CLOUD BASED RESOURCE ALLOCATION AND STALLING PREVENTION FOR VIDEO STREAMING APPLICATION

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Abstract: Today Internet has become an integral part of most of our life. The attempt to display media files through Internet was started from the mid-20th century. Video distribution is pointed out as one of the most promising applications of the Internet. Nevertheless, this application is a costly service to provide because of its quality-of-service requirements and the number of potential users. In order to guarantee scalability, providers often serve low-quality videos with no continuous reception. Thus, most of the users are not satisfied with the quality of received video. The proposed research work aims to implement the Video on Demand Service in Cloud Environment in a more secure, scalable and cost effective manner. This paper addresses the problem of optimizing the playback delay experienced by a population of heterogeneous clients, in video streaming applications. We consider a scenario, where clients subscribe to different portions of a scalable video stream, depending on their capabilities. This paper examines the challenges that make simultaneous delivery and playback, or streaming, of video difficult, and explores algorithms and systems that enable streaming of on demand video over packet networks such as the Internet. Prediction Based Resource Algorithm is proposed that the video content is distributed in the form of frames and considering random frames to be sequentially loaded into the user memory .To provide security to the provided content ,the uploaded file is manually audited. This minimizes the buffering delay of the video content irrespective of the bandwidth and provides appropriate content to the clients.

Keywords : cloud computing, video on demand, buffering delay, performance analysis, audit.

I. INTRODUCTION

Multimedia Streaming is constantly received by and presented to an end user while being delivered by a provider. The term "streaming media" can apply to media other than video and audio as a better description for video on demand on IP networks. It is economically inefficient to provide streaming distribution with guaranteed QoS relying only on central resources at a media content provider. To achieve a high QoS for multimedia services, we propose a media-edge cloud (MEC) architecture, in which storage, central processing unit (CPU), and graphics processing unit (GPU) clusters are presented at the edge. Over the past decade, more traffic is increased due to different forms of video (TV, Internet, File sharing using P2P, Video on Demand –VOD etc.,) Cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services [2,19].Cloud multimedia services provide a capable, flexible, and scalable data processing method and offer a elucidation for the user demands of high quality and diversify multimedia.

Media Streaming is a type in which different types of media is constantly received by and presented to an end user which is being delivered by a provider. Now a days streaming of videos online has been in great demand. Almost every user watch the videos online but many a times it is difficult to watch the video without buffering as it is delivered directly from the centralized data servers and on this servers multiple user tries to watch the video online at the same time and it puts loads on the servers so sometime many users couldn't watch it properly gets started with the buffering or also sometimes it is unable to access the video.

With the rapidly increased cloud-service scale and user scale [1], the data centers can hardly provide cloud services, e.g., Video-on-Demand (VoD) with guaranteed Quality of Service(QoS) to geo distributed users.Generally speaking, accessing multimedia video services through networks is no longer a problem. The major video platforms, such as You tube and Amazon, have good management styles and provide users to share multimedia videos easily with diversified services. No matter what the service is, users will always expect powerful, sound and stable functions. For multimedia videos, stability is of the greatest importance. To develop multimedia services provide a capable, flexible, and scalable data processing method and offer a elucidation for the user demands of high quality and diversify multimedia.

Video streaming is not an issue in wired networks but wireless networks (mobile users) has been suffering from sharing of videos over limited bandwidth of links. Though

3G and LTE have been introduced to cope up with the bandwidth, the efforts were not successful due to rapid increase of mobile users. While receiving videos via 3G/4G mobile networks, users suffer from long buffering time to load video and interruptions due to limited bandwidth and link fluctuations. Thus, it is important to increase the quality of video streaming in mobiles using networking and computing resources effectively. Thus, it is vital to pick up the service quality of mobile video streaming while via the networking and computing assets competently.

