

This draft intends to seek comments of all those interested on the subject, so as to introduce a mechanism for identifying the minimum quality of service standards and associated measurement, reporting and record keeping tasks for broadband service providers.

All interested are requested send their comments and views on this draft latest by 24th November, 2011. Your comments may be sent in writing, or through email to Mr. Ali Asghar, Director General (Law & Regulations), PTA Headquarters F-5/1, Islamabad. E-mail: aliasghar@pta.gov.pk

In exercise of powers conferred under clause (o) of sub-section (2) of section 5 of the Pakistan Telecommunication (Re-organization) Act, 1996 the Pakistan Telecommunication Authority is pleased to make the following regulations:

PART - I

PRELIMINARY

1. Short title and commencement. (1) These Regulations shall be called "Broadband Quality of Service (QoS) Regulations, 2011".

(2) These Regulations shall come into force from the date of gazette notification.

2. Definitions. (1) In these Regulations, unless there is anything repugnant in the subject or context: -

- (a) "**Act**" means Pakistan Telecommunication (Re-organization) Act, 1996 ;
- (b) "**Authority**" means the Pakistan Telecommunication Authority established under section 3 of the Act;
- (c) "**AAA**" means Authentication, Authorization, and Accounting server provides authentication, authorization, and accounting (AAA) services for access to computer resources;
- (d) "**Bandwidth**" means in the computer networks, the data transfer rate, the amount of data that can be carried from one point to another in a given time period, expressed in bits (of data) per second (bps);
- (e) "**Broadband**" means always on services with a data rate greater than

128Kbps or as adopted by the Authority from time to time;

- (f) **“BSP”** means Broadband Service Provider;
 - (g) **“FLL”** means Fixed Local Loop;
 - (h) **“HLR”** means Home Location Register;
 - (i) **“KPI”** means Key Performance Indicators;
 - (j) **“NTP”** means Network Termination Point;
 - (k) **“QoS”** means Quality of Service;
 - (l) **“Rules”** means all or any rules issued by the Federal Government under Section 57 of the Act;
 - (m) **“Regulations”** means all regulations issued by the Authority including without limitation, these regulations; and
 - (n) **“WLL”** means Wireless Local Loop.
- (2) Words and expressions used herein but not defined shall have the same meaning assigned to them in the Act, Rules, and other Regulations.

3. Scope and Applicability -These Regulations shall apply to all BSP (s) in order to define the KPI(s) for Broadband services. These KPI(s) shall act as benchmarks for determining QoS standards for Broadband from the consumers’ perspective. The objective of laying down these indicators is to ensure transparent, quantifiable QoS parameters, which the service provider is required to provide for enhancing consumer satisfaction.

PART - II

QUALITY OF SERVICE - TESTING METHODOLOGY

4. Quality of Service Benchmarks The following factors shall be considered while testing the KPI(s) for Broadband:

- (a) Should be easily understood by the public, useful and important;
- (b) All network related parameters be applicable at the NTP. For wireless application the last mile air interface shall be considered as the NTP;
- (c) Use of realistic, real time traffic instead of using test lines for measurements;
- (d) Maintain consistency across all similar BSP(s);
- (e) All tests to be carried out at a designated place defined by the Authority, without mobility;
- (f) The parameters are designed for the statistical and individual applications; The resultant values shall be derived by the application of a simple statistical function to the individual values;

- (g) Testing, where applicable shall be performed at least during peak and off-peak traffic hours;
- (h) Test areas shall be identified by the Authority after obtaining coverage information from operators;
- (i) Test lines shall be provided by the BSP's within one week;
- (j) Duration of each test and number of samples shall be approved by the Authority before each survey; and
- (k) Customer premises equipment power backup arrangements should be ensured before commencement of the test.

PART - III

BROADBAND SERVICE STANDARDS [TECHNICAL]

5. Technical Quality of Service Standards (1) All BSP(s) shall adopt the performance parameters as prescribed below and in Annex-A to these Regulations:

Provided further that the Authority may modify, delete or add KPI(s) and/or their rating tables on the basis of the extent of coverage, new deployments and the QoS factors provided at Annex -A, as and when required.

(2) All monitoring by the Authority shall be performed at the NTP of the BSP(s) and checked against the following parameters:

(a) Network Availability.-The parameter shall check the availability of the network or service, as is claimed or "advertized" by the BSP. This shall verify operator coverage claims. It is a binary check. The network availability shall be checked for all the broadband service providers in a manner identified at Table 1-Annex A. Coverage maps may be obtained from service providers before the actual verification testing is done.

(b) Link Speed.-The link speed (LS) shall be checked against the advertised speeds. Actual link rates shall be measured during the proposed "T" test times. Once a link has been established successfully, sustainability of the service shall be checked. The link speed shall be checked in a manner identified at Table 2 at Annex A.

