"INVESTIGATION OF RENDERING AND STREAMING VIDEO CONTENT OVER CLOUD USING VIDEO EMULATOR FOR ENHANCED USER EXPERIENCE"

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Abstract

In this era of information technology the devices are becomes more efficient and effective such as mobile devices or smart phones (i. e. android, Microsoft windows). The increasing capability and use of internet using these devices enable us to share and view internet contents from these devices. Therefore utilities of the mobile devices are increases as the internet growing their resources. On the other hand due to the mobility effect the strength of network is also affected and the efficient experience of contents visualization and downloads are also affected. In this presented work the content delivery networks such as cloud video hosting is investigated. Additionally the claims on efficient data delivery and video streaming is also investigated in order to find which method or which format of data is suitable for good video streaming experience in cloud environment. Therefore the proposed study includes the investigation of cloud platform, mobile device video surfing and effect of video formats in content delivery. In order to perform such study a test environment is developed through the android based video player implementation. And cloud storage service through the public cloud OpenShift. The cloud storage service enables a user to host the video contents on the cloud server and play the video through the developed video player. After implementation of the given test model the performance of video player is estimated in terms of delay, byte send and receive and the packet loss patterns over three most popular video file formats namely 3GP, MP4 and WEBM. The evaluation of results demonstrates the delay on content delivery is higher with MP4 and much efficient with 3GP format. But the packet loss pattern on the 3GP format is much higher as compared to the MP4 file formats.

***Keywords*: cloud computing, mobile computing, android, video content delivery, streaming**

Introduction

The cloud computing is new generation computing manner. That becomes popular due to it is remote process execution ability and scalable storage of data. In addition of that it is it provides the environment for design and develops the applications on remote systems with efficient computing experience. The high speed execution also enables the cloud to deliver the user contents more efficiently and effective manner. The efficient abilities of cloud computing offers to store and retrieve the data from their storage therefore in this work the cloud storage services for the video and audio content delivery in different formats and their claims are investigated for finding the their authenticity.

In order to perform the proposed experimental analysis a test bed is prepared using the public cloud hosting service and the video contents of different file formats namely 3GP, MP4 and the WEBM file formats. Additionally a mobile application based video player is also required to implement which accept the streamed video contents from the server and play the video on mobile device. In order to simulate the entire work the two different modules are required to implement first modules is used to host on the cloud server. this cloud based application provide the user interface for uploading the video contents on the hosting server and the second module is implemented in order to provide the interface for the mobile device user. Therefore the application for mobile user is implemented using the android platform.

In this presented work the key aim to investigate the video format data transfer and streaming over the cloud environment. Additionally to improve the experience of user for video data or video content delivery for the android based devices. Therefore the proposed approach needs to design a system, which initially provides the user interface for the cloud storage. That accepts the user input data form any source of user disk storage and upload it over the server storage. On the other hand required to provide a user device based application development which utilizes the cloud server data using the implemented web services for delivering it or stream it over the client mobile device.

In addition of that it is also required to apply some technique which provides the efficient streams of data to deliver the contents over the mobile devices to play without any hurdle. The further section of the chapter explores the proposed technique and the methodologies of the entire system development.

System Modeling

Cloud computing is a new computational and storage technology. That reflects their ability by scaling the resources and minimizing the resource conflicts. Therefore in this age this technology becomes increasingly popular. A number of applications which used for accepting huge volume of data and processing a huge quantity of data is utilizing the technology of cloud computing. Among them the video content based applications are also in high demand a huge amount of traffic is attracted on these web apps and/or mobile apps.

