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Analysis of Task Scheduling Algorithms in Cloud Computing

AbinTAbraham[1] & E. J. Thomson Fredrik[2]

[1]Department of Computer Science, Karpagam Academy of Higher Education, Coimbatore, India. Email: abysid@gmail.com

[2]Department of Computer Science, Karpagam Academy of Higher Education, Coimbatore, India. Email: thomson500@gmail.com

Abstract

Scheduling the tasks in Cloud Computing increases the efficiency in retrieving data from cloud storage. The retrieval of data from the cloud storage with security is a significant issue. One of the main reasons for building up a system for retrieval is to fine-tune the time for response to a query, upgrade the retrieval and confirm the security in cloud storage. As a researcher, we had taken this work to survey the main ideas about integrity, retrieval and scheduling to identify problems in scheduling with security in cloud computing. Based on the above ideas, the scheduling strategy has had the best advancement and is a cornerstone in cloud computing. One of the efficient methods that were recently following in the cloud to retrieve securely is the Rule and Agent system. The benefit of these ongoing retrieval models is to fine-tune the time for response to a query, upgrade the retrieval and confirm the security in cloud frameworks. In order to give asecure retrieval and effective tool, Rule and Agent systems were overviewed. The effects of the investigation were dissected, based on the presentation of the FFBAT, firefly and BAT calculations by comparing the level in risks and total time for execution.

Keywords:BAT,Firefly, FFBAT,Software as a Service (SaaS),Platform as a Service (PaaS),Infrastructure as a Service (IaaS).

1. Introduction

Cloud Computing (CC) in the current era plays aninteresting and significant area for researchers in the digital world that permits access to the network whenever needed and advantageous to distribute computing assets. Cloud Computing consists of the deploymentof

services such as (SaaS, Iaas and Paas) to give an adaptable and straight methodology for data retrieval and support" (Zafar et al. 2017) [1]. The participants in the CC are:

Provider:In order to ensure more prominent security and to handle huge information, this participant provides various infrastructures.

Clients:Clients are the end-user to utilize different types of services that are available in the cloud.

Developer:In order toaccomplish the (QoS) prerequisites, this CC software developeris situated between client and service provider.

Through computing with wide resources having a big centric data as a backbone, it was able for providers to support the clients with different types of services" (Hamouda et al. 2018) [2]. The resources of the datasupport usage efficiency and Quality of Service (QoS) was getting degrade because of the consistent and growth in demand. Expansion of request for services will influence the QoS, it must be handled professionallyonly by balancing the loads in CC. By utilizing the resources properly, there is a need to balance the loads and allocation of resources efficiently (Fowley et al. 2018) [3]. There may be some improper (over/under) in resources, due to a lack of allocating the resources properly and unbalancing the load. The resource wastage is taken place by keeping resources idle in a busy environment as well as the higher resource loads lead to service degradation. Regardless of progressing analysis, the performance of CC execution is a reason for concern. Balancing in loads and handling of services are the main parts the researchers were focussing to make a good computing performance in the cloud(Mishra et al. 2018) [4].

The fundamental goal of CC is smarter to utilize resources dispersedly, accomplish large transmission, execution and comprehend countless issues. This can be accomplished only through a component called Load Balancing (LB). This was utilized to gain framework execution, security and accessibility in the cloud environment. By utilizing various strategies to balance the cloud load, it is possible to solve the issues of over/under a load of resources (Vanitha and Marikkannu 2017) [5]. The existing LB methods are relied upon the frameworks of cloud computing. The dynamic LB methods are capable to take huge loads and different requests on-demand whereas the static LB methods are capable to take fewer requests and loads only on demand.

The main objective of load balancing isto avoid under as well as overload of computing and maintain the proper balance of the loads in the cloud environment. The better allocation of

resources and its reallocating was an essential component. In order to achieve proper service quality for scheduling and the optimal utilization of the resources, the exact resources for the cloud computing operation need to be selected.

