

On grounds of the provisions of Article 3 letters c) and i), Article 4 paragraph (2) letter b), Article 6 paragraph (2), Article 10 paragraph (4), Article 11 paragraph (1) and Article 12 paragraphs (1) and (3) of the Government Emergency Ordinance no.22/2009 on the establishment of the National Authority for Management and Regulation in Communications, approved by Law no.113/2010, with the subsequent amendments, as well as of Article 19 paragraphs (1) and (3) and of Article 21 of Law no.304/2003 on universal service and users' rights relating to the electronic communications networks and services, republished,

# THE PRESIDENT OF THE NATIONAL AUTHORITY FOR MANAGEMENT AND REGULATION IN COMMUNICATIONS

issues this:

# DECISION

# on establishing the quality indicators for the provision of the Internet access service and the publication of the due parameters

**Art.1.** – (1) This decision establishes the quality indicators related to the provision of the Internet access service and imposes on the providers of publicly available electronic communications services the obligation to publish the parameters of these indicators, as well as to include the quality levels for the provided service in the contracts concluded with the end-users and in the general conditions for service provision, as the case may be.

(2) This decision establishes a relevant set of quality indicators related to the provision of the Internet access service, as well as the conditions and means of publication by the providers of publicly available electronic communications services of the parameters of these indicators to enable the end-users to benefit from relevant, comprehensive, comparable and user-friendly information.

(3) This decision shall apply to the commercial offers of publicly available Internet access services, with the exception of the individual offers proposed within direct negotiations.

**Art.2.** The providers of publicly available electronic communications services offering Internet access services, irrespective of the support or technologies used or of the service provision manner, shall have the following obligations:

a) to publish on their own websites the values of the parameters of the administrative quality indicators related to the provision of the Internet access service, under the conditions established in the Annex which is part of this decision;

b) to prepare and publish on their websites a procedure for measuring the administrative quality parameters provided for in the Annex;

c) to send the National Authority for Management and Regulation in Communications, hereinafter referred to as ANCOM, a notice on the fulfilment of the obligations specified under letters a) and b), on the basis of the procedure for their measurement, by indicating the website and the direct link where the respective information is published;

d) to make available for ANCOM, upon request, information on the values of the administrative quality parameters, the measurement procedure and the carrying out of measurements;

e) to include in the contracts concluded with the end-users and in the general conditions for service provision, as the case may be, the quality levels or the information established according to the distinctions under the Annex.

**Art.3.** – (1) The values of the quality parameters provided for in Article 2 letter a) shall be published by the providers of publicly available electronic communications services offering Internet access services on a quarterly basis, as follows:

a) until the 25<sup>th</sup> of April, for the January 1<sup>st</sup> - March 31<sup>st</sup> data collection period;

b) until the 25<sup>th</sup> of July, for the April 1<sup>st</sup> - June 30<sup>th</sup> data collection period;

c) until the 25<sup>th</sup> of October, for the July 1<sup>st</sup> - September 30<sup>th</sup> data collection period;

d) until the 25<sup>th</sup> of January, for the October 1<sup>st</sup> - December 31<sup>st</sup> data collection period.

(2) The providers of publicly available electronic communications services to gain the right to provide Internet access services after the entry into force of this decision shall publish the information specified in Article 2 letter a) until the first of the timelines provided for in paragraph (1) that follows the fulfilment of a 4-month term from the date of gaining the right to provide Internet access services at the latest.

(3) The procedure under Article 2 letter b) shall be published until January 1<sup>st</sup>, 2012.

(4) The providers of publicly available electronic communications services specified in paragraph (2) shall publish the procedure under Article 2 letter b) within 60 days from the date of gaining the right to provide Internet access services.

(5) The information under Article 2 letters a) and b) shall be updated whenever necessary, with the mention of the last modified date.

**Art.4.** – (1) The information under Article 2 letter c) shall be transmitted within 30 days from the date of first publishing the values of the administrative quality parameters, based on the procedure for their measurement.

