Broadband Internet – Quality of Service Framework

Decision Notice

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1 Introduction

In January 2012, the MCA published a consultation document proposing a Quality of Service Framework for Broadband Internet. Following the completion of the consultation process, this document puts forward a **Quality of Service Framework** in respect of broadband Internet services that addresses the following three objectives:

- the identification of a minimum number of parameters considered suitable to characterise a broadband Internet service;
- the establishment of the relevant methodology to measure these parameters; and
- the establishment of a set of obligations that will be incumbent on ISPs and which will establish with a level of confidence, that the service available to the subscriber is the service contracted

The MCA's 'Response to Consultation – Broadband Internet – Quality of Service Framework' annexed to this Decision provides an overview of the consultation conducted by the MCA on the subject matter, the responses to the Consultation and the rationale for the various Decisions captured in this Decision Notice.

2 Legal Background

Regulations 39[1] and 39[2] of the "Electronic Communications Networks and Services (General) Regulations", [SL399.28 of the Laws of Malta[1]] (hereinafter "ECNSR"), empowers the Authority, subject to a public consultation, to require ISPs to measure and publish a set of QoS parameters suitable for the service they offer, which information must be published in a manner which is comparable, adequate and up-to-date.

The provisions in regulations 37 and 39 of the ECNSR state that service or network providers must publish the QoS information specified in regulation 39 of the ECNSR in at least the following:

- at the point of sale, either verbally by the representative or through material easily accessible by the subscriber available at the retail outlet; and
- on a website if the network or service provider owns a website.

Regulation 35[1][b][iv] of the ECNSR requires service providers to include the following information in the contracts concluded with their subscribers:

- the service availability;
- the minimum access speed, which should not be significantly lower than the marketed upper limit; and
- information about the forms of traffic management and other restrictions on traffic which the ISP adopts on its connections.

Regulations 35, 37, and 39 of the ECNSR are equally applicable to ISPs without distinction to the platform over which the Internet service is delivered. Also, regulations 35 and 37 of the ECNSR, do not distinguish between broadband subscribers who avail themselves of contracts offered by the ISPs and those subscribers which negotiate tailor made contracts with the ISPs.

Without prejudice to the Authority's right to issue further decisions in respect of the implementation of regulations 35, 37 and 39 of the ECNSR in order to extend the scope of Quality of Service Framework, this Decision is limited to:

a) Broadband Internet service which is delivered using fixed access networks. These include both wired access networks and fixed wireless access networks. For the avoidance of doubt, broadband Internet service which is delivered over mobile access networks is outside the scope of this Decision.

b) Any reference to the term 'subscriber' is restricted to individuals or entities which avail themselves of standard contracts offered by the ISP. Individuals or entities which negotiate a tailor made contract with their ISPs are outside the scope of this Decision.

Extracts of regulations 35, 37 and 39 of the ECNSR are reproduced in Annex 1 of this Decision Notice.

[1] As per S.L. 399.28 of the Laws of Malta

3 Definitions

In this document the following definitions are used:

"Internet Service Provider" is an undertaking which provides access to the Internet to its subscribers.

"Point of Presence" (PoP) means an access point which connects an Internet Service Provider to the Internet.

"Subscriber" means any person who avails himself of any contract which is offered by the Internet Service Provider, excluding tailor made contracts.

"Time Consistent Busy Hour" The 1 hour period starting at the same time each day for which the average traffic of the resource group concerned is greatest over the days under consideration.

"End user" means any person who makes use of applications which are available over the Internet.

4 Quality of Service Parameters

The Quality of Service of Broadband Internet shall be measured on the basis of

a) Data Transmission Speed

Data Transmission Speed defined as the time taken for an amount of data to be transferred successfully from Point A to Point B which points are both connected to the Internet. The subscriber's end is located at Point A. Data transmission speed is measured in both the download and the upload directions as follows:

i. **Data Transmission Speed in the Download Direction** shall refer to the Data Transmission Speed achieved by a broadband connection when data is flowing from the subscriber's end of the connection towards a machine connected to the Internet and acting as a data receiver at Point B;

ii. **Data Transmission Speed in the Upload Direction** shall refer to the Data Transmission Speed achieved by the broadband connection when data is flowing from a machine connected to the Internet, acting as a data transmitter located at point B, in the direction of the subscriber's end of the connection;

b) Availability of Internet Access (Network Availability)

In line with ETSI ES 202 765-4, 'Availability of Internet Access' is defined as the probability that the end user, through his/her Internet connection, is able to reach other network elements which are also connected to the Internet.

