



# **QUALITY OF SERVICE REGULATIONS FOR ELECTRONIC COMMUNICATIONS NETWORKS AND SERVICES IN THE BAHAMAS**

## **REGULATIONS**

**ECS 42/2016**

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# QUALITY OF SERVICE REGULATIONS FOR ELECTRONIC COMMUNICATIONS NETWORKS AND SERVICES

## Part 1 Introduction

- 1.1 In exercise of the powers and duties conferred upon it by sections 45 and 46 of the Communications Act, 2009, the Utilities Regulation and Competition Authority (“URCA”) hereby issues the following Regulations. These Regulations may be cited as the *“Quality of Service Regulations for Electronic Communications Networks and Services in The Bahamas”*.
- 1.2 These Regulations set out Key Performance Indicators (KPIs) against which the quality of the networks and services operated and provided by licensees subject to these Regulations will be assessed.

## Part 2 Application

- 2.1 These Regulations shall be applicable to all licensees having been issued an individual operating licence by URCA in accordance with Part IV of the Communications Act.

## Part 3 Interpretation

- 3.1 In these Regulations, unless the context requires otherwise, the following terms shall have the meaning ascribed below:

“Individual Operating Licence” or “IOL” shall have the meaning attributed to it in section 20(1) of the Communications Act;

“Licensee” means the holder of an IOL.

“Minimum Required Service Standard” or “MRSS” means the service standard applicable to the specific parameters of the Licensee’s service, as defined in the Schedule.

“Reportable Metrics” means each parameter of a Licensee’s service in respect of which an MRSS is established in the Schedules, and in respect of which the Licensee is required by these Regulations to report its performance.

“Reporting Area” means a group of populated islands of The Bahamas which shall be grouped together for the purpose of reporting a Licensee’s performance of each Reportable Metric applicable to that Licensee, in accordance with these Regulations.

“Reporting Period” means the periods of time over which measurements of the Licensee’s performance in respect of each Reportable Metric must be taken, recorded and reported on by Licensees.

- 3.2 Terms used shall, unless otherwise specifically defined herein, have the meanings ascribed in section 2 of the Communications Act.

#### **Part 4 Objectives of these Regulations**

- 4.1 These Regulations aim to advance key communications policy objectives of the Communications Act and the Electronic Communications Sector Policy by furthering the interests of persons in The Bahamas in relation to electronic communications networks and services by:
- i. establishing MRSS that Licensees are required to provide to end-users of their networks and services;
  - ii. requiring Licensees to comply with the MRSS within twenty-four (24) months after the date of publication of these Regulations;
  - iii. requiring Licensees to measure and report to URCA on a quarterly basis their performance against the MRSS; and
  - iv. establishing the penalties that URCA may impose on Licensees that fail to meet the MRSS.
- 4.2 These Regulations prescribe MRSS for the following electronic communications networks and services:
- i. Fixed and Fixed-Wireless Networks and Services;
  - ii. Cellular Mobile Networks and Services; and
  - iii. Internet Networks and Services.

#### **Part 5 Minimum Required Service Standards for Fixed Networks and Services**

- 5.1 In addition to any other relevant requirement in these Regulations, the Communications Act, any licence issued under the Communications Act, or any other regulatory measure made by URCA, Licensees providing fixed and/or fixed-wireless electronic communications networks and services are required to achieve the MRSS specified in Schedule 1 of these Regulations and to report their performance to URCA against those MRSS in accordance with paragraph 10 of these Regulations.

#### **Part 6 Minimum Required Service Standards for Cellular Mobile Networks and Services**

- 6.1 In addition to any other relevant requirement in these Regulations, the Communications Act, any licence issued under the Communications Act, or any other regulatory measure made by URCA, Licensees providing cellular mobile electronic communications services are required to achieve the MRSS specified in Schedule 2 of these Regulations and to report their performance to URCA against those MRSS in accordance with paragraph 10 of these Regulations.

#### **Part 7 Minimum Required Service Standards for Internet Networks and Services**

- 7.1 In addition to any other relevant requirement in these Regulations, the Communications Act, any licence issued under the Communications Act, or any other regulatory measure made by URCA, Licensees providing internet services are required to achieve the MRSS specified in

Schedule 3 of these Regulations and to report their performance to URCA against those MRSS in accordance with paragraph 10 of these Regulations.

## **Part 8 Reporting**

8.1 Each Licensee shall measure all Reportable Metrics applicable to the Licensee over the Reporting Period set out in this paragraph. Each Reporting Period shall be three (3) months in duration as follows:

- i. January 1 to March 31 of each year;
- ii. April 1 to June 30 of each year;
- iii. July 1 to September 30 of each year; and
- iv. October 1 to December 31 of each year.

