# Priority Based Task Scheduling for Cloud Computing

By

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A thesis submitted in partial fulfillment of the requirement for the degree of Bachelor of Science in Software Engineering

**Department of Software Engineering**

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# APPROVAL

This thesis titled on "**Priority Based Task Scheduling for Cloud Computing**", submitted by **Md. Saidul Islam (ID: 161-35-1602)** to the Department of Software Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Software Engineering and approval as to its style and contents.

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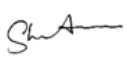

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I declare that this thesis paper has done by me under the supervision of Ms. Lamisha Rawshan, Senior Teacher, Dept. of Software Engineering, Daffodil International University. I am also announced that neither this thesis paper nor any parts of it have been submitted anyplace for any reason.

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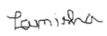

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# Abstract

In this chapter, we present a priority-based cloud task scheduling algorithm that prioritizes the task by adding after multiplying the four major task attributes (bandwidth, task length, cpu usage, memory) with their prioritization key. With the rapid growth in cloud technology, it's crucial to perform the task in the cloud environment efficiently. This research has focused to ensure the efficiency of cloud resources in the IaaS to distribute the cloud task among the cloud resources. After reviewing the recent research in cloud scheduling, it is found that most of the paper has given less significance to the bandwidth to ensure the cloud efficiency. In this paper, we create a relation between bandwidth with the cloud performance and we find that bandwidth is a key factor in cloud performance. It is more convenient to ensure the efficiency in cloud infrastructure.

**Keywords:** Cloud computing, IaaS, Scheduling, Bandwidth, Priority, Prioritize Key

# Chapter 1 Introduction

## 1.1 Background

With the vast advancement in information and communication technology, cloud computing has become a hot topic in the research field. Now, most of all the enterprise has moved to a cloud platform as the cloud has become more convenient than the traditional way of computing but still, there are some drawbacks of cloud scheduling algorithms to schedule the task to resources to perform more efficiently. That arises a huge waste of resources, time, energy, costs and environmental impact (Awada Uchechukwu, 2014) (Jordi, Tores;, 2014) (U.S Environmental Protection Agency, 2006). To get the most benefits of the cloud, the task should allocate to the resources most efficiently, and to do that a lot of methodologies have been adopted undertaking optimization perimeter. Typically, most of the cloud efficiency aware task scheduling has been taken the **Make Span, Execution Time, Response Time, Priority, Speed/Bandwidth** as their optimization attribute. In recent years, many researchers have been introduced different cloud task scheduling algorithms like the **Round Robin algorithm, Genetic algorithm, Ant colony optimization, min-min algorithm, Enhance Round Robin Algorithm, Pair Based Algorithm** (Omara & M. Alkhashai, 2016) (Hongjian Li, 2018) (A.Stephen, 2018) (Pandaba Pradhan, 2016) (Panda, 2018) to distribute the cloud task among the resources more efficiently.

## 1.2 Motivation of The Research

With the rapid growth of the internet, it opens a new door to develop cloud Applications and infrastructure. Cloud provides consumers to develop, host, manipulate cloud's storage, network, and operating system. As a result, it saves a lot of costs, resources, and time of the cloud service consumers as well as it is economically beneficial for both the providers and consumers. But a little traffic in the cloud infrastructure (cloud software, network, operating system, virtual server, virtual machine) can cause a great

degradation in cloud performance. It is reciprocal to the main object of a cloud-based system. My main aim to develop a model that can be helpful to improve the performance of cloud infrastructure**.**

### 1.3 Problem Statement

While reviewing the existing research paper, I found that most of the researcher has given the less significant to the importance of bandwidth or speed of task that has been submitted from a user machine but bandwidth is a crucial attribute to make a cloud infrastructure to perform its task efficiently. Another important key factor that I have noticed from the existing research that there is less significant research to find out the relation among the bandwidth and other efficient performance parameters for instances make span of a job, response time, execution time.

### 1.4 Research Question

Question 1: Is the proposed Prioritization Based Cloud Task Scheduling Algorithm effective?

Question 2: Is the implemented model providing better result as compared to the other cloud scheduling algorithm?

### 1.5 Research Objective

- To propose a new cloud task scheduling algorithm by prioritization the task with the prioritize value of the task
- To implement the algorithm
- To compare and evaluate the result with the existing algorithms

## 1.6 Thesis Organization

In this research, IEEE referencing system has been used in this document. The paper has been furnished with five chapters which is described below:

Chapter 1: In this chapter, background of the research, motivation of the research, the problem statement, research question and research objectives are given.

Chapter 2: In this chapter, I described my research theoretical base line.

Chapter 3: In this chapter, I describe the existing research and find out the research gap.

Chapter 4: In this chapter, describes the methodology and approach of my research.

Chapter 6: In this chapter include the research direction and future direction.

# Chapter 2 Theoretical Baseline

## 2.1 Cloud Computing:

Cloud computing can be defined as a method that provides fundamental resources of computing including applications, servers, storage for computing, services, networking, development, and deployment platform to the consumer as subscription-based services in a pay-as-you-go model.

Like distributed and parallel computing system, Cloud computing is a collection of virtualized computers which has an inter-connection and dynamic provision. It appears as a unified computing resource to consumer negotiating between consumer and cloud service providers based on **the Service Label Agreement**.

## 2.2 Cloud Computing Model Organization:

Cloud computing organized into three models which are

- Essential Characteristics of Cloud
- Cloud Service models
- Deployment models of Cloud

## 2.3 Cloud Essential Characteristics:

- **On-Demand Self-service**:

  In cloud computing, the provision of computing resources like server time or network storage can be done automatically by consumers unilaterally without human interaction with each service provider.

- **Broad Network Access**:

  Capabilities of Cloud are available from various client platforms like mobile, pc, laptop, tablet over the network using a standard protocol (Example: Http) mechanism.

- **Resource Pooling**:

  The provider computing resources can be pooled for serving multi-consumers using a model named **multi-tenant** model with different physical and virtual resources that are dynamically assigned and reassigned according to the demand of the user. Multi-tenancy is a sense of location independencies in which subscriber has no knowledge or control over the exact location of the provided resources but may specify location at a higher level of abstraction (e.g. country, state or datacenter). Examples of pooled resources are storage, processing, memory, network bandwidth, and virtual machines.

- **Rapid elasticity**:

  In Cloud computing, capabilities can be rapidly and elastically provisioned. In some cases, provision can be automatic for quick scale-out and rapidly released to quickly scale in. Consumer has availability of cloud capabilities which provisioned often appear to unlimited and user can be purchased in any quantity at any time.

- **Shared Infrastructure:**

  The most significant characteristic of cloud computing is sharing infrastructure. The cloud computing model uses a virtualized model and able to share physical services, storage, and networking capabilities. The infrastructure model makes the most of the infrastructure available across several users.

- **Measured Service**:

  Cloud uses an automatic metering capabilities to optimize resources of cloud infrastructure, oversee and control by leveraging a few levels of abstraction appropriate to the type of service (e.g., capacity, handling, and transfer speed) and for giving charging and detailing data straightforwardness for both the supplier and buyer of the utilized benefit.

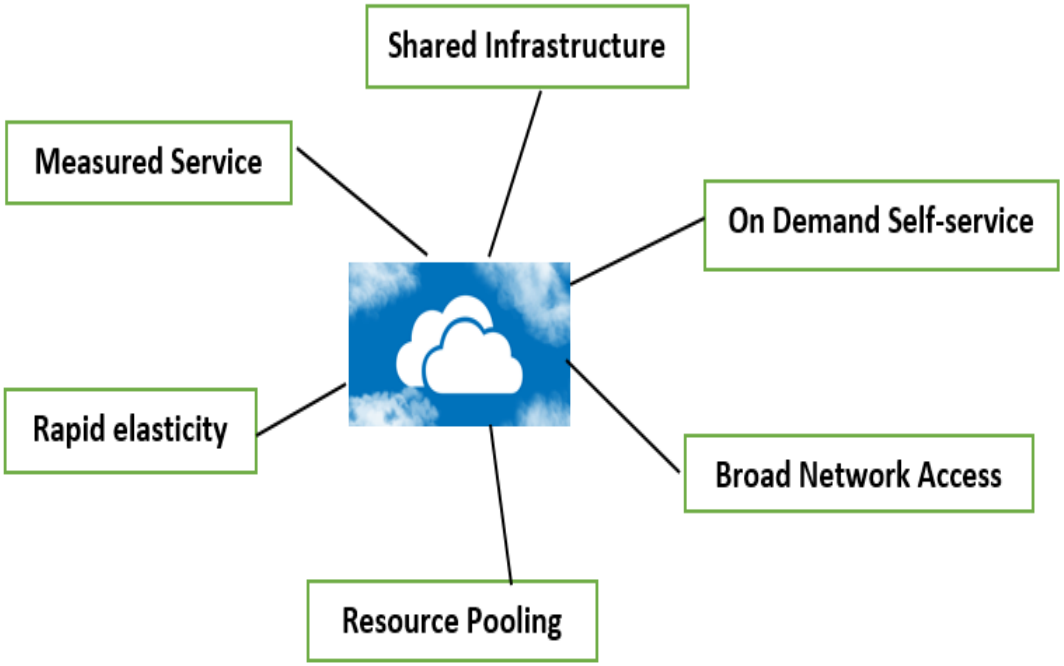


**Figure 1: Cloud Characteristics**

## 2.4 Service Models:

The cloud service model categorized into three service models.

- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)

## 2.5 Software as a Service:

Applications provided by the cloud providers in the cloud environment is known as Software as a Service. Users can access this software by internet from various IT devices through an interface like a web browser. In the SaaS model, the user has no access to cloud resources like network, servers, operating systems, storage.

