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Load Balancing and Resource Allocation Technique in Cloud Computing for Data Encryption/Decryption using Ad-Hoc Network

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Abstract

Mobile cloud computing is envisioned as a promising approach to augment computation capabilities of mobile devices for emerging resource-hungry mobile applications.[14] Nowadays people depends upon cloud services for various aspects and enjoy various benefits of cloud computing in the form by deploying IaaS, PaaS, and SaaS services and using it's versatile functionalities. Due to advancement in technology, people are using mobile phones more for different purposes as it is providing them same and some advanced features like desktops and mainframes. With this mobile computing have opened new frontiers for Mobile Cloud Computing with Offloading perspective later it provides privacy and security. [13]
In this paper, we are discussing Compare and Balance- Load Balancing and resource allocation technique for mobile cloud offloading that uses cost and time of request processing for processors as key parameters. Also output analysis is done successfully by providing screenshots and implementation details.

Key Words: Mobile cloud computing; Computation offloading; Load balancing; Encryption; Resource allocation

Introduction

Today "Cloud computing" is not only a buzz word but also it is providing various practical applications in desktops as well as in mobile computing. Advancements in computing technology have expanded the usage of computers from desktops and mainframes to a wide range of mobile and embedded applications, including surveillance, environmental sensing, GPS navigation, mobile phones, and autonomous robots, etc. [3] Many of these applications run on systems with limited resources. For example, mobile phones are battery-powered. Environmental sensors have small physical sizes, slow processors, and small amounts of storage. Most of these applications use wireless networks and their bandwidths are order-of-magnitude lower than wired networks. Meanwhile, increasingly complex programs are running on these systems- for example, video processing on mobile phones and object recognition on mobile robots. Thus, there is an increasing gap between the demand for complex programs and the availability of limited resources. [3]

Mobile Systems, such as smart phones, have become the primary computing platform for many users. Various studies have identified longer battery lifetime as the most desired features of such systems. [2] There are various application we are using in day to day life that consumes much of energy of our mobile phones and leaving us behind with switching off of mobile phone as well application do not get loaded completely. Rendering of images, videos, high computation games are some of the examples which consumes most of energy. The only

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natural solution remains with us is Computation Offloading, which adds to battery lifetime and energy consumption of mobile phones. Offloading uses principle to migrate intensive parts of computation to cloud server and let it process and produce output. [1] This reduces the work of mobile phones of loading and responding to particular application.

Literature Survey

Mobile cloud offloading has been considered in the literature [4]–[6]. MAUI [4] is an offloading system designed for Windows phones. It uses Microsoft .NET to identify the methods that can be offloaded and the states that needed to be transferred during offloading. MAUI continuously collects essential data, e.g., energy consumption, CPU utilization, and network conditions, at runtime. It uses the collected data to make the decision on whether to offload for saving energy of mobile devices. In particular, MAUI builds a call graph and solves it as a 0-1 integer linear programming problem. THINKAIR [5] enables method-level offloading system on Android phones. CloneCloud [6] is an offloading system for Android. Different from MAUI [4] and ThinkAir [5], it directly works with application binaries. The difference between MAUI and CloneCloud by considering their architectures and other factors as migration granularities, source availability,

optimization target, migration constraints, execution prerequisite are clearly explained in [7]. The factors affecting the technology evolution and the technique of dynamically offloading computation from native applications running on mobile devices to outside surrogates is explained in [8]. The load balancing algorithm as dynamic compare and balance for cloud server optimization is given in [9]. It considers server optimization techniques which helps to minimize the number of host machines to be powered on, for reducing the cost of cloud servers. Different issues in development of a dynamic load balancing algorithm for multicomputer distributed systems is explained in [10]

Proposed Work

We proposed a system which describes how Computation offloading can be performed providing privacy and security to user data. As we know that mobile devices are having limited resources such as CPU power, memory size, storage, and battery lifetime compared to laptops and desktops. Battery lifetime is considered to be most desirable factor for everyone using Mobile phones and specially smartphones. As there are various high computational intensive applications such as GPS navigation, voice recognition, video processing, gaming, image retrieval and many more which requires more amount of energy. This signifies that we are having limited resources and demand is more from application. There is a need to build a bridge between demand and supply paradigm of mobile devices. [13]

Here we are proposing a system which considers encryption of a file as standalone application to show computation offloading. Following block diagram or architecture of our proposed system clearly defines details of system.

