A PRELIMENERY REPORT ON

Cost Effective Resource Provisioning Approach for Cloud Environments

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE

BACHELOR OF ENGINEERING

Submitted by

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Sinhgad Institutes

CERTIFICATE

This is to certify that project entitled

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is a bonafide work carried out by Students under the supervision of Name of Guideand it is submitted towards the partial fulfillment of the requirement of Bachelor of Engineering (Computer Engineering).

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Date: / / 2021

ABSTRACT

Nowadays, companies are using cloud infrastructure against huge cost which is again not used in an effective manner. The proposed system gives the solution for the most favorable usage of cloud resources to reduce the infrastructure cost by analyzing EC2 instances on the private clouds like Amazon or Google. The managing the cloud resources we required different modules like monitoring use of EC2 instance and per- formance matrix and suggesting the resource/plan for cost reductions etc.

Keywords-*EC2 VM Usage Monitoring, Cloud computing ,Monitoring Performance Matrix, CPU and RAM utilization,AES Algorithm,EC2 In- stances*

List of Abbreviation

1. AWS - Amazon Web Server

2. AES - Advance Encryption Standard

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Chapter 1 INTRODUCTION

Cost optimization is a major concern in cloud computing as owners of large IT infrastructures have to pay a large cost for resource utilization. The infrastructure resources of cloud computing can be widely distributed in different phases according to the needs of different users. In the course of a cloud, implementation users have the flexibility to choose the EC2 instance type that provides the appropriate mix of resources for the target application and workload. The charges are applied on the basis of resource utilization, but it is very high as most of them not used in an effectiveway.

The main purpose of the system is to create private cloud (test bed) by using (Ama- zon Account) along with monitoring critical resources like RAM, CPU, memory, band- width, partition information, running process information and utilization and swap usages etc. Also, recommend the price reduction strategy. The system also enables optimum utilization of cloud resources.

1.1 MOTIVATION

- Every cloud provider has different pricing strategies for computingresources. In the course of a cloud, implementation users have the flexibility to choose the EC2 instance type that provides the appropriate mix of resources for the target application and workload. They apply charges on the basis of resource utilization, but it is very high.

- The main purpose of the system is to create private cloud (test bed) by us- ing (Amazon Account) along with monitoring critical resources like RAM, CPU, memory, bandwidth, partition information, running process information and utilization and swap usages etc. Also, recommend the price reduction strategy.

1.2 PROBLEM DEFINITION

To devlope a tool i.e. “ Cloud Resource Optimizer and Recommendation ” tomonitor and analyze cost pattern on cloud accounts and capable of giving suggestions about cost containment . It also offers an optimizer service to identify other ways to save money on the cloud.

Chapter 2 LITERATURE SURVEY

Subhas Chandra Misra et al. [1] propose a system for helping companies analyze distinctiveness of their business in addition to previous IT resources to recognize their existence in the relocation to the Cloud structure. A common Return on Investment (ROI) representation has also been explained for consideration of the different inde- finable effect of Cloud Computing, despite the cost. The analysis presented herein provides a much broader viewpoint and approaching into Cloud Computing to its likely adopters.

Advantages

1. System provides an in-depth analysis of the financial perspective of CC in a very lucid and simple manner.
2. Provides both the objective as well as the subjective decision making tool to find the suitability of a company for adopting CC.

Ryan Chard et al.The author of [2] proposes a Scalable Cost-Aware Cloud Infras- tructure Management and Provisioning (SCRIMP) a service-based system that enables application developers and users to reliably outsource the task of provisioning cloud infrastructure. It shows that by understanding application requirements, predicting dynamic market conditions, and automatically provisioning infrastructure according to user-defined policies and real-time conditions that our approaches can reduce costs by an order of magnitude when using commercial clouds while also improving execution performance and efficiency.

Advantages

1.SCRIMP optimizes the cloud provisioning process for batch workload-based applications.

Xinhui Li et al. [3] give clear idea about cost computation and examination in a Cloud computing with the use of suits of metrics and formulas for Cost of Ownership (TCO) and utilization cost. Cloud infrastructure flexibility and extensively used vir- tualization technology in the Cloud are taken into consideration. This gives a base for assessing financial effectiveness of Cloud and offers the suggestion for cost optimization of Cloud. This calculation and analysis strategy used in the interior Cloud environment and show firstly its investigation ability on the cost allocation and use imbalance factor.

Advantages

1.System provides Cloud TCO and Cloud Utilization Cost, to evaluate the economy efficiency of Cloud.

Keith R et al. [4] present a system that suggests a typical HPC workload executed on Amazon EC2. The system clearly shows a strong connection for application communication and its general performance on EC2. Also, variability in EC2 performance is given.

Alexandru Iosup et al. [5] propose a system which shows that the present clouds required a sequence of magnitude in performance, development to be helpful to the scientific community and show which development should be measured first to deal with this inconsistency between offer and demand.The system gives the existence of technical computing workloads for Many-Task Computing (MTC) users.

Amelie Chi Zhou et al.[6] develops system entitled Dyna to decrease the predictable cost for WaaS provider. An A*-based instance configuration technique is used by the author for a hybrid instance configuration using spot instances. The presented system can effectively reduce the monetary cost in comparison with the existing approaches.

Amelie Chi Zhou et al.[6] develops system entitled Dyna to decrease the predictable cost for WaaS provider. An A*-based instance configuration technique is used by the author for a hybrid instance configuration using spot instances. The presented system can effectively reduce the monetary cost in comparison with the existing approaches.

Guoxin Liu et al.[7] provide a model to decrease the payment cost of clients and at the same time is guarantee their SLOs(service level objective) with the globally dis- tributed data centers belonging to different CSPs with different resource unit prices. The cost minimization problem can be solved by using integer programming.

Krishnadas Nanath et al. [8] proposed a model analyze the cost - benefits to decide upon the adopt ability of cloud computing. It takes into consideration various pa- rameters of an organization such as number of servers, power requirements and other computational/non - computational resources. This model uses a three layer approach for the cost - benefit analysis and draws insights on profitability when an organization shifts to cloud computing in each layer. The three layers are base cost estimation, data pattern based cost estimation and project specific cost estimation . These layers are designed to provide different levels of decision making to aid managers in their attempt to find out the prospects of adopting cloud computing in their organization. The data for cost benefit analysis was collected from organizations that comprised of both small scale and large scale data centers. It was found that c loud computing is profitable for start - ups and small firms (small scale data centers) when compared to well - established firms.a model to analyze the cost - benefits to decide upon the adopt ability of cloud computing. It takes into consideration various parameters of an organization such as number of servers, power requirements and other computational/non - computational resources. This model uses a three layer approach for the cost - benefit analysis and draws insights on profitability when an organization shifts to cloud computing in each layer.

Advantages

1.System provides a three layer approach in order to incorporate maximum exurbanite in the model for easy computation.

Chapter 3

SOFTWARE REQUIREMENTS SPECIFICATION

3.1 INTRODUCTION

The key characteristics of cloud computing are the ability to scale resources practically infinitely, the capability to pay only when a resource is actually needed, and the elimi- nation of large upfront costs for users. In addition, low prices and ease of use encourage enterprises to utilize cloud computing to host their IT infrastructure. Cloud computing is offered by cloud providers, among which the most prominent examples are Amazon Web Services (AWS), Google Cloud 2, and Microsoft Azure 3. Every cloud provider has different pricing strategies; however, for computing resources, they offer two categories of products: on-demand instances and reserved instances. On-demand instances are virtual machines created and paid for only when utilized. A cloud user adds and re- moves an on-demand instance with maximum flexibility. Conversely, reserved instances are computational resources reserved and paid for a certain period, with an upfront fee.

The latter category requires a higher level of commitment for the user; therefore, if extensively utilized, they result to be cheaper during a long-term utilization. To evade redundant expenses, cloud computing user required to do careful planning. Currently, researchers have extensively studied the field of cost optimization in cloud computing. Nonetheless, the current state-of-the-art approaches have some limitations. AWSpro- vides a suite of Elastic Compute Cloud (EC2) instance types for different use cases.

These instance types provide varying combinations of CPU, memory, storage and net- work capacity.

In the course of a cloud, implementation users have the flexibility to choose the EC2 instance type that provides the appropriate mix of resources for the target application and workload. Currently, the choice of an instance type is usually based on a heuristic approach and does not guarantee that an optimal solution is selected with regards to performance and cost. In this paper, we present the model for an efficient assignment of workloads to servers in order to reduce cost as well as to maximize resource utiliza- tion.

As in cloud computing, there are two main actors involved, there are two sides of cost optimization: cost optimization performed by providers and cost optimization performed by users[5]. Cost optimization performed by cloud providers mainly focuses on minimizing the cost to maintain a physical data center. The cost minimization is typically achieved by reducing electricity consumption. We develop a system that monitors VMs (EC2 Instances) on private clouds like Amazon or Google and provides solutions to reduce infrastructure cost from the customer’s point of view.

