

# IPv6 in 3GPP Evolved Packet System

*I-D: draft-korhonen-v6ops-3gpp-eps*

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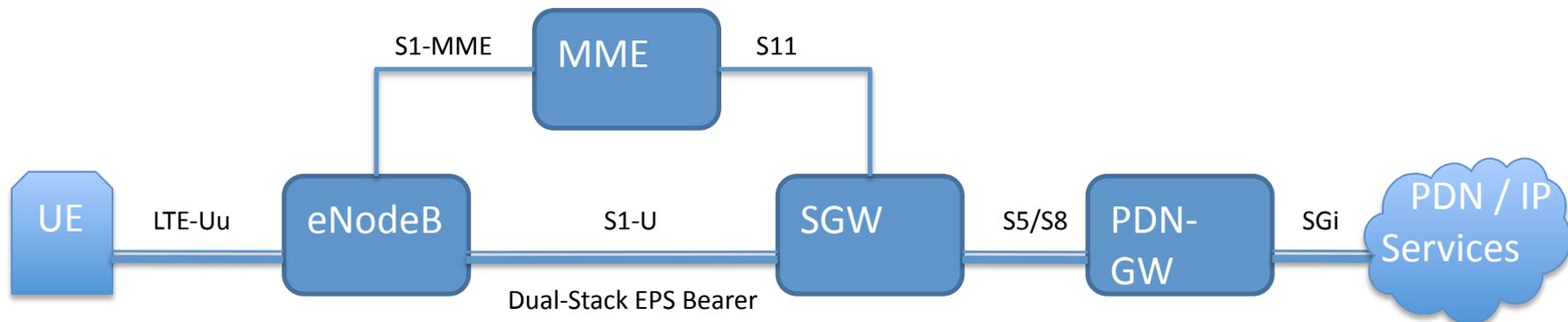


# Some Common Terminology..

- EPC = Evolved Packet Core
- RAN = Radio Access Network
- EPS = Evolved Packet System (EPC + RAN)
- eNodeB = evolved NodeB i.e. base station in EPS
- 3GPP Access = radio system developed by 3GPP
- Non-3GPP Access = radio system not developed by 3GPP
- UE = User Equipment i.e., a mobile host, wireless device
- APN = Access Point Name
- PDN = Packet Data Network i.e. an IP network
- SGSN = Serving GPRS Support Node
- GGSN = Gateway GPRS Support Node
- SGW = Service Gateway
- PDN-GW = Packet Data Network Gateway
- MME = Mobility Management Entity
- Release-x = named version of the GPRS/EPS architecture (eg. Rel 4, Rel 5 etc)

# Basic Evolved Packet System Architecture

- Architecture supports EUTRAN and legacy 2G/3G accesses as well
- PtP link is established between the UE and the P-GW
- User-plane traffic always tunneled over the transport network.
- User-plane addressing independent of transport network addressing and IP versions.



# PDN Connection

- A PDN Connection is an association between an UE and a PDN, represented by one IPv4 address and/or one /64 IPv6 prefix
- A PDN is identified by an APN
- Each PDN is accessed via a PDN-GW
- A PDN is responsible for the IP address/prefix management for the UE.
- On an UE a PDN Connection is equivalent (or visible to an IP stack) as a virtual network interface.
- Pre-Release-8 “equivalent” for a PDN Connection is the PDP Context (used in GPRS).

# EPS Bearer Model

- A logical concept of a bearer has been defined as an aggregate of one or more IP flows related to one or more services.
- The EPS bearer is between the UE and the PDN-GW, and used to transport IP (v4 and/or v6) packets
- The UE performs the binding of the UL IP flows and the PDN-GW performs the binding of the DL IP flows

# Access Point Name concept

- UEs and network use APNs to identify a network (e.g. internet, corporate intra-network, etc) and to some extent the associated services in that network.
- APNs are piggybacked on the administration of the DNS namespace.
- During the connection (bearer) setup, APNs are used (by SGSN/MME) to discover the gateway (GGSN/PDN-GW) that provides the IP connectivity to the network identifier by the APN.

