Energy Aware Resource Handling For Scientific Workflow in Compute Cloud

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Abstract: Cloud computing is the latest distributed computing paradigm and offers enormous opportunities to solve large-scale scientific problems. Large-scale applications expressed as scientific workflows are often grouped into interdependent workflow sets. Resolving Scientific Problems using Cloud Computing has so many challenges that needs to be solved for smoother and better solution towards problems. Workflow scheduling in Large-Scale Scientific Workflow makes a sense for better Result. As effective energy management is crucial for all Cloud Services, We are going to work our Resource Allocation in Cloud Computing for Scientific Workflow such a way, so that Energy Consumption in Cloud Computing can be reduced. We will develop such a model that can reduce Energy Consumption using Better Resource Allocation.

Keywords: Energy-aware method, resource allocation, scientific workflow, cloud computing.

I. INTRODUCTION

The National Institute of Standards and Technology(NIST) Define "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models"[1].

To aware energy consumption can be possible through efficient Resource allocation. There are many availabletechnique to aware energy in existence. For the MinimizeOverall workflow completion time, Tardiness, Cost of execution of the workflowAndEfficient utilization of idle resources of Cloud using Cloud Workflow Scheduling Algorithm[2] To conduct scientific workflow execution in energy aware fashion across cloud platform or even inside a cloud through Energy aware Resource Allocation Method[3] In this work, we aim to resource handling for workflow is one of major issue in cloud environment. We aim to Resource handing in workflow system. We work on various Mapping Scheduling Technique respectively simple mapping, Resource Based mapping, Greedy mapping. Greedy mapping with load Balancing Technique utilize resource properly.

The paper has been organized as under. After this introduction session, we study various resource allocation techniques in workflow scheduling section-2 viz. related work. We identify few research ways in the domain of resource handling using mapping technique in section-3. In section-4, we propose our work which we wish to carry out to achieve resource allocation. In section-5 we conclude our research followed by future work and list of references.

II. RELATED WORK

Rimal et al[2] identify the issue of energy aspect during workflow scheduling over cloud environment . Authors presents an algorithm which is confirm to minimize overall workflow completion time, tardiness, efficient utilization of ideal resources of cloud.Xiaolong Xu et al[3] identify the issue of To conduct scientific workflow execution in energy aware fashion across cloud platform or even inside a cloud. Authors present an algorithm which named EnReal: Energy aware Resource Allocation method. Which claimed the algorithm maintains an effective workflow scheduling. This method consist three method Start Time Partition(STP) , PM Resource monitoring, Migration Based Allocation, Energy aware global Resource allocation.Lee et al[4] is finding the issue of Resource Efficiency of a scientific workflow scheduling. Authors present Maximum Effective Reduction(MER) algorithm to Minimal Makespan increase for maximum resources. Authors claim that Workflow schedule not apparent due to incompatibility between Makespan and resource usages. Proposed method Maximum Effective Reduction(MER) Contains three task: Delay limit Identification, task consolidation and, resource consolidationSpitz et al[5] is finding the issue of Selection of resources should not be based solely whether resource meets QoS requirement. Authors present a technique to evaluate resource selection Novel Scheme To degree of automation in the trust evolution process increase. Which claimed a technique improves the process of the service plan for improving a better level of service quality which is Business process aware trust consumption based work on Trust Level Workflow(TLWF).Cao et al[6] is finding the issue is Maintain sustainable cloud computing facing with complexity and big data size. So, VM allocation strategy is very higher task in cloud. To reduce energy consumption within acceptable performance. Authors propose new Dynamic Voltage Frequency Scaling and DNS Scheme. While claimed the estimated features can help the Green cloud system architecture for minimum partial earliest completion(MECT) and Minimum energy consumption(MEC).