(c) Service Availability (in %):- The metric shall check for the availability of the internet.

During testing if N attempts are made to connect to the internet and if F times the attempt failed, then:

$$\text{Availability} = (1-F/N) \times 100\%$$

An attempt is declared as failure, if we are not able to connect to internet within 75 seconds for FLL communications and 120 seconds for WLL communications. The availability shall be checked in a manner identified at Table 3 (Annex A).

Under this KPI two parameters shall be checked:

- 1) Connect time (for instances when the modem is started afresh or after a rest)

- (a) Transceiver Connect time is 45 seconds through FLL access and 75 seconds through WLL access respectively.
- (b) AAA Authentication Time is 30 seconds through FLL access and 45 seconds through WLL access respectively.

2) Service Availability:

For clarity following assumption is added:

- (a) Within the same HLR;
- (b) User identification number (UID)/password has to be given explicitly;
- (c) Within 3 Km of radial distance from the switch (For copper only loops extending from exchange to customer premises);
- (d) Customer terminal powered up (fresh boot up for every applicable test);
- (e) Laptop is powered up; and
- (f) 75 seconds figure is for FLL communications and 120 seconds for WLL communications.

The availability of service shall exclude downtime for the purpose of upgrading or routine maintenance of the network system provided that users are informed in advance of any such up-gradation or maintenance actions.

Following rating shall apply to the statistics: (Table 3.1 for grading at Annex-A)

- (a) Grade A shall apply to percentages equivalent to 95% or above;
- (b) Grade B shall apply to percentages <95% and ≥80%;
- (c) Grade C shall apply to percentages <80% and ≥70%;
- (d) Grade D shall apply to percentages <70% and ≥50%;and
- (e) Grade E shall apply to percentages <50.

(i) Retainability :- This KPI shall check the retainability of the service over a period of 60 minutes. No disconnection over a period shall be termed as Grade A. Subsequent grading applied accordingly shall be as follows (Table 4 -Annex A):

- (a)** Grade A shall apply to no Disconnect (DC) within 60 min.;
- (b)** Grade B shall apply to a DC within ≥45 and <60 min;
- (c)** Grade C shall apply to a DC within ≥30 and <45min;
- (d)** Grade D shall apply to a DC within ≥15 and <30 min;
- (e)** Grade E shall apply to a DC within ≥5 and <15min;

Recurring tests shall be performed prior to the expiry of automatic log-off (session clearance) time. The time decided by Authority will have to be programmed by all BSP(s) and/or the decision by the Authority shall be binding.

(d) Bandwidth.-

(i) Download Speed (kbps/Mbps): The actual download speed available to the subscriber shall be measured. Keeping the reasonable loading level in the intra network links up to ISP node, and the fact that in general for normal broadband operations data rate is lower than the advertised/plan data rate, the data speed must be at least 60% of the advertised speed of broadband service plan, both download and upload, and this must be experienced at least 70% of the time. For example, if your broadband download service plan

is 1000 Kbps, a pass result shall be considered if data speed is 600 Kbps or better. The Download Speed shall be checked in a manner identified at (Table 5 -Annex A).

Data download speed = Size of the test file (data) in ISP Server (in MB) / Transmission Time (in seconds) required for error free transfer of the entire data.

Size of test file should be 10MB. It should be downloaded from website of the BSP and/or PTA's web server as long as the choice is consistent for all. For other download packages the file size shall be adjusted accordingly to maintain the same anticipated download time.

(ii) Upload Speed (kbps/Mbps): Methodology used for calculating upload speeds shall be similar to download speeds. The Upload speed shall be checked in a manner identified at Table 5.2 (Annex A) e.g. if the Broadband upload service plan is 128Kbps a pass result shall be considered if data speed is 76.8Kbps.

(iii) Upload/ Download Speed Ratio:

With this KPI, upload/ download speed ratio shall be intimated first by the service provider followed by the Authority to check for conformity through test measurements. This shall be calculated as indicated in Table 5.4. (Annex A).

(iv) Contention Ratio:

It is the ratio of peak bandwidth utilization of a BSP averaged for the last three months obtained from operator's MRTG, to the total sum of the individual bandwidth sold to the residential subscribers of the same operator. Same shall be recorded against Table indicated in Table 5.5 (Annex-A). If required, contention ratio for business subscribers maybe calculated separately.

