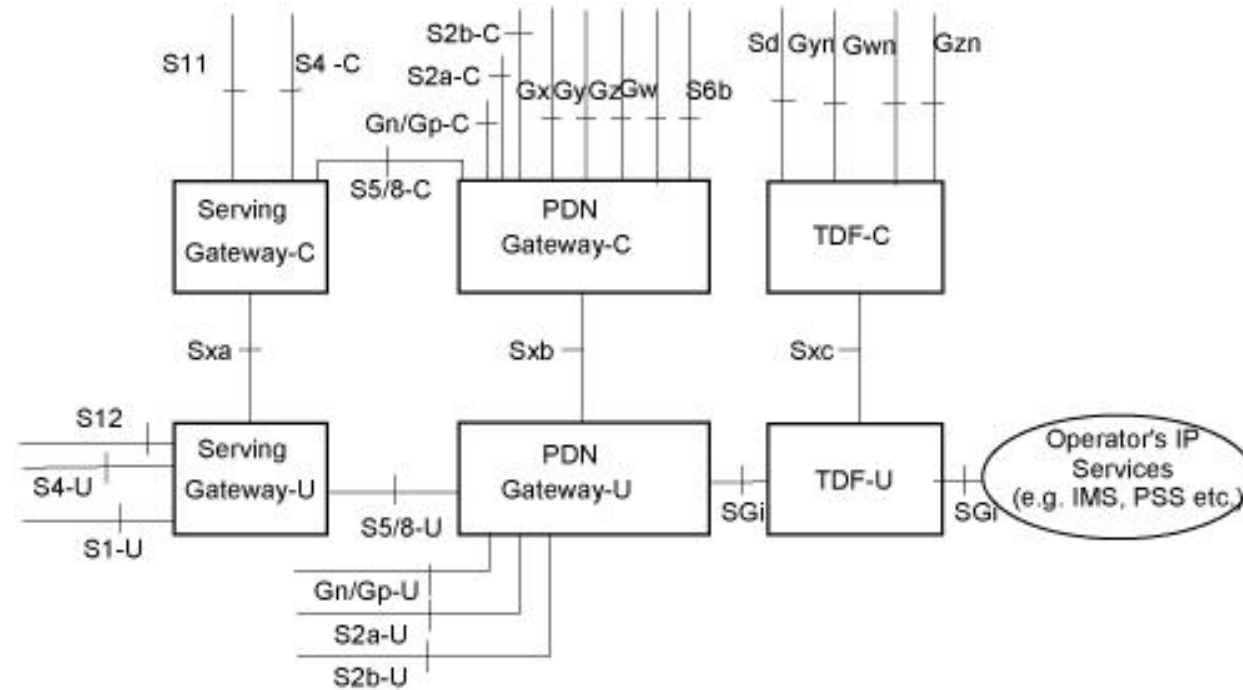
# EPC before CUPS



# EPC after CUPS



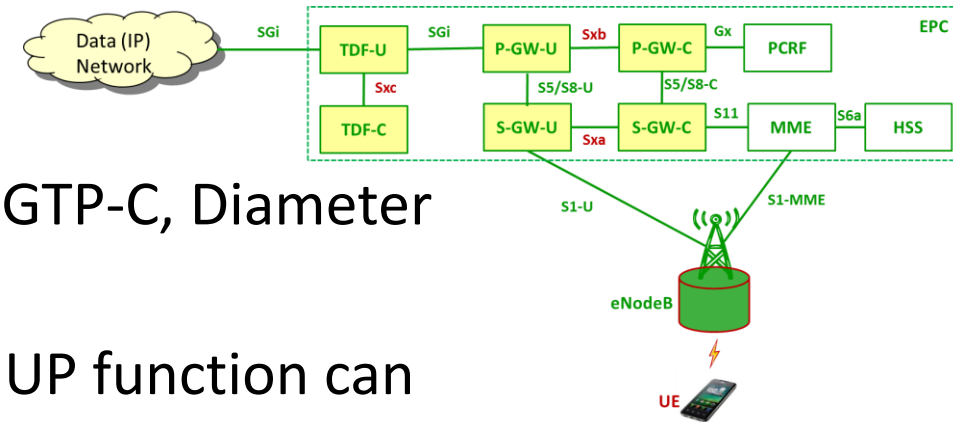
# 3GPP CUPS Architecture



Source: [3GPP](#)

