UGANDA
COMMUNICATIONS
COMMISSION

INFORMATION DOCUMENT

DRIVE TEST METHODOLOGY FOR QUALITY OF SERVICE MEASUREMENTS

CONSULTATION PROCESS

Background

The Uganda Communications Commission is in the process of reviewing the QoS standards for the communications sector. The provision for a review was made within the current QoS standards document which has been in effect since 2007.

It has become necessary to carry out a full review of the QoS standards so as to address changes that have taken place in the sector in the recent past. These changes include, but are not limited to, increased dissatisfaction of consumers and the changing economic and technological characteristics of the market.

The review process is currently in advanced stages. Quality of service parameters have been developed and agreed upon by Uganda Communications Commission and industry stake holders.

The Commission has now embarked on the process of establishing the method of monitoring of the performance of the telecom operators on the agreed upon parameters. This process will also include the definition of the target values for each performance indicator.

UCC, in accordance with international standards, has identified the “Drive test” method as the method of choice for monitoring of performance on several of the parameters.

This document comes to explain the salient aspects of the “Drive test” methodology to the stakeholders on both the industry and consumer sides, and to invite them to seek clarifications if needed.

Making a submission

Only written submissions (Electronic/hard copy) will be considered. The close of submissions to this paper is 5.00 pm on **Monday 10th September, 2012.** Submissions received after the above indicated date may not be considered.

Submissions can be sent to:

Hand delivery:
Telecoms and Broadcasting
Uganda Communications Commission,
UCC House,
Plot 42-44 Spring Road,
Bugolobi - Kampala

Or by post to:
Telecoms and Broadcasting
Uganda Communications Commission,
P O Box 7376
Kampala – Uganda

Or by email to:
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1. DEFINITIONS

In this document, the following terms shall have the corresponding meanings:

Availability: Availability of an item to be in a state to perform a required function at a given instant of time or at any instant of time within a given time interval, assuming that the external resources, if required, are provided. (ITU-T Rec. E.800)

Call attempt: An attempt to achieve a connection to one or more devices attached to a telecommunications network. (ITU-T Rec. E.600)

Communications services: Services performed consisting of the dissemination or interchange of sound, video or data content using postal, radio, or telecommunications media, excluding broadcasting

Consumer: The party that uses the telecommunication service(s) provided

Criterion: A characteristic of a product or a service that is observable and/or measurable.

Customer: Any person who is, or has indicated a willingness to be, provided with any relevant telecommunications service by an operator

Data: The use of binary signals to transmit information from one device to another; typically anything other than voice.

Quarter: 3 months segmentation of a calendar year, the month of January to March is designated as the first quarter, the following set of months subsequently designated in ascending order.

Regions: Geographical demarcation of Uganda in accordance to UBOS, As of July 2011, the designated sub regions consisted of West Nile (8 districts), Mid Northern (15 districts), North East (15 districts), Mid Eastern (14 districts), East Central (10 districts), Central I (13 districts), Central II (11 districts), Mid Western (12 districts) and South Western (14 districts)

Sample: A set of test calls captured for a defined test period/session

Test calls: Call attempts with predefined constant call patterns

2. ACRONYMS

For the purposes of the present document the following acronyms apply:

ETSI - European Telecommunications Standards Institute

ITU - International Telecommunications union

KPI - Key Performance Indicator

MO - Mobile Originated

PESQ - Perceptual Evaluation of Speech Quality

QoS - Quality of Service

SMS - Short Message Service

UCC - Uganda Communications Commission

3. INTRODUCTION

In support of Section 5 of the proposed Uganda Communications Commission (UCC) Quality of Service Framework, the QoS drive test methodology document has been developed with the aim of standardizing the UCC Drive test QoS monitoring methodology. The "Drive test" methodology shall be used for the verification and auditing of operator performance on the QoS parameters.

4. SCOPE

This document describes the typical procedures that shall be used to perform QoS measurements on mobile/cellular networks. The document also describes the settings that will be used to carry out such measurements.

5. Goal

The goal of the measurements described in the document is to assess the network under test for its quality parameters as defined in TS 102 250-1, that is, the network quality for the respective transactions from the subscribers' point of view.

6. Drive Test Monitoring Setup

In carrying out a drive test, measurements are conducted in a way that user behavior is simulated, with a number of channel parameters/ characteristics under the control of the measurement equipment.

Measurements are carried out simultaneously to ensure comparability of test results

The testing procedure is fully automated to eliminate the subjectivity that is inherent to human intervention.

The Mobile Originated (MO) approach will be used for most of the measurement profiles, unless otherwise specified.

7. Monitoring of categories of KPIs

7.1 Voice call service

The tests under this category will be carried out to evaluate the network's ability to provide and maintain service when requested by a user. Test calls are generated by the mobile test device/unit to a stationary terminal.

To enhance comparability, all call attempts which form part of the statistics shall follow a consistent time pattern.

7.1.1 Set up of equipment

The system comprises of two units, that is, the calling unit and the receive unit. The calling terminal is situated at a mobile test unit while the receive terminal is situated at a stationary unit. A predefined set of calls are generated at the calling terminal and auto received at the called terminal. The call lasts until it is terminated by the calling unit.

