International Conference on "Advances In Computing, Communication And Intelligence" ICACCI-2014 At Mauritius
Special Issue of International Journal of Electronics, Communication & Soft Computing Science and Engineering, ISSN: 2277-9477

Cloud Multimedia Services in Smart Phone

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Abstract **:- Cloud multimedia services provide an efficient, flexible, and scalable data processing method and offer a solution for the user demands of high quality and diversified multimedia. As smart phones and wireless networks become more and more popular, network services for users are no longer limited to the home. Multimedia information can be obtained easily using mobile devices, allowing users to enjoy ubiquitous network services. Considering the limited bandwidth available for mobile streaming and different device requirements that provides multimedia data suitable for a terminal unit environment via interactive mobile streaming services. Cloud computing is introduced as a new and speedily growing and accepted way of providing better and efficient applications for mobile devices. It provides huge data storage and processing services for mobile user.**

This paper discusses cloud computing as a currently exploring way to deliver remote mobile applications to mobile devices through internet providing a remedy to the lack of resources in mobile devices. It provides mobile world a new ad hoc infrastructure where data storage and processing is performed outside the mobile device and cloud computing gets an extended feature of mobility.

Keywords **: video streaming, multimedia services**

I. INTRODUCTION

Now a day's user's demanding higher multimedia quality, storage space configuration, and sharing services in various terminal and to meet the fast-changing information industry the extended technology is developed that is media cloud. It realizes multimedia computing based on the powerful arithmetic capability of cloud computing. Multimedia services have become universal application services with the development of 3G and 4G networks. Through intelligent mobile phones or tablets users expect to watch videos smoothly and at a certain level of quality, no matter what changes occur in the network environment. When a multimedia video service is applied, the service quality declines greatly while trying to meet the demands of video transmission. Users often view live videos that freeze have intermittent sound, or even failure to operate. Therefore, how to execute smooth playback with limited bandwidth and the different hardware specifications of mobile streaming is an interesting challenge. Interactive mobile multimedia services communicate and coordinate the mobile device with the server-side to select the multimedia file applicable to the device environment such as bandwidth, resolution and arithmetic capability so as to realize an optimal multimedia streaming service [1].

Through cloud computing it is feasible to provide infrastructure, platform, and software as services for users from any computer with an Internet connection. Mobile cloud computing then extends such services to mobile devices. computing has the potential to have far-reaching impacts in the wireless industry and in our society. The rapid changes in smart phones the mobile users are huge interests to watch video and play online games on this. Survey shows that among all the mobile data traffic across the world, 66.5% will be video related by 2017. But as mobile devices are limited by computation, memory, and energy, it may not serve as platforms for rich media, were it not for cloud applications and services. It is forecasted that cloud applications will account for 84% of the total mobile data traffic in 2017 is compared to 74% by the end of 2012 [2]. To this end, mobile cloud computing is a promising solution to bridge the widening gap between the mobile multimedia demand and the capability of mobile devices. With the assistance of the cloud, multimedia applications can be either carried out in the mobile device or in the cloud.

I. Media based cloud

Multimedia cloud computing can be divided into two major parts. One is the multimedia-aware cloud (media cloud), and the other is cloud-aware multimedia (cloud media).

2.1 Multimedia-aware cloud

The multimedia-aware cloud mainly aims at multimedia files in the cloud environment. Meeting the requirement of QoS, according to the arithmetic capability of the cloud involves the balanced sharing of the load, real-time dynamic coding and heterogeneous work conversions. Media cloud is used job scheduling for various clusters in the cloud environment to attain load balance. It also used the greedy mode to calculate the speeds of various components in the cloud, in order to efficiently improve the overall applications. To obtain open cloud computing middle-ware the http or UDP transmission protocol is used for domestic multimedia sharing and universal Plug and Play (UPnP) as an open multimedia platform [3].

2.2 Cloud-aware multimedia

Differing from the multimedia-aware cloud, cloud-aware multimedia inclines to the streaming service of front-end multimedia data. Multimedia video files are usually quite large. In order to provide the multimedia streaming service of real-time videos, files are divided into packets so that the client-side can view multimedia information instantly as received instead through downloading. [4]The term mobile cloud computing means to run an application such as Google's Gmail for Mobile6 on a remote resource rich server as displayed in Fig. 1, some other example are Face book's location aware services, Twitter for mobile, mobile weather widgets etc. In this system the mobile device acts like a thin client connecting over to the remote server through 3G.

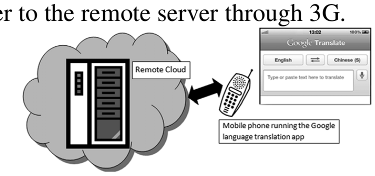

Fig.1. A remote cloud server catering to mobile devices through the internet [4].