8.2 The Reporting Areas shall, unless modified by URCA in accordance with these Regulations, be as follows:

- i. Reporting Area I: New Providence and Grand Bahama;
- ii. Reporting Area II: Abaco, Eleuthera, Exuma and Andros; and
- iii. Reporting Area III: All other islands

8.3 URCA may by the publication of a Notice to that effect on its website, and by direct written notification to affected Licensees, vary any or all of the Reporting Periods or Reporting Areas set out in these Regulations, after affording sufficiently interested persons a reasonable opportunity to comment on the proposed changes and considering any comments received. A Notice issued by URCA under this paragraph shall take effect in respect of reporting periods ending no earlier than six (6) months after the date of publication of the Notice.

8.4 For each MRSS, Reporting Area and Reporting Period, each Licensee shall:

- i. monitor and record the Reportable Metrics applicable to the Licensee as set forth in the relevant Schedule;
- ii. complete and submit by mail and email to URCA's Director of Electronic Communications, no later than 30 calendar days after the end of each Reporting Period, a report of all applicable Reportable Metrics using the reporting form provided in the relevant Schedule. The requirement to submit the first report shall commence one hundred and eighty (180) calendar days after the publication date of these Regulations, in respect of the immediately preceding Reporting Period;
- iii. submit in writing any additional information or clarification related to its report or its performance against the applicable MRSS requested by URCA in writing, including details of the times, places and other particulars of the measurements, within thirty (30) calendar days after it is required in writing to do so; and
- iv. retain data collected in accordance with these Regulations, including all measurements and related records, for a period of no less than twelve (12) months after the end of the Reporting Period to which the data related, or as may be otherwise directed by URCA in writing.

- 8.5 URCA may, at the request of a Licensee or on its own volition, permit a Licensee to combine two or more Reporting Areas in its reports. In considering whether or not to do so, URCA shall take into account, without limitation to URCA's general discretion, the following factors:
- i. the value of information about variations in quality of service between separate Reporting Areas;
  - ii. the relationship between the network structure and corporate organisation of the relevant Licensee, and the physical boundaries of the Reporting Areas;
  - iii. The numbers of customers using the relevant services in the Reporting Areas; and/or
  - iv. the difference in costs to the relevant Licensee that can result from taking measurements for separate Reporting Areas and taking measurements for combined Reporting Areas.
- 8.6 URCA may from time to time require a Licensee to commission an audit, by a reputable independent firm approved by URCA, of some or all of the data measured, collected and retained by Licensees under these Regulations.
- 8.7 URCA may require Licensees to make necessary amendments or corrections to the measurements and reporting format submitted under these Regulations and to re-submit any report of part thereof as a consequence of such amendment or correction.
- 8.8 For each Reportable Metric, Reporting Area and Reporting Period, measurements shall be reported to URCA on Forms specified in Schedule 1 through Schedule 3 and must contain:
- i. the name of the Licensee and Licence number;
  - ii. the name and type of service;
  - iii. the description of the Reporting Area;
  - iv. the Reporting Period;
  - v. any explanatory remarks by the Licensee, including but not limited to remarks about changes in environmental or operating conditions during the Reporting Period and/or in respect of the Reporting Area that contributes to the Licensees failure to achieve the MRSS; and
  - vi. any other information or comparison of service quality that URCA determines to be appropriate, possibly including information that URCA may utilise to help customers to assess the performance of competing Licensees.
- 8.9 In considering the impact of explanatory remarks from a Licensee under Part 8.8(v) of these Regulations, URCA may take into account factors including but not limited to:
- i. any service deficiencies that arise partly or wholly from the utilisation by the Licensee of the services of another Licensee; and
  - ii. any changes in environmental or operating conditions during the Reporting Period and/or in respect of the reporting area that could not have been reasonably foreseen by the Licensee.

## **Part 9 Investigation**

9.1 URCA may investigate the measurement, reporting and record keeping procedures of a Licensee under these Regulations in accordance with its powers under section 9(1) of the Communications Act and may exercise its powers of information gathering pursuant to section 9(2) of the Communications Act, and the Conditions of the relevant licence.

## **Part 10 Contravention and Enforcement**

10.1 A Licensee shall have committed a contravention or breach of these Regulations if the Licensee:

- i. fails to perform the measurement, reporting, and recordkeeping requirements set out in these Regulations.
- ii. fails to achieve the MRSS, save that URCA shall not take any enforcement action or levy any penalty in respect of a contravention or breach of this provision that occurs within twenty-four (24) months of the publication date of these Regulations, or thereafter within twelve (12) months of the date on which the MRSS was most recently changed to require a higher standard of quality than was required immediately before;
- iii. fails to submit, within the time specified by URCA, information required and requested by URCA pursuant to these Regulations;
- iv. submits or publishes false or misleading information about its performance in respect of any standard set by these Regulations; or
- v. obstructs or prevents an investigation by URCA relating to verification of measurements, reporting and record keeping procedures under these Regulations.

