An Implemented Algorithm Approach For VM Placement In Azure Cloud For Enhancing Features Of Data Centers And Its Related Key Security

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***Abstract*—**In the era of cloud computing, efficient Virtual Machine (VM) placement plays a pivotal role in optimizing resource utilization, improving performance, and maintaining robust security within data centers. This research paper presents an implemented algorithmic approach tailored for VM placement in Microsoft Azure cloud environments, aiming to enhance both operational features and key security aspects of modern data centers. The proposed solution focuses on dynamic resource allocation, load balancing, and minimization of latency while incorporating security constraints such as isolation, data integrity, and compliance. By mixing policy-aware scheduling and brainy placement heuristics, the algorithm enhance scalability and mitigates susceptibilities associated with multi-tenant structures. Experimental results demonstrate significant improvements in resource efficiency, response times, and adherence to security benchmarks when compared to traditional VM placement strategies with PM. This study contributes toward developing more secure, cost-effective, and performance-optimized cloud data centers using Azure's capabilities.

***Index Terms*—**Virtual Machine Placement, Azure Cloud, Cloud Computing, Data Center Optimization, Resource Allocation, Load Balancing, Cloud Security, Algorithm Implementation, VM Scheduling, Multi-Tenancy, Isolation, Data Integrity, Performance Enhancement, Secure Cloud Infrastructure, Policy-aware Placement.

I. INTRODUCTION

With the fast growth of processing and packing technologies and the accomplishment of the Internet, computing resources have become cheap, more powerful and more universally accessible than ever before. This technological trend has allowed the realization of a new computing model called cloud computing, in which resources (e.g., CPU and storage) are given as general utilities that can be leased and released by users through the Internet in an on-demand fashion. In a cloud computing situation, the old-style role of facility provider is distributed into two: the infrastructure providers who achieve cloud platforms and lease possessions according to a usage-based assessing model, and service providers, who rent resources from one or many infrastructure earners to serve the end users. The emergence of cloud computing has made a marvelous impact on the Information Technology (IT) industry over the past few years, where big companies such as Google, Amazon and Microsoft strive to provide more powerful, dependable and cost-efficient cloud platforms, and business enterprises seek to reshape their business models to gain benefit from this new paradigm. Certainly, cloud computing brings various compelling features that make it goodlooking to business proprietors.

No up-front investment: Cloud computing usages a pay-as you-go pricing model. A service provider does not need to capitalize in the infrastructure to start gaining benefit from cloud computing. It simply rents resources from the cloud according to its own wants and pay for the usage.

Lowering operating cost: Resources in a cloud environment can be rapidly billed and de-allocated on demand. Hence, a service provider no longer needs to provision capacities according to the peak load. This delivers huge savings since resources can be released to save on operating costs when service demand is short.

Highly scalable: Infrastructure providers pool big amount of resources from data centers and make them easily accessible. A service provider can easily enlarge its service to large scales in order to handle rapid rise in service demands (e.g., flash-crowd effect). This model is occasionally referred as surge computing [1]

The cloud computing allows its users to utilize computing resources from the cloud data centers as a service, in its place of owning it. Due to this, cloud computing smears virtualization in which hardware possessions of one or more computer systems are divided into various execution environments referred as Virtual Machines (VMs). Usually, each VM is isolated from other VMs and can act as a complete system to implement the user applications. In order to host a VM, a Physical Machine (PM) or server necessity provide all resources that the VM requires, with its CPU, memory, storage and network bandwidth requirements [11]. Inside a server or a physical machine, the VMs are measured by a layer of software called VM Monitor (VMM) or hypervisor, which, as indicated in figure 1, resides between the hardware platform and the VMs. Usually, the VM monitor supports the creating, migrating and terminating VM instances

