THE TELECOMMUNICATIONS ACT

The Telecommunications (Quality of Service Standards) Rules, 2023

In exercise of the power conferred upon the Office of Utilities Regulation by section 44 of the Telecommunications Act, and of every other power hereunto enabling, the following Rules are made after consultation with the Minister: –

PART I. *Preliminary*

Citation. 1. These Rules may be cited as the Telecommunications (Quality of Service Standards) Rules, 2023.

Commencement. 2. These Rules, other than Part IV, shall come into operation on the 1st day of February, 2024; Part IV of these Rules shall come into operation on the 1st day of August, 2024.

Interpretation. 3. In these Rules, unless the context otherwise provides –

"accountable officer" means the officer appointed under rule 11;

"active prepaid subscription" means one which has been used in the last ninety days for a revenue generating activity, including –

(a) sending or receiving a voice or video call;

(b) sending or receiving a SMS or MMS;

(c) utilising a premium rate service;

(d) data transfer, including Internet access;

"active subscription" means a postpaid or active prepaid subscription;

"ADSL" or "asymmetric digital subscriber line" means a form of data communications technology that enables data transmission over copper telephone lines;

"BBH" or "bouncing busy hour" means the hour during a day when a public network carries its highest volume of traffic;

"BSC" or "base station controller" means the mobile network component that controls one or more BTS;

"BTS" or "base transceiver station" means an equipment that facilitates wireless communication between the customer device and the public network;

"busy hour" means the sliding sixty minute period during a twenty-four hour period when the highest traffic load occurs on a public network;

"call attempt" means an attempt to achieve a connection to one or more devices attached to a public network;

"CDMA" or Code-Division Multiple Access" means a type of digital access technology used in mobile networks;

"cell" means the geographical area covered by a mobile base station that is used to provide connectivity for end-users to the mobile network;

"customer complaint" means an expression of dissatisfaction with the provision of a specified service or facility or any service ancillary to the provision of the specified service or facility, which is submitted to a licensee for resolution by way of a medium designated by the licensee for receipt of complaints;

"customer contract" means the contract for the provision of a specified service or facility between the licensee and the customer;

"customer service call" means a call to a telephone number designated by a licensee for the purposes of receiving –

(a) a customer complaint including a fault report; or

(b) a service enquiry or order for a specified service;

"customer service centre" means an office or any other location where a

customer can conduct a customer service transaction which includes –

(a) applying for a specified service or facility; or

(b) lodging a customer complaint;

"day" means a twenty-four hour period beginning at midnight;

"disconnection" means a deliberate cessation or suspension of a specified service or facility provided to a customer by a licensee, which may include the removal of a network termination point;

"drive test" means the method of measuring and assessing the coverage, capacity, or the quality of service of a mobile network while driving;

"fault report" means a report of a disrupted or degraded service or facility made to a licensee by a customer or on behalf of a customer, by way of a medium designated by the licensee for submission of fault reports;

"fixed services" means fixed voice services and fixed Internet access services;

"force majeure" means an event or circumstance outside of the reasonable control of a licensee, and includes an act of God, a natural disaster, civil unrest, vandalism or theft, an industrial disturbance, a war, an arrest or restraint by Government, economic embargoes against Jamaica, flooding, fire, explosion, or breakdown of telecommunications outside of Jamaica;

"ICMP" means Internet Control Message Protocol;

"ISP" or "Internet service provider" means a licensee that provides the services of accessing and using the Internet;

"ISP node" means the location where an ISP's gateway router is

connected with an upstream service provider;

"IVR" or "interactive voice response" means an automated telephony system that interacts with the callers and routes calls to the appropriate recipient;

"IXP" or "Internet Exchange Point" means a physical location through which ISPs and content providers connect to or exchange traffic with each other;

"measurement methodology" means an approach for measuring a measurement parameter;

"measurement parameter" means a measurable characterization of the quality standard of an aspect of a facility or a specified service;

"measurement period" means the period of time during which the measurement parameters are to be measured;

"measurement target" means a value of a given measurement parameter that is required to achieve the minimum quality standards under these Rules;

"MMS" or "Multimedia Messaging Service" means a communication technology that allows users to transmit or receive multimedia content using a mobile device;

"MSC" or "mobile switching centre" means a network component used for the routing and switching of calls through the mobile network;

"mystery shopping" means a method of gathering information about a specified service or facility, including measurement of quality of service or assessment of compliance with applicable rules and guidelines, where the identity or purpose of the person gathering the information is generally unknown by the licensee;

"network access point" means a major overseas Internet interconnection

point that serves to logically link the global Internet;

"off-net" means calls that originate on one public network in Jamaica and terminates on another public network in Jamaica;

"on-net" means calls that originate and terminate within the same public network;

"PCH" or "Paging Channel" means a logical channel used to broadcast paging and notification messages;

"POP" or "point of presence" means a demarcation point or interface point between communicating networks;

"premium rate service" means a value-added service provided through a public network, with or without content, and charged at special rates;

"reporting area" means the territory of Jamaica or any geographical area within Jamaica as may be specified by the Office;

"service order" means a request made to a licensee by or on behalf of a customer to be supplied with a specified service, by way of a medium designated by the licensee for submission of such requests;

"small licensee" means a carrier or a service provider that serves less than one percent of the total customer base in the telecommunications market in which that carrier or service provider operates;

"SMS" or "Short Message Service" means a communication technology that allows users to transmit or receive text messages using mobile devices;

"SDCCH" or "stand alone dedicated control channel" means a channel which carries signalling information following mobile to network connection establishment and channel assignment;

"TCH" or "traffic channel" means a logical channel in a mobile network that carries either encoded speech or user data;

"working day" means the period between the hours of 8:00 a.m. and 5:00 p.m., Monday to Friday, that is not a public general holiday.

Objects of Rules.

4. The objects of these Rules are to –

(a) outline the minimum quality standards for the provision of facilities or specified services by all licensees;

(b) enable the Office to monitor the quality standards of the facilities or specified services provided by each licensee;

(c) protect and promote the interests of the customers and consumers.

Application of Rules.

5. These Rules apply to all licensees, but in the case of a new licensee, these Rules shall apply as of nine months after the effective date of the licence of the licensee.

PART II. *Functions of the Office*

Application of measurement methodology.

6. – (1) The Office may measure the measurement parameters, in relation to a licensee, using the same measurement methodologies specified in these Rules and report on such measurements.

(2) The Office may measure any measurement parameter not specified in these Rules, in relation to the operation of a licensee, using internationally recognised measurement methodologies and report on such measurements.

(3) The Office may conduct measurements of the measurement parameters within such reporting area and at such frequency, as the Office may determine.

Audit of licensee.

7. – (1) The Office may perform an audit of –

(a) the conduct of measurements;

(b) the methods used by the licensee to measure the measurement parameters, including the processing and reporting of the variables

used in a measurement methodology for a measurement parameter;

(c) the information contained in or relating to a report submitted under rule 13; and

(d) any of the systems, procedures and operations of a licensee to assess their accuracy.

