

# A Study of YouTube's Service Quality

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**Abstract** – YouTube is the most trending and most widely used video streaming platform in today's date. Their users are spread across the world. With such a broad user base, it becomes important to survey the quality of service provided by them at global level. In the following paper the researchers attempt to study the relevant literature on the topic and explain their methodology of assessing the quality of service provided by YouTube. They also attempt to state the gaps and shortcomings in the services provided by the streaming platform effectively and come up with relevant suggestions.

**Keywords**– YouTube, Service, Quality, Quality of Experience, QoE, Quality of Services, QoS, over-the-top, OTT, assessment, survey.

## I. INTRODUCTION

Over-the-top media services, also known as OTT services are video streaming media services provided over internet directly to the users/viewers. It is an industry with a boom in the global market with huge players coming in as competitors. There are 2 major ways of revenue generation for OTT services, one being subscription-based video on demand (VoD) services where user subscribes to the OTT platform by paying them based on their predefined plan and other way is to display ads and provide the content for free. Various examples of subscription-based platforms are Netflix, Prime video, Hulu, iTunes etc. One major player with ad-based structure is YouTube. Although YouTube too has a section for subscription-based model with YouTube premium and YouTube TV, the main source of revenue generation is ad-based model where content is accessible free of cost. This has actually made YouTube the biggest video streaming platform with largest customer base.

YouTube is a user centric video publishing platform with certain characteristics of social media as well. The major online social networks such as Facebook, Twitter and Pinterest are seamlessly connected with YouTube. Moreover, it is already the globally largest video sharing network but still systematically growing. YouTube became a killer application for broadband mobile network providers. YouTube attracts a large share of data traffic in India and this itself is a challenge for the network service providers to guarantee a user satisfaction level while streaming through such services. Furthermore, in order to guarantee a user satisfaction level and due to a very competitive market environment, additional investments to its network infrastructure will be needed. Therefore, it is crucial to obtain statistically relevant Service Quality assessments in order to find a reasonable trade-off between Service Quality and investments.

According to estimates, with 100 million video views per day YouTube accounts for approximately 60% of the videos watched on the Internet; YouTube is also growing at a rapid pace, with 65,000 video uploads per day. At present, the YouTube service has over a billion users which are almost one in a third of all people on the Internet. Every day people watched hundreds of millions of hours on YouTube channel which can generate billions of views.

Today, YouTube is the most relevant site for independent content creators to earn and to get platform with a wide audience where the audience too derives several benefits varying from entertainment to learning for people coming from all walks of life.

Hence, considering the mass and might of the giant that YouTube is and the large customer base that it boasts it is necessary to identify the gaps in its services which can be bridged by either YouTube itself or any of its competitors trying to gain a competitive edge.

## II. RESEARCH METHODOLOGY

The research was conducted on an independent basis by using secondary sources of data. If an accurate study with the help of relevant and absolute data is carried out about the Services of YouTube, then the quality of services can be determined which would potentially reveal the strengths, shortcoming, and gaps in this over-the-top service provider.

Various previously conducted researches on the service quality levels of YouTube are critically analysed and are used as the base for conducting further research of the same.

## III. OBJECTIVE

Objective of the following paper is to provide constructive feedback to YouTube to overcome their shortcomings and also provide the competitors in over-

the-top media service industry as well as the new entrants in the industry with the knowledge of the gaps in the services provided by YouTube which would help them bridge these gaps to gain competitive edge.

#### Literature Review

To assess the quality of YouTube, Arisa Vilaikruad and Peerapong Uthansakul have carried out an experiment [1]. The experiment has been carried with the following steps –

- Experimental Design
- Data Collection
- Data Evaluation

We will see each step in detail.

### 1. Experimental Design

The experiments are designed to determine a sample group or target group for assessing the quality of YouTube videos on 3G and 4G mobile networks. As shown in Figure 1, the collected data to evaluate the satisfaction with YouTube services and QoS parameters are measured by using the Azenqos application. After downloading the log files from Azenqos server, the analysis of the satisfaction of users and all QoS parameters can be done offline in computer.

