



# Deploying VoLTE

## Understanding and Managing the Challenges

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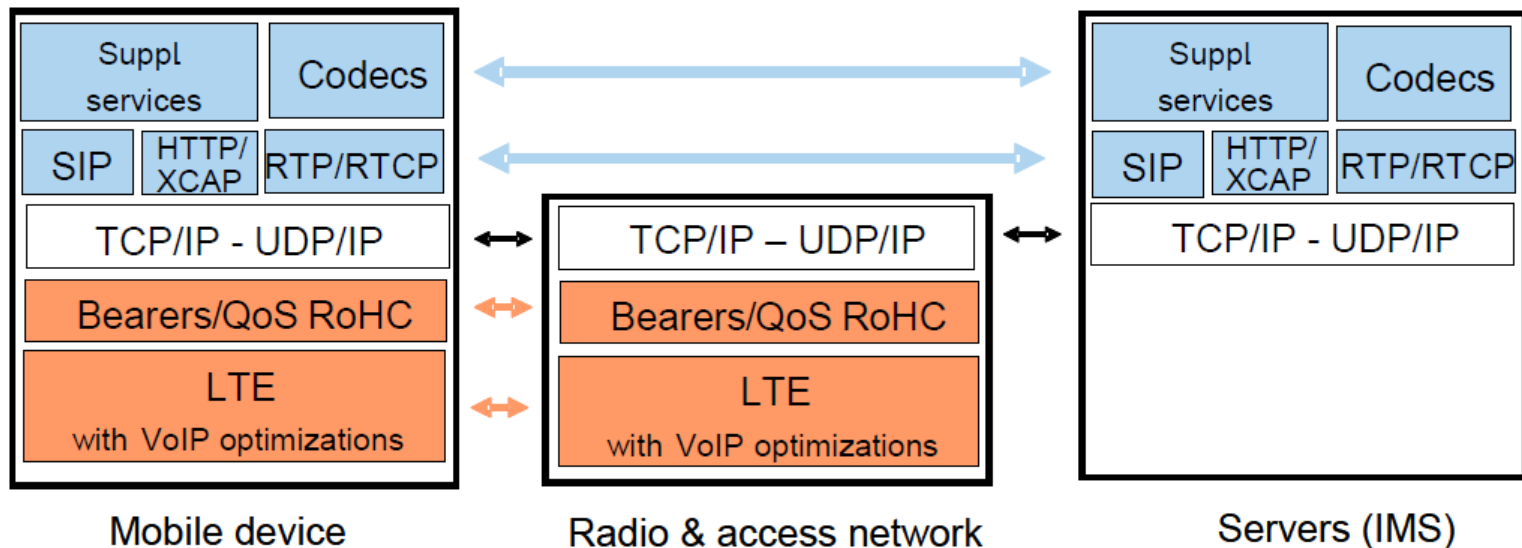
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# IR.92 IMS Profile

- Per the GSMA, the IR.92 IMS Profile for Voice and SMS

*“identifies a minimum mandatory set of features which are defined in 3GPP specifications that a wireless device (UE) and network are required to implement in order to guarantee an interoperable, high quality IMS-based telephony service over LTE radio access”*

## Recommended UE and network protocol stacks for VoLTE from IR.92-v7.01



**IR.92 provides a good 3GPP feature set for VoLTE,  
but there is still a link budget challenge**

# VoLTE vs. 3G Voice UL Link Budget Differences

Line Item	Approximate LTE LB loss compared to 3G voice	Explanation
IP Overhead	~ 1 dB	RoHC, MAC/RLC/PDCP overhead for VoIP
Sensitivity	~ 1.5 dB	No SHO in LTE TTI bundling only over 4 subframes
Fade Margin	> 0.5 dB	No SHO in LTE
Vocoder	0-3 dB	3G voice LB can be based on ~6 kbps voice
Total	3 – 6 dB	Assumes same loading level between 3G and LTE

**IP Overhead, lack of SHO, and possibly increased vocoder rates all contribute to the VoLTE link budget challenges**

# Frequency Band and Vocoder Considerations

## VoLTE Coverage Relative to 3G Voice Coverage

VoLTE UL Frequency	3G Voice Frequency					
	~ 12k vocoder			~ 6k vocoder		
	850 MHz	1750 MHz	2 GHz	850 MHz	1750 MHz	2 GHz
750 MHz	79%	139%	183%	52%	92%	109%
1750 MHz	37%	65%	86%	25%	43%	56%
2550 MHz	23%	40%	52%	15%	26%	34%

Most 3G voice deployments have a low frequency coverage carrier, so most VoLTE deployments end up in the red areas above



# Other Deployment Considerations

- **Outdoor-to-Outdoor** (Outdoor Macro coverage)
  - Outdoor coverage usually not a significant issue since macro grids typically designed with 15-20 dB of building penetration
- **Indoor-to-Indoor** (Indoor Small Cell coverage)
  - No VoLTE link budget problem for indoor small cells since eNB Tx power is so low (i.e. small cell indoor coverage is DL limited, not UL limited like in macro case)
- **Outdoor-to-Indoor** (Indoor coverage from Outdoor Macro)
  - This is where VoLTE has a big link budget challenge

**Until small cell penetration grows, VoLTE will have indoor coverage challenges vs. 3G voice**

# Managing the VoLTE Coverage Challenges

- **DENSIFICATION** – Indoor small cells critical to improving VoLTE coverage indoor
- **VoLTE SON** – dynamically optimizing HO triggers and thresholds critical to overcoming lack of SHO
- **SRVCC TO 3G VOICE** – when initiate on VoLTE but move into poor VoLTE coverage area
- **LTE-Adv** – improve VoLTE link budget with Rel-10 and beyond LTE enhancements
- **LEVERAGE VoWi-Fi** – use VoWi-Fi indoors where VoLTE coverage is poor

Many mechanisms will be used to address VoLTE coverage challenge