Digital Multimedia Database Streaming Framework Development

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Abstract

The need for providing mobile multimedia services is increasing as the mobility of individuals' increases and wireless network are widely adopted. The advantages of Cloud Computing is utilized to address the shortage in computation, memory, and energy resources to support advanced graphic processing functions in real-time, especially for high-resolution digital multimedia contents, as well as security vulnerabilities for wireless networks connecting mobile terminals. This paper presents a framework for streaming digital multimedia contents through cloud computing infrastructure. The framework describes the relationship among the service provider, the cloud provider, and the mobile device. The main aim of this framework is to provide a scheme for multimedia streaming service that can operate in a ubiquitous environment through mobile devices.

Keywords: *Digital Contents, Cloud Computing, streaming*

1. Introduction

The rapid delivery of digital multimedia data has been provided by ubiquitous networks. Multimedia contents (e.g. video) floods the web and the amount of its transmission across the Internet is expected to go off in the near future. The currently used multimedia processing and transmission schemes and technologies do not adapt to the need for ubiquitous access to digital multimedia contents from a variety of mobile terminals. The increased access to multiple services based on real-time multimedia streaming and the pervasiveness of mobile devices is a make way for an increased collection of a vast amount of visual data.

Cloud computing as one of the top emerging technologies can offer digital multimedia contents streaming delivery with an increased robustness and efficiency. It provides for opportunities that becomes available to mobile users and enables them to receive more scalable and resilient services, platforms and even infrastructure at lower cost and with higher business agility.

The need for providing mobile multimedia services is increasing as the mobility of individuals' increases and wireless network are widely adopted. Since mobile terminals do not have enough computation, memory, and energy resources to support advanced graphic processing functions in real-time, especially for high-resolution digital multimedia contents, the advantages that Cloud computing will be utilized. Security

vulnerabilities for wireless networks connecting mobile terminals can also be addressed though provisions in the cloud.

This paper presents a framework for streaming digital multimedia contents through cloud computing infrastructure. The framework describes the relationship among the service provider, the cloud provider, and the mobile device. The main aim of this framework is to provide a scheme for multimedia streaming service that can operate in a ubiquitous environment through mobile devices.

The rest of this paper is organized as follows: Section 2 explains the overview of cloud computing and its service offerings; Section 3 outlines the digital multimedia contents streaming framework design; and the concluding remarks in Section 4.

2. Cloud Computing

Cloud computing refers to the use of computing resources (e.g. hardware and software) that are delivered as a service over a network (typically the Internet). The name comes from the use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. Cloud computing entrusts remote services with a user's data, software and computation [1]. It is defined as an Internet-based computing, whereby shared resources, software, and information are provided to computers and other devices on demand. It is already a permanent fixture of consumer oriented services such as email, storage and social media [4].