VM migration is an exciting cloud computing feature which is aimed to respond to dynamic requests of the VMs in order to potential the promised Service Level Agreement (SLA) to the cloud consumers. Thus, when a VM needs some resources which cannot be provided in the hosted physical machine, the VM is drifted to another physical machine to satisfy the VM's requested resource. Also, the VMs may be drifted to provide better management of the physical machines and data centers. One of the vital operations which is conducted as a part of the VM migration is the VM placement in which a proper physical machine is nominated to host the VM.[2]

II. LITERATURE SURVEY

The main aim for the existence of different insights of cloud computing is that cloud computing, unlike other technical terms, is not a new technology, but rather a new processes model that brings together a set of existing technologies to run business in a another way. Indeed, most of the technologies castoff by cloud computing, alike virtualization and utility -based pricing, are not new. Instead, cloud computing leverages these existing technologies to encounter the technological and economic supplies of today's demand for information technology. [3]

Microsoft Azure aims to deliver an integrated development, hosting, and control Cloud computing environment so that software developers can easily make, host, manage, and scale equally web and non-web submissions through Microsoft data centers.[4]

III. PROBLEM FORMULATION AND PROPOSED METHODOLOGY IN VM PLACEMENT WITH SOLUTION

Every VM needs a different amount of resources as it may serve different workloads. So, the total used resources of the server can be considered as the total resources consumed by the hosted virtual machines. VM placement planning has a major influence on resource waste and VM migration.

MBO (Monarch Butterfly Algorithm) is smearing the iterative approach to describe and spawn new individuals.

This concern approach can be established by starting, fitness assessment, separation, movement ,change.

Algorithm 4 Upgrading Operator

1.Start

2. Input: PM = {Pm_1,...,Pm_n}

3. VMs = {v1,...,v_m}, Population

4. for i = 1 to the PopulationSize

5. do

6. for k = 1 to Dim

7. do

8. crisscross if the current VM is not assigned to any PM

9. if (i,k) == 0 then

10. z(i, k) = Mapping(V M_k, P M, K)

11. end the if

12. end for the k

13. end for the i

14. Yield: Population, PMpm

15. stop

This operator code is discovered in this concern algorithm. The algorithm efforts to assign the free virtual machine to the related server with light load, that can be checked in Lines 4 to 13.

