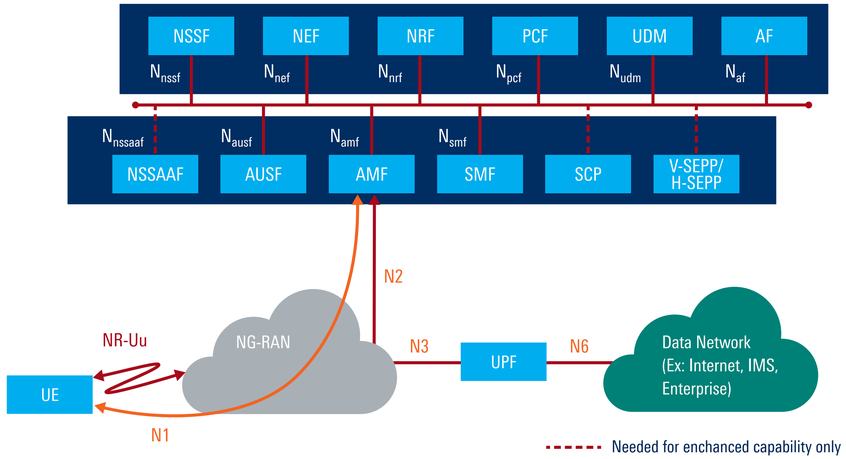
5G NETWORK ARCHITECTURE

For more Information

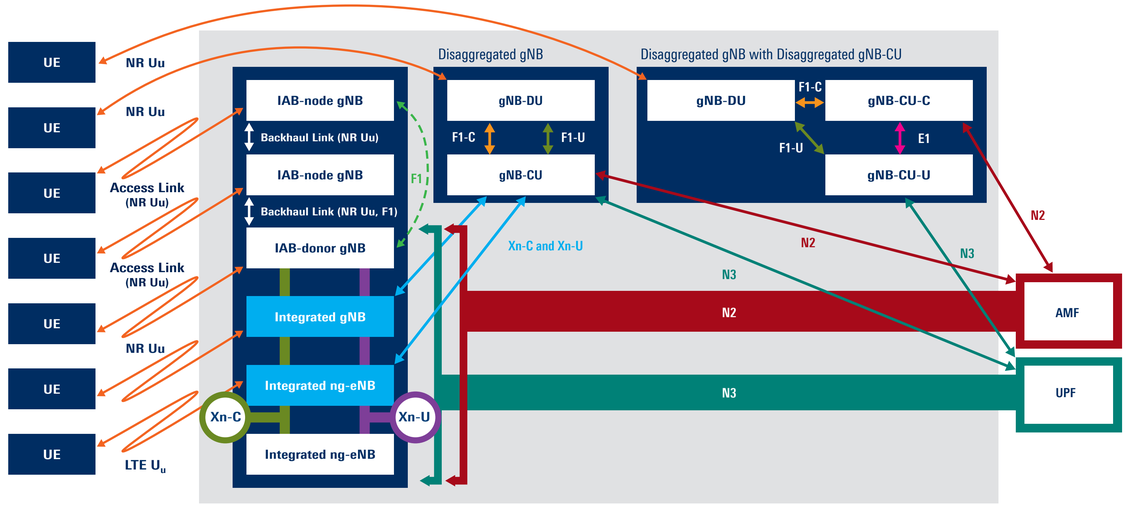
Overall Service Based Architecture (SBA)



Overall Service Based Architecture

3GPP has defined a service-based architecture, where different Network Functions (NFs) provide services via service-based interfaces. For example, other NFs can use Namf interface to obtain services of the AMF.

NG-RAN Architecture

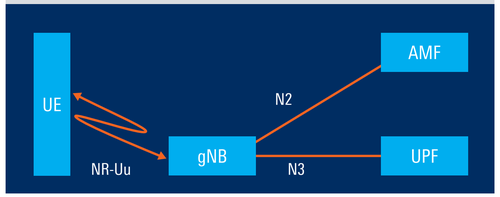


NG-RAN Architecture

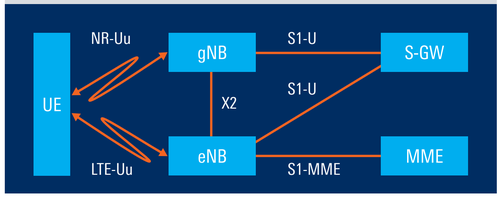
The Next-Generation Radio Access Network (NG-RAN) consists of NR-based gNBs and LTE-based ng-eNBs. The NG-RAN connects to the 5GC/NGC.