III. PROPOSED WORK

Our Proposed work has been given in three phases:

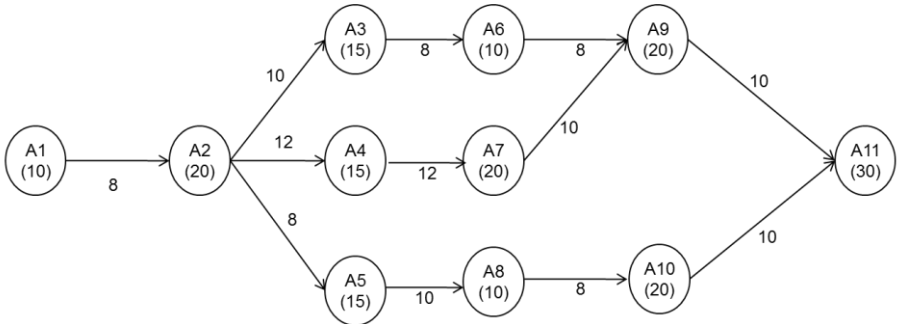
3.1 Simple Mapping

3.2 Resource Capacity Based Mapping

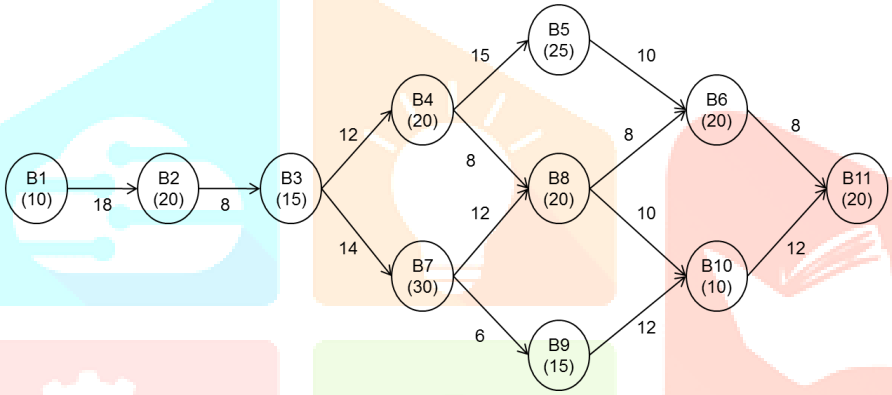
3.3 Greedy Mapping without Load Balancing and With Load Balancing

Here we take some sample workflow to examine result as per given,

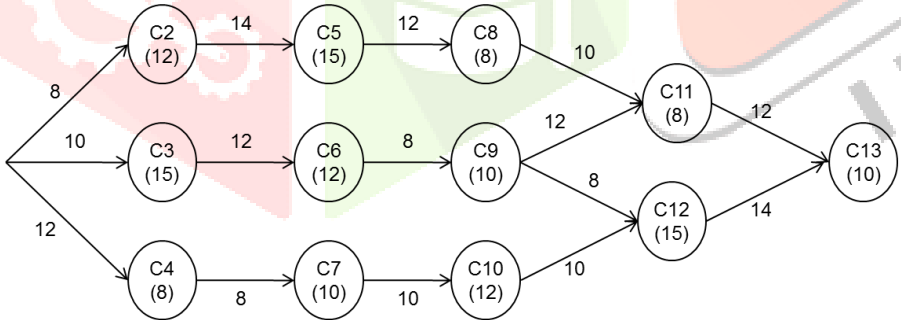
Workflow A,



Workflow B,



Workflow C,



As per taken three sample workflow calculate by using mapping technique to resource allocation for energy aware

3.1 Simple Mapping

For part A, We propose a technique Resource allocation with simple mapping

Table 1: Resource allocation with simple mapping

R1		R2		R3	
2000	Number of Inst.(MIPS)	1500	Number of Inst.(MIPS)	2500	Number of Inst.(MIPS)
A1	10000	B1	10000	C1	10000
A2	20000	B2	20000	C2	12000

	A3	15000	B3	15000	C3	15000
	A4	15000	B4	20000	C4	8000
	A5	15000	B5	25000	C5	15000
	A6	10000	B6	20000	C6	12000
	A7	20000	B7	30000	C7	10000
	A8	10000	B8	20000	C8	8000
	A9	20000	B9	15000	C9	10000
	A10	20000	B10	10000	C10	12000
	A11	30000	B11	25000	C11	8000
					C12	15000
					C13	10000
		185000		210000		145000
Individual Workflow Computation Cost		92.5		140		58
Individual Workflow Communication Cost		0		0		0
Total Workflow Cost		92.5		140		58
Overall Execution Time		140				

Communication Cost Metrix

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
A1		8									
A2			10	12	8						
A3						8					
A4							12				
A5								10			
A6									12		
A7									12		
A8										8	
A9											12
A10											10
A11											

3.2 Resource Capacity Based Mapping

For part B, We propose a technique Resource allocation with resource capacity based mapping.

