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Cloud Computing Using Cost Based Task Scheduling Approach

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Abstract : Cloud computing is a developing mechanism. It brings infrastructure, platform, and software that are accessible as subscription-based facilities in a pay-as-you-go prototype to customers. To study and analysis current scheduling algorithms/techniques/methods used in cloud computing environment, sharing resources among a large pool of users assists in reducing infrastructure costs and peak load capacity. Due to the raise in convention of many applications currently, there is necessitating for high processing and storage capacity along with the consideration of cost and instance This paper focuses on highlighting the strengths and limitations of the proposed technique. The paper provides an insight into the reviewed literature to reveal new aspects of research.

Keywords : Cloud Computing, Task Scheduling , Iaas, Data Center .

I. INTRODUCTION

Cloud computing is demanding computation paradigm which provides various computing resources, data and application of clouds that has many appealing benefits, such as scalability & reliability. However, with the vogue of computing services, there is a expeditious increase in users that causes huge amount of energy/cost consumption. [1] There is need to solve this problem, that how resource utility gets improve and energy consumption reduces without effecting system performance. Task scheduling problem is a best way for this issue. So how to schedule tasks according to energy and cost aware way has become one of the most important research issues [2]. For cloud service providers, their pursuing goal: win maximum profit with minimum rental cost. [3]

Task scheduling is one of most discussed issues in the today's cloud computing environments. In cloud systems, the goal of the scheduling techniques is to divide the workload among the computing nodes and maximize the utilization of resources while minimize the total task execution time. The task scheduling process basically carry out in two stages: In first stage, scheduler allocates application requested resources to the cloud and in second stage, the incoming tasks are assigned to the appropriate virtual nodes in an effort for balancing the loads among the nodes. [4]

Task scheduling methods in cloud computing has enchanted great attentions. Many researchers have proposed many divergent scheduling algorithms which streamed under the cloud computing environment. [5] Task scheduling algorithm is responsible for dispatching tasks to cloud provider, that are submitted by users onto heterogeneous available resources [4].

II. ARTICHITECTURE OF CLOUD COMPUTING

Cloud computing is an Internet-based technology. In cloud computing, the cloud is an image for the Internet (based on how it is represented in computer network diagrams) and is a speculation for the complex infrastructure it conceals [6]. The architecture of cloud computing is a tremendous network of "cloud resources" interconnected as in a grid running as parallel, that ever using the procedure of virtualization to increase the computing power per server [7]. Applications of users work on the virtual operating systems are shown as in Figure 1.

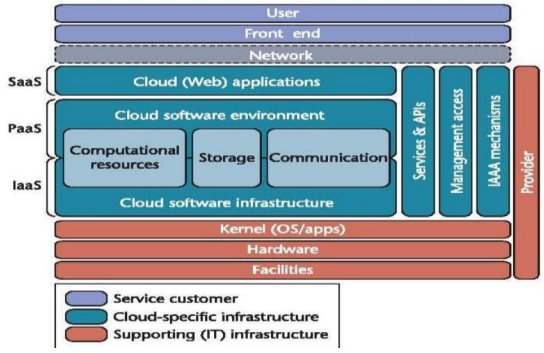

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Figure 1. Architecture Of Cloud Computing

Cloud service models are generally classified into SaaS, PaaS, and IaaS. It is beneficial to add more structure in the service model stacks: Fig. 1 shows a cloud computing architecture . [8]
Mostly communication and the design of this computing technology background could exist into four levels: the hardware level, the platform based level, the infrastructure based level and the application based level. These are discussed as:

A. Hardware Level

This level is responsible for the supervision of corporal capitals of the cloud, containing resource supplier, switches, routers, power and refrigeration mechanism. In particular, the hardware level is normally implemented in datacentres. A datacentre typically consists of thousands of providers that are organized in stands and integrated over shifts, routers or additional stuffs. Delegate subjects at hardware coating comprise hardware shape, responsibility progressiveness, circulation organization, electricity and refrigeration reserve regulation.