3.1.1 Project Scope

In our proposed model, we are creating private cloud (test bed) by using an Amazon Account. By connecting to existing user’s Amazon Account with user Id and Password cloud Usage Monitoring System can fetch all the Performance Matrix-like RAM, CPU, memory bandwidth, and exchange usages etc.

To estimate the output of the whole setup, We require arranging resource examine and load balancing tools on the test bed and calculate the need of available resources like Storage Pricing, CPU pricing, Request Pricing and Storage Management Price. This result can be geographically dispersed and contain a large number of purchaser and agent.

3.1.2 User Classes and Characteristics

- User can view CPU and RAM usage utilization of amazon ec2 nodes.

- User can connect existing user's to amazon account using user id and password and fetch all the performance matrix.

3.1.3 Assumptions and Dependencies

Let us Assume:

- User must have basic knowledge of computer.
- User must have basic knowledge of handling WebPages.
- Must be familiar basic with Networking and communication.
- Admin only the user who is allowing to access network.

Dependencies:

- Only Administrators will be able to edit main configurations.
- Escalation mechanism is limited to administrator only.
- System must have internet connections.

3.2 FUNCTIONAL REQUIREMENTS

3.2.1 System Feature 1(Functional Requirement)

- Creating private cloud (test bed) by using Amazon Account.
- Resource Monitoring of Cloud Nodes
- Monitoring account wise VM Usage
- Provding an efficient resource utilization
- Providing authentication and authorization

3.2.2 System Feature 2(Functional Requirement)

User Module:

- User should be able to view CPU and RAM usage utilization of amazon ec2 nodes.
- User will connect existing user's to amazon account using user id and password and fetch all the performance matrix.

3.3 EXTERNAL INTERFACEREQUIREMENTS

3.3.1 User Interfaces

- User interface screen will be log in screen first.
- Professional look and feel
- Use of AJAX at least with all registration forms
- Use of reports

3.3.2 Hardware Interfaces

The minimum configuration required on computer.

- **System:** Intel P4 or above
- **RAM:** 256MB Memory
- **Hard Disk(HDD) :** 80 GB

3.3.3 Software Interfaces

- **IDE :** Eclipse Luna
- **Platform :** Microsoft Windows 7 Professional or greater
- **Language :** Java 1.8
- **Database :** MySQL

- **Amazon AWS API**
- **REST Web Services**

3.3.4 Communication Interfaces

- Communication Interface process is intended to give an approach to archive and track extend interfaces from Planning stage (FEP) to the end of the project.
- The system use the HTTP protocol for communication over the internet and for the intranet communication will be through TCP/IP protocol suite.

3.4 NONFUNCTIONAL REQUIREMENTS

3.4.1 Performance Requirements

High Speed

The system should process the requested task in parallel for various activities to give a quick response then the system must wait for process completion.

Accuracy

The system should correctly execute the process; i.e. display the result i.e according to the particular parameter.
System output should be in user required format.

Interoperability

System should have the ability to exchange information and communicate with internal and external applications and systems. It must be able exchange information both internally and externally.

Response Time:

The response time of the system should be deterministic at all times and very low, i.e it should meet every deadline. Thus, the system will work in real time.

3.4.2 Safety Requirements

- The data safety must be ensured by arranging for a secure and reliable transmis- sion media. The source and destination information must be entered correctly to avoid any misuse or malfunctioning.
- The source and destination information must be entered correctly to avoid any misuse or malfunctioning.
- Safety requirements against the natural disaster and accidents.
- Failures due to technical issues.

3.4.3 Security Requirements

- All the user details shall be accessible to only high authority persons.
- Access will be controlled with usernames and passwords.

3.4.4 Software Quality Attributes

- Maintainable software should have
- Encourage in-code documentation (XML docs in javadoc, etc.)
- use a wiki to maintain the documentation
- Unit Tests = Good for documenting specifications
- Comments = Good for documenting design decisions.
- Unit Tests + Comments = Good for documenting specifications and design de- cisions. = Easily maintainable software.
- Faster feedback from any changes made to the system
- Providing better transparency into the changes happening to the system
- Propagating environmental changes and code changes more rapidly while maintaining control

3.5 SYSTEM REQUIREMENTS

3.5.1 Database Requirements

The database is required to be created and maintained in MySQL Server. Stored procedures are also created to retrieve and operate on data.

3.5.2 Hardware Requirements

The minimum configuration required on server platform.

- **System :** 2.4 GHZ, 80 GB HDD for installation.
- **RAM :** 512 MB memory.

3.5.3 Software Requirements

Eclipse Luna

- Eclipse Luna is an open source community whose projects building tools and frameworks are used for creating general purpose application. The most popular usage of Eclipse Luna is as a Java development environment.
- Eclipse Luna is an open source community, whose projects are focused onbuild- ing an open development platform comprised of extensible frameworks, tools and runtimes for building, deploying and managing software across the lifecycle. The Eclipse Luna Foundation is a not-for-profit, member supported corporation that hosts the Eclipse Luna projects and helps cultivate both an open source commu- nity and an ecosystem of complementary products and service.
- The independent not-for-profit corporation was created to allow a vendor neutral and open, transparent community to be established around Eclipse Luna. Today, the Eclipse community consists of individuals and organizations from a cross section of the software industry.

JDK 1.8

- The Java Development Kit (JDK) is a software development environment used for developing Java applications and applets. It includes the Java Runtime Environment (JRE), an interpreter/loader (java), a compiler(javac), an archiver (jar), a documentation generator (javadoc)and other tools needed in Java development.

- A Java virtual machine(JVM) is an abstract computing machine that enables a computer to run a Java program. There are three notions of the JVM: spec- ification, implementation, and instance. The specification is a document that formally describes what is required of a JVM implementation. Having a single specification ensures all implementations are interoperable.
- A JVM implementation is a computer program that meets the requirements of the JVM specification. An instance of a JVM is an implementation running in a process that executes a computer program compiled into Java bytecode.

MySQL

- Java web application will require storing large amounts of metadata and keep data organized. Therefore there was a need to host a Java web application with MySQL. A few other benefits of using MySQL as opposed to other database software for your Java hosting include:
- State-of-the-art security: MySQL's reputation as the safest relational database currently in use makes it ideal for e-commerce sites that handle frequent online transactions and other sensitive data.
- High-quality performance: Built to handle the most demanding websites with the heaviest traffic, it's not bogged down by high usage. Even when it's used by traffic-heavy sites like Twitter and Facebook, MySQL maintains its lightning fast performance speeds.
- More uptime: MySQL guarantees 100% uptime so that you never have toworry about surprise software crashes.
- Easy maintenance: Because it's open-source, the software is constantly being upgraded and debugged, which means less maintenance for you to worry about – all you have to worry about your Java site or web application.
- It's used everywhere: MySQL's popularity actually doubles as a benefit – because it's an industry standard, it's compatible with almost any operating system you

can think of. Following are the basic steps that are needed to follow for setting up dedicated hosting Server:

1. Build your own dedicated server
2. Install Apache Tomcat
3. Install the latest version of MySQL (versions are available for Windows, Linux, and Mac)
4. Configure and test your MySQL installation

Amazon AWS API REST

Web Services

3.6 ANALYSIS MODELS: SDLC MODEL TO BE APPLIED

Iterative SDLC Model

The development process of our system is starts with the requirements to the functional part, which can be expanded later. The process is repetitive, allowing to make new versions of the product for every cycle. Every iteration includes the development of a separate component of the system, and after that, this component is added to the functional developed earlier. As the software evolves through successive cycles, tests must be repeated and extended to verify each version of the software. The major steps of the SDLC model are given below:

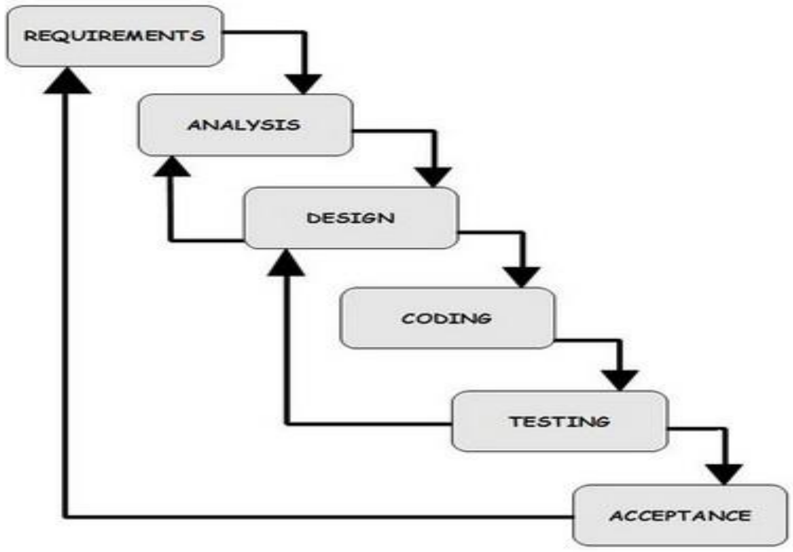


Figure 3.1: Iterative SDLC Model

- **Requirement gathering:** All the functional and non-functional requirements of the project were identified. Interaction with the users and all other stakeholders of the project was conducted to identify all the requirements starting from important features like maintaining audit trail, security parameters etc. to the very basic features like the look and the feel of user interface. The different requirements mainly fall into categories:

  1.System features

  2.Security parameters

3.User requirements 4.Administrator

requirements 5.User interface

- **Design:** The first step was database design. A complete database required for the implementation of this project was designed. The second step was project design. The project was designed based on a framework. The framework uses three layers:

  a. Business entities layer: It identifies all the entities used in the project.

  b. Business logic layer: This layer operates on the business entity to achieve the goals.

  c. Data access layer: This layer serves as an interface between backend and the services.

