The Resources Utilization for Cloud Service Providers by Using Rough Set Based Approach

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***Abstract*- As we seen that, today's generation of IT has widely use the cloud computing services, that means in future cloud computing will important part of IT enterprise. In which the application software and databases are stored at centralized large data storage. Now in cloud data center, management of data & services may not be fully trustworthy.**

In this research work we have proposed the resources utilization for cloud service providers. After identifying the service requirements, the user can submit their job to the cloud and there the middleware can implement this mathematical model to rate CSPs and on the basis of their capabilities. In this system we are trying to develop the Ontology system which may give the actual values of the CSPs on the basis of the parameters taken for more efficient utilization.

The target of the research is to seek out the advantages and downsides with reference with adaptive value model, Parameters Validity, Parameters handiness and their utilization. The Algorithm is implemented on the broker side which gives the ratings to the CSPs on the basis of their capabilities

***Index Terms*- cloud computing, CSP, Ontology, Rough Set Approach, value model, Parameters Validity, Parameters handiness**

I. INTRODUCTION

The Cloud computing is the next level in the evolution of internet, the means through which everything to be as services whenever and wherever you need. According to U.S. National Institute of Standards and Technology (NIST): Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models.

In cloud computing, everything is delivered as a Service (XaaS). Thus, today there are three main servicemodels such as Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS).

A. Software as a Service

Through cloud computing, cheaper and powerful processor, come together and form "software as a service"service model architecture and put them at centralized data storage server because of this network bandwidthincreases and network connection should be reliable.

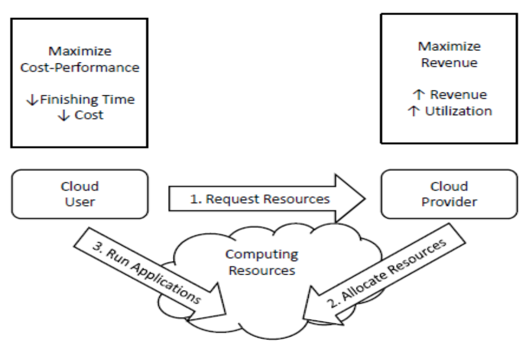


Figure 1:- Cloud Usage Scenario

B. Platform as a Service

PaaS offers a high-level integrated environment to build, test, and deploy custom applications. A client(developer) have the flexibility to build (develop, test and deploy) applications on the provider's platform (API, storage and infrastructure).

C. Infrastructure as a Service

It provides software, hardware and equipment's to deliver software application infrastructure with a resource usage based pricing model.

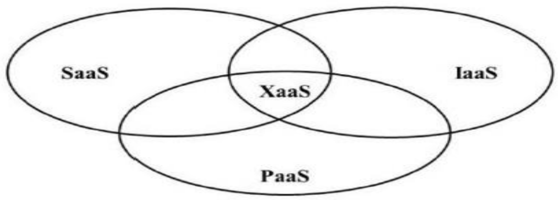


Figure 2:-Service Models

➢ DEPLOYMENT MODELS OF CLOUD COMPUTING

According to NIST, cloud computing model have four deployment models.

Public cloud:-The cloud infrastructure is provisioned for open use by the general public.

Private cloud: The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units)

Community cloud: The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations).

Hybrid cloud: The cloud infrastructure is provisioned for open use by the general public.

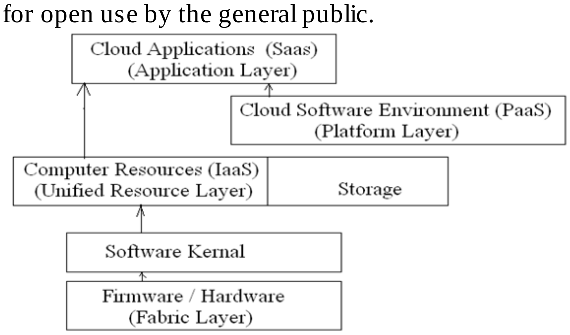


Figure 3:- System Architecture of Cloud Computing

➢ DRIVERS OF CLOUD COMPUTING

The major driving thought cloud provider in present market is Amazon, Microsoft, Google, Oracle, IBM, VMware, Citrix, Sales force, and there are many different vendors offering different cloud services and the cloud providers are having different forms to provide these services [18].

