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PART II

Statutory Notifications (S. R. O.)

GOVERNMENT OF PAKISTAN

PAKISTAN TELECOMMUNICATION AUTHORITY

NOTIFICATION

Islamabad, the 27th June, 2014

S. R. O. 731 (I)/2014.— In exercise of the 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 may be called the Broadband Quality of Service Regulations, 2014.

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

[4743 (2014)/Ex. Gaz.] *Price : Rs. 5.00*

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

(a) **"Act"** means Pakistan Telecommunication (Re-organization) Act, 1996 ;

(b) **"Authority"** means Pakistan Telecommunication Authority established under section 3 of the Act;

(c) **"AAA"** means the Authentication, Authorization, and Accounting server which provides authentication, authorization and accounting services for access to computer resources.

(d) **"Bandwidth"** means, in terms of computer networks, the data transfer rate *i.e.* the amount of data that can be carried from one point to another in a given time period. Bandwidth is expressed in bits (of data) per second (bps);

(e) **"Broadband"** means 'always on' services with a data rate equal to or greater than 256 Kbps or as adopted by the Authority from time to time in line with policy issued by the Federal Government;

(f) **"Broadband Service Provider"(BSP)** means fixed local loop, wireless local loop and class data licensee;

(g) **"Network Termination Point" (NTP)** means Network Termination point which is any point of termination on a telecommunication system at which the terminal equipment may be connected;

(h) **"Rules"** means all rules issued by the Federal Government under Section 57 of the Act; and

(i) **"Regulations"** means all regulations issued by the Authority.

(2) Words and expressions used but not defined in these regulations shall have the same meaning assigned to them in the Act, Rules and Regulations.

3. **Scope and Applicability.**—These Regulations shall apply to all BSP (s) in order to define the key performance indicators (KPIs) for Broadband services. These KPIs shall act as quantifiable benchmarks for determining quality of service for Broadband service.

PART – II

TESTING METHODOLOGY

4. Quality of Service Testing Methodology.—The following factors shall be considered while testing the KPIs for Broadband, where applicable:

(a) All network related parameters be applicable at the NTP. For wireless application the last mile air interface shall be considered as the NTP;

(b) Use of realistic, real time traffic instead of using test lines for measurements;

(c) Maintain consistency across all similar BSPs;

(d) All tests to be carried out at a designated place defined by the Authority, without mobility;

(e) Testing, where applicable shall be performed at-least during peak and off-peak traffic hours;

(f) Test areas shall be identified by the Authority after obtaining coverage information from operators;

(g) Test lines shall be provided by the BSPs within one week of Authority request;

(h) Information on different service packages shall be collected prior to initiating the testing.

(i) Duration of each test and number of samples shall be approved by the Authority before each survey; and

(j) Authorized officer of the Authority shall ensure that his/her testing equipment to check the customer premises equipment has proper power back up before commencement of the test.

PART – III

BROADBAND QUALITY OF SERVICE STANDARDS [TECHNICAL]

5. Technical Quality of Service Standards.—(1) All BSPs 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 key performance indicators and/or their rating tables on the basis of the extent of

coverage, new deployments and the Quality of service factors provided at Annex -A, as and when required.

(2) 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 at least during peak and off-peak traffic hours.

(3) All monitoring by the Authority shall be performed at the NTP of the BSPs 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 in Table 1 in 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 in Table 2 in Annex A.

(c) **Service Availability (in %).**— The metric shall check for the availability of the internet service.

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

Availability = (1–F/N) × 100%

An attempt is declared as a failure, if internet connection is not established within 75 seconds for FLL communications and 120 seconds for WLL communications. The availability shall be checked in a manner identified in Table 3 in Annex A.

Under this KPI following 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 Home Location Register;

(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 for FLL communications and 120 seconds for WLL communications.

The availability of service shall exclude service 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. Subsequent grading shall be applied as provided in table 3.1 in Annex-A.

(d) **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 shall be applied as provided in Table 4 in Annex A.

Recurring tests shall be performed prior to the expiry of automatic log-off (session clearance) time. The time decided/determined by the Authority shall be programmed by all BSPs.

(e) **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/planned data

rate, the data speed must be at least 60% of the advertised speed of broadband service plan, of both download and upload, and this must be experienced at least 70% of the time. For example, if the 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 in Table 5 in Annex A. Subsequent grading shall be applied as provided in table 5.1 in 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 at least 10MB. It should be downloaded from website of the BSP and/or PTA's website 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 in Table 5.2 in Annex A, for e.g. if the Broadband upload service plan is 256 Kbps a pass result shall be considered if data speed is 153.6 Kbps. Subsequent grading shall be applied as provided in table 5.3 in Annex A.

