Analysis Of Quality Of Service Parameters Over Cloud Networks

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Abstract : Cloud computing is gaining popularity every day. Building high-quality cloud applications with high service quality is a critical research issue. This paper presents an analysis of the quality of service parameters across cloud network involving media server. When browsing a media from server to client, bandwidth is a very crucial parameter. Latency is the time of packet that it takes to travel from one endpoint to another and jitter is the variation amongst the value obtained for latency. Bandwidth, latency and jitter parameters are calculated on the client side for different videos of different resolutions via. 480p and 720p. A comparative study is done for both the results obtained. The aim of this research paper is to design, implement and analyze a code-based solution for automatic calculation of QoS parameters.

IndexTerms - **QoS, latency, bandwidth, jitter, Cloud Service, network.**

I. INTRODUCTION

QoS is the measurement of the service's complete performance, such as performance seen on the network by cloud service user . Several related aspects of the network service are often considered in order to quantitatively measure the QoS, such as bandwidt h, latency and jitter.

Cloud service providers mainly calculate the required bandwidth of cloud service users only by considering the available bandwidth needed by different types of applications. Information technology administrators are often suggested to determine the bandwidth that the company will need for both data storage and cloud operations transformation, as well as latency. It is important to know that there is dependency amongst latency and jitter.

Latency cannot be drastically reduced ; however, at any time, bandwidth can be increased. The latency of the cloud service is the delay between a cloud service user request and a cloud service provider response.

Jitter is the time delay variance between data packets over a network. It is a disruption in the normal chain of sent data packets. The technical term used for jitter is the "packet delay variance." Jitter appears as different symptoms, based on the application we are using. Jitter is also calculated in milliseconds like latency.

In-short, bandwidth, latency and jitter are considered as important metrics for media server performance. There are different methods and techniques for calculating bandwidth, latency and jitter. On the client side, calculation of these QoS parameters is done, then we perform analyzes for these parameters.

II. LITERATURE REVIEW

Since the crucial factors in future QoS networks are latency and jitter, it is necessary to investigate the analysis of delay and therefore the latency and jitter that determines this. To our best knowledge, there is no comprehensive study of the characteristic analysis of latency and jitter for IEEE 802.11eWLANs, and delay analysis is limited to the derivation of the mean value. therefore, we need to analyze the latency and jitter by using higher moments, and the probability distribution function of the delay [1].

A.Haq represents the survey for bandwidth utilization at Federal University of Technology Minna campus with the hope of proffering a general solution that can be adopted in Nigerian universities for effective bandwidth management. A significant bandwidth allocation is needed in order to meet up with the challenges of the day and the task of networking, communicating and reaching the word in our universities[2].

Author Daniel Shaya present the very simple class to measure latency. It.s not the Rolls Royce solution that is HDR Histogram but it provides a simple method "math.sqrt" method to compute latency quite nicely[3].

The main challenge in the engineering of current IP networks is the integration and support of a wide variety of applications and services combining voice, data, streaming, and VoD. The different media types exchanged by these applications have different requirements in terms of bandwidth, latency, jitter, and reliability. For real-time and interactive services, delay jitter remains one of the most important parameters of quality of service. Nevertheless, the effect of jitter on network structure and operation is not well understood. Getting some qualitative understanding of this QoS requirement will be only possible when we have a fast evaluation method for jitter that can be used in network design algorithms[5].

Recently, there have been some proposals for delay jitter models in DiffServ networks. An extension of [7] was proposed in [6] to evaluate the per-class jitter. The authors [8] provided some analysis of the delay jitter by means of event-driven simulations (ns-2) where EF flows are represented by renewal periodic ON–OFF flows.

All of these methods mentioned above focus on analyzing QoS parameters with respect to bandwidth, latency and jitter. Such calculations take time and analysis may cause difficulties. It is therefore necessary to produce simple formulas for analyzing such

QoS parameters which can be done in a short period of time. Math.sqrt) (method-based code formulas provide smoothness for calculating latency, as well as simple code formulas provide quick jitter and bandwidth calculation and analysis can be done in seconds.

III. METHODOLOGY

We use simple java class programs to analyze the quality of service parameters. The Emby media server is used to stream the videos, it automatically converts and streams the media on the fly to play on any device. It also provides cloud synchronization for personal media to the cloud for easy backup, archiving, and conversion. Store the content in multiple resolutions to allow direct streaming from any of the devices. Client side login is done through the javafxwebbrowser application and all calculations are done on the client side.