Amazon: Amazon web services include the elastic compute cloud (EC2), Amazon simple storage services (s3) and it is also provides a highly computing platforms to the client with high flexibility and availability for build a wide range of applications.

Google: Google app engine, It is supports the application programming interface for the data store, image manipulation, Google accounts and email services.

Microsoft: Windows Azure Platform is a group of cloud technologies which provides a specific set of services to application developers.

IBM: Lotus Live platform provide platform as a service.

Sales force: software as a service.

VMware: it is providing virtualization infrastructure.

➢ CLOUD BROKERS

Cloud Brokers are daunting task to sort through the options of cloud computing services that are available. [6] A "Cloud Broker" is an intermediary between cloud providers and end users that assist companies in choosing the platform that best suits their needs, assist in the deployment and integration of apps across multiple clouds or provide a choice of multiple competing services that allow end users the freedom to move between platforms.

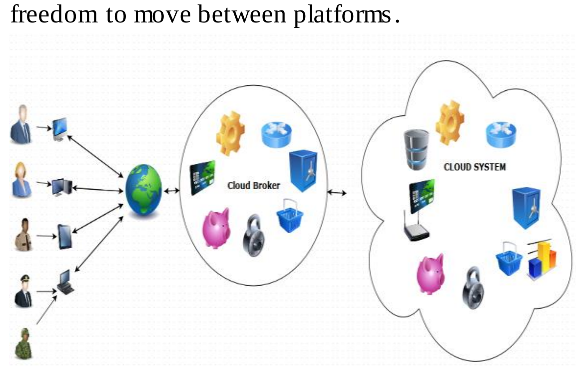


Figure 4: Basic working of Cloud Broker in Cloud Computing

II. CHALLENGES IN THE CLOUD COMPUTING

However, we argue that many cloud services and cloud-oriented applications are not efficient enough for the following reasons: 1) lack of information sharing, 2) assumption of homogeneous environments and 3) unpredictability of the environments.

The problem in cloud computing here deals with the cloud service provider's choice of the developed parameters. For a few CSPs there are also sure services or activity that will be declining and unimaginable to be accessed at sure points throughout the day. This sort of unwanted picks defeats the aim of the cloud. If we have a tendency to square measure investment plenty of comes within the cloud, then we have a tendency to expect the cloud service to be reliable. Even the highest CSPs within the market are facing the similar issues within the cloud setting. Here we have seen a lot of importance of CSPs for taking in account the features or characteristics such as Infrastructure, Platform, and Services. The method of selecting a Cloud Service Provider is evaluated on the basis of Which-Cloud Provider-Provides- What.

The target of the research is to seek out the advantages and downsides with reference with adaptive value model, Parameters Validity, Parameters handiness and their utilization. The Algorithm is implemented on the broker side which gives the ratings to the CSPs on the basis of their capabilities. To identify the capability of the CSP (Cloud Service Provider) we have analyzed, are twelve Major parameters namely: Risk Management, Compliance and Audit, Data Operation, Legal Issues, Incident Response, Interoperability And Portability, Virtualization, Business Continuity And Disaster Recovery, Application Security, Datacenter Operation, Identity And Entitlement And Access Management.

On the basis of the above identified parameters, we have also framed some relevant questionnaire for each. This questionnaire helps us to give the internal rating for each CSP. Finally we tried to implement the algorithm for both Cloud Service Providers and Cloud users to whom we are calling tenants.