B. Infrastructure Level

Similarly recognized as virtualization level, the infrastructure level generates a puddle of contents and calculating capitals by sorting out the physical servers by means of virtualization understanding like Xen, KVM and VMware. The infrastructure level is a foremost module of cloud computing technology, as a lot of main services, like dynamic resource provision, are completed approachable over virtualization skills.

C. Platform Level

This level comprises of operating system(OS) and application backgrounds. The purpose of the platform level is to decrease the load of requests into VM containers. For example, Google App Engine perform on the platform level to deliver API specification for applying storage, database and web requests.

D. Application Level

The application level contains real world cloud requests. Unlike from old requests, cloud requests could influence the auto-increment facility to attain improved presentation and inferior working price. The architectural modularity permits an extensive variety of request supplies through sinking organizational and conservation cost. [9]

III. CLOUD COMPUTING DEPLOYEMENT MODELS

Large organizations get benefited from the private cloud, whereas smaller businesses will most likely to be public cloud. As cloud computing is continuously expanding, businesses will continue to shift back and forth through four major paradigms. There are four kinds of clouds that provide three services. These are public cloud and private cloud. In public cloud, these three services can be sold to customers on the internet, Amazon Elastic Cloud(EC2), Google App Engine are popular public cloud providers. Private cloud has data centers with complex network to provide services to lesser number of end users. [10]

A. Private Cloud

The cloud infrastructure is prerequisite for selected use by a single or small organization consisting of multiple consumers (e.g., colleges, business units etc.). Private cloud may be operated, managed, owned by the organization, a third party, or may be combination of both of them.

B. Community Cloud

The cloud infrastructure is basically used by an appropriate community of customers of an organization that have shared concerns (e.g., mission, security requirements, policy, and compliance deliberation). Community cloud may be owned, managed, and operated by one or more number of organizations in the community, by a third party, or may be combination of them, and it may exist on or off premises.

C. Public Cloud

The cloud is prerequisite for open use by the common public or business.

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IV. PROBLEM FORMULATION

Conventional way for task scheduling in cloud computing be likely to use the direct tasks of users as an overhead application base. There are some problems with it. These problems leads to over-cost and over-priced in some eminent simple task while under-cost and under-priced in low-volume complex ones. The problem is that there may be no relationship between the overhead application base and the way that different tasks cause overhead cost for resources in cloud systems. Larger number of simple tasks increases the cost and the cost is decreases if system have small number of complex tasks.

Cloud Computing is expanding as the next generation platform, so that it requires a managed and scheduled system that allows users to access the cloud services for deployment and for the execution of application. To accomplish this requirement, build a system, that will be easy to use, lightweight, scalable and allow the users to deploy the applications on cloud services efficiently.

Generally, while scheduling the task, system allocates the task to each VM based on its computing power and available resources. If the VM is capable of doing such task and resources required by that task are available, then system allocate the task to VM. While one task is running, system allocates the next task to the same VM without checking whether the available bandwidth is sufficient for task or not, then task moves in waiting state if bandwidth is not sufficient and also stops the execution of all the upcoming tasks on same VM. Due to this, the total execution time of the entire task increases which results in wastage of resources. Therefore, first check the available bandwidth of the both virtual machine and the task , then allocates the task to the virtual machine based on its bandwidth computing power to decrease the wastage of resources and execution time.

A. Objective

1) The problem is to have a technique that can effectively allocates the task, so that the cost and time will minimize and resources can be effectively utilized. The problem is to determine what kind of applications can be allocated to a single host that will provide the most efficient overall usage of the resources.

2) The aim of this thesis work is to propose an efficient task scheduling technique so that the utilization of the resources can be enhanced and the waiting time of tasks will be minimized. An existing technique is compared with the proposed technique.