Contention Ratio= Avg. of three months Peak BW(MRTG) : Σ BW sold to relevant subscribers

(e) Round Trip Time (RTT, milli-sec).- RTT shall be measured upto the broadband remote access server (BRAS). *A packet must have a delay no longer than 110 ms based on a minimum standard packet size of 32 bytes. RTT shall be checked in a manner identified at Table 6 (Annex A).*

(f) Packet Loss. (%) Number of Packets which do not reach the destination. The recommended benchmark for packet loss should be less than 2%. Following formula shall be used to determine packet loss ratio:

Number of lost packet / (Number of lost packet + Number of packets received successfully.).

Minimum number of packets is 10. Authority may increase for more accuracy.

(g) Jitter.(ms)_ Jitter is the variation in the time between packets arriving, caused by network congestion, timing drift, or route changes. Jitter should be less than 15ms.

PART - IV

BROADBAND SERVICE STANDARDS [NON-TECHNICAL]

6. **Non-Technical Quality of Service Standards.**-All BSP(s) shall adopt the non-

technical performance standards provided as follows:

(1) Tariff Comparison.-The cost of all the packages provided by each BSP shall be collected on business/residential, data/ volume or any other package plans, if any. The cost shall be calculated in Pak Rupees, as identified in Table-7 at Annex A.

(2) Customer Service:

- (a) Unplanned Outage.** - As per the applicable license conditions and regulations. Reasons for outage to be recorded by the Operator. The Operator shall keep logs with proper command line information, verifiable by the Authority as and when required;
 - (b) Planned Outage.**- As per the applicable license conditions and regulations;
 - (c) Automated Ticketing System for Recording Complaints.**-The availability of computerized customer complaint database shall be ensured by the BSP(s). The system should be capable of generating automated tickets to the complainants. If automated system is not available then the operator should record the reasons and intimate to the Authority as per Authority directives or regulations.
 - (d) Response to Assistance Requested.**-As per the applicable license conditions and regulations.
- (3) Billing Complaints.**-As per the applicable license conditions and regulations.
- (4) Service Provisioning Complaints.**-As per the applicable license conditions and regulations.

PART - V

SERVICE PROVIDER OBLIGATORY TESTING AND REPORTING REQUIREMENTS

7. Quality of Service Testing.-(1) In addition to Authority's own conducted surveys and tests, all BSP(s) shall carry out quarterly testing of the quality of service of its Broadband service being provided in accordance with the parameters prescribed in these Regulations.

(2) The Authority may depute its representatives to be present at the quality tests and surveys carried out by the BSP(s).

(3) Each BSP(s) shall maintain record of all data collected against each QoS parameter/factor tested as prescribed by the Authority in these Regulations.

8. Reporting Requirements.-(1) The data collected in the testing phase shall be submitted to the Authority within thirty (30) days of the end of each quarter to which the

data relates or at such intervals as the Authority may direct from time to time and in the form and format as prescribed by the Authority.

(2) The BSP(s) shall keep a record of the said quality tests and surveys, in such form and manner as the Authority may specify. This record shall at all times be open to inspection and audit by the Authority or representative of the Authority, with or without notice to the BSP(s).

(3) The record of all data shall be retained and maintained in the safe custody of the BSP(s) for a period of three (03) years.

9. Inspection of Quality of Service.-(1) The Authority may conduct inspections, surveys, tests or make surprise checks through its designated representative or conduct performance audit of quality of service of the BSP(s) from time to time to ensure that services are provided in accordance with the standards laid down in these Regulations, the terms and conditions of the license or as determined by the Authority from time to time.

(2) In order to carry out the tests and surveys the BSP(s) shall provide test connections to Authority within one week of request (no more than 3 test connections per zonal office PTA) shall extend full co-operation and provide all assistance to the representative/ inspecting officer (s). The Authority may engage, if circumstances so require, third party/consultants to conduct quality of service audit.

(3) The inspecting officer shall prepare an inspection report of such QoS inspections, which clearly spell out the shortfalls observed during such inspection. This report shall be provided to the BSP(s). The BSP(s) shall immediately take all remedial measures to remove the shortfalls identified in the report and submit compliance report within 30 days by confirming that all stated shortfalls have been removed.

10. Publication of Quality of Service Reports. _ (1) The Authority may publish survey results, service test results, and ratings of the BSP(s) as provided in Annex- A for information of general public.

(2) All survey results, service test results and ratings of the BSP(s) shall be available for the information of the general public on the website of each BSP(s).

Annex-A
Evaluation Tables (Samples)

1. Broadband Service Providers(BSP) and Packages

The testing plan will benchmark all BSP's of Pakistan who offer similar Connection Plan. The following shall apply to the above KPI's as applicable.

Speed/BSP	BSP- A		BSP-B		BSP-C		BSP-D		BSP-E		BSP-F		
	B	R	B	R	B	R	B	R	B	R	B	R		
128 Kbps	Y/N													
256 Kbps														
....														
<i>B= Business R= Residential BSP= Broadband Service Provider Y=Yes N=No</i>														

In case a test is performed at multiple times for multiple days then the result shall be calculated for the mean of all values. It shall be ensured that the test shall be conducted atleast during peak and off-peak traffic hours.