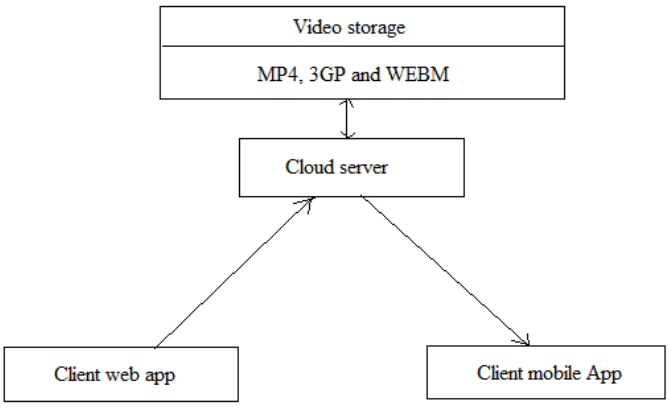

Figure 1. Methodology

In this proposed work the key aim to develop an environment for video content delivery application for the mobile applications more specifically for android applications. Additionally tries to recover the content delivery performance during the fluctuating resources such network availability and the strength. Therefore a testing application is developed using cloud platform and android mobile application. The proposed testing

environment is simulated using figure given below. The entire system contains the following essential components:

1. **Client web application:** that is a client web application used as on demand service for utilizing the cloud platform for upload the video content on the cloud server. Therefore a JSP based application is written for the OpenShift cloud. Additionally the code repository is prepared using the GitHub. This application enables a user to select a video file from the local machine and upload it to the server.
2. **Mobile application:** there are a number of mobile devices and smart phones are available for use in market. Among them the android platform is selected to develop and deploy the mobile based video player. This player provide a list of video files which are hosted on the cloud server and by selecting the appropriate video the user can play the video on mobile video player.
3. **Cloud server:** in place of the normal hosting service the cloud platform is selected to host the video contents. That promises to provide the efficient data delivery for the all kinds of networks.
4. **Cloud storage:** the storage of the cloud platform contains only three key formats of data namely MP4, 3GP and WEBM. All these formats are enabled to use with the video player and also plays the video when they are selected.

This section provide the experimental environment and test bed, the next section provide the performance analysis of the system.

Performance Analysis

A. Testing Scenario

In order to perform the streaming from the server to client device the OpenShift public cloud is used to host the video files. Additionally to utilize the files with the mobile device the following configuration is used for android device. The experimentation of the system involves the different file formats namely 3GP, MP4 and WAVM.

Table 1 Android Device Configuration

Android version	Android 5.1.1 lollipop
Processor	G^{3rd} generation 1.4 GHz
RAM	2 GB
Chipset	Quad comm MSM8916
GPU	Adreno 306

B. Delay

The delay is also known as the response time. That is a measured in terms of the time difference between making the request to the server for initializing the process at the client end. The given Figure 2 shows the different experiments performed on the three different data formats, with the delay associated with the playing the video.

Table 2. Delay in Sec

Experiments	3GP	WEBM	MP4
1	8.09	11.69	36.65
2	9.0	11.93	36.99
3	10.02	12.38	37.19

4	10.11	12.86	37.48
5	10.23	13.02	37.89
6	10.31	13.29	38.22
7	10.67	13.82	39.00

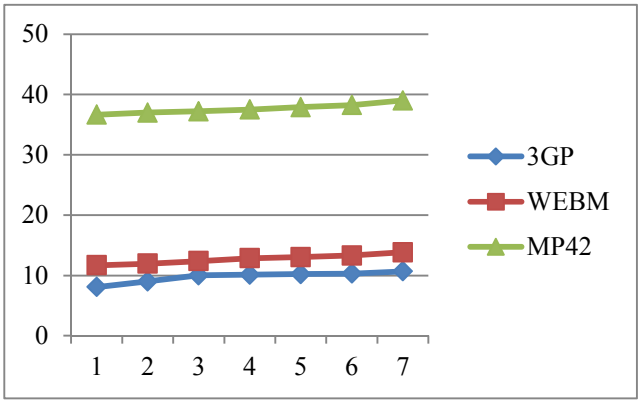

Figure 2. Delays in sec

In order to find the difference among the formats which are producing the delay, thus the mean delay difference is estimation is performed and obtains the difference.