Availability of Internet Access is further defined as the ratio of the total time during which the Access Network, the Core Network and the Local and International Connections are simultaneously available to the subscriber in a given period of time.

c) Latency

Latency defined as the time interval between the instances that a packet of data is launched from an IP based machine located at 'Point A' to the moment it is received by machine located at 'Point B'.

d) Packet Loss

Packet Loss defined as the percentage ratio of those packets sent from 'Point A' in the network which did not reach their intended destination, Point B, to the total number of packets transmitted over a specific time interval.

5 Measurement Methodology

5.1 Technical Measurements

a) The ISP is required to measure the QoS parameters using passive measurement techniques.

b) The term 'Reference Point' used in this section is defined as that network element within the Core Network of the ISP such that it is as near as possible to the point whereby the core network interfaces with the external connection points (typically the International Gateway connection and the Local Gateway) whereby all incoming connections from the subscribers' end are expected to be concentrated.

5.1.1 Measurement Method of Data Transmission Speed

The upload and download speeds shall be derived from the measurement of SNMP counters that are maintained by the router(s) located at the Reference Point.

5.1.2 Measurement Method of Availability of Internet Access

In order to measure the Availability of Internet Access the ISP shall take into account:

a) **Access Network Availability**: The period(s) of time during which the Access Network is able to receive connections from the Customer Premises Equipment (CPE)

b) **Core Network Availability**: The period(s) of time during which the Core Network is available to route traffic from the Access Network and the International and/or the Local Connections.

c) **Local and International Connections Availability**: The period(s) of time during which the Local and International connections are available and able to carry traffic. A local connection is considered available when the ISP can connect to at least one server which is connected to the Internet via a local ISP. An International connection is considered available when the ISP can connect to another server which is not based in Malta via its international connections.

d) The **Unavailability due to Planned Maintenance** shall consist of total duration when either of the Access Network, Core Network, and the Local and International Connections is unavailable due to maintenance.

Provided that such unavailability occurs during the period between midnight (00:00) (included) and six in the morning (06:00) excluded and is the result of planned maintenance.

Provide further that any such unavailability is clearly stated when availability figures are forwarded to the Authority.

The "**Total Available Period**" shall consist of the total duration when the Access Network Availability, the Core Network Availability and the Local and International Connections Availability overlap simultaneously.

The "**Total Period of Downtime**" shall consist of the total period of time which excludes the "Total Available Period" and the "Unavailability due to Planned Maintenance".

Availability of Internet Access shall equate to (1 – (Total Period of Downtime)/(Total Available Period + Total Period of Downtime + Unavailability due to Planned Maintenance)) expressed as a percentage.

5.1.3 Measurement Method of Latency

Latency shall equate to half the average time taken for a minimum of five (5) consecutive ICMP Echo request/reply pairs between the subscriber's CPE and the Reference Point.

5.1.4 Measurement Method of Packet Loss

Packet Loss shall equate to the ratio of the number of ICMP echo/reply packets which are lost when transmitted from the Reference point to the subscriber's CPE, as opposed to the total number of ICMP requests. An ICMP ping request which does not generate a counter reply is deemed to be lost.

5.2 Data Sampling Methodology

Measurement of QoS parameters is to be based on a sample of appropriate size such that the resultant measurements enjoy a margin of error which is not larger than 5%. Furthermore the chosen sample base must be representative of

a) Each individual broadband package offered by the ISP;

b) The distribution of the subscribers across the whole territory of Malta and Gozo;

c) The distribution in time over a 24 hour basis, 7 days a week with the exclusion of periods in which there is no service due to preventive maintenance.

d) In those cases where the ISP confirms that internal wiring, at the subscriber's premises, to be the cause of lack of performance of the broadband connection, the ISP may exclude such sources, provided that such exclusions are documented.

5.3 Data Reporting and Publishing

a) The ISP shall prepare its QoS parameters measurements in the form of a report. The ISP should choose its own format provided that the following information is documented as part of the report:-
   - the margin of error of the statistical figures;
   - the methodology used for the collection of data including any limitations which may have an impact on the results;
   - a clear identification of the location points within the ISP's network that form the basis of the results measured;
   - the presentation of QoS measurements for each broadband package and which measurements need to be broken down by region where each region is established in accordance with the Demographic Review of 2010 as published by the National Statistics Office.

b) This report is to be provided to the Authority every quarter.