(2) The information under paragraph (1) shall be transmitted to the ANCOM headquarters or territorial structures where the provider is registered, in one of the following ways:

a) as a hard copy, signed and sealed by the legal representative or by a person mandated therefor, by submission, upon signature, or by mail with confirmation of receipt;

b) in electronic format, having included, attached or logically associated an extended electronic signature based upon a qualified certificate and generated using a secured device for creating electronic signature.

**Art.5.** – (1) ANCOM shall create, manage and make available to the public an interactive application on its website to measure the quality indicators provided for in section B under the Annex. The values of the measured quality parameters shall be calculated upon using a test server placed in an interexchange Internet connection node.

(2) The interactive application mentioned in paragraph (1) shall be developed in consultation with the providers of publicly available electronic communications services under Article 2.

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(3) Within 30 days from receiving a notification from ANCOM on the creation of the interactive application under paragraph (1), the providers of publicly available electronic communications services identified in Article 2 shall cumulatively comply with the following obligations:

a) send ANCOM, in one of the ways established in paragraph (4), complete and accurate information on their commercial offers, with the content and under the form established by ANCOM;

b) introduce the corresponding information in electronic form, for each commercial offer, by accessing the database of the application under paragraph (1) via a web interface made available therefor by ANCOM, whereas the information concerned is to be verified and validated by ANCOM.

(4) Where the providers of publicly available electronic communications services launch a new commercial offer, amend the existing offer or launch a short-term promotional offer which envisages the quality of service indicators as well, the providers in question shall send ANCOM the appropriate information and shall introduce this information in electronic format, under the conditions of paragraph (2), within 4 working days from the date of launching or amending these offers.

(5) The information under paragraph (3) letter a) and paragraph (4) shall be transmitted to the ANCOM headquarters or territorial structure where the provider is registered, in one of the following ways:

a) as a hard copy, signed and sealed by the legal representative or by a person mandated therefor, by submission, upon signature, or by mail with confirmation of receipt;

b) in electronic format, having included, attached or logically associated an extended electronic signature based upon a qualified certificate and generated using a secured device for creating electronic signature.

(6) The providers of publicly available electronic communications services under Article 2 shall not restrict the users' access to the application mentioned in paragraph (1).

(7) The measured values and the due statistics shall be published by ANCOM on the website, in accordance with the timetable provided for in Article 3 paragraph (1).

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**Art.6.** – (1) Until January 20<sup>th</sup>, 2012, the providers of publicly available electronic communications services identified in Article 2 shall include in the contracts concluded with the end-users and in the general conditions for service provision, as the case may be, the quality levels or the mentions set out in accordance with the distinctions under the Annex hereunder, and shall indicate the webpage where the information under Article 2 letters a) and b) is published.

(2) The providers of publicly available electronic communications services to gain the right to provide Internet access services after the entry into force of this decision shall take all appropriate measures in order to observe the provisions of paragraph (1) from the date of gaining this right or from the date provided for in paragraph (1), depending on the later fulfilled term.

**Art.7.** – (1) The providers of publicly available electronic communications services under Article 2 shall keep posted on their websites complete and exact data on the information specified for in Article 2 letter a) in order to enable the end-users to access, if necessary, the values corresponding to the last four quarters as well.

(2) The providers of publicly available electronic communications services under Article 2 shall keep complete and exact records of the measurements regarding the parameters of the administrative quality indicators of the Internet access service made during the last four quarters preceding the quarter corresponding to the ongoing data collection period.

(3) The providers of publicly available electronic communications services under Article 2 shall post on the main page of their website, in an easily visible spot, a direct link to the webpage where the administrative quality parameters of the service are published.

(4) In view of ensuring the accuracy of the published data, ANCOM may decide to verify the records and the measurements made by the providers of publicly available electronic communications services in line with the provisions hereunder, including on the basis of an audit carried out by an independent body, on the provider's expense.

**Art.8.** – The first values of the quality parameters provided for in Article 2 letter a) shall be published until April 25<sup>th</sup>, 2012, for the January 1<sup>st</sup> - March 31<sup>st</sup>, 2012 data collection period.

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**Art.9.** – (1) This decision shall be published in the Romanian Official Journal, Part One, and shall become effective as of June  $1^{st}$ , 2011.