3.1 Media server set-up:

The first stage of the system uses the Media Server to import media libraries for the latter stage. We use the Emby server for greater flexibility. Emby Media server provide some good level of security to make the multimedia contents as well as other details to be secure. Once the server is set, CSP create some libraries for multimedia content. CSP also uploads multimedia content to the local host. This content is accessible through local host by CSP. Two different resolution videos are imported here to calculate the parameter performance. Videos with Resolutions taken into account for calculating bandwidth, jitter and latency. Two different resolution videos: a) 480p with data rate 809kbps and b) 720p with data rate 1275kbps are considered.

3.2 Client set up:

Second, we use Netbeans for CSU. We install this software and use JavaFxApplication for the project. We're building a GUI where CSU can access various websites such as Google Drive, Yahoo.com, YouTube and local host. CSP is able to access local host and other websites. From there, CSP can view or download multimedia content. The client accesses the resolution video and calculates the bandwidth, latency and jitter, and the results of the parameters are displayed to the client in a tabular format.

3.3 Bandwidth Calculation:

We use java code to calculate the bandwidth rate for a particular resolution video. The initial process of calculating bandwidth starts with the start time, which is assumed to be 0. Within while Loop, downloaded data will be added to the total data considered as a Total Download. The downloaded rate in bytes per second is calculated in Outside the loop, kilobytes per second and megabytes per second.

Formulas:

For download rate in bytes per second,

```
ct=d.getTime()/1000                    (1.1)

t=(double)(ct - startTime);            (1.2)

bytesPerSec = TotalDownload/ t;        (1.3)
```

Here, ct stands for CalculationTime and t stands for TimeDifference.

For download rate in kilobytes per second,

```
kbPerSec = bytesPerSec / (1024);       (1.4)
```

For download rate in megabytes per second,

```
mbPerSec = kbPerSec / (1024);          (1.5)
```

3.4 Latency Calculation:

The time between making a request and starting to see a result is Latency. We retrieve the starting time of the process and also the end time of the process, the difference between them is considered here as latency. It includes the processing time of the streamed video.

$$\text{latency} = \text{end time of process} - \text{start time of process} \quad (1.6)$$

3.5 Jitter Calculation:

Mean value of the latency values is calculated. Then squared deviation for latency value is calculated then square root for the value retrieved/totalValues is calculated. The result is value for jitter.

$$avg = (x1+x2+...+xn)/n \quad (1.7)$$

where x1, x2,..., xn are the latency values
n is total number of latency values

squared deviation (sd) is calculated:

$$sd= (x1-avg)^2 + (x2-avg)^2 + ... + (xn-avg)^2 \quad (1.8)$$

Finally, Calculation of jitter is done from the square root of the average squared deviation

$$jitter =sqrt (sd/n) \quad (1.9)$$

IV. RESULT

The result of bandwidth for the following resolution videos are as shown below.

i. For 480p with data rate 809kbps video, we get 1727.29902475kbps bandwidth.

ii. 720p with data rate 1275kbps video the bandwidth is 1727.29922783 kbps bandwidth.

The outcome of Latency for the same resolution videos are…

i. 480p with data rate 809kbps = 3.41ms latency.

ii. 720p with data rate 1275kbps = 19.34 ms latency.

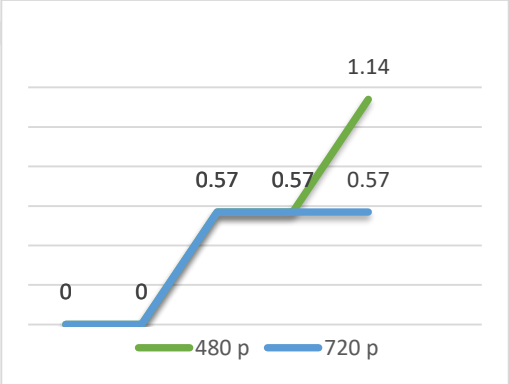

Fig. 1. Variation in Latency values

Calculating jitter for both resolution videos.

i. 480p with data rate 809kbps = 0.441434 pdv

ii. 720p with data rate 1275kbps =1.086713 pdv

pdv here stands for packet delay variance.

From the upper result, we analyzed that when the video data rate is high, we get high bandwidth video is low, we get less bandwidth, latency, and jitter.

Table 1:Analysis

QoS Parameters	480p with data rate 809 kbps	720p with data rate 1275 kbps
Bandwidth	1727.29902475 kbps	1727.29922783 kbps
Latency	3.41 ms	19.34 ms
Jitter	0.441434 pdv	1.086713 pdv

V. CONCLUSION

In this research, we concluded at the end of the analysis that the bandwidth, latency and jitter QoS parameters affect the quality on the network. Since this analysis is faster, simpler and less time consuming, we can use this method to calculate other parameters such as delay, throughput, etc. We will try to deploy enhancement technique in the future, which will provide a solution to reduce the jitter value for different quality videos.

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