

---

**ITU Workshop on Performance, QoS and QoE for Multimedia  
Services**

**Dakar, Senegal, 19-20 March 2018**

**APPLICABILITY OF ITU-T G.VoLTE  
RECOMMENDATION FOR EFFECTIVE QoS  
ASSESSMENT AND COMPLIANCE**

**Samuel K. Agyekum, BSc. MPhil**

**Editor, ITU-T E.807 and Co-Editor E.811 Recommendations  
National Communications Authority, Ghana**

---

## Presentation Outline

- Background to ITU-T G.VoLTE Rec .
- QoS Assessment Methods per G.1000 Rec.
- Possible VoLTE Implementation Scenarios
- VoLTE QoS Assessment Indicators
- QoS degradation assessment using NMS
- Recommendations

---

# Background to ITU-T G.VoLTE Rec.

## Objective

This Recommendation seeks to provide guidelines concerning the key aspects impacting end-to-end performance of managed voice applications over LTE networks and how they can be properly assessed using current elements of knowledge.

## Work Plan

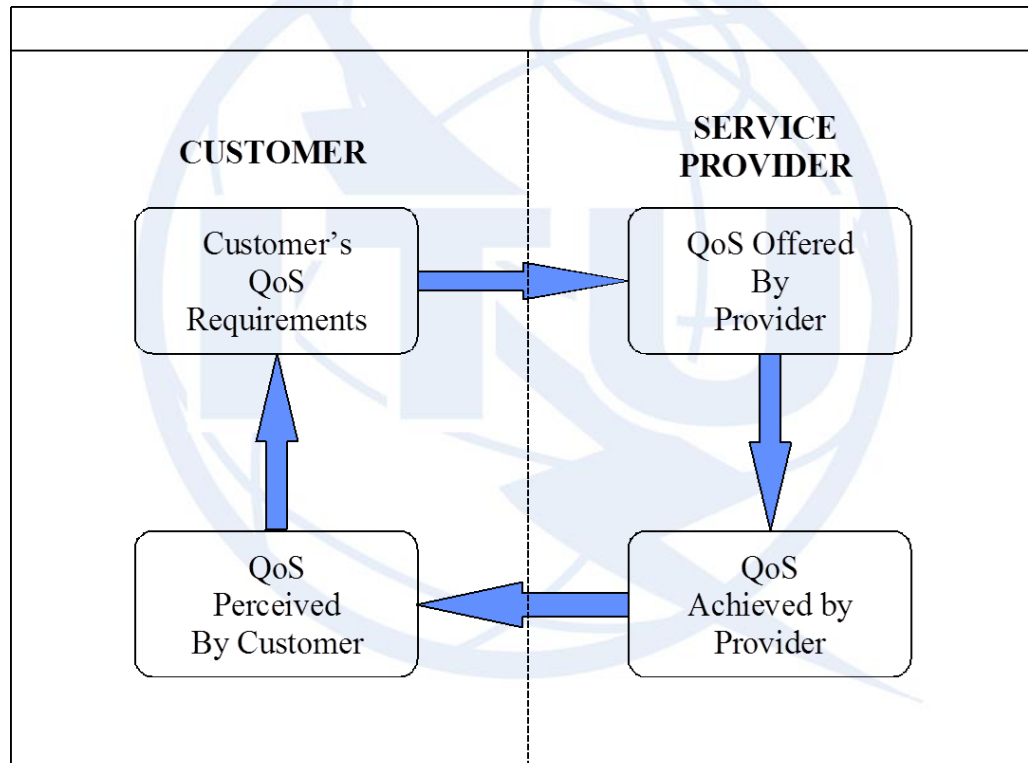
Study Period	Status of G.VoLTE
2013	Work Started
2014	First draft
May 2015	Stable draft
January 2016	Consented

---

# Consumer benefits of VoLTE

- Superior Voice Quality (High-definition)
- Faster Call Setup Time
- Improved battery life of 4G-devices
- Integration with VoWiFi