(2) The Office may apply any auditing and testing technique, including –

(a) inspecting the equipment of a licensee;

(b) analysing the records, documents or other information requested from a licensee;

(c) mystery shopping;

(d) conducting or commissioning a drive test; and

(e) accompanying a licensee on that licensee's drive test.

(3) In an audit, a licensee shall be prepared to demonstrate that –

(a) the measurements and reporting requirements have been complied with;

(b) the employees and agents of the licensee who make, process and report the measurements, understand the requirements;

(c) the employees and agents of the licensee use clear procedures to make, process and report the measurements;

(d) the employees and agents of the licensee use systematic procedures for auditing how they make, process and report the measurements;

(e) the support systems of the licensee that are involved in making, processing and reporting the measurements do so accurately; and

(f) the operations performed by the licensee in making, processing and reporting the measurements can be traced for individual measurements.

Publication of quality standards information.

8. – (1) Subject to paragraph (3), the Office may publish any information on the quality standards at such time and in such manner as the Office may determine.

(2) The information referred to in paragraph (1) may –

(a) specify any variance between the measurement targets and the results of measurements conducted, and any other publicly available information;

(b) indicate whether any differences in the results of a measurement parameter relate to the provision of a similar type of specified service;

(c) specify any uncontrollable forces which the Office considers relevant to the results of a measurement parameter for a facility or specified service;

(d) identify each licensee that is not complying with the minimum quality standards under these Rules; and

(e) include a comparison of prices for the different types of facilities or specified services which are derived from the pricing plans publicized by each licensee.

(3) The Office shall –

(a) before the publication of the information referred to in paragraph (1), provide a licensee with the relevant portion of the information relating to that licensee's operations;

(b) provide the licensee an opportunity to review and propose, within ten working days, any changes of the reported facts or circumstances contained in the information relating to the licensee's operations; and

(c) within fifteen working days of the receipt of a proposed change by

the licensee, review the proposed change, and accept, amend or reject the proposed change.

PART III. *General Requirements of a Licensee*

Measurement target.

9. – (1) A licensee shall, as of the effective date of these Rules, for each measurement period, comply with the measurement targets set out in the Schedule.

Schedule.

(2) Paragraph (1) shall not apply –

(a) to a licensee whose licence is less than nine months old, as referred to in rule 5; and

(b) during the period which the Office suspends, in whole or in part, the conduct of measurement and reporting of measurement parameters of a licensee under rule 15.

Restrictions on publication.

10. A licensee shall not disclose or make available to the public any of the information referred to in rule 8 or part thereof unless the licensee –

(a) provides to the Office, the details of the information and circumstances under which the information or part thereof is to be disclosed or made available to the public;

(b) receives the written approval of the Office to disclose or make available to the public the information or part thereof; and

(c) accepts any revision that the Office proposes to the information or part thereof that is to be disclosed or made available to the public.

Accountable officer.

11. A licensee shall appoint a senior officer who shall be responsible for the administration and management of the measurement and reporting obligations of the licensee under these Rules.

PART IV. *Measuring and Reporting*

Measuring and reporting. Schedule.

12. – (1) A licensee shall apply the measurement methodologies set out in the Schedule to determine its results for the parameter being measured.

(2) Subject to rules 14 and 15, a licensee who provides the facilities or specified services set out in the Schedule shall –

(a) measure the corresponding measurement parameters in the Schedule within the reporting area and for the measurement period; and

(b) report to the Office on a quarterly basis, on the results of the measurements done over a quarter, within one month of the end of such quarter, or such other period as the Office may determine, from time to time.

(3) The measurement period referred to in paragraph (2) shall be one month or such other period as the Office may determine, from time to time.

(4) The obligation to measure and report, as set out in this rule, shall not commence until the expiration of six months after the commencement of these Rules.

Reporting to the Office.

13. – (1) A licensee shall prepare and submit a report, in accordance with rule 12, in a format required by the Office.

(2) A report under paragraph (1) shall –

(a) include information on each variable used in a measurement methodology for a measurement parameter;

(b) provide information on the date and the time of the measurement of the measurement parameter, the measurement methodology used, the measurement period and the reporting area;

(c) provide supporting records, documents or other information in the report to the Office that describes how a measurement parameter is calculated from the data collected from the network elements of the licensee, including any counters applicable to the calculation of that measurement parameter;

Schedule.

(d) indicate whether the measurement targets set out in the Schedule and the reporting requirements have been met; and

(e) include a declaration from the accountable officer of the licensee that the licensee has properly effected the measurement and reporting requirements in accordance with these Rules.

Exemption from measuring and reporting.

14. – (1) The Office may, subject to any terms and conditions, exempt a small licensee from conducting measurements of, and reporting on, a measurement parameter, if the Office is satisfied that the costs of compliance by a small licensee are disproportionate to its revenue.

(2) A small licensee may submit a written request to the Office to be exempted from conducting measurements of and reporting on any or all measurement parameters.

(3) Upon receipt of the request, the Office shall review the submission and make a determination as to whether an exemption should be granted.

(4) For the purpose of determining whether to exempt a small licensee, the Office may, in writing, require the small licensee to provide any further information as the Office considers necessary.

(5) The Office shall, in writing, notify the small licensee of the determination to grant the exemption or to refuse to grant the exemption.

(6) The small licensee shall continue to comply with the measurement and reporting requirements under these Rules until the notification of the grant of the exemption is received by the licensee.

(7) The Office may publish guidelines, from time to time, indicating the basis upon which the Office will determine disproportionality of costs of compliance to the revenue of a small licensee.

Suspension of measurement and reporting.

15. The Office may, for a specified period, suspend, *in whole or in part*, the obligation to conduct measurements and reporting of measurement

parameters by a licensee where the Office determines that despite the diligence of the licensee, the ability of the licensee to measure, report or meet the measurement targets, is impaired by force majeure.

PART V. *Customer Care*

Live customer service agent.

16. A licensee shall provide an option to speak to a live customer service agent on its IVR and such option shall not be below the first submenu of the first layer (the service menu) of the IVR.

Customer complaint.

17. – (1) Notwithstanding section 44(2) of the Act, a person seeking to resolve an issue with the facilities or specified services provided by a licensee may make a customer complaint pursuant to paragraph (2).

(2) A customer complaint may be made by –

(a) making a customer service call;

(b) visiting the customer service centre of the licensee;

(c) writing to the licensee; or

(d) using such other method for submission of complaints as the licensee may designate, from time to time.

Customer complaint handling procedures.

