5G NSA Network Architecture Overview

5G Non-Standalone (NSA) architecture enables the initial deployment of 5G capabilities while leveraging existing 4G LTE networks for certain functionalities.

Key Components:

UE (User Equipment):

Represents the 5G-capable device (e.g., smartphone, IoT device) that communicates with the network.

gNodeB (gNB):

5G New Radio (NR) base station that connects to the UE over the air interface.

Supports functions like radio resource management and user data handling.

E-UTRAN (Evolved Universal Terrestrial Radio Access Network):

Includes LTE base stations (eNodeBs) and evolved Packet Core (EPC).

Provides LTE radio access and core network connectivity for the 5G NSA architecture.

NG-RAN (Next Generation Radio Access Network):

The combined network consisting of both LTE and 5G NR.

gNBs are part of NG-RAN, providing both LTE and 5G NR access.

EPC (Evolved Packet Core):

LTE core network that handles user data, authentication, and mobility Management Supports both LTE and 5G NR through interworking functions (N26 interface).

Architecture Components:

Control Plane (CP):

Handles signaling and control messages between the UE, gNB, EPC, and NG-RAN. Manages mobility and session establishment across LTE and 5G NR.

User Plane (UP):

Carries user data packets between the UE and external networks.

Directs data flows based on Quality of Service (QoS) requirements.

Dual Connectivity:

Enables simultaneous connections to LTE (via E-UTRAN) and 5G NR (via gNodeB).Improves coverage, capacity, and data rates by aggregating resources from both networks.

Interfaces:

Xn Interface:

Between gNBs for inter-cell coordination and handover support.

N1 Interface:

Between gNB and EPC for control plane signaling (LTE-RRC).

N2 Interface:

Between gNB and EPC for user plane traffic (GTP-U tunneling).

N3 Interface:

Between gNB and UE for radio interface communication (5G NR).

Deployment Considerations:

Coverage and Capacity Enhancement:

Utilizes LTE infrastructure for broader coverage while deploying 5G NR for enhanced capacity and speed.

Migration Path to Standalone (SA) 5G:

NSA architecture allows gradual migration to full 5G capabilities (SA) as 5G core networks (5GC) are deployed.

Service Differentiation:

QoS mechanisms ensure differentiated services for diverse applications (e.g.,

Enhance Mobile Broadband, Ultra-Reliable Low Latency Communications).

Conclusion:

5G NSA architecture integrates LTE and 5G NR to deliver enhanced mobile broadband and prepare networks for future 5G applications. It optimizes existing infrastructure while paving the way for standalone 5G deployments.