This work attempts to define a Cloud based model for Video on Demand (VoD) as a Service which enhances the security and scalability of the VoD applications. This model simulates the real theatre environment wherein the full control including the rewinding, fast forward, play and stop is with the distributors. As the control is not given to the client, the user cannot pause, forward or rewind the video. All the clients who have requested for a video will see the same scene at a given time.

In the proposed model, the video data are stored in distributed locations effectively through content delivery network. The server in the cloud environment along with the administrator (distributor) has the control and can manage the video stored in the "Storage as a Service" layer. It supports the streaming of all video file formats such as mp4, etc. The advantage of this cloud based model is, even if thousands of requests are placed on the server at a time, the server will be able to stream the video simultaneously to all the clients. The providers can upload the videos of any length and size in the form of block blobs to the cloud storage that can be accessed from anywhere at any time with providers permission. The providers and the consumer details are stored in the structured cloud table.

II. RELATED WORK

Cloud computing techniques are used to provide scalable resources to service providers to serve mobile users. Hence clouds are used for large scale real time video services. Many Mobile cloud computing technologies have provided private agents for serving mobile users e.g., Cloudlet. This is because, in cloud multiple threads can be created dynamically based on user demands.

The Internet has rapidly emerged as a mechanism for users to find and retrieve content, originally for web pages and recently for streaming media content delivery networks (CDNs) were originally developed to overcome performance problems for delivery of static web content (web pages). These problems include network congestion and server overload, that arise when many users access popular content. CDNs improve end-user performance by caching popular content on edge servers located closer to users. This provides a number of advantages. First, it helps prevent server overload since the replicated content can be delivered to users from edge servers. Furthermore, since content is delivered from the closest edge server and not from the origin server, the content is sent over a shorter network path, thus reducing the request response time, the probability of packet loss, and the total network resource usage. While CDNs were originally intended for static web content, recently, they are being designed for delivery of streaming media as well.
When Media Revolution Meets Rise of Cloud Computing which provides a cost-effective and powerful solution for the coming tide of the media consumption. Based on previous summary of the recent work on media cloud research, in this section, we first make some suggestions on how to build the media cloud, and then propose some potentially promising topics for future research.

Distributed Scheduling Scheme for Video Streaming over Multi-Channel Multi-Radio Multi-Hop Wireless Networks says for developing fully distributed scheduling schemes that jointly solve the channel-assignment, rate allocation, routing and fairness problems for video streaming over multi-channel multi-radio networks. Unlike conventional scheduling schemes focus on optimal system throughput or scheduling efficiency, our work aims at achieving minimal video distortion and certain fairness by jointly considering media-aware distribution and network resource allocation. Extensive simulation results are provided which demonstrate the effectiveness of our proposed schemes.

There are two kinds of adaptive streaming techniques based on whether adaptivity is controlled by the client or the server. Rate adaptation controlling techniques used TCP-friendly control methods for streaming services to detect the link quality so that adaptation can be done accurately. But by using this technique the servers have to always control which results in large workload. To overcome this issue,the H.264 Scalable Video Coding (SVC) technique has been introduced. Through this technique quality oriented scalable video can be delivered. The high quality video scan be achieved using cloud-based proxy because cloud computing improves the performance of SVC coding.

In the process of problem formulation, uncertain demand and uncertain cloud providers' resource prices are considered. In contrast, the optimization problem formulated in our work takes into account a given probability distribution function obtained from aforementioned studies for the prediction of media streaming demands. Furthermore, the problem of cost minimization is addressed by utilizing the discounted rates offered in the non-linear tariffs.
The whole video storing and streaming system in the cloud is called the Video Cloud (VC). In the VC, there is a large scale video base (VB), which stores the most of the popular video clips for the video Service Providers (VSPs).A temporal video base (temp VB) is used to cache new candidates for the popular videos, while temp VB count the access frequency of each video.