- **Construction:s** All modules and user interface was built in this step. Develop- ment was done using Java. Database was constructed inMySQL.

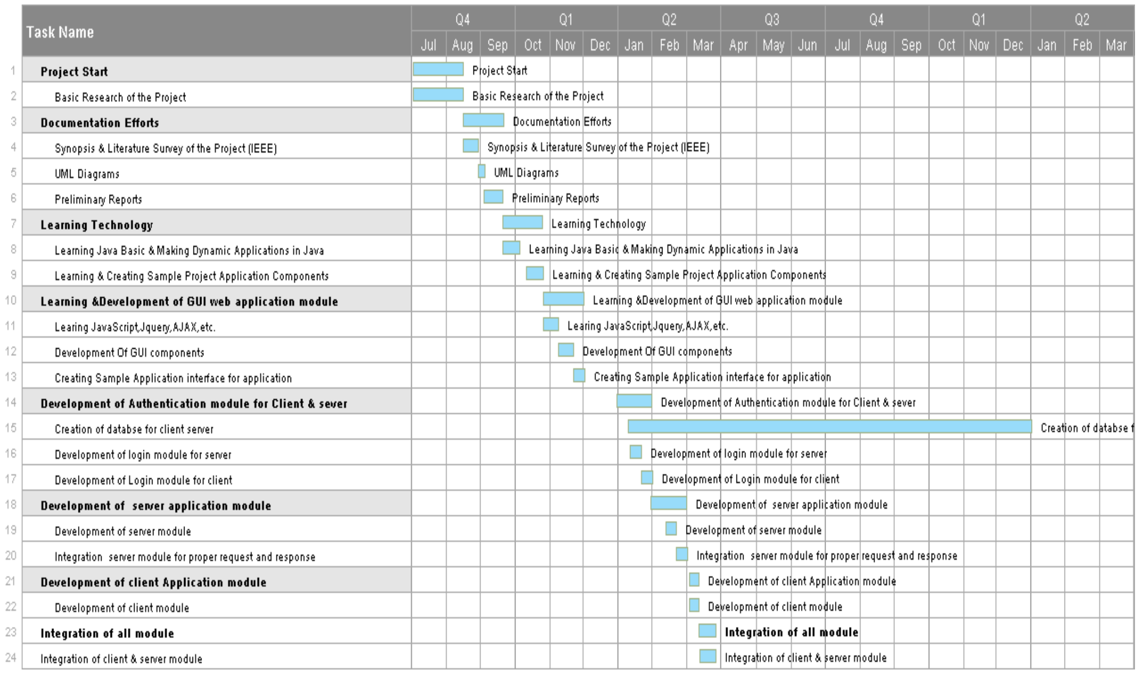
- **Integration and system testing:** All the modules were integrated together. The user interface was integrated with the modules which made the use web services. Data flow originated from the database built in MySQL. In testing phase project was tested and debugged. Various test cases were developed and the project was tested at the developers end as well as users end. Debugging was done to discover errors and exception which were corrected.

- **Installation and maintenance:**Our system is installed on one dedicated ma- chine and it is accessible to admin and all authenticated users. Maintenance of our system is done on regular basis. New requirements and features can be added as and when required as long as they do not conflict with the existingfeatures

3.7 SYSTEM IMPLEMENTATION PLAN

Project planning is part of project management, which relates to the use of schedules such as Gantt charts to plan and subsequently report progress within the project environment. A project management plan is the planning document, capturing the entire project end-to-end, covering all project phases, from initiation through planning, execution and closure.

Analysis or prototyping should increase in direct proportion with project size and complexity. 20 to 25 % of effort is normally applied to software design.



	Task Name
1	**Project Start**
2	Basic Research of the Project
3	**Documentation Efforts**
4	Synopsis & Literature Survey of the Project (IEEE)
5	UML Diagrams
6	Preliminary Reports
7	**Learning Technology**
8	Learning Java Basic & Making Dynamic Applications in Java
9	Learning & Creating Sample Project Application Components
10	**Learning &Development of GUI web application module**
11	Learing JavaScript,Jquery,AJAX,etc.
12	Development Of GUI components
13	Creating Sample Application interface for application
14	**Development of Authentication module for Client & sever**
15	Creation of databse for client server
16	Development of login module for server
17	Development of Login module for client
18	**Development of server application module**
19	Development of server module
20	Integration server module for proper request and response
21	**Development of client Application module**
22	Development of client module
23	**Integration of all module**
24	Integration of client & server module

Figure 3.2: Timeline Chart

1. Requirement gathering
2. Literature Survey of existing systems
3. Requirement Modeling and training
4. Development of mock screens
5. Actual Implementation

The Gantt chart for the project is drawn below. The Gantt chart shows the project planning right from the beginning when the topic was finalized.

It depicts the software development life cycle (SDLC). The milestones in the project include topic selection, requirements gathering, Software Requirements Specification, Hardware Requirements Specification.

The milestones also depict the project planning stage. In the Gantt chart below the milestones are represented according to the months in the development lifetime.

Chapter 4

SYSTEM DESIGN

4.1 SYSTEM ARCHITECTURE

In today’s competitive market, measuring application success as “user interface” alone is no longer enough. Poor availability costs revenue, loyalty and brand image. Applica- tion leaders are shifting business-centric metrics to service level management (SLM) to bring IT closer to business. So it is necessary to build up a scalable CLOUD explana- tion which is able to carry requirements of Stock Broking firm with no negotiation on performance, scalability, and cost. Below figure shows the architecture of the proposed system.

In our proposed model, we will be doing,

- **Cloud Setup** Creating private cloud (test bed) by using (Amazon Account)
- **Resource Monitoring** Monitoring critical resources like RAM, CPU, memory, bandwidth, partition information, running process information and utilization and swap usages etc.
- **Authentication and authorization** We need to connect to existing user’s Amazon account using user id and password and fetch the entire performance matrix like CPU, RAM, storage etc.
- **Testing** In order to evaluate the performance of complete setup, need to deploy resource monitoring and load balancing tools on test bed and evaluate need of available resources. Modules:

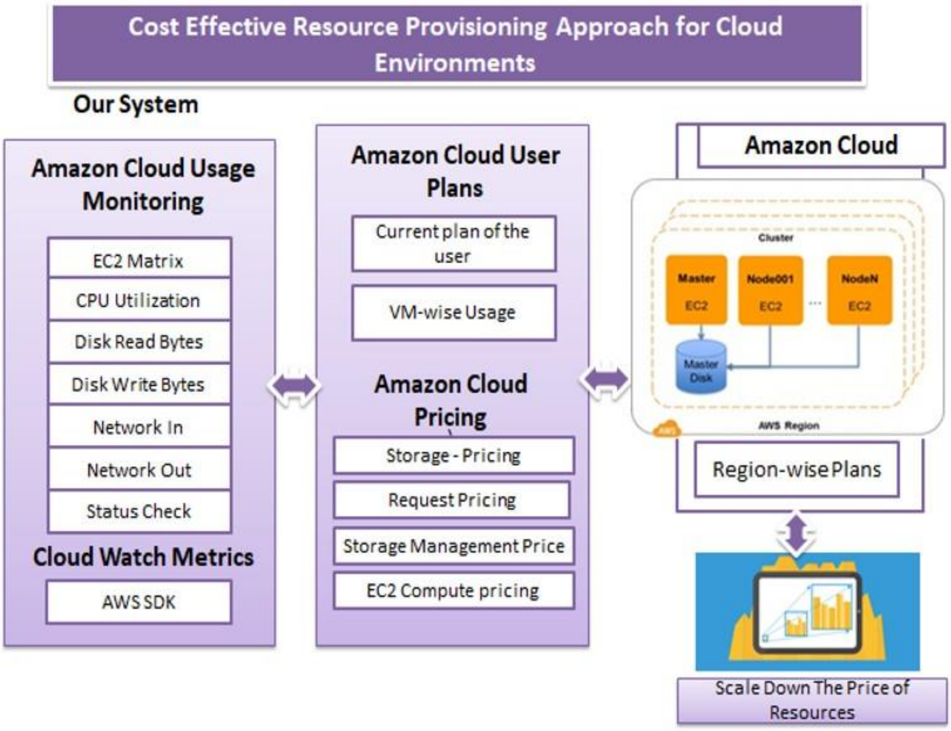


Figure 4.1: System Architecture

- **Resource Monitoring of Cloud Nodes:** a. User should be able to view CPU and RAM usage utilization of Amazon ec2 nodes.

  b. CPU and RAM utilization statistics should be dynamic and should refresh every second.