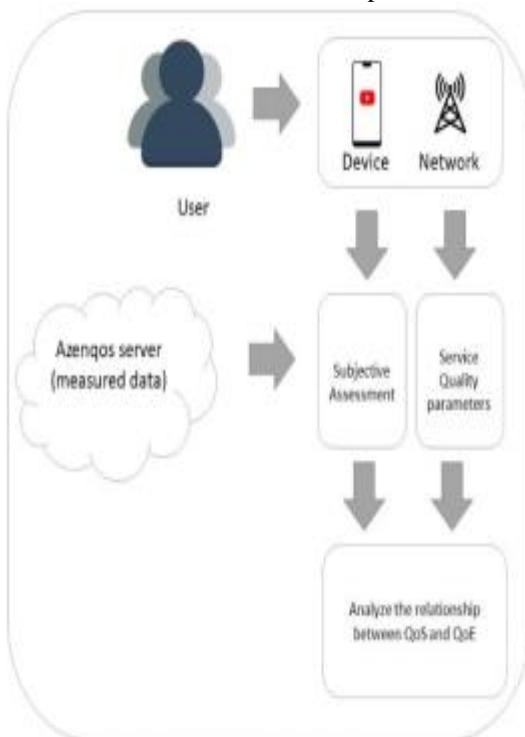


Fig.1. Experimental Design.

### 2. Data Collection

The authors collected data for analysing the results from two sources. The first source is the data from assessment of user satisfaction. This can be done by asking the users to give MOS level after watching YouTube videos. In that time of asking users, all QoS parameters are measured

and sent to the server. Data from the satisfaction assessment come in the level of assessment based on the principle of MOS. The users are 90 undergraduate students aged 21-23 years old. They watch the video six times per location. The number of samples in the assessment of MOS is 1,080. Video length is approximately two minutes. The quality of video is 1080p. The place of experimental study is spread throughout the area of Suranaree University of Technology.

The second source come from the server of Azenqos. Actually, more QoS parameters come in the log file but this paper focuses on only data parameters relating to YouTube service including with YouTube duration to first play, YouTube buffering duration, and download throughput. The example of collected data is shown in Table II. The authors accumulate the position (Latitude, longitude) to indicate where the assessment of MOS is undertaken.

### 3. Data Evaluation

After collecting the data assessment of user satisfaction of YouTube services by subjective assessment method, the offline analysis is performed by MATLAB programming. The analysis is separated into two parts. The first one focus on the relationship between QoS parameters. This investigation provides more insight on the basic understanding of YouTube service. The second part focus on the effect of each QoS parameter on QoE in terms of MOS. This study will let us know the most influencing QoS parameters.

This paper has presented the effect of QoS parameters on the user satisfaction of YouTube videos on 3G and 4G mobile networks.

M. Haddad, E. Altman, R. El-Azouzi, T. Jiménez, S. Elayoubi, S. Jamaa, A. Legout, A. Rao perform an extensive study on two rating types: Absolute Category Rating (ACR) and acceptability and the assessment setup [2]. They attempt to design automatic assessment tool which will follow the methodology requirements and collect all dedicated data. The paper proposes a subjective assessment methodology with selected results on mobile YouTube Quality of Experience (QoE).

After this, multiple network conditions were defined and described in tight cooperation with a mobile operator as well. Due to a wide scale of tested conditions and the necessity of precise results processing, the developed transparent QoE assessment tool is described and selected QoE results are discussed.

The result of the experiment presents the quality and acceptability ratings. The general consistency of obtained ratings can be very well seen in all scenarios. The quality and acceptability ratings are rising with the increase of

resolution and with increase of initial loading delay both ratings are decreasing.

The overall quality and acceptability at resolution 320x180 pixels is clearly insufficient. The considerable improvement is achieved at resolution 640x360 pixels. The video quality reaches the QoE saturation point at resolution 854x480 pixels. Moreover, it can be seen the relative quality decrease between optimal streaming conditions (no initial loading delay) and 5 and 10 second initial loading delays, but it can be observed that the test subjects are not very sensitive to initial loading time up to 10 second duration. Both quality ratings show perfect correlations between quality and acceptability ratings. The smartphone use case has 97,2% and tablet use case has 99,1% Pearson correlation. Finally, it can be seen than in identical scenarios, but using different devices, different ratings were obtained. Based on that, we found out that test subjects have higher QoE expectations from the tablet than from smart phone. It is especially due to larger screens with higher resolution provided by tablets.