III. RESEARCH METHODOLOGY

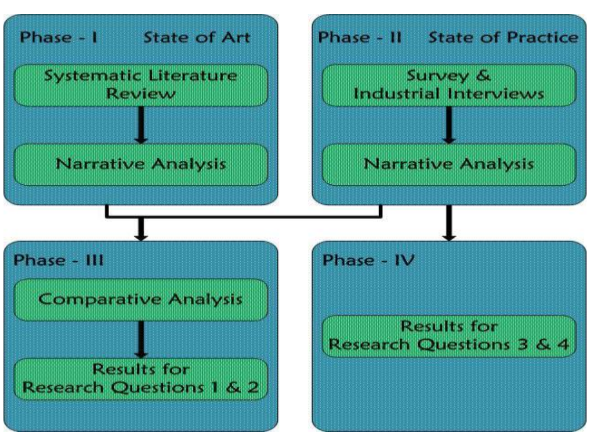
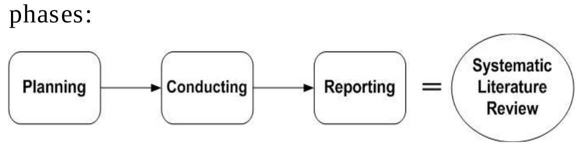


Figure 5: systematic research work and design

The literature review is providing the systematic identification and evaluation of the particular research work and it is also interrupting all available research work. Main aim of the literature is evaluate the systematic research work of any topic by using auditable methodology. Literature review binds the existing research work in a fair manner. Whenever, the literature review is must be undertaken predefine search strategy allow to the completeness of the work to be accessed for the researcher. It is also very helpful to identify and evaluating to the systematic way for giving to right solution for summarizing the evidence reducing the gap between current research work and providing an optimal solution of an cloud computing.

We are adopted the guidelines and systematic process by kitchenham [24] in this research work and Systematic review is conducted mainly in three phases:



Here, different type surveys are given below:

- Written surveys
- Oral surveys
- Electronic surveys

In this research, we have undertaken the electronic survey. In this surveys query can be sent via mail to particular respondent.

➢ DATA ANALYSIS METHOD

Data analysis and synthesis means, collecting the relevant data for particular topic and summarizing the result in suitable form from the different research paper. In the analysis the data for particular field and finding the suitable data from various research paper and thesis.

➢ Narrative Analysis

This analysis is a non-quantitative analysis method which is represents the extracted information in a tabular form from the study. It is should be structured and highlight similarity and difference between them which is come from study.

➢ Comparative analysis

This analysis is identify and evaluating the similarity and difference of the literature with real world context. However, it is found through comparative analysis and qualitative analysis.

IV. RELATED WORK

This section has two parts; first part evaluates the approaches of comparison and evaluation services such as Cloud stone, Cloud Harmony, Cloud Cmp, Cloud Sleuth, Cloud Rank-D and Cloud Monitoring. The second part reviews the approaches of service ranking such SMI Cloud [7], service mapper [8], Service Ranking System (SRS) [9], SLA Matching [10], Cloud Rank [11] and Aggregation [12] for cloud service ranking

- Evaluation Approaches for Cloud Services:

Evaluation approaches uses from monitoring tools and benchmarks to compare and evaluate services. As more companies begin offering cloud-based services and, in turn, as more and more companies begin to migrate to the cloud, there's an increasing demand for tools to monitor and assess cloud performance. Benchmarking is a quantitative foundation of computer system and architecture research. Benchmarks are used to experimentally determine the benefits of new designs.

- Ranking Approaches for Cloud Services:

After obtain the evaluation information from monitoring or benchmark tools, with utilize this information can rank the cloud services proportionate with user's requirement. This section peruses ranking approaches in cloud computing services base on quality of service.

- Rough set based Approach:

Rough set theory is a new mathematical approach to imperfect knowledge. The problem of imperfect knowledge has been tackled for a long time by philosophers, logicians and mathematicians The rough set approach seems to be of fundamental importance to AI and cognitive sciences, especially in the areas of machine learning, knowledge acquisition, decision analysis, knowledge discovery from databases, expert systems, inductive reasoning and pattern recognition.

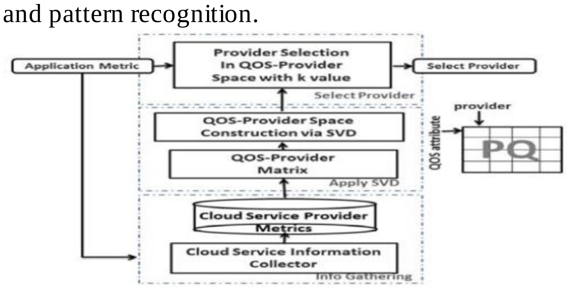


Figure 6: Cloud service mapper

At the end, there is only one service selected and represented based on user requirement. However, it is better to rank all of the selected services. This provides the user with knowledge about priority of the services and selects a service more knowingly.