18. A licensee shall –

(a) establish its customer complaint handling procedures which shall include –

(i) a statement of the right for a customer to complain;

(ii) the contact details and opening hours for the customer service centre of the licensee;

(iii) the telephone numbers to which customer service calls may be made and the times at which calls will be received;

(iv) the types of supporting information that are required when making a customer complaint;

(v) the expected duration of each step of the customer

complaint handling procedures;

(vi) the escalation procedures to be adopted in relation to both the licensee and the Office;

(b) provide assistance to a person lodging a customer complaint where the person requests the assistance of the licensee;

(c) provide persons with disabilities with an accessible means to lodge complaints or make enquiries;

(d) acknowledge a written complaint within five working days after the complaint is received;

(e) deliver to a customer who has lodged a customer complaint, a progress report, every fifteen working days, until the conclusion of the customer complaint is reached;

(f) advise a customer who is dissatisfied with the resolution of the customer complaint, that the customer may refer the complaint to the Office;

(g) undertake that a customer will not be asked to pay any sum in relation to a customer complaint made while that customer complaint is being handled by the licensee or by the Office;

(h) advise each customer of the conclusion of their complaint and the results of any related investigation within three working days after the conclusion is reached.

Customer complaint record.

19. – (1) A licensee shall keep a record of a customer complaint for a minimum period of six months after a customer complaint has been resolved.

(2) A customer complaint record shall include –

(a) the name of the customer;

(b) the address of the customer;

(c) the complaint case number;

(d) the date when the customer complaint was received;

(e) the nature of the customer complaint;

(f) the result of any investigation;

(g) the date of any progress report sent and the contents of the progress report;

(h) the conclusion of the customer complaint, including the steps taken by the licensee to finally resolve the complaint; and

(i) the date when the conclusion of the customer complaint was communicated to the customer.

Notice of maintenance or upgrade of network.

20. – (1) A licensee shall give its customers and the Office two working days advanced notice of any period of downtime that is scheduled for routine maintenance or for upgrading of its network.

(2) The notice to the Office shall provide details of the nature of the maintenance or the upgrading of the network and the projected downtime hours.

(3) The licensee shall notify the Office, as soon as practicable after becoming aware that the actual downtime is likely to exceed the projected downtime, and provide reasons for the delay and a new projected downtime.

PART VI. *Enforcement*

Offences and penalties.

21. A person who contravenes a provision of these Rules is subject to the enforcement measures specified under Part XIII of the Act.

PART VII. *General*

Modification of measurement frequency and reporting area.

22. The Office may modify the measurement frequency, reporting period and reporting area, on an *ad hoc* basis.

SCHEDULE (Rules 9, 12 and 13)

MEASUREMENT PARAMETERS, METHODOLOGY AND TARGETS

1. *Customer Service Call Answer Parameters*

Measurement summary

1.1. The "customer service call answer" parameter comprises three different measurements:

- Customer Service Call Answer Rate #1 measures the proportion of customer service calls that are connected successfully (i.e. without encountering congestion, busy signal, no reply or any other failure);
- Customer Service Call Answer Rate #2 measures the proportion of customer service calls which are answered by either an IVR machine or a live customer service agent within five (5) rings;
- Customer Service Call Answer Rate #3 measures the proportion of customer service calls where the customer, having accessed the IVR and deciding to speak to a live agent, is not in the queue for more than two (2) minutes.

1.2. This parameter is applicable to all licensees who provide fixed voice service, mobile voice services, SMS and MMS services, and Internet access services.

Measurement constituents

1.3. Customer Service Call Answer Rate #1 shall be calculated using the following formula:

> The number of customer service calls that are connected successfully shall be divided by the total number of customer service call attempts.

The result, which forms the Customer Service Call Answer Rate #1, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of customer service calls that are set up successfully, shall also be provided.

1.4. Customer Service Call Answer Rate #2 shall be calculated by the following formula:

> The total number of customer service calls reaching the IVR or a live customer service agent within five (5) rings shall be divided by the total number of customer service calls that are connected successfully.

The result, which forms the Customer Service Call Answer Rate #2, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of customer service calls that reach an IVR or live customer service agent within five (5) rings, and the number of customer service calls that are set up successfully, shall also be provided.

1.5. Customer Service Call Answer Rate #3 will be calculated by the following formula:

> The number of customer service calls reaching a live customer service agent within two (2) minutes of the caller selecting this option on the IVR, shall be divided by the total number of customer service calls in which the customer has selected to speak to an agent.

The result, which forms the Customer Service Call Answer Rate #3, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of customer service calls that reach a live customer service agent within two (2) minutes of the caller selecting this option on the IVR and the total number of customer service calls in which the customer has selected to speak to an agent shall also be provided.

1.6. The time taken for connecting to a live customer service agent shall be calculated from the time the customer has keyed the relevant number in the IVR option menu for speaking to the live customer service agent.

Measurement agents

1.7. Licensees shall make and report to the Office, measurements of the Customer Service Call Answer Parameters. Licensees shall make the measurements using techniques appropriate to their own operations and provide documentation to the Office which describes how the measurements are calculated from data collected.

Measurement targets

1.8. A minimum of ninety-five percent (95%) of customer service calls shall be connected successfully and not more than five percent (5%) of customer service calls shall encounter congestion or busy signal or no reply or any other failure.

1.9. A minimum of ninety-five percent (95%) of all customer service calls shall be answered by either an IVR machine or a live customer service agent within five (5) rings.

1.10. Where the customer accesses the IVR and decides to speak to a live customer service agent, a minimum of ninety-five percent (95%) of these customer service calls shall be in the queue for no more than two (2) minutes.

2. *Customer Complaint Submission Rate*

Measurement summary

2.1. "Customer complaint submission rate" refers to the proportion of customer complaints received during a measurement period for a particular telecommunications service to the number of active subscriptions for that service at the end of the measurement period.

2.2. This parameter is applicable to all licensees who provide fixed voice services, mobile voice services, SMS and MMS services, and Internet access services.

2.3. Licensees shall place customer complaints into the following categories:

A. For complaints related to accounts:

(i) disputed charges or balances

(ii) failed attempts to pay charges, change credit balances or determine credit balances

(iii) bills received late or not at all

B. For complaints related to disconnections:

(i) blocked calls or messages to or from certain numbers

(ii) disconnections for incomplete payment or credit balance exhaustion

(iii) failed reactivations after complete payment or credit

balance renewal

C. For complaints related to networks:

(i) failed calls or messages

(ii) Internet access speed below subscribed levels

D. For other complaints:

(i) faulty customer equipment or facility

(ii) missing or late attendance at appointments

(iii) delayed resolution of complaints

(iv) delayed supply of specified services or facilities

(v) delayed repair of faults

(vi) other complaint subject areas not covered by the categories already mentioned.

For the purposes of the complaints categories at D. (iii), (iv) and (v) above, "delayed" refers to any complaint resolved after the expiration of thirty (30) days from the date of submission of the complaint by the customer.

Measurement constituents

2.4 The number of customer complaints received during the measurement period shall be divided by the number of active subscriptions for the particular telecommunication service at the end of the measurement period. The result, which forms the customer complaint submission rate, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of active subscriptions for the service shall also be provided. The formula to be used to calculate the measurement parameter for each specified service or facility is as follows:

$$\frac{\text{The \# of CCspec}}{\text{The \# of ASspec}}$$

Where:

CCspec = customer complaints received for the specified service/facility during the measurement period

ASspec = active subscriptions for the specified service/facility during the measurement period.