## **Part 11 Penalties**

11.1 Any Licensee that contravenes any provision of these Regulations shall be liable to a fine or another penalty or enforcement action to be determined by URCA in accordance with the provisions of the Communications Act.

11.2 The possible sanctions available to URCA include a decision to:

- i. issue an order under section 95 of the Communications Act;
- ii. issue a determination pursuant to section 99 of the Communications Act;
- iii. impose a financial penalty under section 109 of the Communications Act; and
- iv. suspend or revoke the Licensee's Licence under section 27 and/or section 109 of the Communications Act.

11.3 URCA will consider the following factors in arriving at a decision on the penalties or sanctions to be imposed:

- i. the seriousness of the breach;
- ii. the past conduct of the Licensee regarding compliance with the Regulations;
- iii. the effect of the contravention on consumers in the relevant market(s);
- iv. the impact of the force majeure;
- v. the extent to which the penalties are likely to improve the choice, price and network quality of service; and
- vi. any representations made by the Licensee regarding the alleged breach and related circumstances.

## **Part 12 Publication**

- 12.1 URCA may compile and publish in its Annual Report, on its website and/or in other appropriate media the Licensees' performance against the MRSS. URCA shall not publish this information earlier than six (6) months after the end of the Reporting Period to which the performance information relates.
- 12.2 Where Licensees are required by URCA to make necessary amendments or corrections to the measurements submitted under these Regulations, URCA may publish the amended or corrected MRSS within six (6) months after the end of the Reporting Period to which the measurements apply, with or without additional notes or comments.



## SCHEDULE 1

### Reportable Metrics and Minimum Required Service Standards for Fixed and Fixed-Wireless Networks and Services

#### Summary of Contents

- 1.0 Preamble
- 1.1 Supply Time for Fixed Network Access
- 1.2 Fault Report Rate Per Fixed Access Lines
- 1.3 Fault Repair Time for Fixed Access Lines
- 1.4 Unsuccessful Call Ratio

#### 1.0 Preamble

The Reportable Metrics in this Schedule shall be reported by the holders of Individual Operating Licences whose services are provided by means of a fixed network and shall be measured against the MRSS set out in respect of each metric. Licensees shall report their performance in respect of these metrics on Form *QoS-Schedule 1: Quality of Service MRSS for Fixed ECS Networks* (See Appendix to Schedule 1).

#### 1.1 Supply Time for Fixed Network Access

##### *(a) Definition*

*Supply Time for Fixed Network Access* is the duration from the instant a valid service order is received by a Licensee to the instant a working service is generated by [Licensee/Licensee]. A valid service order may be made verbally, or in writing or in any other form that is considered acceptable by the Licensee. A valid service order excludes cancelled orders<sup>1</sup>.

Where a Licensee and customer agree that an order for multiple connections or service installations will be completed in stages, each agreed delivery time should count as a separate customer order for measurement purposes. Where a customer request services at multiple locations, the provision of the service at each location counts as a separate customer order.

##### *(b) Measurement and Statistics*

The parameter should include all network accesses supplied for the data measurement and reporting period.

##### *(c) Reporting criteria*

The Licensee shall report:

- i. the times in which the fastest 99% of orders are completed; and
- ii. percentage of orders completed by the date agreed with the customer.

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<sup>1</sup> Recommendation from Section 5.1 of ETSI EG 202 057-1: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 1: General, Page 16.

## **1.2 Fault Report Rate Per Fixed Access Lines**

### *(a) Definition*

*Fault report rate per fixed access lines* is a valid report of disrupted or degraded service that is reported by the customer to the Licensee's designated point of contact and is attributable to the fixed access line. Fault reports should be assumed valid unless there is a specific reason to consider that they are invalid. In cases where a customer reports a fault that is found to be cleared when tested, it should be counted as a valid report unless the Licensee has reason to believe that the fault did not occur.

### *(b) Measurement and Statistics*

The parameter shall include all valid fault reports in the Reporting Period. The statistic shall exclude faults caused by any equipment on the customer side of the network termination point (NTP) and faults, which are attributable to the Licensee's core network or other interconnected networks.

Network faults reported against either basic or primary rate access or single or multi-line analogue access, should be counted as a single fault, regardless of the number of channels activated or affected. The count of the number of access lines should be one for basic or primary rate access regardless of the number of channels activated.