Table 3: Resource Capacity Based Mapping

R1		**R2**		**R3**	
2000	**Number of Inst.(MIPS)**	**1500**	**Number of Inst. (MIPS)**	**2500**	**Number of Inst. (MIPS)**
A1	10000	C1	10000	B1	10000
A2	20000	C2	12000	B2	20000
A3	15000	C3	15000	B3	15000
A4	15000	C4	8000	B4	20000
A5	15000	C5	15000	B5	25000

	A6	10000	C6	12000	B6	20000
	A7	20000	C7	10000	B7	30000
	A8	10000	C8	8000	B8	20000
	A9	20000	C9	10000	B9	15000
	A10	20000	C10	12000	B10	10000
	A11	30000	C11	8000	B11	25000
			C12	15000		
			C13	10000		
		185000		145000		210000
Individual Workflow Computation Cost		92.50		96.67		84.00
Individual Workflow Communication Cost		0.00		0.00		0.00
Total Workflow Cost		92.50		96.67		84.00
Overall Execution Time		96.67				

Communication cost matrix

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
A1		8									
A2			10	12	8						
A3						8					
A4							12				
A5								10			
A6									12		
A7									12		
A8										8	
A9											12
A10											10
A11											

3.3 Greedy Mapping

For part B, We propose a technique Resource allocation with greedy mapping.

Table 3: Greedy Mapping

R1		**R2**		**R3**	
2000	**Number of Inst.(MIPS)**	**1500**	**Number of Inst. (MIPS)**	**2500**	**Number of Inst. (MIPS)**
A1	10000	C1	10000	B1	10000
A2	20000	C2	12000	B2	20000
A3	15000	C3	15000	B3	15000
A4	15000	C4	8000	B4	20000
A5	15000	C5	15000	B5	25000

	A6	10000	C6	12000	B6	20000
	A7	20000	C7	10000	B7	30000
	A8	10000	C8	8000	B8	20000
	A9	20000	C9	10000	B9	15000
	A10	20000	C10	12000	B10	10000
	A11	30000	C11	8000	B11	25000
			C12	15000		
			C13	10000		
		185000		145000		210000
Individual Workflow Computation Cost		92.50		96.67		84.00
Individual Workflow Communication Cost		0.00		0.00		0.00
Total Workflow Cost		92.50		96.67		84.00
Overall Execution Time		96.67				

Communication Cost Metrix

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
A1		8									
A2			10	12	8						
A3						8					
A4							12				
A5								10			
A6									12		
A7									12		
A8										8	
A9											12
A10											10
A11											