2.5 The measurements shall include all customer complaints received during the measurement period, for the reporting area, regardless of the validity, extent of repetition, and subject of the complaint.

2.6 There shall be separate measurements for each separately identified telecommunications service, for prepaid and post-paid plans, and for each category of customer complaint set out in 2.3 above.

Measurement agents

2.7 Licensees shall make and report to the Office the measurements of the customer complaint submission rate.

Measurement targets

2.8 There shall be at most, five (5) customer complaints, in total, per one hundred

(100) active subscriptions for the service in a measurement period.

2.9 There shall be at most, one (1) customer complaint about accounts, per one hundred (100) active subscriptions for the service in a measurement period.

2.10 There shall be at most, one (1) customer complaint about disconnections, per one hundred (100) active subscriptions for the service in a measurement period.

2.11 There shall be at most one (1) customer complaint related to networks per one hundred (100) active subscriptions for the service in a measurement period.

3. *Customer Complaint Resolution Rate*

Measurement summary

3.1. "Customer complaint resolution rate" refers to the proportion of customer complaints that are resolved in given times.

3.2. The time taken to resolve a customer complaint is the time beginning when a customer complaint is received by a licensee and ending when the licensee issues its final decision on the matter.

3.3. This parameter is applicable to all licensees who provide fixed voice services, mobile voice services, SMS and MMS services and Internet access services.

Measurement constituents

3.4. The number of customer complaints that are resolved during the measurement period in given times of fifteen (15) working days and thirty (30) working days, shall be divided by the sum of the number of customer complaints outstanding at the beginning of the measurement period and the number of customer complaints received during the measurement period. The formula to be used to calculate the measurement parameters for each specified service or facility are as follows:

$$\frac{\text{The \# of CCres within 15 working days}}{(\text{The \# of CCout} + \text{the \# of CCrec})}$$

$$\frac{\text{The \# of CCres within 30 working days}}{(\text{The \# of CCout} + \text{the \# of CCrec})}$$

Where:

CCres = customer complaints resolved during the measurement period

CCout = customer complaints outstanding at the beginning of the measurement period

CCrec = customer complaints received during the measurement period.

3.5 The results, which form the customer complaint resolution rate, shall be provided as measurements in the form of percentages rounded up or down to the nearest percentage point. The number of customer complaints outstanding at the beginning of the measurement period and received during the measurement period shall also be provided.

3.6 The measurements shall include all customer complaints resolved during the measurement period for the reporting area, regardless of the validity, extent of repetition, and subject of the customer complaint.

3.7 There shall be separate measurements for each separately identified specified service or facility, for prepaid and post-paid plans for applicable specified services, and for each category of customer complaint set out in 2.3 above.

Measurement agents

3.8 Licensees shall make and report to the Office the measurements of the customer complaint resolution rate.

Measurement targets

3.9 At least eighty percent (80%) of the total number of customer complaints shall be resolved within fifteen (15) working days.

3.10 At least ninety-five percent (95%) of the total number of customer complaints shall be resolved within thirty (30) working days.

4. *Fixed Service Supply Rate*

Measurement summary

4.1. "Fixed service supply rate" refers to the proportion of fixed service orders that lead to services in working order within given service supply times, in locations where the services are offered.

4.2 The "service supply time" is the time beginning when a service order is accepted by a licensee and ending when the service has been supplied in working order.

4.3 This parameter is applicable to all licensees who provide fixed voice services and fixed Internet access services.

Measurement constituents

4.4 The number of service orders that lead to services in working order during the measurement period in given times of five (5) working days and ten (10) working days shall be divided by the sum of the number of service orders outstanding at the beginning of the measurement period and the number of service orders received during the measurement period. The results, which form the service supply rates, shall be reported as measurements in the form of percentages rounded up or down to the nearest percentage point. The number of service orders outstanding at the beginning of the measurement period and received during the measurement period shall also be provided. The formula to be used to calculate the measurement parameters for each specified service or facility are as follows:

$$\frac{\text{The \# of SOsup within 5 working days}}{\text{(The \# of SOout + the \# of SOrec)}}$$

$$\frac{\text{The \# of SOsup within 10 working days}}{\text{(The \# of SOout + the \# of SOrec)}}$$

Where:

SOsup = service orders that lead to fixed services in working order during the measurement period

SOout = service orders outstanding at the beginning of the measurement period

SOrec = service orders received during the measurement period.

4.5 Service orders about the same service and about the same network termination point shall be counted as the same, regardless of the number of channels or lines affected. In other cases, service orders shall be counted as different from each other.

4.6 Measurements shall be made for each separately identified fixed service including voice, xDSL, FTTx, fixed wireless Internet, and such other fixed

services as may be offered.

Measurement agents

4.7 Licensees providing fixed services shall make and report to the Office the measurements of the fixed service supply rate.

Measurement targets

4.8 At least eighty percent (80%) of the number of service orders lead to services in working order within five (5) working days.

4.9 At least ninety-five percent (95%) of the number of service orders lead to services in working order within ten (10) working days.

5. *Fault Report Submission Rate*

Measurement summary

5.1. "Fault report submission rate" refers to the number of fault reports received per one hundred (100) active subscriptions for the service per measurement period.

5.2. This parameter is applicable to all licensees who provide fixed services.

Measurement constituents

5.3 The number of fault reports received for fixed services during the measurement period shall be divided by the number of active subscriptions for the service at the end of the measurement period. The result, which forms the fault report submission rate, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of active subscriptions for the service shall also be provided. The formula to be used to calculate the measurement parameter for each specified service or facility is as follows:

$$\frac{\text{The \# of FRrec}}{\text{The \# of ASfx}}$$

Where:

FRrec = fault reports received for fixed services during the measurement period

ASfx = active subscriptions for the fixed services at the end of the measurement period.

5.4 Fault reports about the same fault and about the same network termination point shall be counted as the same, regardless of the number of channels or lines affected. In other cases, fault reports shall be counted as different from each other.

5.5 There shall be separate measurements for each separately identified fixed service.

Measurement agents

5.6 Licensees of fixed services shall make and report to the Office the measurements of the fault report submission rate.

Measurement targets

5.7 There shall be at most, five (5) fault reports per one hundred (100) active subscriptions for the service in a measurement period.

6. *Fault Repair Rate*

Measurement summary

6.1. "Fault repair rate" refers to the proportion of faults that are repaired in the given fault repair time, after receiving fault reports.

6.2 The "fault repair time" is the time beginning when a fault report is received by a licensee and ending when the service has been restored to working order.