The system model that we advocate in this paper for media streaming using cloud computing consists of the following components: media owner, media user and audit. In this paper, we propose a clustering-based cloud node selection approach for communication-intensive cloud applications. By taking advantage of the cluster analysis, our approach not only considers the QoS values of cloud nodes, but also considers the relationship (*i.e.*, response time) between cloud nodes. Our approach systematically combines cluster analysis and ranking methods. The experimental results show that our approach outperforms the existing ranking approaches.

III. PROPOSED SYSTEM.

A video sequence consists of a sequence of video frames or images. Each frame may be coded as a separate image, for example by independently applying JPEG-like coding to each frame. However, since neighboring video frames are typically very similar much higher compression can be achieved by exploiting the similarity between frames. Currently, the most effective approach to exploit the similarity between frames is by coding a given frame by (1) first predicting it based on a previously coded frame, and then (2) coding the error in this prediction. Consecutive video frames typically contain the same imagery, however possibly at different spatial locations because of motion. Therefore, to improve the predictability it is important to estimate the motion between the frames and then to form an appropriate prediction that compensates for the motion.

The process of estimating the motion between frames is known as motion estimation (ME), and the process of forming a prediction while compensating for the relative motion between two frames is referred to as motion-compensated prediction (MC-P).Block-based ME and MC-prediction is currently the most popular form of ME and MC-prediction: the current frame to be coded is partitioned into 16x16-pixel blocks, and for each block a prediction is formed by finding the best-matching block in the previously coded reference frame. The relative motion for the best-matching block is referred to as the motion vector.

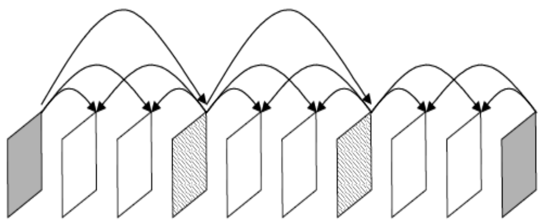

Figure1: Algorthim design

There are three basic common types of coded frames:

(1) intra-coded frames, or I-frames, where the frames are coded independently of all other frames,
(2) Predicatively coded, or P-frames, where the frame is coded based on a previously coded frame, and
(3) bi-directionally predicted frames, or B-frames, where the frame is coded using both previous and future coded frames.

Figure 1 illustrates the different coded frames and prediction dependencies for an example MPEG Group of Pictures (GOP). The selection of prediction dependencies between frames can have a significant effect on video streaming performance, e.g. in terms of compression efficiency and error resilience. Video delivery by video streaming attempts to overcome the problems associated with file download, and also provides a significant amount of additional capabilities. The basic idea of video streaming is to split the video into parts, transmit these parts in succession, and enable the receiver to decode and playback the video as these parts are received, without having to wait for the entire video to be delivered. Video streaming can conceptually be thought to consist of the follow steps:

1) Partition the compressed video into packets
2) Start delivery of these packets
3) Begin decoding and playback at the receiver while the video is still being delivered .Video streaming enables simultaneous delivery and playback of the video. This is in contrast to file download where the entire video must be delivered before playback can begin. In video streaming there usually is a short delay (usually on the order of 5-15 seconds) between the start of delivery and the beginning of playback at the client. This delay, referred to as the pre-roll delay, provides a number of benefits.

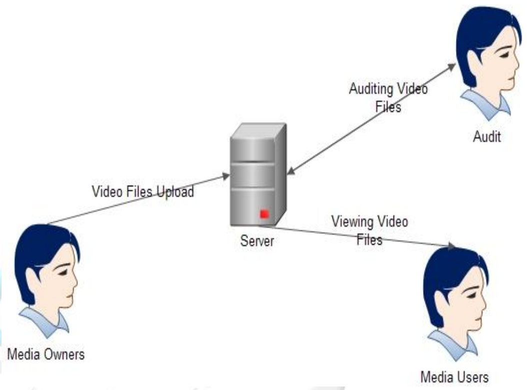

Figure 2: Architecture diagram

Video security:

Usually, in the client side, when the video is cached, there is a very high possibility that the video will be pirated. When "Video on Demand as a Service" is offered to larger audience, the caching is a problem and it is not feasible to support real time encryption with unicast connections. Thus to increase the security, the manual auditing by the cloud service provider is adopted. Depending on the level of authorization a user is assigned, he or she is granted one or more permissions to perform specific operations or actions. These actions typically map directly to important business functions, or to the management of the application itself. For example, a consumer can only read a video blob data to specified time duration that the provider permits. A provider can upload, read and delete a video data depending on his permission scope. Managing the access control is given based on the scope of the roles. Each scope inherits roles, permissions, and business rules from their parent.

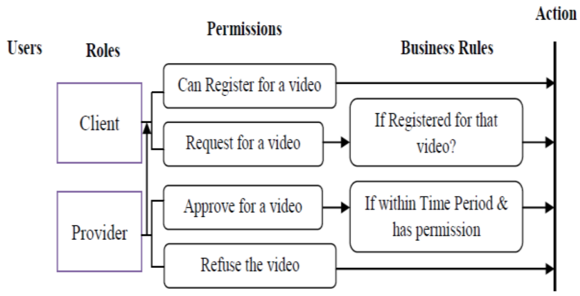

Figure 3:Auditing system

IV. PERFORMANCE:

The main metric to calculate the streaming capacity is called performance. The performance is computed on the basis of the performance measurements of each scenario part. This section analyzes and measures the performance of the proposed Video on Demand as a Service (VoDaaS). The performance measure is based on the following criterions. The upload time of video files of varying sizes that are divided into different block blobs. The average upload time for a chunk of different block blob size of different video files. The different video files starting from 1MB to 75MB are uploaded to cloud storage by dividing it into block blobs of 32KB, 64KB and 1MB. The time taken to upload the video files of varying sizes is shown below:

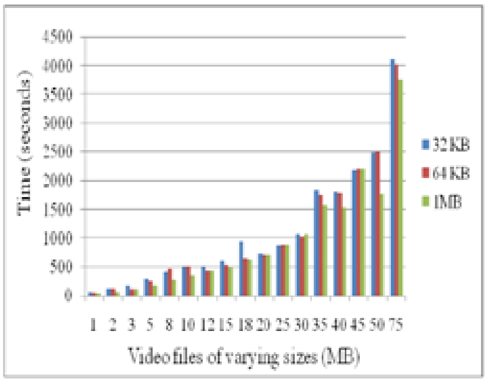

Figure 4: Upload time for storing blob data to cloud storage

The above result shows that the upload time of the blob data increases as the size of video file increases and in most of the cases, for a particular video file size, the upload time increases as the number of block blob increases. Therefore, the total time taken to upload 75MB file which is divided into 32 KB is higher when compared to other uploads in the given scenario. It is mandatory to divide the video files that are above 64KB into block blobs to upload it to cloud storage and the maximum size of a particular block blob is 4MB. While deciding to divide the blob into block blobs, to achieve faster and better upload time, reduce the number of block blobs or keep the block blob as higher as it can accommodate.

The average time taken for uploading a chunk of 32 KB and 64 KB data are below 5000 millisecond and to upload a chunk of 1 MB to cloud storage is seven times higher than uploading a 32 KB and 64 KB block blob. Even though, the upload time of video files that are divided into 1MB of block blob is less, the average time to upload a chunk of block blob is higher. Therefore, it is found that it is faster to upload a larger file than to upload multiple small files to the cloud storage.

V. CONCLUSION

An effective Video on Demand service is developed and implemented in Cloud Environment to provide a smooth and lively streaming of video files to the clients. The performance measure like upload time are analyzed with video files of varying sizes from 1MB to 75MB each divided into blocks or frames and contents are distributed. Before the file is provided to the clients, the manual audit is performed such that appropriate contents are provided. The results pertaining to the above are reported which shows that the video runs smoothly without any interruption irrespective of the bandwidth resource provided by the cloud.

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