(2) On the date this decision comes into force, the Decision of the President of the National Regulatory Authority for Communications no.138 of December 16<sup>th</sup>, 2002, published in the Romanian Official Journal, Part One, no.20 of January 15<sup>th</sup>, 2003 shall be repealed.

# PRESIDENT, MARIUS CATALIN MARINESCU

Bucharest, 9 May 2011 No.1201

#### ANNEX

## QUALITY INDICATORS RELATED TO THE PROVISION OF THE INTERNET ACCESS SERVICE

## A. ADMINISTRATIVE QUALITY INDICATORS

#### A.1. Supply time for Internet access

### A.1.1. Definition

*The supply time for Internet access* is the time duration, expressed in elapsed days, from the instant a provider receives a valid supply order or, when applicable, a valid order for the activation of the Internet access service to the instant the service is functional and becomes available for the end-user who made the request.

An Internet access service is considered to be functional when both physical access and logical access are ensured.

A valid order may be made verbally, in writing or in any other form accepted by the provider.

#### A.1.2. Specific parameters

The values of the following parameters are counted and published, for each of the supply times for Internet access assumed by the provider in the contracts concluded with the end-users and in the general conditions for service provision, as the case may be:

a) the time by which the fastest 80% of orders are completed;

b) the time by which the fastest 95% of orders are completed;

c) the percentage of orders completed by the date agreed with the end-user;

In view of ensuring the possibility to assess the quality of the offered service, the following information associated to the quality indicator shall be published:

a) the provider's hours during which, and ways in which, orders may be submitted;

b) the standard accuracy for keeping appointments - in view of installations - if the provider quoted such a window for keeping appointments.

### A.1.3. Data collection and calculation

The data are collected upon monitoring the real registrations from the data collection period, itemized on types of access technologies, and taking into consideration only the orders for which the installation technical conditions are met.

The order completion time is calculated in elapsed days.

If the service is functional and becomes available for the end-users on the same day the request was made then the supply time of the Internet access service is considered to be one day.

Where the installation and activation of the service does not require the intervention of one of the provider's technical teams at the service provision point, the supply time of the Internet access service is calculated from the instant the user's order for activation reached the provider to the instant the service has become functional and available for the end-user.

The parameters provided for in point A.1.2. letters a) and b) are measured as follows:

- the supply times for Internet access are sorted in an ascending order;

- x% from the total number of measurements made is a number "n" to be rounded down;

- the "n"<sup>th</sup> time in the sorted ascending list of measurements will be the parameter "the time by which the fastest x% of orders have been completed".

Where a service provider and end-user agree that a request for multiple connections or service instances will be completed in stages, each agreed delivery time counts as a separate customer order for measurement purposes.

As well, where an end-user orders service to be provided at several sites, the provision of service at each site counts as a separate end-user order.

Where the providers offer different supply times for residential and business users, or based on other criteria, the statistics shall be published separately.

The statistics include all the connections installed in the data collection period, regardless of the date on which the providers received the supply orders. The statistics shall include the following cases:

a) the supply orders which require the installation of a new access line;

b) the supply orders which require an existing access line (e.g. over xDSL, including the use of the local loop access service).

The following shall not be included:

a) the connection orders cancelled by the end-users;

b) the orders for the installation of additional services;

c) the cases where the cases where essential access to end-user premises is not provided by the end-user on the agreed date and time, in view of carrying out the installation procedures;

d) for the parameters under point A.1.2. letters a) and b), the cases where the delays to installation are expressly requested by the end-user; however, these cases shall be included instead in the statistics regarding the parameter under point A.1.2. letter c).

In view of ensuring the possibility to verify the published data, the providers shall keep the registrations referring to the supply time for Internet access indicator and these registrations shall contain the date when the initial supply order was submitted, as well as the date on which this service was received or rendered operational.

# A.1.4. Quality parameters which must be included in the contracts concluded with the end-users and in the general conditions for service provision, as applicable

The contracts concluded between the providers and the end-users and the general conditions for service provision, as applicable, shall specify the quality level assumed by the provider for the indicator "supply time for Internet access".

#### A.2. Fault repair time

#### A.2.1. Definition

*The fault repair time* is the duration, in hours, from the instant a valid fault has been reported to the service provider to the instant when the service element or Internet access service has been restored to normal working order.