7.1.2 Test profile and time out values

a) End to End call time out: 90 seconds
b) Service accessibility timeout value: 15 seconds
c) Call duration: 60 seconds

A call is considered to be completed if it is active until the measurement equipment actively ends it.

7.1.3 Parameters monitored on the voice call service

a) **Call setup time**: The time taken for a call attempt from the calling terminal to receive a connection to the receiving terminal.

b) **Call Completion**: A call attempt is termed as completed when it is successfully setup within 15 seconds and lasts for 60 seconds before it is actively terminated by the equipment.

c) **Blocked call**: A call attempt that is not successfully set up within 15 seconds of initiating it from the calling terminal.

d) **Dropped call:** A call attempt that is successfully set up within 15 seconds of initiation but which is subsequently prematurely terminated due to limitations in the network. The call will be terminated before the equipment actively terminates it.

e) **Good Quality**: A call attempt with a conversational rating greater than 3.5 on the PESQ scale

7.1.4 Sample characteristics

Sample size
A minimum of 10 samples per network at each region will be collected for each quarter.

Sample components
A sample comprises a minimum of 100 test calls[1] collected during the morning and evening test sessions.

7.2 Voice Quality tests

To measure Voice quality the test system generates sound files at two points of a network, the files received at each end are recorded and compared with a reference file in order to determine any loss of quality en-route by using the ITU predefined PESQ algorithm (P.862 ITU). PESQ provides a score in the range of 1 to 5 where 1 is unacceptable & 5 is excellent.

7.2.1 Setup of equipment

Calls are initiated alternatively by one terminal then the other, regardless of which terminal made the call. After the calls are connected, sound files are generated at either end for the duration of the call. Voice quality measurements are processed at the central unit and accordingly assigned a PESQ scale value.

7.2.2 Test profile and time out values

a) End to End call time out: 90 seconds
b) Service accessibility timeout value: 15 sec
c) Call duration: 60 seconds

7.2.3 Sample characteristics

Sample Size
A minimum of 10 samples per network at each region will be collected for each quarter.

Sample components
A sample comprises a minimum of 100 test calls[2] collected during the morning and evening test sessions.

[1] Test call: predefined call attempts
[2] Test call: predefined call attempts

7.3 SMS (Short Message Service) measurement

These tests will be carried out to evaluate the network's ability to provide SMS transportation service when requested by a user. User SMS are generated from the mobile test device/unit to a destination mobile terminal in a fixed location. The call setup is thereafter similar to the voice call service test design for all transactions.

7.3.1 Set up of equipment

The system comprises two units, the calling unit and the receive unit. The calling terminal is situated at a mobile test unit while the receive terminal is at a stationary unit. SMS content is generated at the mobile unit and sent to the stationary unit. A central unit compiles statistics of all SMS content received and sent by each unit respectively.

7.3.2 SMS Test profile and time out values

The SMS is tested in the MO (Mobile Originated) mode. The SMS is 120 characters long and uses different characters to test content integrity based on standard TS 102 250-5. The interval between two SMS shall be 70 seconds.

The time window of measurements for calculating the completion rate shall be 125 seconds.

To ensure comparability, all SMS sending attempts which form part of the sample follow a constant time pattern as detailed below. Additional SMS sending attempts, for example in the case of failure of delivery to the network, must not affect the pattern of the statistically relevant call attempts.

Test profile and time out values

a) Service accessibility SMS MO timeout: 30 seconds
b) Access delivery SMS MO timeout: 60 seconds
c) End to End Delivery time SMS timeout: 125 seconds

7.3.3 Sample characteristics

Sample size

A minimum of 10 samples per network at each region will be collected for each quarter.

Sample components

A sample comprises a minimum of 100 test calls[3] collected during the morning and evening test sessions.

8. Drive test route design

The routes are representative of the local population distribution and simulate user behavior profiles. The procedure therefore prioritizes commercial centers during the morning session and residential areas during the evening session.

The route length will be a minimum distance of 50KM and this will be proportional to the physical and population size of the town.

9. QoS statistical Evaluation

The monitoring equipment is installed with a software tool which supports the storage and organization of information as well as the generation of statistics on the data obtained by the measuring unit.

The software tool makes it possible to generate different reports on single or multiple monitoring sessions.

The equipment also incorporates a GPS receiver which makes it possible to geo-reference all measurements, localize significant events, detect the cause of the events, and in conjunction with a MAPINFO tool, makes it possible to visualize statistics in the form of a digitally generated geographic map.

[3] Test call: predefined call attempts

10. References

i. **ETSI TS 102 250-3 V1.2.1 (2004-03):** Speech Processing, Transmission and Quality Aspects (STQ); QoS aspects for popular services in GSM and 3G networks; Part 3: Typical procedures for Quality of Service measurement equipment

ii. **ETSI TS 102 250-5:** Speech Processing, Transmission and Quality Aspects (STQ); QoS aspects for popular services in GSM and 3G networks; Part 5: Definition of typical measurement profiles

iii. **ITU (ITU-T G.107):** International telephone connections and circuits – Transmission planning and the E-model, The E-model: a computational model for use in transmission planning.

iv. **ETSI EG 202 057-1-4 V1.1.1 (2005-10):** Speech Processing, Transmission and Quality Aspects (STQ); User related QoS parameter definitions and measurements.