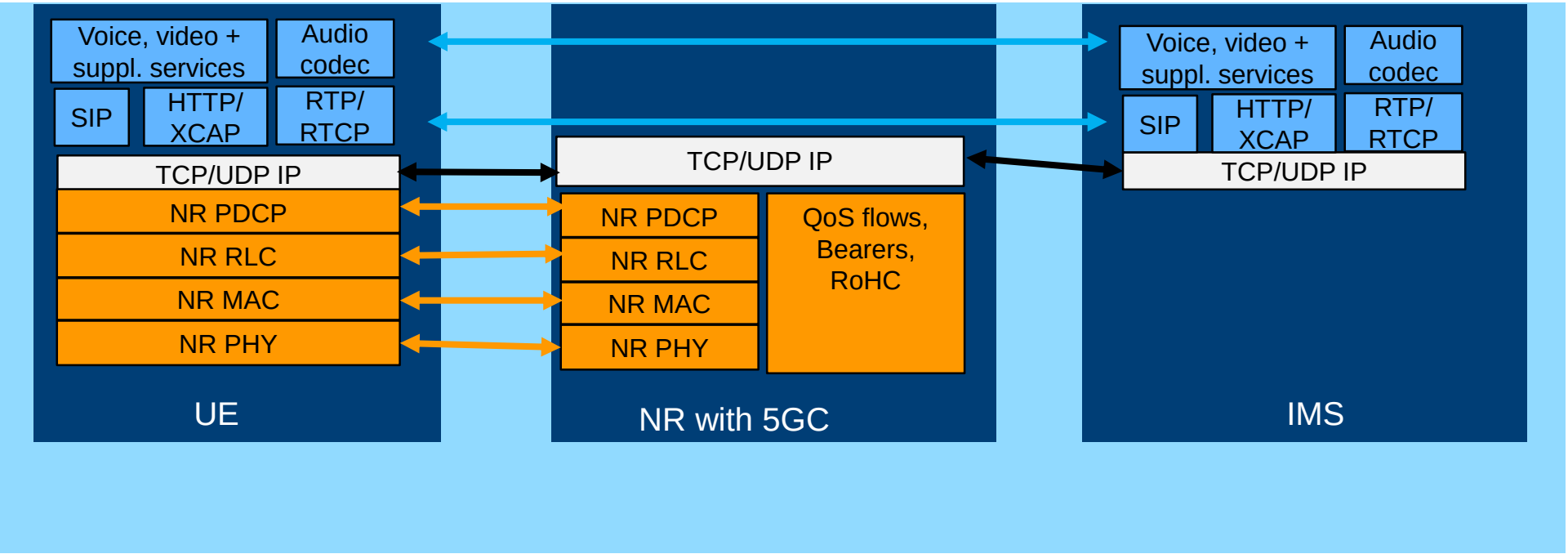
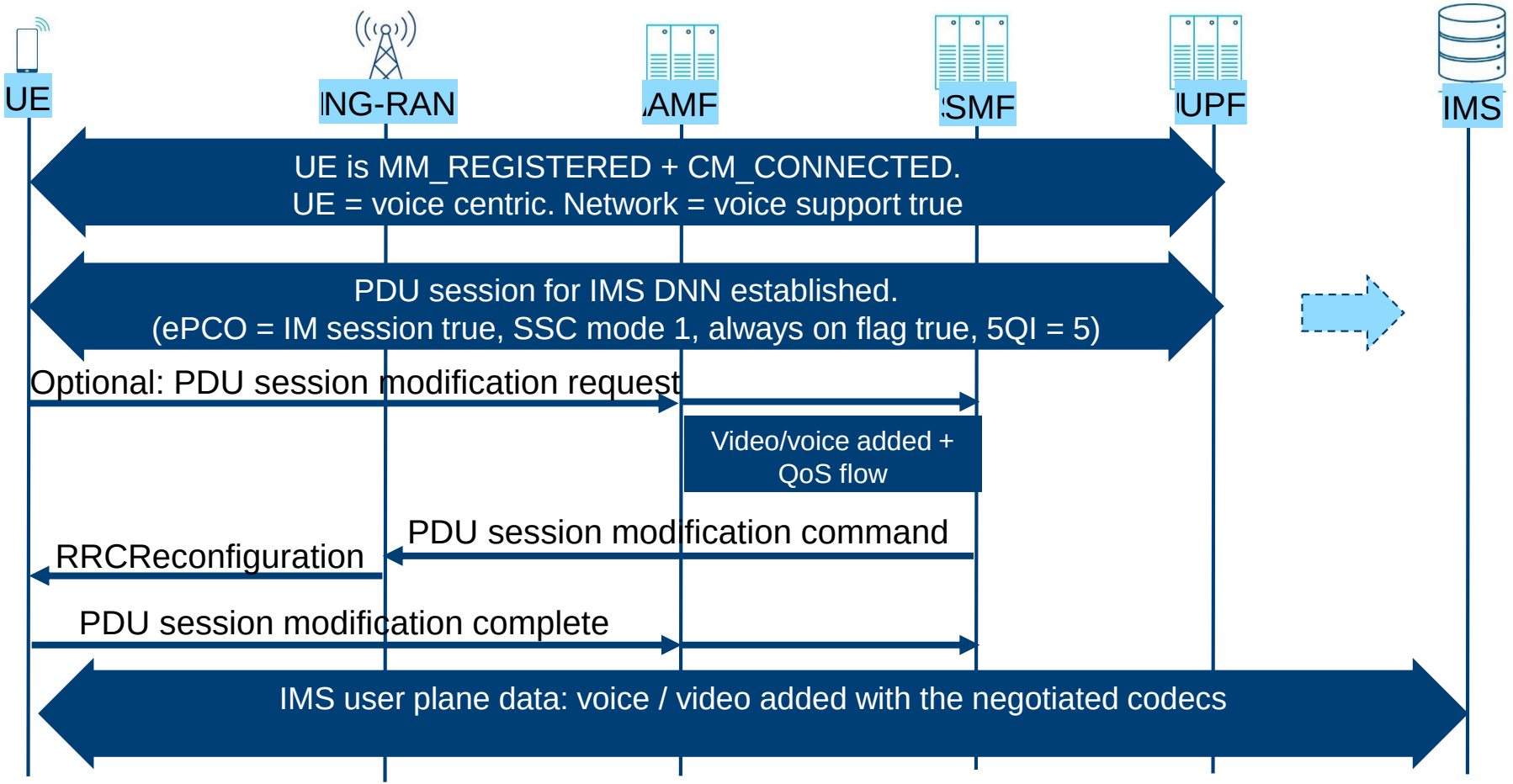
VOICE OVER NR