6.3 This parameter is applicable to all licensees who provide fixed services.

Measurement constituents

6.4 The number of fault reports that are cleared during the measurement period in given times of twenty-four (24) hours and forty-eight (48) hours shall be divided by the sum of the number of fault reports outstanding at the beginning of the measurement period and the number of fault reports received during the measurement period. The results, which form the fault repair ratio, shall be provided as measurements in the form of percentages rounded up or down to the nearest percentage point. The number of fault reports outstanding at the beginning of the measurement period and received during the measurement period shall also be provided. The formula to be used to calculate the measurement parameters for each specified service or facility are as follows:

$$\frac{\text{The \# of FRclr within 24 hours}}{(\text{The \# of FRout} + \text{the \# of FRrec})}$$

$$\frac{\text{The \# of FRclr within 48 hours}}{(\text{The \# of FRout} + \text{the \# of FRrec})}$$

Where:

FRclr = fault reports that are cleared during the measurement period

FRout = fault reports outstanding at the beginning of the measurement period

FRrec = fault reports received during the measurement period.

6.5 For purposes of the measurements, a fault report is considered cleared if the services concerned have been restored to working order, or if the fault is proven to be caused by a third party.

6.6 Measurements shall be made for each separately identified fixed service including voice, xDSL, FTTx, fixed wireless Internet, and such other fixed services as may be offered.

6.7 Licensees shall also separately report on those faults that are caused by a third party.

Measurement agents

6.8 Licensees who provide fixed services shall make and report to the Office the measurements of the fault repair rate.

Measurement targets

6.9 At least eighty percent (80%) and ninety-five percent (95%) of the number of faults shall be repaired in twenty-four (24) hours and forty-eight (48) hours respectively.

7. *Call Set-up Success Rate*

Measurement summary

7.1 "Call set-up success rate" refers to the proportion of established calls to call attempts i.e. the proportion of call attempts that result in a connection to the dialed number. This parameter shall be measured during the BBH.

7.2 This parameter is applicable to all licensees who provide fixed voice services and mobile voice services.

7.3 Separate measurements shall be made for on-net and off-net calls.

Measurement constituents

7.4 The call set-up success rate shall be calculated using the following formula:

$$\frac{\text{The \# of successful on-net call establishments}}{\text{The \# of on-net call attempts}}$$

$$\frac{\text{The \# of successful off-net call establishments}}{\text{The \# of off-net call attempts}}$$

The result, which forms the call set-up success rate, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of on-net successful call establishments, and the number of on-net call attempts shall be provided. The number of off-net successful call establishments, and the number of off-net call attempts shall also be provided.

Measurement agents

7.5 Licensees who provide mobile voice services and fixed voice services shall make and report to the Office measurements of the on-net and off-net call set-up success rates. Licensees shall make the measurements using techniques appropriate to their own network elements and provide documentation to the Office which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

7.6 At least ninety-eight percent (98%) of the number of on-net calls that are attempted shall be set up successfully.

7.7 At least ninety-five percent (95%) of off-net calls that are attempted shall be set up successfully.

8. *Call Set-up Time Parameter*

Measurement summary

8.1 The "call set-up time" parameter evaluates service availability to set up calls in an acceptable time. It measures the proportion of call set-ups that are set up within the acceptable time. The "call set-up time" refers to the period starting when the address information required for setting up a call is received by the originating network and ending when a connection is established with the destination network (i.e. a busy tone, ringing tone or recorded announcement is received from the called party's network by the calling party). The acceptable delay is five (5) seconds for on-net and ten (10) seconds for off-net calls.

8.2 All on-net and off-net calls, as the case may be, shall be included in the measurement of this parameter. Additionally, unsuccessful call set-ups are excluded from the measurement of this parameter.

8.3 This parameter is applicable to all licensees who provide fixed voice services and mobile voice services.

Measurement constituents

8.4 The call set-up time parameter shall be calculated using the following formula:

$$\frac{\text{The \# of successful call establishments which occur within the acceptable delay}}{\text{The \# of successful call set ups}}$$

8.5 The call set-up time shall be calculated using the following formula:

$S_t = (t_2 - t_1)$

t_2 = point of time when a connection is established with the destination network

t_1 = the point of time after the last digit of the address information has been sent by the customer equipment.

The result, which forms the call set-up time parameter for on-net and off-net calls respectively, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of on-net calls set up within five (5) seconds and the number of on-net calls that are set up successfully shall be provided. The number of off-net calls set up within ten (10) seconds and the number of off-net calls that are set up successfully shall also be provided.

Measurement agents

8.6 Licensees who provide mobile voice services or fixed voice services shall make and report to the Office, measurements of the on-net and off-net call set up times. Licensees shall make the measurements using techniques appropriate to their own network elements and provide documentation to the Office, which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

8.7 In the case of on-net calls, ninety-eight percent (98%) of the number of on-net calls shall be set up within five (5) seconds.

8.8 In the case of off-net calls, at least ninety-five percent (95%) of the number of off-net calls shall be set up within ten (10) seconds.

9. Dropped Call Rate

Measurement summary

9.1 The "dropped call rate" refers to the proportion of calls that, once they have been connected to the intended recipient, and therefore have an assigned traffic channel, are interrupted prior to their normal completion by either the calling or called party, the cause of the early termination being within the operator's network. This includes calls dropped due to failure of handover, radio loss, poor signal strength and network congestion. The "percentage of worst affected cells" parameter refers to the percentage of cells having a dropped call rate in excess of two percent (2%) in a measurement period. The dropped call rate and percentage of worst affected cells parameters shall be measured during the BBH.

9.2 These parameters are applicable to all licensees who provide mobile voice services.

Measurement constituents

9.3 The dropped call rate shall be calculated by dividing the number of dropped calls by the number of calls connected to intended recipients. The formula to be used to calculate the measurement parameter is as follows:

$$\frac{\text{The \# of dropped calls}}{\text{The total \# of calls connected to intended recipients}}$$

The result, which forms the dropped call rate, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of dropped calls and the total number of calls connected to intended recipients shall also be provided.

9.4 The percentage of worst affected cells parameter shall be calculated by:

$$\frac{\text{The \# of cells having dropped call rate} > 2\% \text{ in a measurement period}}{\text{The total \# of cells in the reporting area}}$$

The number of worst affected cells and their location shall also be provided.

Measurement agents

9.5 Licensees which provide mobile voice services shall make and report to the Office, measurements of the dropped call rate and the percentage of worst affected cells parameter. Licensees shall make the measurements using techniques appropriate to their own network elements and provide documentation to the Office, which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

9.6 No more than two percent (2%) of on-net calls shall result in dropped calls.

9.7 In the case of the percentage of worst affected cells, the target shall be no more than three percent (3%).

10. Point of Interconnection (POI) Congestion Rate

Measurement summary

10.1 Point of interconnection (PoI) congestion is defined as the ratio of calls failed over the PoI (between two licensees) due to unavailability of free circuits to the total call requests for seizure of PoI circuits. The "PoI congestion" parameter refers to the percentage congestion of the interconnect circuits. This parameter denotes congestion at the outgoing traffic between two networks and is applicable to both fixed and mobile networks. This parameter shall be measured during the BBH.