   The Authority through this Decision reserves the right to establish a reporting format should it deem this necessary in order to make the QoS measurements easily understandable and comparable between the different ISPs.

c) After an adequate period of review of the reports submitted by the ISPs, the Authority shall establish a date for publication of these reports on the ISPs website.

The requirement for data reporting to the Authority shall come into effect after 9 months from the publication of this Decision.

6 Network Performance Parameters

6.1 Information in respect of Network Performance Parameters

When the Authority is required to address situations whereby

a) Consumer complaints are received at the Authority citing significant deterioration of broadband QoS; and/or
b) A deterioration of broadband QoS is observed by the Authority through studies which it may conduct from time to time or otherwise,

it may deem necessary to request information from the relevant ISP about its Network Performance in order to establish the source(s) of the said deterioration. In doing so, the Authority will be assessing the network performance of the ISP using:

a) **Connection Oriented** parameters as listed in 6.2 and
b) **Core Network** related parameters as listed in 6.3 below.

6.2 Connection Oriented Parameters

Connection Oriented Parameters shall comprise of:

a) **Available Data Rate** defined as the speed by which a connection can handle traffic. This is measured in bits per second (bps).

b) **Connection Utilization** defined as the ratio between the actual bandwidth which is committed and in use as a percentage of the Available Data Rate of a given connection.

c) **Packet Drop Ratio** defined as the number of packets which a specific connection drops out of the network as a ratio of all the packets which are handled by the connection.

These parameters are applicable to the Access Network, and the Local and the International Connections which are defined as follows:

a) the **Access Network** which shall refer to all the network elements comprising of the connections labelled 'A' and the component labelled "Access Network" in Figure 1. This delineation encompasses the connection of each individual subscriber up to the point where these are aggregated to the point of connection to the core network.

b) the **Local and International Connections (Gateways)** shall refer to the external connections of an ISP (labelled 'C' and 'D' in Figure 1 below). For the purpose of estimating the Network Performance of these connections, the ISP shall aggregate together these connections according to their termination. All connections which are actively used to carry locally bound traffic shall be considered as single Local Connection, while those connections which an ISP uses to carry traffic to/from International servers shall be considered as a single International Connection. Such aggregation should exclude those connections which are in a

state which do not normally carry traffic and furthermore, require an intervention to be able to do so.

In order to delineate the area of influence of the ISP and isolate the ISP's network from the remaining components of the Internet, the boundaries that are appropriate for the International connectivity point should be extended to the first International Point of Presence (PoP) where the International connection is terminated.

6.3 Core Oriented Parameters

a) **Bandwidth Utilization** is defined as the amount of bandwidth which is utilized at the Core Network as a ratio of the total bandwidth available in the core network. This indicator is to be measured during the Time Consistent Busy Hour (TCBH).

b) **Packet Drop Ratio** is defined as the number of packets which are dropped out of the network by the Core Network as opposed to the total number of packets which are handled by the core network.

These parameters are applicable to the **Core Network** which term shall refer to those network elements which connect together the Access Network, and any external connections, either local or International which an ISP may have. The core network is labelled as "ISP Core Network" in Figure 1 below.