❖ SaaS has some basic characteristics described below:

- **Availability through web browser**:
  SaaS applications do not require any installation on the user device. By any web browser which uses standard protocol mechanism, user can access this software.

- **Availability on-demand**:
  To use SaaS Software, the user does not need to go to any kind of sales process. By gaining access once, one can access SaaS software at any time from any place

- **Payment terms based on usage**:
  As the setup of the SaaS application has no complexity and it does not require any infrastructure investment, there is no massive cost in setup. Consumer has to pay for the service which is used by him/her. In case of stop service using, consumer does not need to pay any longer

- **Lower IT demands**:
- To use a SaaS application, there is no need to have a higher knowledge of IT as there is no complexity to setup.


**Figure 2: SaaS Application**

**2.6 Platform as a Service:**

In PaaS, consumer can deploy onto the cloud infrastructure but has no control in underlying cloud infrastructure. Consumers can create or acquired their application by using providers' programming language or tools. The PaaS gives the capabilities to consumers to control their deploying or acquiring applications.

- The basic characteristics of PaaS is described below:

– **Runtime Framework**:

PaaS can be defined as the "Software Stack". End-user code is executed by the runtime framework following the policies is set by the cloud provider and application owner.

- **Abstraction**:

  PaaS focuses on the application which must be supported by the cloud. A higher level of abstraction is distinguished for the Platform-oriented cloud application which cloud provides. During deploying an application in PaaS, PaaS assure the limitless pooling of cloud computing resources, eliminate the complexity of deployment and infrastructure configuration.

- **Automation**:

  If the deploying process which includes deploying the application, configuring application components, provisioning and configuring supporting technology like load balancers and databases and managing system change based on policies are set by the user, the cloud can automate the process. PaaS has also an ability to slash costs across the development, deployment and management aspects of the application life cycle.

- **Cloud Services**:

  For developers and architect, PaaS offers services and APIs which simplifies the job to deliver elastic, scalable, highly available cloud applications. Examples of cloud services and APIs are distributed caching, queuing and messaging, workload management, file and data storage, analytics and more.


**Figure 3: PaaS Application**

## 2.7 Infrastructure as a Service:

In Infrastructure as a Service model, consumer has capabilities to compute process, storage, networks, servers, and other computing resources and in IaaS, consumer can deploy and run arbitrary application which may include operating systems.


**Figure 4: IaaS Application**

- Basic characteristics of IaaS is described below:

– **Variety of services**:

IaaS provides a variety of services that includes hardware and as well as software resources. Resources that can be availed from IaaS through bandwidth, load balancers, virtual server space and many more.

- **Availability assurance**:

  IaaS promise an assurance of availability even a server ceases to function. By placing cloud resources among the multiple servers located in diverse locations. Service can be provided even in case of server failure or in the event of a total shutdown of a data center.

- **Accessibility**:

  Accessing in IaaS resources functionality available for consumers from any location. IaaS can be operated by single or multiple users by login credentials to help authorized users to avail of its services. IaaS also allows full accessibility in cloud infrastructure.

- **Scalability**:

  There is no need for any concern of organizations to resource provisioning in a cloud environment. IaaS can accommodate by varying degrees of resources requirements of the organizations by scaling up or scaling down. Additionally, cloud-based service including the IaaS application is also known for its flexibility and agility.

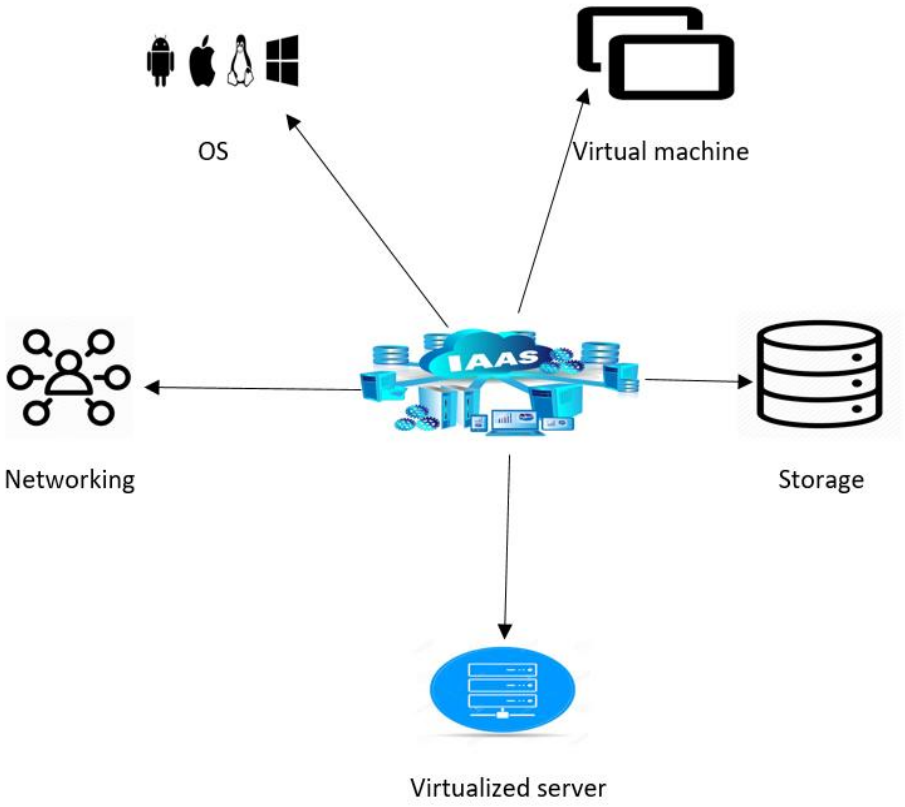


**Figure 5: Resource Accessible by IaaS**

## 2.8 Deployment Model of Cloud:

There are four deployment model in the cloud:

- Private cloud
- Public cloud
- Community cloud
- Hybrid cloud

- **Public Cloud**:

  Public cloud is not the exact thing which means by the word 'Public'. In the public cloud model, services are provided to the client by a third party servers through the internet. Services may be free or inexpensive. In the public cloud deployment model, the client's data is not publicly available; there is an access control mechanism provides by the vendors. Public cloud is an elastic, cost-effectiveness deployment strategy.

  **Example:** Email, Hosted Desktop, Website.

- **Private Cloud**:

  Like the public cloud, a private cloud deployment strategy also provides an elastic and beneficial service. Deployment, maintenance, and operation is done for a specific organization. In a private cloud model, deployed, maintained and operated for a specific organization. Public cloud deployment strategies is much secure than any other deployment strategy of a cloud.

  **Example**: Amazon, IBM, Cisco, Dell, Red

- **Hybrid Cloud**:

  Hybrid cloud is a combination of private and public cloud which are internally operated. In a cloud infrastructure, there can be different types of clouds. It must have an ability to allow data from one cloud to another through a web-like web 2.0 interfaces. A hybrid cloud is a solution to support that kind of requirement to retain information and provides correspondents services.

  **Example**: VM ware, Google, Amazon, Microsoft

- **Community Cloud:**

  If a cloud is shared, controlled and used by a group of organizations having shared interest can define as a community cloud. Shared organization has common requirements or common goal to achieve.

Access to the data and applications in the cloud is shared by the members of the community.

**Example**: Salesforce

❖ **Public Cloud vs Private Cloud vs Community Cloud vs Hybrid Cloud:**

| **Public Cloud** | **Private Cloud** | **Community Cloud** | **Hybrid Cloud** |
|---|---|---|---|
| 1. Cloud service is provided by providers is available on a commercial basis rendered by a third party. | 1. Cloud service is provided privately for a specific organization. | 1. Cloud service is shared by a group of organizations. | 1. A combination of public and private cloud. |
| 2. Due to vulnerabilities, the public cloud is not a secure deployment model. | 2. Highly secured as resources are not shared. | 2. As resources are shared among a group, there exists a security concern. | 2. Slightly secure than the public cloud. |
| 3. It is cost-effective as it does not require investing in expensive cloud infrastructure. | 3. High cost in investing expensive cloud infrastructure. | 3. The cost is higher than the public cloud. | 3. Scalability provides by the public cloud, one has to pay for extra capacity. |
| 4. It has no maintenance cost. | 4. Operating expenses are done by the company. | 4. Maintenance cost divides among the groups who share the cloud. | 4. It requires more maintenance resulting in higher operating expenses. |
| 5. The public cloud is less customizable. | 5. Highly customize the deployment model. | 5. Customers can be built their customized solutions. | 5. Organizations can customize resources. |

**Table 1: Public vs Private vs Community vs Hybrid Cloud**

## 2.9 Challenge and Issues in Cloud Computing:

Cloud computing has a very rapid growth. Its vast growth, some issues, and challenges arise which described below:

- **Security and Cloud**:

  Using cloud-oriented service means puts down or manipulation data on storage or a server that is owned and controlled by a third party organization. Is there any guarantee that Provider Company will not abuse consumer data? Information may theft or provider can share your data with others for lucrative interest. Till now, the cloud is facing a hard challenge to assure the security of consumer data and is considered as a big threat to the cloud. There is a need for a mechanism to markup integration with the cloud security system to cloud system providers.

- **Performance Degradation:**

  The base of cloud computing resources is the internet and the speed of the internet greatly affects the performance of the cloud. Data-intensive or transaction-intensive applications are highly effective when migrating to the public cloud. Performance is a major concern for this kind of application. Supporting tools like a load balancer, data replicators and servers need to install to have a good performance. The cloud process is questioned by some issues like energy consumption, ecological impact, business process, cost-aware service.