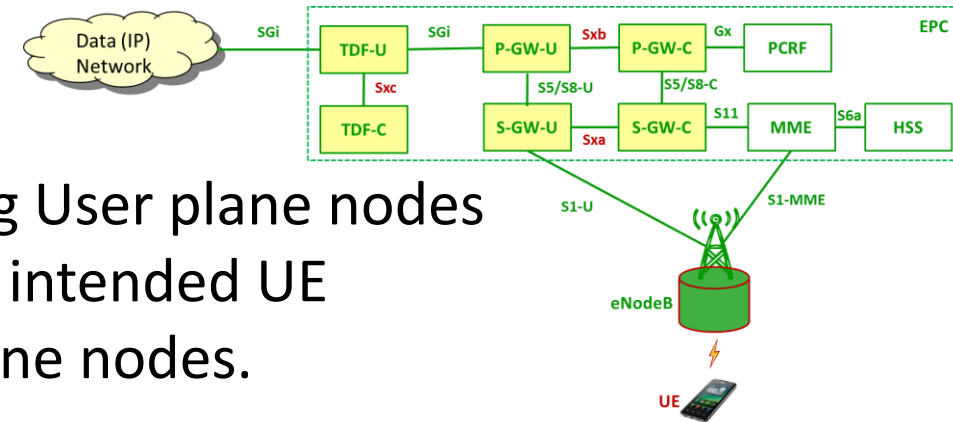


# High Level Principles for CUPS Architecture



- The CP function terminates the Control Plane protocols: GTP-C, Diameter (Gx, Gy, Gz).
- A CP function can interface multiple UP functions, and a UP function can be shared by multiple CP functions.
- An UE is served by a single SGW-CP but multiple SGW-UPs can be selected for different PDN connections. A user plane data packet may traverse multiple UP functions.
- The CP function controls the processing of the packets in the UP function by provisioning a set of rules in Sx sessions
- A legacy SGW, PGW and TDF can be replaced by a split node without effecting connected legacy nodes.

