SECURITY LAPSES COVERED GENETIC BASED CLOUD SCHEDULING MODEL

[1]Kanchan Kumari, [2]Dr. Ankit Kumar
[1]Research Scholar, [2]Assistant Professor
[1,2]Department of Computer Science,
[1]Baba Mast Nath University, Asthal Bohar, Rohtak

Abstract*—Cloud scheduling is the inclusive task of distributed cloud environment for effective sharing of services and sources. The security features and requirements of available cloud servers and users can be different. If, the service allocation is done based security requirements of the user, most of the security lapses can be handled in cloud environment. In this paper, a security based scheduling model is provided to improve the reliability and effectiveness of scheduling in cloud environment. The proposed model also used the genetic based method for improving the reliability and effectiveness of decision making of scheduling process. The paper has presented the proposed model and implements it in matlab environment. The results identified that the model has executed the processes with effective wait time and migration count.

***Index Terms*—Cloud Scheduling, Distributed Environment, Genetics, Resource Allocation, Security.**

I. INTRODUCTION (HEADING 1)

All Cloud system is the distributed environment which offers different kind of services and resources through common environment. These services are offered in open environment which is accessible to both public and private users. The restrictions and constraints are also defined on this distribution procedure based on the applications, environment, service type and the user type. The web scalability, robustness, versatility are the key aspects of this shared environment. The usability mapping based on the user and application requirement, the virtualization is implemented in this environment to improve the effectiveness and adaptability of this distributed cloud environment. The virtualization is defined as the intermediate or available architecture which distributes the services and resources to the users on their requests. The virtualization exist in cloud environment at different level including hardware level, network level, storage level, data level and desktop level. After setting up the virtualization technology in this environment, the effective and robust sharing or distribution of resources and services can be achieved in the cloud environment. As the services and resources are offered to the users, multiple users can generate the request in this environment to access these services. The scheduling is the method applied at this stage for setting up the sequence of request processing distributed cloud environment. The scheduling is the integrated process of service distribution to achieve better resource utilization and to improve the degree of user satisfiability.

The scheduling in cloud environment is deep scientific process which is addressed by multiple inclusive tasks. These subtasks exist in a scheduling framework are job submission, resource finding, job sequences. This integrated flow of scheduling process is shown in figure 1.

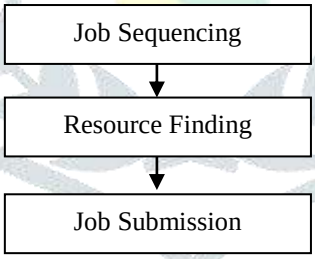


Figure 1 : Tasks on Job Scheduling

Figure 1 shows the flow of work stages of scheduling performed in distributed cloud environment. The scheduling system accepts the user request applies a series of processes for effective resource allocation and scheduling. As the system begins, the job is submitted to the environment through common middle layer architecture. This intermediate layer works as the interface between the cloud servers and the users. The constraint level analysis is performed on the submitted request to identify the user requirements so that the relative process can be performed. As the fair requests are submitted, the resource search is performed to fulfill the user requirements. The extensive search method is defined in this stage on all the cloud servers and virtual machines. The resources that can satisfy the users at highest level are selected to deliver as the product or service to the client. The availability and resource type analysis is also performed at this stage before allocating the service to the clients. If a service or product is allocated to the multiple clients, then the sequence scheduling is performed to identify the sequence in which the resource will be utilized by the users. The job scheduling is actually performed at this stage to decide the processing sequence. The scheduling is one of the effective methods that can improve the effectiveness and reliability of service execution in distributed cloud environment.

In this paper, a genetic based scheduling method is provided for distributed cloud environment to handle the security lapses exist in the public access. The paper has presented the proposed scheduling model and implementation results. In this section, the introduction to the scheduling process in cloud environment is provided. The section has identified the features of cloud and scheduling process. In section II, the work provided by the earlier researchers is presented and discussed. In section III, the proposed genetic based scheduling method is provided. The flowchart of the proposed method is also provided in this section. In section IV, the implementation results generated in this environment are presented and discussed. In section V, the conclusion of this work is presented.