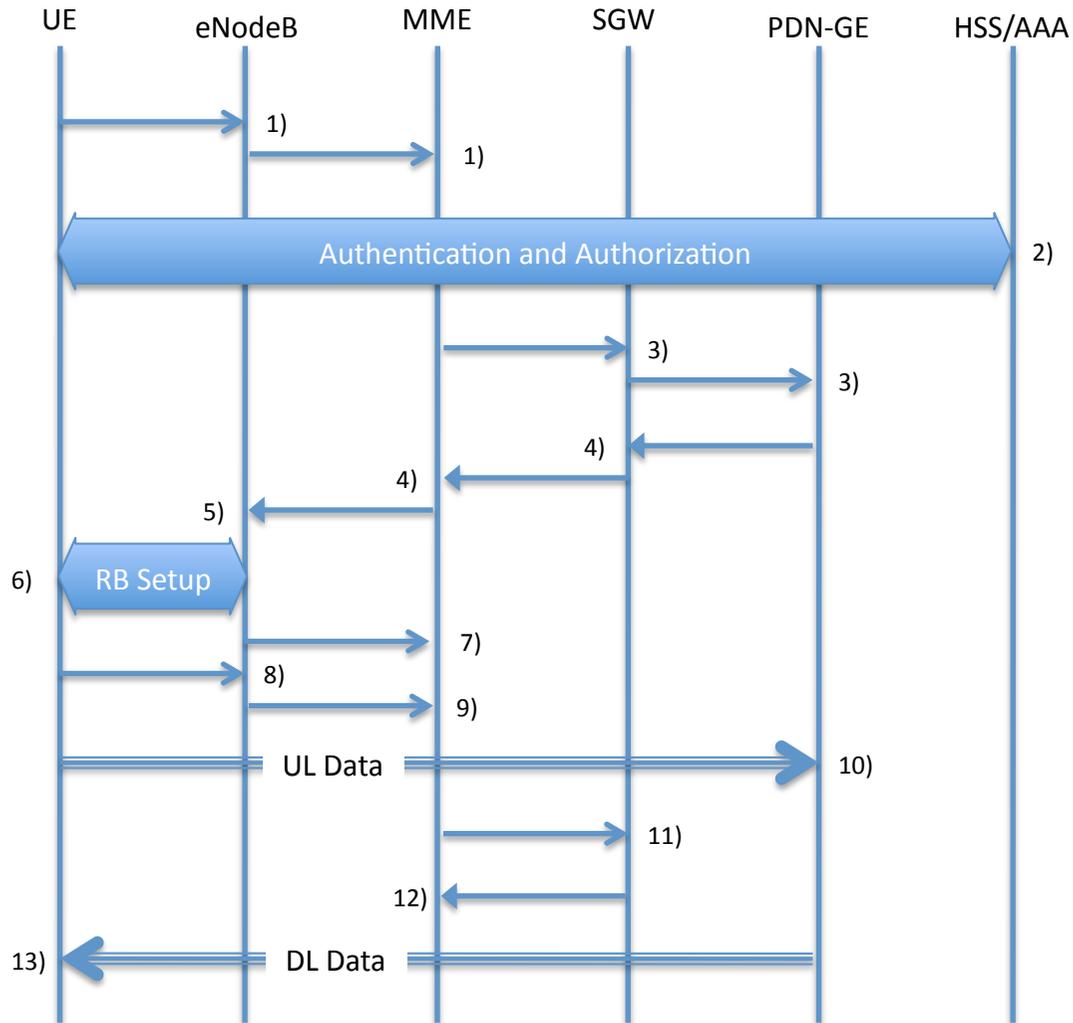
# Address Management

- IPv4 Address Configuration.
  - Two methods: DHCPv4 or within the EPS bearer setup signaling (the common way)
  - DHCP is optional on both the UE and the P-GW
- IPv6 Address Configuration.
  - One method: Stateless Address Autoconfiguration after the bearer setup.
  - A single /64 prefix is only supported

# EPS Bearer Types

- IPv4 only bearer.
  - The bearer is configured with one IPv4 address.
  - The link is “IPv4 only”.
- IPv6 only bearer.
  - The bearer is configured with one /64 prefix.
  - The link is “IPv6 only”.
- IPv4v6 bearer.
  - The bearer is configured with both IPv4 address and one /64 prefix.
  - New bearer type since Release-8.
  - The link is “dual-stack”.
  - V4v6 bearer type is the default in Rel-8 and beyond
  - Rel 9 has also introduced the DS PDP context type for UTRAN and EDGE