- **Availability Assurance:**

  Though cloud computing commits to provide an uninterrupted service, cloud service unavailability occurs once and again which has a great economic impact. Particularly, when demand increases, resources may unavailable resulting delay to provide service.

- **Managed Workload:**

  Managing database workload, development workload, transactional workload, analytical workload arising during accessing IaaS or developing a SaaS application using PaaS also remains a big concern in cloud computing.

- **Cost-Effectiveness:**

  There are cost issues in the cloud because it has a requirement to has a 24 hours open connection as well as huge costs in maintenance (e.g. private or hybrid model) or using a large amount of data back in-house.

## 2.10 Scheduling:

Scheduling is a set of actions and methodologies to allocate a job to a particular resource in an optimize way considering some constraints to achieve an optimized solution. For scheduling, the biggest challenge is to distribute the task among the resources in an order so that the scheduling can be in an optimized state.

### Need Of Scheduling In Cloud Computing:

Scheduling has a crucial impact on cloud infrastructure. The need of scheduling in cloud computing is described below:

- **Performance:**

  The performance of the cloud mainly depends on how efficiently resources are scheduled to process a job. If the user request is directly assigned to cloud resources, the performance of the cloud will have a great degradation as it arises a lot of load and increase the time delay. It also creates an internal network traffic.

- **Prevention Resource Wasting:**

  Scheduling saves resources from being wasted. No scheduling means that the task is not being executed in an optimized order. That's causes huge resources waste.

- **Save Time and Cost**:

  Scheduling assures the efficiency performance of the cloud. So, it is time and cost-effective.

- **To Ensure Availability:**

  The cloud promised uninterrupted services. Without efficient resource scheduling, it’s not possible to ensure availability.

## 2.11 Classification of Scheduling Algorithm in Cloud:

Scheduling in a cloud can be categorized into three main categories:

- **Resource Scheduling:** Scheduled resources to assign a task by finding an optimized solution.
- **Task Scheduling:** Scheduled task and assign in resource to find an optimized solution.
- **Workflow Management:** Define the sequences of steps for a solution which is optimized.

### Task Scheduling:

Task scheduling can be sub-categorized into six categories according to their optimization
Parameter.

| Scheduling | Optimization Parameter |
|---|---|
| Efficiency Aware Scheduling | Make Span, Execution Time, Response Time, Priority, Speed/Bandwidth |
| Energy-Aware Scheduling | Energy Consumption |
| Cost Aware Scheduling | Providers Revenue & Cost, Resource Cost, User Expenses |
| Load Balancing Aware Scheduling | Workload |
| Utilization Aware Scheduling | Utility Model |
| QoS Aware Scheduling | Availability, SLA, Throughput, Reliability |

**Table 2: Scheduling Algorithm and Their Optimization Parameter**

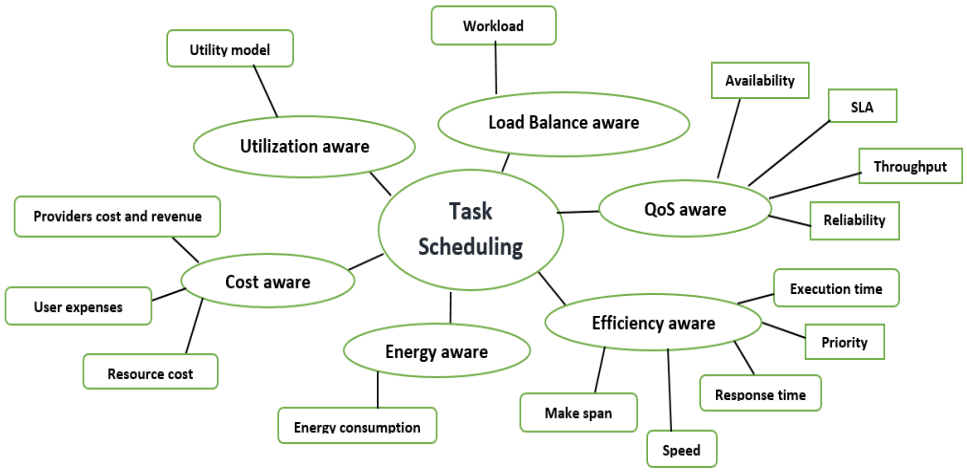


**Figure 6: Classification of Scheduling Algorithm**

## 2.12 Efficiency Aware Task Scheduling:

Efficiency aware scheduling algorithms deals with how efficiently cloud infrastructure perform. This kind of scheduling is assessed by specific performance optimization parameters like execution time, response time, speed/bandwidth, priority, make span of a job. Optimization parameter of a task scheduling is described shortly below:

- **Execution Time:**

  Time taken by a job to being completed its task is referred to as execution time. Let, execution time for a task is T; task arrives in queue at $T_0$th second and complete its task at $T_5$th second, then

$T_0$ $T_1$ $T_2$ $T_3$ $T_4$ $T_5$

Execution time, $T = \Delta T$ seconds

$= (T_5 - T_0)$ seconds

Execution time has a proportional relation to system performance. The system performance decrease if the execution time is high and increases when the execution time is low.

- **Response Time:**

  Response time is the elapsed time taken by cloud infrastructure between an inquiry to react and response for a request. It considered a measurement parameter of system performance. Low response time makes system performance-critical.

  Let, response time is R, the arrival time of a task T-1 is $T_5$th second and cloud infrastructure reacts on $T_{10}$th second then

$T_5$ $T_6$ $T_7$ $T_8$ $T_9$ $T_{10}$

Response Time, $R = \Delta T$ seconds

$= (T_{10} - T_5)$ seconds

- **Make Span of A Job**:

  The make span of a job refers to the time duration taken to complete a set of tasks that means the time difference of completing the time of the first task and last task in a set of jobs. The minimization of the make span of a job increases the system performance.

Let, there are three tasks T-1, T-2, T-3 in a set of jobs. The task T-1 has an execution time of 5 seconds, T-2 has its execution time of 5 seconds and task T-3 finished its execution at 2 seconds. The first task T-1 is started its execution at $T_0$th seconds and the finishing time of the last task T-3 is $T_{12}$th seconds, then

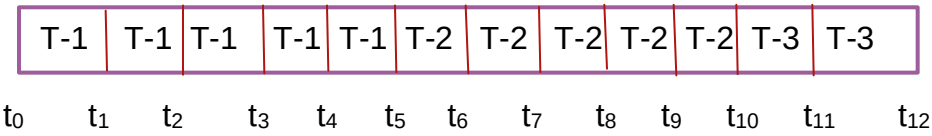


Figure: Gant Chart for Make Span of a Job

Make span of a job = $\Delta T$ seconds
= $(t_{12} - t_0)$ seconds

- **Bandwidth/ Speed:**

As the internet is the backbone of cloud computing, bandwidth plays a crucial role in assuring the efficiency of cloud performances. Performance and bandwidth are proportional to each other. In a heterogeneous system, task having a high bandwidth makes system performance fast. Contrary, low bandwidth makes system performance-critical.

- **Basic Scheduling Process:**

Scheduling process of an algorithm can group into three stages:

- **Resource Finding and Checking Status** :

Available resource is listed by the cloud provider to schedule the task submitted by the user. The status of working resources is also collected to make an efficient task scheduling.

- **Resource selection**:

  Resources are selected to execute a task base on specific constraints. Selection criteria of a resources assure tasks quality.

- **Task Submission**:

  The task is submitted to selected resources for execution.

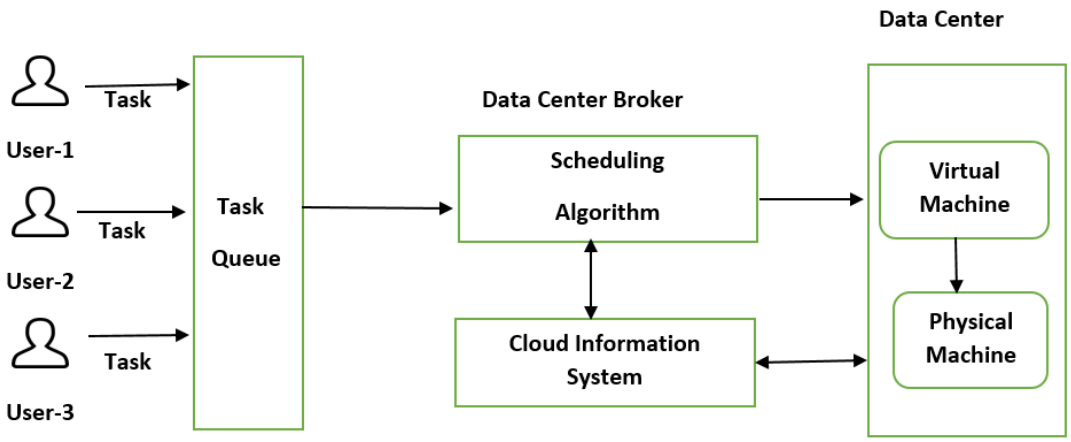


**Figure 7: Basic Scheduling Process**

## 2.13 Experimental Environment:

In cloud computing, the experiment of a new model or algorithm can be done in both simulation and realistic environment.