(iii) **Download/ Upload Speed Ratio:**

This KPI shall be intimated first by the service provider to be followed by the Authority to check for conformity through test measurements. This shall be calculated as indicated in Table 5.4 in 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 Multi-Router Traffic Grapher (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 in Annex A. If required, contention ratio for business subscribers may be calculated separately.

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

(f) **Round Trip Time (RTT, milli-sec).—.** RTT shall be measured upto the Broadband Remote Access Server (BRAS). *A packet must have a delay of no longer than 110 ms based on a minimum standard packet size of 32 bytes. RTT shall be* tested using 'ping' and shall be from the destination address provided by operator within its network as identified in Table 6 in Annex A. Subsequent grading shall be applied as provided in table 6.1in Annex A.

(g) **Packet Loss (%).** Packet loss shall be calculated using **'ping'** as identified in Table 7 of Annex-A. The minimum number of packets that shall be tested at one time is 100, which may be reviewed by the Authority from time to time. The formula to measure packet loss is defined as follows:

Packet Loss = [L/(L+R)]*100

Where,

L = Number of Lost Packet

R = Number of packets received

Subsequent grading shall be applied as provided in table 7.1 in Annex A.

(h) **Jitter (ms).—** Jitter shall be calculated using 'ping' as identified in Table 8 of AnnexA. The minimum samples shall be 100.If RTT avg is the average RTT, derived out of 100 samples, and RTT 1,RTT 2....RTT 100 are the RTT for individual packets then jitter shall be calculated as follows:

Jitter= E (RTTavg-RTTk)/100 (magnitude shall be used without '+/-' signs)

Subsequent grading shall be applied as provided in table 8.1 in Annex A.

PART – IV

BROADBAND QUALITY OF SERVICE STANDARDS [NON-TECHNICAL]

6. Non-Technical Quality of Service Standards.—All BSPs shall adopt the non-technical performance standards 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 in Annex B.

(2) **Customer Service:**

(a) **Unplanned Outage.**—The BSPs unplanned outage process shall comply with the license conditions and Regulations. Reasons for outage shall be recorded by the BSP. The BSP shall keep logs with proper command line information, verifiable by the Authority as and when required;

(b) **Planned Outage.**—The BSPs shall ensure compliance to the license conditions and Regulations when planning an outage.

(c) **Automated Ticketing System for Recording Complaints.**—The availability of computerized customer complaint database shall be ensured by the BSP. The system should be capable of generating automated tickets to the complainants. If the automated system is not available in accordance with these regulations, the BSP must record the reasons under intimation to the Authority; and

(d) **Response to Assistance Requested.**—The BSPs shall provide assistance to consumers in accordance with the license conditions and Regulations.

(3) **Service Provisioning and Billing Complaints.**—Service Provisioning and billing complaints shall be processed in accordance with the license conditions and Regulations.

PART – V

BROADBAND SERVICE TESTING AND REPORTING REQUIREMENTS

7. **Quality of Service Testing.**—(1) In addition to Authority's own conducted surveys and tests, all BSPs 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 BSPs.

(3) Each BSPs shall maintain record of all data collected against each Quality of Service 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, in the form and format as prescribed by the Authority.

(2) The BSPs 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 designated representative of the Authority, with or without notice to the BSPs.

(3) The record of all data shall be retained and maintained in the safe custody of the BSPs 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 the quality of service offered by BSPs from time to time to ensure that services are provided in accordance with the standards prescribed in the license, these Regulations or as determined by the Authority from time to time.

(2) In order to carry out the tests and surveys the BSPs shall provide test connections to PTA within one week of request (no more than 3 test connections per zonal office) and shall extend full co-operation and provide all required assistance to the designated representative.

(3) The Authority may, if circumstances so require, engage a consultant to conduct the quality of service audit.

(4) The designated representative shall prepare an inspection report of such Quality of service inspections, which clearly spell out the shortfalls, if any, observed during the inspection. This report shall be provided to the BSPs. The BSPs shall immediately take all remedial measures to remove the shortfalls identified in the report and submit a compliance report within thirty (30) days by confirming that all the specified 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 BSPs as provided in Annex A for information of the general public. The tariff detail shall always be included while publicizing the survey results.