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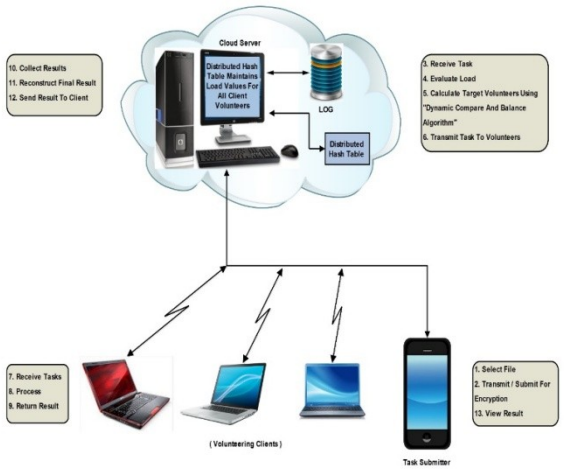

Figure 1. Block Diagram for Cloud basedload balancing in ad-hoc network using dynamic compare and balance algorithm [13]

The Algorithmic steps for model of Load Balancing in Ad-Hoc Network as Compare & Balance-Load Balancing and Resource Allocation Algorithm is as follows:

Algorithm: Compare and Balance-Load Balancing and Resource Allocation Algorithm

1. Start

2. Initially all processors are in ideal stage

3. Submit task by Mobile/Web Client for Encryption or Decryption of file

4. Initialize processors and start volunteering to search for jobs

5. If job = NULL then

Return to step 3

Else job = AVAILABLE then

Go to Step 5

6. Evaluate and Compare cost of available processors and Last Job Completion time.

If cost<3 && LJCT>= 5ms then

Allocate job to that processor

Apply AES cryptography algorithm for encryption/decryption

Calculate Result

Return Result (encrypted/decrypted file) to Mobile/Web Job Submitter

Else

Wait for LJCT>=5ms

Repeat Step 6

7. End

System Flow diagram (Flow Chart) for above algorithm can be shown as follows in fig 2.

Implementation Details

We have successfully implemented our proposed system with following hardware and software details. The hardware requirement are as follows: Processor as Intel dual core and above with frequency as 1.73 and above, RAM as 1 GB & above, Hard Disk capacity as 80 GB and above. For Software Specifications, we have used Operating System as Windows 8, Java Development Kit 1.7.0, Eclipse Framework 4.3.2, MySQL 5_2.1.40, and Net Beans Platform as NetBeans IDE 8.0.2, Glassfish Web Server, Java-ADT V22.0.5.

The screenshots for output windows and other intermediate steps are furnished below. We have developed a system in which server is having functionality to change or set cost of processors or volunteering clients manually. As well start and stop volunteering options are provided. Log of everything is maintained by clients, so that we can easily track whether our system working fine or not. As and when job will get available and client's starts processing can be seen in log maintained list.

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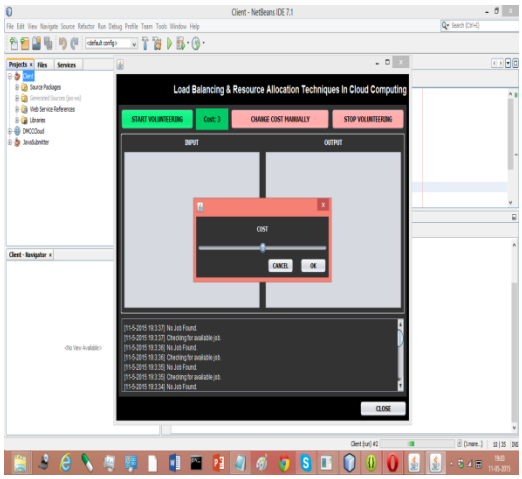