#### IV. SUGGESTIONS

As per the studies conducted it can be inferred that YouTube should modify their algorithms. The video quality must adjust itself in pixels based on the type of device that it is being streamed upon rather than just following a common algorithm for all devices as the specifications like screen size, resolution, network adaptability, etc. for each device is distinct. This would improve Quality of Experience (QoE) for users of individual devices dramatically.

With the introduction of 5G and announcement of 6G technology in telecommunications it is important that YouTube adopts itself to such changes as these would revamp the world of data provision and network provision at a great level. In the coming couple of years, the face of telecommunication services across the globe would completely change the expectations of users in case of service quality provided by over the top service platforms. One major problem observed by the researchers during the research process was that YouTube does not ask for "interests" of the users. This results in spamming of irrelevant video recommendations rather than the topics which they are actually interested in. It may happen that a user searches for a topic only once for a particular purpose which upon fulfilment is of no use to the user but YouTube assumes this as one the "interests" of the user and spams his feed with similar videos. Also, YouTube keeps on recommending the same videos which the user has already watched completely or partially. On the other hand, OTT platforms such as Netflix asks the user to fill in details about his/her interests at the time of creating an account to effectively display recommendations which best suit the interests of the users giving them a custom look.

#### V. CONCLUSION

YouTube is a very popular streaming platform and boasts the largest market share in the industry amongst all its competitors. The major reason behind this is that it is free of charge unless a premium account is to be purchased. Due to this, YouTube is beneficial for the users, content creators, corporate organisations as well as advertisers using the platform for promotion purposes.

Despite all these factors there are certain shortcomings in the services of YouTube which the paper has been successful at pointing out. The output of the research identifies the various shortcomings and the gaps in the services of YouTube which can be used by YouTube itself to further improve their service quality delivery. Also, the various competitors in the OTT industry as well as new entrants can gain a wider market share and a competitive advantage by bridging the gaps YouTube has created in its services.

Therefore, the companies in this industry must understand the relationship between Quality of Service and Quality of Experience it can provide to its user base.

#### REFERENCES

- [1]. Vilaikruad, P. Uthansakul "Effect of Quality of Service Parameters on Quality of Experience for YouTube Service in Mobile Networks", 14th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON), 2017
- [2]. M. Haddad, E. Altman, R. El-Azouzi, T. Jiménez, S. Elayoubi, S. Jamaa, A. Legout, A. Rao "A Survey on YouTube Streaming Service"
- [3]. M. Seufert, F. Wamser, P. Casas, R. Irmer, P. Tran-Gia and R. Schatz, "YouTube QoE on mobile devices: Subjective analysis of classical vs. adaptive video streaming." 2015 International Wireless Communications and Mobile Computing Conference (IWCMC), Dubrovnik, pp. 43-48, August 2015.
- [4]. Wubin Pan, Gaung Cheng, Hua Wu and Yongning Tang, "Towards QoE assessment of encrypted YouTube adaptive video streaming in mobile networks." 2016 IEEE/ACM 24th International Symposium on Quality of Service (IWQoS), Beijing, pp. 1-6, June 2016.
- [5]. P. Casas, A. D'Alconzo, P. Fiadino, A. Bär and A. Finamore, "On the analysis of qoe-based performance degradation in youtube traffic." 10th International Conference on Network and Service Management (CNSM) and Workshop, Rio de Janeiro, p. 1-9, November 2014.
- [6]. G. Chatzopoulou, C. Sheng, and M. Faloutsos, in 2010 INFOCOM IEEE Conference on Computer

- Communications Workshops, March 2010, pp. 1–6.
- [7]. M. Zink, K. Suh, Y. Gu, and J. Kurose, “Characteristics of YouTube network traffic at a campus network - measurements, models, and implications,” *Computer Networks*, vol. 53, no. 4, pp. 501 – 514, 2009.
- [8]. N. Yoshihara, H. Tode, and K. Murakami, “Buffer management mechanism suitable for TCP streaming in qos-aware ip router,” in *Consumer Communications and Networking Conference (CCNC), 2010 7th IEEE*, 2010.