A valid fault report is a report of disrupted or degraded service that is accepted as justified by the provider and attributable to the network whereby the Internet access service is provided, which requires repairs. In the case of the Internet access service provided without guaranteed technical quality parameters, a fault report is a report of disrupted service.

### A.2.2. Specific parameters

The values of the following parameters shall be counted and published, for each of the fault repair times included by the provider in the contracts concluded with the end-users and in the general conditions for service provision, as applicable:

a) the time by which the fastest 80% of valid faults have been repaired;

b) the time by which the fastest 95% of valid faults have been repaired;

c) the percentage of faults cleared in the time agreed with the user.

In view of ensuring the possibility to assess the quality of the offered service, the information associated to the quality indicator referring to the standard accuracy for keeping appointments, if the provider quoted such a window for keeping appointments, shall be also provided.

Where there are special circumstances (adverse weather conditions, closed or impracticable roads etc.), the providers may offer in addition to the mentioned specific quality parameters other values which exclude the effects of those circumstances. In this case, a note explaining the differences between the two values shall be published.

### A.2.3. Data collection and calculation

The fault repair time is measured in elapsed hours.

The statistics shall include all the valid faults cleared in the data collection period, irrespective of when the fault was reported.

These parameters shall be measured upon monitoring all the registrations concerning the valid faults cleared in the data collection period.

The parameters under point A.2.2. letters a) and b) are calculated as follows:

- the fault repair times are sorted in an ascending order;

- x% from the total number of measurements made is a number "n" to be rounded down;

- the "n"<sup>th</sup> time in the sorted ascending list of measurements shall be the parameter "time by which the fastest x% of valid faults have been repaired".

The situations where the faults require the intervention on other electronic communications networks, interconnected with the provider's network, on which the provider is unable to receive information as to the repair of the occurred fault are not included. As well, the statistics shall not include the situations where the providers receive complaints for faults which have already been cleared nor for the reported faults that are caused by the equipment owned by the end-user.

The provider may exclude from the statistics the cases where:

a) the fault repair depends upon access to the end-user premises and this access is not possible at the desired time;

b) the end-user requests a delay.

When calculating the fault repair time, the providers that choose to include the abovementioned cases may substract from the measured time the delay introduced by the end-user.

The provider that may not distinguish between:

a) faults attributable to its individual network;

b) faults attributable to other networks;

c) faults attributable to the terminal equipment owned by the end-user;

d) invalid faults,

shall use for all parameters the total number of reported faults, specifying this in the published document.

In view of ensuring the possibility to verify the published data, both the fault report and the repair report shall mention the registration date and time, respectively the fault repair date and time.

# A.2.4. Quality parameters which must be included in the contracts concluded with the end-users and in the general conditions for service provision, as applicable

The contracts concluded between the providers and the end-users and the general conditions for service provision, as applicable, shall include the quality level assumed by the provider for the indicator "fault repair time".

#### A.3. Frequency of the end-user complaints

#### A.3.1. Definition

*The frequency of end-user complaints* is the number of complaints logged per end-user per data collection period.

#### A.3.2. Specific parameters

The value of the parameter "number of complaints logged per end-user per data collection period" shall be counted and published.

Where complaints attributable to the prejudicial interferences generated by electronic communications networks located on the territory of a neighbouring country are logged, the published parameter may exclude the effects of these interferences, whereas the prejudicial interference related complaints shall be counted separately without being published.

In view of ensuring the possibility to assess the quality of the offered service, the information associated to the quality indicator "frequency of end-user complaints", referring to the hours during which faults may be reported and the means of reporting, shall be also published.

### A.3.3. Data collection and calculation

The statistics include all the complaints received in the data collection period, regardless of the validity and subject of the complaint, or any other element invoked in the complaint. The provider must create and permanently update a register where to enlist all the complaints logged by the end-users, highlighting separately the complaints relating to faults, respectively those relating to bill correctness. The provider shall communicate the end-user a registration number for each logged complaint.

Where more than one complaint is made by the same end-user on the same matter, each instance of the complaint shall be counted and registered separately.

