An Approach for Sharing Secured and Efficient Video Streaming over the Cloud

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***Abstract*—** Due to the increasing demands of video traffics in mobile networks, current wireless system is unable to perform better with current traffic demands. This leads a gap between these traffic demands and the wireless system resulting in poor service quality of video streaming in mobile networks, disruptions and long buffering time of the videos and less data security. As mobile users have low configurations, they are affected by signal strength. Hence, in order to face traffic demands, streaming and security problems a cloud computing approach is proposed. Cloud Computing own and manages mobile users data resulting in fast data access and storage, and will give access of videos faster. Following the cloud computing technologies, this paper shows the functioning of various methods and architecture which are used in cloud to provide effective solution for providing better service and security to mobile users. But cloud services for data storage are not trusted, hence security problems arises. Here, an innovative encryption algorithm AES for videos security and SVC techniques for video streaming are used for safely exchanging highly c confidential video and to maintain a balance between security and computational time.

Keywords - *Cloud computing, scalable video coding, adaptive video streaming, AES.*

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I. INTRODUCTION

Over last few decades, more traffic has been increased due to different forms of video streaming and downloading by the mobile users in mobile networks. Now video streaming is not an issue in wired networks but wireless networks (mobile users) suffers from sharing of videos over limited bandwidth of links. Even 3G and LTE having good bandwidth, the efforts are not successful for increase of mobile users. While streaming video using 3G/4G mobile networks, users still suffer from long buffering time to load videos, interruptions due to limited bandwidth, link fluctuations and large number of users. Thus, it is important to increase the quality of video streaming in mobile users [2]. The quality of mobile video streaming can be improved by using two aspects i.e. scalability and adaptability. In scalability, the video Streaming services of wireless system must be compatible with multiple types of mobile devices having various video resolutions, computing powers, wireless links and so on. Capturing multiple bit rates of same video may increase the burden on servers in terms of storage and sharing. To resolve this issue, the Scalable Video Coding (SVC) technique has been introduced. SVC standardizes the encoding of a high-quality video bit stream contains one more subset bit streams[3][4][5]. Whereas, in case of adaptability, videos should able to change themselves in order to fix themselves better in some new environment in case of streaming globally. Cloud computing techniques are used to provide scalable resources to service providers to serve mobile user. Hence, clouds are used for large scale real time video services [3][6].

Cloud computing is a remote, internet-based computing, which provides shared resources, software, and information to computers and other devices. Now a day's, cloud computing is more and more cult to its agility, low cost, device independence, reliability , scalability, security and reduced maintenance cost[7][8][9]. In cloud computing, top three IT cloud services challenges are security, availability and performance. The cloud computing security issue is always the key factor and it is ranked one. Cloud computing service are broadly classified into three delivery models: the Infrastructure as a Service (IaaS); the Platform as a Service (PaaS); and the Software as a Service (SaaS).

SaaS is a software delivery methodology that provides licensed multi-tenant access to software and its functions remotely as a Web-based service Saas have highly scalable architecture and are usually billed based on usage of users. They are having multi tenant environment. The capability provided to the End users is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices anytime and from anywhere, through a thin client interface such as web browsers. Today SaaS is offered by companies such as Google, Salesforce, Microsoft, , etc. This approach follows Software as a services cloud computing.

II. RELATED WORK:

2.1. Video streaming techniques:

In the adaptive streaming, the video traffic rates are adjusted in order to have good video quality experience to wide variety of mobile users. Adaptive streaming techniques, has two types depending on the adaptively is controlled by either the client or the server. The example for client controlling adaptability is The Microsoft's Smooth Streaming and Adobe which has live bit rate segments encoded with configurable bit rates and video resolutions at servers, while clients dynamically request videos based on local monitoring of link quality. Other adaptive streaming services where servers control the adaptive transmission of video segments are the Quavlive Adaptive Streaming. In server side adaptability, the burden of video maintaining multiple copies of the video content with different bit rates is increased. TCP friendly rate control methods for streaming services providing adaptability are proposed [12][13], where TCP throughput of a flow is predicted as a function of packet loss rate, round trip time, and packet size.

For conversational 3G video streaming, a rate adaptation algorithm is introduced in [14].

The Scalable Video Coding (SVC, extension of H.26) technique [4]are used currently for adaptive video streaming system deployed in [3], which studies the real-time SVC decoding and encoding. A quality-oriented scalable video delivery using SVC is proposed in [6] , but it is only tested in a simulated LTE Network. Regarding the encoding performance of SVC, Cloud Stream mainly proposes to deliver high-quality streaming videos through a cloud-based SVC proxy [9]. The above studies motivate us to use SVC for video streaming on top of cloud computing.