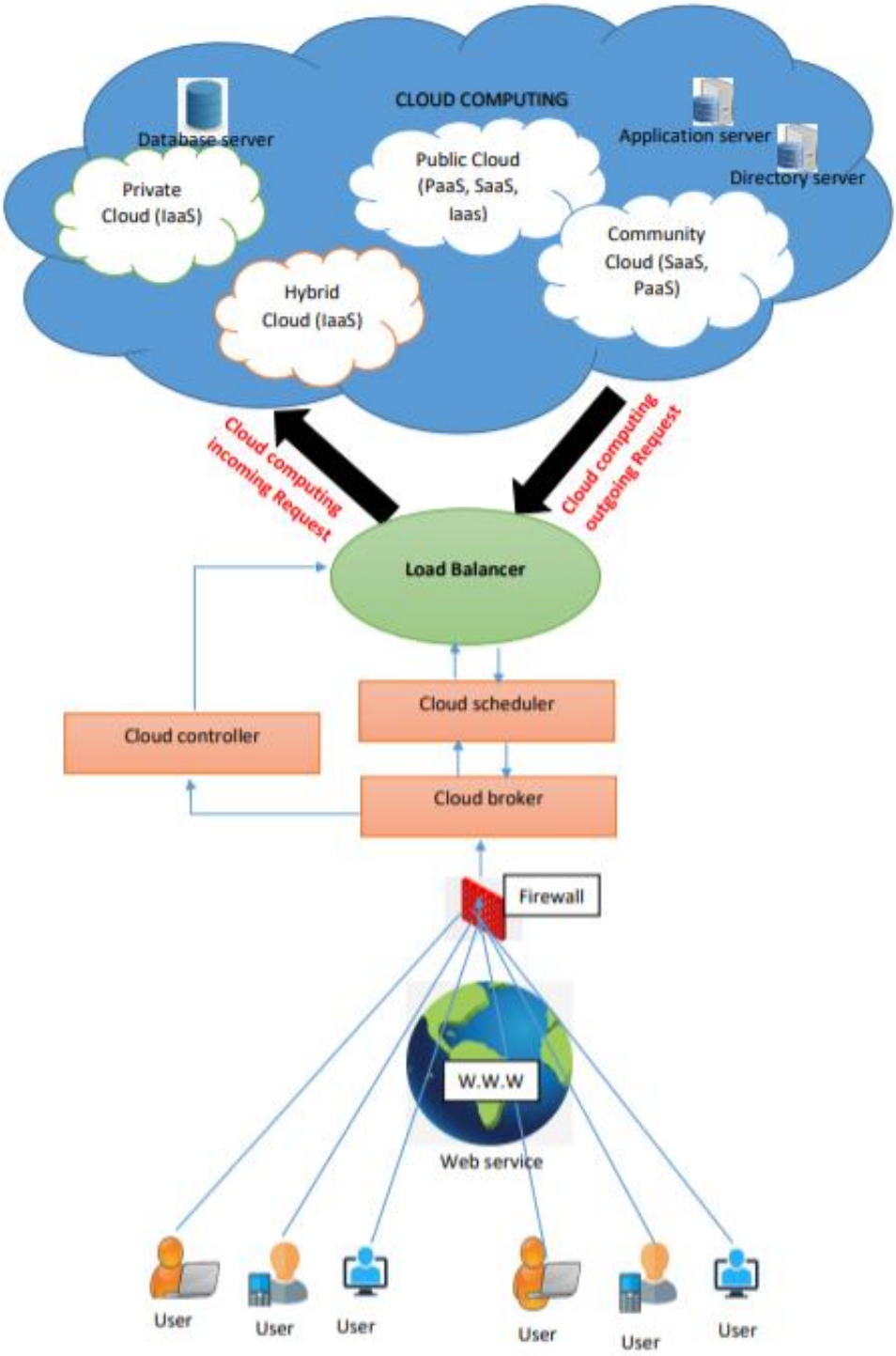

Figure 1. Cloud computing outline

In the cloud, the mediator between client and Cloud Service Provider are the brokers termed as Cloud Services Brokering (CSB). Utilization of various kinds of cloud administrations

(public or private) is necessary for satisfying the service criteria of the CSB. It acts as an object between users and CSP to handle the jobs such as customization, collection and integration. Different methods were developed in balancing the workloads by many analysts for performance improvement. The outline of Cloud Computing has appeared in Figure.1Various infrastructure of cloud was shown in figure 1.1 described below:

(i) Private cloud: In this infrastructure, the clients canhandlethe equipment and applications.The client's company had full control to manage the resources which are secured by a firewall. Highlighting features of this infrastructure was very efficient to handle as well as deployable with up gradation, provides secure transmission and highly maintainability.

(ii) Public cloud:In this infrastructure, the users can access services to any extent based on their requirements and also there is no need to purchase any hardware resources. The users are publically able to use the cloud through any browser environment and also they are payable based upon their service usages. Overall comparing with other infrastructure, the security is less.

(iii) Community cloud:In this infrastructure, the providers from the third party are utilized by the community to deploy and manage the infrastructure of the cloud. Here the infrastructure was developed and used by different client companies together.

(iv) Hybrid cloud:The structure of this infrastructure is the mixing of private, public and community clouds. Here the private cloud is associated with at least one outer cloud administrations. This approach provides good security to screen information and applications and permits the gathering to get their data online.

The cloud computing is capable to give following service types:

(i) Software as a Service (SaaS):This type of service supports in a manner by providing their support during usage of infrastructure and maintenance support until the end.

(ii) Platform as a Service (PaaS): This type of service supports in a manner by providing hardware resources and some application components to their client's company from any vendor's company in which they can create and execute their applications.

(iii) Infrastructure as a Service (IaaS):This type of service supports in a manner by providing hardware resources to their client's company in which they can utilize their software applications and their operating systems. In Figure 2,the overall structure of the cloud computing was plotted clearly.