# QoS Assessment methods per the ITU-T G.1000 Rec.



T1213040-02

---

# QoS Assessment methods per the ITU-T G.1000 Rec.

## Measurement Method 1:

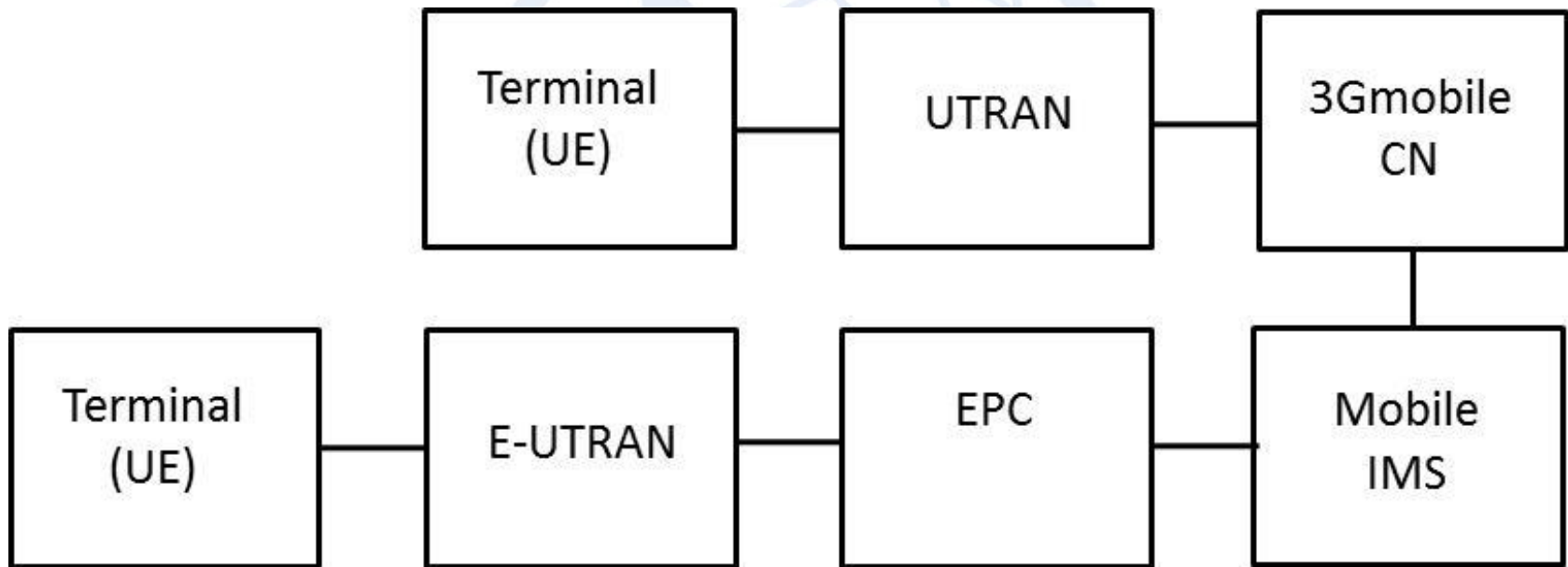
This is conventionally done using drive-test tools and processes to investigate compliance with QoS license obligations

## Measurement Method 2:

Implementation of Network Monitoring Solution (NMS)