II. CLOUD MOBILE MEDIA ARCHITECTURE

A typical CMM application has a small footprint client on the mobile device, which provides the appropriate user interfaces such as gesture, touch screen, voice, and text based to enable the user to interact with the application. The resulting control commands are transmitted uplink through cellular Radio Access Networks (RAN) or Wi-Fi Access Points to appropriate gateways located in operator Core Networks (CN), and finally to the Internet cloud [5]. Mobile cloud computing can help to providing mobile applications the capabilities of cloud servers and storage together with the benefits of mobile devices and mobile connectivity, possibly enabling a new generation of truly ubiquitous multimedia applications on mobile devices[6]. Figure 2 shows the overall architecture, including end-to-end flow of control and data between the mobile devices and the Internet cloud servers, for a typical CMM application. Though a CMM application may utilize the native resources of the mobile device, like GPS and sensors, it primarily relies on cloud computing Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) resources, like elastic computing resources and storage resources, located in Internet public, private, or federated (hybrid) clouds.

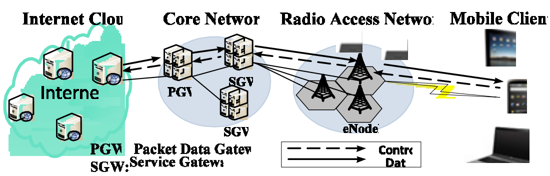

Fig.2. Cloud Mobile Media architecture, showing control and data flows. [5]

Mobile Cloud Storage is the most commonly used category of CMM applications, with offerings from Amazon, Apple, Dropbox, and Google, among others. These services provide diverse capabilities, including storing documents, photos, music and video in the cloud, accessing media from any device anywhere irrespective of the source of the media and the device used to generate the media and synchronizing data across multiple devices [7].

III. CLOUD MOBILE MEDIA SERVICES

Cloud computing is a relatively new trend in Information Technology that involves the provision of services over a network such as the Internet. The cloud services offered are divided in three categories: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) as illustrated in Fig. 3. SaaS delivers software applications such as word processing over the network. PaaS delivers a host operating system and development tools that come installed on virtualized resources [8].

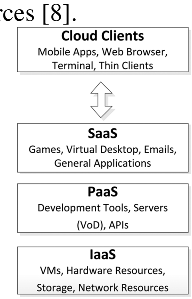

Fig.3. Cloud service layer [8]

Cloud services are very flexible therefore they are provided on demand. The provider manages the delivery of services and the clients can demand as little or as many resources as they require and are billed accordingly. From the client side, all that is needed is a computer with a web browser or a thin client with the ability to remotely connect to the Cloud [8, 9].There is some basic services given by cloud are:

4.1 Cloud Storage Service

Mobile Cloud Storage is the most commonly used category of CMM service today, with offerings from Amazon, Apple, Dropbox, Funambol, and Google, among others. These services provide diverse capabilities, including storing documents, photos, music and video in the cloud, accessing media from any device anywhere irrespective of the source of the media platform used to generate the media, and synchronizing data across multiple devices a typical user owns[10].

4.2 Audio and video streaming based services

Utilizing cloud computing resources it can perform and compute intensive tasks of encoding, transcoding and transrating data in high speed. Computing costs can be reduced for on demand video by caching popular videos at different resolutions and bit rates. The Interactive Services category is expected to be a rapidly growing segment of mobile multimedia applications, including mobile video conferencing, mobile remote desktop and interactive mobile advertisements [11].

4.3 Rendering adaptation approach

Graphic rendering is the process of generating an image from a graphic scene file, which usually contains geometry, viewpoint, texture, lighting, and shading information as a description of the virtual scene. It is configurable by a set of rendering parameters [5]. In order to prolong the battery lifetime and increase the availability of mobile devices, power aware design needs to be carefully studied. On the other hand, audio/video streaming/playback, video telephony, and mobile TV have been considered as the most popular applications for 3G and future mobile handsets. DVS for multimedia application was proposed in which scaling was performed at each video frame based on the timing information given by the video server. In some task-based DVS techniques utilizing information inside video codec are compared [12].

4.4 Adaptive Video Streaming Techniques

In the adaptive streaming, the video traffic rate is adjusted on the fly so that a user can experience the maximum possible video quality based on his or her link's time-varying bandwidth capacity.There are mainly two types of adaptive streaming techniques, depending on whether the adaptively is controlled by the client or the server. The Microsoft's Smooth Streaming is a live adaptive streaming service which can switch among different bit rate segment with configurable bit rates and video resolutions at servers, while clients dynamically request videos based on local monitoring of link quality [13].