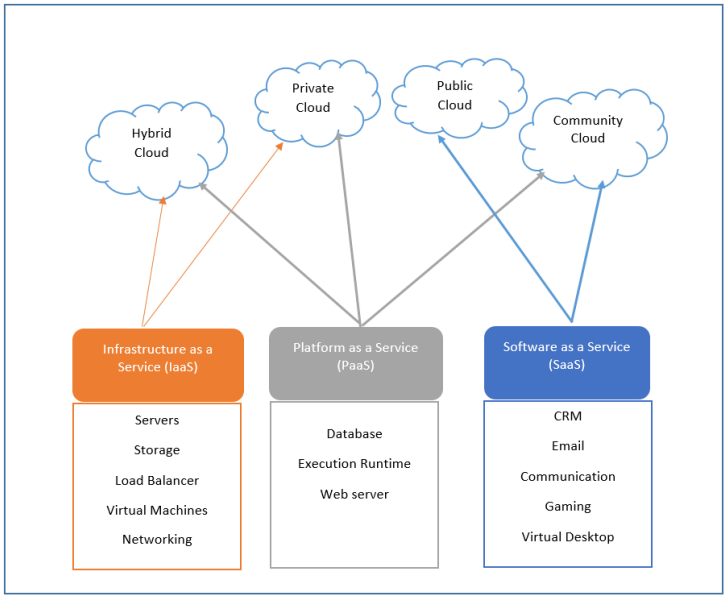

Figure2. Overall structure of the cloud

This paperpresents a relative analysis of the various methodologies to balance the workloads in the cloud. It gives a depth outline of the ongoing procedures utilized in load balancing and CSB. The structure of this paper is sorted out as follows: Section 1 deals with various service characteristics models in the cloud, Section 2 plots the related works, Section 3 gives a detailed portrayal on some ongoing scheduling algorithm, Section 4 shows the performance of the algorithm which are surveyed and Section 5 discusses the conclusion and future research work.

2. Related Works

In [6], Guzek et al. (2015) stated that a broad scope of cloud's problems was taken with the help of Computational Intelligence (CI) that supports many analysts in the field of cloud computing. Many scheduling problems in the cloud are very critical, due to lack of ideal calculation and fast activity to understand them. As a result of the variety of variables included, a hypothetical multi-specialist or game methodology might be important to facilitate all CI devices included. The researchers also opendifferent doors for coordinating, for example, CI coordination with numerical calculationsorMachine Learning (ML).

The precise audit of the survey on the available scheduling procedures through a profundity investigation of more than 20 significant examinations among the 810 essential papers was analyzedin the exploration work by the researchersMilani and Navimipour (2016) [7].By organizing briefly of various attributes depend on the investigation of available strategies were additionally described.

In [8], Vakili and Navimipour (2017) described that in a cloud,efficiency was upgraded as well as time and cost of the available services also reduced by implementing an innovative service in the cloud. Theirstudies commitment incorporates: (i)It gives an outline of areas with difficulties in the scope of issue related to the arrangement by a cloud administration. (ii) It gives the structures in the cloudfor several significant methods through some primary classifications which include system based components, heuristics and agents. (iii) The main territories to tune the techniques for the arrangement of administrations were mentioned in their upcoming works.

In the structures with fog computing, the issue for allocating the tasks as well as scheduling for various fog nodes was optimized by the method termed as Bees Life Algorithm (BLA) which belongs to a bio-inspired method introduced by Bitam et al. (2018) [9].

In [10], Fan and Ansari (2019) proposed in the arrangement of cloudlet, the parameters such as an end to end delay and cost are the main attributes and provided proper solution for approaching cost-effective tool in cloudlet.

3. Methodology

3.1.BAT Algorithm

This technique is utilized to enhance the outcomes through proper allocation of jobs. Its work depends upon the intellectual conduct of calculation based on the swarm. By utilizing this technique, it gives an ideal outcomeby limiting the processing periodas well as it finishes the assignment before its cut-off time.

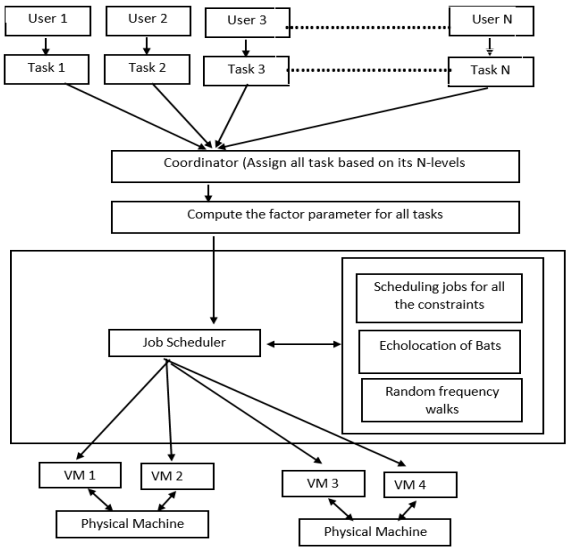

Figure 3.BAT Algorithm based Task Scheduling Model

The meta-heuristic method was utilized from the optimization techniques to deliver exact solutions for scheduling a task based on the client's input, as it has appeared in Figure 3. This concept was utilized to limit the time duration for processing the task within the cut-off time. If the job is with the same client or with other client the conditions of the assignment should be maintained. The Directed Acyclic Graph (DAG) was used to undertake the task's input and it was represented as 'T' which means task quantity.The time taken to distribute the information within tasks is specified with the edges. It has a relation such as Entry-Exit. For instance, the nodes are separated as parent and child. The relation shows the node acting likea child can’t get process without getting input from its node acting as a parent. The parent's output is the child's input. BAT algorithm can be implemented for scheduling the job optimistically.This method acts like a bat behavior based on population heuristics.