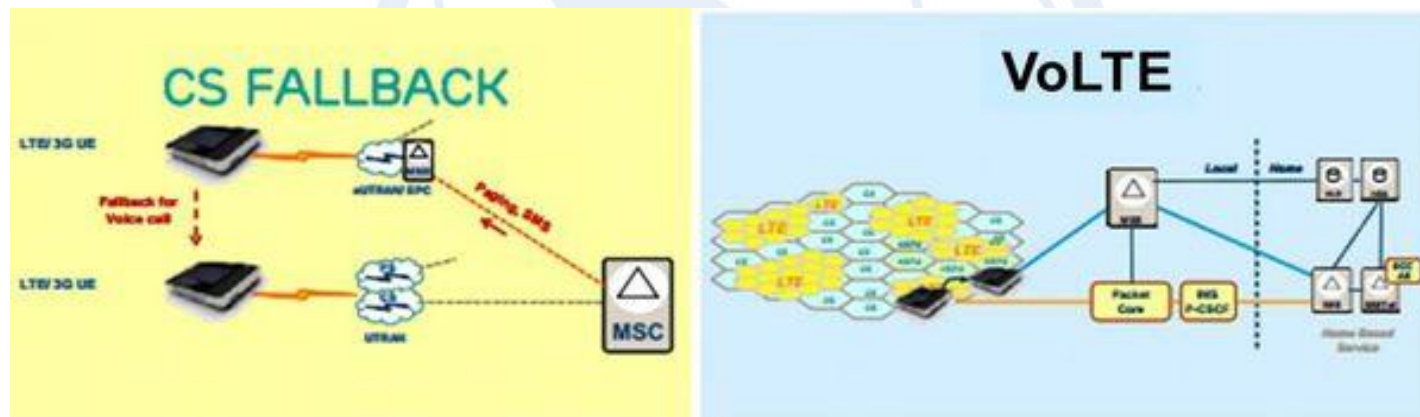
This will facilitate an **EX ANTE** regulatory regime where regulators will proactively prompt the VoLTE service provider on areas of the network undergoing degradation and direct an improvement action to the licensee.

# Identify VoLTE Implementation Scenarios



# Identify VoLTE Implementation Scenarios

A Circuit Switched Fall Back (CSFB) to an existing 2G/3G network scenario may be applicable in the early years of LTE roll-out from a business-case perspective



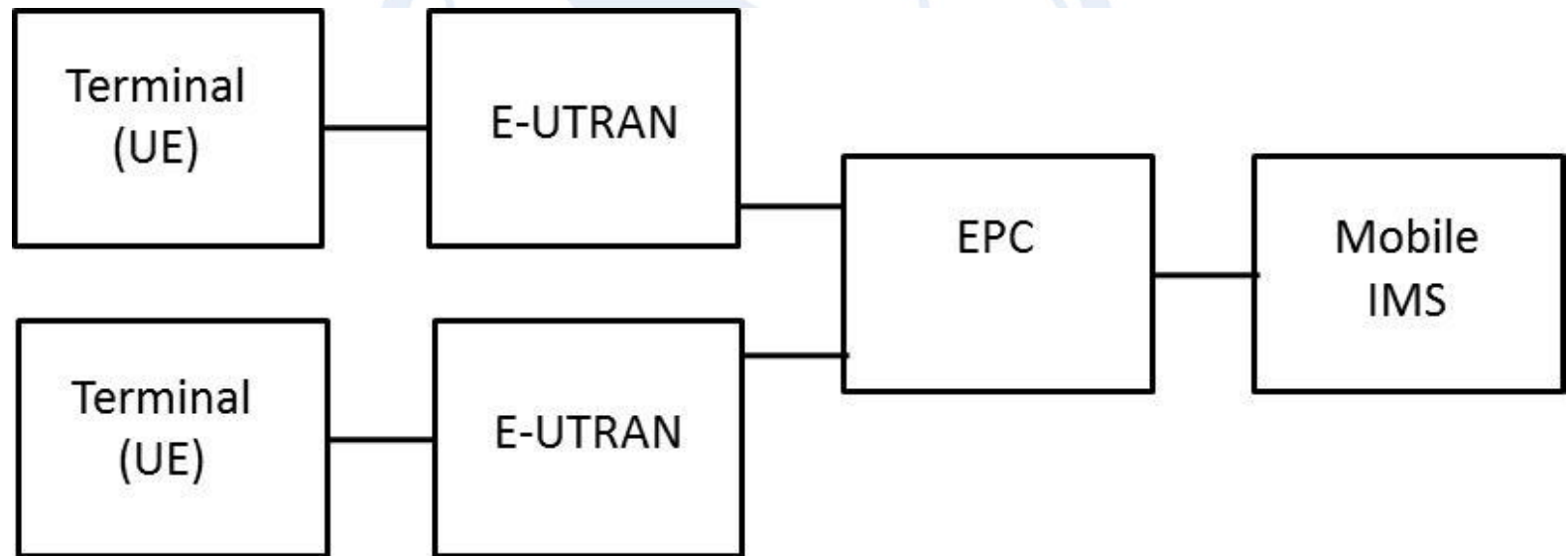
Requires 4G LTE coverage to overlap with 2G/3G coverage for the voice call to be originated/terminated



