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Energy-Efficient Resources Management in Container- Based Clouds

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ABSTRACT

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Cloud enables access to a shared pool of virtual resources through Internet and its adoption rate is increasing because of its high availability, scalability and cost effectiveness. However, cloud data centers are one of the fastest-growing energy consumers and half of their energy consumption is wasted mostly because of inefficient allocation of the server's resources. Therefore, this thesis focuses on software level energy management techniques that are applicable to containerized cloud environments. Containerized clouds are studied as containers are increasingly gaining popularity. And containers are going to be major deployment model in cloud environments.

Keywords : Energy Consumption, Cloud, Energy Efficiency

I. INTRODUCTION

- Cloud Computing is a realization of utility-oriented delivery of computing services on a pay- as-you-go basis.
- The National Institute of Standards and Technology (NIST) defines Cloud Computing as "... 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".

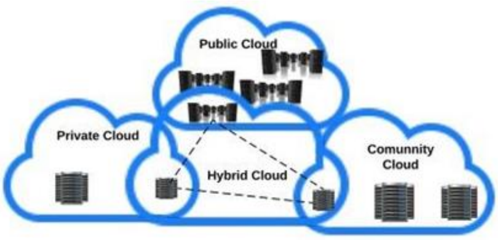

Fig 1.1. The four cloud deployment models: private, public, community, and hybrid cloud

Public: In this model, the Cloud is available to the general public.
Private: The private Cloud is accessible by a business or organization while it is not available to the general public.
Community: This category of cloud provides services to a limited number of individuals or organizations that have shared concerns (e.g., mission, security requirements, and compliance considerations). These organizations are commonly managed, secured, and governed by either a third party managed service provider or all of the participating organizations.
Hybrid: This model is an integration of two or more of the aforementioned cloud deployment models. Here, customers benefit from the multiple deployment models, what consequently eliminates the boundaries and limitations of each cloud model while increasing the capacity through aggregation.

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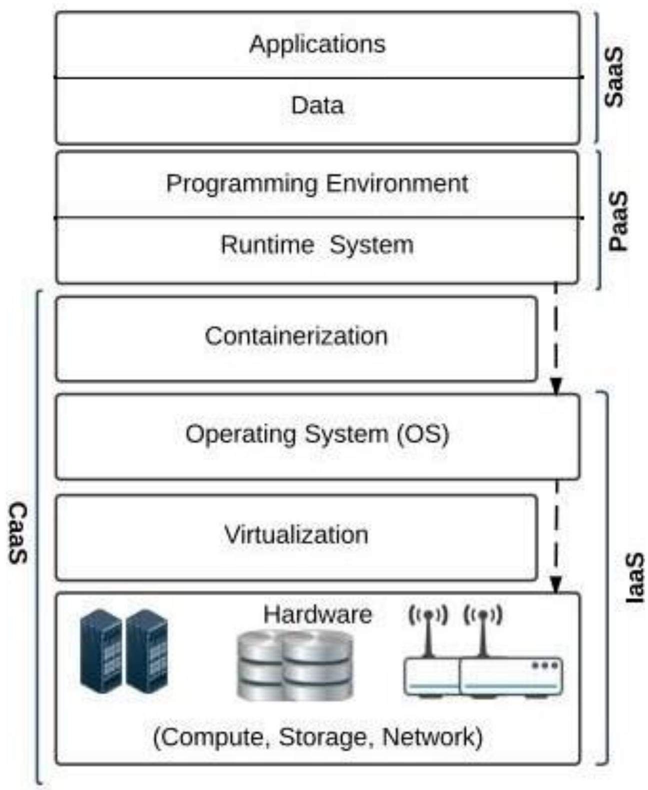


Fig 1.2 Cloud Computing Architecture

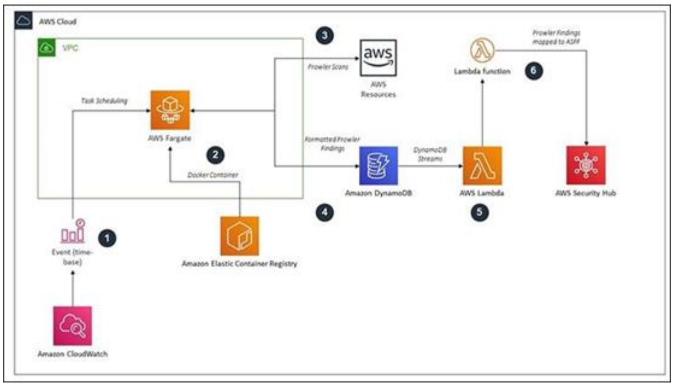
II. Problem Statement

This thesis tackles research challenges in relation to energy-efficient resource management techniques applicable for containerized cloud environments in which containers are running on VMs. In summary, the following research problems are explored:

- How to map tasks/containers to virtual machines considering available cloud workload data?
- How workload characterization methodologies/techniques affect the number of identified virtual machine sizes and energy consumption in a PaaS/ CaaS environment?
- How the algorithms applied in various stages of the consolidation process in a CaaS/PaaS environment affects the total energy consumption and SLA violations?
- Is container consolidation a better approach than VM consolidation?

III. PROPOSED METHOD

Task scheduling algorithms in cloud data center are responsible for allocating the tasks submitted by the different cloud users to the available cloud resources. The main objective of task scheduling algorithm is to achieve a highly performance computing and the best system throughput. Tasks in cloud computing are submitted to the Data Center Broker by the Users. The Data Center Broker works as a mediator between the cloud users and providers and is responsible for scheduling tasks on virtual machines (VM). Data Center is a virtual Infrastructure for housing resources and consists of a number of Hosts. Data center broker provides a policy for scheduling of submitted tasks. Broker communicates directly with the cloud controller and assigns tasks to Virtual machines in the host of the data center. Aws Task Scheduling Processing Way Defined Below.



IV. PROPOSED ALGORITHM

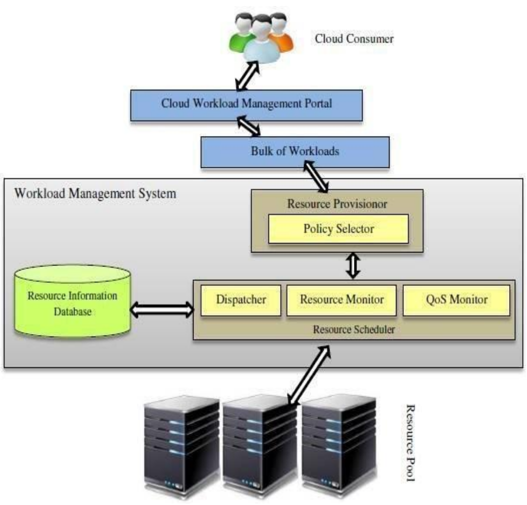
Step –1

Create VM to different Datacenter according to computational power of host/physical server in term of its cost processor, processing speed, memory and storage.

Step-2
Allocate cloudlet length according to computational power.
Step -3
Vm Load Balancer maintain an index table of Vms, presently vm has zero allocation.
Step -4
Cloudlet bound according to the length and respective MIPS.
Step -5
Highest length of cloudlet get highest MIPS of virtual machine.
Step -6
Datacenter broker sends the request to the Vm identified with id.
Step -7
Update the available resource.

The Round Robin algorithm focuses on fairness and on distributing the load equally to all nodes. Each job in a queue has same execution time and it will be executed in turn. The scheduler starts assigning VM to each node and move further for next VM to place in next node. Algorithm is applied for all the nodes until one VM is assigned to each node. Again it goes to the first node repeat this process to the next VM request.

V. PROPOSED ARCHITECTURE



VI. Results

Cloudlet Time Shared Policy						
Task	Waiting Time			**Turnaround Time**		
	FCFS	SJF	RR	FCFS	SJF	**RR**
T1	0	0	0	2	2.25	**2**
T2	0	0	0	4	2.36	**2**
T3	0	0	0	6	2.59	**2**
T4	0	0	0	7	2.7	**2**
T5	0	0	0	8	2.81	**2**
T6	0	0	0	9	2.81	**2**
T7	0	0	0	10	3.04	**2**
T8	0	0	0	11	3.15	**2**
T9	0	0	0	13	3.15	**2**
T10	0	0	0	15	3.6	**2**
AVG	**0**	**0**	**0**	**8.5**	**2.85**	**2**

Task Scheduling TimeShared

Comparison chart for the method

Comparison of FCFS, SJF and RR using cloudlet time shared policy

VII. CONCLUSION

At the end of the literature survey it can be concluded that Improving the energy efficiency of cloud data centers is an ongoing challenge that can increase the cloud providers return of investment (ROI) and also decrease the CO2 emissions that are accelerating the global warming phenomenon. Despite the increasing popularity of Container as a Service (CaaS), energy efficiency of resource management algorithms in this service model has not been deeply investigated.

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