II. RELATED WORK

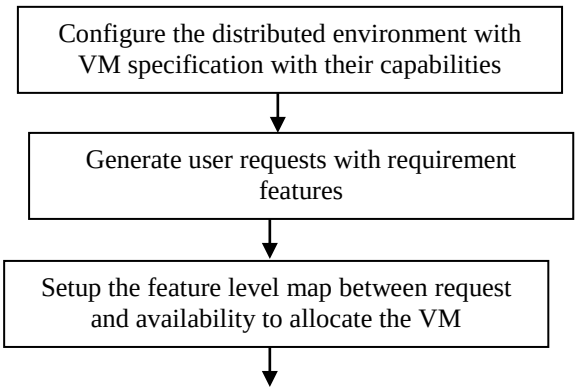
In last one decade, lot of work is defined by the researchers to optimize the cloud scheduling and resource allocation methods to improve the effectiveness of distributed cloud environment. In this section, the work provided by the researchers on cloud scheduling is presented. Author[1] has defined a delay based analysis to improve the concurrency in distributed cloud environment with associated task scheduling. The time bounded task execution was achieved by the author with effective resource allocation. The structural model with delay constraint was defined to achieve the high degree of concurrency in distributed environment. Author[2] has improved the accuracy and effectiveness of resource allocation by applying the mathematical modeling. In this approach, a controlled and unbalanced resource assignment was provided by the author using parallel genetic approach. The constraint based cloud system characterization was applied by the author to improve the significance of scheduling method. Wubin et al.[3] has considered the dynamic parameter and behaviour of scheduling method. The linear integer programming was applied by the author with constraint adjustment and migration control. The infrastructure control based method improved the performance of cloud system and reduced the migration cost. The parameter modeling was applied to improve performance of cloud scheduling system. Author[4] has used the min-min and max-min approaches to achieve effective task scheduling in heterogeneous cloud environment. The load analysis was considered as decision parameter for improving the scheduling constraint in cloud environment.

Author[5] has provided a work on wait time processing to improve the effectiveness of resource allocation in cloud environment. The reservation queue based priority queue setup and the wait list management was provided by the author to reduce the execution time. The parameter based evaluation and experimentation was provided to improve the effectiveness of process execution in cloud system. Author[6] has applied the analytical decision criteria by generating the pair wise comparison on different available machines and cloud server. The priority based analysis is performed to identify the consistent and inconsistent allocation in cloud system. The task scheduling methods were defined by the author to fulfill the resource requirement based on different available parameters including the bandwidth, memory and power consideration. The parameter specific evaluation was defined by the author improve the reliability of task scheduling. Author[7] has presented as study on different available methods of workflow scheduling in cloud environment. The aspects, constraints and objectives of available methods were discussed by the author. The various challenges faced in this the public environment was also identified by the author. Author[8] has provided the exploration of various cloud scheduling method with computational observation. The available heuristic and non-heuristic methods were discussed by the author with relative client side concerns. Author[9] has defined a trust based analysis method to improve the reliability of scheduling of task in cloud environment. The security specific criteria and the trust monitor was including to handle the abnormal behaivour in cloud system. The penalties based evaluation was defined by the author to improve the effectiveness of service execution in real environment.

Author[10] has defined an energy parameter consideration while allocating the service to the users. The tasks scheduling algorithms were defined by the author to reduce the energy consumption of virtual machines. The data center based request processing and service allocation was defined by the author to improve the quality of service. Author[11] has defined a reliability evaluation method for effective resource allocation in distributed environment. The infrastructure level analysis was defined by the author to achieve better utilization of available resources. The cloud data center based evaluation was defined by the author for improving the scheduling method and to achieve effective service delivery to the users. Author[12] has defined incentive based scheduling with specification of security level. The swarm intelligence was applied by the author to identify the potential security challenges in the cloud environment. Performance, cost and security improvement achieved by the author were also discussed for this distributed environment. Author[13] has defined a genetic based method with constraint control to achieve effective resource distribution and scheduling. The integer sequence based fitness function was defined to improve the reliability and effectiveness of task execution in distributed environment. Author[14] has defined rough set based programming framework for real environment to achieve effective service distribution and execution in distributed environment. The cloud specific evaluation was defined by the author to achieve effective and reliable execution of tasks within the time restrictions. Author[15] has defined the dynamic scheduling based method to gain better utilization of bandwidth and other available server side resources. The improvement to the Min-Min algorithm was provided by the author to improve the service distribution in cloud environment.

III. RESEARCH METHODOLOGY

This cloud system is distributed in the public environment with available services. The users can requests these services using common interface. The interface takes the decision for effective service allocation based on the user requirement. The security is one of the major problems that exist in such distributed environment. As the services are distributed by public clouds, there exist the clouds with different configurations and security features. Same kind of services can be available on clouds with different level of security. In the same way, the users can have different view and requirements while requesting the services. The middle layer architecture has to allocate the effective VMs to the users and to execute them on cloud server. For this, the middle layer is defined with service allocation and scheduling methods. The scheduling method defines the sequence of request execution. The proposed middle layer architecture is able to provide the effective service allocation and execution. At the time of service allocation, the security lapses are handled by this architecture. The optimized sequence of service execution is identified by the proposed middle layer architecture using Genetic approach. In this section, the proposed middle layer architecture is defined with its functional behaviour. The broader view of the proposed model is shown in figure 2.