Network Available Areas CityWise(ANAC) <i>(*Table shall be repeated for all BSP's)</i>												
BSP- A												
	ANAC 1		ANAC 2		ANAC 3		ANAC 4		ANAC 5		
	B	R	B	R	B	R	B	R	B	R	B	R
Network Availability	Y/N											
<i>B= Business R= Residential BSP= Broadband Service Provider ANAC=Advertised Network Available Areas CityWise(By BSP's) Y=Yes N=No</i>												
Network Coverage Maps may be obtained from BSP's before recording this API.												

Table 1: Network Availability

Link Speed														
Speed/BSP	BSP- A		BSP-B		BSP-C		BSP-D		BSP-E		BSP-F		
	B	R	B	R	B	R	B	R	B	R	B	R		
128 Kbps														
256 Kbps														
512 Kbps														
....														
<i>B= Business R= Residential BSP= Broadband Service Provider</i>														

Table 2: Link Speed

Service Availability (%) BSP-A <i>(*Table shall be repeated for all BSP's/ Package)</i>					
	T1	T2	T3	Average %
Day1					*Availability = (1-F/N) × 100%.
...					
<i>N= Total No. of times the experiment is done for a single BSP/ Package F=No. of times internet is unreachable</i>					

Table 3: Service Availability

Service Availability(%)				
Grade A	Grade B	Grade C	Grade D	Grade E
95% or above	<95% and ≥80%	<80% and ≥70%	<70% and ≥50%	<50%

Table 3.1: Service Availability Grading

Retainability(minutes)				
Grade A	Grade B	Grade C	Grade D	Grade E
60 min (No DC)	<60 and ≥45	<45 and ≥30	<30 and ≥15	<15 and ≥5

Table 4: Retainability

Download Speed														
Speed/BSP	BSP- A		BSP-B		BSP-C		BSP-D		BSP-E		BSP-F		
	B	R	B	R	B	R	B	R	B	R	B	R		
128 Kbps														
256 Kbps														
....														
<i>B= Business R= Residential BSP= Broadband Service Provider Table Shall be repeated for T timings in a day</i>														

Table 5: Download Speed

Download Speed				
Grade A	Grade B	Grade C	Grade D	Grade E
>Speed*75 %	>Speed*75% and <Speed*60%	>Speed*60% and <Speed*45%	>Speed*45% and <Speed*30%	<Speed*30%
<i>Speed implies to advertised speeds by BSP's</i>				

Table 5.1: Download Speed Grading

Upload Speed							
Speed/BSP	BSP- A	BSP-B	BSP-C	BSP-D	BSP-E	BSP-F

	B	R	B	R	B	R	B	R	B	R	B	R		
128 Kbps														
256 Kbps														
....														
<i>B= Business R= Residential BSP= Broadband Service Provider Table shall be repeated for T timings in a day</i>														

Table 5.2: Upload Speed

Upload Speed				
Grade A	Grade B	Grade C	Grade D	Grade E
>Speed*75 %	>Speed*75% and <Speed*60%	>Speed*60% and <Speed*45%	>Speed*45% and <Speed*30%	<Speed*30%
<i>Speed implies to advertised speeds by BSP's</i>				

Table 5.3: Upload Speed Grading

Ratio of Upload/Download Speed			
	BSP-A	BSP-B	...
1M/128 Kbps	Plan A(Ratio)		
1M/1M			
...			

Table 5.4: Upload/Download Speed Ratio

Contention Ratio			
BSP-A	BSP-B
...
Contention Ratio= Avg. of three months Peak BW(MRTG) : \sum BW sold to relevant subscribers			

Table 5.5: Contention Ratio

Round Trip Time					
BSP-A					
<i>(*Table shall be repeated for all BSP's)</i>					
	T1	T2	T3	Average(ms)
Day1					
...					

Table 6: Round Trip Time (RTT)

RTT(For Local Latency in ms)			
Grade A	Grade B	Grade C	Grade D
<70ms	Between 70ms and 80ms	Between 80ms and 90ms	Between 90 and 100ms or 100ms+

Table 6.1: Round Trip Time (RTT) Grading

Tariff (Pak Rs.)														
Speed/BSP	BSP- A		BSP-B		BSP-C		BSP-D		BSP-E		BSP-F		
	B	R	B	R	B	R	B	R	B	R	B	R		
128 Kbps														
256 Kbps														
....														
<i>B= Business R= Residential BSP= Broadband Service Provider</i>														

Table 7: Cost Comparison

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