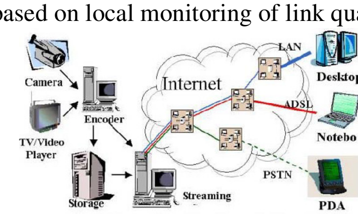

Fig.4. Video streaming in cloud applications

4.5 Quality of services

A QoS aware service-populating model can bring many advantages to numerous types of services and applications. Furthermore, this type of service often has active content which is not possible to cache regionally, so moving the entire service closer to a geographical region is going to be of great benefit if there is high demand for that service in the area. Another benefit to web services using this framework is that load balancing becomes easier to manage [8].

4.5 Augmented Execution

It is a technique used to overcome the limitations of Smartphone in terms of computation, memory and battery. Running applications in heterogeneous changing environments like mobile clouds requires dynamic partitioning of applications and remote execution of some components. Applications can improve their performance by delegating part of the application.

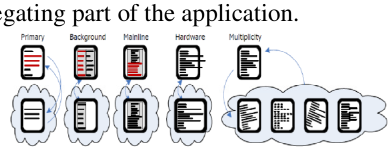

Fig.5. Clone Cloud categories for augmented execution remote execution on a resource-rich cloud infrastructure.

4.6 Application Mobility

The mobile cloud is accessed through heterogeneous devices. In order to provide seamless user experience same applications need to run on different devices. The application mobility plays a crucial role in enabling the next generation mobile applications. It is the act of moving application between hosts during their execution. Application mobility is migrating running application states from one device to another to which the user has an immediate access. Application mobility is closely related to process migration [14].

4.7 Ad-hoc Mobile Clouds

An ad-hoc computing cloud represents a group of mobile devices that serve as a cloud computing provider by exposing their computing resources to other mobile devices. This type of mobile cloud computing becomes more interesting in situations with no or weak connections to the Internet and large cloud providers. Offloading to nearby mobile devices save monetary cost, because data charging is avoided, especially favored in roaming situations.

4.8 Face Recognition

A most basic and fundamental perception task is the recognition of human faces. The problem has been long studied in the computer vision community, and fast algorithms for detecting human faces in images have been available for some time. Identification of individuals through computer vision is still an area of active research, Spurred by applications in security and surveillance tasks. For example, an application that can recognize a face and remind you who it is can be quite useful to everyone, and invaluable to those with cognitive or visual impairments.

4.9 Speech Recognition

Speech as a modality of interaction between human users and computers is a long studied area of research. Most success has been in very specific domains or in applications requiring a very limited vocabulary, such as interactive voice response in phone answering services, and hands-free, in vehicle control of cell phones. The speech recognition application considered here is based on an open-source speech-to-text framework based on Hidden Markov Model (HMM) recognition systems.

4.10 Object and Pose Identification

Another application is based on a computer vision algorithm originally developed for robotics, but modified for use by handicapped users. The computer vision system identifies known objects, and importantly, also recognizes the position and orientation of the objects relative to the user. This information is then used to guide the user in manipulating a particular object.

4.11 Mobile Augmented Reality

The defining property of a mobile augmented reality application is the display of timely and relevant information as an overlay on top of a live view of some scene. For example, it may show street names, restaurant ratings or directional arrows overlaid on the scene captured through a smart phone's camera. Special mobile devices that incorporate cameras and see-through displays in a wearable eye glasses form factor can be used instead of a smart phone [15].

4.12 Physical Simulation and Rendering

It is used in computer graphics. Using accelerometer readings from a mobile device, it physically models the motion of imaginary fluids with which the user can interact. For example, it can show liquid sloshing around in a container depicted on a smart phone screen, such as a glass of water carried by the user as he walks or runs. The application backend runs physics simulation, based on the predictive-corrective incompressible smoothed particles hydrodynamics (PCISPH) method. FLUID is implemented as a multithreaded Linux application. To ensure a good interactive experience, the delay between user input and output state change has to be very low, on the order of 100ms.