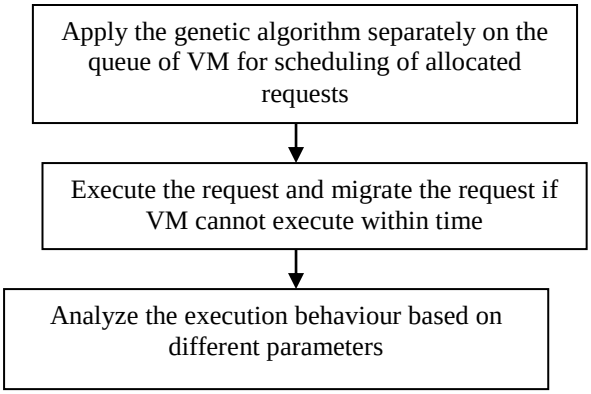


Figure 2 : Work Flow Middle layer architecture

The proposed work is provided as the middle layer architecture that accepts the user request and map it to the cloud server based on the user requirement. The architecture work is divided in two main stages for VM allocation and to schedule the allocated requests. At the first stage, the security features are analyzed to handle the security lapses exist the distributed environment. Based on this stage, the most effective VM will be allocated to the most critical request. In the same way, the requests with lesser security requirements will be loaded to the cloud server with lesser security support. At the stage of VM allocation, the security features, load and memory are the parameters considered while performing the request and capacity mapping. This two-way analysis is performed by the middle layer architecture to achieve effective cloud service allocation. Once the effective service is allocated, the next task is to execute the requests on each virtual machine. For the execution, there is the requirement to setup the execution sequence. In this work, the genetic algorithm is applied with parameter specification to generate the effective sequence of request execution. Figure 2 has explained each of the work stage of middle layer architecture. Once the genetic based scheduling is performed, the virtual machines start executing the tasks in the defined sequence. But there can be some situations that can be delayed the execution because of which the task cannot be executed within the time limit. The scheduler also performs the analysis on the effective execution of task. If such situation is identified, the task can be migrated to other virtual machine. In this way, the effective execution of each request is obtained by the middle layer architecture. The capabilities of virtual machine and the environment can be analyzed based on multiple parameters including wait time, finish time etc. In this paper, the analytical results are also provided for task execution in cloud environment.

The main contribution of this research work is to define a parameter effective genetic method for execution of user requests. The genetic algorithm is integrated in the middle layer to set the sequence of request execution on each virtual machine. The proposed scheduling method is able to execute the requests with minimum wait time and migrations. The genetic based algorithm proposed in this work is provided in table 1.

Table 1 : Genetic based Scheduling Algorithm

```
Algorithm (Requests, VM)
/*Requests is the user request generated with relative features and VM is the list of service providers
 */
{
    1. Population=Initialize()
       [Process user requests with relative parameters to initiate the scheduling process]
    2. PopulationSeq=RandomPermautation(Population)
       [Generate the possible scheduling sequence of requests using random permautation algorithm]
    3. For i=1 to IterationCount
       [Apply the genetic process for specific number of iterations]
       {
    4. [Parent1 Parent2]=Select(PopluationSeq)
       [Perform the ranked selection from population sequence]
    5. Child1=ApplyDPXCrossover(parent1,Parent2)
       [Apply the DPX Crossover for selection of new parent]
    6. OptimizedSeq=RandomMutation(Child1)
       [Apply the random mutation on population sequence for generation of new child]
    7. Update(Population,OptimizedSeq)
       [Update the population by including the new optimized population sequence to the population set]
       }
    8. Return OptimizedSeq
}
```

Table 1 has provided the algorithm to execute the user requests which are allocated in the particular queue of each virtual machine. The requests are analyzed and observed under the start time, deadline and memory parameters. Based on this the weighted sequence is generated. These sequence sets collectively generates the population set for genetic process. The random permutation is applied to generate the possible execution sequences of requests. These N sequences are processed the genetic based scheduler to identify the effective sequence. The configuration parameters of genetic model are provided in table 2.

