Setting Broadband Quality of Service Parameters for the Sudan

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ABSTRACT

The International Telecommunication Union (ITU) has recently declared that internet traffic has exceeded the nominated capacity of traffic for the first time ever since the telecom history. The corner stone of the current internet traffic is broadband. Broadband terms mean to describe recent internet connections that range from 5 to 2000 times faster than earlier internet dial-up technologies. The present telecom trends are composed of quality of service and security The quality of service is the most efficient mean of customer satisfaction. This paper presents a unique method for broadband quality of service settings and customization, in regards to the indicators and targeted values for the broadband quality of service parameters. Moreover, the proposed quality of service parameters has been tested and evaluated for the current Sudanese networks applying the most advanced measuring tools. The key findings of the paper are recommended to be approved by the Sudanese regulatory authority, in order to be deployed by the national telecom operators.

I. INTRODUCTION

The quality of service is considered as one of the most important means to support the development of the telecommunications sector, which gives clear indications for the extent of matching network operators with the required specifications while providing the possibility to take advantage of these networks in the techniques and future systems. Broadband. Combines connection capacity (Bandwidth) and transmission capacity that is faster than primary rate, or to be more precise, integrated services digital network (ISDN) at 1.5 or 2.0 megabits per second [1].

This paper focuses on the quality of service standards and sets parameters for broadband quality of service, which is considered highly important to ensure acceptable and competitive service delivery.
The current situation for Broadband in Sudan An active complex system for quality of services is already in place with dedicated parameters for measurements and monitoring with regards to most of the offered services which lack broadband service. In addition, there are indicators to measure the quality of services and data short message services. Having said that, there is an absence of Broadband service measurements and monitoring.

Therefore, there is a strong need for broadband quality of service standards such as Key Performance Indicators (KPIs) and parameters, in addition to measuring and monitoring techniques.

There is a challenge for supportive standard indicators, which measure broadband services in order to be approved, applied by service providers and consequently accepted by the regulator.

The proposed solution is to set the broadband quality of service parameters with targeted values in addition to applying adequate measuring and monitoring technique [3]. This paper is organized as follows: Abstract Section I is an introduction and a brief information about the whole research paper Section II is about the adopted methodology. Section III is the results and discussion of what has been done. Section IV represents the Conclusion, which was derived from the results that have been observed and provide recommendations.

II. METHODOLOGY

The Methodology used in this paper to determine parameters for broadband starts with similar countries experiences, there will be an overview through different countries KPIs for QOS, market indicators, exposing to various KPIs then, a filtering process will be applied according to countries that have almost similar indicators to the target country. Therefore a few countries will be chosen, and from these countries experiences, some average values of Quality of Service indicators for broadband will be extracted, which will be the suggested values for these indicators in the country and according to the case study in this paper, the country is Sudan.

A. Broadband setting Parameters Steps

The following steps are for setting broadband parameters for any particular country to upgrade the performance by setting quantitative and qualitative parameters. The first step is to analyze and filter the market indicators for the mentioned countries at the ITU website as country profiles in a form of tables, representing: various statistics, which is formed in every country's profile by ITU. After that, a filtering process will be performed to each table using indicators' weights. Then performing the second stage of filtering which it represents comparing the filtered results for the countries and indicate which of these countries are more similar to the targeted country. After determining the most similar countries to the targeted country in their experience, comes the stage of extracting their broadband parameters, using the average value of some of the most important parameters to suggest these values as targeted values for these parameters to be implemented in the targeted country.

Also, the least values of every parameter from these countries experiences could be used instead of the average values such as will be seen in the case study of Sudan.

B. Setting Broadband Parameters for Sudan

The guidelines for setting parameters for broadband mentioned above will be applied to determine parameters for Sudan, and the guidelines' steps will be clear in the case study and could be applied to any other country.

C. Various Statistics

Firstly must expose the tables for various statistics of country's profiles from the ITU website, it's represented as list contains countries profile and each country profile has its KPIs, in this paper each one of the KPIs has been recollected in a form of table for a bunch of countries together in the same table to facilitate the comparison between the countries.

The next table represents various statistics indicators for seventeen countries in addition to Sudan as a reference country, from countries profiles in the ITU website.