This gives the ideal outcomes for large scale information while contrastingupon existing methods. It consists of some stages (i) Based on a particular threshold, the jobs are scheduled (ii) The bat's Echolocation (iii) Pulse from its emitting and frequencies which are random. To attain minimum time for execution within its cutoff time, the process alters its location during the scheduling of tasks. The assignment ought to be kept up the reliance, when the tasks are organized for scheduling. Scheduling of jobs efficiently wasaccomplished by delivering an ideal outcome as well as boosting thetask proficiency. In Bats Echolocation, it relies upon the conduct of the bat and numerous small bats contain astonishing echolocation thus it was profoundly advanced hearing sounds. This framework is termed as sonar, since it utilizes sound as signals to prevent distraction, to identify other bats and to locate its food. While it identifies its data, the signals will be bounced back to it. It is ready to decipher the signals to check, whether the identified material is huge or little. Within a second, the size of the material was identified and also method of handling the operation is also identified. It helps for improving the proficiency and discovering prey. It is entirely adaptable to illuminate the wide scope of the undertaking in N-levels. The quantity of allocationhad been taken care of with more prominent probabilities on the various machine are allocated in their particularities machine. As indicated by this, it will recognize every task that is scheduled to deliver a compelling result. They utilize a random stage to deliver an upgraded outcome. By these viable random frequencies, the speed can consequently modify the frequency (or recurrence) of their emitted pulses.It helps job scheduling with minimal time for execution within the cut-off time.

Scheduling utilizing bat calculation

In order to schedule tasks work process in cloud computing, another metaheuristic strategy BAT wasimplied. This depends on the bats that are virtual by its echolocation attitude. The echolocation attitude could be planned such that its partners with the same goal work. The calculation depends on these accompanying principles: (i) The attitude of bats echolocation is used to detect the distance, (ii) They fly by particular position X_i with velocity V_i. The frequencies of pulses that are emitted were automatically altered and its rate r[0,1] was balanced relying upon the bat's distance from its target. (iii)The bat's loudness was shifted from a value with enormous L_0 to value with its minimum L_{min}.

BAT's MethodPseudoCode

1. Initialize the bat population x_i and v_i (1.2.3.... n)
2. Initialize frequencies f_i, pulse rate r_i, and loudness L
3. While (t < Max number of iterations)
4. Generate new solution by adjusting frequency
5. Update the velocities location/solutions using the following equations
6. fi = f_min + (f_max – f_min) rand
7. $v_i^{s+1} = v_i^s + (x_i^s - x_*)Fi$
8. $x_i^{s+1} = x_i^s + v_i^{s+1}$
9. If (rand >r_i)
10. Select a solution among the best solution
11. Generate local solution among the selected best solution
12. End If
13. Generate a new solution by flying randomly
14. If (rand < L_i& $f(x_i)$ <fx*))
15. Accept the new solution

The above Table1 shows the BAT's method pseudo-code.This method was yet been investigated for cloud's allocations tasks because of its astonishing capabilities such as altering the frequencies,ability of theiremitting pulses sound while bouncing from its

surrounding prey or objects. The pulse sound rate gets increased by minimizing their echo loudness, when it reaches the prey nearby. To tackle the scheduling issues in the cloud, this individual bat allocates the jobs to VM's for every task, based on their bats which are virtual echolocation attitudes. This attributes empowers them to identify their prey's position. Signals with modulated frequencies are utilized for echolocation. Bats tune in to naturally zooming into the areas where ideal outcomes residing and controls of attributes, thus it will be an efficient method to schedule the resources in the cloud.

3.2. FIREFLY Algorithm

ThisFF calculation is motivated by the sparkling design conduct of fireflies which works as the framework of a signal to seduce different fireflies. They utilize the glimmering light particularly to seducetheirprey or mates by implementing upcoming procedures:

(i)Every one of the fireflies is dependenton other fireflies.

(ii) The measure of seductionwithin fireflies is backward connection respective to their distance and illuminance.

(iii) If luminance in both of the fireflies was also identical, then it starts to process in random order.

An advanced bionic calculation was produced through genuine firefly after recreation strategy, strength and good critics. The estimation rule for random is more efficient to tackle huge level issues. A proficiency with reasonableness issues in the use of FFA calculation isboosted via looking through the procedure in FF calculation by along these lines that every firefly is contrasted with different fireflies with its method. When the illuminance of one firefly is low by other firefly, it will be directed to more luminance firefly. Hence FF's illuminance 'j' viewed through FF 'i' was characterized in condition (1)

$$\beta_j(r) = \beta_j(O)e^{\gamma r^2} \quad (1)$$

$$r = || x_i - x_j || = \sqrt{\sum_{k=1}^{d} (x_i^k - x_j^k)^2} \quad (2)$$

Where,

γ= Medium coefficient of light immersion

r = Distance of Euclidean from ff_itoff_j,

$\beta(0)$ =Illuminance of the ff_j at r = 0, and

xi and xj= Locations of the ff_i andff_j.