Table 3. Mean Delay in Sec

File formats	Average difference
MP4	37.6
3GP	97.7
WEBM	12.7

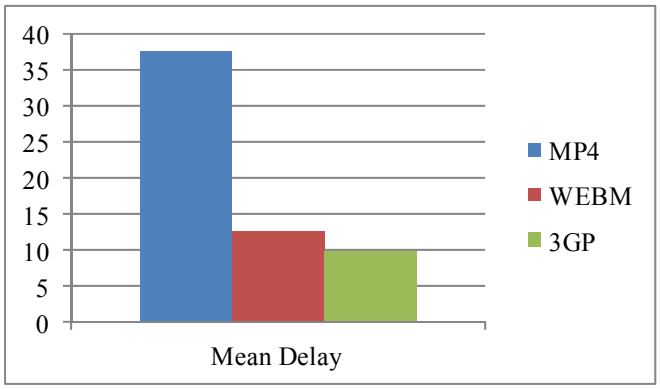

Figure 3. Mean Delays in Seconds

C. Kilo Bytes Received and Send

The amount of data received from the server side is given using the bytes received, and for continuous connectivity the additional information is transferred through the device is given as the byte send. The amount of send bytes are reported using Figure 4 and Figure 5 shows received bytes for entire formats namely 3GP, WEBM and the MP4. According to the obtained results the byte send and received is depends upon the length of file and the amount of data which is required to transfer.

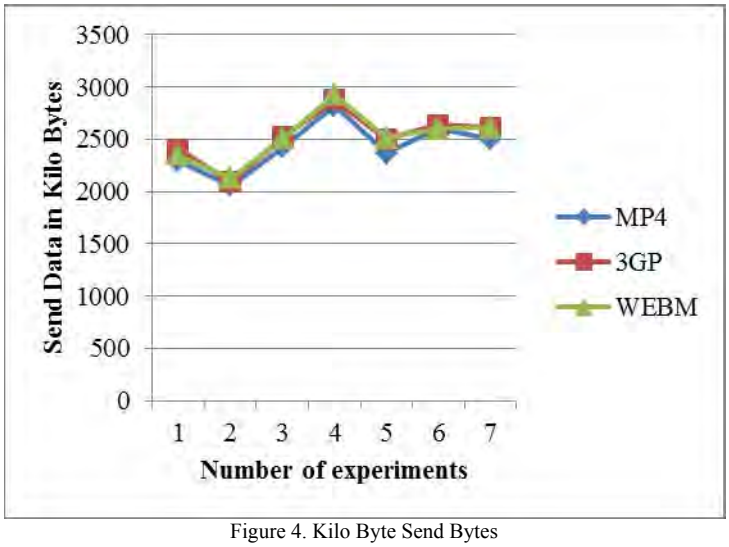

Figure 4. Kilo Byte Send Bytes

Table 4. Kilo Byte Send

S. No.	MP4	3GP	WEBM
1	2295.17	2407.31	2347.69
2	2054.51	2088.69	2131.46
3	2424.53	2521.66	2511.49
4	2819.70	2879.27	2927.90
5	2369.30	2501.51	2513.29
6	2600.47	2635.130	2598.95
7	2501.59	2610.08	2614.39

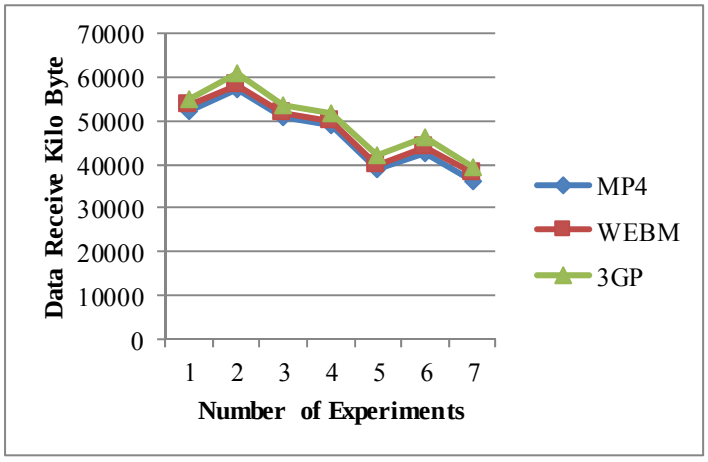

Figure 5. Received Kilo Bytes

Table 5. Kilo Bytes received

S. no.	MP4	WEBM	3GP
1	52108	53341	54780
2	57458	57996	60735
3	50720	51535	53651
4	48758	49753	51687
5	39100	40031	41940
6	42479	43804	46183
7	36326	38078	39350