The statistic should be calculated by dividing the number of trouble tickets during the Reporting Period by the average number of access lines in the network under consideration during the same Reporting Period, where fault reports are recorded by the Licensee by the use of trouble tickets.

This statistic should be calculated by dividing the number of valid fault reports observed during the Reporting Period by the average number of access lines in the network under consideration during the same Reporting Period where Licensees cannot distinguish between:

- i. valid faults attributable to the fixed access line;
- ii. faults attributable to the core network;
- iii. faults attributable to other networks;
- iv. faults attributable to CPE supplied by the Licensee; or
- v. invalid faults.

### *(c) Reporting criteria*

The Licensee shall report the percentage of fault reports per fixed access line.

## **1.3 Fault Repair Time for Fixed Access Lines**

### *(a) Definition*

*Fault repair time for fixed access lines* is the difference between the time a Licensee receives a fault report and the time at which service is fully restored<sup>2</sup>.

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<sup>2</sup> Page 60 of Consumer Protection Regulations (ECS 19/2013). <http://www.urbahamas.bs/consumer-protection.php>

*(b) Measurement and Statistics*

This parameter shall include all valid faults and should be provided only in cases where the term of service agreement offers a "standard repair" time to customers. The parameter may be excluded where the Licensee does not offer a "standard repair" time or where the Licensee agrees with the customer to provide a faster repair service for payment of higher maintenance fees and in cases where lower fees are charged in return for a lower level of repair service.

*(c) Reporting criteria*

The Licensee shall report the mean time taken from the instant a fault report has been made by the customer to the instant when the service element or service has been restored to normal working order.

## **1.4 Unsuccessful Call Ratio**

*(a) Definition*

*Unsuccessful call ratio* is defined as the ratio of unsuccessful calls to the total number of call attempts for a specified time. An unsuccessful call is a call attempt to a valid number, properly dialed following dial tone, where neither called party busy tone, nor ringing tone, nor answer signal, is recognized at the access of the calling party within thirty (30) seconds from the instant when the last digit of the destination subscriber number is received by the network<sup>3</sup>.

*(b) Measurement and statistics*

The parameter should be calculated using:

- i. measurements on all real traffic; or
- ii. measurements on real traffic for outgoing calls in a representative population of local exchanges to a representative set of destinations; or
- iii. test calls in a representative population of local exchanges ; or
- iv. any combination of the above.

Measurements may be based on the analysis of tones or on signalling information or on a combination of them. The number of observations shall be chosen such that the samples are based on normal distribution, but is not required to exceed a test call rate of 1 in 1000. For indirectly connected customers, either measurement should be based on call data from the processor of the originating local exchange for real calls or measurements should be made on the subscriber line side of the local exchange in the access network.

*(c) Reporting criteria*

The Licensee shall report:

- i. the percentage of unsuccessful calls for national calls, together with the number of observations used and the absolute accuracy limits for 95% confidence calculated from this number. A national call is a call that originates and terminates on numbers which have been allocated to a Licensee by URCA

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<sup>3</sup> Recommendation from Section 5.1 of ETSI EG 202 057-2: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 2: Voice telephony, Group 3 fax, modem data services and SMS, Page 14.

- pursuant to The Bahamas National Number Plan (NNP)<sup>4</sup>.
- ii. the percentage of unsuccessful calls for international calls, together with the number of observations used and the absolute accuracy limits for 95% confidence calculated from this number. An international call is a call that originates from a number which has been allocated to a Licensee by URCA pursuant to The Bahamas NNP and terminates on an international number.

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<sup>4</sup> The Bahamas National Number Plan (ECS 17/20110).  
<http://www.urcabahamas.bs/consultations.php?cmd=view&article=238>

**Form QoS-1: Reportable Metrics for Fixed and Fixed-Wireless Networks and Services**

Licensee Name:

Name of Service:

Reporting Area:

Reporting Period:

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED SERVICE STANDARD (MRSS)	FORMULAE	THE STANDARD ACHIEVED BY THE LICENSEE SHOULD BE REPORTED IN THIS COLUMN
<p><b>Supply Time for Fixed Network Access</b></p> <p><i>Ref: Section 1.1 of Schedule 1</i></p>	<p>i) The time in which the fastest 99% of orders is completed</p>	<p>New Providence and Grand Bahama: no more than 5 days</p> <p>Abaco, Eleuthera, Exuma, Andros: no more than 6 days</p> <p>All other islands: no more than 7 days</p>	<p>List the customer complaint resolution times in ascending order</p> <p>Let the n<sup>th</sup> time = fastest 99% of calls n<sup>th</sup>= 0.99[ number of observations]</p>	
	<p>ii) The percentage of orders completed by the date agreed with the customers</p>	<p>Not less than 99%</p>	$ST = \frac{S}{N} \times 100$ <p>ST = Supply Time for Fixed Network Access S = Number of customer complaints resolve in agreed time N = Total number of agreements</p>	