---

# Identify VoLTE Implementation Scenarios

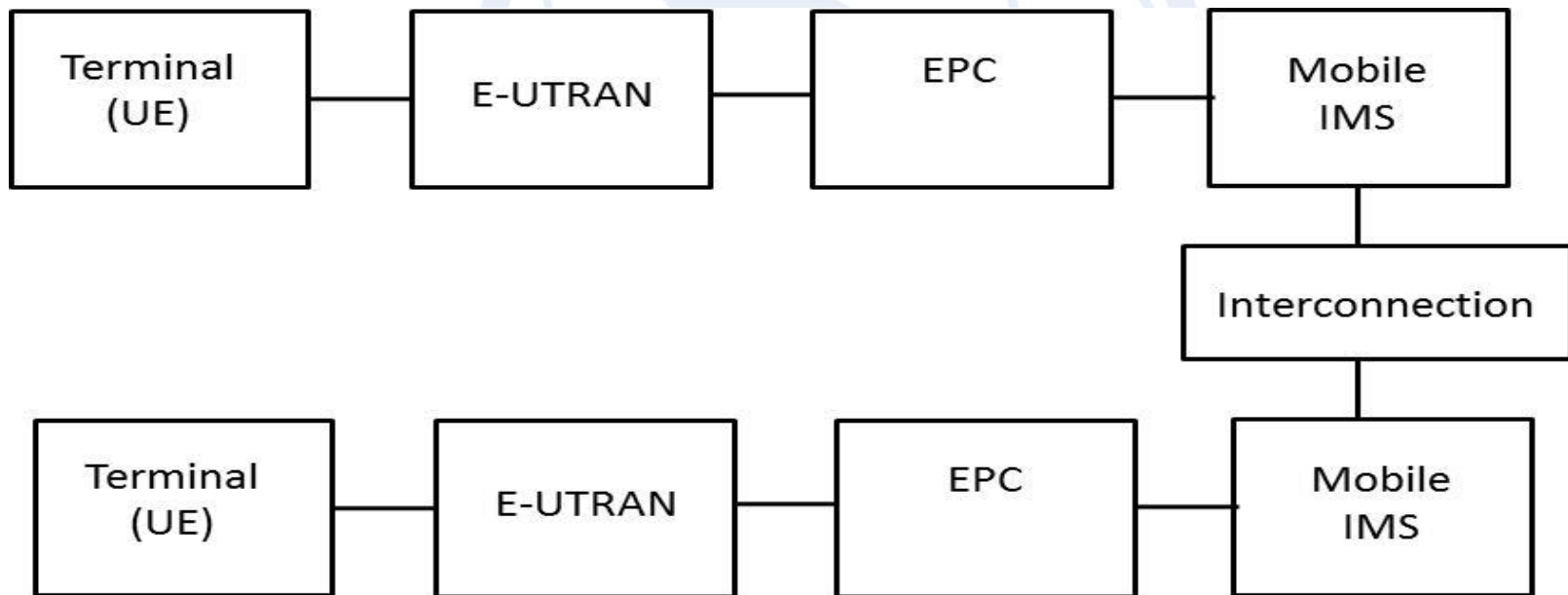
All-IMS scenario is implemented for a fully deployed LTE network



