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ELASTIC CLOUD COMPUTING APPROACH FOR BIG DATA ANALYTICS

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Abstract: The latest developments in the communication and the information technologies have turned out to be the foundation for the emergence of the industrial developments and progress in the business causing digital transformation in the industrial and the business operations. The clubbing of the internet and the information technology along with the tangible things that are the responsible for the industrial operations, generate a huge set of data that requires enormous network bandwidth, high processing power and accessible resolutions. So the paper presents the elastic cloud computing approach to bring down the complexities in deploying, cost of the groundwork and maintenance and provide an automated resource provisioning according to the demands. This method increases the amount of the computing power available, network properties and the storage. The experimental results for the novel elastic approach for the big data analytics is obtained by the simulation through MATLAB in terms response time, processing power and cost.

Keywords: Cloud Computing, Big Data Generation, Elastic Computing**,** Processing Power, Network Bandwidth, Genetic Algorithm, Meta Heuristic and Queuing Model.

1. INTRODUCTION

The cloud technology offers innumerable benefits to the industrial and the business operations providing speedy, more flexible, easier and cheaper solutions on demand. More over the well planned and the well-structured cloud computing can offer even more innovative solutions that are very impactful [1].

Initially, in the beginning of the cloud era, the industries had hesitations to adopt cloud into the business or the industrial activities and faced many difficulties in the sharing and transferring of thoughts that were monumental.

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The cloud computing reduced much of their complexities by enabling, thoughts and the ideas to be shared at any distance across the world [2-4].

Large scale industrial operations and the business deals usually generate a huge amount of data that in turn requires an enormous amount of computing power, storage and the network bandwidth necessitating a preset resource provisioning that would meet the demands of the huge amount of data. The cloud computing [5-7] is usually preferred for handling the huge set of data due to its service elasticity. The enabling features of the Cloud computing is presented below in the figure.1

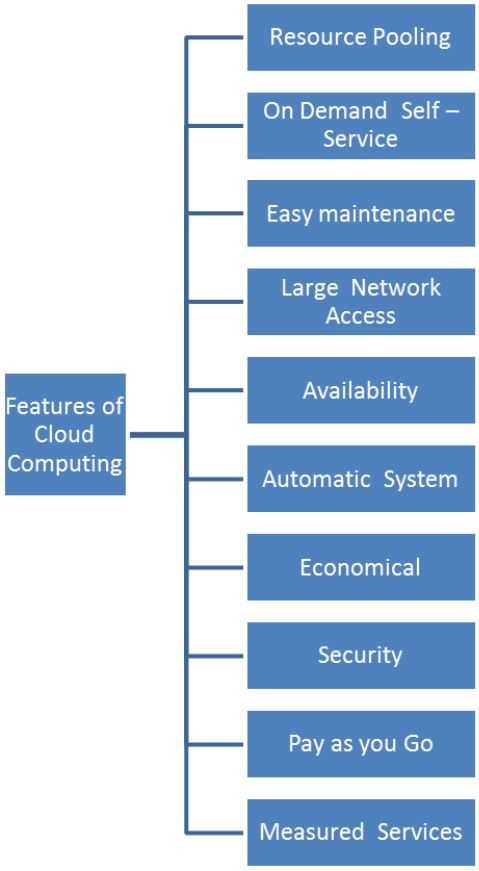

Fig.1.Features of Cloud Computing

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The elastic services of the cloud computing affords the system to work according to the demands and the changes in the load by enabling an automated resource provisioning and de-provisioning, making the available resources in the system to match its demand of the service request.

The cloud computing [8-10] usually employs the elasticity approach by engaging the auto-scaling techniques that may be proactive or reactive and that rely on the automated scaling decisions that are based on the values of the performance metrics such as CPU and the memory usage or the service metrics such as the queue length, service throughput, response time etc.

The proposed method in the paper provides the elastic cloud computing approach for the industrial big data by employing auto scaling technique that uses the meta heuristic for the accurate prediction of the computational load of the servers, uses the (M/M/c): $(\infty/FIFO)$ queuing system to arrange the service request in order and engages the genetic algorithm (GA) to determine the optimal number of resources that would satisfy the demands of the predicted server.

The proposed objective in the paper aims in developing an auto scaling method that provides the minimized delay in the service provisioning and reduces the over-provisioning of the elastic cloud. The proposed methodology is organized with the literature survey in the 2, the proposed auto scaling technique for the elastic cloud computing for industrial big data in 3, and the experimental results in 4, and the conclusion in 5.