V. PROPOSED WORK

Task scheduling and resources are the main problems in cloud computing. The task scheduling affects the performance of the system. To decrease the consumption of resources, consider a network bandwidth while constructing the algorithm, here proposing a non-linear programming model for task scheduling. In this, computer hosts such as $p_1, p_2, p_3 \ldots\ldots p_n$ and each of these hosts has a virtual machine with its corresponding virtual machine monitors and here adopt a “bounded bandwidth multipart communication model”, which is used for heterogeneous distributed computing environment. In this there are "m" virtual machines with computing power. Time needed to execute each task is cp1 , cp2... cpm . Here by using this non-linear programming method , allocate the proper number of task to each virtual machine based on available network bandwidth.

In order to measure direct costs of applications, every individual use of resources (like CPU cost, memory cost, I/O cost, etc.) must be measured. When the data of each individual resource's cost has been measured, accurate cost and profit analysis based on it, than those of the traditional way can got.

Cost of every individual resource used is different. The priority level can be sorted by the ratio of task’s cost to its profit. For easy management, three lists can be built for the sorted task, each list has a label of priority level such as HIGH, MID and LOW. Cloud systems can take some out from the highest priority list, some from medium priority list to compute. Maps should be scanned in each and every turn to modify the priority level of each task.

Parameters are defined as followed :

A. Ri,p: The ith individual use of resources by the kth task.

B. Ci,p: The cost of the ith individual use of resources by the kth task.

C. Pp: The profit earned from the kth task

D. Lp: The priority level of the pth task.

The priority level of each task can be calculate as in formula (1), the total individual resources use is supposed to be n, so the priority level of the pth task is

$$L_K = \sum R_{i,p} \times C_{i,p} / P_p \quad (1)$$

1) Priority based Task Scheduling Algorithm in Cloud Computing

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This section describe how to design an algorithm of activity based costing method in cloud computing. The specific algorithm is described as followed:

Algorithm1. Algorithm of Pre-process
1. Initialization: a. T_i = Tasks b. R_i = Resource c. P_i = Priority 2.For each resource : i)Calculate the priority level ii)End 3.For every priority level: i)Sort them into an appropriate list ii)End 4.While system is running: i)If new source coming do a)Calculate its priority level and put it in to appropriate list. b)End If ii)End while

Algorithm2. Algorithm of Process
1. Do pre-process as a thread 2.While system is running: i)If every list is non-empty, do: a) Process the task which has the highest priority. b)Scan every list to modify the priority base on the restrictive conditions. c)End if ii)End while

Algorithm explains the efficient scheduling of tasks while allocating the task this algorithm considers the computing power of the virtual machine, resources so it allocates the tasks in such a way that reduces the waiting time of tasks:

a) Submitting the tasks to virtual machine
b) Assigning priority to virtual machine
c) Assigning priority to tasks
d) Performing host of each model
e) From the result of the above model we are assigning tasks to each virtual machine
f) Tasks are in waiting
g) Tasks checks for the idle virtual machine
h) Then tasks checks for the required priority
i) Executes the task