---

# Identify VoLTE Implementation Scenarios

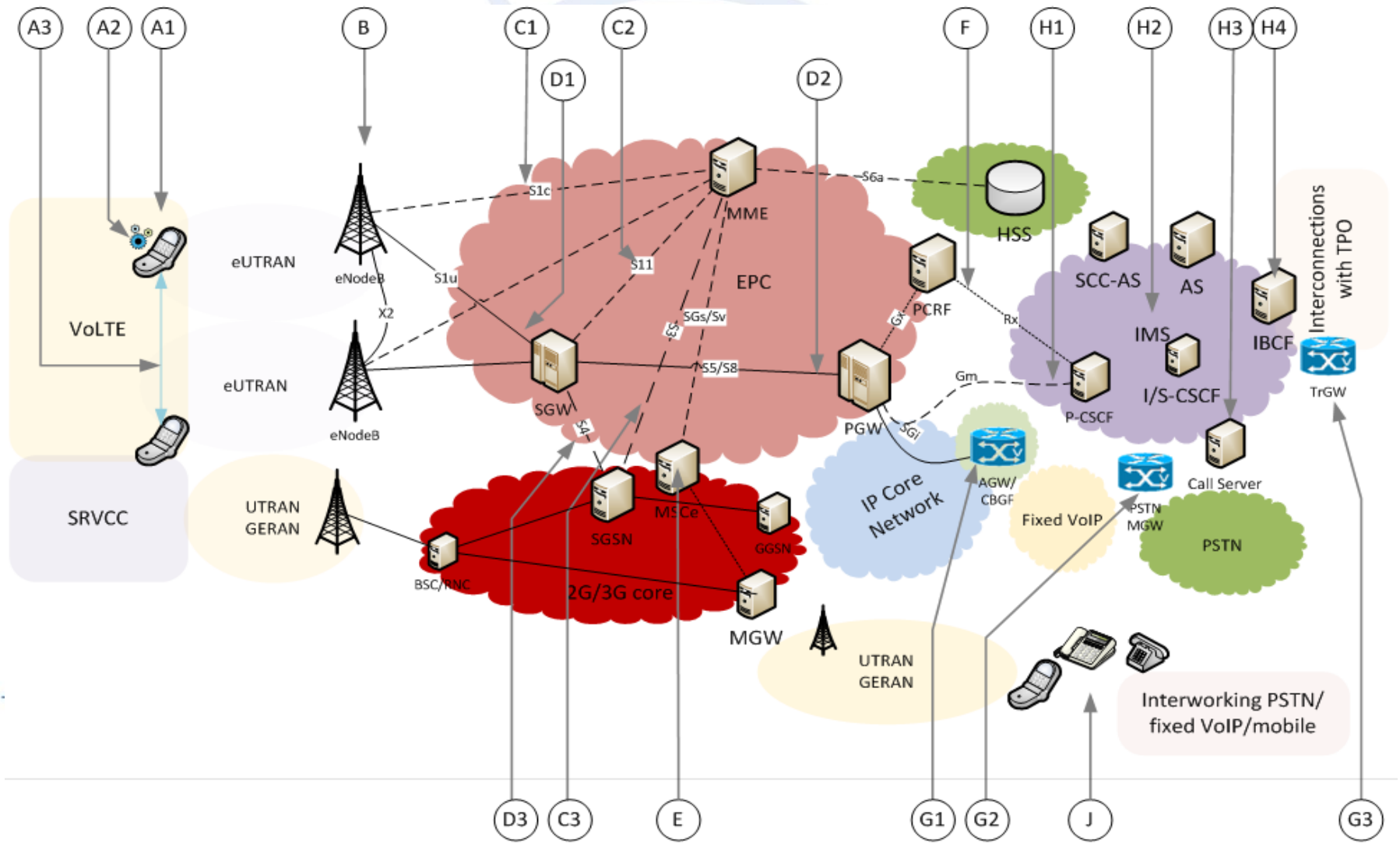
This scenario requires an interconnection between two separate LTE operators. E.g. (2600 MHz Operator to a 700/800 MHz Op.)