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

ERUM LATIF,
Director (L&R).

Annex-A

(*See* regulation 5)

Sample Evaluation Tables

The following shall apply to the KEY PERFORMANCE INDICATORS as specified in these Regulations.

Broadband Service Providers (BSP) and Packages

The testing plan will benchmark all BSPs of Pakistan who offer similar Connection Plans.

Collection of Service Package Information of Operators

Package Details*	**BSP- A**		**BSP-B**		**BSP-C**		**BSP-D**		**BSP-E**		**BSP-F**		.....	
	B	R	B	R	B	R	B	R	B	R	B	R		
Wired	Y/N	...	...	...								...		
Wireless														
etc	....					...						...		

B= Business R= Residential BSP= Broadband Service Provider Y=Yes N=No

****Package details may include information on speed, mode i.e. wired or wireless, and provisioning of voice / data, etc.***

Table 1: *Network Availability*

*Advertised Network Available Areas City Wise(ANAC) (*Table shall be repeated for all BSPs)*												
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											
B= Business R= Residential BSP= Broadband Service Provider												
ANAC=Advertised Network Available Areas City Wise(By BSP)												
Y=Yes N=No												
Network Coverage Maps may be obtained from BSPs before recording this KPI.												

Table 2: *Link Speed*

Link Speed (Uplink , Downlink)														
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														
....														
B= Business R= Residential BSP= Broadband Service Provider														

Table 3: *Service Availability*

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

Table 3.1: *Service Availability Grading*

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

Table 4: *Retainability*

Retainability (minutes)				
Grade A	***Grade B***	***Grade C***	***Grade D***	***Grade E***
60 min	<60 and ≥45	<45 and ≥30	*<30 and ≥15*	*<15 and ≥5*

Table 5: *Download Speed*

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														
....														
B= Business R= Residential BSP= Broadband Service Provider														
(Table Shall be repeated for T timings in a day														

Table 5.1: *Download Speed Grading*

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%*
Speed implies to advertised speeds by BSPs				

Table 5.2: *Upload Speed*

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														
....														
B= Business R= Residential BSP= Broadband Service Provider														
Table shall be repeated for T timings in a day														

Table 5.3: *Upload Speed Grading*

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%*
Speed implies to advertised speeds by BSPs				

Table 5.4: *Download/ Upload Speed Ratio*

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

Table 5.5: *Contention Ratio*

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

Table 6: *Round Trip Time (RTT)*

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

Table 6.1: *Round Trip Time (RTT) Grading*

RTT(For Local Latency in ms)			
Grade A	*Grade B*	*Grade C*	*Grade D*
≤ 70ms	*> 70ms and ≤80ms*	*> 80ms and ≤ 90ms*	*> 90ms and ≤* 110ms

Table 7: Packet Loss

Packet Loss BSP-A ***(*Table shall be repeated for all BSP)***				
	Time	Packets Status in RTT		Packet Loss (%)
		Packets Lost (L)	Packet Received (R)	
Day1	T1			
	T2			
	T3			
Day2	T1			
	T2			
	T3			

Table 7.1 Packet loss grading

Packet Loss				
Grade A	Grade B	Grade C	Grade D	Grade E
≤ 2%	> 2% and ≤ 3%	> 3% and ≤ 4%	> 4% and ≤ 5%	> 5 %

Table 8: Jitter

Jitter BSP-A *(*Table shall be repeated for all BSP)*								
BSP Name		**Off Peak Traffic Time**		**Peak Traffic Time**		**Medium /Normal Traffic Time**		**Average RTT (msec)**
	Day 1	RTT_1		RTT_1		RTT_1		
		RTT_2		RTT_2		RTT_2		
		.....		.....		.....		
		RTT_{100}		RTT_{10}		RTT_{100}		
	Day 2	RTT_1		RTT_1		RTT_1		
		RTT_2		RTT_2		RTT_2		
		.....		.....		.....		
		RTT_{100}		RTT_{10}		RTT_{100}		

Table 8.1: Jitter grading

Jitter				
Grade A	Grade B	Grade C	Grade D	Grade E
≤ 15 ms	> 15ms and ≤ 20ms	>20ms and ≤ 25ms	> 25ms and ≤ 30ms	> 30 ms

Annex-B

(See regulation 6)

Cost Comparison

Tariff (Pak Rs.)														
Down Load 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														
....														
B= Business	***R= Residential***		***BSP= Broadband Service Provider***											

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