- **Select Cloud Plans for popular clouds like Amazon. Cost of service depends on region of server, memory usage, CPU etc. Cloud service providers charge for following services which need to be added in sys- tem**

  a. Storage – Pricing

  b. Request Pricing

  c. Storage Management Price

  d. CPU pricing

- **Monitor account wise VM Usage of following parameters** a. CPUUti- lization

  b. DiskReadBytes

  c. DiskWriteBytes

d. NetworkIn
e. NetworkOut
f. StatusCheck

- **Propose efficient resource utilization**
  a. By suggesting memory cutdown
  b. By suggesting cpu cutdown
  c. By suggesting storage cutdown

4.2 DATA FLOW DIAGRAMS

A data flow diagram (DFD) is a graphical representation of the flow of data through an information system, modeling its process aspects. It shows data is processed by a system in terms of inputs and outputs.

4.2.1 DFD Level-0

It only contains one process node (Process 0) that generalizes the function of the entire system in relationship to external entities.

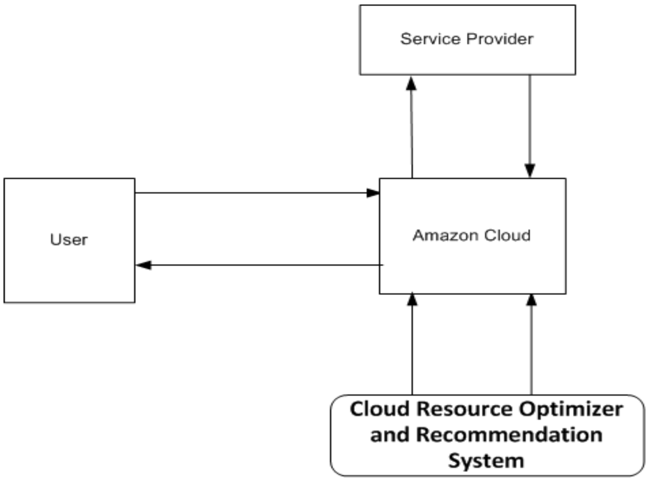


Figure 4.2: DFD Level-0

4.2.2 DFD Level-1

DFD level 1 diagram expands the DFD 0 and shows the detailed flow of the proposed system.

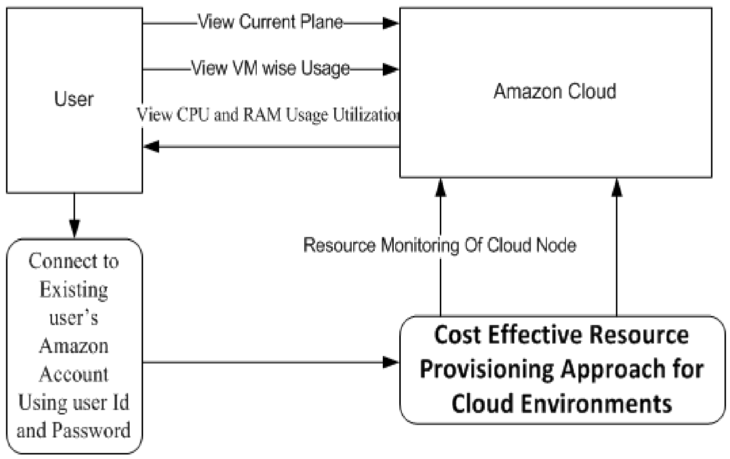

User
View Current Plane
View VM wise Usage
View CPU and RAM Usage Utilizatio
Amazon Cloud
Connect to Existing user's Amazon Account Using user Id and Password
Resource Monitoring Of Cloud Node
Cost Effective Resource Provisioning Approach for Cloud Environments

Figure 4.3: DFD Level-1

4.2.3 DFD Level-2

DFD level 2 diagram expands the DFD 1 and shows the detailed flow in the proposed system. It shows the different processes that take place to perform the authentication.

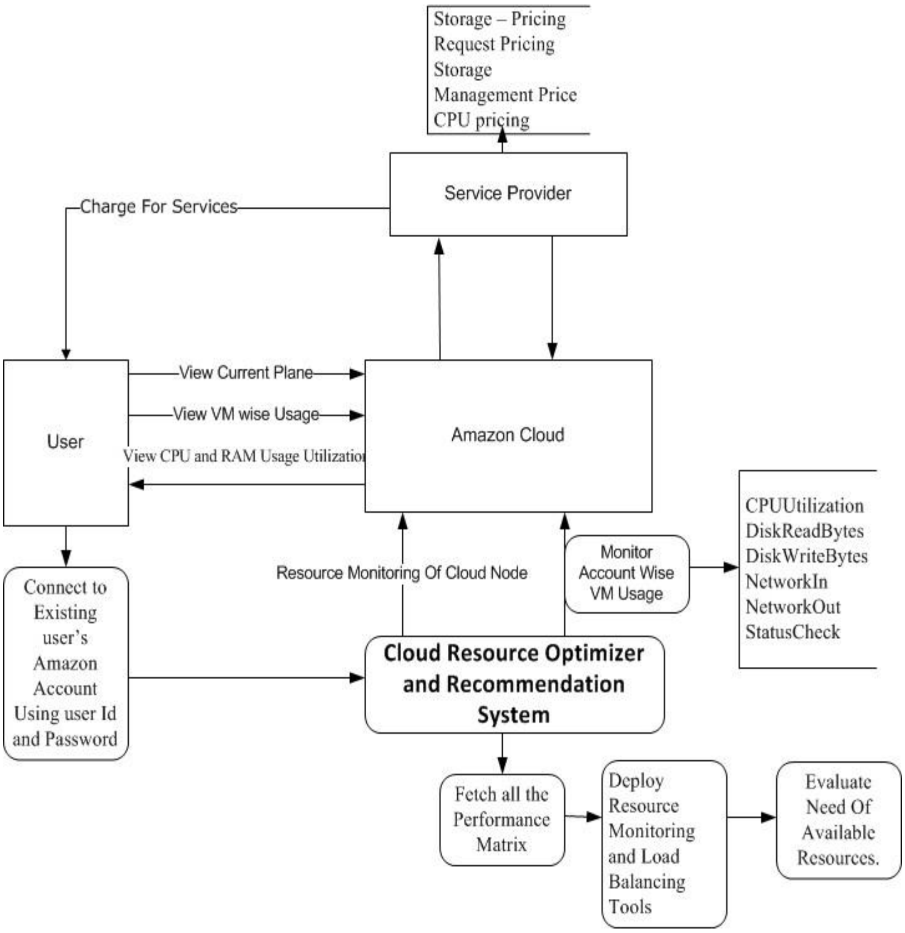
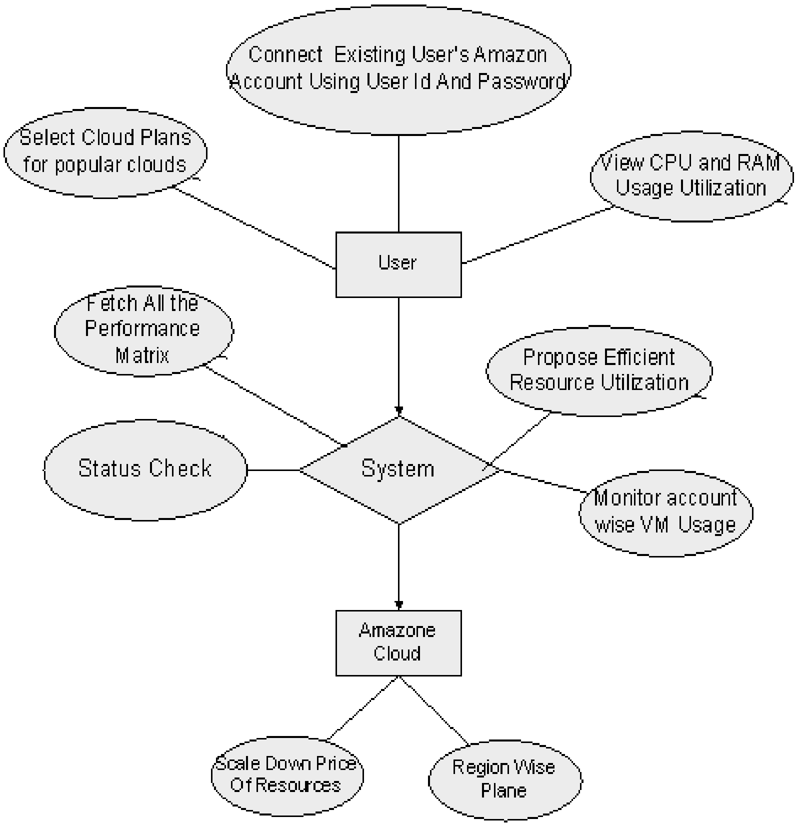

Storage – Pricing
Request Pricing
Storage
Management Price
CPU pricing
Service Provider
Charge For Services
View Current Plane
View VM wise Usage
View CPU and RAM Usage Utilizatio
User
Amazon Cloud
CPUUtilization
DiskReadBytes
DiskWriteBytes
NetworkIn
NetworkOut
StatusCheck
Monitor Account Wise VM Usage
Resource Monitoring Of Cloud Node
Connect to Existing user's Amazon Account Using user Id and Password
Cloud Resource Optimizer and Recommendation System
Fetch all the Performance Matrix
Deploy Resource Monitoring and Load Balancing Tools
Evaluate Need Of Available Resources.