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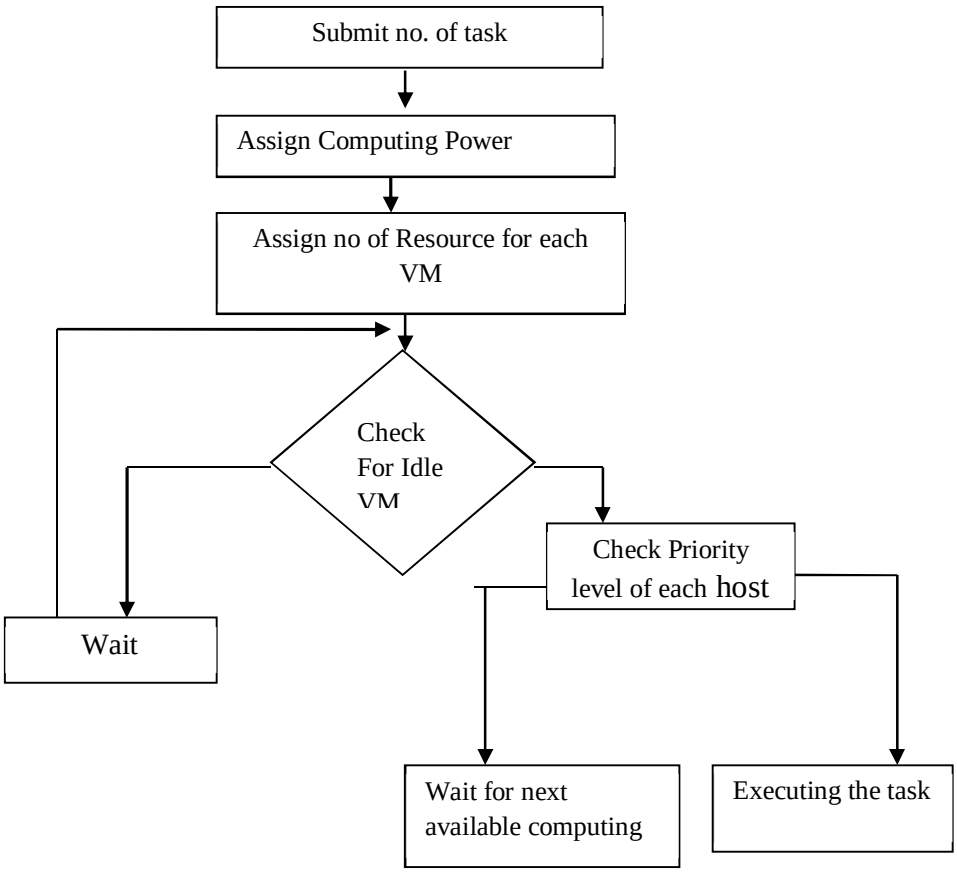

DFD. Flow Chart of Proposed Work

VI. RESULTS AND ANNALYSIS

The CloudSim simulation layer provides support for modeling and simulation of virtualized Cloud-based data center environments including dedicated management interfaces for virtual machines (VMs), memory, storage, and bandwidth. The fundamental issues such as provisioning of hosts to VMs, managing application execution, and monitoring dynamic system state are handled by this layer. A Cloud provider, who wants to study the efficiency of different policies in allocating its hosts to VMs (VM provisioning), would need to implement their strategies at this layer. Such implementation can be done by programmatically extending the core VM provisioning functionality. There is a clear distinction at this layer related to provisioning of hosts to VMs. A Cloud host can be concurrently allocated to a set of VMs that execute applications based on SaaS provider's defined QoS levels. This layer also exposes functionalities that a Cloud application developer can extend to perform complex workload profiling and application performance study. The top-most layer in the CloudSim stack is the User Code that exposes basic entities for hosts (number of machines, their specification and so on), applications (number of tasks and their requirements), VMs, number of users and their application types, and broker scheduling policies. By extending the basic entities given at this layer, a Cloud application developer can perform following activities:

A. Generate a mix of workload request distributions, application configurations;
B. Model Cloud availability 7 scenarios and perform robust tests based on the custom configurations; and
C. Implement custom application provisioning techniques for clouds and their federation CloudSim has been used to create the simulation environment. The inputs to the simulations are total number of tasks, average MI of tasks, MI deviation percentage, granularity size and task overhead time. The MIPS of each resource is specified in Table 1.1.

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This Dissertation adopts Cloud 3.0.3 to simulate the algorithm of task scheduling described previously. CloudSim 3.0.3 provides a series of core function for the establishment and simulation of heterogeneous distributed computing environment, particularly suitable for simulation and research of task scheduling on cloud. We simulated the algorithm with

1) six nodes
2) five seconds of granularity time
3) Average MI of tasks 10.

Results are tabulated in Table 2 and Table 3 below:

Table 1.1 MIPS of Cloud Resources

Resource	MIPS
R1	140
R2	156
R3	165
R4	302
R5	145
R6	205

Table 1.2 Simulation of Processing Time

Process Time in Seconds

No of Cloudlets	Purposed Based Algorithm	Sequential Algorithm
25	172.56	195.1
50	382.45	398.01
75	480.4	580.35
100	585.34	867.5

Table 1.3 Simulation of Processing Cost

Process Cost in Rs.