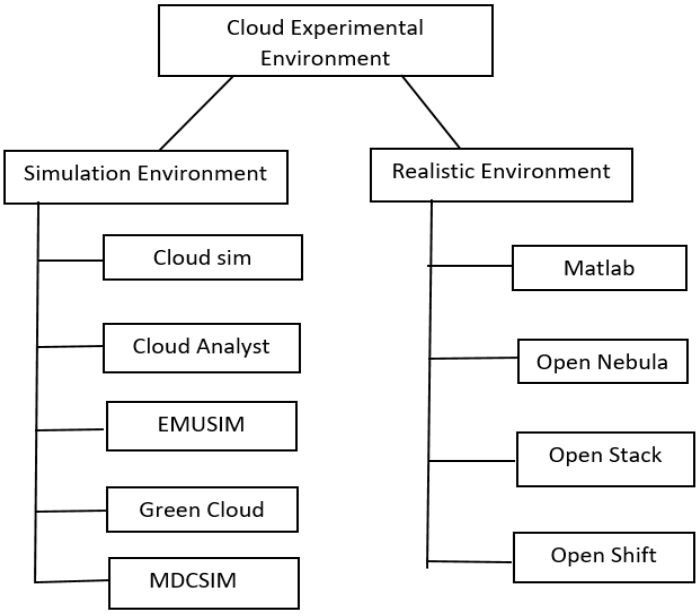


**Figure 8: Cloud Experimental Environment**

❖ **A Pie Chart of Cloud Experimental Environment:**

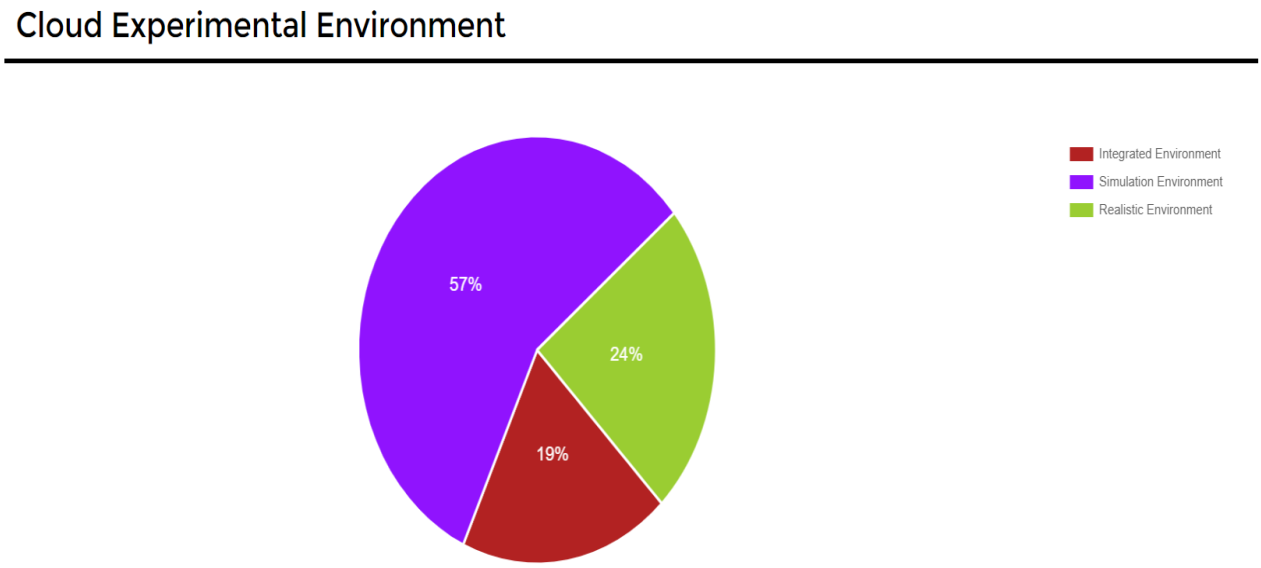


**Figure 9: Pie Chart of Cloud Experimental Environment**

From the pie chart, we find that simulation environment is the popular to simulate the cloud algorithm which accounts for 57% from my reviewing paper. Realistic environment and integrated occupies the 24% and 19% respectively.

# Chapter 3 Literature Review

## 3.2 Case Study in Cloud Task Scheduling

In this study, we present an overview of previous research to make the cloud environment more efficient.

A well-known cloud scheduling algorithm (Shubham Mittal, 2016) that is enhanced the round-robin algorithm to maintain the performance of the existing round-robin algorithm despite being having a large time quantum. They set the time quantum of the round-robin algorithm with the burst time of the smallest task but they don't provide any specific methodology to update the time quantum and if the largest task arrives fast, it has to wait till all the execution as its decrease the system performance.

(Hussin M. Alkhashai, 2016) Provides an algorithm to optimize the execution time of the heterogeneous tasks. They define the best mapping into heterogeneous resources to minimize the execution time and use the best-fit algorithm instead of random selection in the initial state of the PSO algorithm. But in their algorithm, there is a big research gap that they consider the all task is independent rather than dependent and that rises a time complexity and there is no specific methodology provided to control or reduce the complexity.

(Lailah M.Mustafa, 2014) Has given an algorithm that is concentrated on the minimizing the processing time of bandwidth aware task. They divide their methodology into two steps. At first, they identify the task and put them into a group. In second step, they mapping the grouping the task among the computing resources but their proposed methodology doesn't schedule the task parallel that means their task is submitting one by one.

(Auday AI-Dulaimy, 2015) Given information about the effect of bandwidth allocation on power efficiency in cloud data centers. They mainly discuss the effect of bandwidth limitation in the task scheduling process. Job execution is mainly divided into data processes (data stage in/out) and compute processes (actual execution). The proposed algorithm exploits the sequence of the job execution process to improve the utilization of the bandwidth of the physical machine.

(Bagherinia, 2015) Provide a methodology that primarily focuses on the scheduling task of the dynamic task. In their methodology, they load the balance in two times, predict the execution time of the task that is running and the load of the host is expressed by the average load of the virtual machine has. But their estimated load and execution time occurs error often.

(Xiaonian Wu, 2013) Provides quality of service-driven algorithm to schedule the task among the cloud computing resources. They schedule the task by prioritization of the task and are set to examine the task of mapping the task to the virtual machine. The task owned the max priority should be scheduled prior to the task with the lower priority.

(Sanjaya Kumar Panda, 2018) Given a cloud computing scheduling algorithm by pairs up the task and they make it more efficient by minimizing the layover time of the task (timing gaps between a paired tasks). They scheduled the task by setting up the task into two different groups and calculate their lease time. But their proposed algorithm is not suitable for the long task and there is a high time interval between the two tasks. The dynamism of the CPU and network usage has not considered in proposed algorithm.

(Hongjian Li S. D., 2018) Provides an energy-efficient algorithm concerning the high energy consumption in the data center. In this paper, they fully considers the heterogeneity of workload task in the data center and classify the task into different task classes with similar resources and performance requirements. But their proposed model depends on the workload types and application.

# Chapter 4 Research Methodology

To make a cloud environment more efficient, our proposed algorithm "**Priority based cloud scheduling algorithm**" has followed methodology.

## 4.1 Proposed Algorithm pseudo code

Start

task_length, cpu_usage, memory, bandwidth ← input

Function priority_task_calculation (task_length, cpu_usage, memory, bandwidth)

priority_task = pk*task_length+pk*cpu_usage+pk*memory+pk*bandwidth

End Function

priority_task. Sort (descending);

If vm_status = available then

priority_task = submitting

Else If

priority_task = waiting state

Else

If waiting state<5 then

priority_task = submitting

Else Priority_task = sent task to starting point

End If

End If

End

In my proposed Algorithm. The value of pk for task_length, cpu_usage, memory and bandwidth is pre-defined and the pre-defined below is how much priority we have given to the basic attribute of a cloud task. Bandwidth is the key factor to complete a task efficiently and fast. It could play a key role to make cloud more efficient. We have given priority then task_length, cpu_usage, memory respectively.

**Pk value:**

**Bandwidth = 4**

**Task_length = 3**

**Cpu_usage = 2**

**Memory = 1**

**Special note:** In our methodology, we assume that all the tasks are homogenous and independent.

### 4.2 Flowchart Diagram

The methodology is demonstrated by a flowchart below:

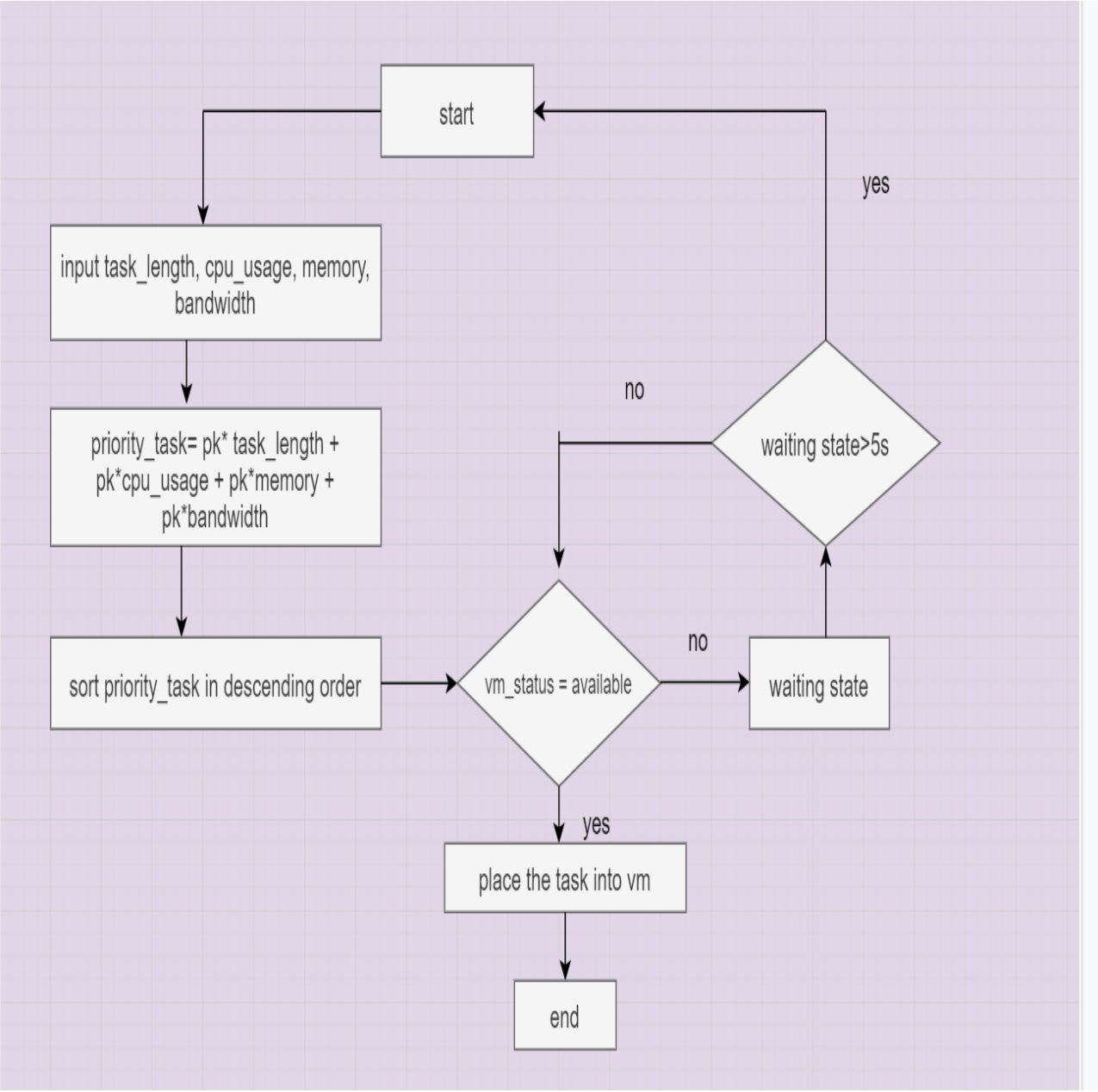


**Figure 10: Flowchart of Priority Based Cloud Task Scheduling**

**Special case**: If the value of two or more task value is same then we have set our criteria to set the priority of the task and that is displayed by the following diagram.

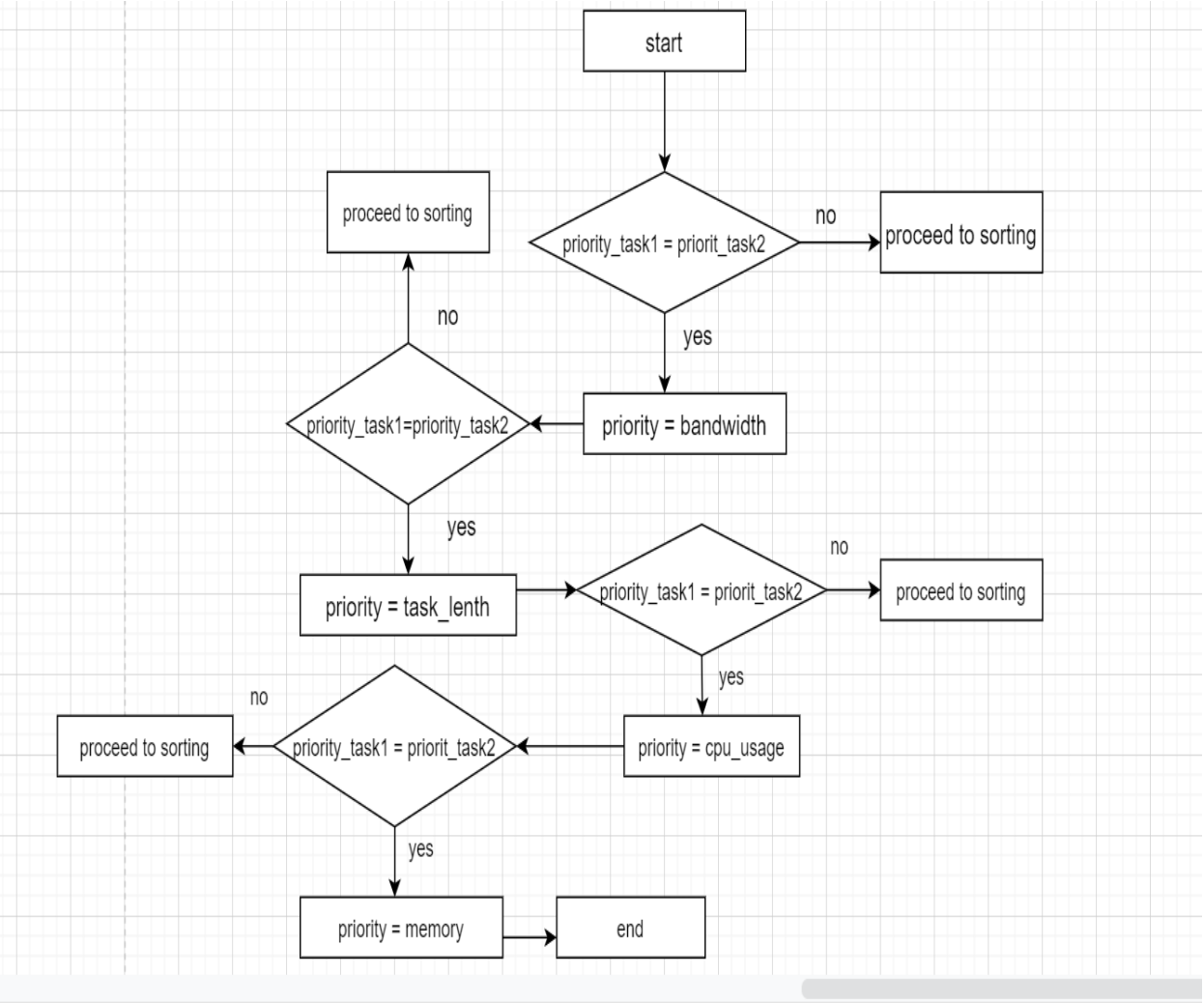


**Figure 11: Special Case**

From the diagram, we find that if the priority value of the two tasks are same, we set the task with the highest bandwidth as high. The procedure is followed by the task_length, cpu_usage, memory.

# CHAPTER 5

# RESULT ANALYSIS

## 5.1 Task and Task's value

Here I consider six homogenous task with a certain instruction volume and data in per instruction volume.

| Task | Instruction Volume | Data Volume |
|---|---|---|
| Task 1 | 796 | 574 |
| Task 2 | 459 | 398 |
| Task 3 | 344 | 267 |
| Task 4 | 985 | 769 |
| Task 5 | 572 | 472 |
| Task 6 | 1500 | 296 |

**Figure 12: Task and Task's Value**

Instruction volume = the number of instruction to be executed in a single task

Data volume = the number of data one instruction volume has

## 5.2 Result Comparison of Proposed Model with First-Fit Algorithm

| Task | Execution Time of Cloud Sim Default Algorithm (First Fit) | Execution Time (Proposed Model) |
|---|---|---|
| Task 1 | 7.96 | 5.74 |
| Task 2 | 4.59 | 4.98 |
| Task 3 | 3.44 | 3.67 |
| Task 4 | 9.85 | 9.69 |
| Task 5 | 5.72 | 4.72 |
| Task 6 | 15 | 11.5 |
| Average | 51.35 | 40.3 |

**Figure 13: Result Comparison**

From the table, It can be analyzed that the make span of a job is better with the proposed algorithm than the cloudsim default algorithm (First Fit) .But for a few task, the execution time is little bit larger than the First-Fit algorithm.

# Chapter 6

# Conclusions and Recommendations

## 6.1 Findings and Contributions:

In this paper, we proposed a new priority based cloud scheduling algorithm based on prioritize the task with their task attributes multiplying with prioritize key. This algorithm ensures the cloud efficiency that reduces the task traffic in cloud resources.

## 6.2 FUTURE DIRECTION

In the future, we will find out the reason behind the mixed execution time and solve it. We will also implement our proposed algorithm assuming the task is dependent and heterogeneous. We will add a machine-learning algorithm to find out the task priority value dynamically to make the algorithm more accurate.