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED SERVICE STANDARD (MRSS)	FORMULAE	THE STANDARD ACHIEVED BY THE LICENSEE SHOULD BE REPORTED IN THIS COLUMN
<p><b>Fault Report Rate Per Fixed Access Lines</b></p> <p><i>Ref: Section 1.2 of Schedule 1</i></p>	<p>The percentage of fault reports per fixed access line</p>	<p>Less than 5%</p>	$FRR = \frac{FR}{N} \times 100$ <p>Where,  FRR= Fault Report Rate</p> <p>FR= Number of faults reported on fixed line</p> <p>N = Total number of fixed-lines</p>	
<p><b>Fault Repair Time for Fixed Access Lines</b></p> <p><i>Ref: Section 1.3 of Schedule 1</i></p>	<p>The mean time is taken from the instant a fault report has been made to the instant when the service element or service has been restored to normal working order</p>	<p>New Providence and Grand Bahama: 72 hours</p> <p>Abaco, Eleuthera, Exuma and Andros: 96 hours</p> <p>All other islands: 120 hours</p>	$FRT = \frac{RT}{N}$ <p>Where,  FRT = Fault Report Time</p> <p>RT= Sum of all repair times (rounded to the nearest hour) for fixed line faults</p> <p>N = Total number of fixed-line faults report</p>	

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED SERVICE STANDARD (MRSS)	FORMULAE	THE STANDARD ACHIEVED BY THE LICENSEE SHOULD BE REPORTED IN THIS COLUMN
<p><b>Unsuccessful Call Ratio</b></p> <p><i>Section 1.4 of Schedule 1</i></p>	<p>i. The percentage of unsuccessful calls for national calls, together with the number of observations used and the absolute accuracy limits for 95 % confidence calculated from this number.</p>	<p>Less than 1%</p>	$UCRN = \frac{C_{un}}{N} \times 100$ <p>Where, UNCR= Unsuccessful International Call Ratio</p> <p>C<sub>un</sub> = Number of unsuccessful national calls on fixed line</p> <p>N = Total number of national fixed-lines calls</p>	
	<p>ii. The percentage of unsuccessful calls for international calls, together with the number of observations used and the absolute accuracy limits for 95% confidence calculated from this number.</p>	<p>Less than 1%</p>	$UCRI = \frac{C_{ui}}{N} \times 100$ <p>Where, UCRI= Unsuccessful International Call Ratio</p> <p>C<sub>ui</sub> = Number of unsuccessful international calls on fixed line</p> <p>N = Total number of outgoing international fixed-lines calls</p>	

## SCHEDULE 2

### Reportable Metrics and Minimum Required Service Standards for Cellular Mobile Networks and Services

#### Summary of Contents

- 2.0 Preamble
- 2.1 Broadband Data Speed
- 2.2 Network Availability (data)
- 2.3 Network Availability (voice)
- 2.4 Call Completion Rate
- 2.5 Dropped Call Rate

#### 2.0 Preamble

The Reportable Metrics in this Schedule shall be reported by the holders of Individual Operating Licences whose services are provided by means of a public cellular mobile network and shall be measured against the MRSS set out in respect of each metric. Licensees shall report MRSS on *Form QoS-Schedule 2: Quality of Service MRSS for Cellular Mobile ECS Networks* (See Appendix to Schedule 2).

#### 2.1 Network Availability (data)

##### *(a) Definition*

*Network availability (data)* is defined as the percentage of time that the data network achieves full connectivity and functionality, where full connectivity means that all network elements are physically connected, and full functionality means that those network elements are working properly.

##### *(b) Measurement and statistics*

The statistic should be obtained by monitoring the links at the Open System Interconnection (OSI) layers. Simple Network Management Protocol (SNMP) messages should be generated by the Network Management System (NMS) and sent in 5-minute intervals to the network elements attached to the links. Specific SNMP Management Information Base variables should be used to indicate the state of the link at the different OSI layers and send an SNMP reply message to the NMS. Where the network equipment is not able to respond to SNMP queries, an equipment proprietary interface may be used.

##### *(c) Reporting criteria*

The Licensee shall report the percentage of time the network achieves full connectivity and functionality during the Reporting Period.