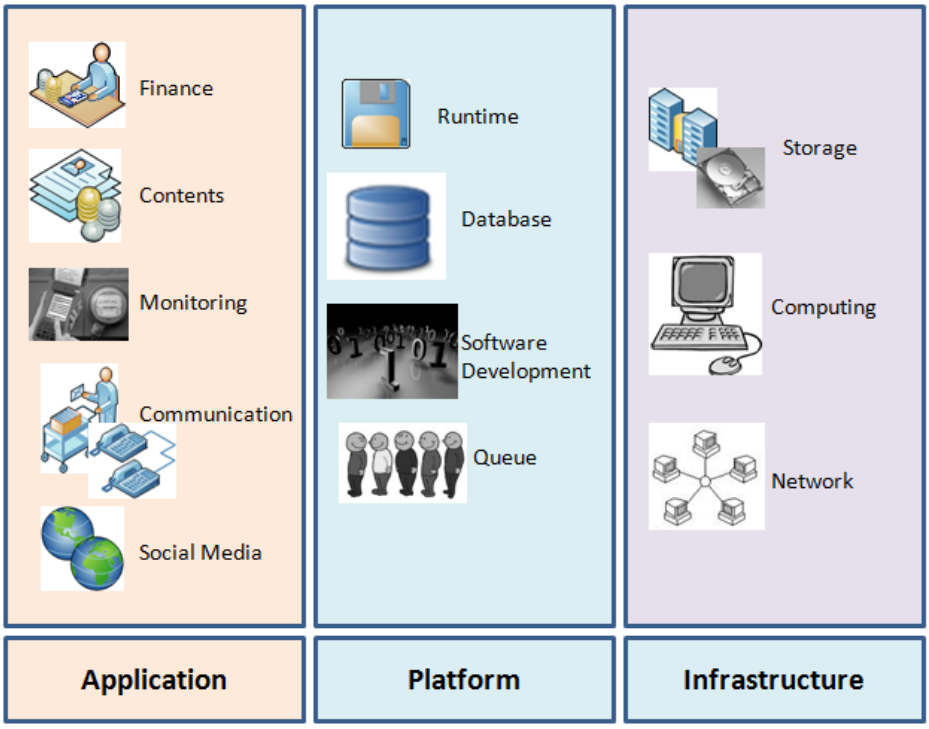

Figure 1. Cloud Computing Services

Cloud computing also refers to the development and implementation of models for enabling omnipresent, convenient, on-demand access to a shared set of configurable computing resources (e.g. networks, servers, storage, applications, and services) [2].

There are three classifications of Cloud service offerings: the Infrastructure as a Service (IaaS); the Platform as a Service (PaaS); and the Software as a Service (SaaS).

Software as a Service (SaaS) offers complete and finished applications on demand. It is a software delivery model in which software and associated data are centrally hosted on the cloud. SaaS is typically accessed by users using a thin client via a web browser [5]. SaaS has become a common delivery model for many business applications, including accounting, collaboration, customer relationship management (CRM), management information systems (MIS), enterprise resource planning (ERP), invoicing, human resource management (HRM), content management (CM) and service desk management. Most widely used examples of SaaS include Gmail, Google Docs, and Salesforce.com.

Platform as a Service (PaaS) offers an operating system and can provide for every phase of software development and testing as well as suites of programming languages that users can use to develop their own applications [6, 7]. It is a category of cloud computing services that provide a computing platform and a solution stack as a service. Along with software as a service (SaaS) and infrastructure as a service (IaaS), it is a service model of cloud computing. In this model, the consumer creates the software using tools and/or libraries from the provider. The consumer also controls software deployment and configuration settings. The provider provides the networks, servers, storage and other services. Commercial examples include Microsoft Windows Azure and Google App Engine.

Infrastructure as a Service (IaaS) offers end users direct access to processing, storage, hardware, and servers and other computing resources over the network. The service provider owns the equipment and is responsible for housing, running and maintaining it. Examples of IaaS include Amazon Elastic Compute Cloud (EC2), Joyent, Rackspace, and IBM Computing on Demand.

Cloud computing also considers cloud application deployment and consumption models in the form public, private and hybrid clouds. Public cloud applications, storage, and other resources are made available to the general public by a service provider. Private cloud is cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party and hosted internally or externally. Hybrid cloud is a composition of two or more clouds (private, community or public) that remain unique entities but are bound together, offering the benefits of multiple deployment models [1].

3. Framework Design for Digital Multimedia Contents Streaming

Digital multimedia streaming refers to the transmission of the digital contents wherein it is constantly received and presented to the end-users while being delivered by service or content providers. A user's media player starts to play the data (e.g. video)

before the entire file has been transmitted. Streaming applications must interoperate seamlessly with other non-broadcast client-server applications such as the Internet sessions.

The Framework presented will provide high-resolution video streams on user's mobile terminals, taking into account the necessary context information to ensure efficiency in terms of delay, functionality richness, and security robustness as shown in Figure 2.