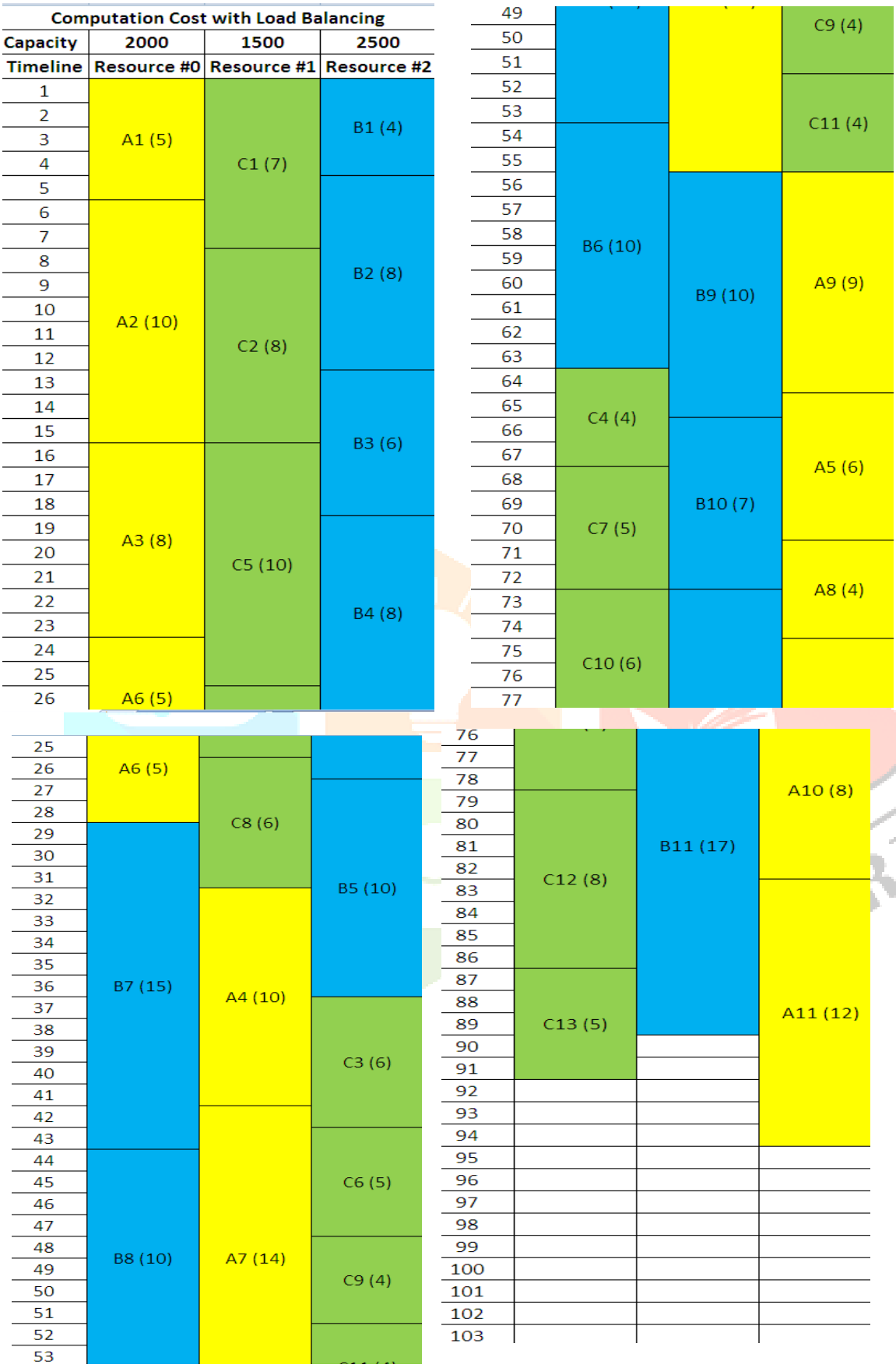
Greedy mapping(Without Load Balancing)

Here in greedy method without load balancing given three resource and many instruction to perform on that as calculate computational cost.