Where the end-user complains again before an existing complaint has been closed, then this should not be treated as a separate complaint but as a continuation of the first unclosed complaint.

The number of complaints logged per end-user shall be calculated as the ratio between the total number of complaints and the number of Internet access end-users registered in the last day of the data collection period.

#### A.4. Frequency of fault complaints

#### A.4.1. Definitions

*The frequency of fault complaints* is the number of complaints generated by the service disruption or degradation, logged per end-user per data collection period.

#### A.4.2. Specific parameters

The number of fault complaints logged per end-user per data collection period shall be counted and published.

Where complaints attributable to the prejudicial interferences generated by electronic communications networks located on the territory of a neighbouring country are logged, the published parameter may exclude the effects of these interferences, whereas the prejudicial interference related complaints shall be counted separately without being published.

#### A.4.3. Data collection and calculation

The statistic includes all the valid complaints, received in the data collection period.

A valid fault report is a report of disrupted or degraded service that is accepted as justified by the provider and attributable to the network whereby the Internet access service is provided, requiring repairs to be done.

In the case of cleared faults, the complaints subsequently submitted by other end-users reporting the same faults, shall be considered valid.

Where more than one complaint is made by the same end-user on the same matter, each instance of the complaint shall be counted and registered separately.

Where the end-user complains again before an existing complaint has been closed, then this should not be treated as a separate complaint but as a continuation of the first unclosed complaint. The frequency of fault complaints shall be calculated as the ratio between the total number of fault complaints and the number of Internet access end-users registered in the last day of the data collection period.

#### A.5. Frequency of bill correctness complaints

#### A.5.1. Definition

*The frequency of bill correctness complaints* is the proportion between the number of bill correctness complaints and the total number of bills issued in the data collection period.

A bill correctness complaint is an expression of the subscriber's dissatisfaction with regard to the payment obligation as opposed to the Internet access services actually provided, which may be communicated orally, in writing or in any other form accepted by the provider.

The subscriber's dissatisfaction may concern, for instance, the billing period, the connection/installation/reconnection/disconnection tariff, the cost-free offers/ the tariff discounts the subscriber benefited from, the additional traffic generated upon exceeding the traffic limit included in the subscription, the total billed amount, or any other such elements triggering the augmentation of the payment obligation.

A bill correctness complaint must not be confused with a billing query (a request for information) or with a fault report.

#### A.5.2. Specific parameters

The value of the parameter "frequency of bill correctness complaints" shall be counted and published.

#### A.5.3. Data collection and calculation

The data are gathered during the data collection period upon counting the number of bill correctness complaints received from subscribers.

The statistic includes all billing complaints received in the data collection period, regardless of the validity of the complaint, Internet access supply date or any other elements invoked in the complaint.

This parameter shall be calculated by dividing the total number of bill correctness complaints, lodged in the data collection period, by the total number of bills issued in the same period.

### A.6. End-user complaint resolution time

### A.6.1. Definitions

*The end-user complaint resolution time* means the duration, expressed in clock hours, from the instant a valid complaint is notified to the provider to the instant the respective complaint has been resolved.

#### A.6.2. Specific parameters

The values of the parameters enlisted below shall be counted and published for each of the end-user complaint resolution times assumed by the provider in the contracts concluded with the end-users or in the general conditions for service provision, as applicable:

a) the time by which the fastest 80% of complaints have been resolved;

b) the time by which the fastest 95% of complaints have been resolved;

c) the percentage of complaints resolved within the time duration assumed by the provider.

#### A.6.3. Data collection and calculation

The complaint resolution time is calculated in hours.

The statistics include all the valid complaints received in the data collection period.

Where the provider assumes different times for resolving the complaints, itemizing these by their type, the statistics may be published separately for each type of complaint.

The parameters under point A.6.2. letters a) and b) are calculated as follows:

- the end-user complaint resolution times are sorted in an ascending order;

- x% from the total number of measurements made is a number "n" to be rounded down;

- the "n"<sup>th</sup> time in the sorted ascending list of measurements shall be the parameter "time duration during which the fastest x% of the complaints have been resolved".

Where more than one complaint is made by the same end-user on the same subject, each instance of the complaint shall be counted and registered separately.