Table 2 : Genetic Configuration parameters

Parameters	Values
Population Size	20 or more
Iterations	100 or More
Selection Function	Ranked Selection
Crossover Operator	Distance Preserving Crossover
Fitness Function	Parameter Adaptive Cost Function
Mutation Function	Random

The genetic is the iterative process defined with the configuration parameters defined in table 2. With each iteration, the parameter based fitness function is applied to select the parent sequences. In this proposed model, the ranked selection method is applied to perform cost based sequence selection. These generated parameters were processed by distance preserving crossover (DPX) to generate the child sequence. The crossover performs the cost-distance based analysis for effective sequence generation. The random mutation function is applied at the final stage to avoid the duplicate sequence generation. This child sequence is included in the population set and processed by the genetic algorithm in next iteration. The process is repeated for N number of iterations. After N iterations, the optimized sequence is obtained. Now the requests are execution by the cloud server using this sequence. While executing the tasks, the deadline consideration is also done. If task cannot be execution within deadline, then it can be migrated to next effective virtual machine.

In this section, the proposed middle layer architecture is described with all its functional stages. The algorithm for genetic based scheduling is also provided in this section. In next section, the analysis results of this proposed model are provided.

IV. RESULTS

In this paper, an effective cloud scheduling method is provided under the consideration of security measures. The simulation of this proposed genetic adaptive scheduling architecture is done in matlab environment. The cloud system is defined with 5 cloud servers and with 5 integrated virtual machines. The security features are defined for each virtual machine as the capabilities of the service provide. The security ranking and load limit is defined for each cloud server randomly. The request is generated by 25 users with security features and time stamping features. The comparative results are generated against the SJF scheduling method. The features of user requests in terms of security requirements and arrival time is shown in figure 3.

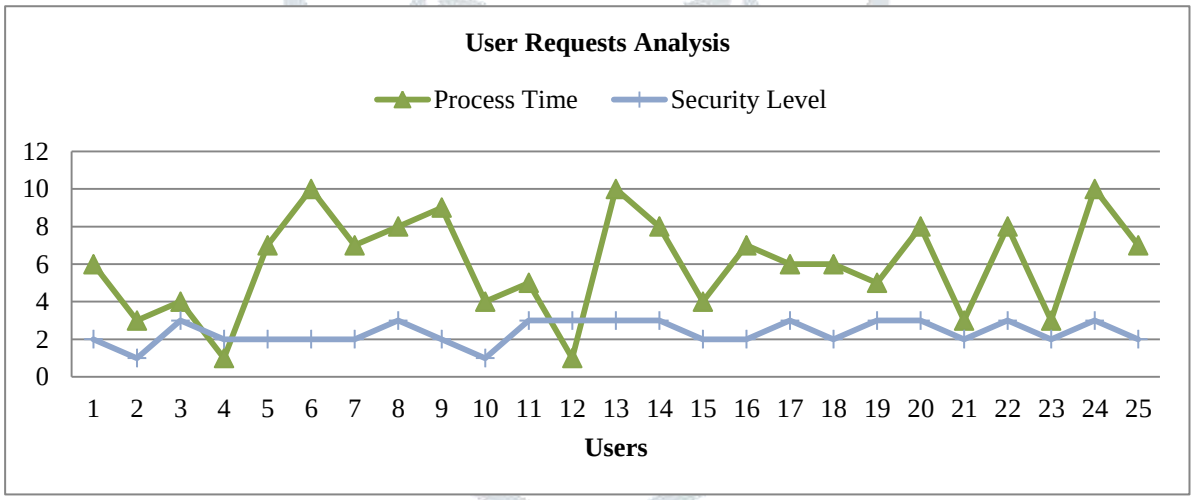


Figure 3: User Request Analysis

Figure 3 shows the user requests input to the distributed cloud environment with security and process time features. In this figure x axis shows the requests generated by 25 users to the cloud system. The comparative evaluation of this proposed model is done under wait time parameter. The comparative results for average wait time for all requests are provided in figure 4.