While $ff_j$was illuminate one, the seduction result tunes the ffi direction value of its based on derived condition:

$$x_{i+1} = x_i + [\beta_j(r)](x_i - x_j) + \alpha(rand) \quad (3)$$

Where

α= randomization attribute

rand= the range of 0.5 and -0.5 are identically random values

In this method, equation (2) and equation(3) proceeds for shiftingff_i. Equation (3) proceeds for shifting results apart from in optimum and local.

FF'S PSEUDO CODE

start

thefunc for Objective f(x), x= $(x_1,\ldots\ldots,x_d)^T$

theff starting populace are generated$\mathbf{X}_i$ (i=1,2,....n)

the li is the intensity of the lightwithxi, was termed as f(**X**i)

thecoeff for absorbing the light was defined as**γ**

while(t <MaxGeneration)

fori=**1**:n all n fireflies

forj=**1**:i all n fireflies

if (I_j> I_i)

the levy flights are utilized in dimension-d for shifting FF i to j

end if

the distance are varied by the attractiveness r via exp[-γ^r]

the intensity of the light was updated by a solution evaluating innovatively

endforj

endfori

the best on present are found by ranking the FF

end while

the outputs are postprocessed the visualized

stop

The Q_k is the queue that is waiting to schedule and $Q_k = \{q1, q2,...,qm\}$ is the assumption of sub job, $A = \{a_1, a_2,...,a_n\}$ is a table represents the number of resources that want to get the process in the cloud, the q_i is the time denotes the very initial level of task process and $EDT(qi)$, $ADT(qi)$ is the recording time of task's original operation begins, finally, st stands for the window which stores the time for scheduling a task.

(i) Establishing the function for objective

In the queue of scheduling, the subtasks can be scheduled efficiently through a minimum latency in service. This can be obtained by an equation that is given below:

$$min \sum_{i=1}^{m1+m2+\cdots+mp} wait_p(q_i) = min\left\{ \sum_{q_i \in Q_k} [ADT(q_i) - EDT(q_i)] + \sum_{q_i \notin Q_k} [st - EDT(q_i)] \right\} \quad (4)$$

(ii) Setting the factor's which are Heuristic

The time taken for completing and processing the task are the heuristics factors.

$$\eta_1(q_i) = \frac{1}{DT(q_i)} \quad (5)$$

$$\eta_2(q_i) = st - ADT(q_i) \quad (6)$$

(iii) About Factor's which are equity

In the method of FF, the attributes of users for requesting resources to compute is involved here,

N (ci): denotes as the number of tasks that are pending to process for clientci;

η3 (qi): denotes as task's factors clarity qi;

F (ci): denotes as users task's factors clarityqi;

η3(qi): denotes the function with a heuristic.

While η3(qi) higher than 2 factors with clarity will influence greatly in selecting the task's probability.

$$F'(c_i) = \ F(c_i) \ = -\frac{K_i}{wait_p(q_i) \ * \ N(C_i)} \tag{7}$$

(iv) Updating the Taskfactor contains heuristics

While $q_i$of task was opted for ordering the resources to compute, then task corresponding for the client's task factor with heuristic c_i was updated towards:

$$\eta_3(q_i) \ = \ F'(c_i) \tag{8}$$

(v) Tasks that are opted based on probability

Within that instance, when 'qi' task-related with the client was being allotted addingup resources, 'c_i' a factor with clarity accordance with the particular client toward remaining tasks want to minimal in proportional.

$$P_x(q_i) = \ \begin{Bmatrix} \frac{\tau_{ix}^{\propto} \ * \ [\eta_1(q_i)]^{\beta_i} * [\eta_2(q_i)]^{\beta_i} \ * \ [\eta_3(q_i)]^{\beta_i}}{\sum_{s\epsilon \ allow}\{\tau_{ix}^{\propto} \ * \ [\eta_1(q_i)]^{\beta_i} * [\eta_2(q_i)]^{\beta_i} \ * \ [\eta_3(q_i)]^{\beta_i}\}} \ i \notin allow \\ 0 \ \ i \notin allow \end{Bmatrix} \tag{9}$$

'x' denotes a planned schedule sequence of tasks within the delivery queue, 'τix' was the parameter of the pheromone, permitting implies how no more process for a task would ever be allocated.

(vi) Updating the intensity of light

Equation (9) denotes FF's light which isa balancefor a task on the corresponding schedule, K2 is coefficient for flying enhanceability, the equation (8) denotes every 'qith time of accumulating was updated.

$$\Delta\tau_{ix} = \ \begin{Bmatrix} \frac{K_2}{\sum_{i=1}^{m1+m2+\cdots.+mp} wait_p(q_i)} q_i \ \epsilon \ scheduling \ queue \\ 0 \ \ q_i \ \notin \ scheduling \ queue \end{Bmatrix} \tag{10}$$

$$\tau_{ix}(NI \ + \ 1) \ = \ (1 - \rho) \ * \tau_{ix} + \Delta\tau_{ix} \tag{11}$$

To schedule the tasks efficiently for FF following procedures are given:

a: Initialize the variable: The attributes for input need to be initialized.