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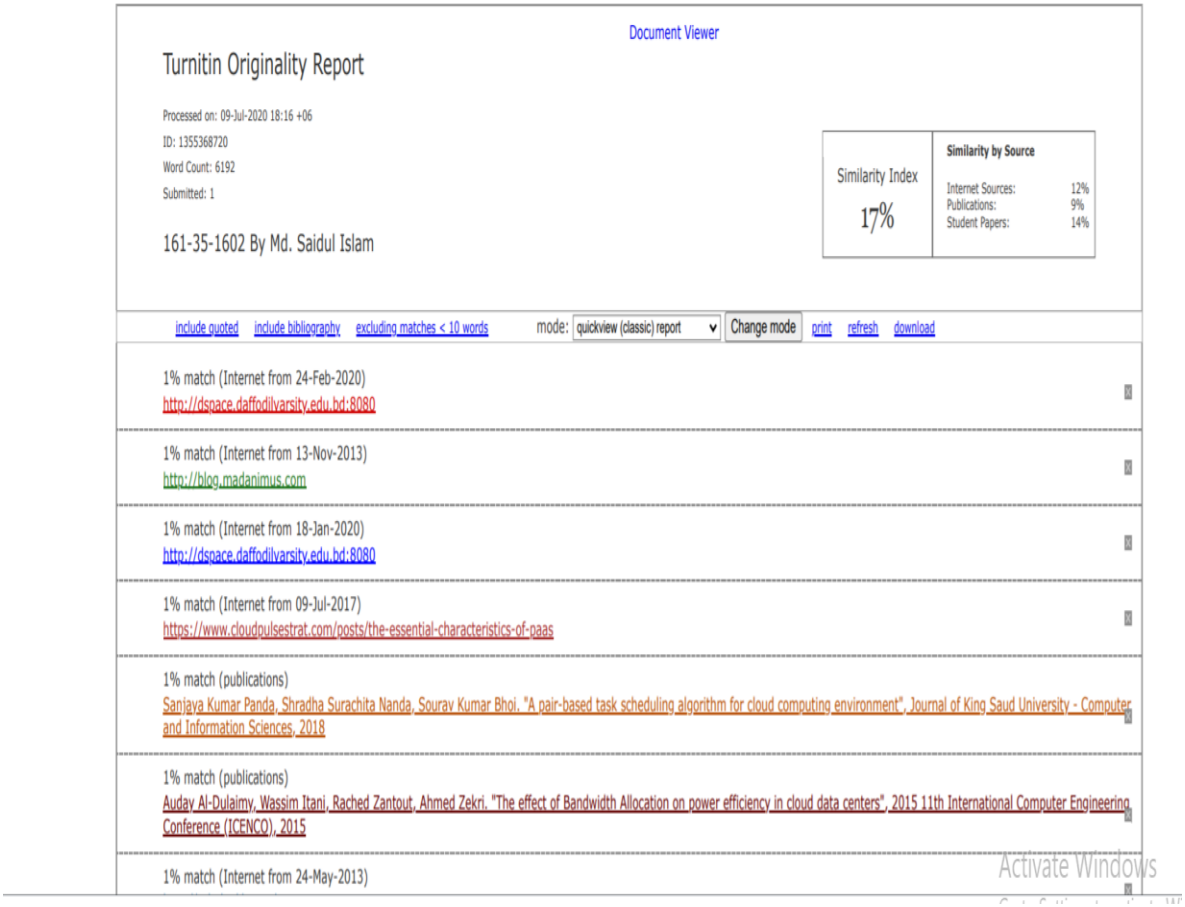

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submitted to selected resources for execution. Figure 7: Basic Scheduling Process 2.13 Experimental Environment: In cloud computing, the experiment of a new model or algorithm can be done in both simulation and realistic environment. Figure 8: Cloud Experimental Environment ©Daffodil International University ? A Pie Chart of Cloud Experimental Environment: Figure 9: Pie Chart of Cloud Experimental Environment From the pie chart, we find that simulation environment is the popular to simulate the cloud algorithm which accounts for 57% from my reviewing paper. Realistic environment and integrated occupies the 24% and 19% respectively. Chapter 3 Literature Review 3.2 Case Study in Cloud Task Scheduling In this study, we present an overview of previous research to make the cloud environment more efficient. A well-known cloud scheduling algorithm (Shubham Mittal, 2016) that is enhanced the round-robin algorithm to maintain the performance of the existing round-robin algorithm despite being having a large time quantum. They set the time quantum of the round-robin algorithm with the burst time of the smallest task but they don't provide any specific methodology to update the time quantum and if the largest task arrives fast, it has to wait till all the execution as its decrease the system performance. (Hussin M. Alkhashai, 2016) Provides an algorithm to optimize the execution time of the heterogeneous tasks. They define the best mapping into heterogeneous resources to minimize the execution time and use the best-fit algorithm instead of random selection in the initial state of the PSO algorithm. But in their algorithm, there is a big research gap that they consider the all task is independent rather than dependent and that rises a time complexity and there is no specific methodology provided to control or reduce the complexity. (Lailah M.Mustafa, 2014) Has given an algorithm that is concentrated on the minimizing the processing time of bandwidth aware task. They divide their methodology into two steps. At first, they identify the task and put them into a group. In second step, they mapping the grouping the task among the computing resources but their proposed methodology doesn't schedule the task parallel that means their task is submitting one by one. (Auday AI-Dulaimy, 2015) Given information about the effect of bandwidth allocation on power efficiency in cloud data centers. They mainly discuss the effect of bandwidth limitation in the task scheduling process. Job execution is mainly divided into data processes (data stage in/out) and compute processes (actual execution). The proposed algorithm exploits the sequence of the job execution process to improve the utilization of the bandwidth of the physical machine. ©Daffodil International University (Bagherinia, 2015) Provide a methodology that primarily focuses on the scheduling task of the dynamic task. In their methodology, they load the balance in two times, predict the execution time of the task that is running and the load of the host is expressed by the average load of the virtual machine has. But their estimated load and execution time occurs error often. (Xiaonian Wu, 2013) Provides quality of service-driven algorithm to schedule the task among the cloud computing resources. They schedule the task by prioritization of the task and are set to examine the task of mapping the task to the virtual machine. The task owned the max priority should be scheduled prior to the task with the lower priority. (Sanjaya Kumar Panda, 2018) Given a cloud computing scheduling algorithm by pairs up the task and they make it more efficient by minimizing the layover time of the task (timing gaps between a paired tasks). They scheduled the task by setting up the task into two different groups and calculate their lease time. But their proposed algorithm is not suitable for the long task and there is a high time interval between the two tasks. The dynamism of the CPU and network usage has not considered in proposed algorithm. (Hongjian Li S. D., 2018) Provides an energy-efficient algorithm concerning the high energy consumption in the data center. In this paper, they fully considers the heterogeneity of workload task in the data center and classify the task into different task classes with similar resources and performance requirements. But their proposed model depends on the workload types and application. Chapter 4 Research Methodology To make a cloud environment more efficient, our proposed algorithm "Priority based cloud scheduling algorithm" has followed methodology. 4.1 Proposed Algorithm pseudo code Start task_length, cpu_usage, memory, bandwidth ? input Function priority_task_calculation (task_length, cpu_usage, memory, bandwidth) priority_task = pk*task_length+pk*cpu_usage+pk*memory+pk*bandwidth End Function priority_task. Sort (descending); If vm_status = available then priority_task = submitting Else If priority_task = waiting state Else If waiting state<5 then priority_task = submitting Else Priority_task = sent task to starting point ©Daffodil International University End If End If End In my proposed Algorithm. The value of pk for task_length, cpu_usage, memory and bandwidth is pre-defined and the pre-defined below is how much priority we have given to the basic attribute of a cloud task. Bandwidth is the key factor to complete a task efficiently and fast. It could play a key role to make cloud more efficient. We have given priority then task_length, cpu_usage, memory respectively. Pk value: Bandwidth = 4 Task_length = 3 Cpu_usage = 2 Memory = 1 Special note: In our methodology, we assume that all the tasks are homogenous and independent. ©Daffodil International University 4.2 Flowchart Diagram The methodology is demonstrated by a flowchart below: Figure 10: Flowchart of Priority Based Cloud Task Scheduling ©Daffodil International University Special case: If the value of two or more task value is same then we have set our criteria to set the priority of the task and that is displayed by the following diagram. Figure 11: Special Case From the diagram, we find that if the priority value of the two tasks are same, we set the task with the highest bandwidth as high. The procedure is followed by the task_length, cpu_usage, memory. CHAPTER 5 RESULT ANALYSIS 5.1 Task and Task's value Here I consider six homogenous task with a certain instruction volume and data in per instruction volume. Figure 12: Task and Task's Value Instruction volume = the number of instruction to be executed in a single task Data volume = the number of data one instruction volume has ©Daffodil International University 5.2 Result Comparison of Proposed Model with First-Fit Algorithm Figure 13: Result Comparison From the table, It can be analyzed that the make span of a job is better with the proposed algorithm than the cloudsim default algorithm (First Fit) .But for a few task, the execution time is little bit larger than the First-Fit algorithm. ©Daffodil International University Chapter 6 Conclusions and Recommendations 6 .1 Findings and Contributions: In this paper, we proposed a new priority based cloud scheduling algorithm based on prioritize the task with their task attributes multiplying with prioritize key. 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publicly available; there is an access control mechanism provides by the vendors. Public cloud is an elastic, cost- effectiveness deployment strategy. Example: Email, Hosted Desktop, Website. • Private Cloud: Like the public cloud, a private cloud deployment strategy also provides an elastic and beneficial service. Deployment, maintenance, and operation is done for a specific organization. In a private cloud model, deployed, maintained and operated for a specific organization. Public cloud deployment strategies is much secure than any other deployment strategy of a cloud. Example: Amazon, IBM, Cisco, Dell, Red • Hybrid Cloud: Hybrid cloud is a combination of private and public cloud which are internally operated. In a cloud infrastructure, there can be different types of clouds. It must have an ability to allow data from one cloud to another through a web-like web 2.0 interfaces. A hybrid cloud is a solution to support that kind of requirement to retain information and provides correspondents services. Example: VM ware, Google, Amazon, Microsoft • Community Cloud: If a cloud is shared, controlled and used by a group of organizations having shared interest can define as a community cloud. Shared organization has common requirements or common goal to achieve. ©Daffodil International University Access to the data and applications in the cloud is shared by the members of the community. Example: Salesforce ? Public Cloud vs Private Cloud vs Community Cloud vs Hybrid Cloud: Public Cloud Private Cloud Community Cloud Hybrid Cloud 1. Cloud service is provided by providers is available on a commercial basis rendered by a third party. 1. Cloud service is provided privately for a specific organization. 1. Cloud service is shared by a group of organizations. 1. A combination of public and private cloud. 2. Due to vulnerabilities, the public cloud is not a secure deployment model. 2. Highly secured as resources are not shared. 2. As resources are shared among a group, there exists a security concern. 2. Slightly secure than the public cloud. 3. It is cost-effective as it does not require investing in expensive cloud infrastructure. 3. High cost in investing expensive cloud infrastructure. 3. The cost is higher than the public cloud. 3. Scalability provides by the public cloud, one has to pay for extra capacity. 4. It has no maintenance cost. 4. Operating expenses are done by the company. 4. Maintenance cost divides among the groups who share the cloud. 4. It requires more maintenance resulting in higher operating expenses. 5. The public cloud is less customizable. 5. Highly customize the deployment model. 5. Customers can be built their customized solutions. 5. Organizations can customize resources. Table 1: Public vs Private vs Community vs Hybrid Cloud ©Daffodil International University 2.9 Challenge and Issues in Cloud Computing: Cloud computing has a very rapid growth. Its vast growth, some issues, and challenges arise which described below: • Security and Cloud: Using cloud-oriented service means puts down or manipulation data on storage or a server that is owned and controlled by a third party organization. Is there any guarantee that Provider Company will not abuse consumer data? Information may theft or provider can share your data with others for lucrative interest. Till now, the cloud is facing a hard challenge to assure the security of consumer data and is considered as a big threat to the cloud. There is a need for a mechanism to markup integration with the cloud security system to cloud system providers. • Performance Degradation: The base of cloud computing resources is the internet and the speed of the internet greatly affects the performance of the cloud. Data-intensive or transaction- intensive applications are highly effective when migrating to the public cloud. Performance is a major concern for this kind of application. Supporting tools like a load balancer, data replicators and servers need to install to have a good performance. The cloud process is questioned by some issues like energy consumption, ecological impact, business process, cost-aware service. • Availability Assurance: Though cloud computing commits to provide an uninterrupted service, cloud service unavailability occurs once and again which has a great economic impact. Particularly, when demand increases, resources may unavailable resulting delay to provide service. • Managed Workload: Managing database workload, development workload, transactional workload, analytical workload arising during accessing IaaS or developing a SaaS application using PaaS also remains a big concern in cloud computing. ©Daffodil International University • Cost-Effectiveness: There are cost issues in the cloud because it has a requirement to has a 24 hours open connection as well as huge costs in maintenance (e.g. private or hybrid model) or using a large amount of data back in-house. 2.10 Scheduling: Scheduling is a set of actions and methodologies to allocate a job to a particular resource in an optimize way considering some constraints to achieve an optimized solution. For scheduling, the biggest challenge is to distribute the task among the resources in an order so that the scheduling can be in an optimized state. Need Of Scheduling In Cloud Computing: Scheduling has a crucial impact on cloud infrastructure. The need of scheduling in cloud computing is described below: • Performance: The performance of the cloud mainly depends on how efficiently resources are scheduled to process a job. If the user request is directly assigned to cloud resources, the performance of the cloud will have a great degradation as it arises a lot of load and increase the time delay. It also creates an internal network traffic. • Prevention Resource Wasting: Scheduling saves resources from being wasted. No scheduling means that the task is not being executed in an optimized order. That's causes huge resources waste. • Save Time and Cost: Scheduling assures the efficiency performance of the cloud. So, it is time and cost-effective. • To Ensure Availability: The cloud promised uninterrupted services. Without efficient resource scheduling, it's not possible to ensure availability. ©Daffodil International University 2.11 Classification of Scheduling Algorithm in Cloud: Scheduling in a cloud can be categorized into three main categories: • Resource Scheduling: Scheduled resources to assign a task by finding an optimized solution. • Task Scheduling: Scheduled task and assign in resource to find an optimized solution. • Workflow Management: Define the sequences of steps for a solution which is optimized. Task Scheduling: Task scheduling can be sub-categorized into six categories according to their optimization Parameter. Scheduling Optimization Parameter Efficiency Aware Scheduling Make Span, Execution Time, Response Time, Priority, Speed/Bandwidth Energy-Aware Scheduling Energy Consumption Cost Aware Scheduling Providers Revenue & Cost, Resource Cost, User Expenses Load Balancing Aware Scheduling Workload Utilization Aware Scheduling Utility Model QoS Aware Scheduling Availability, SLA, Throughput, Reliability Table 2: Scheduling Algorithm and Their Optimization Parameter ©Daffodil International University Figure 6: Classification of Scheduling Algorithm 2.12 Efficiency Aware Task Scheduling: Efficiency aware scheduling algorithms deals with how efficiently cloud infrastructure perform. This kind of scheduling is assessed by specific performance optimization parameters like execution time, response time, speed/bandwidth, priority, make span of a job. Optimization parameter of a task scheduling is described shortly below: • Execution Time: Time taken by a job to being completed its task is referred to as execution time. Let, execution time for a task is T; task arrives in queue at T0th second and complete its task at T5th second, then T0 T1 T2 T3 T4 T5 Execution time, T ? ?T seconds ? (T5 ? T0) seconds Execution time has a proportional relation to system performance. The system performance decrease if the execution time is high and increases when the execution time is low. • Response Time: Response time is the elapsed time taken by cloud infrastructure between an inquiry to react and response for a request. It considered a measurement parameter of system performance. Low response time makes system performance-critical. Let, response time is R, the arrival time of a task T-1 is T5th second and cloud infrastructure reacts on T10th second then T5 T6 T7 T8 T9 T10 Response Time, R ? ?T seconds ? (T10 ? T5) seconds • Make Span of A Job: The make span of a job refers to the time duration taken to complete a set of tasks that means the time difference of completing the time of the first task and last task in a set of jobs. The minimization of the make span of a job increases the system performance. ©Daffodil International University Let, there are three tasks T-1, T-2, T-3 in a set of jobs. The task T- 1 has an execution time of 5 seconds, T-2 has its execution time of 5 seconds and task T-3 finished its execution at 2 seconds. The first task T-1 is started its execution at T0th seconds and the finishing time of the last task T-3 is T12th seconds, then T-1 T-1 T-1 T-1 T-1 T-2 T-2 T-2 T-2 T- 3 T-3 t0 t1 t2 t3 t4 t5 t6 t7 t8 t9 t10 t11 t12 Figure: Gant Chart for Make Span of a Job Make span of a job ? ?T seconds ? (t12 ? t0) seconds • Bandwidth/ Speed: As the internet is the backbone of cloud computing, bandwidth plays a crucial role in assuring the efficiency of cloud performances. Performance and bandwidth are proportional to each other. In a heterogeneous system, task having a high bandwidth makes system performance fast. Contrary, low bandwidth makes system performance-critical. ? Basic Scheduling Process: Scheduling process of an algorithm can group into three stages: • Resource Finding and Checking Status : Available resource is listed by the cloud provider to schedule the task submitted by the user. The status of working resources is also collected to make an efficient task scheduling. • Resource selection: Resources are selected to execute a task base on specific constraints. Selection criteria of a resources assure tasks quality. • Task Submission: The task is