2. Existing Work

The auto scaling techniques that paves way for the elasticity of the cloud computing is categorized into two ways as reactive and proactive [11]. The reactive mechanism is utilized for the continuous system monitoring and triggering of scaling option. It is a rule based methodology that sets the limitations on rule violation and executes the scaling after the observation of the rule violations. This increases the reaction time of the system and overloads the system [12- 14]. The proactive method unlike the reactive method covers the violations of the reactive scaling by taking into consideration the history and predicting the resource requirement of the future. Almost all the existing models of the cloud computing employs the reactive models, the proactive scaling models have been a major area of research.

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They are various proactive scaling methods the table.1 below provides the types of the scaling methods used in enhancing the elasticity of the cloud computing [15-17].

Auto –Scaling Techniques	Working	Hassle in Implementation	Cost Minimization	Compatible with
Reactive	The threshold values are set by the users and the resources are optimized as per those values	Has fixed steps	Medium	Applications with the increasing loads during few unknown days
Proactive	The threshold value is set and the time to scale up are scheduled	lesser steps	Medium	Applications with increasing load with the known days
Predictive	Uses heuristics model to predict the upcoming traffic and scale the resources ahead	3 step Wizard	High	Application with the cyclic periods

Table.1 Auto scaling Types

3. PROPOSED SYSTEM

The proposed system utilizes the predictive auto-scaling method to accurately predict the computational load using of the server observing its history and develops a queuing model to arrange the service request in order, based on the time of the request send form the user. Later the proposed system uses the genetic algorithm to identify the optimal resources that satisfy the needs of the user Request. The block diagram of the proposed auto-scaling system is given below in fig .2

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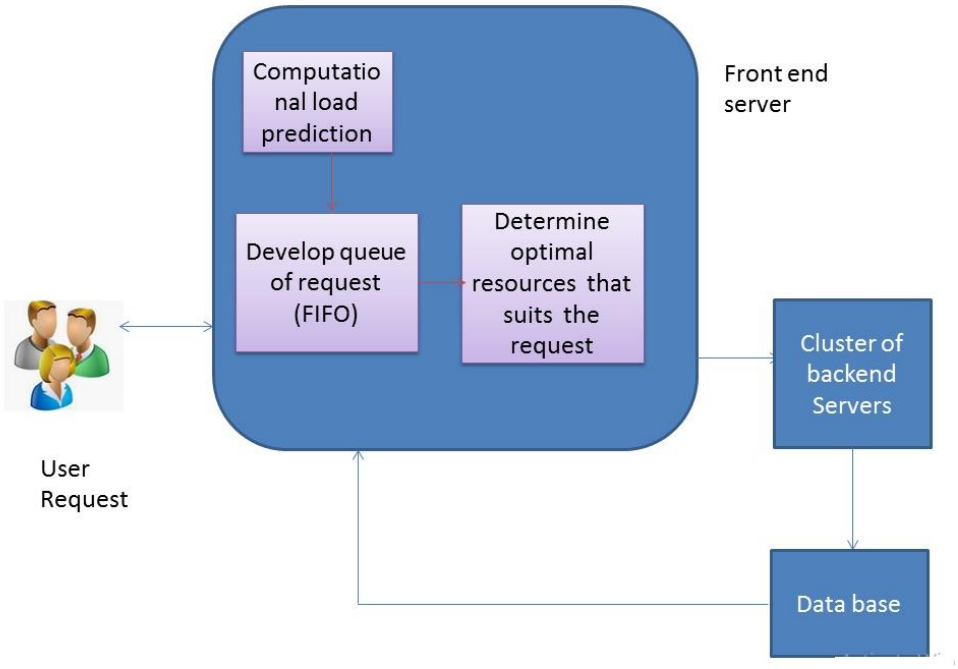

Fig.2: Proposed Block Diagram

The algorithm below provides the step in forming a predictive auto-scaling model to present the elastic cloud computing approach to satisfy the big data in the industries. The proposed method uses the artificial bee colony [16] based prediction to predict the computational load, queues [13] [14] the requests of the users on first come first serve order and determines the optimality of the resources applying the Genetic algorithm [9] [17]

3.1. PROPOSED ALGORITHM

The Table .2 given below shows the step involved in the process of auto–scaling to provide an elastic cloud computing approach for the big data analytics.