No of Cloudlets	Purposed Based Algorithm	Sequential Algorithm
25	424.21	445.45
50	775.02	865.51
75	891.35	958.61
100	1024.51	1278.31

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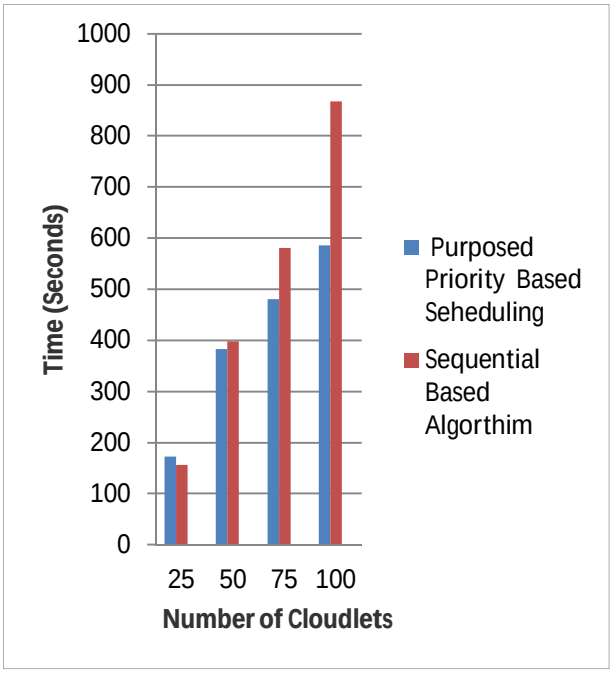
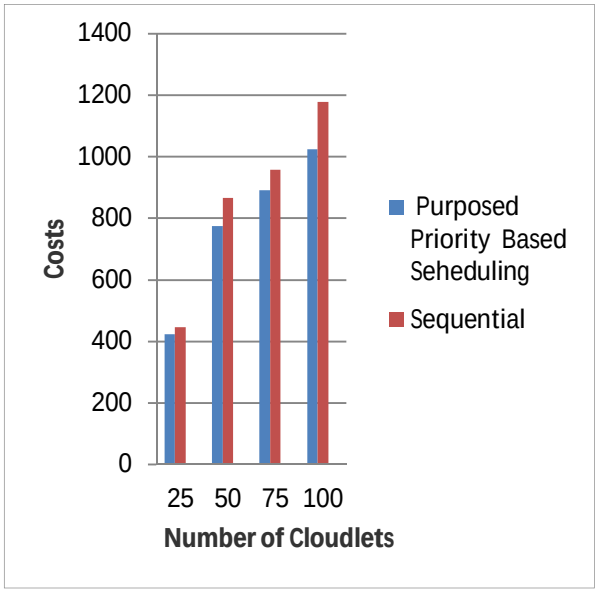
We have compared the results for processing time and processing cost for various numbers of Cloudlets namely 25, 50, 75 and 100.
Table 1 Compare with Priority Based Task scheduling algorithm with grouping on the basis of time taken for completion of the tasks for the values.
Graph 1 From the below Figure it can be seen that for Priority Based Task Scheduling the time taken to complete tasks after grouping the tasks is very less when compared with time taken to complete the tasks without grouping the tasks.
Graph 2 compares sequential based algorithm, scheduling algorithm with grouping on the basis of cost spent for processing the tasks for the values in Table 3
From the above Figure it can be seen that for sequential based algorithm, Scheduling the processing cost spent to complete tasks after grouping the tasks is very less when compared with the processing cost spent to complete the tasks without grouping the tasks.



Graph 1: Profit Based Task Scheduling for Processing Time



Graph 2: Priority Based Task Scheduling for Processing Cost

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From the above graphs, which show the comparison of completion time taken and processing cost spent for sequential based algorithm scheduling algorithm and purposed priority based scheduling algorithm, we can conclude that and purposed priority based the scheduling algorithm is better than sequential based algorithm scheduling algorithm.