Figure 4.4: DFD Level-2

4.3 ENTITY RELATIONSHIP DIAGRAMS

Data objects and their major attributes and relationships among data objects are described using an ER - like form.ER diagram is a data model for describing the data or information aspects of a software system. The main components of ER models are entities and the relationships that exist among them. The various entities are system and admin.

Figure 4.5: ER Diagram


Connect Existing User's Amazon Account Using User Id And Password
Select Cloud Plans for popular clouds
View CPU and RAM Usage Utilization
User
Fetch All the Performance Matrix
Propose Efficient Resource Utilization
Status Check
System
Monitor account wise VM Usage
Amazone Cloud
Scale Down Price Of Resources
Region Wise Plane

4.4 UML DIAGRAMS

4.4.1 Use Case Diagram

. Use case diagram is a simple representation of a users interaction with the system that shows the relationship between the user and the different use cases in which the user is involved.Here the actors are voter, Election officer and system.

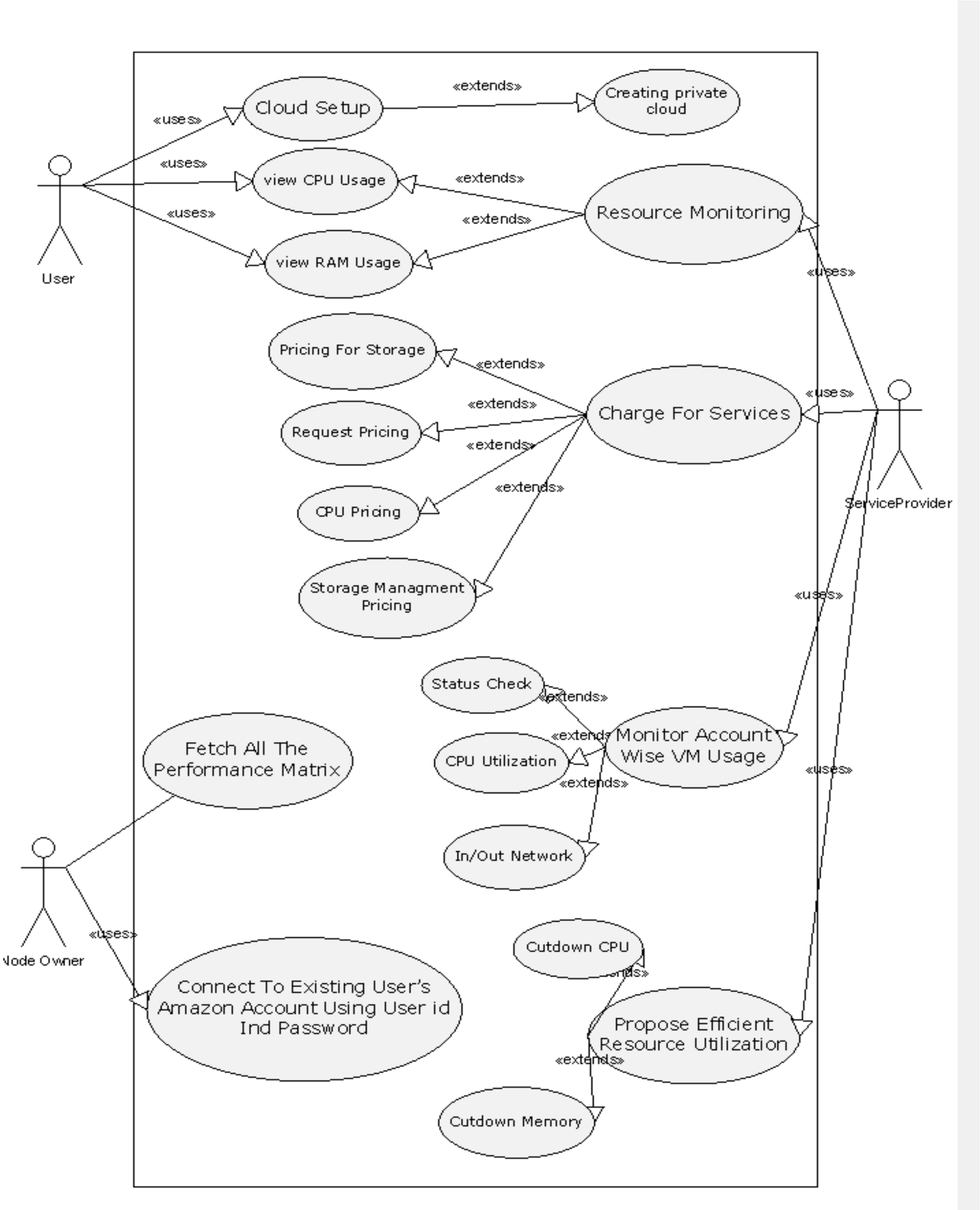


Figure 4.6: Use Case Diagram

4.4.2 Sequence Diagram

A Sequence diagram is an interaction diagram that shows how processes operatewith one another and in what order. Sequence diagrams are sometimes called event diagrams or event scenarios. The sequence diagram for the proposed system shows the interaction in between admin, system and database.

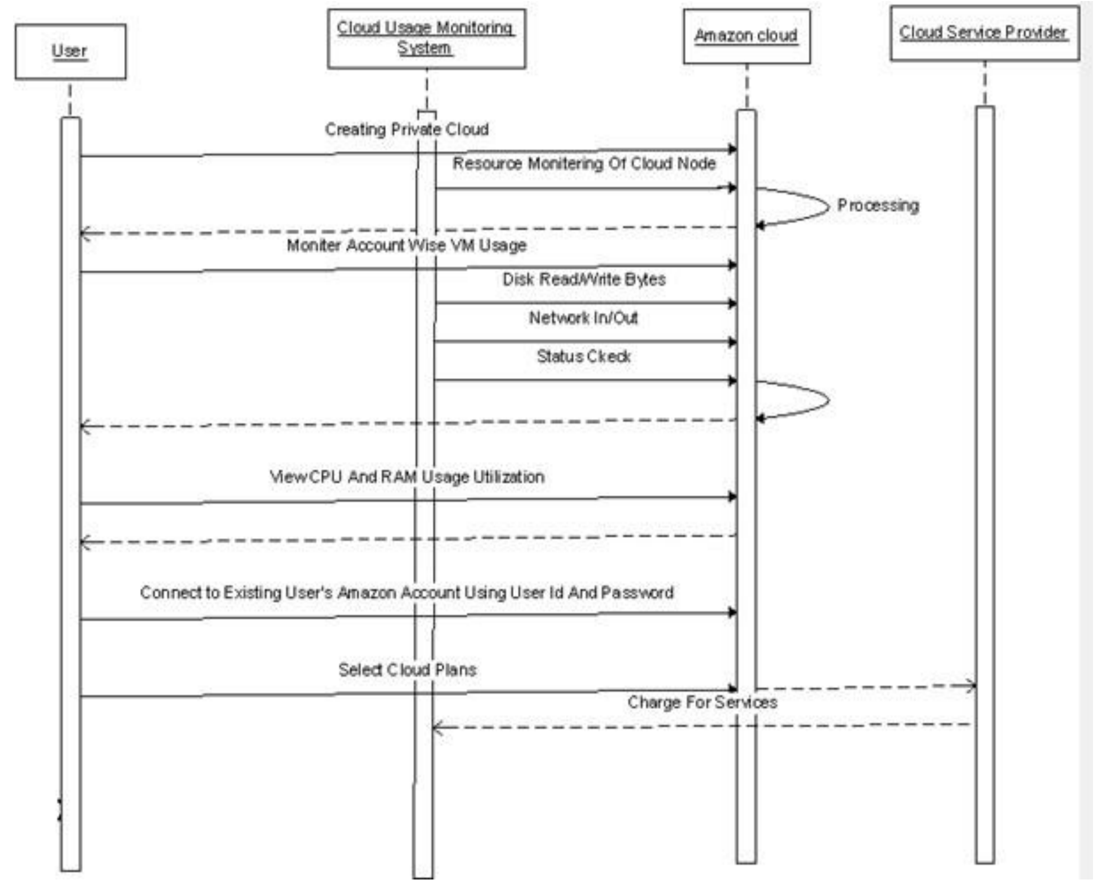

User
Cloud Usage Monitoring System
Amazon cloud
Cloud Service Provider
Creating Private Cloud
Resource Monitering Of Cloud Node
Processing
Moniter Account Wise VM Usage
Disk Read/Write Bytes
Network In/Out
Status Ckeck
ViewCPU And RAM Usage Utilization
Connect to Existing User's Amazon Account Using User Id And Password
Select Cloud Plans
Charge For Services

Figure 4.7: Sequence Diagram

4.4.3 Class Diagram

Class diagram is a type of structure diagram that shows the structure of the classes, attributes, operations and relationship among them. Given below is the class diagram of the proposed system which shows 8 classes such as user, system, database.

