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TECHNOLOGY
QUALITY OF SERVICE PARAMETERS EVALUATION IN CELLULAR
NETWORKS

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ABSTRACT

Quality of Service refers to the evaluation of the overall performance of a service, such as a telephony or computer network particularly the performance seen by the users of the network. QoS is mostly observed from the subscriber's side. This includes aspects such as the mobile signal strength available to users and other call availability measurements. QoS is normally calculated during signal transmission called KPIs that is connected to the subscriber's happiness whilst using mobile services. QoS parameters are monitored through RF analysis by Drive Test. Some of these QoS parameters related to call and data are discussed in this paper. These parameters directly or indirectly represents the quality of service provided by the network operators in context of Nepal. This analysis of parameters has helped us identify problems like call performance, slow servicing, least ease of use in a service test area for different service providers in the country.

KEYWORDS: QoS, KPIs, Subscriber, Telephony.

1. INTRODUCTION

Quality of Service (QoS) is the main indicator of the performance of a telecom network and of the degree to which the network conforms to the stipulated norms and standards specified by the regulator or any other agency designated for the same [1]. Quality of service (QoS) parameters in mobile gives tolerable check to the subscribers. KPIs are calculated from dimensions of various mobile parameters. The KPIs used as principles in the estimation of QoS given by Mobile operators (MOs). The incapability to put up calls, unacceptable voice quality for the duration of calls, dropped calls, lost data packets or even reliable data network ease of use are some of the problems have to bear with and frequently period pay for [6].

2. QOS PARAMETERS

Visualizing the subscriber's perspective, Quality of Service (QoS) is shaped by a number of key performance parameters [2]. It is the role of Nepal Telecommunication Authority (NTA) as a regulating body to measure the approved parameters for evaluating operator's service quality. It is necessary to automate the QoS parameters database system which helps NTA for periodic analysis and effective regulation [4]. Some of the parameters defined under network performance regarding both voice and data are listed below:

Call Connection Time

The time between sending of complete call initiation information by the caller (A-party) and in return receipt of call setup notification [3]. It is measured as $t_2 - t_1$ where t_2 = point of time where connect is established (B-Party) (e.g. alerting or subscriber busy is detected by test equipment); and t_1 = point of time when send button on mobile equipment (A-Party) is pressed. Measured over a one-month period [5].

Call Setup Success Rate (CSSR)

The CSSR indicates the probability of successful calls initiated by the MS (Mobile Station). The CSSR is an important key performance indicator for evaluating the network performance [4]. If it is low the subscribers are not likely to make calls successfully. The user experience is thus affected. Call Setup Success Rate = (Total number of established calls / Total number of call attempts) 100

Download/Upload Throughput

It represents the total data rate (throughput) achieved while download/upload.

3. QOS ANALYSIS

Drive test is a method of measuring and assessing the coverage, capacity and Quality of Service (QoS) of a mobile radio network. Drive Test is the procedure to perform a test while driving. Drive testing requires a mobile vehicle outfitted with drive testing measurement equipment. [5] It is a method in which testing tools mounted on a moving vehicle collect key performance indicators (KPIs) of the cellular network by repeatedly making voice or data calls. All the available service providers at the location are tested simultaneously. The tools are configured in a way so that a favorable network (4G/ 3G/ 2G) in Auto Mode is selected for each service providers automatically as per availability. Drive Test Tool: JDSU E6474A. It is the drive test software to record and analyze the samples for measuring various QoS parameters. Post Processing Tool: Gladiator. These equipments are usually highly specialized electronic devices that interface to mobile handsets. This ensures measurements are realistic and comparable to actual user experiences. [5] The datas for the QoS analysis in this paper are extracted from the NTA's Drive Test Report-Pokhara which was performed in January 2019.

4. QOS BY LAW

The theoretical results were obtained on a period basis. Every leading network service provider in the market should follow the Benchmarks by the "NEPAL TELECOMMUNICATION AUTHORITY (NTA)". A network is said to be good if it satisfies the benchmarks of NTA.