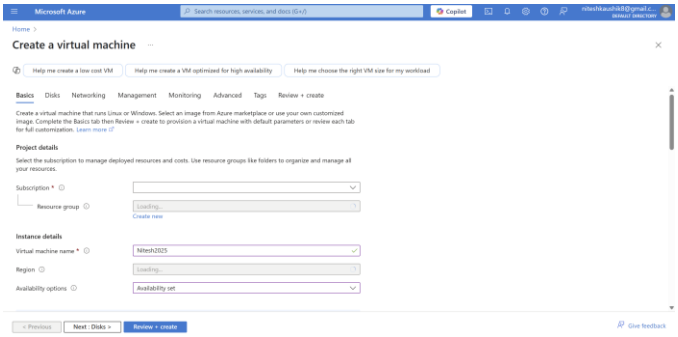

Fig. 2 Microsoft Azure VM creation process ,1st step i.e. Basic

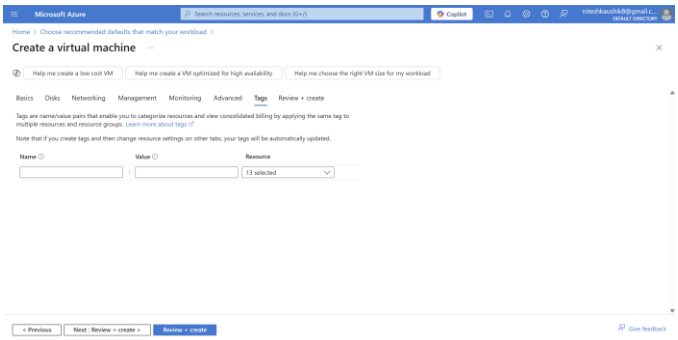

Fig. 3 Microsoft Azure VM creation process last step i.e. Review and Create

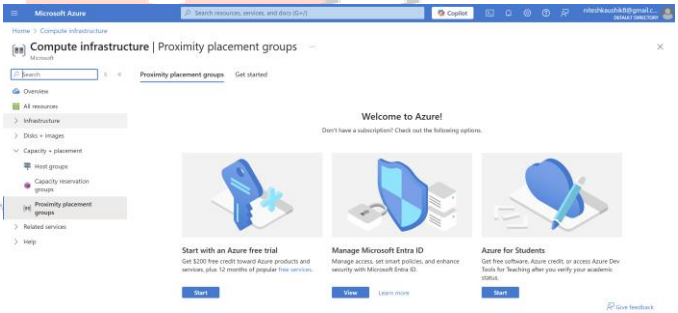

Fig. 4 Microsoft Azure VM Placement process showing all three options

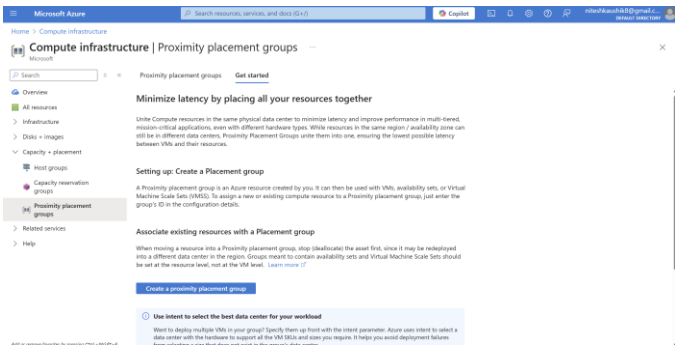

Fig. 5 Microsoft Azure VM placement option details

Fig. 2 shows the 1st step i.e. Basic and Fig.3 shows the last step i.e. Review and Create of VM creation in Microsoft Azure my

portal ,which include 08 steps (Basic, Disks, Networking, Management, Monitoring, Advanced, Tag, and Review & Create and Fig. 3 shows the details of VM placement with 03 options in groups (Host group, Capacity reservation group and Proximity placement groups) and Fig. 5 shows the details of VM placement groups, basically these placement groups is a logical grouping which are making Azure total resources are actually located near to each other. They are valuable for workloads ,where low potential is a requirement.

V. PROPOSED NEW MBO-VM ALGORITHM PROCESS WITH RESULTS

The proposed new MBO-VM algorithm first makes a random initial population of NP individuals and then splits the entire population into subpopulation 1 (NP1) (Pop 1) and subpopulation 2 (NP2) (Pop 2)

Algorithm 2 Planned New MBO-VM placement algorithm

Step 1:- Beginning: - In the starting generation counter t is set with
some other parameters -In this related fitness of every concern individual is checked.
Step 2:- Fitness assessment
Step 3:- Distribute the whole population in two specific Sub population (Pop 1 and Pop 2)
Step 4:- Creating new subpopulation from previous algorithms.
Step 5: Upgrade with its optimum solution.
Step 6:- Again recheck the whole solution before finishing the concern loop.
Step 7:- Termination of while loop
Step 8 :- Finest results in output are shown.

VI PERFORMANCE EVALUATION

The concert of our projected new MBO-VM algorithm is to secure energy and enhance resource use has been equated with other VM placement algorithms in this concern literature.
The CloudSim toolkit [5] was used to measure our proposed new MBO-VM algorithm. CloudSim is the most preferred simulation tool among cloud researchers, and most cloud researchers use it extensively to develop VM placement algorithms.With the help of cloudsim concern researchers will able to check the newest applications.