# Assessment Indicators to be measured using QoS monitoring tools

Name	Definition	QoS Threshold (LTE-LTE)	QoS Threshold (LTE-3G)
Call Drop Rate	Service continuity in terms of capacity to maintain calls to their normal end.	2%	3%
Service availability	End to end service availability in terms of capacity to establish calls from, and to, a VoLTE customer.	99%	98%
Call set up time (PDD)	Time interval (in seconds) between the end of dialing by the caller and the reception back by him of the appropriate ringing tone or recorded announcement.	1 s CSFB: 5 s	3 s
Voice Quality	Provides an objective view on the quality of the voice signal as it may be perceived by the customer.	3.8	3.8 (if HD Voice) 2.8 (otherwise)

# QoS degradation assessment using Network Monitoring System (NMS)



---

# QoS degradation assessment using Network Monitoring System (NMS)

Identify the 3 main classes of QoS degradations:

- Call Set up Performance
- Service Availability
- Voice Quality

---

# QoS degradation assessment using Network Monitoring System (NMS)

## Strategy 1:

Determine measurement points to use as guide to evaluate degradations accounting for “QoS achieved” by the BWA licensee-

- At **end points**, where end-users access the network and experience the service (here **A and J**)
- At **interfaces** within the RAN, EPC, b/n the EPC and CS core of the 2G/3G operator (see **B, D, E and G**)
- At signaling **points of presence of serving elements where IMS is located** (see **C, F, and H (but also E)**)

# QoS degradation assessment using Network Monitoring System (NMS)

## Strategy 2

Identify the possible causes of these QoS degradations

Kind of degradation	Possible Reasons:	Location
Registration Failure	<ul style="list-style-type: none"> <li>○ Problem with MME, HSS or PCRF</li> </ul>	EPC
Service Unavailability	<ul style="list-style-type: none"> <li>○ Error in scheduling</li> <li>○ RRC connection setup failure</li> </ul>	eUTRAN
	<ul style="list-style-type: none"> <li>○ Not available due to load (SGW or PGW)</li> <li>○ Failed negotiation (allocation of QCI, codec, etc.)</li> </ul>	EPC
Delay in Call Setup	<ul style="list-style-type: none"> <li>○ Load.</li> <li>○ Interworking between systems</li> <li>○ CS Fall back at call set up</li> </ul>	All
Link Failure	<ul style="list-style-type: none"> <li>○ Bad negotiation between 2 equipment of the network during call establishment (bad codec management).</li> </ul>	eUTRAN/ EPC
Call Drop	<ul style="list-style-type: none"> <li>○ Terminal bug, Bad Covered Area, Handover failures due to problems with neighboring cells, etc.</li> <li>○ RRC connection drop</li> </ul>	Terminal/ eUTRAN
	<ul style="list-style-type: none"> <li>○ <b>Link Failure: System Failure, Bad re-negotiation between 2 equipment of the network during call.</b></li> </ul>	EPC

---

# QoS degradation assessment using Network Monitoring System (NMS)

## Strategy 3

Direct LTE operators offering voice services on network improvement in specific areas of the VoLTE network.



---

## Recommendation(s)

- Regulators, especially those in the sub-region, should engage LTE licensees on a rigorous Pilot Test campaign on voice service testing. Possible observations may inform the ongoing work on G.ViLTE.
- Review QoS obligations of LTE operators to include voice service offerings and align, where necessary, with suggested indicators and thresholds for voice.

---

*Thank  
you*