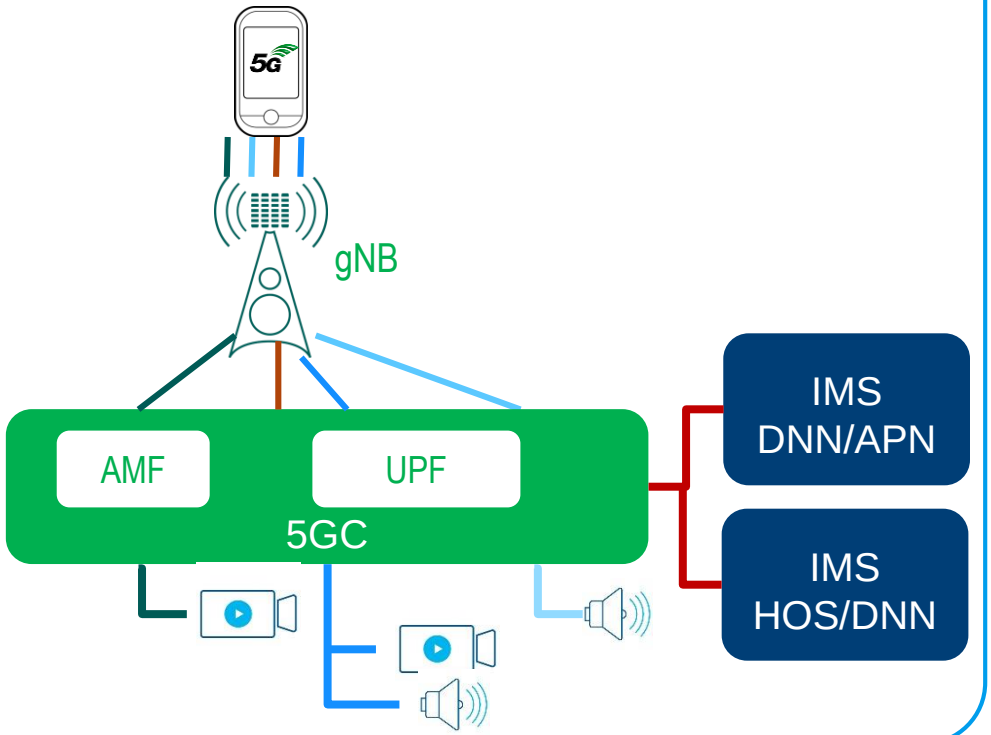


VOICE OVER NR - CALL FLOW



VOICE OVER NR – BEARER + IMS ASPECTS

VoNR targets for standalone (option 2), dual connectivity is possible



Radio bearer configuration and support request

- UM DRB with 5QI = 1 (conversational voice)
- UM DRB with 5QI = 2 (conversational video)
- AM DRB with 5QI = 5 (IMS SIP signaling)
- AM DRB with 5QI = 6-9 (non-GBR video)

1 or 2 IMS registrations:

- IMS DNN for all IIMS services
- HOS IMS DNN for home operator RCS services

UE PDCP should support RTP and RTCP RoHC compresssion and UE MAC layer should support DRX

MTSI: MULTIMEDIA TELEPHONE SERVICES FOR IMS

MTSI user plane stack is assumed on top of IP. Lower 5G layers, no specific settings for voice

Assumption: SDAP header = zero

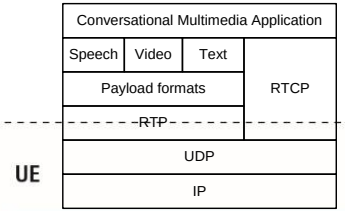
Assumption: PDCP header = focus on latency, no integrity check, only encryption

