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AMES-Cloud: A Framework of AMOV & ESOV using Clouds

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Abstract - The demand on video traffic concerning mobile networks have been increase rapidly above the usual level, the wireless link capacity cannot keep up with the traffic needed. The poor service quality of video flooding on mobile networks such as long buffering time and disturbance in continuity, are caused due to the separation between the traffic need and the capacity of link, along with time-varying link conditions. The advantage of Cloud Computing is that we propose a new mobile video streaming framework, named AMES-Cloud, which has two main parts: Adaptive Mobile Video streaming (AMOV) and Efficient Social Video sharing (ESOV), these construct a private agent to provide streaming services for each mobile user. For a given user, depending on feedback of quality of the link, AMOV makes her private agent to adjust the streaming flow with video coding technique. Similarly, ESOV detects the social network interactions among the users of mobile, and their private agents try to prefetch the video content. To clearly show the performance, we implement prototype of AMES-Cloud framework. Based on social network analysis, the private agents in clouds can impressively provide the adaptive streaming and perform video sharing.

Keywords- Adaptive video streaming, cloud computing, scalable video coding, social video sharing.

I.INTRODUCTION

Cloud computing has recently come forth as a new paradigm for maintaining and delivering services over the Internet. Cloud computing is attractive to business owners as it abolishes the requirement for users to plan ahead for pro-visioning, and allows enterprises to start from the small and increase resources only when there is a augment in service demand[2]. Cloud computing provides huge opportunities to the Information Technology industry, the development of cloud computing technology is currently at its formative years, with many cases to be addressed. With the fast development of processing and storage technologies and the success of the Internet, computing resources have become less in cost, more powerful and available in all over the world than ever before. This technological development has enabled the understanding of a new computing form called Cloud computing. Recently there have been many studies on how to improve the service quality of mobile video streaming on two views: • Scalability: Scalability is the ability of a system or process to handle growing amount of work in a capable manner to accommodate that growth[2]. The video streaming services of mobile devices should maintain a large range of its devices; as they have different video resolutions, different powers in computing and so on. Also, the obtainable link power of a mobile device may vary depending on the strength of signal, other user's traffic in the same cell, and link condition variation. Storing multiple versions of the same video content may contract high overhead in terms of communication and storage. To address this case, the Scalable Video Coding (SVC) technique of the video compression standard defines a base layer (BL) with multiple enhances layers (ELs). These sub streams can be encoded by taking the advantage of three scalability features: (I) spatial scalability by rooting the resolution of image, (ii) temporal scalability by rooting the frame rate, and (iii) quality scalability by rooting the image firmness. By the SVC, a video can be played at the lowest quality if only the BL is transported. • Adaptability: Adaptability is to make suitable to or fit for a specific use or situation. Conventional video streaming techniques intended by taking into consideration fairly stable traffic links between servers and users perform poorly in mobile environment. Thus to provide allowable video streaming

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services we need to dealt with the irregular wireless link status. To address this view, we have to fine-tune the video bit rate adapting to the currently time-varying available link bandwidth of each mobile user. Such adaptive streaming techniques can effectively reduce packet losses and bandwidth waste. To achieve the best quality of video streaming services, the scalable video coding and adaptive video streaming techniques can be jointly combined. That is, depending on the current link condition we can dynamically adjust the number of SVC layers. As the number of users increases, the problem is that the server should take over the substantial processing overhead.

II. AMES Cloud Framework:

In this section we explain the AMES-Cloud framework which includes the Adaptive Mobile Video streaming (AMOV) and the Efficient Social Video sharing (ESOV). As shown in Fig. 1, the whole storing process of videos and streaming system in the cloud is called the Video Cloud (VC). In the VC, there is an extensive video base (VB), which stores the most of the popular video clips for the video service providers (VSPs). A temporal video base (tempVB) is used to cache new candidates for the videos which are popular. The VC keeps running a collector to look for videos which are already popular in VSPs, and will again encode the collected videos into the SVC format and store into tempVB. By this 2-tier storage, the AMES-Cloud can search most of the popular videos permanently. The administration work will be handled by the controller in the Video Cloud. If there is any video streaming need from the user, a sub-video cloud (subVC) is created dynamically for each mobile user. The sub-VC has a sub video base (subVB), which stores the recently fetched video segments. The video deliveries among the subVCs and the VC in most of the conditions are actually not “copy”, but just “link” operations on the same file permanently within the cloud datacenter. There is also encoding utility in subVC, and if the mobile user demands a video, which is not in the subVB or the VB in VC, the subVC will fetch, encode and transfer the video. Throughout the process of video streaming, mobile users will always report link conditions to their respective subVCs, and then the subVCs recommend adaptive video streams. Each mobile device also has a temporary caching storage, which is called local video base (localVB), and is used for buffering and prefetching.