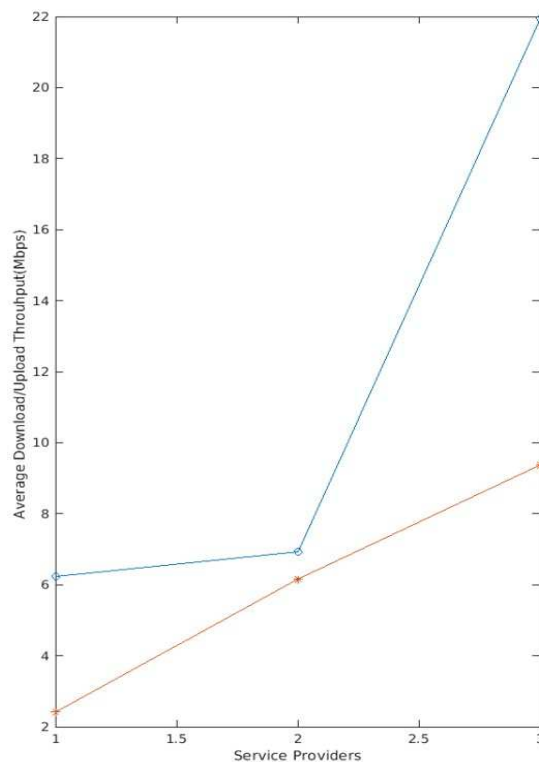


Figure 1 Average Throughput Comparison

Tabulations and analysis

Some QoS parameters were analyzed based on the datas taken from the NTA Drive Test Report *Copyright.

- Test Duration : 1 month

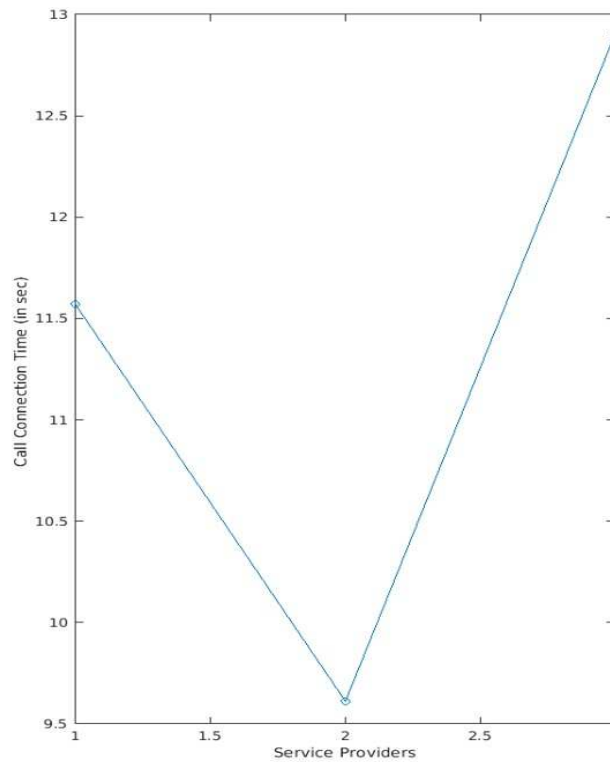


Figure 2 Call Connection Comparison

- For call test - Call Duration: 120 Seconds
- For internet data dest - FTP Test Server: Virtual Private Server located in Nepal , / FTP Download and Upload File Size: 100 MB and 50 MB.
- (1) represents NTC(Nepal Telecom)
- (2)- represents NCELL,
- (3)- represents SMART TELECOM

Table 1 Qos data extraction

Network Service Providers	QoS Parameters		
	Call Connection Time	CSSR	DL-UL Throughput
(1) NTC	11.57	98.53	6.23—2.42
(2) NCELL	9.61	95.7	6.92—6.17
(3) SMART CELL	12.91	92.86	21.93—9.37

^aTime in sec, CSSR in percentage Throughput in Mbps

5. RESULTS AND DISCUSSION

Graphical Analysis showing comparison of QoS parameters with the leading Service Providers in the country. NTC, Ncell and Smart Cell. Amongst all the NTC service provider has given that the best services to call success and messaging. Smart Telecom although not having satisfactory call availability services is giving a better internet/data performance i.e. user throughput.



6. CONCLUSION

Above analysis based on end user's perspective was implemented. We know that success of any network depends on its three factors: coverage, capability and quality of service. Three key performance indicators were analyzed using the Drive Test Data performed by the Nepal Government Telecommunication Authority (NTA) which was operated in Pokhara. The main motive is to identify the scenario of comparison among various network service providers and investigate the troubles in Pokhara area from the outcome of our simple evaluation. Nepal Telecom seems to be more reliable giving more availability and coverage in rural areas as well. Therefore by successfully performing the evaluation, the QoS, consistency and accessibility of RF Coverage region will be visualized resulting in more customers' awareness regarding network service quality and increased competition among telecom service providers in upcoming days.

7. ACKNOWLEDGEMENTS

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