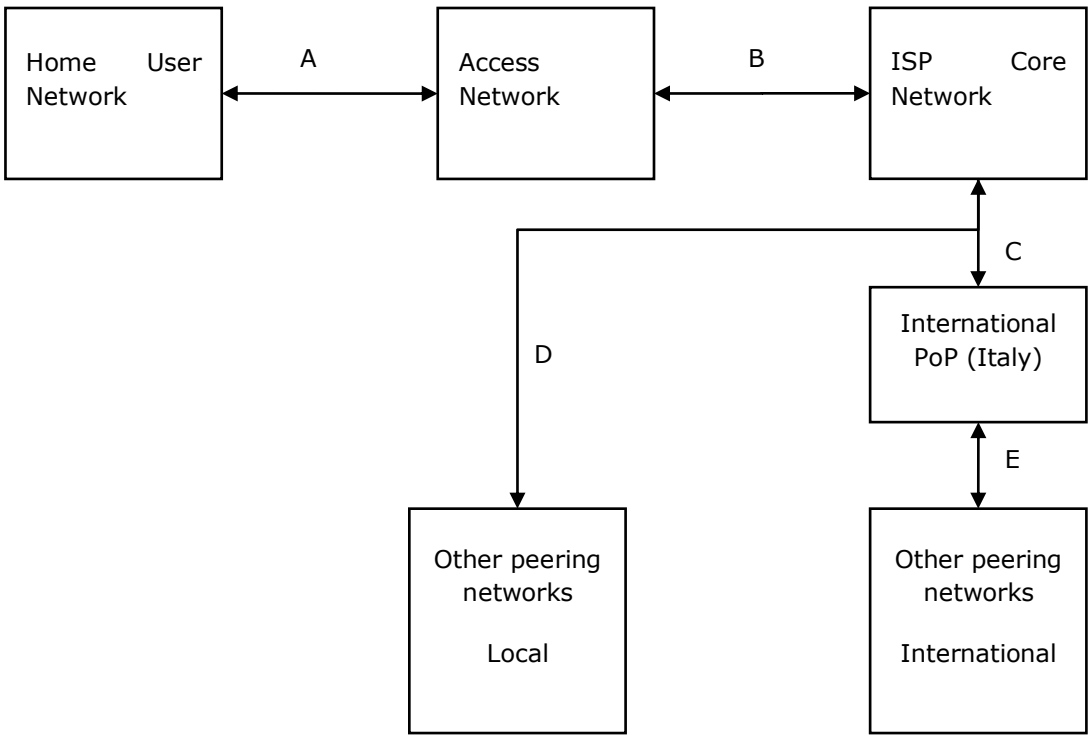

Figure 1 1 High level schematic diagram of a generic ISP setup

7 Service Contract Obligations

7.1 Introduction of Typical Speed Range

a) The ISP is required to qualify the Broadband Access Speed through the use of the Typical Speed Range (TSR) parameter which is computed in line with the procedure listed in 7.1.1 in the case of connections sold under existing packages and in accordance to procedure listed 7.1.2 in the case of new broadband packages.

b) The established TSR shall be indicated to the subscriber

i. in any advertising material with the same importance as is given to the headline speed

ii. at the point of sale, and

iii. in any subscriber's contract issued after the effective date of this decision.

c) Should an ISP opt to make use of a numerical figure to describe the speed of its broadband Internet packages additional to the Typical Speed Range, the ISP should ensure that in no instance can the headline speed be greater than the maximum access speed ever achievable by a connection sold under the specified headline speed. The ISP should take due consideration to Access Network configuration which might limit, in any way, the performance of the broadband connection.

d) The ISP should not sell to its subscribers connections which cannot perform within the limits of the TSR figures

Provided that in the case whereby a subscriber insists in purchasing a particular package in spite of the fact that the ISP cannot guarantee the performance of the connection within the established TSR, the subscriber contract should reflect such a scenario.

iv. ISPs are required to calculate the TSR figures on a quarterly basis and to maintain the statistical data related to the calculation of the latest TSR figures for audit purposes.

This Decision comes into force after nine (9) Months from publication date of this Decision Notice

7.1.1 Procedure for the Calculation of the TSR for <u>existing</u> Broadband Packages

a) The ISP should choose a statistical sample out of the sold broadband connections which is representative of all connections sold under the same headline speed. The chosen sample should be such that the resultant statistics would enjoy a statistical margin of error of 5% or better

b) The access speed of the group is to be measured over a period of time which should not be less than thirty (30) days and which is representative over a 24/7 basis.

c) The 80th and 20th percentile marks should be then used as the TSR of the particular package.

7.1.2 Procedure for the Estimation of the TSR for <u>new</u> Broadband Packages

a) The ISP should use realistic and prudent estimates to calculate the TSR using available network information.

b) Following the launch of a new package, the ISP should monitor the performance of the broadband connections sold under an estimated TSR thus ensuring that the estimated TSR is met.

c) Should the estimated TSR be significantly different from the actual TSR the ISP should inform its subscribers of that particular package with the revised TSR by way of changing the subscribers' contract using the established mechanism under decision "Modifications to the Terms and conditions of subscriber contract" issued by the MCA[2].

[2] https://www.mca.org.mt/consultation/decision-subscriber-contracts

7.2 Obligations of Network Providers towards ISPs

Contracts regulating the agreements between the upstream and the downstream providers are to include, as a minimum, the necessary performance commitments in terms of the Network Performance parameters, such that the downstream provider can offer to its subscribers the required level of service as required in this Decision

Appendix 1 Legal Instruments

In this appendix a list of extracts from the relevant provisions under Electronic Communications Networks and Services (General) Regulations (SL 399.28 of the Laws of Malta) which relate to the obligations of broadband providers vis-a-vis quality of service.