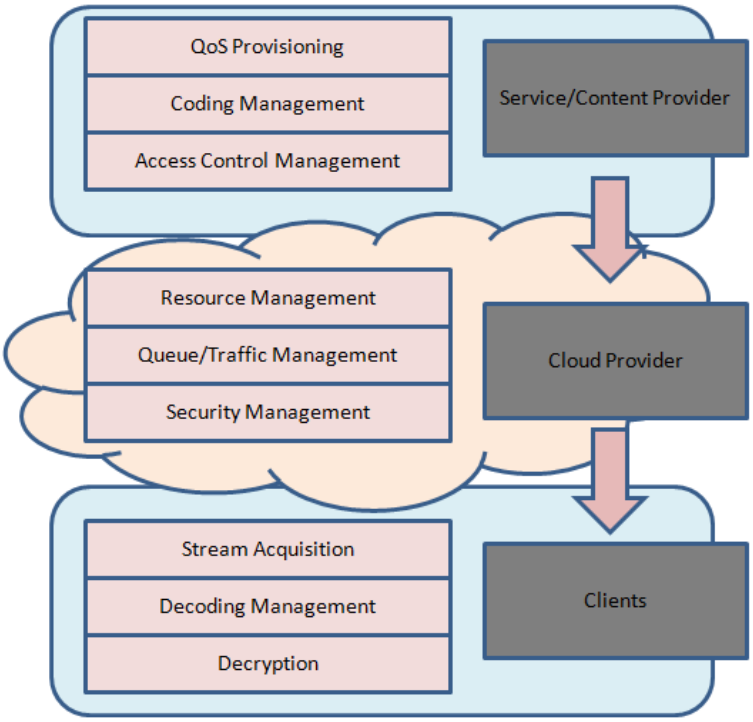

Figure 2. Multimedia Streaming Framework

The service provider will implement Quality of Service (QoS) policies, access control and authorization models, scalable coding schemes, and as well as accounting. Service providers will deliver end-users with consulting, legal, real estate, education, communications, storage, processing, and many other services. Digital contents requested to be streamed are assured with quality, scalable coding mechanisms, and access and authorization management as it will be delivered to the user's mobile terminals.

Scalable coding will provide content delivery and standardize the encoding of high-quality multimedia streams to adapt to different applications where content needs to be transmitted to many clients with different computational power.

The cloud provider is responsible for resource allocation and management allowing the optimal use of the shared resources by the different user categories. Queuing and

traffic management is incorporated to support the execution of computing-intensive functionalities that cannot be run on user's mobile terminals. The cloud infrastructure also performs real-time encryption of high-resolution digital multimedia contents.

The client's mobile terminal is the recipient of the digital multimedia contents streaming capable of streaming acquisition, and decoding and decrypting management.

The framework for digital multimedia contents streaming will provide delivery of digital contents and services to client's mobile terminals that operates in a ubiquitous environment. The activity flow for the presented framework is described in Figure 3.

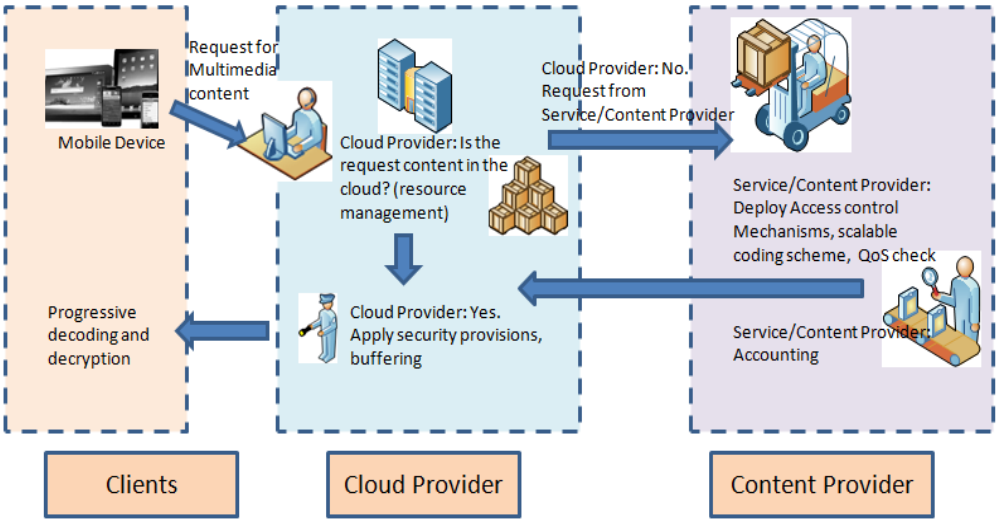

Figure 3. Multimedia Streaming Framework Activity Flow

Mobile devices used by clients must support scalable coding functionalities in real-time multimedia streaming. The decoding scheme will be minimized by the buffering and queuing management at the cloud provider level decreasing the processing delay. Techniques for the improvement of compression and encryption schemes will be deployed to support progressive decoding and decryption in the client's mobile devices.

4. Conclusions

This paper presents a framework for streaming digital multimedia contents through cloud computing infrastructure. The framework describes the relationship among the service provider, the cloud provider, and the mobile device. The main aim of this framework is to provide a scheme for multimedia streaming service that can operate in a ubiquitous environment through mobile devices. The framework will provide high-resolution video streams on user's mobile terminals, taking into account the necessary context information to ensure efficiency in terms of delay, functionality richness, and security robustness.

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