# Advantages of CUPS Architecture

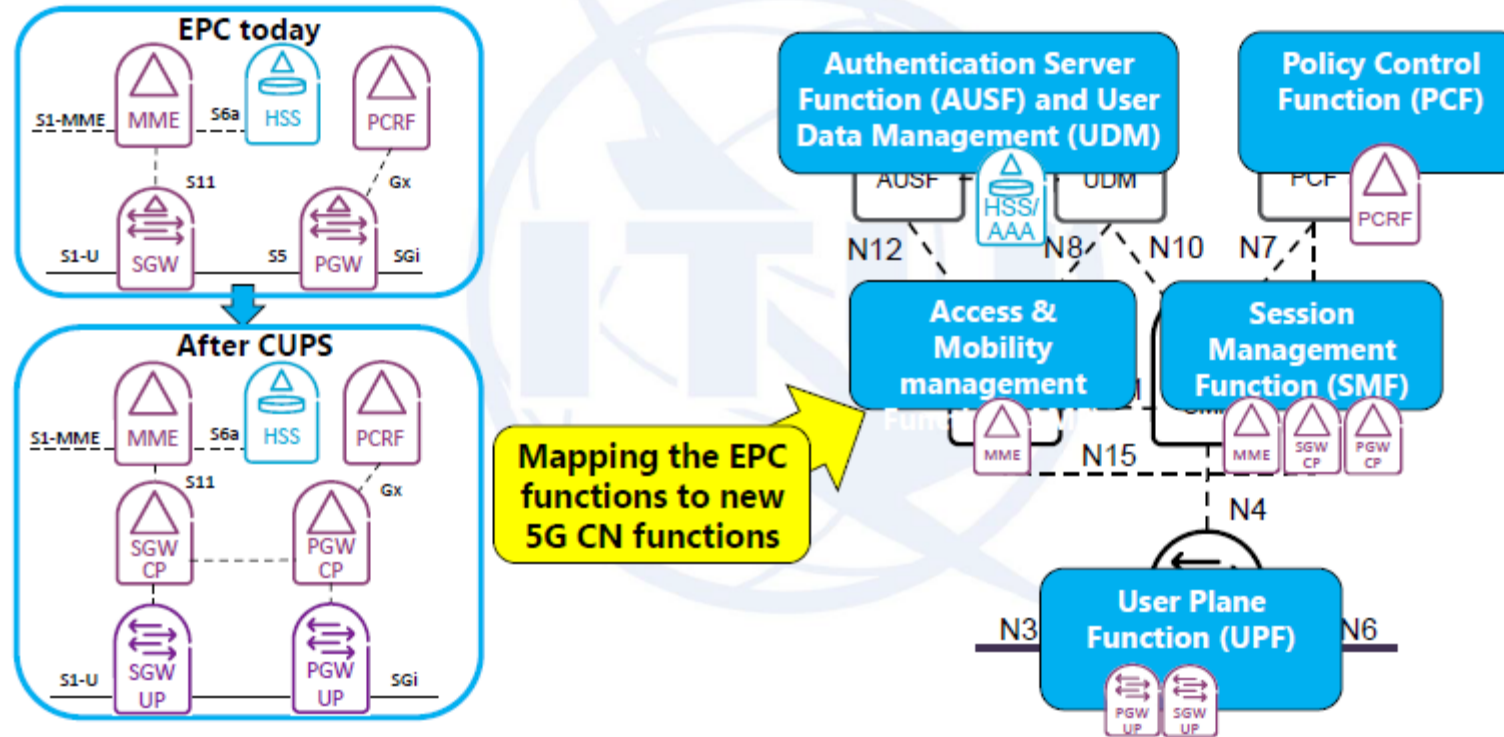


- Reducing Latency on application service, e.g. by selecting User plane nodes which are closer to the RAN or more appropriate for the intended UE usage type without increasing the number of control plane nodes.
- Supporting Increase of Data Traffic, by enabling to add user plane nodes without changing the number of SGW-C, PGW-C and TDF-C in the network.
- Locating and Scaling the CP and UP resources of the EPC nodes independently.
- Independent evolution of the CP and UP functions.
- Enabling Software Defined Networking to deliver user plane data more efficiently.