Table 4: Greedy Mapping Without Load Balancing

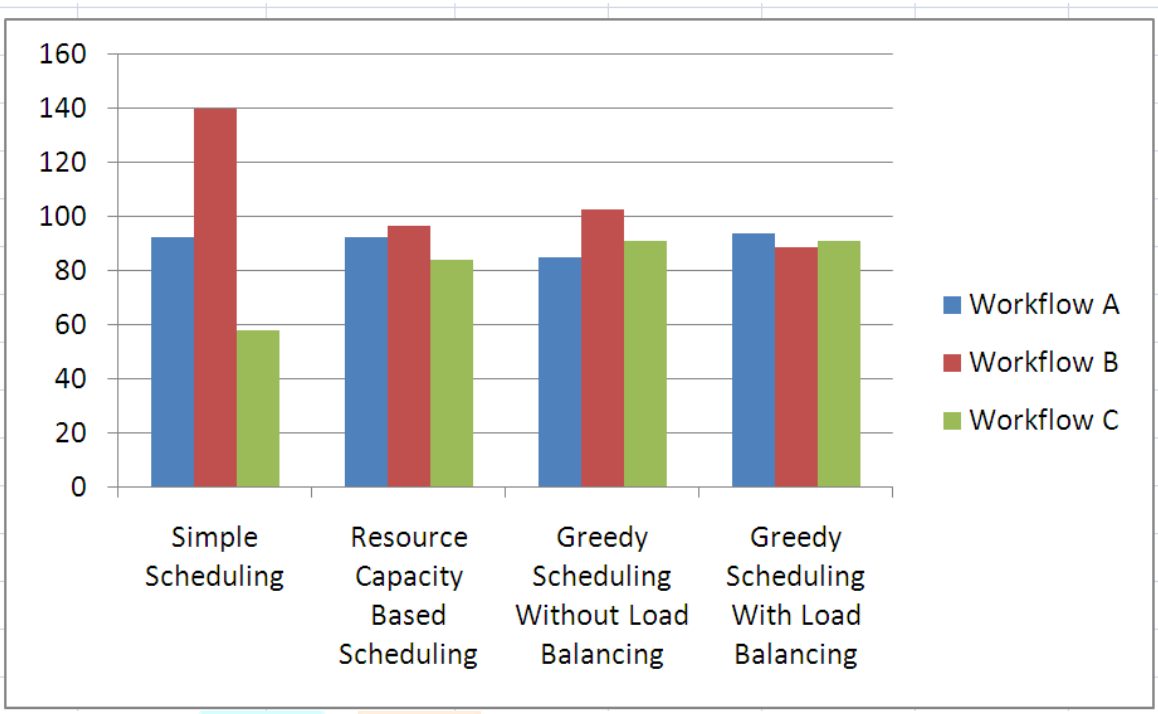
Greedy mapping(With Load Balancing)

Here in greedy method with load balancing technique given three resource and many instruction is given to perform based on load balance technique on resources in on that as calculate computational cost.