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Algorithm Steps	Procedure
STEP 1	Monitor the user request , record the history of the resource utilization and the SLA
STEP 2	Apply Artificial Bee Colony algorithm and predict the server processing load using the equation $Load + (histroy\ item\ * load) * (present\ load\ )$
STEP 3	For the user request $\{u_1, u_2 \dots \dots u_3\}$, gather the CPU and the memory requirement (R_r), total time of the execution $(Exec_{time})$, the time of request reception $(Reqst_{recep})$, the dead line of the request $(Request\ _{deadline}\ )$ and processing power $(Proc_{power})$ and the network band width (net_{BW}) required.
STEP 4	Employ the $(M/M/C : \infty/FIFO)$ to queue the user request according to the $Reqst_{recep}$
STEP 5	Apply Genetic algorithm to determine the optimal resources by the process of the selection, mutation , crossover and the evaluation .
STEP 6	Select the Resource satisfying the R_r , $Proc_{power}$, net_{BW} of the user request and with the high processing speed as the optimal resource .
STEP 7	Perform Computation , store the Results in the cloud data base
STEP 8	REPEAT the process for every user request , and STOP

Table.2 Proposed Algorithm

The algorithm is repeated for each process, identifying the optimal resources for the entire user request, rejecting the other resources. The proposed system would be more suitable for the any type of industries either small scale or large scale with the heavy data generation.

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4. EXPERIMENTAL RESULTS

The coding for the proposed method is developed and executed using the MATLAB. The Results are obtained in the terms of the response time, power consumption and the cost. The results acquired for the proposed method is compared with prevailing EASM [12] and the DRDP [15].

The fig.3 below shows the percentage power consumption, cost and the response time of the proposed model and compared with the existing EASM and the DRDP

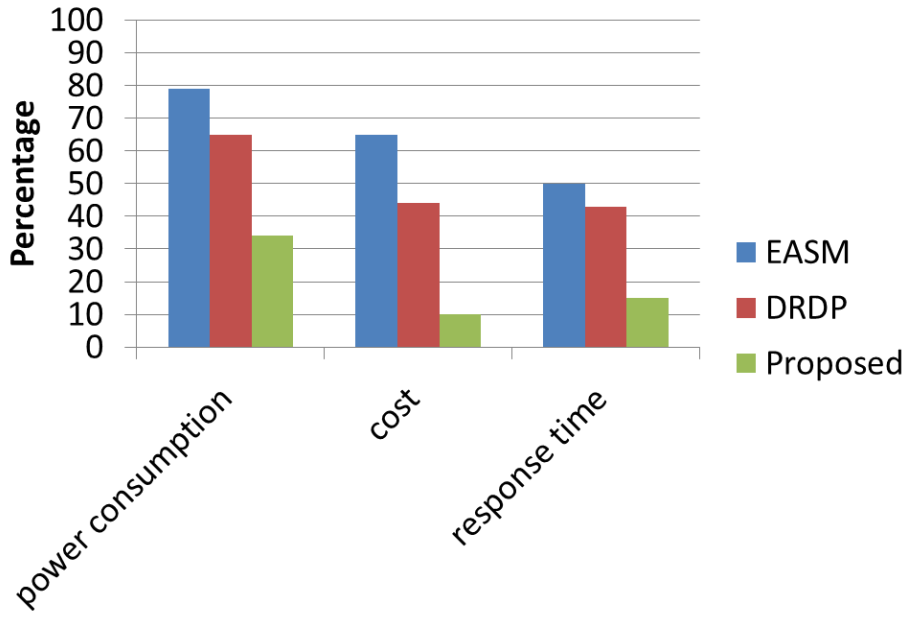

Fig.3 Power Consumption, Cost, Response Time

The table.3 below provides the particulars of the provisioned resources, under provisioned resources, unreserved requests, SLA violations, optimal resource allocations, and the accuracy in the processing load predictions for different number of user request.

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Number of Users	Accuracy in prediction %	Provisioned resources %	Un-provisioned resources%	Unreserved requests %	SLA violations%	Optimal resource allocation%
10	89	55	10	.1	.4	89
25	85	56	15	.24	.8	90
40	90	58	20	.56	.9	92
65	92	59	35	.34	1	93
80	93	60	23	.78	2	95
100	95	65	27	.65	5	96

Table .3 Particular of the Proposed Auto scaling Method.

5. CONCLUSION

The elastic cloud computing approach for the big data generated in the large scale industries is developed in the paper using the predictive auto-scaling technique that utilizes the metaheuristic artificial bee colony algorithm in the predicting the processing load of the servers, uses the queuing theory to arrange the request in the first come first serve order and applies the genetic algorithm to identify the optimal resources that satisfies the user request. the performance results obtained shows he proposed auto scaling system reduces the cost and he response time along with the power consumption when compared with the prevailing methods.

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