IV. PROPERTIES OF MOBILE VIDEO SERVICE

Mobile video streaming is a one of the trendy application. Multimedia streaming usually contains several major elements, such as the encoder, the decoder, the streaming server and the player. Streaming technology can be classified into two types: the web server and the streaming server. The web server is a general web server, using Hyper-Text Transfer Protocol (HTTP) as the communication medium. Streaming in this mode is called HTTP streaming [3].Recently there have been many studies on how to improve the service quality of mobile video streaming on two aspects:

5.1 Scalability: Mobile video streaming services should support a wide spectrum of mobile devices, they have different video resolutions, different computing powers, different wireless links. Also, the available link capacity of a mobile device may vary over time and space depending on its signal strength, other user's traffic in the same cell, and link condition variation. Storing multiple versions with different bit rates of the same video content may incur high overhead in terms of storage and communication. To address this issue, the Scalable Video Coding (SVC) technique (Annex G extension) of the H.264 AVC video compression standard defines a base layer (BL) with multiple enhance layers (ELs). These sub streams can be encoded by exploiting three scalability features:

(i) Spatial scalability by layering image resolution (screen pixels).

(ii) Temporal scalability by layering the frame rate, and (iii) Quality scalability by layering the image compression.

By the SVC, a video can be decoded or played at the lowest quality if only the base layer is delivered. However, the more ELs can be delivered, the better quality of the video stream is achieved [13].

5.2 Adaptability: Traditional video streaming techniques designed by considering relatively stable traffic links between servers and users perform poorly in mobile environments. Thus the fluctuating wireless link status should be properly dealt with to provide ’tolerable” video streaming services. Adaptive streaming techniques can effectively reduce packet losses and bandwidth waste. Scalable video coding and adaptive streaming techniques can be jointly combined to accomplish effectively the best possible quality of video streaming services. That is, we can dynamically adjust the number of SVC layers depending on the current link status. Every mobile user needs to individually report the transmission status (e.g., packet loss, delay and signal quality) periodically to the server, which predicts the available bandwidth for each user [13].

V. PERFORMANCE EVOLUTION OF SERVICES

Mobility is well supported while the capability of mobile devices is greatly enhanced by the cloud to enable rich media applications. Mobile cloud computing relies on wireless networks such as 3G and Wi-Fi for data and control between the cloud and mobile devices. Compared with fixed and wired networks, wireless networks have limited bandwidth, probably longer latency, and intermittent connectivity. It is shown that the private agents in the clouds can effectively provide the adaptive streaming, and perform video sharing on the social network analysis**.** While the video streaming is not so challenging in wired networks, mobile networks have been suffering from video traffic transmissions over scarce bandwidth of wireless links. Although network operators’ desperate efforts to enhance the wireless link bandwidth such as 3G and LTE, soaring video traffic demands from mobile users are rapidly overwhelming the wireless link capacity. While receiving video streaming traffic via 3G/4G mobile networks, mobile users often suffer from long buffering time and intermittent disruptions due to the limited bandwidth and link condition fluctuation caused by multi-path fading and user mobility. Cloud computing can improve the transmission adaptability and pre fetching for mobile user.

Limitation of Mobile Multimedia services:

A smart phone provides very useful and valuable services to mobile users on demand basis at anytime, anywhere in the world. These services are incredibly to user for upholding their daily life style. To provide mobile multimedia services in cloud is not so easy because some security issue such as data transfer in proper manner, encoding/decoding, mobile battery etc. Mobile multimedia services are advantageous to us but these services have some limitations such as:

- **Energy conservation in the cloud:** The prior work on energy saving mainly considers the energy consumption on the client side. However, for the sake of green communication, a joint optimization framework that considers the energy consumption both in the cloud and on the client side should be investigated.
- **High Definition (HD) and uncompressed videos:** The High Definition (HD) and uncompressed video streaming under bandwidth constrained wireless networks while taking costs and energy into account.
- **Adaptive QoE provisioning:** Mainly focus on the new requests, it is still an open problem on how to adapt the scheduled session to the wireless network and cloud dynamics for QoE provisioning.
- **Security and privacy:** As more and more video applications and online games are developed in the mobile cloud, security and privacy issues regarding particular scenario such as video conferencing should be investigated.

The future of Cloud multimedia services envisage the ability for clients to request services directly from the network rather than asking for physical resources that offer these services. This will simplify the process for end-users and open the way for other changes. In this service-oriented approach, we expect clients to simply request a Service ID and the network infrastructure to find where the service is running and connect the clients. This gives the possibility of running a service in multiple locations and directing client requests to the most appropriate instance depending on their location and network status.

VI. CONCLUSION

Mobile cloud computing can be leveraged to enable multimedia applications on mobile devices. Mobile cloud computing for multimedia applications is still in developing age. For mobile multimedia streaming services, how to provide appropriate multimedia files according to the network and hardware devices is an interesting issue. The convergence of mobile computing and cloud computing enables new multimedia applications that are both resource-intensive and interaction-intensive. For these applications, end-to-end network bandwidth and latency matter greatly when cloud resources are used to augment the computational power and battery life of a mobile device.

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