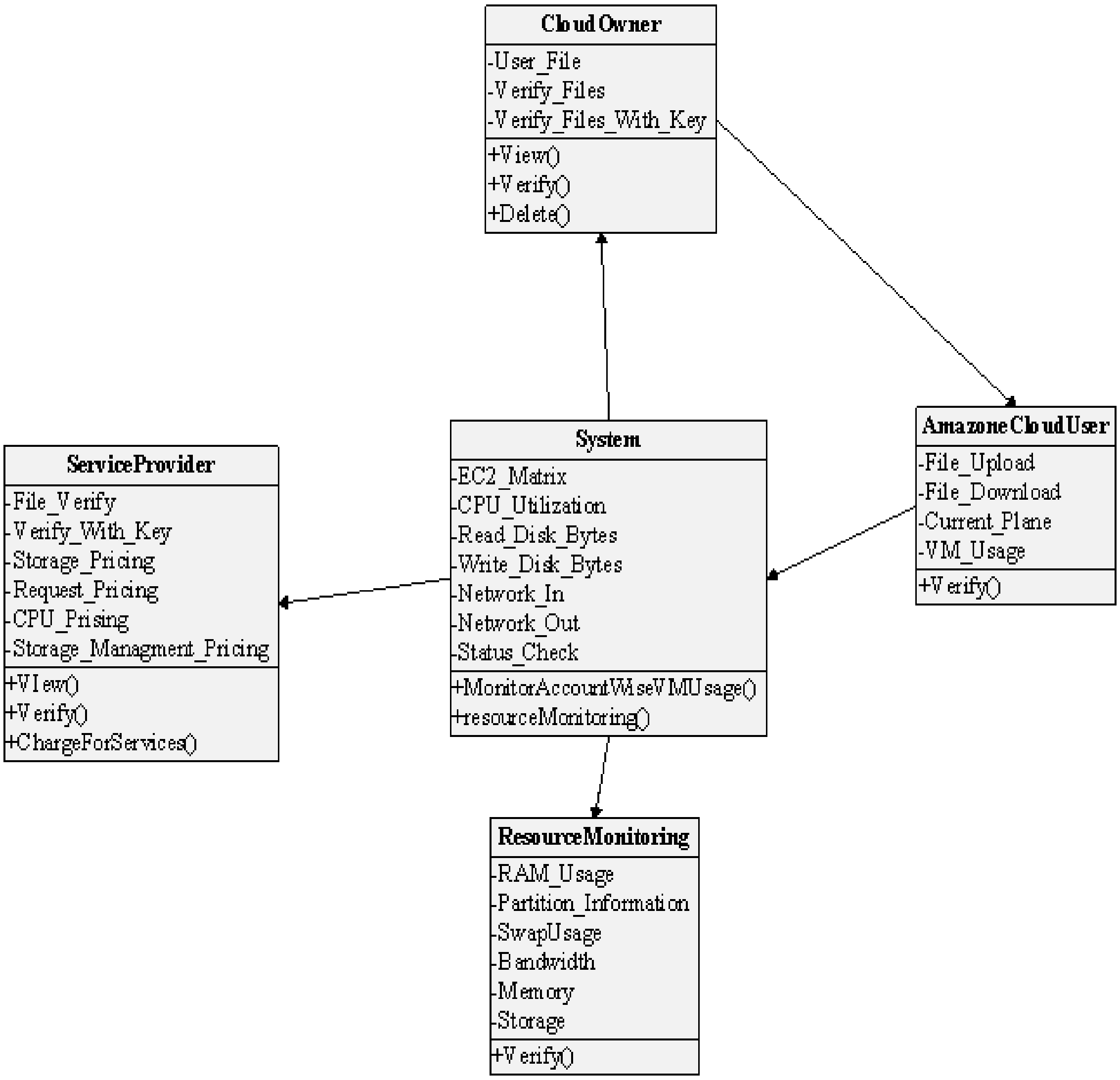


Figure 4.8: Class Diagram

4.4.4 Component Diagram

A component diagram depicts how components are wired together to form larger components and or software systems. A component is something required to execute a stereotype function. Examples of stereotypes in components include executable, documents, database, tables, files.

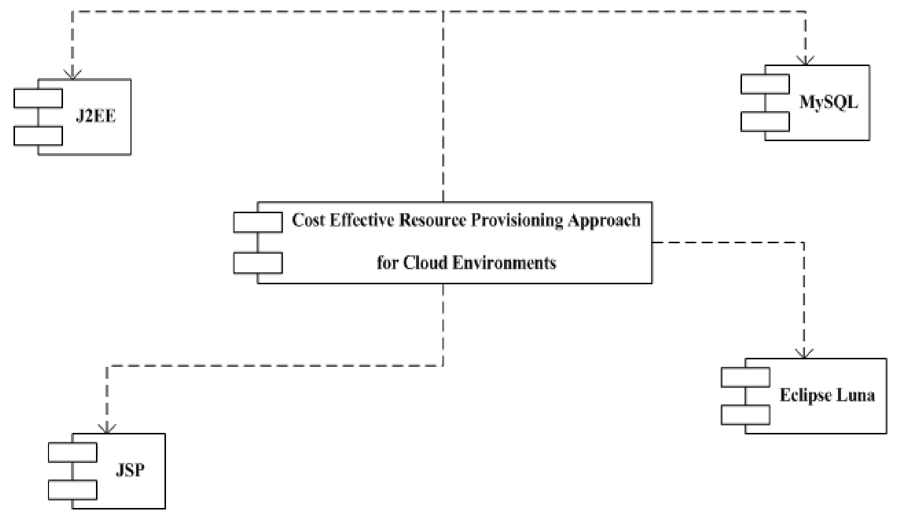

J2EE
MySQL
Cost Effective Resource Provisioning Approach for Cloud Environments
Eclipse Luna
JSP

Figure 4.9: Component Diagram

4.4.5

Deployme onents of a system wl ram for the proposed ɔonents on which the ver, Client, Windows JVM and the Database.

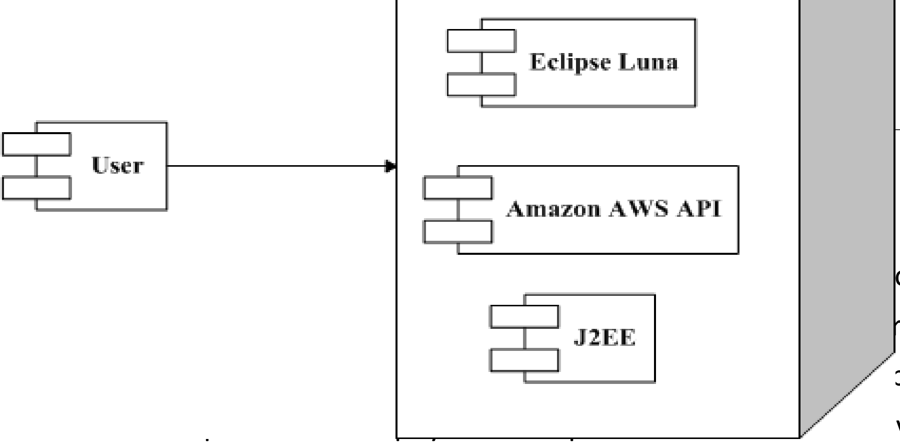


Figure 4.10: Deployment Diagram

4.4.6 Activity Diagram

Activity diagrams are graphical representations of workflows of step-wise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step- by-step workflows of components in a system. An activity diagram shows the overall flow of control.