Assumption: RLC = unacknowledged mode

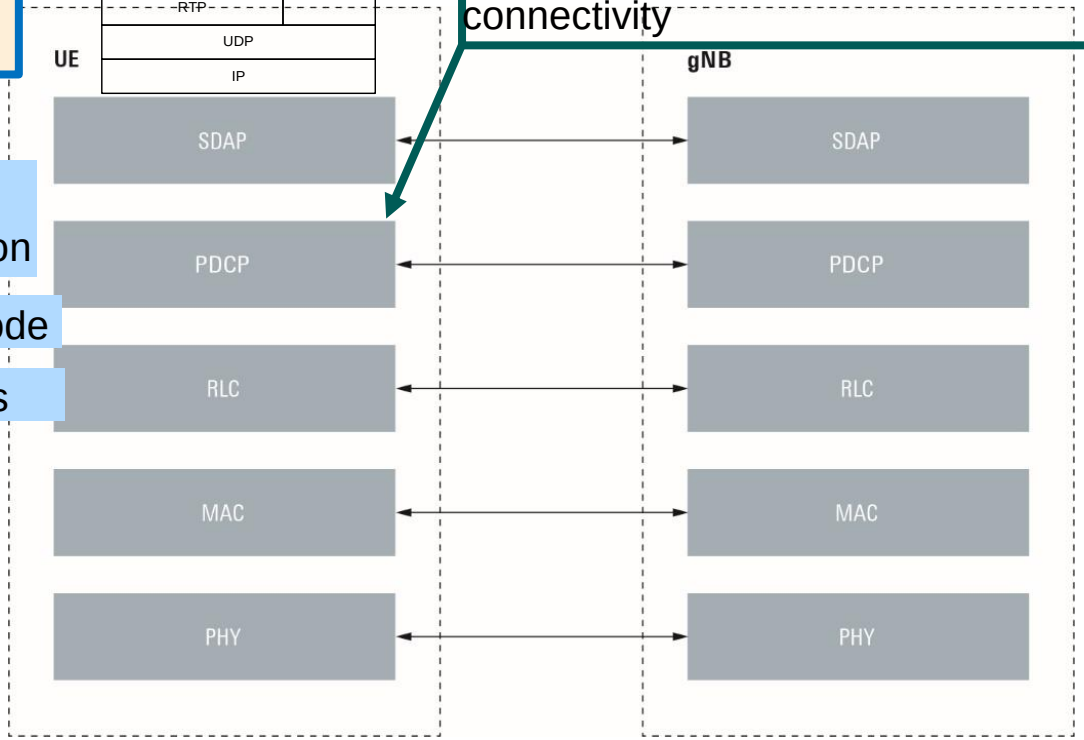
Assumption: MAC = low #HARQ process

Assumption: QoS settings: 5QI = 1 or 7 (5QI=7: priority 70, delay = 100ms, PER ~ 10^{-3})

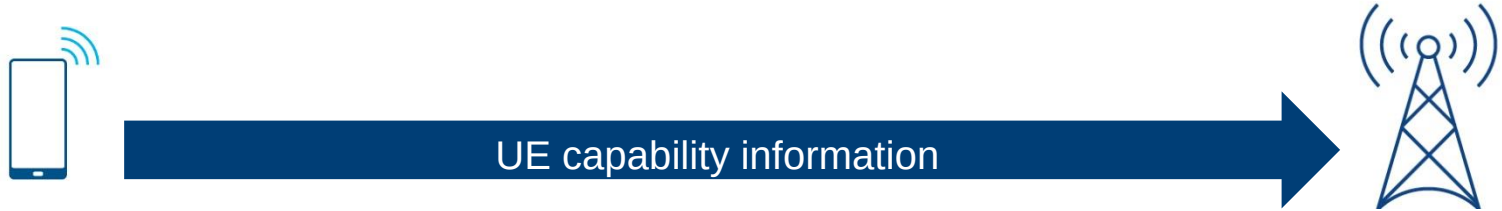
Assumption: PHY supports semi-persistent scheduling, DRX + slot aggregation (e.g. TTI bundling in EUTRA)



UE indicates whether it supports voice over NR via MCG or SCG in dual connectivity