#### 2.2 Broadband Data Speed

##### *(a) Definition*



*Broadband data speed* is defined as the data transmission speed that is achieved separately for downloading and uploading specified test files from a remote website using a cellular mobile device<sup>5</sup>.

*(b) Measurement and statistics*

The data transmission speed shall be calculated by downloading/uploading a test file and dividing the size of the test file by the transmission time required for a complete and error-free transmission. The test file should consist of incompressible data containing random numbers, a compressed file or the digits of the number Pi and must be at least twice the size (in kilobits) of the theoretically maximum data transmission rate per second (in Kbits/s) of the broadband access under consideration. The transmission time is the time starting when the access network has received the necessary information to start the transmission and ending when the last bit of the test file has been received. The measurement should be taken when the network is lightly loaded.

*(c) Reporting criteria*

The Licensee shall report the data transmission speed that is achieved, on a lightly loaded network, separately for downloading and uploading specified test files from a remote website using a cellular mobile device. ***Broadband data speed shall not be reported for 2G networks.***

## **2.3 Network Availability (voice)**

*(a) Definition*

*Network availability (voice)* is defined as the percentage of time that the voice network achieves full connectivity and functionality, where full connectivity means that all network elements are physically connected, and full functionality means that those network elements are working properly.

*(b) Measurement and statistics*

The statistic shall be calculated:

- i. using measurements based on network element counters, which must be made using an automatic data collection system, based on network element counters, which register the real traffic of the network; and
- ii. from test calls in a representative population of Network Termination Points (NTPs).

Measurements should accurately reflect traffic variations over the hours of a day, the days of the week and the months of the year.

*(c) Reporting criteria*

The Licensee shall report the percentage of time the network achieves full connectivity and functionality during the Reporting Period.

## **2.4 Call Completion Rate**

*(a) Definition*

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<sup>5</sup> Recommendation from Section 5.2 of ETSI EG 202 057-4: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 4: Internet access, Page 17

*Call Completion Rate* is defined as the ratio of successful calls to the total number of call attempts for a specified time. A successful call is a call attempt to a valid number, while in a coverage area, where the call is answered or called party busy tone or ringing tone is recognized at the access of the calling party within forty (40) seconds from the instant when the last digit of the destination subscriber number is received by the network<sup>6</sup>.

*(b) Measurement and statistics*

The statistic shall be calculated:

- i. using measurements based on network element counters, which must be made using an automatic data collection system, based on network element counters, which register the real traffic of the network; or
- ii. from test calls in a representative population of NTPs; or
- iii. using a combination of the above.

Measurements should accurately reflect traffic variations over the hours of a day, the days of the week and the months of the year.

*(c) Reporting criteria*

The Licensee shall report the percentage of calls completed, calculated from all the call attempts in the Reporting Period including:

- i. average monthly rate across all cell sites;
- ii. average completion rate for busiest cell site on each island; and
- iii. average monthly completion rate for each cell site.

## **2.5 Dropped Call Rate**

*(a) Definition*

*Dropped call rate* is the proportion of incoming and outgoing calls, which, once they have been correctly established, and, therefore, have an assigned traffic channel, are dropped or interrupted prior to their normal completion by the user, the cause of the early termination being within the operator's network<sup>7</sup>.

*(b) Measurement and statistics*

The statistic shall be calculated using measurements from an automatic data collection system or based on network element counters that register the real traffic of the network. Measurements should be calculated from all of the calls in the period, when using the measurements based on network element counters, the measurement must be made via an automatic data collection system, based on the network counters that register the real traffic of the network and accurately reflect traffic variations over the hours of a day, the days of the week and the months of the year.

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<sup>6</sup> Recommendation from Section 6.4.1 of ETSI EG 202 057-3: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 2: QoS parameters specific to Public Land Mobile Networks (PLMN), Page 12.

<sup>7</sup> Recommendation from Section 6.4.2 of ETSI EG 202 057-3: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 2: QoS parameters specific to Public Land Mobile Networks (PLMN), Page 13.

*(c) Reporting criteria*

The Licensee should report the percentage of dropped calls, including:

- i. Average monthly dropped call rate;
- ii. Average monthly busy hour dropped call rate; and
- iii. Average monthly dropped call rate for the hour with the worst performance.