Regulation 35

35. (1) In accordance with the provisions of article 23 of the Act an undertaking providing connection to a public communications network and, or publicly available electronic communications services shall provide its subscribers with a contract that shall specify in a clear and comprehensive manner at least:

.....

(b) details of the services provided, including in particular:

.....

(iv) The service quality levels offered, including as a minimum, the:

(1) maximum time for the initial connection and disconnection;

(2) maximum repair time for faults or other service failures;

(3) maximum response time for customer complaints and information requests;

(4) minimum service availability;

(5) minimum access speeds in case of Internet service, ensuring that these do not differ significantly from the marketed upper levels; and where appropriate, other quality of service parameters as defined by the Authority.

(v) information on any procedures put in place by the undertaking to measure and shape traffic so as to avoid filling or overfilling a network link and on how those procedures could impact service quality.

Regulation 37

37. (1) An undertaking providing connection to a public electronic communications network and, or publicly available electronic communications services shall, as a minimum, publish in a transparent, comparable, adequate and up-to-date manner:

(a) all the information specified in regulation 35(1);

(b) the information specified in accordance with regulation 39 (1), if so mandated by the Authority;

(2) Without prejudice to any decisions that the Authority may take in this regard, the information referred to in subregulation (1) shall, be conveyed in a clear and comprehensive manner to end-users, at least:

(a) verbally by an authorized representative prior to take up of service and conclusion of a contract, if so requested;

(b) in writing at all retail outlets of the undertaking, such that it is readily available for inspection free of charge by the general public during normal office hours; and

(c) in writing on any website operated or controlled by the undertaking, preferably through the same page where the service is publicised or through a link set for this purpose, in a size and graphic presentation enabling the easy identification thereof.

Regulation 39.

(1) The Authority may, after taking account of the views of interested parties, require undertakings that provide connection to a public communications network and, or publicly available electronic communications services, to publish comparable, adequate and up-to-date information for end-users on the quality of their services and on measures taken to ensure equivalence in access for disabled end-users:

Provided that such information shall, on request, also be supplied to the Authority in advance of its publication.

(2) The Authority may specify, inter alia, the quality of service parameters to be measured, and the content, form, timing and manner of information to be published, including possible quality certification mechanisms, in order to ensure that end-users, including disabled end-users, have access to clear, comprehensive, comparable, reliable, up-to-date and user-friendly information:

Appendix 2 – Extract from the Demographic Review 2010 issued by the National Statistics Office

Referring document: Demographic Review 2010

Definitions and Methodological Notes

Section 6. Classifications pg XVII

Localities are classified into districts according to the Malta Geographical Codes (MGC) as follows:

Southern Harbour – Valletta, Senglea, Cospicua, Ħaż-Żabbar, Fgura, Floriana, Kalkara, Ħal Luqa, Marsa, Paola, Santa Luċija, Ħal Tarxien, Xgħajra

Northern Harbour – Ħal Qormi, Birkirkara, Gżira, Ħamrun, Msida, Pembroke, Tal-Pieta`, St Julian's, San Ġwann, Santa Venera, Tas-Sliema, Swieqi, Ta' Xbiex

South Eastern – Żejtun, Birżebbuġa, Gudja, Ħal Għaxaq, Ħal Kirkop, Marsaskala, Marsaxlokk, Mqabba, Qrendi, Ħal Safi, Żurrieq

Western – Mdina, Ħaż-Żebbuġ, Siġġiewi, Ħ'Attard, Ħal Balzan, Ħad-Dingli, Iklin, Ħal Lija, Rabat, Mtarfa

Northern – Ħal Għargħur, Mellieħa, Mġarr, Mosta, Naxxar, St Paul's Bay

Gozo and Comino – Victoria, Fontana, Għajnsielem and Comino, Għarb, Għasri, Ta' Kerċem, Munxar, Nadur, Qala, San Lawrenz, Ta' Sannat, Xagħra, Xewkija, Żebbuġ

Appendix 3 – Glossary

ICMP	Internet Control Message Protocol
ISP	Internet Service Provider
ECNSR	Electronic Communications Networks and Services (General) Regulations SL399.28 of the Laws of Malta
ECRA	Electronic Communications (Regulations) Act – Chapter 399 of the Laws of Malta
MCA	Malta Communications Authority
PoP	Point of Presence
QoS	Quality of Service
SNMP	Simple Network Management Protocol
TSR	Typical Speed Range