5G NR VOICE: RRC MESSAGES WITH VOICE ASPECTS



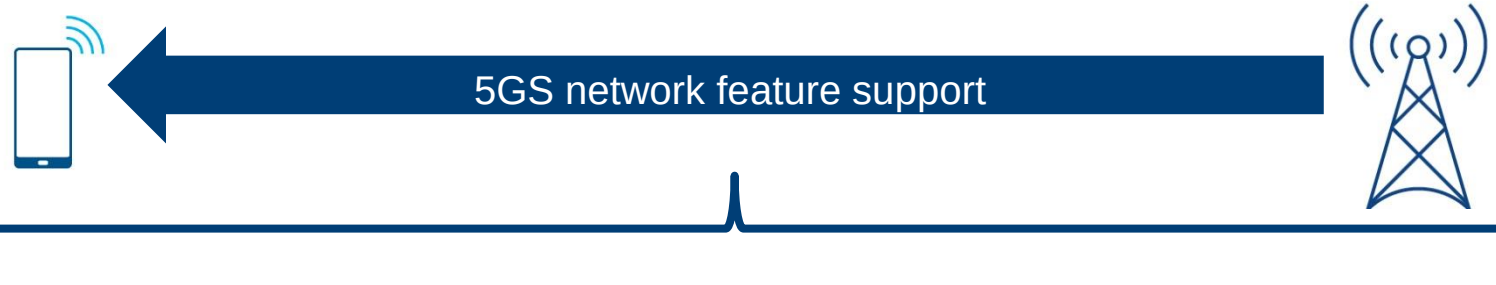

```
IMS-Parameters ::=          SEQUENCE {
    ims-ParametersCommon        IMS-ParametersCommon                OPTIONAL,
    ims-ParametersFRX-Diff      IMS-ParametersFRX-Diff              OPTIONAL,…}

IMS-ParametersCommon ::=    SEQUENCE {
    voiceOverEUTRA-5GC          ENUMERATED {supported}              OPTIONAL,
    ...,
    voiceOverSCG-BearerEUTRA-5GC        ENUMERATED {supported}      OPTIONAL
    voiceFallbackIndicationEPS-r16          ENUMERATED {supported}      OPTIONAL}

IMS-ParametersFRX-Diff ::= SEQUENCE {
    voiceOverNR                 ENUMERATED {supported}              OPTIONAL,
    ...
}
```

If UE supports voice over standalone 5G NR, than above flag “voiceOverNR” must be true.

5G NR VOICE: NAS MESSAGE WITH VOICE ASPECTS



5GS network feature support IEI							
Length of 5GS network feature support contents							
MPSI	IWK N26	EMF	EMC			IMS- VoPS-N3GPP	IMS- VoPS-3GPP
5G-UP CIoT	5G- HC-CP		IPHC-CIoT		RestrictEC	MCSI	EMCN3
0 Spare	0 Spare	0 Spare	0 Spare	0 Spare	5G-EHC-CP CIoT	ATS-IND	5G-LCS

Emergency service fallback

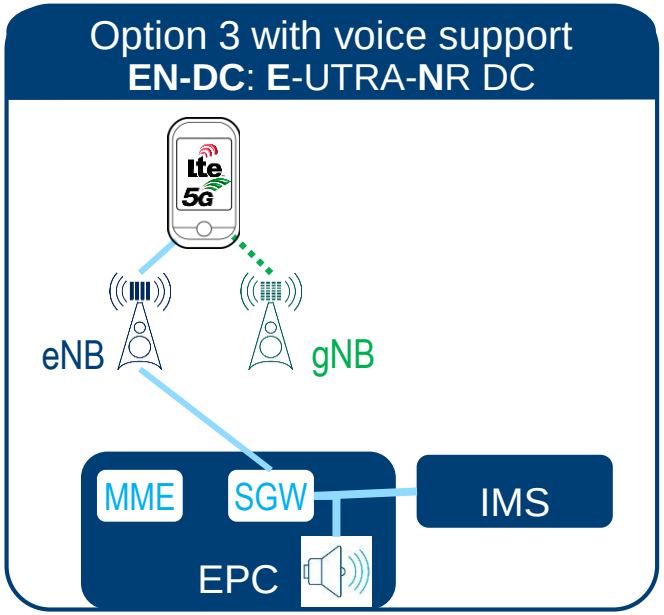
Emergency service capability

Voice service support

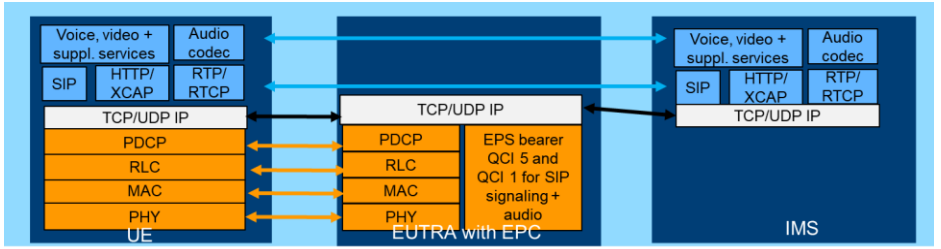
ARCHITECTURE OPTIONS AND VOICE SERVICES IN 5G

Option 3 supports two possible voice implementations:

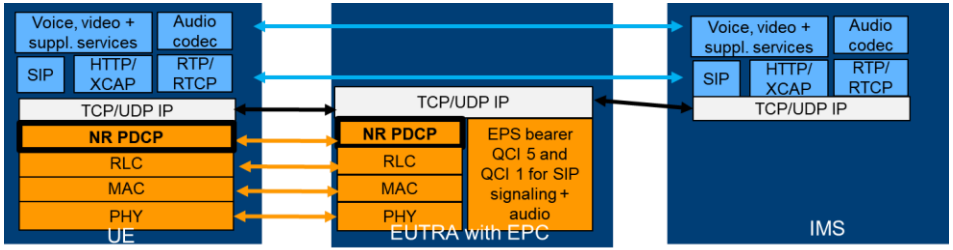
eNB is the Master Node



VoLTE as legacy in LTE

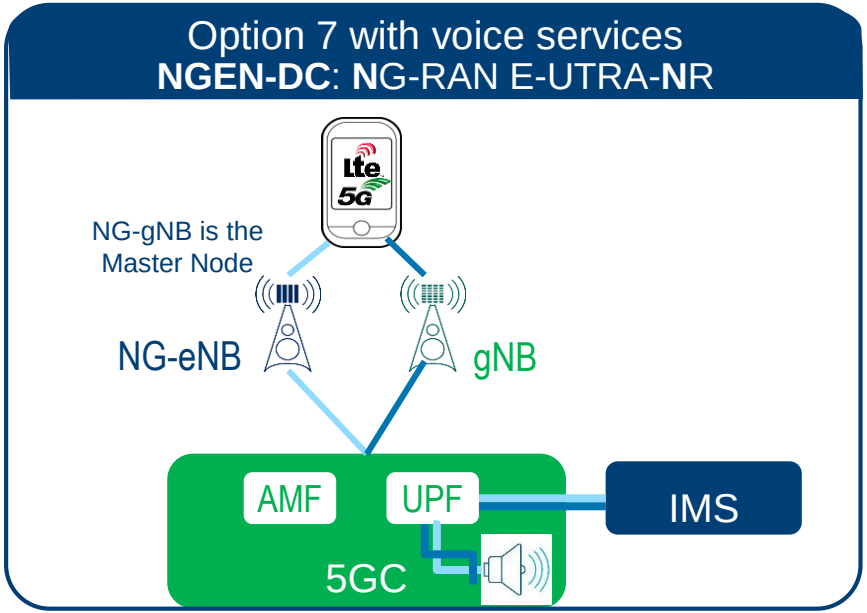


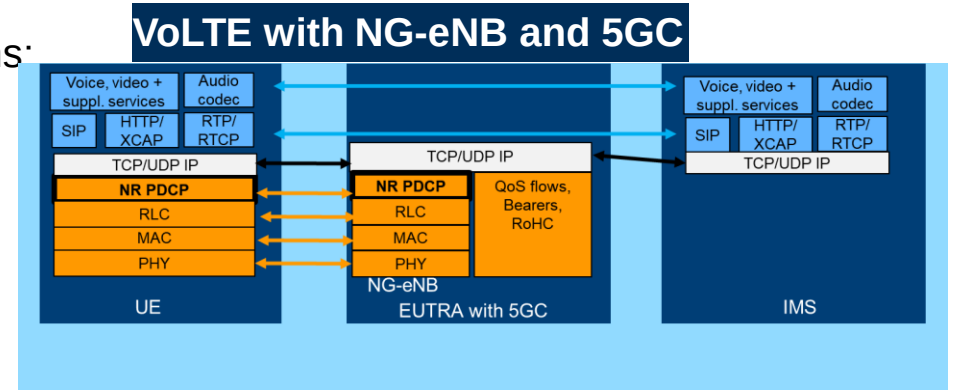
VoLTE using NR PDCP

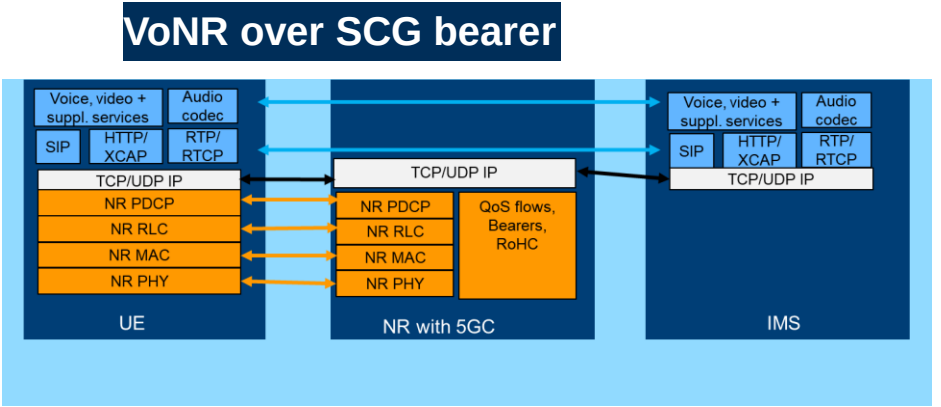


ARCHITECTURE OPTIONS AND VOICE SERVICES IN 5G

Option 7 supports two possible voice implementations:

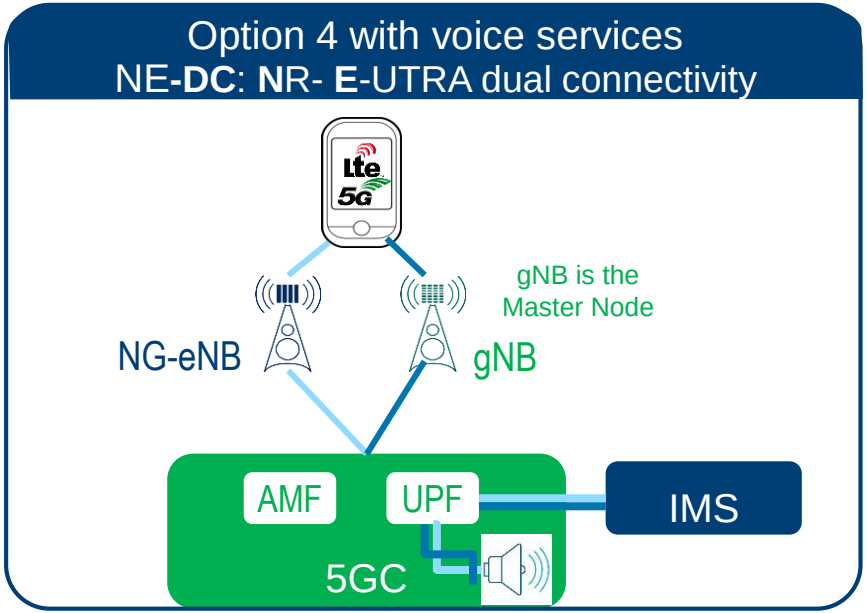




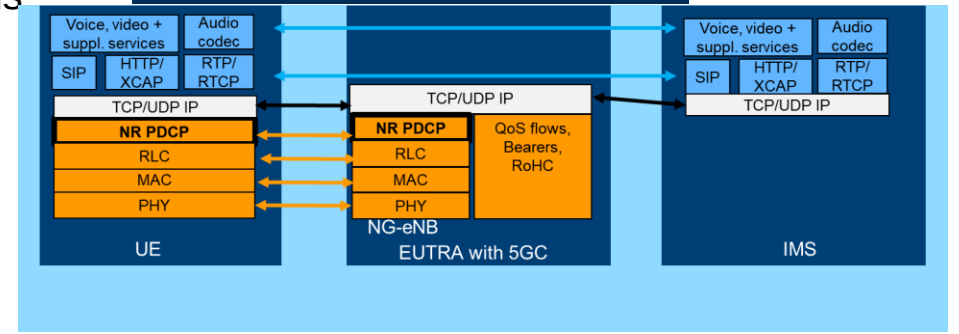


ARCHITECTURE OPTIONS AND VOICE SERVICES IN 5G

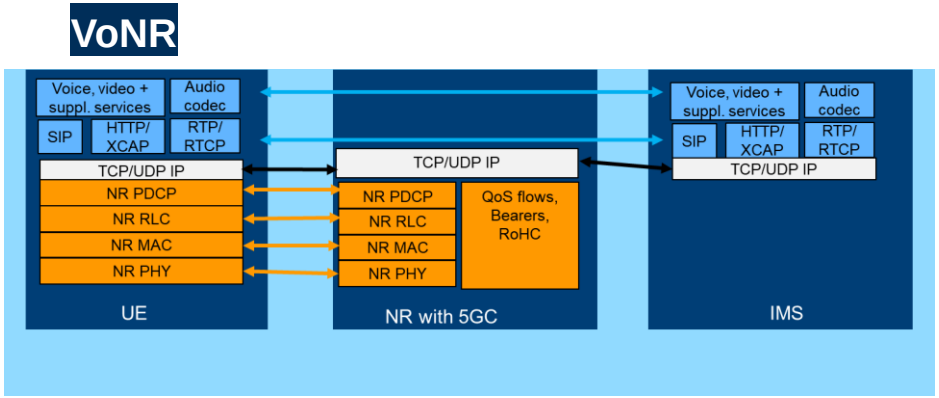
Option 4 supports two possible voice implementations:



VoLTE with NG-eNB and 5GC

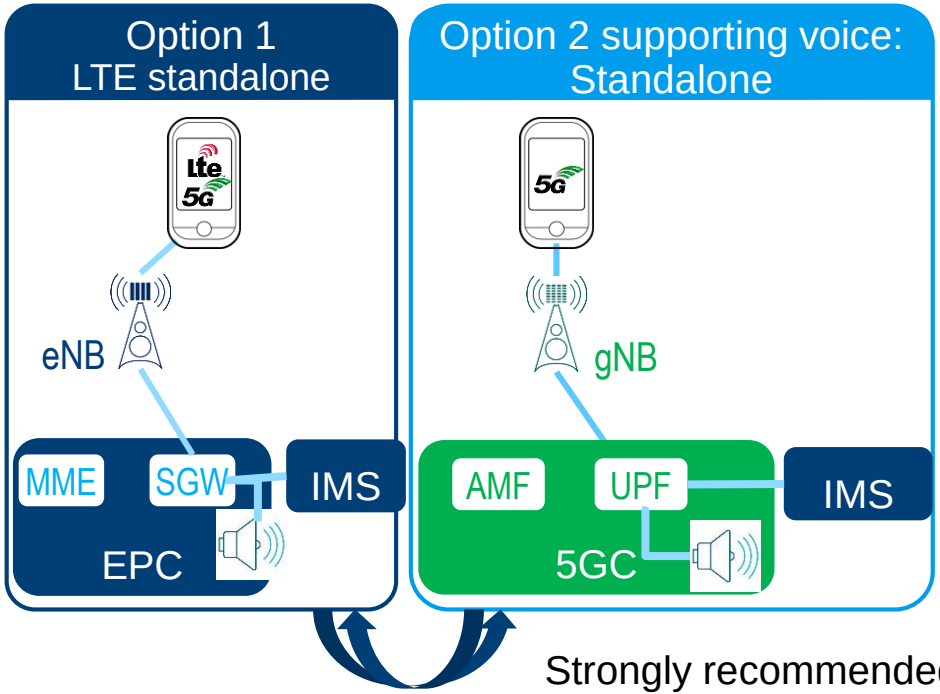


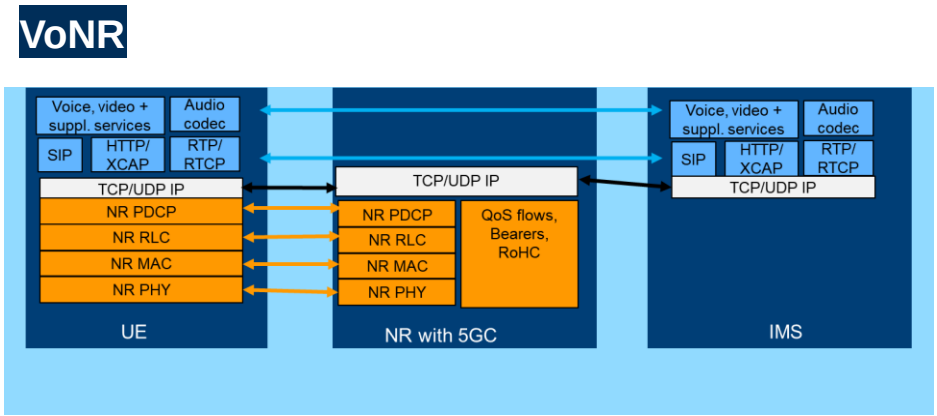
VoNR



ARCHITECTURE OPTIONS AND VOICE SERVICES IN 5G

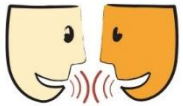
Option 2 supports VoNR with optional EPS fallback or RAT fallback depending on coverage

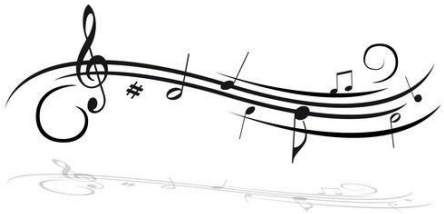




Strongly recommended: LTE + 5G coexisting in parallel to support inter-system mobility for best voice QoS

ENHANCED VOICE SERVICES EVS





High data rate + good audio quality

Motivation for EVS is a mix of speech and audio data (music)

EVS

EVS primary mode

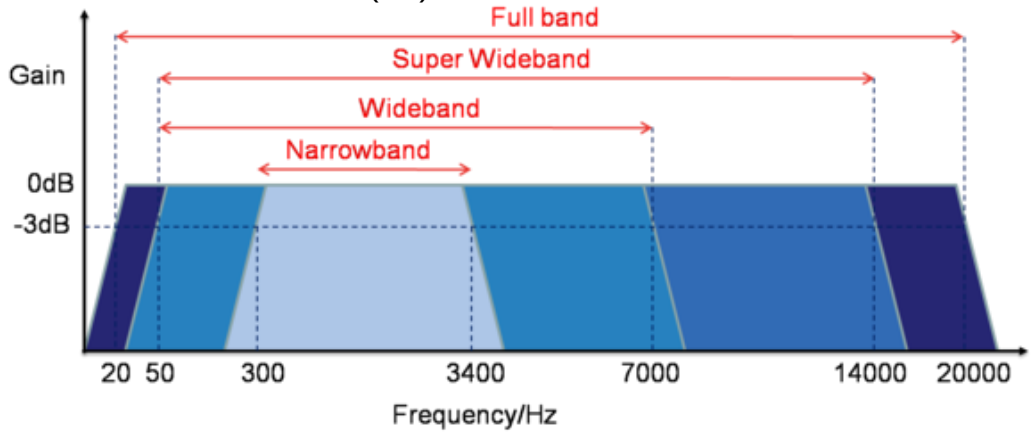
- 11 codec modes
- Requires transcoding when used with AMR-WB

EVS AMR-WB IO mode

- 9 codec modes
- No transcoding needed
- Fully compatible with AMR-WB

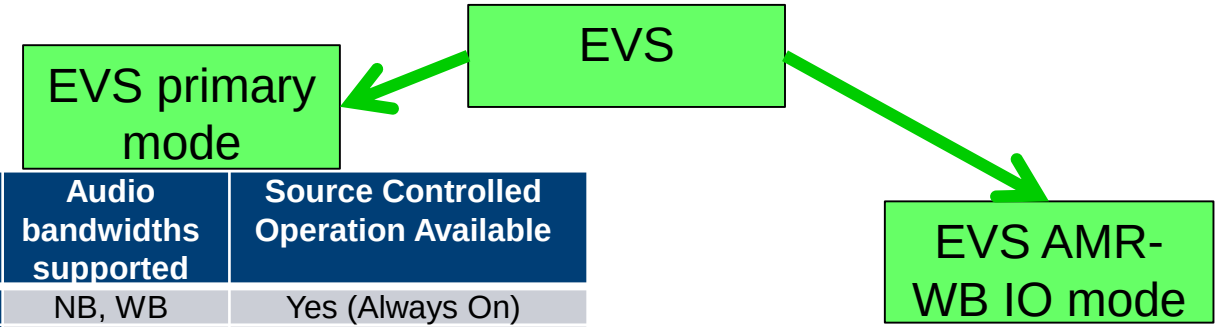
AUDIO BANDWIDTH DEFINITION

- 300-3400 Hz = Narrowband (NB)
- 50-7000 Hz = Wideband (WB)
- 50-14000 Hz = Super Wideband (SWB)
- 20-20000 Hz = Fullband (FB)