2.2Mobile cloud computing techniques:

Using cloud computing a better video streaming services are provided, in case of wired network because of its scalability and capability[7]. Factors such as wireless link dynamics, user mobility, the limited capability of mobile devices are need to be considered for extending cloud computing services[16][17]. Recently, Stratus [10] and Cloudlets[11] proposed new designs for users on top of mobile cloud computing environments, which virtualized private agents that are in charge of satisfying the requirements of mobile users.

2.3.Video security:

Various algorithms have been proposed recently, some look very effective but lack efficiency. Recently Simple Permutation method [18] encrypts every byte in the video stream using algorithms such as AES or DES. This algorithm considers the video bit stream as standard text data. The security level is high as every byte is encrypted one by one. In Pure Scrambling[20] ,Video bytes in each frame of the video are shuffled using permutation operation .In Crisscross Permutation algorithm [21] , first generates a 64 byte permutation list and then this list quantized into an 8x8 block and are followed by a simple splitting procedure. In Choose and Encrypt [22], Encrypting and decrypting the entire video stream is not practical in real-time applications. A solution is needed in which frames in the video can be selectively encrypted.

III. ADAPTIVE AND EFFICIENT VIDEO STREAMING AND SHARING IN CLOUD

3.1. Video streaming

In streaming procedure, video clip data file is sent in a continuous flow to the end users. Streaming movies are nothing but series of "moving images" that are sent in compacted form over the Internet and shown by the audience .This implies the strategy for shifting information such as a stable ongoing flow and it is known as Streaming or encoded movie that is sent across end users system , known as Streaming. Real-time and pre-recorded streaming are two kinds of steaming.

3.2. Video Streaming Architecture

The figure 1 shows the architecture of the adaptive and efficient way of enhancing the video streaming and sharing of video to the mobile users. The architecture was provided in cloud called as constructed based on the video service.

3.2.1. Video service provider (VSP): the originated place of actual video data. VSP can handle multiple requests at the same time, while coming to the QoS with the mobile users.

3.2.2. Video cloud (VC): it provides availability of video, get the original video data from the VSP and provide the reliable services and makes the sharing of those videos among the users much easier.

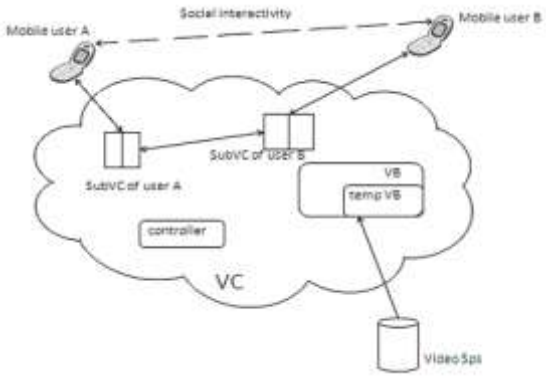

Fig 1- working of cloud and mobile users.

3.2.3. Private agent: an agent created for every mobile user who requests for the video service to the video cloud Video base .

3.2.4.Video Base(VB): consists of the video data that are provided as the ser vice s to mobile users. Whereas, Temp video base(TVB) contains the most recently accessed video data and contains most frequently accessed video data.

The cloud provides services under s adaptive mobile video streaming(AMOV) and efficient mobile video sharing(ESOV) methods. The video streaming and video sharing plays the vital role in providing the reliable service to the mobile users which are connected socially with each other or may not. The mobile computing and mobile device provides space to be connected over social network. Images and videos or any multimedia data are shared among the friend and users of the social media. Requesting the video .uploading video, watching videos are the actions performed by users. This cloud provides platform to provides these services in better way.

3.3. SVC

SVC is an extension to the H.264/AVC video compression standard, which defines a base layer (BL) with multiple enhance layers (ELs). . By using SVC, a video can be decoded or played at the lowest quality if only BL is delivered. However, if more ELs delivered, quality of the video stream is better. These streams are encoded by exploiting by these three scalability features: (i) spatial scalability by layering image resolution (ii) temporal scalability by layering the frame rate, (iii) quality scalability by layering the image compression. By using SVC encoding techniques, the server doesn't need to

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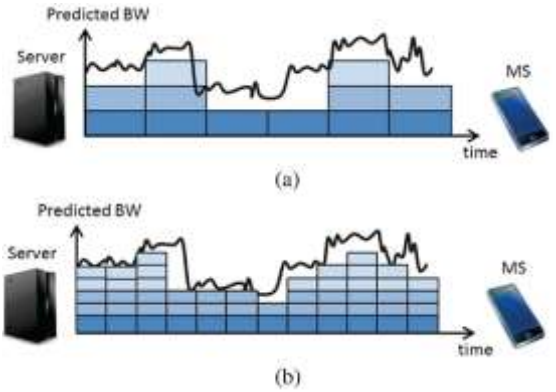

Fig.2. svc Layer System (a) Traditional video streaming (b) Svc layers, scalable and adaptive streaming Concern the mobile user side or the link quality. If some packets are lost, then also mobile user can decode the video. Hence SVC-based video streaming at the server side needs to be controlled with the rate adaptation method for efficiently utilizing the bandwidth. The SVC video streaming have flexible scalability, and high quality coding efficiency.