## Form QoS-2: Reportable Metrics for Cellular Mobile Networks and Services

Licensee Name:

Name of Service:

Reporting Area:

Reporting Period:

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED SERVICE STANDARD (MRSS)	FORMULAE	THE STANDARD ACHIEVED BY THE LICENSEE SHOULD BE REPORTED IN THIS COLUMN
<p><b>Network Availability (data)</b></p> <p><i>Ref: Section 2.1 of Schedule 2</i></p>	<p>The percentage of time the network achieves full connectivity and functionality during the Reporting Period calculated from the data in the period</p>	<p>Not less than 99%</p>	$A = \left(100 - \frac{T_{uc} + T_{nf}}{T_s}\right) \times 100$ <p>Where, A = Availability</p> <p>T<sub>uc</sub> = Total minutes network elements are not fully connected.</p> <p>T<sub>nf</sub> = Total minutes network elements are not fully functional</p> <p>T<sub>s</sub> = Total service time in minutes</p>	
<p><b>Broadband data Speed</b></p> <p><i>Ref: Section 2.2 of Schedule 2</i></p>	<p>The data transmission speed that is achieved, on a lightly load network, separately for downloading and uploading specified test files from a remote website using a cellular mobile device</p>	<p>Downlink: 2 Mbps</p>		
<p><b>Network Availability (voice)</b></p>	<p>Availability of the voice cellular mobile network is the percentage of time</p>	<p>Not less than 99.9%</p>	$A = 100 - \frac{T_{uc} + T_{nf}}{T_s} \times 100$ <p>Where,</p>	

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED SERVICE STANDARD (MRSS)	FORMULAE	THE STANDARD ACHIEVED BY THE LICENSEE SHOULD BE REPORTED IN THIS COLUMN
Ref: Section 2.3 of Schedule 2	when the cellular mobile voice network is operational		<p>A = Availability</p> <p>Tuc = Total minutes network elements are not fully connected.</p> <p>Tnf = Total minutes network elements are not fully functional</p> <p>Ts = Total service time in minutes</p>	
	the number of observations used	99% of all relevant data	The observations should be normally distributed with $P(z < -1.96 \text{ or } z > 1.96)$	
<p><b>Call Completion Rate</b></p> <p>Ref: Section 2.4 of Schedule 2</p>	<p>The Licensee shall report the percentage of calls completed, calculated from all the call attempts in the period</p>	<p>&gt; Average monthly rate across all cell sites: greater than 99%</p> <p>&gt; Average completion rate for busiest cell site on each island: greater than 95%</p> <p>&gt; Average monthly completion rate for each cell site: greater than 75%</p>	$CCR = \frac{C_{com}}{N} \times 100$ <p>Where, CCR = Call Completion Rate</p> <p><math>C_{com}</math> = Number of calls completed</p> <p>N = Total number calls attempted</p>	
<p><b>Dropped Call Ratio</b></p> <p>Ref: Section 2.5 of Schedule 2</p>	<p>The percentage of dropped calls including:</p> <p>i. Average monthly dropped call rate;</p>	<p>&gt; Average monthly dropped call</p>	$DCR = \frac{CD}{N} \times 100$	

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED SERVICE STANDARD (MRSS)	FORMULAE	THE STANDARD ACHIEVED BY THE LICENSEE SHOULD BE REPORTED IN THIS COLUMN
	ii. Average monthly busy hour dropped call rate; and iii. Average monthly dropped call rate for the hour with the worst performance	rate: less than 1%  > Average monthly busy hour dropped call rate; less than 2%  > Average monthly dropped call rate for the hour with the worst performance: less than 3%	Where, DCR = Dropped Call Ratio  $C_D$ = Total Number of dropped cellular mobile calls  N = Total number of cellular mobile calls	
	i) The number of observations performed	99% of all relevant data	The observations should be normally distributed with $P(z < -1.96 \text{ or } z > 1.96)$	

## **SCHEDULE 3**

### Reportable Metrics and Minimum Reportable Service Standards for Internet Protocol-based Electronic Communications Networks and Services

#### **Summary of Contents**

- 3.0 Preamble
- 3.1 Availability
- 3.2 Delay
- 3.3 Bandwidth

#### **3.0 Preamble**

The Reportable Metrics in this Schedule shall be reported by the holders of Individual Operating Licences whose services include the provision of Internet services, and shall be measured against the MRSS set out in respect of each metric. Licensees shall report their performance in respect of these Reportable Metrics on *Form QoS-Schedule 3: Quality of Service MRSS for Internet Protocol Networks* (See Appendices to Schedule 3).

#### **3.1 Availability**

##### *(a) Definition*

*Availability* is defined as the percentage of time that the IP network achieves full connectivity and functionality, where full connectivity means that all network elements are physical connected, and full functionality means that those network elements are working properly.

##### *(b) Measurement and statistics*

The statistic should be obtained by monitoring the links at the Open System Interconnection (OSI) layers. Simple Network Management Protocol (SNMP) messages should be generated by the Network Management System (NMS) and sent in 5-minute intervals to the network elements attached to the links. Specific SNMP Management Information Base variables should be used to indicate the state of the link at the different OSI layers and send an SNMP reply message to the NMS. Where the network equipment is not able to respond to SNMP queries, an equipment proprietary interface may be used.