Figure 3. Cost of processors can be set manually as well volunteering client starts volunteering to process job

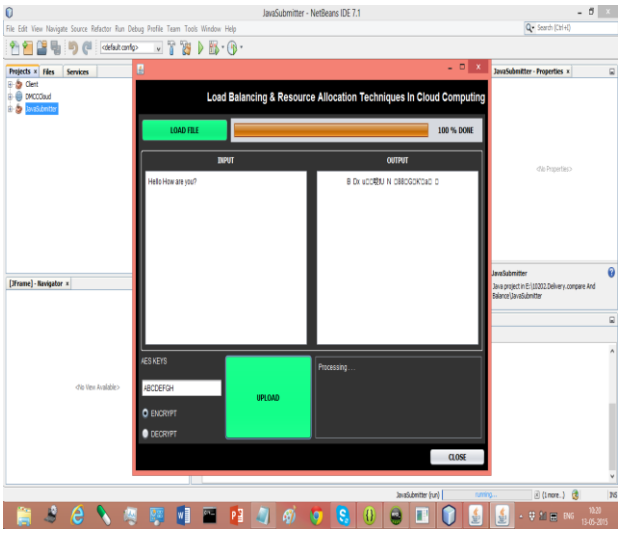

Figure 4. The encryption of file submitted by Mobile/Web Job submitter successful

Above screenshot shows that Mobile/Web Job submitter loads file and uploads for encryption. It gets uploaded successfully and then converted to encrypted file. The contents of file uploaded and encrypted can be seen on screen. WE are using here AES cryptography for encryption and decryption.

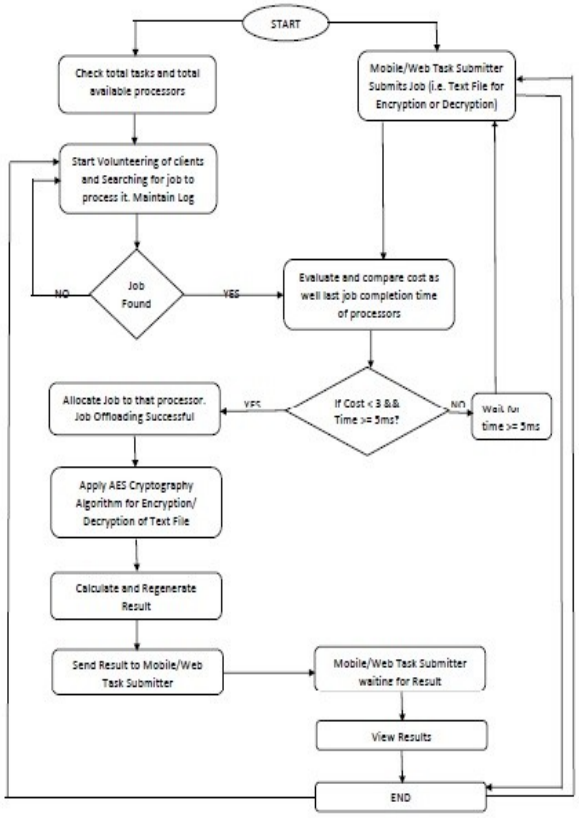

Figure 2. System Flow Diagram (Flow Chart) for Compare-Balance: Load Balancing and resource allocation Algorithm

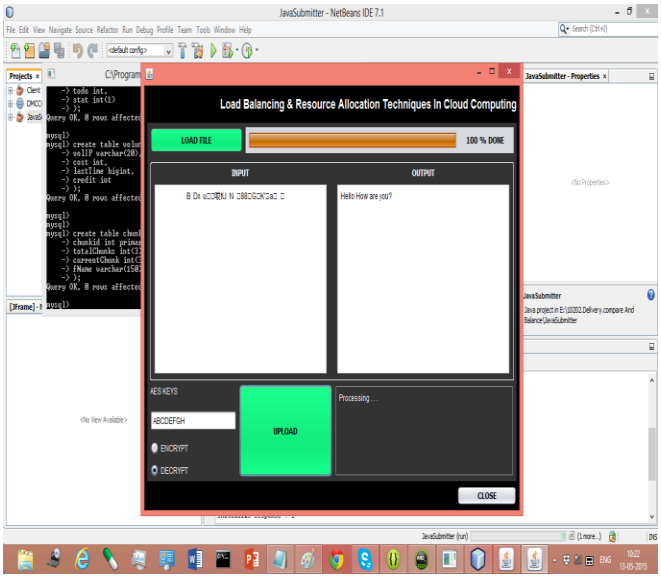

Figure 5. The decryption of file submitted by Mobile/Web Job submitter successful