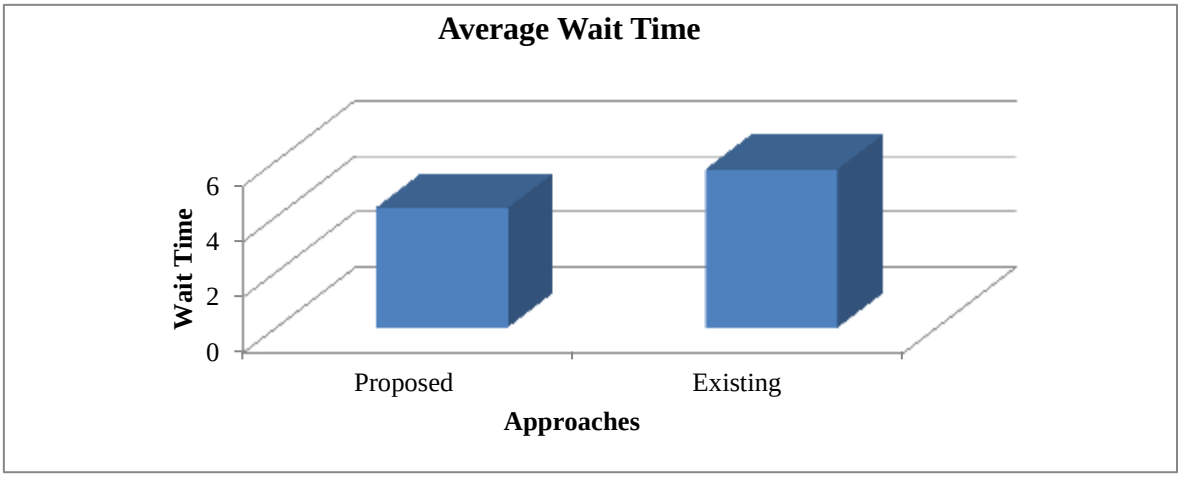


Figure 4 : Average Wait time Analysis

Figure 4 shows the analysis of this proposed genetic adaptive model in terms of average wait time. The figure shows that the proposed model has reduced the wait time effectively. The average wait time of existing work is 5.7 sec and for proposed model it is 4.3. The comparative analysis in terms of number of migrations occurred in existing and proposed approach is shown in figure 5.

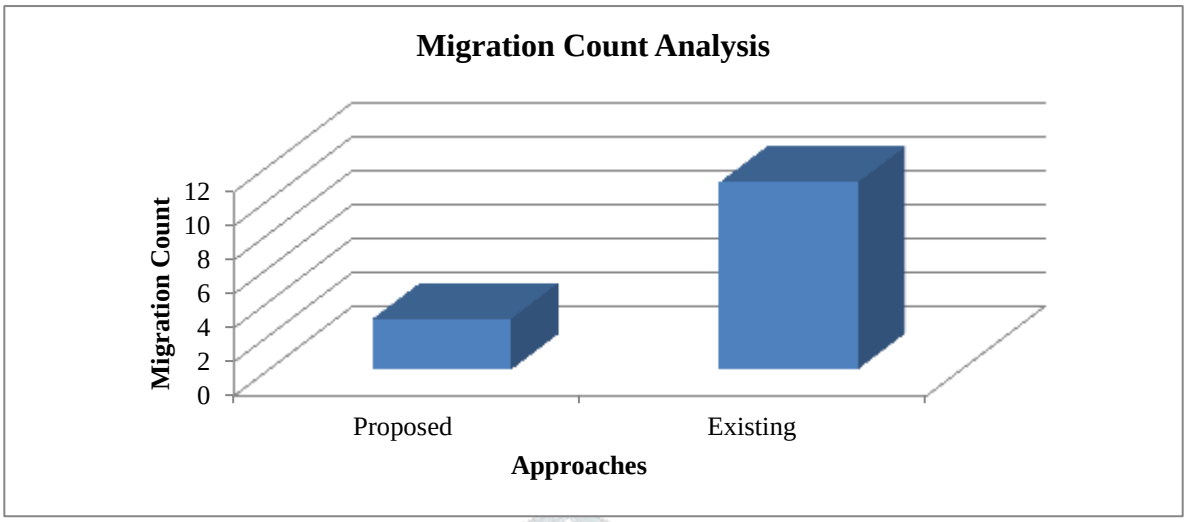


Figure 5 : Migration Count Analysis

Figure 5 shows the migration count analysis obtained from existing and proposed approaches. Lesser the migration count, more effective the scheduling system is considered. The figure shows that the proposed approach has reduced the migrations to 3 whereas in existing approach the migration count is 11. The results identified that the proposed model has improved the performance of service execution in cloud environment.

V. CONCLUSION

The distributed cloud environment suffers from the issue of security lapses that affects the performance of service execution. In this paper, the security feature adaptive genetic model is presented to improve the cloud security allocation and scheduling. The model is defined as the middle layer architecture that accepts the requests from user and map it to the service providers based on security, efficiency and reliability constraints. The paper has provided the algorithmic approach and its simulation in matlab environment. The comparative results identified the significant improvement is achieved in terms of wait time and migration count reduction.

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