Multi-RAT Connectivity

Standalone NR with the 5GC (“Option 2”)



Non-Standalone NR with the EPC (“Option 3/3a/3x”)



Option 1: E-UTRA with EPC (Baseline)
Option 2: Standalone NR with NGC
Option 3, 3a, 3x: Non-Standalone NR with EPC
Option 4, 4a: Non-Standalone E-UTRA with NGC
Option 5: Standalone E-UTRA with NGC
Option 6: Standalone NR with EPC
Option 7, 7a, 7x: Non-Standalone NR with NGC
Option 8, 8a: Non-Standalone E-UTRA with EPC

Multi-RAT Connectivity

A UE may connect to multiple base stations (e.g., eNB and gNB) simultaneously.
Two popular network architectures are Standalone NR with the NGC (“Option 2”) and Non-Standalone NR with the EPC (EN-DC or Option 3/3a/3x).

Key Functions of NFs

NF	Expansion and Key Function
5G-EIR	5G- Equipment Identity Register: Records blacklisted device IDs
AF	Application Function: Influences traffic routing and facilitates QoS control
AMF	Access and Mobility Management Function: Exchanges NAS signaling with the UE and manages registration, connection, reachability, and mobility
AUSF	Authentication Server Function: Authenticates the UE
LMF	Location Management Function: Helps determine the UE location
N3IWF	Non-3GPP Interworking Function: Supports an IPSec tunnel toward the UE through a non-3GPP access network
NRF	Network Repository Function: Supports discovery of NFs/services
NSSAAF	Network Slice-Specific Authentication and Authorization Function: Provides Network Slice-specific authentication and authorization by relaying Extensible Authentication Protocol (EAP) messages
NSSF	Network Slice Selection Function: Determines allowed Network Slices
NWDAF	Network Data Analytics Function: Provides Network Slice-specific analytics to an NF
PCF	Policy Control Function: Creates policy rules (e.g., to support QoS control)
SCP	Service Communication Proxy: Facilitates indirection communication between NFs and NF services
SEPP	Security Edge Protection Proxy: Secures inter-PLMN Control Plane interfaces
SMF	Session Management Function: Manages UE sessions and allocates an IP address to the UE
SMSF	Short Message Service (SMS) Function: Supports SMS over NAS
UDM	Unified Data Management: Manages subscriptions and generates authentication credentials
UDR	Unified Data Repository: Stores subscription data, policy data, and structured data for exposure
UDSF	Unstructured Data Storage Function: Supports storage, modification, and retrieval of unstructured data
UPF	User Plane Function: Acts as a mobility anchor for user traffic

Selected Reference Points and Associated NFs

Interface/ Reference Point	Associated NFs
N4	SMF-UPF
N5	PCF-AF
N7	SMF-PCF
N8	AMF-UDM
N9	UPF-UPF
N11	AMF-SMF
N12	AMF-AUSF
N13	AUSF-UDM
N14	AMF-AMF
N15	AMF-PCF
N22	AMF-NSSF
N33	NEF-AF
N58	AMF-NSSAAF
N59	NSSAAF-UDM

Governing Protocols on Major Interfaces

Interface/ Reference Point	Associated NFs	Associated NFs
E1	E1 Application Protocol (E1AP)	TS 38.463
F1-C	F1 Application Protocol (XnAP)	TS 38.473
N1	5G Non-Access Stratum (NAS) Signaling	TS 24.501
N2	Next Generation Application Protocol (NGAP)	TS 38.413
N3, Xn-U, F1-U	GPRS Tunneling Protocol version 1- User Plane (GTPv1-U)	TS 29.281
Xn-C	Xn Application Protocol (XnAP)	TS 38.423
Service Based Interfaces: N*** (Ex: N_{ausf})	Application Programming Interfaces (APIs) based on Hyper Text Transfer Protocol (HTTP)/2 protocol with Javascript Object Notation (JSON)	IETF RFC 7540 for HTTP/2, IETF RFC 8259 for JSON, TS 29.5NN for NF services (Ex: 29.500 Overall SBA, 29.502 SMF, 29.503 UDM, 29.518 AMF, and so on based on the NF)

Service that adds value
- Worldwide
- Local and personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

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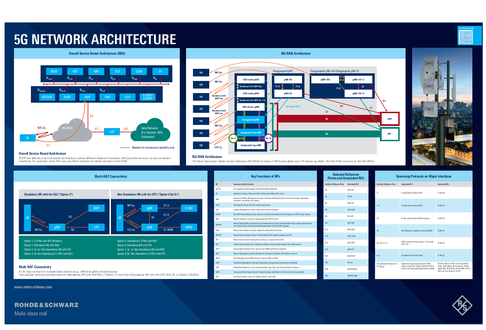
Poster



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