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UML Diagrams for Specified Model

Our proposed system is now developed completely. We have built some UML Diagrams for proposed system as Package diagram and Deployment diagram as follows.

Package Diagram

Package Diagram shows the arrangement and organization of model elements in middle to large scale project. It shows both structure and dependencies between sub-systems or modules. [11] Package diagrams are used to provide a visualisation of namespaces. The package diagram for our application is as shown in fig 6 which consists of different packages for implementation as NetBeans IDE, GUI (AWT/Swing), Web services, Algorithm as load balancing and resource allocation, and hash table to maintain log.

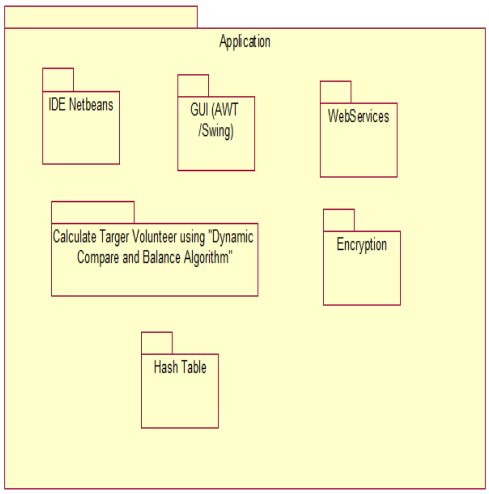

Figure 6. Package Diagram

Deployment Diagram

Deployment diagrams are used to visualize the topology of the physical components of a system where the software components are deployed. So deployment diagrams are used to describe the static deployment view of a system as well describes the hardware components where software components are deployed. [12]

The deployment diagram for our system is as follows in fig 7 which shows various hardware and software components.

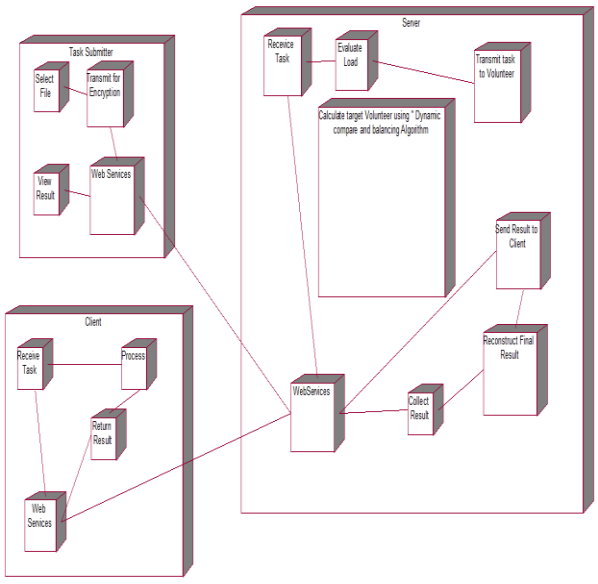

Figure7.DeploymentDiagram

Conclusion

In this paper we have focused on Mobile Cloud offloading concept and demonstrating it with the help of Compare balance- Load Balancing and resource allocation algorithm for cloud computing with the help of Encryption/Decryption of file as an application. We have also discussed system flow diagram and proposed algorithmic solution steps. The implementation details with software and hardware specifications and output screenshots are discussed in details. We believe that computation offloading in Mobile cloud computing will be the next big step in future. The proposed system with dynamic compare and balance algorithm offers improved cost advantages to cloud vendors. Also, we are trying to deploy our system on cloud platform as amazon or other cloud services.

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