In order to find the mean performance for individual file formats for serving the data is reported as:

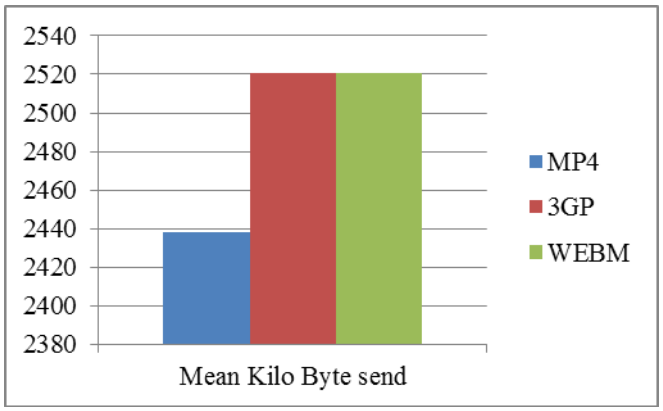

Figure 6. Mean Kilo Byte Sent

The amount of data communicated among client and server system is evaluated in this section therefore the Figure 6 and 7 shows the amount of data send and received. In these diagrams the X axis shows the amount of data transferred and Y axis shows the amount of bytes transmitted. In further the Figure 8 shows the amount of packets send during the play of each format and the 9 shows the average number of packets received during the communication. According to the evaluation of results the amount of byte sends and received is comparatively higher is the similar manner as the amount of delay is reducing. According to the comparative results the format of 3GP exchange more packets as compared to the WEBM and too fewer amount of packet exchange is observed with MP4. Thus in terms of packet exchange the MP4 format of data produces less overhead.

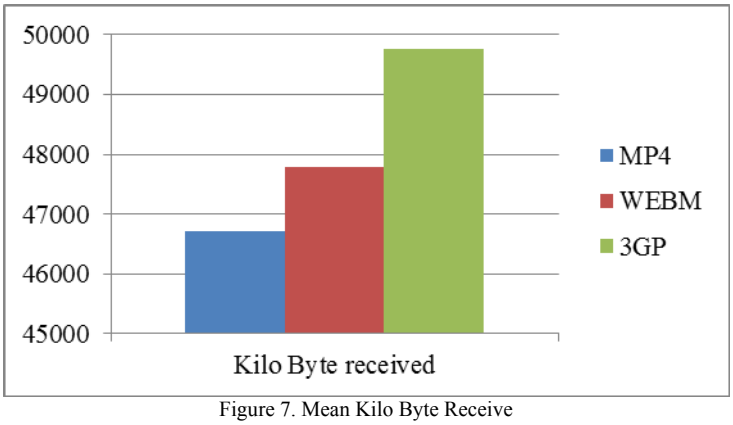

Figure 7. Mean Kilo Byte Receive

D Packet loss pattern

During transmission the amount of data which is not properly recovered for utilization is given as packet loss patterns.