Where,

A = Set of resources

Qk = Queuing to schedule

MAX_NI = the iteration with a larger amount

I = Brightness

p = locating particularly

β **=** Clarity (a) Attractiveness and

st = Window's length.

b: Iterating individually: Accumulation of ' ***x′*** arrangement. While***x*** **>** ***s***, it terminates the layer's process, representing in which every resource with computation with its time of available was allotted to every individual execution of task go to Step6; else go on.

c: Loops within Iterating individually: Resources with computing g$a_j \rightarrow a_j + 1$. Again, everyresource with computation towards manages every conditional typewhich satisfies the task's condition, while $j > l_1 + l_2 + ... + l_n$, execute Step2; else,process Step4.

d: For opting for the task,aprobability was evaluated based on equation (8).

e: The changes in the queue will be dispatched. The form of a matrix is assigned for the queue to dispatch as a column with 's' and rows with 'n'.For every occasion, the resource for computinghas opted which was straight away transferred to queue. Create Modifications which move towards for Step 3.

f: Based on equation (9) & equation (10),the intensity of light is updated, thenproceed for Step7.

g: Processingcondition to terminate: NI → NI + 1, while NI> MAX _NI then time to complete the task not yet modified for a repeated period, Goto*b* cycle.

3.3. FFBAT Algorithm

For discovering the ideal scheduling, we have taken a combination of BAT and FireFly (FF)methods (FFBAT). A few research examines both BAT and FF individually based on swarm calculations insight to determine issues. The FF calculation was restricted to some limit, for example, it gets caught in a few neighbourhood optima. It plays out a nearby hunt too and is once in a while unfit to dispose of the neighbourhood optima. FFattributes were

static cannot be altered within a period.Likewise it doesn't remember or review any history of a superior area for every firefly. It leads FF to precede onward, paying little attention to their already good areas, thus it winds up by forgetting the other better areas. The usage of the BAT was much confused compared to other numerous methods. Since the fact that every bat is allocated a lot of associating attributes, for example, rate of pulse, speed, frequencies and location. By combining the above methods, good security and better execution can be achieved. Hence this hybrid method will be a better outcome for scheduling issues.

SR= Set of scheduled resources

SLT= Level of security for each task

RM= Tasks resource mapping

ExeC= Total cost for execution

ExeT= Total time for execution

R(T)= Rate of risks.

The following procedure describes this hybrid method:

(i) Encoding the solutions:

To find a solution a discretionary populace was developed initially by this hybrid technique for processing the taken tasks. Thus the upgradedmethod makes/perceives the perfect arrangement quickly. It will stand better among the most essential issues in appropriated processing for task scheduling inside the cut-off time with the most extreme security level.

N= quantity of tasks S ={s1, s2...sM}.

In order to perceive issues for encoding an essentialness, estimation of the issue from the startingis to be carried out. The purpose of this examination is to pick anaccurate fitting VM and securestages for every task to restrict the total work process execution cost, while meeting the deadline and hazard necessities. For example, here it has taken a process that contains four tasks witha plan of sixteen dimensional with their positionsare portrayed by twenty assistance. In this, every direction of tasks had an allocated place. For example, 0-3 are identified with task 1, 4-7 to undertaking 2, 8-11 to task 3 and 12-15 to task 4. The example arrangement association is given in Figure 3.2.

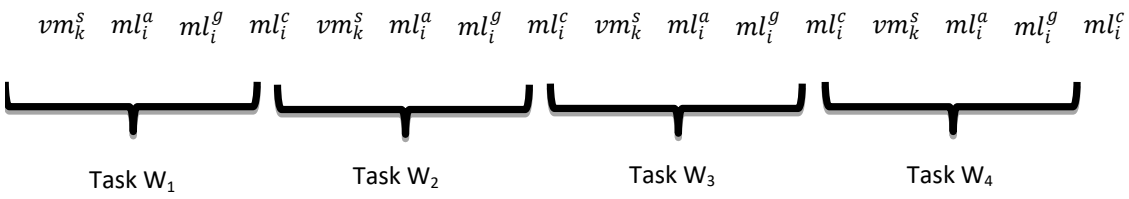

Figure4. Encoding the Solutions

(ii) Calculating the Fitness

Once the function for fitness was accomplished, the scheduling of the tasks can be assigned. The scheduling wants to be at minimal *EX eC*then *EX eT*should be done within cut-off time also with minimal *R* (*T*).

$$fitness = \begin{cases} min\ EX_{\ e}C \\ EX_eT \leq T^D \\ R(T) \leq R(C) \end{cases} \quad (12)$$

Where,

R(C) = Workflow's constraint rate of risk.