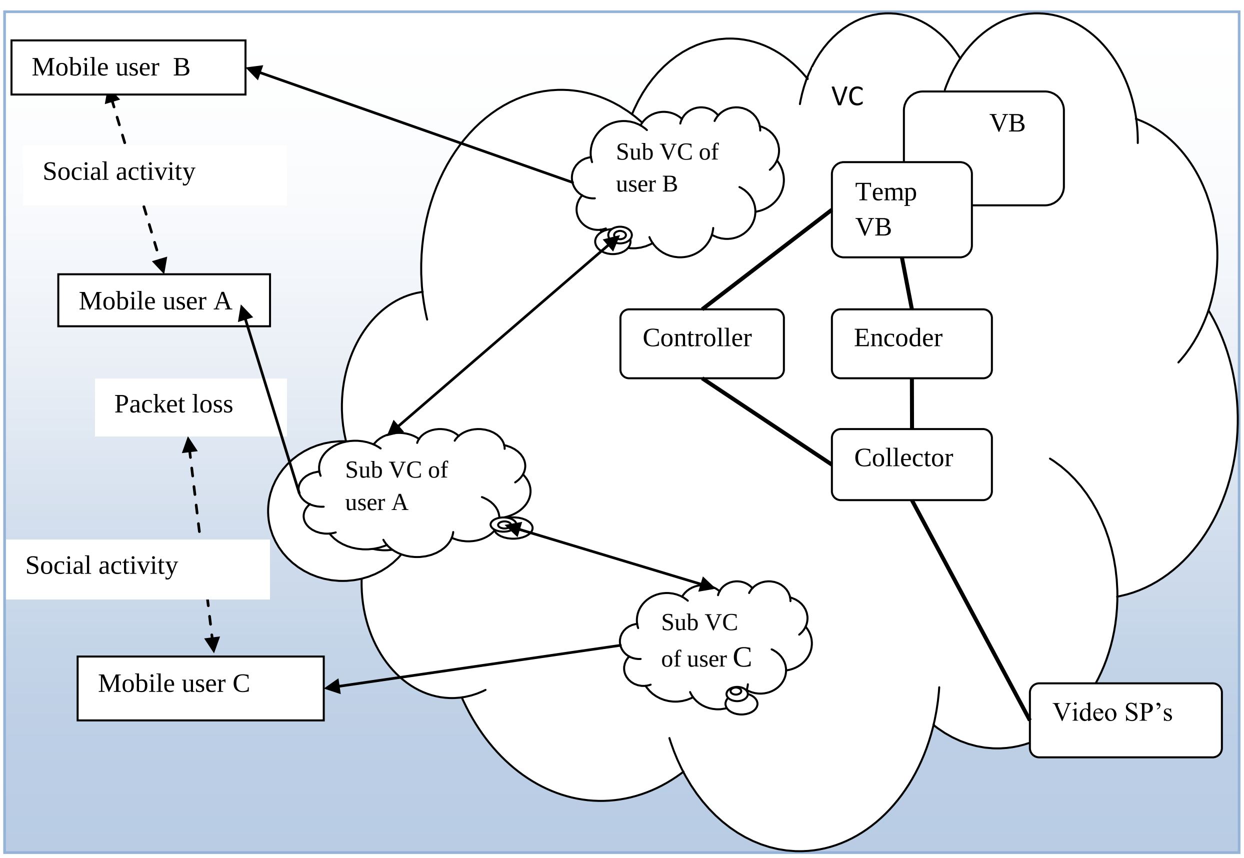

Fig.1. The Framework of AMES-Cloud

In the case of video delivery and prefetching between different data centers, an transmission will be carried out, which can be called "copy", as the cloud provides its service may across different places, continents. And because of the best possible deployment of data centers, as well as the capable links among the data centers, the "copy" of a large video file takes little delay.

III. CLOUD COMPUTING ARCHITECTURE:

This section describes the architectural, business and different function models of cloud computing. The architecture of a cloud computing can be divided into 4 layers: the hardware layer, the infrastructure layer, the platform layer and the application layer, as shown in Fig. 2.
The hardware layer: This layer is accountable for the organization of physical resources of the cloud, considering physical servers, routers, switches, power and cooling systems. The hardware layer is classically implemented in data centers. A data center generally contains thousands of servers that interconnected through switches, routers or other fabrics[6]. Typical issues at hardware layer include hardware configuration, fault- tolerance, traffic management, power and cooling resource management.