If an end-user complains again before an existing complaint has been closed, then this shall not be treated as a separate complaint but as a continuation of the first unclosed complaint.

When calculating the complaint resolution time, the provider may substract from the measured time any delay introduced by the customer.

If the resolution of a complaint is delayed because the collaboration of the end-user is needed but can not be obtained in a reasonable term, the instance may be excluded from the statistics.

# A.6.4. Quality parameters which must be included in the contracts concluded with the end-users and in the general conditions for service provision, as applicable

The contracts concluded between the providers and the end-users and the general conditions for service provision, as applicable, shall include the quality level assumed by the provider for the indicator "end-user complaint resolution time".

### **B. TECHNICAL QUALITY INDICATORS**

#### B.1. Data transmission speed

#### B.1.1. Definitions

*The data transmission speed* is the data transmission rate, measured in kilobits/second (kbps) or Megabits/second (Mbps), achieved separately for the transmission of the test files

specified for upstream and, respectively, downstream, between the web site provided for in Article 5 paragraph (1) and an end-user's terminal equipment.

The data transmission speed is dependent on the connection standard and/or on the technology employed within which the nominal or maximum transmission rate is indicated.

The nominal/maximum data transmission speed is the rate specified in the provider's commercial offer.

The guaranteed minimum data transmission speed is the minimum rate the provider commits to ensure in line with the commercial offer and the contract concluded with the enduser. If the provider does not ensure a guaranteed minimum speed, then the respective provider shall explicitly mention this in the contract or in the general conditions for service provision.

*The measured data transmission speed* means, for a given connection, the data transmission speed measured and displayed in real time via an application made available to the end-user by ANCOM.

### **B.1.2. Specific parameters**

The values of the following parameters shall be counted and published, broken down for upstream and downstream, corresponding to each nominal/maximum transmission speedand/or guaranteed minimum data transmission speed:

- a) the nominal/maximum data transmission speed;
- b) the guaranteed minimum data transmission speed, if applicable;
- c) the measured data transmission speed;
- d) the average data transmission speed in the course of the data collection period;
- e) the number of measurements made in the course of the data collection period.

### B.1.3. Data collection and calculation

The data are gathered in the course of the data collection period by measuring the traffic generated by an end-user via the test file, by means of an application available on the ANCOM website. The application contains cache prevention mechanisms.

The measured data transmission speed is calculated in real time, by dividing the size of the test file by the transmission time required for a complete and error-free transmission, the outcome being displayed on the application webpage. The test file is a file containing a sequence of random numbers. As well, the test file may contain data that were already compressed, such as a .zip or .jpg file. The test file may have at least twice the size (in kbit) of the nominal/maximum data transmission rate (in kbps) for the access connection under consideration.

For each nominal/maximum data transmission speed, the average data transmission speed is calculated as the arithmetic mean of the measured data transmission speed for all the end-users who accessed the application and for all the measurements made in the course of the data collection period.

B.1.4. Quality parameters which must be included in the contracts concluded with the end-users and in the general conditions for service provision, as applicable

The contracts concluded between the providers and the end-users and the general conditions for service provision, as applicable, shall include the nominal/maximum transmission speed and the guaranteed minimum transmission speed. If the provider does not ensure a guaranteed minimum speed, then the respective provider shall explicitly mention this in the contract or in the general conditions for service provision.

# B.2. Packet transmission delay

#### **B.2.1.** Definitions

*The packet transmission delay* is the time duration, in milliseconds, from the instant the first bit of the packet passes through the access line of the source terminal equipment to the instant the last bit of the same packet has been received by the destination terminal equipment. The data packet transmission delay is the sum between two components:

a) the time duration taken by the first bit of the packet to reach from source to destination (delay of the transmission way) which depends on the physical distance of the connection (the propagation delay), the number of active and passive equipment crossed along the link (the processing delay), and the instant network load (the congestion delay);

b) the time duration taken to transmit all the bits within the packet, which depends on the data transmission rate through the access line.

The maximum packet transmission delay is the value of the indicator specified in the provider's commercial offer.

*The measured packet transmission delay* is the delay measured and displayed in real time via an application made available for the end-user by ANCOM.