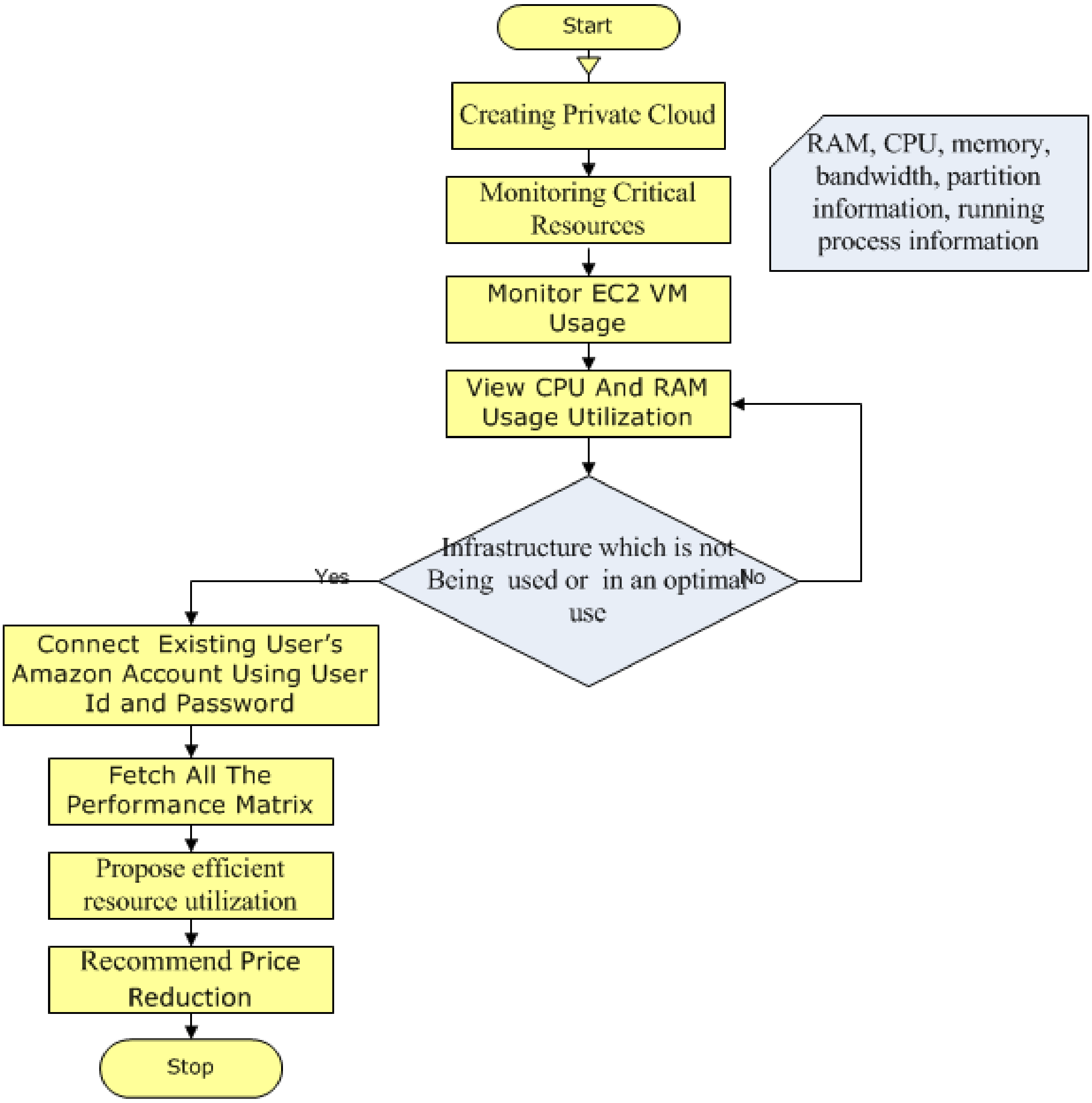

Start
Creating Private Cloud
Monitoring Critical Resources
Monitor EC2 VM Usage
View CPU And RAM Usage Utilization
RAM, CPU, memory, bandwidth, partition information, running process information
Infrastructure which is not Being used or in an optimal use
Yes
No
Connect Existing User's Amazon Account Using User Id and Password
Fetch All The Performance Matrix
Propose efficient resource utilization
Recommend Price Reduction
Stop

Figure 4.11: Activity Diagram

Chapter 5

OTHER SPECIFICATION

5.1 ADVANTAGES

- Used to monitor and analyze cost pattern on cloud accounts.
- Gives a suggestions about cost optimization and delivering cost containment.
- Analyze usage of the user and give suggestions for future plans according tothe user's usage.
- Evaluate the performance of workloads on EC2 and reduce infrastructure cost from the customer's point of view. It also gives the optimum utilization of cloud resources.

5.2 LIMITATIONS

5.3 APPLICATIONS

1. The application is used for providing suggestions about cost optimization and delivering cost containment.
2. Used in monitoring and analyzing cost pattern on cloud accounts.

Chapter 6

CONCLUSION

6.1 CONCLUSION

- Cloud computing refers to a paradigm for accessing computing resources which is becoming increasingly popular. Despite the fact that having a cloud infrastruc- ture is usually cheaper than maintaining a physical data center, owners of large and complex IT infrastructure might incur large costs.

- Therefore, the problem of cost optimization in cloud computing is becoming increasingly important. This system analyses the problem of cost optimization in cloud computing.

- We also evaluate the performance of the resource monitoring and load balancing tools. This system monitors the VM node on private cloud to reduce infrastruc- ture cost from the customer's point of view.

Annexure A

Feasibility Assessment

Problem statement feasibility assessment using, satisfiability analysis and NP Hard,NP-Complete

NP-Hard problem:

- NP-Complete and NP-Hard are: A decision problem is in P if there is a known polynomial-time algorithm to get that answer. The collection of all problems that can be solved in polynomial time is called P. That is, a decision questionis in P if there exist an exponent k and an algorithm for the question that runs in time O (nk) where n is the length of the input.
- A decision problem is in NP if there is a known polynomial-time algorithm for a Non-deterministic machine to get the answer. The estimation cannot be solved in fixed time or we can not define their execution complexity with a mathematical algorithm, are called as Non-Deterministic polynomial problems.

NP-COMPLETE:

- NP Complete In computational complexity theory, a decision problem is NP- complete when it is both in NP and NP-hard. The set of NP-complete problems is often denoted by NP-C or NPC. The abbreviation NP refers to nondeterministic polynomial time.
- Although any given solution to an NP-complete problem can be verified quickly (in polynomial time), there is no known efficient way to locate a solution in the first place; indeed, the most notable characteristic of NP-complete problems is

that no fast solution to them is known. That is, the time required to solve the problem using any currently known algorithm increases very quickly as the size of the problem grows. The problem identified related to elastic image matching comes under the NP-Complete category.

- The time required for monitoingr VMs (EC2 Instances) on private clouds,mon- itoring performance matrix and providing resource utilization can be done in polynomial time. So it is NP-Complete.
- The time to encrypt and share key with user and store encrypted data is done in polynomial time . So it is NP-Complete.
- All project algorithms can be determined in polynomial time but requires in- definite time for db interaction. Hence all db file handling projects are NP- COMPLETE.

A.1 MATHEMATICAL MODEL

Let S be the system :

S= {U, F,R,T,Ss}, where

U= {U1, U2, U3. .... Un / 'U' is a Set of all USERS }

U is the users of the system. Users of the system may grow as the system is used by more and more people. User is infinite set.

F=Functions R=Evaluation

Function T=Testing

Ss = {S REG, S LOGIN, / Ss is a Set of Storage Service}

STORAGE SERVER will provide four services like Registration, Login.As this set also has finite attributes, so this is also Finite Set

- F1 = CPUUtilization
- F2 = Storage Pricing
- F3= RequestPricing

ACTIVITIES AND EVENTS

- **EVENT 1 :**
  Connect to existing user's amazon account using user id andpassword. Let
  f(U) be a function of User Thus, f(U)→{Ss}

- **EVENT 2:**
  User will be monitoring the critical resources. Let
  f(A) be a function of System.
  Thus, f(A)→{U Ss}