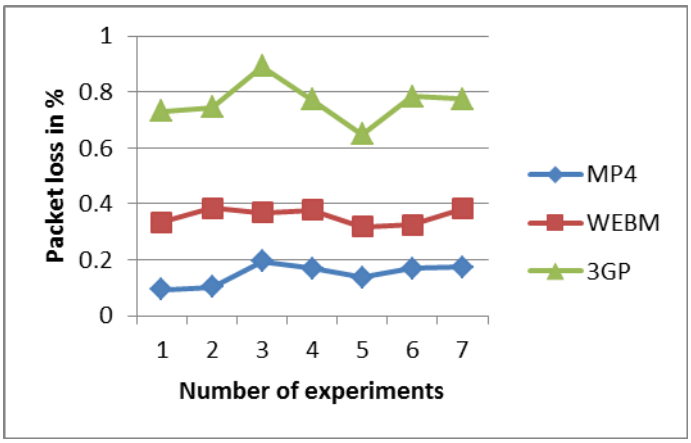

Figure 8. Packet Loss Pattern

The packet loss pattern of all the formats of data is given using Figure 8, in this diagram the number of different experiments performed is given using X axis and the Y axis shows the amount of lost packets in terms of percentage. Additionally the experiment basis outcomes of the packet loss pattern are given in Table 6. These experimental lost packets in terms of their mean loss rate are given using Figure 9.

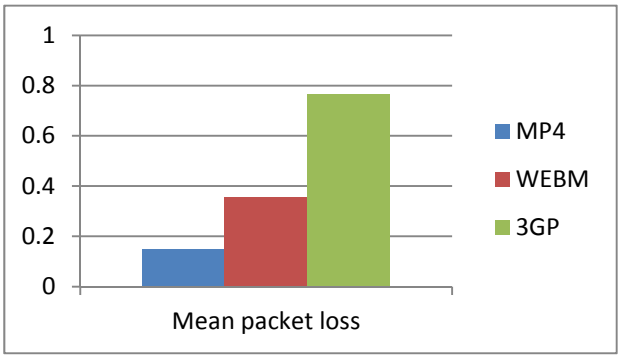

Figure 9. Mean Packet Loss

Table 6. Packet Loss Pattern.

S. No.	MP4	WEBM	3GP
1	0.0941	0.3334	0.7301
2	0.1028	0.3847	0.7453
3	0.1937	0.3681	0.8928
4	0.1683	0.3782	0.7721
5	0.1377	0.3173	0.6482
6	0.1682	0.3247	0.7842
7	0.1737	0.3821	0.7746

Conclusions

The key aim of the proposed study is to find the suitable technique and video file format that can satisfy the currently increasing need of video streaming. Therefore a case study is performed with the cloud platform, mobile application and three different file formats. This chapter presents the summary of the entire work and the future extension of the work is also proposed. In this age of internet and technology a number of services are becomes online. Additionally the empowerment of mobile devices are also provides the services which can be used new generation mobile devices. Among these applications the video content surfing applications are also increases rapidly. Additionally the consumption of these applications is much frequent in mobile devices. But the mobile devices are suffering from the issues of fluctuating network availability and the strength of data transmission.

Therefore in order to enhance the video streaming experience specific content delivery networks, video hosting storages and the different approaches are developed. These developed approaches are promising to deliver the contents more efficiently and effectively by which the user experience is becomes excellent. But during investigation that is found most of the methods and techniques are just theoretical approaches on which the pre-processing time or delay is high thus experience becomes poor.

In order to find an effective and efficient technique the proposed study presents a technique to investigate the authenticity of techniques and file formats. The proposed platform includes the android application, cloud hosted platform and the three different formats of data for streaming the video and computing the client end performance of video player. The experimentation is performed on the fixed file formats such as 3GP, MP4 and WEBM which are used for most video content web applications and mobile applications.

According to the obtained performance of content delivery the following outcomes are obtained as given below Table 7.

Table 7. Performance Summary

S. No.	Parameters	MP4	WEBM	3GP
1	Delay	High	Avg	Low
2	Send bytes	Low	Avg	High
3	Received bytes	Low	Avg	High
4	Packet loss	Low	Avg	High

According to the obtained results the performance of the entire given formats are compared with similar environment and that is found the MP4 promises to deliver high quality of video with less loss rate but the delay on the response is higher. On the other hand the 3GP format demonstrates the high packet loss rate but produces less delay to play the video.

The proposed investigation on the video streaming and rendering in mobile platform is successfully achieved and the comparative outcomes are reported. In near future the work is extended for developing more effective file formats and methods which are really delivers the contents as promised.

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