IV. VIDEO SECURITY

4.1. AES

AES is a substitution-permutation network having 128-bit block size and a key size of 128,192 or 256 bits. The AES cipher is specified as a number of repetitions transformation rounds which convert the input into the final output of cipher text. The numbers of cycles of repetition are as follows:

a. 10 cycles of repetition for 128 bit keys.
b. 12 cycles of repetition for 192 bit keys.
c. 14 cycles of repetition for 256 bit keys.

Here, AES encryption and decryption algorithm is used while designing this approach over the cloud. Firstly, while uploading video, video data are encrypted and stored over cloud in encrypted form. During encryption of video, the video which also contain the audio information are first divided into frames. The shuffling block then shuffles these frames and then these frames are passed on to the frame stitching block forming the new encrypted video. By doing this, videos are impossible to decrypt and understand is achieved.

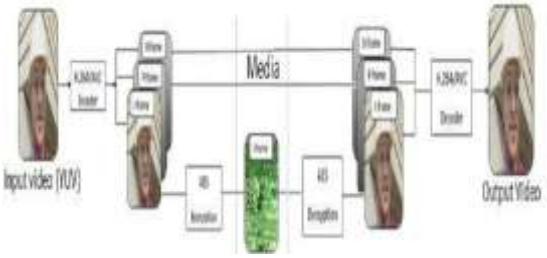

Fig 3- AES encryption and decryption.

The shuffling algorithm uses a random key generation function implemented in java and this function is termed as the "Shuffling Key" and is sent along with the video to the destination decryption block. The shuffling key is encrypted along with the video using AES. Thus the video is beyond human interception [16]. Finally after the video is transferred to the mobile users, the decoder will first run the AES algorithm over codeword to decode and obtain the clean video. The encryption and decryption is explained in Fig 3.

5. IMPLEMENTATION

As per the design of the framework we have implemented the social network system as an application over the cloud. Codes are written mainly in java. Video streaming is acheiced succesfully adaptively following the SVC coding and effective sharing of videos as well. However the formats of videos can be played in mp4. Below is a figure which illustrates the execution of a mp4 video.To evaluate the performance of this approach, a sample .mp4 video, 108 seconds long, which was uploaded by one user , firstly encrypted by AES and then stored over the cloud in encrypted form. And while streaming uploaded video we experience seamless vides .After watching video ,it show delay graph indicating streaming speed difference between current and proposed approach. Thus this approach gives efficiency and security to mobile user data. Modules involves for implementation:

5.1. Module 1- Streaming

5.1.2. Scalable video coding technique.

5.1.3. Delay graph representing streaming speed difference between current system and the proposed approach system.

User1-News Feed, Search Friends, Share Video, Update Details

User2-Upload Video, register their details (name, password, gender, age), make friends

5.2. Module 2 - Security: (i) Encryption and decryption (ii) Authentication process (iii)Authorization practices.

Here, the videos are encrypted and decrypts with help of AES algorithm. Authentication and Authorization practices are used in implementation practically. In Authentication process, users create name and password to become user of the cloud for security purpose. Whereas, in Authorization practices, list of various users who are authenticated are defined.

Fig 4- user streaming module.

6. CONCLUSION

Here, proposal of the cloud,adaptive mobile video streaming and video security AES approach is used, where cloud stores the videos efficiently and securely in the clouds and constructs private agent (subVC) for active mobile users in order to try to give "non-terminating" streaming of videos by adapting to the changes of quality of links which depends on scalable vid eo coding technique, and to try to provide "non-buffering" video streaming experience by background prefetching based on the tracking of the interactions of mobile

users.The framework is evaluated by prototype implementation, and showed successfully that the cloud computing method brings improvement to the adaptability and scalability of the mobile streaming, and the efficiency of intelligent perfecting. Using this approach unauthorized viewing of the video file can be prevented and hence this algorithm provides a high level of security and faster streaming by comparing with current systems.

METHODOLOGY	SECURITY LEVEL	SPEED	ENCRYPTION RATIO
SIMPLE [19][19]	HIGH	SLOW	100%
PURE [20]	LOW	FAST	100%
CRISSCROSS [21]	VERYLOW	LOW	100%
CHOOSE & ENCRYPT [22]	HIGH	FAST	50%
PROPOSEDAES[23]	VERYHIGH	FAST	100%

Table 1- Comparisons of Video Encryption Algorithms

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