# CUPS evolution to 5G - Ericsson

## 5G CORE architecture overview

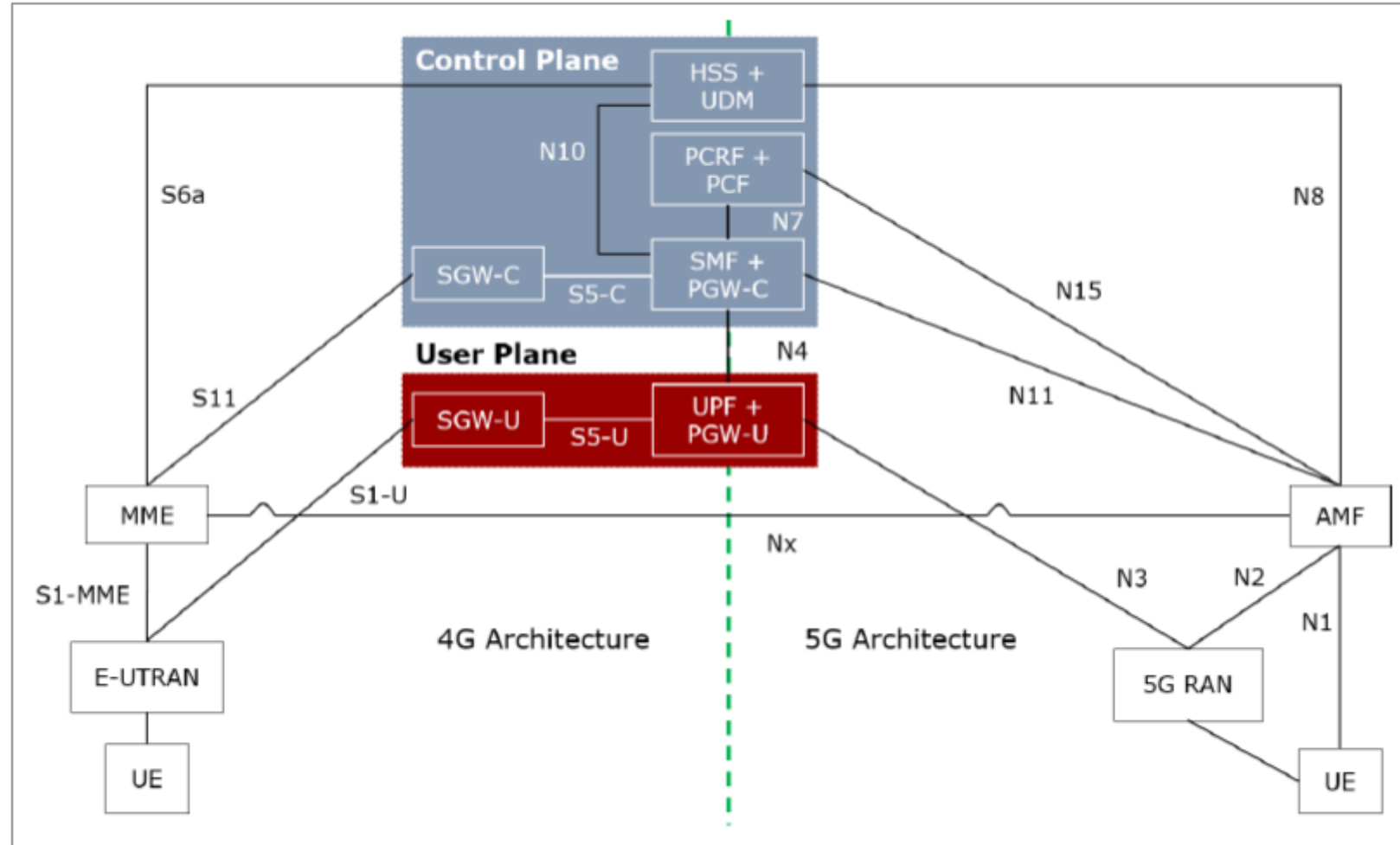
Changes and improvements compared to 4G



Source: [ITU](https://www.itu.int)

# CUPS evolution to 5G Architecture

Figure 6: CUPS Evolution to 5G Architecture



Source: 3GPP, Huawei

Source: [Heavy Reading](#)

# Further Reading Materials

---

- 3GPP: Control and User Plane Separation of EPC nodes (CUPS) - <http://www.3gpp.org/cups>
- ITU: 5G Network Architecture and FMC - Joe Wilke, Ericsson - <http://www.itu.int/>
- Heavy Reading: Service-Based Architecture for 5G Core Networks - <http://www.3g4g.co.uk>

Thank You

To learn more, visit:

3G4G Website – <http://www.3g4g.co.uk/>

3G4G Blog – <http://blog.3g4g.co.uk/>

3G4G Small Cells Blog – <http://smallcells.3g4g.co.uk/>

Operator Watch - <http://operatorwatch.3g4g.co.uk/>

Follow us on Twitter: <https://twitter.com/3g4gUK>

Follow us on Facebook: <https://www.facebook.com/3g4gUK/>

Follow us on LinkedIn: <https://www.linkedin.com/company/3g4g>

Follow us on Slideshare: <https://www.slideshare.net/3G4GLtd>

Follow us on Youtube: <https://www.youtube.com/3G4G5G>

Follow us on Storify: <https://storify.com/3g4gUK>