##### *(c) Reporting criteria*

The Licensee shall report the percentage of time the network achieves full connectivity and functionality during the Reporting Period.

#### **3.2 Delay**

##### *(a) Definition*

*Delay* is the time taken for an IP packet to make the average round trip from the sender to the target recipient and includes the sum of the queuing delay, switching delay, transmission delay and propagation delay.

*(b) Measurement and statistics*

The statistic should be obtained from at least three (3) test sessions, separated from each other by at least twenty-four (24) hours. Each session should be conducted from a traffic-weighted location inside the Reporting Area during the Busy Time for the Service and should consist of sending the following ping command to the Regional Internet Registry (RIR) websites below:

- i. ping -n 100 www.arin.net
- ii. ping -n 100 www.lacnic.net
- iii. ping -n 100 www.afrinic.net
- iv. ping -n 100 www.apnic.net

*(c) Reporting criteria*

The Licensee shall report the average delay as a function of round-trip times (RTTs)<sup>8</sup>.

### **3.3 Bandwidth**

*(a) Definition*

The *bandwidth* is defined as the average speed achieved when downloading and uploading specified test files, in Mbps, from a remote website and a user's computer or router<sup>9</sup>.

*(b) Measurement and statistics*

The bandwidth shall be calculated by downloading/uploading a test file and dividing the size of the test file by the transmission time required for a complete and error-free transmission. The test file should consist of incompressible data containing the digits of the number Pi and must be at least twice the size (in Kbits) of the theoretically maximum data transmission rate per second (in Kbits/s) of the Internet access under consideration. The transmission time is the time starting when the access network has received the necessary information to start the transmission and ending when the last bit of the test file has been received.

*(c) Reporting criteria*

The Licensee shall report, as separate values, the average bandwidth achieved for downloading and uploading specified test files.

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<sup>8</sup> Recommendation from Appendix II, table III.4 of ITU-T Y.1541: Series y; Global Information Infrastructure and internet protocol Aspects – Quality of service and network performance; Network performance objectives for IP services, Page 17

<sup>9</sup> Recommendation from Section 5.2 of ETSI EG 202 057-4: Speech processing, Transmission and Quality Aspects (STQ); user related QoS parameter definitions and measurements; Part 4: Internet access, Page 17



**Form QoS-3: Reportable Metrics for Internet Networks and Services**

**Licensee Name:**

**Name of Service:**

**Reporting Area:**

**Reporting Period:**

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED SERVICE STANDARD (MRSS)	FORMULAE	THE STANDARD ACHIEVED BY THE LICENSEE SHOULD BE REPORTED IN THIS COLUMN
<p><b>Availability</b> <i>Ref: Section 3.1 of Schedule 3</i></p>	<p>The percentage of time the network achieves full connectivity and functionality during the Reporting Period calculated from the data in the period</p>	<p>Not less than 99.9%</p>	$A = 100 - \frac{T_{uc} - T_{nf}}{T_s} \times 100 (\%)$ <p>Where, A = Availability</p> <p>T<sub>uc</sub> = Total minutes network elements are not fully connected.</p> <p>T<sub>nf</sub> = Total minutes network elements are not fully functional</p> <p>T<sub>s</sub> = Total service time in minutes</p>	
<p><b>Delay</b> <i>Ref: Section 3.3 of Schedule 3</i></p>	<p>The average value of the RTTs, in milliseconds</p>	<p>Less than 233 milliseconds</p>	$D = \frac{\sum RTTs}{12}$ <p>Where, D = Delay ΣRTT = sum of average Round Trip Times (RTTs) reported by the twelve (4x3) ping -n 100 commands.</p>	

NETWORK PERFORMANCE METRICS	REPORTING CRITERIA	MINIMUM REQUIRED SERVICE STANDARD (MRSS)	FORMULAE	THE STANDARD ACHIEVED BY THE LICENSEE SHOULD BE REPORTED IN THIS COLUMN
<p><b>Bandwidth</b></p> <p><i>Ref: Section 3.4 of Schedule 3</i></p>	<p>The average speed achieved for downloading and uploading specified test files, in kbps</p>	<p>Not less than 80% of bandwidth agreed in Service Level Agreement</p>	<p>Bandwidth (download)</p> $= \frac{\text{mean download speed}}{\text{agreed speed}} \times 100$ <p>and</p> <p>Bandwidth (upload)</p> $= \frac{\text{mean upload speed}}{\text{agreed speed}} \times 100$	