# PDN Connection Establishment

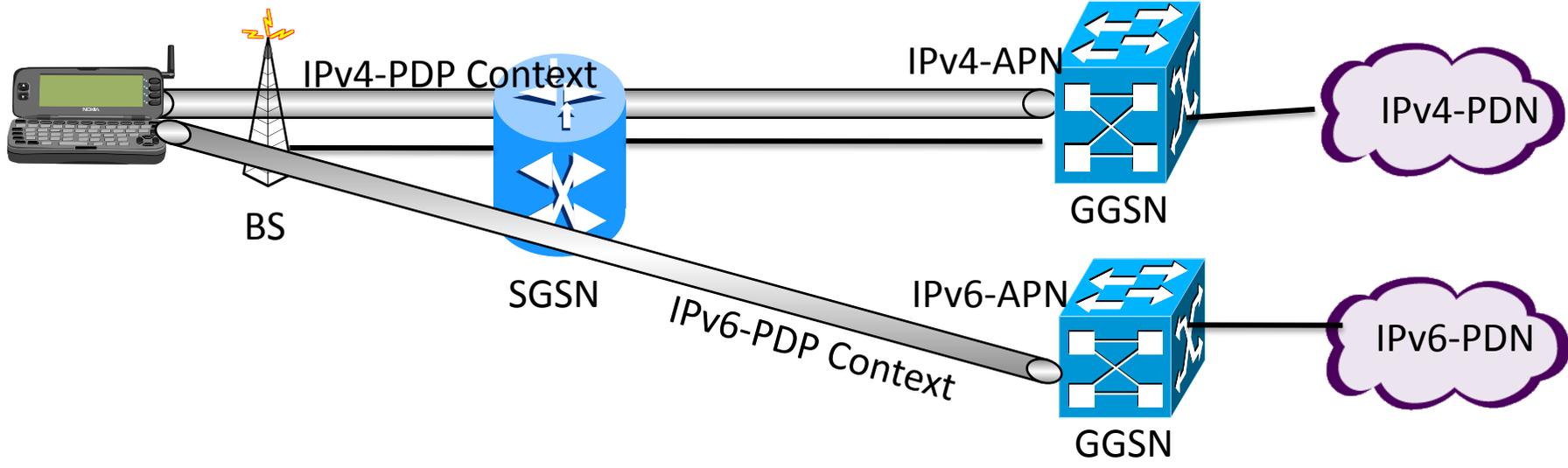
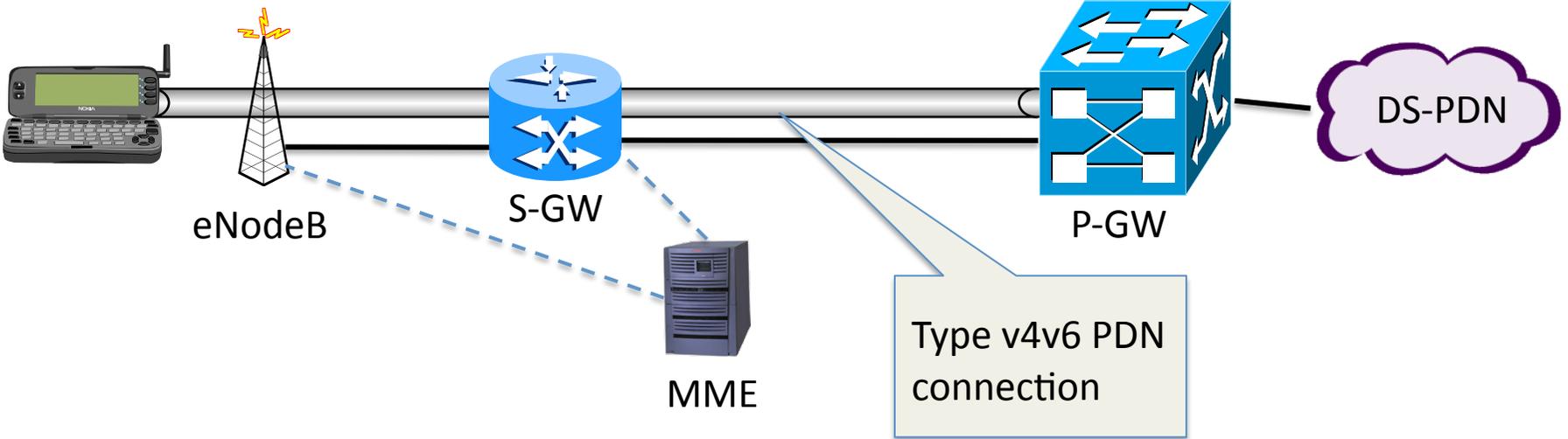


1. Attach request
2. Auth/AuthZ phase
3. Create Session Request
4. Create Session Response
5. Initial context setup request/Attach accept
6. Radio bearer reconfig
7. Initial context setup response
8. Direct transfer
9. Attach complete
10. UE starts sending UL data
11. Modify bearer request
12. Modify **bearer** response
13. DL data transmission starts

# Dual-Stack Approach for IP Access

- Networks prior to Release-8
  - Dual-stack connectivity possible by opening two parallel PDP Contexts of types IPv4 and IPv6.
  - Shows up as two separate interfaces to the IP stack.
- Networks from Release-8 onwards.
  - A single IPv4v6 PDN Connection in addition to having separate v4 and v6 PDN connections.
  - Shows up as one interface with both IPv4 and IPv6 addresses to the IP stack (with v4v6 type).

# Dual-stack approach



# Summary/Conclusion

- 3GPP networks support IPv4 and IPv6 connectivity in EPS and earlier architecture
- Type v4v6 PDN connection is optimal for providing a UE with DS connectivity
- Transition to IPv6 via the DS approach ensures that legacy devices and services do not suffer from service disruption and hence a pragmatic solution