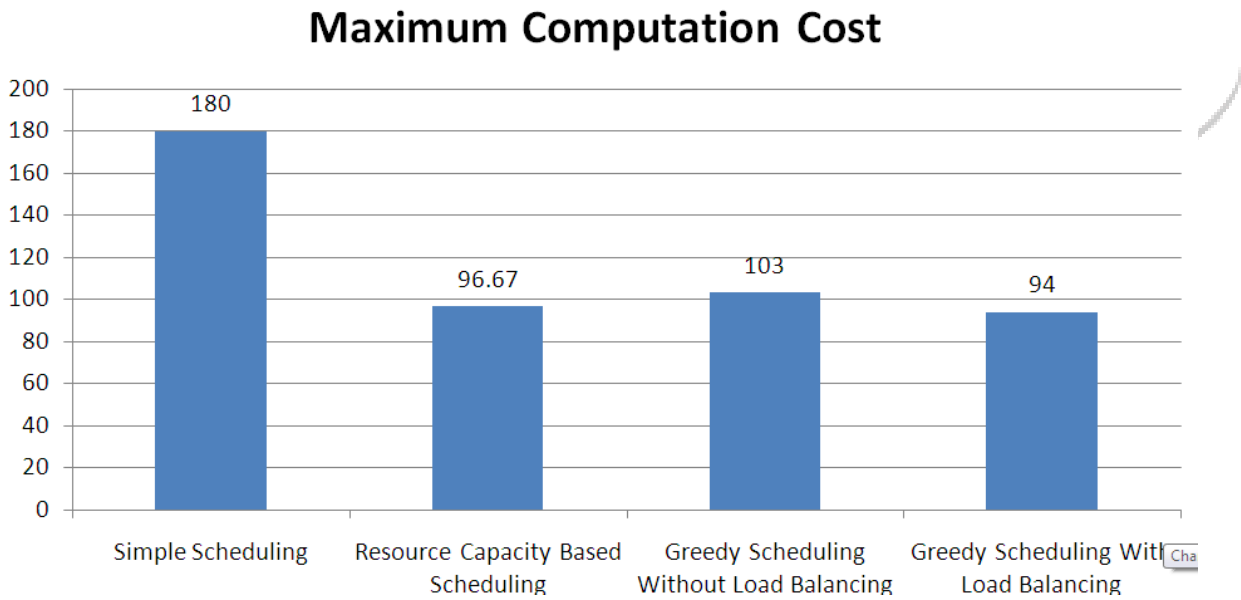


IV. EXPERIMENTS AND RESULT ANALYSIS

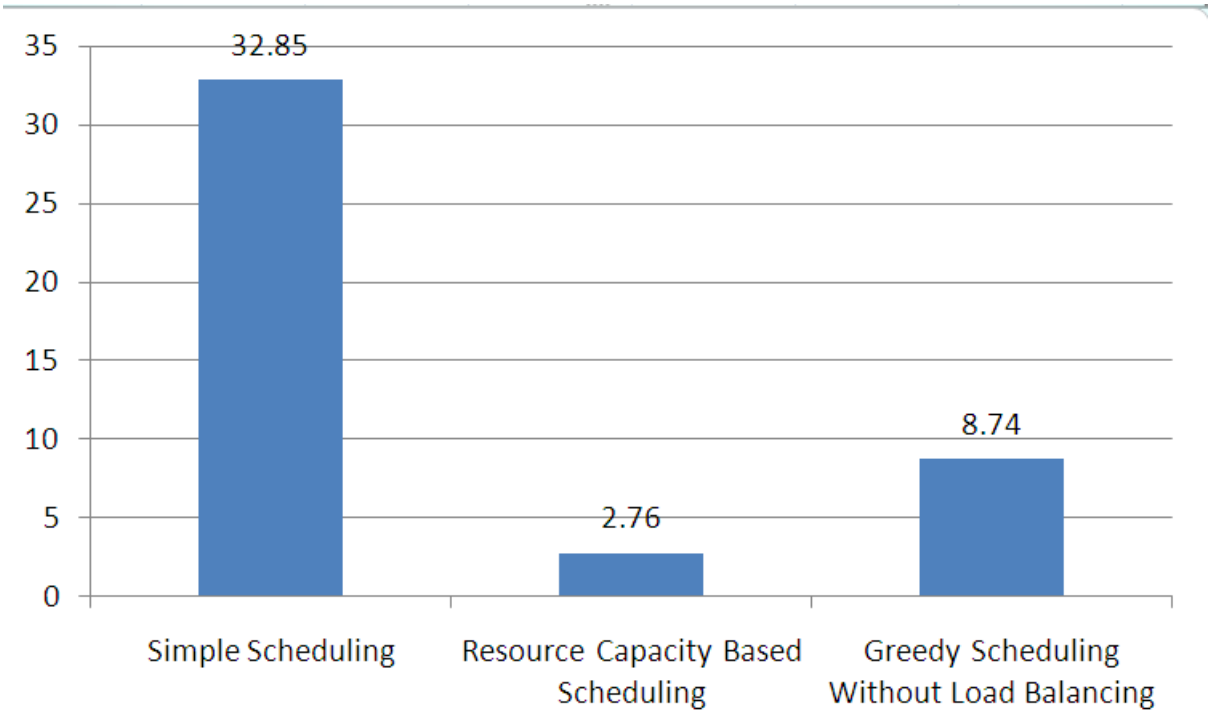
Existing system for three sample workflow result through existing technique there are more variation in resource utilization. Our Propose to resource handling in workflow technique to reduce energy consumption and resource proper utilization. Greedy Scheduling with Load Balancing technique is more sufficient from others.



[Figure 1: Computation Cost of each workflow for various schemes]



[Figure 5.3 Maximum Computation Cost]



[Figure 2: Improvement due to Greedy Scheduling with Load Balancing]

CONCLUSION

Resource Handling for workflow is one of major issue in cloud environment. We aim to Resource handing in workflow system. We work on various Mapping Scheduling Technique respectively simple mapping, Resource Based mapping, Greedy mapping. Greedy mapping with load Balancing Technique to utilize resource properly. We wish to our proposed work implement on cloudsim simulation and differentiate the result with existing Mechanism.

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