10.2 This parameter is applicable to all licensees who provide fixed voice services and mobile voice services.

Measurement constituents

10.3 PoI congestion rate shall be calculated using the following formula:

$$\frac{\text{The total \# of calls failed due to unavailable PoI circuits}}{\text{The total \# of call requests for seizure of PoI circuits}}$$

The result, which forms the PoI congestion rate, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest

percentage point. The number of calls failed due to unavailable PoI circuits and the number of call requests for seizure of PoI circuits shall also be provided.

Measurement agents

10.4 Licensees who provide mobile voice services or fixed voice services shall make and report to the Office measurements of the PoI congestion rate during the BBH. Licensees shall make the measurements using techniques appropriate to their own network elements and provide documentation to the Office, which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

10.5 The target for the PoI congestion rate shall be less than or equal to zero-point five percent (≤0.5%) for outgoing traffic on individual PoIs.

11. Traffic Channel (TCH) Congestion Rate

Measurement summary

11.1 The "traffic channel (TCH) congestion" parameter refers to the percentage congestion of traffic channels. This parameter shall be measured during the BBH.

11.2 This parameter is applicable to all licensees who provide mobile voice services.

Measurement constituents

11.3 The TCH congestion rate shall be calculated using the following formula:

$$\frac{\text{The total \# of blocked TCH requests}}{\text{The total \# of TCH requests}}$$

The result, which forms the TCH congestion rate, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of unavailable (blocked) TCH requests wherever they occur during a call attempt, and the total number of TCH requests shall also be provided.

Measurement agents

11.4 Licensees who provide mobile voice services shall make and report to the Office measurements of the TCH congestion rate, and shall make and measure their outgoing traffic during the BBH. The measurements shall be taken at the BSC level. Licensees shall make the measurements using techniques appropriate to their own network elements and provide the Office with documentation which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

11.5 The target for the TCH congestion rate shall be less than or equal to two percent (≤ 2%).

12. Stand Alone Dedicated Control Channel (SDCCH) Congestion Rate

Measurement summary

12.1 The "stand alone dedicated control channel (SDCCH) congestion" parameter refers to the percentage congestion rate of SDCCH resources. This parameter

shall be measured during the BBH.

12.2 This parameter is applicable to all licensees who provide mobile voice services.

Measurement constituents

12.3 The SDCCH congestion rate shall be calculated using the following formula:

$$\frac{\text{The total \# of failed SDCCH requests}}{\text{The total \# of SDCCH requests}}$$

The result, which forms the SDCCH congestion rate, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of unavailable (blocked) SDCCH requests wherever they occur during a call attempt, and the total number of SDCCH requests shall also be provided.

Measurement agents

12.4 Licensees who provide mobile voice services shall make and report to the Office measurements of the SDCCH congestion rate, and shall measure their outgoing traffic during the BBH. The measurements shall be taken at the BSC level. Licensees shall make the measurements using techniques appropriate to their own network elements and provide the Office with documentation which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

12.5 The target for the SDCCH congestion rate shall be less than or equal to one percent ($\leq 1\%$).

13. Paging Channel (PCH) Congestion Rate

Measurement summary

13.1 Where the underlying network is a CDMA network, licensees shall report the paging channel (PCH) congestion rate in place of the SDCCH congestion rate. The "PCH congestion rate" refers to the percentage congestion of paging channels.

13.2 This parameter is applicable to all licensees who provide mobile voice services.

Measurement constituents

13.3 The PCH congestion rate shall be calculated using the following formula:

$$\frac{\text{The total \# of failed PCH requests}}{\text{The total \# of PCH requests}}$$

The result, which forms the PCH congestion rate, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of failed (blocked) PCH requests wherever they occur during a call attempt, and the total number of PCH requests shall also be provided.

Measurement agents

13.4 Licensees who provide mobile voice services shall make and report to the Office, measurements of the PCH congestion rate and shall measure their outgoing traffic during the BBH. The measurements shall be taken at the BSC level. Licensees shall make the measurements using techniques

appropriate to their own network elements and provide the Office with documentation which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

13.5 The target for the PCH congestion rate shall be less than or equal to one percent ($\leq 1\%$).

14. Handover Success Rate

Measurement summary

14.1 "Handover success rate" refers to the proportion of handovers that are successfully completed out of the total handover requests made. A successful handover occurs when a call is handed off from one cell to the next without end-user interruption. This parameter shall be measured during the BBH.

14.2 This parameter is applicable to all licensees who provide mobile voice services.

Measurement constituents

14.3 The handover success rate shall be calculated using the following formula:

$$\frac{\text{The total \# of successful internal and external outgoing handovers}}{\text{The total \# of internal and external outgoing handover attempts}}$$

The result, which forms the handover success rate, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of successful handovers and the total number of internal and external outgoing handover attempts during the BBH shall also be provided.

Measurement agents

14.4 Licensees who provide mobile voice services shall make and report to the Office, measurements of the handover success rate. Licensees shall make the measurements during the BBH using techniques appropriate to their own network elements and provide the Office with documentation which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

14.5 The target for the handover success rate shall be greater than or equal to ninety-eight percent ($\geq 98\%$).

15. Mobile Network Availability

Measurement summary

15.1 The "mobile network availability" parameter refers to a mobile network's ability to respond to requests made by those accessing the network. This parameter measures the amount of time the network is delivering services relative to the amount of time it is expected to deliver services. It measures the degree to which BTSs, Node Bs, eNodeBs and MSCs are operative and not in a state of failure or outage at any given point of time.

15.2 This parameter is applicable to all licensees who provide mobile voice services and mobile Internet access services. Licensees shall separately measure and report on this parameter for each of the mobile networks that

they operate.

Measurement constituents

15.3 Mobile Network Availability will be measured by three (3) parameters:

(a) BTSs, Node Bs and eNodeBs accumulated downtime (including transmission links and circuits) over the measurement period;

(b) MSCs accumulated downtime over the measurement period; and

(c) accumulated downtime for a cell sector over the measurement period.

15.4 BTSs accumulated downtime for the measurement period will be calculated by the following formula:

$$\frac{\text{The total BTS downtime in hours}}{\text{(The total \# of BTSs x the \# of hours in a measurement period).}}$$

15.5 Node Bs accumulated downtime for the measurement period will be calculated by the following formula:

$$\frac{\text{The total Node B downtime in hours}}{\text{(The total \# of Node Bs x the \# of hours in a measurement period).}}$$

15.6 eNodeBs accumulated downtime for the measurement period will be calculated by the following formula:

$$\frac{\text{The total eNode B downtime in hours}}{\text{(The total \# of eNode Bs x the \# of hours in a measurement period).}}$$

15.7 MSCs accumulated downtime for the measurement period will be calculated by the following formula:

$$\frac{\text{The total MSC downtime in hours}}{\text{(The total \# of MSCs x the \# of hours in a measurement period)}}$$

15.8 For each type of network, licensees shall also disclose the accumulated cell sector downtime in hours:

$$\frac{\text{The total cell sector downtime in hours}}{\text{(The total \# of cell sectors x the \# of hours in a measurement period)}}$$

The number of BTSs, Node Bs, eNodeBs, MSCs and cell sectors, the total downtime in hours for each in a measurement period, the number of days with greater than sixty (> 60) minutes downtime and the worst downtime over a twenty-four (24) hour period in a measurement period shall also be reported.