### **B.2.2. Specific parameters**

The values of the following parameters are counted and published:

- a) the maximum packet transmission delay;
- b) the measured packet transmission delay;
- c) the average packet transmission delay;
- d) the number of measurements made.

### B.2.3. Data collection and calculation

According to the definition, the measurement of this indicator would require using two synchronized test equipment items (monitoring programmes), located in the two terminal points of the connection. Out of practical reasons, *the loop delay*, which means *the bidirectional transmission delay* measured in the source terminal point by the reflection (retransmission) of the packets in the other connection terminal point, shall be measured (*in milliseconds*).

The data are gathered in the course of the data collection period by measuring the traffic generated by an end-user via an application available on a webpage.

The transmission delay is calculated in real time, by halving the time necessary to send an *Echo Reply Message* between a web site and an end-user's terminal equipment, the outcome being displayed on the application webpage. To establish the measured value, the *Echo Reply Message* shall be sent at least 10 times. The average transmission delay is calculated as the arithmetic mean between the transmission delays of the packets of all end-users who accessed the computer application in the course of the data collection period.

# B.2.4. Quality parameters which must be included in the contracts concluded with the end-users and in the general conditions for service provision, as applicable

Where the provider ensures a guaranteed value of the parameter "maximum data packet transmission delay", the respective provider shall mention the value of this parameter in the contract and in the general conditions.

# B.3. <u>Jitter</u>

# B.3.1. Definitions

*The jitter* is the difference, in milliseconds, between the transmission delays (B.2. indicator) achieved by two consecutive packets.

The maximum jitter is the value of the indicator specified in the provider's commercial offer.

*The measured jitter* is the transmission delay measured and displayed in real time via an application made available for the end-user by ANCOM.

# **B.3.2. Specific parameters**

The values of the following parameters are counted and published:

- a) the maximum *jitter*,
- b) the measured jitter,
- c) the average *jitter*,
- d) the number of measurements made.

# B.3.3. Data collection and calculation

The data are gathered in the course of the data collection period by measuring the traffic generated by an end-user via test files, upon making use of a computer application available on a webpage.

Jitter is measured in real time, by measuring the difference between the transmission delays occurred between two consecutive *Echo Reply Messages*, sent between a web site and an end-user's terminal equipment, the results being displayed on the application webpage. To establish the measured value, the *Echo Reply Message* shall be sent at least 10 times.

The average *jitter* is calculated as the arithmetic mean between the packet delay variations of all the end-users who accessed the computer application during the data collection period.

# B.3.4. Quality parameters which must be included in the contracts concluded with the end-users and in the general conditions for service provision, as applicable

Where the provider ensures a guaranteed value of the parameter "maximum *jitter*", the respective provider shall mention the value of this parameter in the contract and in the general conditions.

# B.4. Packet loss rate

## **B.4.1.** Definitions

*The packet loss rate* is the percentage ratio between the number of sent data packets which did not reach or reached only partly the destination, and the total number of data packets sent by the source.

The maximum packet loss rate is the value of the indicator specified in the provider's commercial offer.

*The measured packet loss rate* is the packet loss rate measured and displayed in real time by means of an application made available for the end-user by ANCOM.

### B.4.2. Specific parameters

The values of the following parameters are counted and published:

- a) the maximum packet loss rate;
- b) the measured packet loss rate;
- c) the average packet loss rate;
- d) the number of measurements made.

# B.4.3. Data collection and calculation

The data are gathered in the course of the data collection period by measuring the traffic generated by an end-user upon making use of a computer application available on a webpage.

The value of the packet loss rate is calculated as the percentage ratio between the number of sent data packets which did not reach or reached only partly the destination, and the total number of packets sent between a web site and an end-user's terminal equipment, the result being displayed on the application webpage. At least 100 IP packets shall be sent in order to establish the value.

The average packet loss rate is calculated as the arithmetic mean between the packet loss rates of all the end-users who accessed the computer application during the reference period.

# B.4.4. Quality parameters which must be included in the contracts concluded with the end-users

Where the provider ensures a guaranteed value of the parameter "maximum packet loss rate", the respective provider shall mention the value of this parameter in the contract and in the general conditions.