V. METHODOLOGY

As per the Rough Set representation, we have represented the CSP and their attributes in a tabular form called Information System. The rows of the table contain the list of cloud service providers and the columns consist of the attributes of the respective cloud service provider. When we talk about attributes that means the parameters we have identified in our study (Data Operations, Risk Management etc.)

Algorithms:

INPUT: Set of job J and set of service provider S with their associated resources and demands vector Ri and Cv respectively set of parameters. The cloud service discovery systems is maintained. The values through ontology (O) process and we have calculated these values and put the actual values at maintained in Matrix 1 and Matrix 2.

OUTPUT: Allocation set of jobs to service providers.

Method: S' = S

For all q belongs to set of jobs j.

```
{
    For (cloud ontology)
    {
        O = Select (Web-pages formed by CSDS)
    }
   Select (Web-pages formed by CSDS)
    {
        Find (service utility (su) for web-pages)
    }
   S'= Su
While (S' ≠ ϕ)
    {
        r' = Select(q, r, S')
        s'= S'- r'
    }
Select (q, r, S')
    {
      For each r, find max cost (r) from available resources S'
      Rating is provided to the resources(r) on the basis on su of ontology.
    }}
```

A very simple information system is shown in the following table 1, which contains rating of CSPs attributes ratings in a Cloud environment. These rating are just for example, as we can find the original ratings for original CSPs by performing some surveys. Here we considered seven service providers with four attributes: Application Security, Legal Issues, Virtualization and Compliance Audit.

Measure / Approach	Year	Solution	Complexity	Number of QOS attributes	Scalability with services increase	Essential and non-essential requirement	Static ranking ability	Objective assessment		Subjective assessment	Don't Use of previous knowledge
								full	weight		
Service mapper	2010	SVD	$O(n^2)$	Limited	×	×	×	×	✓	×	×
SRS	2011	Weight assignment	-	Limited	✓	×	✓	×	✓	×	×
SLA Matching	2011	-	-	SLA	×	×	×	-	-	×	×
Aggregation	2012	Benchmark and fuzzy	-	Not Limited	-	×	×	×	✓	✓	×
CloudRank	2012	Prediction	$O(n^2m)$	Not Limited	-	×	×	✓	×	×	✓
SMICloud	2013	AHP	$O(n^3+m^3n)$	Standard	×	✓	×	✓	✓	×	×

Table 1: Comparison of existing approaches for ranking in cloud environment (n is number of cloud services, m is number of users).

VI. ANALYSIS AND RESULT

Cloud Computing model provides services and delivers on demand resources (such as software, platform and infrastructure [1, 2]) in user's request time.

The quality of service (QoS) information is required in service comparison. This information can be measured by providers or a third party [5]. Some attributes like response time, delay, usability, security, privacy and availability are defined for preparing quality of service information. The value of these attributes represents degree of quality of services [6,7]. Generally, the goal of ranking of services is helping users to evaluate and compare different services. So, users can select the most appropriate service that satisfies their requirement. This paper describes service rankings in two parts. Firs part treat evaluation and comparison of services and the second part treat service ranking. Service ranking and selecting most appropriate service is performed by some approaches, such as three component architecture of Service Measurement Index (SMI) Cloud [7], service mapper [8], Service Ranking System (SRS) [9], SLA Matching [10], CloudRank [11] and Aggregation [12].