Problem Statement While reviewing the existing research paper, I found that most of the researcher has given the less significant to the importance of bandwidth or speed of task that has been submitted from a user machine but bandwidth is a crucial attribute to make a cloud infrastructure to perform its task efficiently. Another important key factor that I have noticed from the existing research that there is less significant research to find out the relation among the bandwidth and other efficient performance parameters for instances make span of a job, response time, execution time. 1.4 Research Question Question 1: Is the proposed Prioritization Based Cloud Task Scheduling Algorithm effective? Question 2: Is the implemented model providing better result as compared to the other cloud scheduling algorithm? 1.5 Research Objective ? To propose a new cloud task scheduling algorithm by prioritization the task with the prioritize value of the task ? To implement the algorithm ? To compare and evaluate the result with the existing algorithms ©Daffodil International University 1.6 Thesis Organization In this research, IEEE referencing system has been used in this document. The paper has been furnished with five chapters which is described below: Chapter 1: In this chapter, background of the research, motivation of the research, the problem statement, research question and research objectives are given. Chapter 2: In this chapter, I described my research theoretical base line. Chapter 3: In this chapter, I describe the existing research and find out the research gap. Chapter 4: In this chapter, describes the methodology and approach of my research. Chapter 6: In this chapter include the research direction and future direction. ©Daffodil International University Chapter 2 Theoretical Baseline 2.1 Cloud Computing: Cloud computing can be defined as a method that provides fundamental resources of computing including applications, servers, storage for computing, services, networking, development, and deployment platform to the consumer as subscription-based services in a pay-as-you-go model. Like distributed and parallel computing system, Cloud computing is a collection of virtualized computers which has an inter-connection and dynamic provision. It appears as a unified computing resource to consumer negotiating between consumer and cloud service providers based on the Service Label Agreement. 2.2 Cloud Computing Model Organization: Cloud computing organized into three models which are ? Essential Characteristics of Cloud ? Cloud Service models ? Deployment models of Cloud 2.3 Cloud Essential Characteristics: • On-Demand Self-service: In cloud computing, the provision of computing resources like server time or network storage can be done automatically by consumers unilaterally without human interaction with each service provider. • Broad Network Access: Capabilities of Cloud are available from various client platforms like mobile, pc, laptop, tablet over the network using a standard protocol (Example: Http) mechanism. ©Daffodil International University • Resource Pooling: The provider computing resources can be pooled for serving multi- consumers using a model named multi-tenant model with different physical and virtual resources that are dynamically assigned and reassigned according to the demand of the user. Multi-tenancy is a sense of location independencies in which subscriber has no knowledge or control over the exact location of the provided resources but may specify location at a higher level of abstraction (e.g. country, state or datacenter). Examples of pooled resources are storage, processing, memory, network bandwidth, and virtual machines. • Rapid elasticity: In Cloud computing, capabilities can be rapidly and elastically provisioned. In some cases, provision can be automatic for quick scale-out and rapidly released to quickly scale in. Consumer has availability of cloud capabilities which provisioned often appear to unlimited and user can be purchased in any quantity at any time. • Shared Infrastructure: The most significant characteristic of cloud computing is sharing infrastructure. The cloud computing model uses a virtualized model and able to share physical services, storage, and networking capabilities. The infrastructure model makes the most of the infrastructure available across several users. • Measured Service: Cloud uses an automatic metering capabilities to optimize resources of cloud infrastructure, oversee and control by leveraging a few levels of abstraction appropriate to the type of service (e.g., capacity, handling, and transfer speed) and for giving charging and detailing data straightforwardness for both the supplier and buyer of the utilized benefit. ©Daffodil International University Figure 1: Cloud Characteristics 2.4 Service Models: The cloud service model categorized into three service models. › Software as a Service (SaaS) › Platform as a Service (PaaS) › Infrastructure as a Service (IaaS) ©Daffodil International University 2.5 Software as a Service: Applications provided by the cloud providers in the cloud environment is known as Software as a Service. Users can access this software by internet from various IT devices through an interface like a web browser. In the SaaS model, the user has no access to cloud resources like network, servers, operating systems, storage. ? SaaS has some basic characteristics described below: ? Availability through web browser: SaaS applications do not require any installation on the user device. By any web browser which uses standard protocol mechanism, user can access this software. ? Availability on-demand: To use SaaS Software, the user does not need to go to any kind of sales process. By gaining access once, one can access SaaS software at any time from any place ? Payment terms based on usage: As the setup of the SaaS application has no complexity and it does not require any infrastructure investment, there is no massive cost in setup. Consumer has to pay for the service which is used by him/her. In case of stop service using, consumer does not need to pay any longer ? ? Lower IT demands: To use a SaaS application, there is no need to have a higher knowledge of IT as there is no complexity to setup. ©Daffodil International University Figure 2: SaaS Application 2.6 Platform as a Service: In PaaS, consumer can deploy onto the cloud infrastructure but has no control in underlying cloud infrastructure. Consumers can create or acquired their application by using providers' programming language or tools. The PaaS gives the capabilities to consumers to control their deploying or acquiring applications. ? The basic characteristics of PaaS is described below: ? Runtime Framework: PaaS can be defined as the "Software Stack". End-user code is executed by the runtime framework following the policies is set by the cloud provider and application owner. ©Daffodil International University ? Abstraction: PaaS focuses on the application which must be supported by the cloud. A higher level of abstraction is distinguished for the Platform-oriented cloud application which cloud provides. During deploying an application in PaaS, PaaS assure the limitless pooling of cloud computing resources, eliminate the complexity of deployment and infrastructure configuration. ? Automation: If the deploying process which includes deploying the application, configuring application components, provisioning and configuring supporting technology like load balancers and databases and managing system change based on policies are set by the user, the cloud can automate the process. PaaS has also an ability to slash costs across the development, deployment and management aspects of the application life cycle. ? Cloud Services: For developers and architect, PaaS offers services and APIs which simplifies the job to deliver elastic, scalable, highly available cloud applications. Examples of cloud services and APIs are distributed caching, queuing and messaging, workload management, file and data storage, analytics and more. Figure 3: PaaS Application ©Daffodil International University 2.7 Infrastructure as a Service: In Infrastructure as a Service model, consumer has capabilities to compute process, storage, networks, servers, and other computing resources and in IaaS, consumer can deploy and run arbitrary application which may include operating systems. Figure 4: IaaS Application ? Basic characteristics of IaaS is described below: ? Variety of services: IaaS provides a variety of services that includes hardware and as well as software resources. Resources that can be availed from IaaS through bandwi dth, load balancers, virtual server space and many more. ©Daffodil International University ? Availability assurance: IaaS promise an assurance of availability even a server ceases to function. By placing cloud resources among the multiple servers located in diverse locations. Service can be provided even in case of server failure or in the event of a total shutdown of a data center. ? Accessibility: Accessing in IaaS resources functionality available for consumers from any location. IaaS can be operated by single or multiple users by login credentials to help authorized users to avail of its services. IaaS also allows full accessibility in cloud infrastructure. ? Scalability: There is no need for any concern of organizations to resource provisioning in a cloud environment. IaaS can accommodate by varying degrees of resources requirements of the organizations by scaling up or scaling down. Additionally, cloud-based service including the IaaS application is also known for its flexibility and agility. ©Daffodil International University Figure 5: Resource Accessible by IaaS 2.8 Deployment Model of Cloud: There are four deployment model in the cloud: › Private cloud › Public cloud › Community cloud › Hybrid cloud ©Daffodil International University • Public Cloud: Public cloud is not the exact thing which means by the word 'Public'. In the public cloud model, services are provided to the client by a third party servers through the internet. Services may be free or inexpensive. In the public cloud deployment model, the client's data is not