III. Result AND DISCUSSION

Table1, the table for various statistics of country's profiles from the ITU website

Indicators	Fixed-telephone subscriptions per 100 inhabitants	Mobile-cellular subscriptions per 100 inhabitants	Fixed (wired)-broadband subscriptions per 100 inhabitants	Mobile-broadband subscriptions per 100 inhabitants

Algeria	8.8	103.3	3	0
Albania	9.7	108.4	5	18.4
Bulgaria	30.4	145.7	17.6	40.3
Côte d'Ivoire	1.3	96.3	0.2	0
India	2.5	68.7	1.1	4.9
Korea	61.9	110.4	37.6	106
KSA	16.7	184.7	6.8	42.8
South Africa	7.9	134.8	2.2	26
Turkey	18.6	90.8	10.5	16.3
UK	52.6	130.8	34	72
USA	44	98.2	28	74.7
Italy	35.5	159.5	22.1	51.8
Jordan	6.7	139.1	3	10.7
Bahrain	21.3	156.2	12.7	67.1
Lebanon	20	93.2	11.7	0.3
Nigeria	0.3	67.7	0	10.2
Kenya	0.6	71.9	0.1	2.2
Sudan	0.9	60.5	0.1	16.4

Table2. Show another various statistics of country's profiles from the ITU website.

Indicators	Households with a computer (%)	Households with internet access at home (%)	Individuals using the internet (%)
Algeria	24.2	19.4	15.2
Albania	20	20.5	54.7
Bulgaria	52	51	55.1
Côte d'Ivoire	2.3	1.3	2.4
India	10.9	9.5	12.6
Korea	82.3	97.4	84.1
KSA	67.7	66.6	54
South Africa	23.6	25.5	41
Turkey	50.2	47.2	45.1
UK	87	88.6	87
USA	79.3	75	81
Italy	67	63	58
Jordan	54.6	43.6	41
Bahrain	92.7	79	88
Lebanon	79.7	64	61.2
Nigeria	11.4	9.1	32.9
Kenya	10.8	11.5	32.1
Sudan	14	29.3	21

Table3. Represents each various statistics indicator's weight.

Indicator	Fixed-telephone subscriptions per 100 inhabitants	Mobile-cellular subscriptions per 100 inhabitants	Fixed (wired)-broadband subscriptions per 100 inhabitants	Mobile-broadband subscriptions per 100 inhabitants

Indica tor weigh t	2	5	3	4

Table4. Another Table represents each various statistics indicator's weight.

Indicators	Households with a computer (%)	Households with internet access at home (%)	Individuals using the internet (%)
Indicator weight	2	3	4

Table5. Filtered Various Statistics KPIs

Indicator	Mobile-cellular subscriptions per 100 inhabitants	Fixed (wired)-broadband subscriptions per 100 inhabitants	Mobile-broadband subscriptions per 100 inhabitants
Algeria	103.3	3	0
Albania	108.4	5	18.4
Bulgaria	145.7	17.6	40.3
Côte d'Ivoire	96.3	0.2	0
India	68.7	1.1	4.9
Korea	110.4	37.6	106
KSA	184.7	6.8	42.8
South Africa	134.8	2.2	26
Turkey	90.8	10.5	16.3
UK	130.8	34	72
USA	98.2	28	74.7
Italy	159.5	22.1	51.8
Jordan	139.1	3	10.7
Bahrain	156.2	12.7	67.1
Lebanon	93.2	11.7	0.3
Nigeria	67.7	0	10.2
Kenya	71.9	0.1	2.2
Sudan	60.5	0.1	16.4

Table6. Another Filtered Various Statistics KPIs

Indicator	Households with internet access at home (%)	Individuals using the internet (%)
Algeria	19.4	15.2
Albania	20.5	54.7
Bulgaria	51	55.1
Côte d'Ivoire	1.3	2.4
India	9.5	12.6
Korea	97.4	84.1
KSA	66.6	54
South Africa	25.5	41
Turkey	47.2	45.1
UK	88.6	87
USA	75	81
Italy	63	58
Jordan	43.6	41
Bahrain	79	88
Lebanon	64	61.2
Nigeria	9.1	32.9
Kenya	11.5	32.1
Sudan	29.3	21

Table7.Filtered Various Statistics KPIs to determine similar countries to Sudan.

Indicators	Mobile-cellular subscriptions per 100 inhabitants	Fixed (wired)-broadband subscriptions per 100 inhabitants	Mobile-broadband subscriptions per 100 inhabitants
Algeria	0.585	0.033	0
Albania	0.553	0.02	0.891
Bulgaria	0.415	0.005	0.406
Côte d'Ivoire	0.628	0.5	0
India	0.88	0.09	3.346
Korea	0.548	0.002	0.154
KSA	0.328	0.014	0.383
South Africa	0.449	0.045	0.63
Turkey	0.666	0.009	1.006
UK	0.462	0.003	0.227
USA	0.616	0.004	0.219
Italy	0.379	0.005	51.8
Jordan	0.434	0.033	1.532
Bahrain	0.387	0.008	0.244
Lebanon	0.649	0.009	54.666
Nigeria	0.893	0	1.607
Kenya	0.841	1	7.454
Sudan Reference	60.5	0.1	16.4

Table8.Another Filtered Various Statistics KPIs to determine similar countries to Sudan.