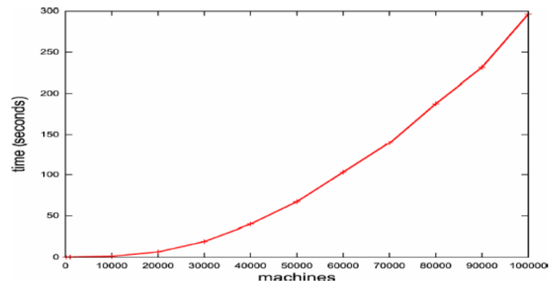


Figure 7: Time to simulation installation

Figures 7 and 8 present, respectively, the amount of time and the amount of memory is required to instantiate the experiment when the number of hosts in a data center increases. The growth in memory consumption is linear, with an experiment with 100000 machines demanding 75MB of RAM. It makes our simulation suitable to run even on simple desktop computers with moderated processing power because CloudSim memory requirements, even for larger simulated environments can easily be provided by such computers.

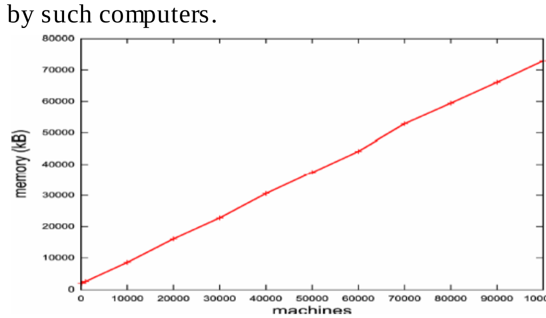


Figure 8: Memory uses in resources utilization

Figures 9 and 10 present task unit's progress status with increase in simulation steps (time) for the space-shared test and for the time-shared tests respectively. As expected, in the space-shared case every task took 20 minutes for completion as they had dedicated access to the processing core. Since, in this policy each task unit had its own dedicated core, the number of incoming tasks or queue size did not affect execution time of individual task units.

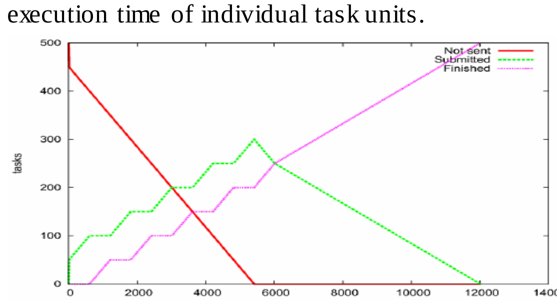


Figure 9: Task execution with space-shared scheduling of task

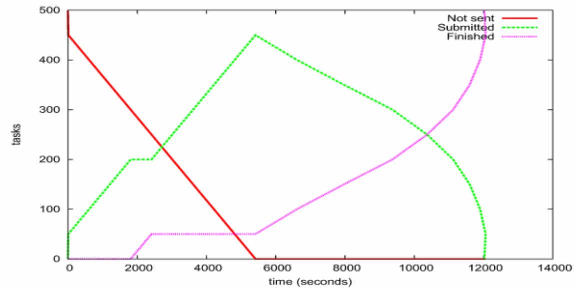


Figure 10: Task execution with time-shared scheduling of task

Table 2 shows the average turn-around time for each Cloudlet and the overall makespan of the user application for both cases. A user application consists of one or more Cloudlets with sequential dependencies. The simulation results reveal that the availability of federated infrastructure of clouds reduces the average turn-around time by more than 50%, while improving the make span by 20%. It shows that, even for a very simple load-migration policy, availability of federation brings significant benefits to user's application performance.

Performance Metrics	With Federation	Without Federation
Average Turn Around Time (Secs)	2221.13	4700.1
Makespan (Secs)	6613.1	8405

Table 2: Performance Result

VII. CONCLUSION&FUTURE WORK

In this research work we have proposed the resources utilization for cloud service providers. After identifying the service requirements, the user can submit their job to the cloud and there the middleware can implement this mathematical model to rate CSPs and on the basis of their capabilities. In this system we are trying to develop the Ontology system which may give the actual values of the CSPs on the basis of the parameters taken for more efficient utilization. The scope of this research can be extend further, in which apart from taking the cumulative cost function, we can also generate the cost on the basis of individual capability of CSP for an individual attribute. For example if a user needs a cloud that CSP whose cost function is maximum for security attribute rather than maximum value from the fuzzy costs.

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