approach and steady supervision by Ms. Lamisha Rawshan. Without her information and guideline, I will not be able to finish this paper. I express my strong thankfulness to my parents, my supervisor for her kind co-operation and consolation and time, my batch mate. ©Daffodil International University iv Table of Contents
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Parameter.....17 ©Daffodil International University vii Abstract In this chapter, we present a priority-based cloud task scheduling algorithm that prioritizes the task by adding after multiplying the four major task attributes (bandwidth, task length, cpu usage, memory) with their prioritization key. With the rapid growth in cloud technology, it's crucial to perform the task in the cloud environment efficiently. This research has focused to ensure the efficiency of cloud resources in the IaaS to distribute the cloud task among the cloud resources. After reviewing the recent research in cloud scheduling, it is found that most of the paper has given less significance to the bandwidth to ensure the cloud efficiency. In this paper, we create a relation between bandwidth with the cloud performance and we find that bandwidth is a key factor in cloud performance. It is more convenient to ensure the efficiency in cloud infrastructure. Keywords: Cloud computing, IaaS, Scheduling, Bandwidth, Priority, Prioritize Key ©Daffodil International University viii i Chapter 1 Introduction 1.1 Background With the vast advancement in information and communication technology, cloud computing has become a hot topic in the research field. Now, most of all the enterprise has moved to a cloud platform as the cloud has become more convenient than the traditional way of computing but still, there are some drawbacks of cloud scheduling algorithms to schedule the task to resources to perform more efficiently. That arises a huge waste of resources, time, energy, costs and environmental impact (Awada Uchechukwu, 2014) (Jordi, Torres, 2014) (U.S Environmental Protection Agency, 2006). To get the most benefits of the cloud, the task should allocate to the resources most efficiently, and to do that a lot of methodologies have been adopted undertaking optimization perimeter. Typically, most of the cloud efficiency aware task scheduling has been taken the Make Span, Execution Time, Response Time, Priority, Speed/Bandwidth as their optimization attribute. In recent years, many researchers have been introduced different cloud task scheduling algorithms like the Round Robin algorithm, Genetic algorithm, Ant colony optimization, min-min algorithm, Enhance Round Robin Algorithm, Pair Based Algorithm (Omara & M. Alkhashai, 2016) (Hongjian Li, 2018) (A.Stephen, 2018) (Pandaba Pradhan, 2016) (Panda, 2018) to distribute the cloud task among the resources more efficiently. 1.2 Motivation of The Research With the rapid growth of the internet, it opens a new door to develop cloud Applications and infrastructure. Cloud provides consumers to develop, host, manipulate cloud's storage, network, and operating system. As a result, it saves a lot of costs, resources, and time of the cloud service consumers as well as it is economically beneficial for both the providers and consumers. But a little traffic in the cloud infrastructure (cloud software, network, operating system, virtual server, virtual machine) can cause a great ©Daffodil International University degradation in cloud performance. It is reciprocal to the main object of a cloud-based system. My main aim to develop a model that can be helpful to improve the performance of cloud infrastructure. 1.3





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Department of Software Engineering Daffodil International University Thesis paper on "PRIORITY BASED CLOUD TASK SCHEDULING" Supervisor: Ms. Lamisha Rawshan Submitted: 18 June, 2020 Author: Md. Saidul Islam ID: 161-35-1602 Spring 2020 i Approval This thesis titling "Priority Based Task Scheduling for Cloud" submitted by Md. Saidul Islam, bearing Id 161 -35- 1602 to the Dept. of Software Engineering, Daffodil International University has been acknowledged as palatable for the fractional fulfillment of the prerequisites for the degree of Bachelor of Science in Software Engineering, Board of Examiners Prof. Dr. Touhid Bhuiyan Chairman Professor and Head Department of Software Engineering Faculty of Science and Information Technology Daffodil International University ii Declaration I declare that this thesis paper has done by me under the supervision of Ms. Lamisha Rawshan, Senior Teacher, Dept. of Software Engineering, Daffodil International University. I am also announced that neither this thesis paper nor any parts of it have been submitted anyplace for any reason. Name: Md. Saidul Islam Id: 161 -35- 1602 Dept. of Software Engineering Faculty of Science and Information Technology Daffodil International University Certified by: Ms. Lamisha Rawshan Senior Lecturer Dept. of Software Engineering Daffodil International University ©Daffodil International University iii Acknowledgment To complete this thesis, I have gratitude to so many people. I believe that it would not be possible without the help of these people. I fully obligated to Daffodil International University for their direction and