(iii) Updation based on FF

Updationhas done as per the following equation:

$$P_i^{t+1} = P_i^t - \alpha_0^{at} e^{-\gamma D_{ij}^2}(P_{ij}^t - P_i^t) + \sigma_t \mu_i^t \quad (13)$$

Where,

P i^{t+1}=Solution of updated *i*th

Pi^t= Solution of the present is *i*th

Pt^j= solution of*j*thsolutionwas one of the illuminated FF.

i^t= Random number vectors from the Gaussian distribution at the time *t*; and

Iteration is finished utilizing the FFmethod and the fitness of the updated solutions is calculated.

(iv)Updation based on BAT

Updationhas done as per the following equation:

$$P_i^{t+1} = P_i^t + VV_i^{t+1} \quad (14)$$

Updation of ith solution velocity done by

$$VV_i^{t+1} = VV_i^t + (P_j^t - P_i^c) * FR_i \quad (15)$$

Where,

Vv_i^{t+1}= ithsolution velocity updation

VV_i^t= ithsolution velocity at present level

P_j^t= Present better solution and

P_i^c= Presentithsolution.

Every solutionfrequenciesare updated by the given equation.

$$FR_i = FR_{min} + (FR_{max} - FR_{min}) * \beta \quad (16)$$

(v) Hybridization

If FF has better fitness value (*BFFv)* than the BAT, the better solution of the FF isreplaced by the BAT. When the value of BAT fitness is less than the value of FFfitness, the solution is replaced by the FF solution.

(vi)Criteria for termination

The calculation ceases its operation, when a most extreme iteration quantity is accomplished. The arrangement maintaining fitness with better esteem is chosen and indicated as the better component to schedule a task. When better fitness is achieved by methods for the FFBAT calculation, the chosen task is scheduled for CC.

Pseudo code FFBAT Based Task scheduling algorithm

Input:

Attributes for FFBAT calculation

Attributes for output of scheduled tasks:

Output:

Task with schedule

Begin

Components for schedule Initialization *SR=SLT=RM=Φ*

$EX_eT=EX_eC=R(T)$

To every task wf_i in W

IF $w_i$containswithout parents

Settingtime to startST (wf_i)=0

Else

Obtaining time of start ST (wf_i) -max {ET

(wf_i) | w_i€ pre (wf_i) }

End if

If $vm_k^{pos[4i]}(wf_i) = vm_k^{pos[4i-1]}(wf_{i-1})$//VM is reused

Evaluate time for processing$ST(wf_i, vm_k^{pos[4i]})$

Evaluate time for ending task$ET(wf_i, vm_k^{pos[4i]})+ST(wf_i)$

Update the lease end time of task wf_{i-1},$LET(wf_{i-1}, vm_k^{pos[4(i-1)]})= ET(wf_i)$

Then set $LST(wf_i, vm_k^{post[4i]})$ =LET$(wf_i, vm_k^{post[4i]})$=0 // avoid recalculating the

leased cost;

Else

Evaluate the time for process$PT(wf_i, vm_k^{post\[4i]})$

Evaluate the task time to end$ET(wf_i, vm_k^{pos[4i]}))+ ST(wf_i)$

Set lense start time $LST(wf_i, vm_k^{pos[4i]})+ ST (wf_i)$

Calculate lease end time $LET(wf_i, vm_k^{pot[4i]})=PT(wf_i, vm_k^{pot[4i]})+LST(wf_i)$

End if

Add $m(wf_i, vm_k^{pos[4i]})$ to the set M,r_i to R and ml to ML;

End for

Calculate P (T)

Calculate TEC

Calculate TET

Calculate the fitness value

Then

Utilizing FF the solution was updated

Utilizing BAT the solution was updated

Then Select the solutions with best

Record schedule = SR, SLT, RM, EX_eC, EX_eT, R(T)

End

4. Results and Discussion

This segment examines the outcomes got from the surveyedmethodsto schedule tasks for processing the works in cloud computing. Thisexaminationis done with outcomes produced that were essentially dependenton the complete execution time and constraints in risks. In order to schedule a work process, we utilized these methods based on risk rate and cutoff time to limit the cost taken for execution. The VM is chosen accordingly on waiting tasks. Also, it concentrates on the level of security too.

The outcomes of the method's complete execution time were shown in Figure 5 and Table 1.Here, by changing the quantity of tasksby shifting it from 30-120. At the point where 120 tasks are utilized, the hybrid methodology accomplishes an execution time of 2800000 ms, which is 4800000 ms for the FFmethod and 8000000 ms for the BAT method.