- **EVENT 3 :**

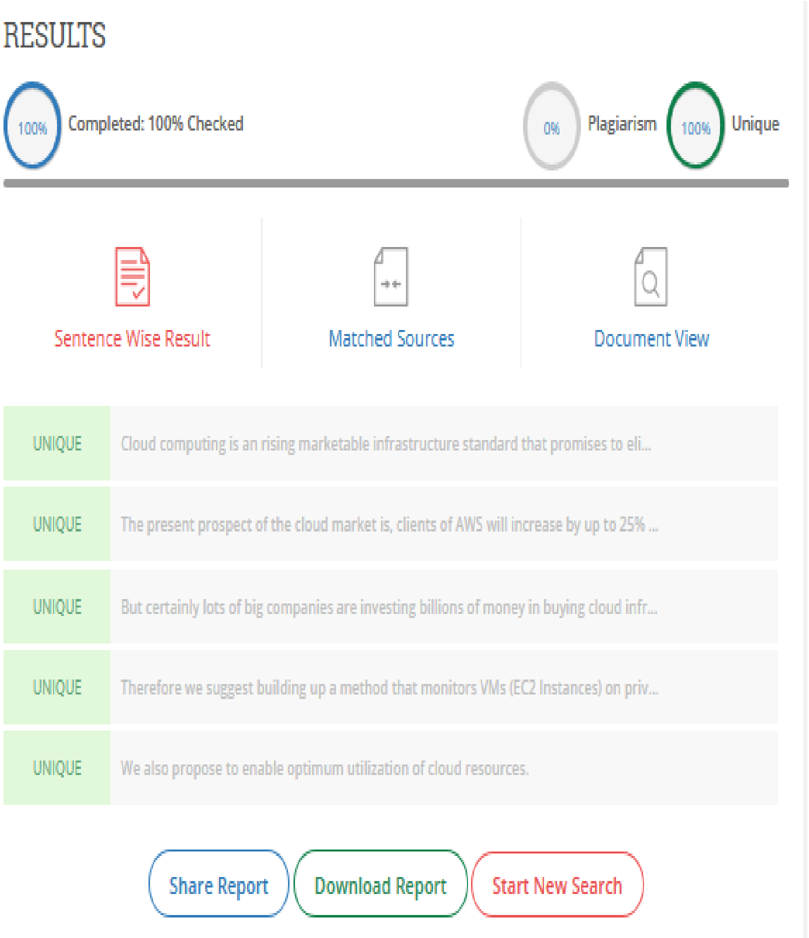
  Evaluate need of available resources

  Let f(R) be a evaluation function.

  Thus, f(R) →{F1,F3,F3,. . . Fn} ε T

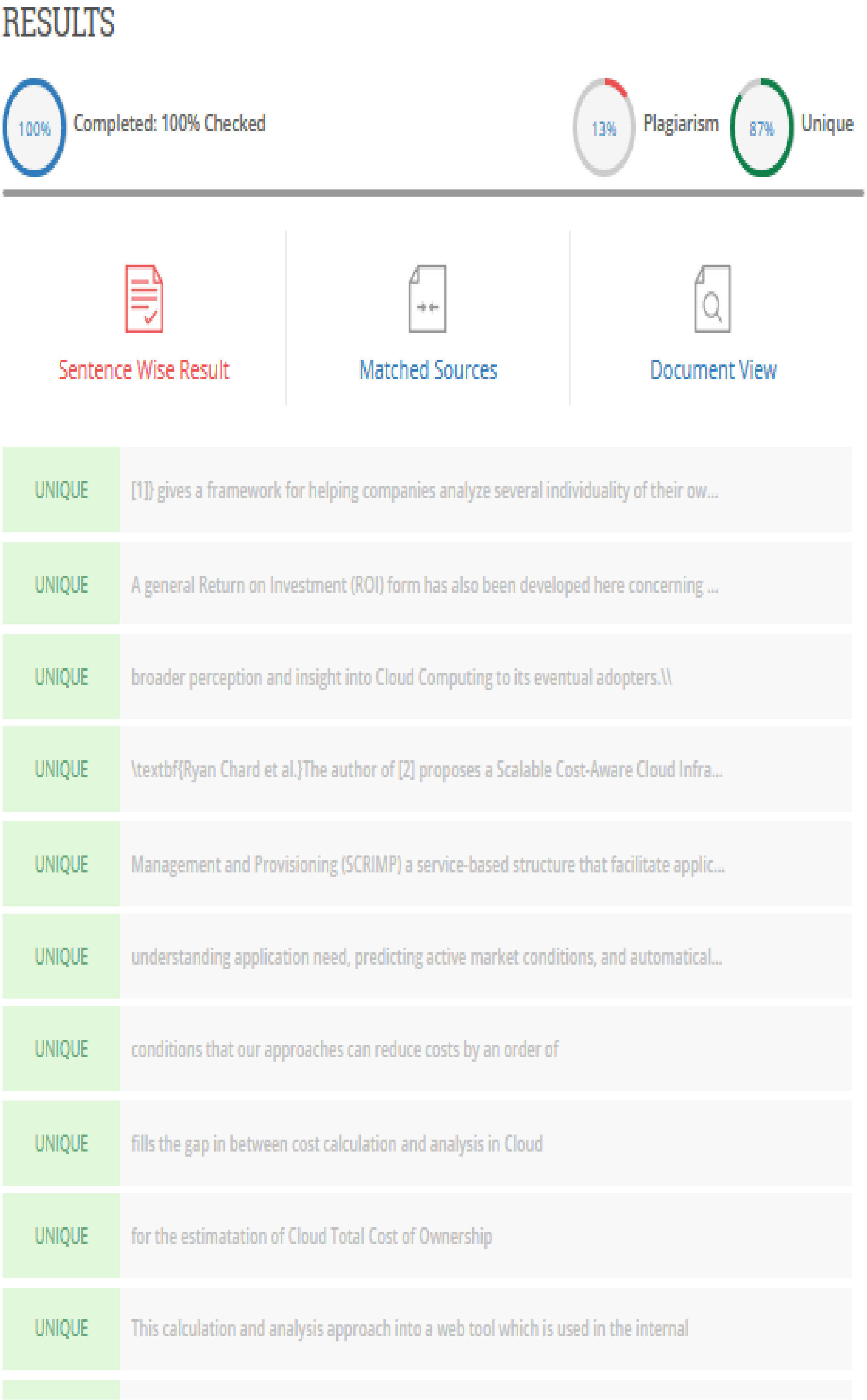
A.2 PLAGIARISM REPORT

Plagiarism Report



UNIQUE	Cloud computing is an rising marketable infrastructure standard that promises to eli...
UNIQUE	The present prospect of the cloud market is, clients of AWS will increase by up to 25% ...
UNIQUE	But certainly lots of big companies are investing billions of money in buying cloud infr...
UNIQUE	Therefore we suggest building up a method that monitors VMs (EC2 Instances) on priv...
UNIQUE	We also propose to enable optimum utilization of cloud resources.

Figure A.1: Abstract Plagiarism



RESULTS

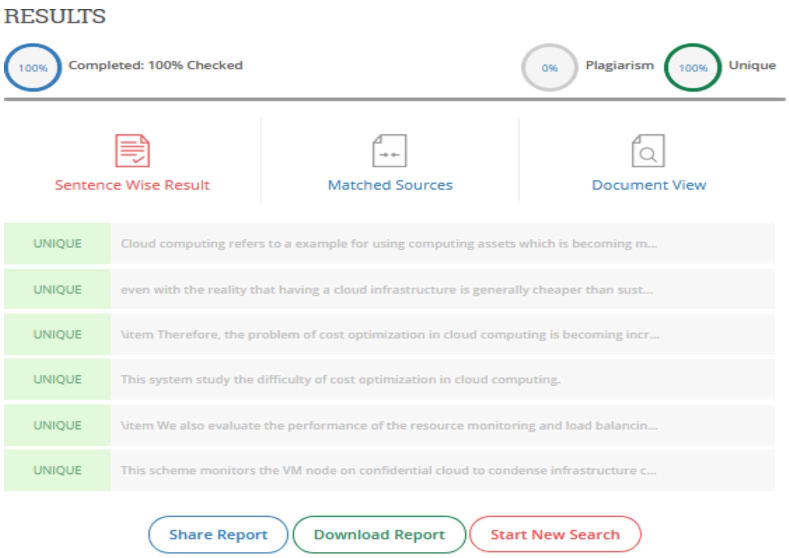
100% Completed: 100% Checked

13% Plagiarism

87% Unique

UNIQUE	[1]} gives a framework for helping companies analyze several individuality of their ow...
UNIQUE	A general Return on Investment (ROI) form has also been developed here concerning ...
UNIQUE	broader perception and insight into Cloud Computing to its eventual adopters.\\
UNIQUE	\textbf{Ryan Chard et al.}The author of [2] proposes a Scalable Cost-Aware Cloud Infra...
UNIQUE	Management and Provisioning (SCRIMP) a service-based structure that facilitate applic...
UNIQUE	understanding application need, predicting active market conditions, and automatical...
UNIQUE	conditions that our approaches can reduce costs by an order of
UNIQUE	fills the gap in between cost calculation and analysis in Cloud
UNIQUE	for the estimatation of Cloud Total Cost of Ownership
UNIQUE	This calculation and analysis approach into a web tool which is used in the internal

Figure A.2: Introduction and Literature Survey Plagiarism



RESULTS

100% Completed: 100% Checked

0% Plagiarism 100% Unique

UNIQUE	Cloud computing refers to a example for using computing assets which is becoming m...
UNIQUE	even with the reality that having a cloud infrastructure is generally cheaper than sust...
UNIQUE	\item Therefore, the problem of cost optimization in cloud computing is becoming incr...
UNIQUE	This system study the difficulty of cost optimization in cloud computing.
UNIQUE	\item We also evaluate the performance of the resource monitoring and load balancin...
UNIQUE	This scheme monitors the VM node on confidential cloud to condense infrastructure c...

Figure A.3: Conclusion Plagiarism

Chapter 7

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