15.9 Any downtime scheduled for routine maintenance or upgrading of the network shall be excluded from the "total downtime in hours" provided that both consumers and the Office are given advance notice of such downtimes.

Measurement agents

15.10 Licensees who provide mobile voice services and mobile Internet access services shall make and report to the Office, measurements of the BTSs, Node Bs, eNodeBs, MSCs and cell sectors accumulated downtime for a measurement period. Licensees shall make the measurements using techniques appropriate to their own network elements and describe to the Office how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

15.11 The target for the BTSs accumulated downtime is less than or equal to one percent (≤ 1%).

15.12 The target for the Node Bs accumulated downtime is less than or equal to one percent (≤ 1%).

15.13 The target for the eNodeBs accumulated downtime is less than or equal to one percent (≤ 1%).

15.14 The target for the MSCs accumulated downtime is less than or equal to one percent (≤ 1%).

15.15 The target for the cell sector accumulated downtime is less than or equal to one percent (≤ 1%).

16. SMS/MMS Completion Rate

Measurement summary

16.1 The "SMS/MMS completion rate" refers to the ratio of correctly sent and received SMSs/MMSs between two mobile devices. It is the proportion of SMSs/MMSs generated between covered and active subscriptions and delivered successfully from one party to the other, to the total number of sent SMSs/MMSs generated in the corresponding measurement period.

16.2 A successful SMS/MMS delivery is one in which the message is transmitted completely without errors between the network termination points and within two (2) minutes after it is sent. In the calculation of this metric, corrupted and duplicate messages shall be deducted from the total number of unsuccessful SMSs/MMSs. This parameter shall be measured during the BBH.

16.3 This parameter is applicable to all licensees who provide SMS and MMS services and shall take into account national SMSs and MMSs generated from active subscriptions on their respective networks and terminating both on-net and off-net.

Measurement constituents

16.4 The SMS completion rate shall be calculated using the following formula:

$$1 - \left[\frac{(\text{unsuccessful SMSs} - \text{duplicated SMSs} - \text{corrupted SMSs})}{\text{The total \# of SMSs sent}}\right]$$

16.5 The MMS completion rate shall be calculated using the following formula:

$$1 - \left[\frac{(\text{unsuccessful MMSs} - \text{duplicated MMSs} - \text{corrupted MMSs})}{\text{The total \# of MMSs sent}}\right]$$

16.6 The results that form the SMS or MMS completion rates shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of SMSs and MMSs successfully delivered and the total number of SMSs and MMSs attempted during the BBH shall also be provided.

Measurement agents

16.7 Licensees who provide SMS and MMS services shall make and report to the Office measurements of the SMS/MMS completion rate. Licensees shall make the measurements during the BBH using techniques appropriate to their own network elements and provide the Office with documentation which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the

calculation of the metric.

Measurement targets

16.8 At least ninety-nine percent (99%) of the number of SMSs of licensees that are attempted between two mobile devices that are active and within network coverage shall be completed successfully.

16.9 At least ninety-nine (99%) of the number of MMSs of licensees that are attempted between two mobile devices that are active and within network coverage shall be completed successfully.

17. Broadband (Internet) Availability Rate

Measurement summary

17.1 The "broadband (Internet) availability rate" parameter measures the reliability of a licensee's broadband service, i.e. the probability that the end-user is able to access the broadband services of his service provider. The broadband (Internet) availability rate is a measure of the period during which the service is available during a measurement period.

17.2 This parameter is applicable to all licensees who provide Internet access services.

Measurement constituents

17.3 The broadband (Internet) availability rate parameter shall be calculated using the following formula:

$$\frac{\text{(The total operational hours} - \text{the total hours of service downtime)}}{\text{The total operational hours}}$$

Operational hours = the number of days in the measurement period x 24 hours
Hours of service downtime = the cumulative duration of downtime per circuit in the measurement period.

To determine the metric, it is important to test the whole transmission chain, which allows access to Internet services outside of the network of the licensee. The total service downtime shall consist of the total duration when any or all of the following network elements are unavailable: the access network, the core network, the local connection and international connection.

17.4 The result, which forms the broadband (Internet) availability rate, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The total hours of service downtime shall also be provided.

17.5 Any downtime scheduled for routine maintenance or upgrading of the network shall be excluded from the "total operational hours" provided that both consumers and the Office are given advance notice of such downtime.

Measurement agents

17.6 Licensees who provide Internet access service shall make and report to the Office, measurements of the broadband (Internet) availability rate. Licensees shall make the measurements during the BBH using techniques appropriate to their own network elements and provide the Office with documentation which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

17.7 This parameter can be measured by checking the accessibility of different web services both within and outside the network of the licensee. The

mixture of the chosen web services shall include services that are hosted both on local and internationally located servers. The number of web services checked shall be such that a false negative is not generated due to a single server being inaccessible.

Measurement targets

17.8 The target for the broadband (Internet) availability rate parameter is ninety-nine point nine five percent (99.95%). This target is applicable to all data networks.

18. Packet Loss Rate

Measurement summary

18.1 The "packet loss rate" parameter refers to the percentage of packets lost during transmission over a network between the end user and the relevant international gateway. The probability of packet loss is a performance parameter that defines the percentage of the total packets submitted that may be discarded during transmission between two designated points.

18.2 This parameter is applicable to all licensees who provide Internet access services.

Measurement constituents

18.3 The packet loss rate parameter shall be calculated using the following formula:

$$\frac{\text{The total \# of packets lost}}{\text{The total \# of packets transmitted between two designated points}}$$

18.4 The result, which forms the packet loss rate, shall be reported as a measurement in the form of a percentage rounded up or down to the nearest percentage point. The number of packets lost and the total number of packets transmitted shall also be provided.

18.5 The packet loss rate shall be measured from the user reference points at the ISP node/POP to the International Gateway/National IXP and from the user reference points at the ISP node/POP to the nearest network access point abroad. The measurements shall be obtained from at least one hundred (100) test transmissions of ICMP Echo Request/Reply messages or speech samples, separated from each other by at least sixty (60) seconds during the BBH for the service. An ICMP Echo Request that does not generate a counter reply is deemed to be lost. The defined packet size for the test transmission shall be of sixty-four (64) bytes. The results received from the tests shall be arranged by the licensee in an ascending order, and the licensee shall be obliged to report only the ninety-fifth (95^{th}) percentile reading. The transmission locations used in the tests shall also be reported.

Measurement agents

18.6 Licensees who provide Internet access services shall make and report to the Office, measurements of the packet loss rate. Licensees shall make the measurements during the BBH using techniques appropriate to their own network elements and provide the Office with documentation which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

18.7 The target for packet loss rate for all types of networks shall not exceed one percent (1%) between the broadband user reference point at the ISP node/POP and the International Gateway/National IXP or between the user

reference points at the ISP node/POP and the nearest network access point overseas. This target is applicable to all data networks.