Nos.	VM type	MIPS	Num cores	RAM (MB)	VM size (GBs)
1	Type 1 [Big]	2300	2	1740	2.5
2	Type2 Small]	800	1	1740	2.5

Table 1:- VM configurations used in the concern data center

No. of VM	New MBO–S1 (Best)	New MBO–S1 (Worst)	New MBO–S1 (Mean)	New MBO–S1 (SD)
100	23.44	24.93	23.64	0.80
200	45.21	46.86	46.32	0.90
250	57.34	58.63	58.42	0.96
300	70.21	73.47	72.48	1.65
400	92.34	95.32	94.23	1.77

Table2 : Energy consumptions of the concern different population strategies using PM Type 1 for S1

No. of VM	New MBO–S2 (Best)	New MBO–S2 (Worst)	New MBO–S2 (Mean)	New MBO–S2 (SD)
100	22.31	24.23	23.95	0.70
200	44.76	45.23	45.10	0.76
250	56.46	57.37	56.75	0.82
300	68.72	70.54	69.21	1.21
400	91.87	93.98	92.56	1.43

Table 3 :- Energy consumption of the concern different population strategies using PM Type for S2

No. of VM	New MBO–S3 (Best)	New MBO–S3 (Worst)	New MBO–S3 (Mean)	New MBO–S3 (SD)
100	20.15	20.85	20.52	0.18
200	43.24	43.83	43.54	0.12
250	54.78	55.12	54.84	0.14
300	64.72	64.94	64.85	0.08
400	89.55	90.98	89.65	0.08

Table 4 :- Energy consumption of the concern different population strategies using PM Type for S3

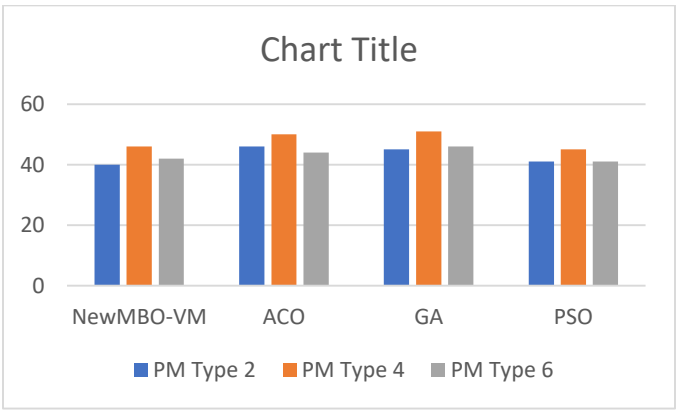

Fig. 4 :- Energy use for all the concern configurations.

Table 1 shows all the various types of virtual machines used to evaluate the proposed VMP solution. All experiments are made using an ASUS laptop with windows 10 OS and the three experiments are directed to evaluate the effectiveness of the proposed new MBO VM solution .Table 2,3,and 4 shows the energy consumption of the concern different population strategies using PM type for S1,S2 and S3 and Fig. 4 shows the energy use for all the concern configurations.

Security features for VM placement in cloud will be as listed:-

1) Isolation mechanism – It include,tenant Isolation,Hypervisor security, Dedicated Host
2) Intelligent VM placement policies include secure-aware scheduling,policy-based placement
3) Anti-collection & Affinity rules include anti-collocation,affinity rules
4) Migration security includes encrypted VM migration,authentication & Integrity checks.
5) Monitoring & auditing includes continuous VM and host monitoring,audit logs
6) Secure boot and integrity verification include trusted boot,trust platform module.
7) Compilance-aware placement includes geolocation constraints and industry certifications

VI CONCLUSION

Due to enhancement in cloud computing main focus is on the concern cost of the related system. So in this paper we proposed New MBO VM concept for variably allotting virtual machines to its related physical machines on its present load and its concern features. By using our concept there will be a decrement in its related consumption of energy with its concern resources. To calculate performance of the given concept ,we are using CloudSim toolkit. Using data centers to the best is being given in its output of simulation also in this paper the focus is on security features for VM placement in cloud In coming future topics related to machine migration and other related issues can be worked and it can be also be used in medical field.

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