Working principle of speech codes are sampling rates of either 8, 16, 32 or 48 kHz converted into a 16 bit PCM

EVS CODE RATES

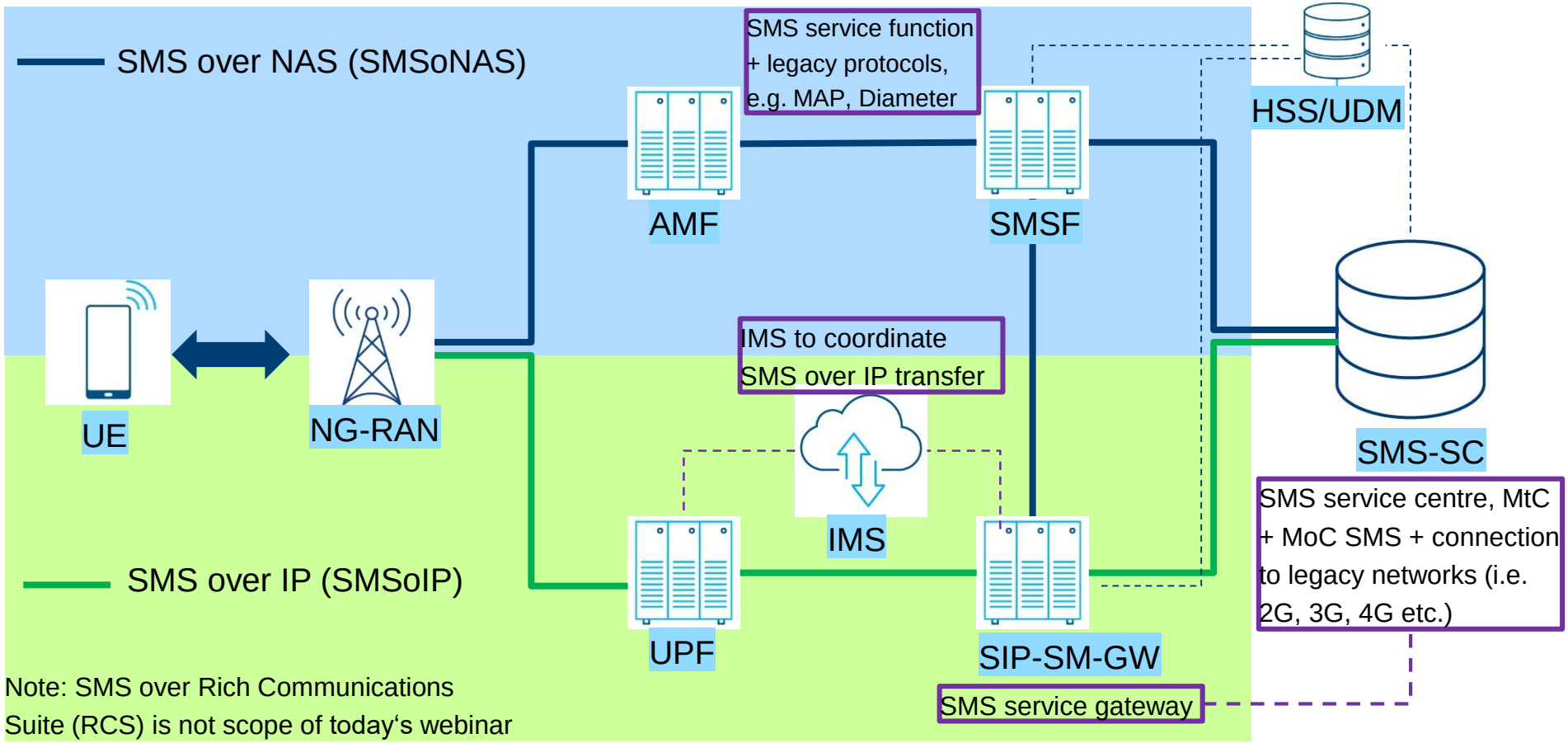


Source codec bit-rate (kbit/s)	Audio bandwidths supported	Source Controlled Operation Available
5,9 (SC-VBR)	NB, WB	Yes (Always On)
7,2	NB, WB	Yes
8.0	NB, WB	Yes
9,6	NB, WB, SWB	Yes
13,2	NB, WB, SWB	Yes
13,2 (channel aware)	WB, SWB	Yes
16,4	NB, WB, SWB, FB	Yes
24,4	NB, WB, SWB, FB	Yes
32	WB, SWB, FB	Yes
48	WB, SWB, FB	Yes
64	WB, SWB, FB	Yes
96	WB, SWB, FB	Yes
128	WB, SWB, FB	Yes

Source codec bit-rate (kbit/s)
6,6
8,85
12,65
14,25
15,85
18,25
19,85
23,05
23,85

AMR-WB interoperable mode for legacy codec compliance

SHORT MESSAGE SERVICE IN 5G NR



IMS EMERGENCY SERVICE OPTIONS IN LTE + 5G NR