Table 1. Performance of Execution Time

NO OF TASKS	BAT	FIREFLY	HYBRID
30	1500000	1200000	800000
60	3000000	2400000	1200000
90	5500000	3600000	2000000
120	8000000	4800000	2800000

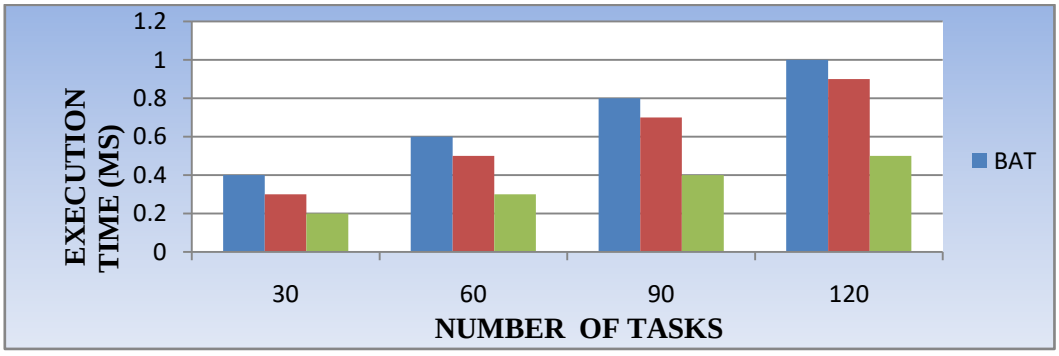

Figure 5. Graph for Execution Time

Figure 6 and Table 2describe the performance level in risk by altering the number of tasks. The hybrid method getsonly a minimum level of risk of 0.5when 120 tasks are assigned.

Table 2. Risk Level

ITERATION	BAT	FIREFLY	HYBRID
30	0.4	0.3	0.2
60	0.6	0.5	0.3
90	0.8	0.7	0.4
120	1	0.9	0.5

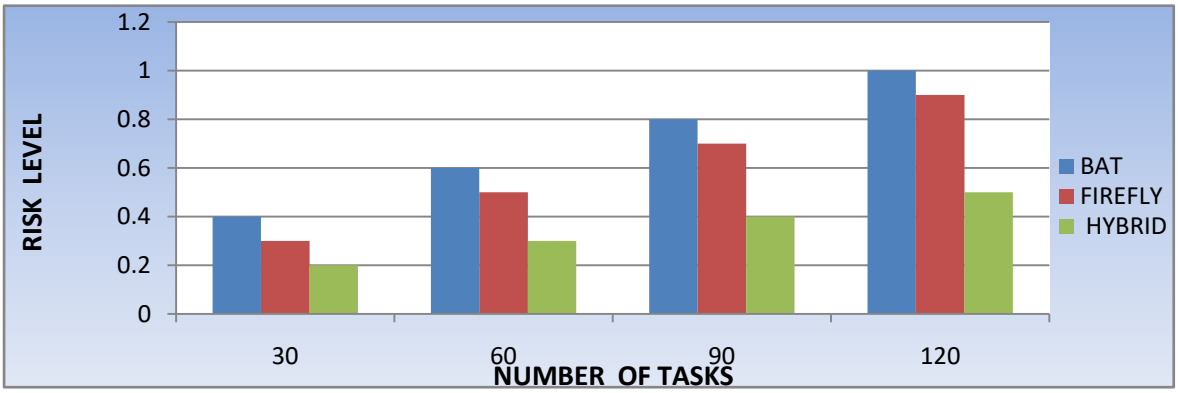

Figure6. Graphfor Risk Level

In cloud computing, we had surveyed some methods for better cost-efficient with high security. The estimation of methods is hoped to minimize the cost for execution within cut-off time and also to reduce the risk rate.An arrangement for the encoding system needs to be completed depending on every VM's tasks and security levels. The process for updating had completed utilizing the BAT, FF and hybrid of bothmethods. An outcome with better fitness has opted for better efficiency. Hence the results of the execution and risk rate for the FFBAT, firefly, and BAT methods were calculated. The test results indicated that the hybrid approach is superior when compared with BAT and firefly.

5. Conclusions

This review started by contemplating and sorting importantareas of cloud computing frameworks. CC has a few interesting highlights, for example, Pooling of resources, flexibility, self-administration, On-request administrations, QoS and pricing. In the current era, the Cloudfaces many more difficulties as far as information security, utilization of energy and consolidation of the server. Many examinations haveonly concentrated on enhancing secure levels atSoftware, OS, VM and Equipment. These steps are not able to give complete

solutions and keep on maintaining information security efforts heavily influenced by the provider of the cloud. This review expected to discover the secure scheduling of the tasks in the cloud to deal with limitingthe execution costs and to boost the level of security.Hence the surveywas completed by examining and analyzing metaheuristic techniques for cloud computing such as BAT, Firefly (FF) and hybrid of both the methodsto settle the issues faced in the scheduleof tasks. Here the results are taken for risk rate and execution time. At last, it proves that the hybrid method is better when compared with only BAT and FireFly. Machine learning based task scheduling in cloud computing will be carried out in future.

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Author Biographies

Abin T Abraham is an Assistant Professor at the department of Computer Applications, SAINTGITS College of Engineering which is affiliated to Kerala Technological University. His research interests include Cloud Computing, IoT etc. Abin T Abraham has taken PG Degree in Computer Applications from the Mahatma Gandhi University.

Dr. E. J. Thomson Fredrik is a Professor at the department of Computer Applications, Karpagam Academy of Higher Education. He obtained Ph.D from Bharathiar University. He has many Scopus Indexed and SCI indexed publications.