VII. CONCLUSION

Cloud computing, or in simpler just "the cloud", also focuses on maximizing the shared resources. Cloud resources are usually not only shared by multiple users but are also dynamically reallocated per demand. This can work for allocating resources to user This work will be extended to design new algorithm which will provide more efficient result than the existing methods in near future.

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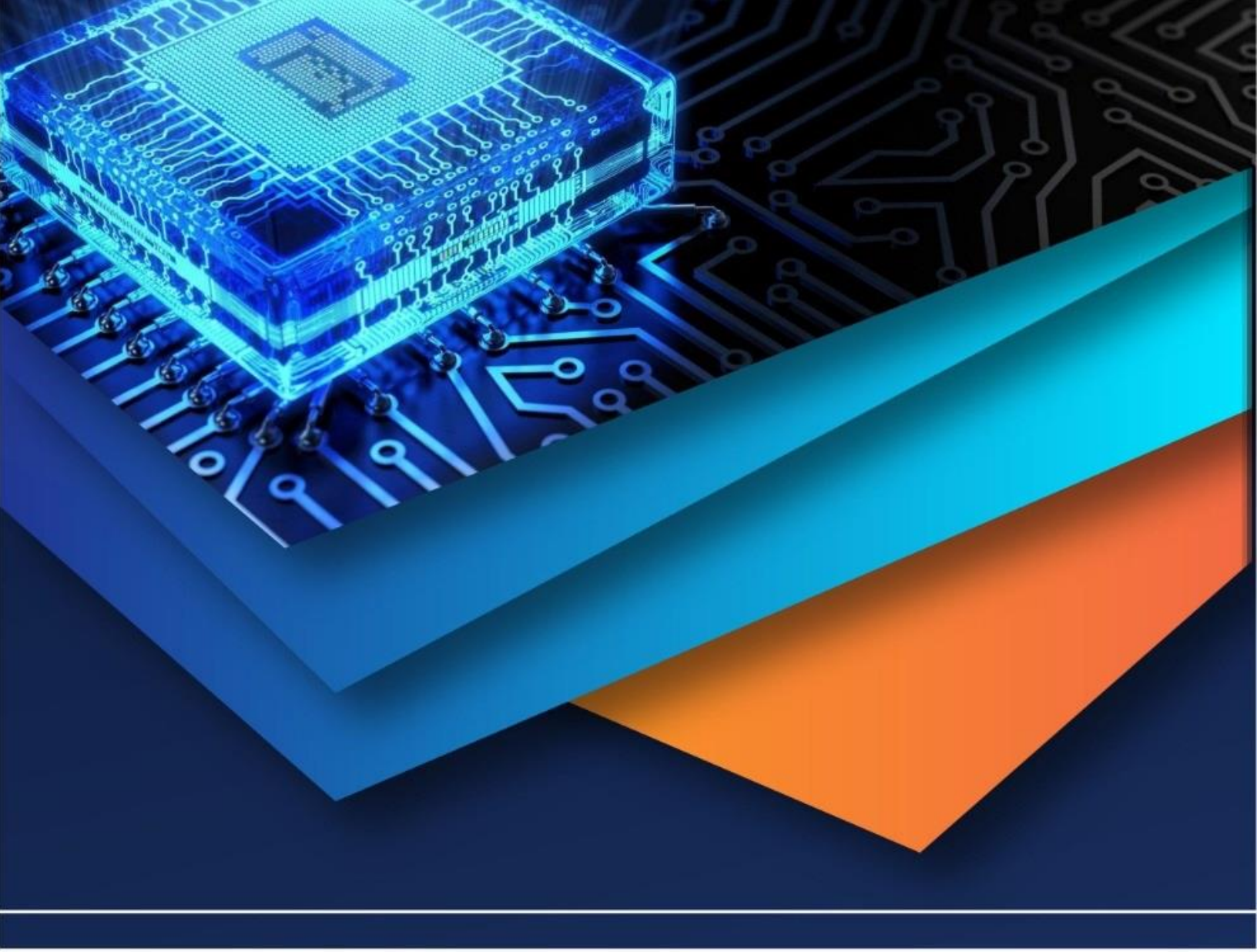

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