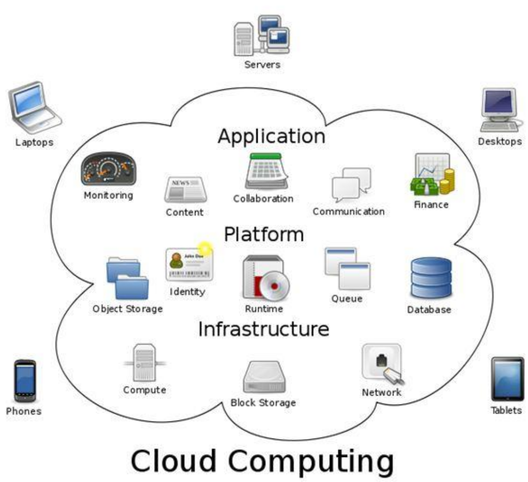

Fig.2 Architecture of Cloud Computing

The infrastructure layer: This layer is also known as the virtualization layer, the infrastructure layer creates a group of storage and computing resources by partitioning the physical resources using virtualization technologies such as KVM and VMware. The infrastructure layer is a vital module of cloud computing, since many key features, such as dynamic resource assignment, are only made available through virtualization technologies.
The platform layer: This layer is built on top of the infrastructure layer; the platform layer consists of operating systems and application frameworks. The purpose of the platform layer is to lessen the yoke of deploying applications directly into VM containers. For example, Google App Engine operates at the platform layer to provide API support for implementing storage, database and business logic of web applications[6]. The application layer: At the highest level of the hierarchy, the application layer consists of the cloud applications. Different from traditional applications, cloud applications can utilize the automatic-scaling attribute to achieve enhanced performance, availability and lower operating cost. Compared to traditional service hosting environments such as committed server farms, the architecture of cloud computing is more modular. Each layer is loosely coupled with the layers above and below, allowing each layer to change separately. This is alike to the design of the OSI model for network protocols[7]. The architectural modularity allows cloud computing to sustain a wide portion of application requirements while dropping management and maintenance overhead.

IV. AMOV (ADAPTIVE MOBILE VIDEO STREAMING):

Using scalable video coding as enabled by SVC, a single stream can be used to serve all end-users. Adaptation can be performed at the server but also in the network in order to alter the video stream according to the usage requirements[8]. Adaptability with Monitoring on Link Quality We designs the mobile client and the subVC. The link quality monitor at mobile client keeps tracking on metrics as well as signal strength, packet round-trip-time (RTT), and jitter and packet loss with a definite duty cycle. And the client will report to the subVC at times. In SVC, a combination of the three lowest scalability is called the Base Layer (BL) while the improved combinations are called Enhancement Layers (ELs). To this view, if BL is guaranteed to be delivered, while more ELs can be also obtained when the link can pay for, a better video quality can be anticipated. The server doesn't need to concern the client side or the link quality, by using SVC encoding techniques.

The client still can decode the video and display, even some packets are lost. But this is still not bandwidth efficient suitable to the avoidable packet loss. So it is needed to control the SVC-based video streaming at the server side with the rate adaptation method to competently utilize the bandwidth. Once the subVC gets the information of the link quality, it will perform a calculation and expect the potential bandwidth in the next time window.

V. ESOV (EFFICIENT SOCIAL VIDEO SHARING) CONTENTS:

In SNSs, users can register to associate well-known people, friends, and particular content publishers; in addition there are different types of social actions between users in SNSs[5]. It is used for sharing of videos in SNSs, individual can able to post videos in public, and they; one who know how to directly suggest a video to particular friend(s); in addition one can regularly get noticed by registered content publisher for accepted videos. The video can be posted by one user may watched by the user's who are friends(to him/her who shared), so that sub VCs can bring out winning background prefetching at the sub VB and still may drive to users local VB. After a video sharing action, there might be a certain amount of delay that the recipient gets to be familiar with the sharing, and initiates to watch videos. As an alternative, a user can able to click to see the videos without several buffering delay as the opening part or even the entire video is prefetched locally in VB. The prefetching from VC to sub VC is simply refers to the "connecting" action; the prefetching from sub VC to local VB depends on the strength of social activities, but also taking the wireless link status.

Sharing publicly: The movement of watch or share a video by a user can be seen by their friends in their timeline. We think this public sharing as a "weak" connectivity between users, as many people may not watch the video that one has watched or shared with any specific suggestion.

Registration: Similar to the well-known RSS services, a user can register to an interested video based on their needs. This is connectivity among the registered user and the video publisher is consider as "median", because the user not watch all subscribed videos.

Direct recommendation: A user can directly recommend a video to friends by a short message. The recipients of message may watch it high resolutions.

VI.CONCLUSION:

In this formulation, we proposed new skeleton of an adaptive mobile video streaming and sharing framework, called AMES-Cloud, which stores videos in the clouds, and make use of cloud computing to build private agent for each mobile user to attempt "non-terminating" video streaming adapting to the variant of link quality depending on the Scalable Video Coding technique. Also AMES-Cloud can advance look for to afford "no buffering" practice of video streaming by background pushing functions among the VB, subVBs and localVB of mobile users. Cloud computing technique brings important improvement on the adaptively of the mobile streaming. The focus of this paper is to verify how cloud computing can improve the transmission adaptability and prefetching for mobile users. In the future, we will also try to improve the SNS-based prefetching, and security issues in the AMES-Cloud.

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