19. Packet Delay Variation (Jitter)

Measurement summary

19.1 The "packet delay variation (jitter)" parameter measures the variation in the delay of packet delivery. Packet delay variation will be measured in milli-seconds.

19.2 This parameter is applicable to all licensees who provide Internet access services. Licensees shall separately measure and report on this parameter for each of the networks that they operate.

Measurement constituents

19.3 The packet delay variation parameter is determined in accordance with the following formula:

$$J = \sqrt{\frac{\sum_{i=1}^{n}(L_i - \bar{L})^2}{n-1}}$$

Where:

J = packet delay variation in milliseconds
$\bar{L}$ = average delay in milliseconds at measurement time
n = the total number of transmitted packets during the measurement time
L_i = packet delay in milliseconds.

19.4 The packet delay variation shall be measured from the user reference points at the ISP node/POP to the International Gateway/National IXP and from the user reference points at the ISP node/POP to the nearest network access point abroad.

19.5 The measurements shall be obtained from at least one hundred (100) test transmissions of ICMP Echo Request/Reply messages or speech samples, separated from each other by at least sixty (60) seconds during the BBH for the service. An ICMP Echo Request that does not generate a counter reply is deemed to be lost. The defined packet size for the test transmission shall be sixty-four (64) bytes. The results received from the tests shall be arranged by the licensee in an ascending order, and the licensee shall be obliged to report only on the ninety-fifth (95^{th}) percentile reading. The transmission locations used in the tests shall also be reported.

Measurement agents

19.6 Licensees who provide Internet access services shall make and report to the Office, measurements of the packet delay variation parameter. Licensees shall make the measurements during the BBH using techniques appropriate to their own network elements and provide the Office with documentation which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

19.7 The target for the packet delay variation (jitter) parameter is less than fifty (< 50) milliseconds. This target is applicable to all data networks.

20. Latency

Measurement summary

20.1 The "latency" parameter refers to the amount of time it takes to transmit data between the source and destination and receiving the expected response. It is estimated as the time taken for an ICMP Echo Request/Reply pair between the subscriber's customer equipment and the ISP's core network. Latency shall therefore be measured as the round-trip delay.

20.2 This parameter is applicable to all licensees who provide Internet access services. Licensees shall separately measure the latency for national fixed services, national mobile services, and international services, and provide separate measurements for each segment of the network based on the technology used.

Measurement constituents

20.3 Latency shall be measured by taking the average time taken for consecutive ICMP Echo Request/Reply pairs between the user (configuration) reference point and the relevant reference point. Latency for national fixed services and national mobile services shall be measured from the user (configuration) reference points at the ISP node/POP to the International Gateway/National IXP. Latency for international services shall be measured from the user reference points at the ISP node/POP to the nearest network access point overseas.

20.4 These measurements shall be obtained from at least one hundred (100) test transmissions of ICMP Echo Request/Reply messages or speech samples, separated from each other by at least sixty (60) seconds during the BBH for the service. An ICMP Echo Request that does not generate a counter reply is deemed to be lost. The defined packet size for the test transmission shall be of sixty-four (64) bytes. The measurements shall be reported as times in milliseconds rounded to two numerically significant figures. The results received from the tests shall be arranged in an ascending order and the ninety-fifth (95^{th}) percentile reading reported. The transmission locations used in the tests shall also be reported.

Measurement agents

20.5 Licensees who provide Internet access services shall make and report to the Office measurements of the latency parameter. Licensees shall make the measurements during the BBH using techniques appropriate to their own network elements and provide the Office with documentation which describes how the measurements are calculated from data collected from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

20.6 The targets for network latency from the broadband user reference points to the International Gateway/National IXP for the various technologies during the BBH are as follows:

(a) the latency for the national segment of fixed networks shall be less than or equal to eighty (≤ 80) milliseconds, at least ninety-five percent (95%) of the time;

(b) the latency for the national segment of mobile networks (3G and later) shall be less than or equal to eighty (≤ 80) milliseconds, at least ninety-five percent (95%) of the time;

(c) the latency for the national segment of satellite networks shall be less than or equal to two hundred and fifty (≤ 250) milliseconds, at least

ninety-five percent (95%) of the time;

(d) the network latency for the International segment (i.e. from user reference points at the ISP node/POP to the nearest network access point overseas) using any of the networks mentioned above shall be less than or equal to two hundred and fifty (≤ 250) milliseconds for at least ninety-five percent (95%) of the time.

21. Data Transmission Speed

Measurement summary

21.1 The "data transmission speed" parameter is defined as the data transmission rate that is achieved separately for downloading and uploading specified test files between a remote website and a user's computer.

21.2 This parameter is applicable to all licensees who provide Internet access services.

Measurement constituents

21.3 The data download speed shall be calculated by using the following formula:

$$\frac{\text{The size of the test file (data) in ISP Server}}{\text{The transmission time required for error free transfer of the entire data}}$$

The data upload speed shall be calculated by using the following formula:

$$\frac{\text{The size of the test file (data) in ISP Server}}{\text{The transmission time required for error free transfer of the entire data}}$$

21.4 The transmission time is the time period 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.

21.5 Where test files are used, the measurements shall be obtained from at least one hundred (100) test transmissions of incompressible data files, separated from each other by at least sixty (60) seconds. The tests shall be conducted within both the national and international domains. In both cases, the tests shall be carried out from at least five (5) different locations, each of which shall account for at least five percent (5%) of the traffic for the relevant service offering. In the case of a national domain, the server shall be located in Jamaica. In the case of an international domain, the server shall be located at the first point of presence overseas as the Office may designate from time to time. For "national" tests, the transmissions shall be from traffic-weighted locations to other traffic-weighted locations. For "international" tests the transmission shall be from traffic-weighted locations.

21.6 For broadband connections up to ten (10) Mbps the size of the test file shall be ten (10) MB; and for broadband connections above ten (10) Mbps the size of the test file shall be thirty-five (35) MB.

21.7 The results received from the tests shall be arranged by the licensee in an ascending order, and the licensee shall be obliged to report only the ninety-fifth (95^{th}) percentile reading. The transmission locations used in the tests shall also be reported.

Measurement agents

21.8 Licensees who provide Internet access services shall make and report to the Office, measurements of the data transmission speed parameter. Licensees shall make the measurements during the BBH using techniques appropriate to their own network elements and provide the Office with documentation which describes how the measurements are calculated from data collected

from the network elements, clearly stating any counters applicable to the calculation of the metric.

Measurement targets

21.9 The target for the data transmission speed between the user and the nearest serving ISP node during download and upload during the busy hour shall be greater than or equal to ninety-five percent (≥ 95%) of the subscribed level for at least ninety-five percent (95%) of the time.

21.10 This target is applicable to all data networks.

Dated this 14th day of December, 2023.

Director-General
Office of Utilities Regulation