Indicators	Households with internet access at home (%)	Individuals using the internet (%)
Algeria	1.510	1.382
Albania	1.429	0.384
Bulgaria	0.574	0.381
Côte d'Ivoire	22.538	8.75
India	3.084	1.666
Korea	0.301	0.249

KSA	0.439	0.388
South Africa	1.149	0.512
Turkey	0.621	0.466
UK	0.331	0.241
USA	0.391	0.259
Italy	0.465	0.362
Jordan	0.672	0.512
Bahrain	0.371	0.239

Table9.Another Filtered Various Statistics KPIs to determine similar countries to Sudan.

Lebanon	0.457	0.343
Nigeria	3.219	0.638
Kenya	2.548	0.654
Sudan	29.3	21

Table10. Filtering Market Indicators to determine the most similar countries to Sudan.

Indicators	Countries			Margin
Mobile-cellular subscriptions per 100 inhabitants	Côte d'Ivoire	India	Turkey	0.6—1
Fixed(wired) - broadband subscriptions per 100 inhabitants	Algeria	Côte d'Ivoire	India	0.03—1
Mobile-broadband subscriptions per 100 inhabitants	Albania	Bulgaria	India	0.8—3.5
Households with internet access at home (%)	Algeria	Albania	India	1.1—3.5
Individuals using the internet (%)	Algeria	India	South Africa	0.5—1.6

Table11.Another Filtering Market Indicators to determine the most similar countries to Sudan.

Indicators	Countries				Margin
Mobile-cellular subscriptions per 100 inhabitants	USA	Lebanon	Nigeria	Kenya	0.6—1

Fixed (wired)-broadband subscriptions per 100 inhabitants	South Africa	Jordan	Kenya		0.03—1
Mobile-broadband subscriptions	Turkey	Jordan	Nigeria		0.8—3.5

Table13. Another Filtering Market Indicators to determine the most similar countries to Sudan.

Mobile-broadband subscriptions per 100 inhabitants	Turkey	Jordan	Nigeria	0.8—3.5
Households with internet access at home (%)	South Africa	Nigeria	Kenya	1.1—3.5
Individuals using the internet (%)	Jordan	Nigeria	Kenya	0.5—1.6

Table14. The average values of parameters from countries similar to Sudan.

Indicator	Average Targeted Value
Latency	Data 250 ms Video 150 ms Audio 100 ms
Throughput	80.14 % of the subscribed speed
Download Speed	3.6 Mbps >> Steady State all 24 h
Upload Speed	1.8 Mbps >> Steady State all 24 h
Service Availability	96 %
Packet Loss	< 3 %

Table15.The least values of parameters from countries similar to Sudan.

Indicator	Targeted Value	Comment
Latency	Data 320 ms Video 230 ms Audio 170 ms	The least values had been chosen to be used as suggested targeted values to be applied in Sudan, and that's because it's the first attempt for approved parameters for broadband in Sudan
Throughput	70 % of the subscribed speed	
Download Speed	2.1 Mbps >> Steady State all 24 h	
Upload Speed	0.9 Mbps >> Steady State all 24 h	

Service Availability	91 %	
Packet Loss	< 5 %	

The International Telecommunication Union's Key Performance Indicators (KPIs) weighing and filtering mechanism is recommended to be customized for similar required topics. Issuance of updated reporting system for the broadband quality of service measurements.

IV. CONCLUSION

Broadband quality of service parameters is recommended to be approved by the regulatory authority. The drafted quality of service parameters should be applied and comforted with the performance of the operator's networks. The customized broadband parameters must be regularly assessed and adopted. The recommended broadband parameters should continually evolve with future techniques and systems. The existing quality of service measuring and monitoring techniques should be upgraded to fit proposed broadband parameters. Deliverables of measurements should be benchmarked with those of the operators on a quality base.The comparative report on the broadband quality of service for the operators should be declared and published. The new parameters which came as a result of this paper and was based on the international KPIs should be raised and adopted by the relevant international organizations, such as ITU, IEEE, and ETSI in order to be evaluated and assessed.

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