

Analysis of VM Placement for Resource Management in Virtual Environment

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Abstract: Cloud computing empowers the clients to arrangement resources on request and execute the application when it's required to get the virtual resources which is required by the resources. At that point, it turns into the assignment of cloud resource suppliers to oblige these virtual resources onto physical resources. This issue is a basic test in cloud computing as resource suppliers, need to outline resources onto physical resources in a way that considers the suppliers' main optimization purpose. An optimal fuzzy assignment technique is used to minimize the cost/time as much as possible. Yager's ranking approaches have been utilized for ranking and generate the crisp value of the fuzzy numbers, in the wake of changing assignment problems into a crisp numbers utilizing phonetic factors. This paper, an algorithm has been presented and makes the comparison between various mechanisms as FCFS, Hungarian, B & B, fuzzy B & B technique for the minimization issue in the fuzzy dataset. With the help of fuzzy set and usage of branch and bound (B & B) has been assigned VM placement for combinatorial assignment problem on permutational.

Keywords: B&B mechanism, Assignment problem method, First come first serve technique, Hungarian technique, VM Placement, Fuzzy B&B Technique.

1. Introduction

Various literature is reviewed the cutting edge of cloud resource allocation for framework as service providers. They gave an outline of the current research discoveries and advancements while concentrating on the resource allocation strategies, for example, resource provisioning, resource disclosure, resource checking, resource mapping, resource distribution, resource solidification, resource demonstrating, resource planning. This overview activated imaginative techniques to deal with the current issues of resource administration in distributed computing and they trust that it can be utilized as a wellspring of intrigued every reader to comprehend the current approaches in this exploration territory for future improvements [1]. They introduce an algorithm for the virtual machine placement, it based on optimization is being an ICA as a result of its simplicity in neighbourhood development, great merging rate and reasonable phrasing. This process examines seek space in a one of a kind way to proficiently get an optimal allocation that all the while limits control utilization and less resources wastage. Its final execution is analyzed with the various

techniques, for example, generic grouping and ant colony based algorithms. The result is better with power consumption, resource wastage, CPU as well as memory usage [2]. Providers must ensure Quality of Service prerequisites of the co-facilitated applications in a server center and at the same time accomplish optimal use of their establishment under fluctuating loads in cloud condition. A various leveled control system that goes for trading off hostile goals inside a server center. The regional control level handles at the same time the issues of resource allocation and affirmation control of virtual machines while the upper level tends to together the load adjusting of the approaching solicitations and placement of virtual machines into a group of physical servers [3]. Assignment problem is a unique kind of linear programming problem in which the main goal is to allocate the number of jobs to the number of workers at least cost/time. The mathematical definition of the issue suggested, this is a 0-1 programming problem and is very deteriorate everyone to develop the algorithm and get an optimal result of transportation issue. Be that as it may, because of exceptionally decadence nature a

unique algorithm is well known as Hungarian approach [4]. There is a numerous issue manages vulnerability in parameters, at that point can't be connected the traditional approach to solve of the transportation issue, however, explained it by utilizing a fuzzy approach which relies upon the ranking function to locate the optimal solution for transportation issues. The fuzzy transportation problem is interconnected between fuzzy set and ranking as well as transportation problem also which implies that the allocations of the resource requests, an aggregate transportation cost are fuzzy numbers [5]. Optimization issue of minimizing cost in allotting accessible jobs to various men/machines in an association/producing units under the condition that one job is given to one machine and one machine needs to accept just a single position is by and large alluded to as an Assignment Problem. To reduce the assignment problem used several techniques like the shortest job, weighted matching, transportation, minimum cost as well as network flow theory. Assignment problem is suitable to solve many more general problems [6]. B&B is needed to solve fuzzy cost to minimize cost and put on to triangular fuzzy numbers, Yager's approach has been applied for allocating the fuzzy numbers and assigning best position issue by B&B. Further converts the qualitative data into quantitative data [7]. A computational technique is explained and fuzzy transportation cost is likewise kept as minimized as possible. Degeneracy problem is additionally overcome by this strategy after that illustrate outcome and effects of other existing methodologies. The existing technique gives a suitable answer for the providers for taking best choice when they are using different strategic issues having uncertain parameters [8]. The resources devoured by an application running in a distributed computing more amounts charged comparing to the application are used. Applying solutions for low the resource utilization is a very important aspect because it is uncertain for large application in cloud environments. A distributed algorithm is used to conquer the scalability. That problem can be explained by recognizing problems plot them between applications into virtual machines to process in

the cloud framework with the end minimization of the resources used by the applications [9]. Assignment problem is common for tackling issues of technical and management filed. The cost isn't deterministic, at that point the problem is said to be placing problem with fuzzy cost and an algorithm is used to solve the fuzzy assignment problem [10]. Trapezoidal fuzzy numbers are reasonable and common in nature. Using LINGO9.0 to solve crisp assignment problem which is transformed from a fuzzy assignment problem and compare with different methods [11]. One's assignment method is solved by fuzzy assignment. Triangular and trapezoidal numbers have been allocated and the best way to assign jobs with best allocation cost. Solving One's Assignment Method is used to rank with Robust formulating the fuzzy number to get the optimal solutions for linear programming with fuzzy assignment problem [12]. Virtual machine placement is optimized with glow-worm swarm optimization form this service level agreement and energy consumption infringement is minimized [13]. Finding the best allocation of the virtual machine on the physical machine is the main problem for service providers in the data center. The operational cost of allocation has the critical effect on the operations of the applications with the help of several algorithms and techniques [14]. The extent of transportation is allocated the demands to resources with the Fuzzy approach and crisp solution also discussed. For the handling of a crisp solution is upgraded in order defined resources properties and requirements. The fuzzy method is used to solve the Allocation problem with the optimized result by Hungarian method [15]. They displayed a positioning model, which thinks about the specialized organizations on different QoS criteria and placed them as indicated by their exhibitions. In additionally play out a consistent assessment of the specialized organizations by looking at the entropy and the hyper entropy of conveying QoS esteems to previous clients [16]. Using the Bottleneck easing-based assignment mechanism optimizes the maximum throughput and minimizes the time for big servers. A bi-level fuzzy model is created for considering the assignments of tasks and workers, where the

errand times rely upon the ability levels of workers. Moreover, different tests are utilized to confirm the better choice for workers and assignments utilizing diverse tests problems [17]. Address the fuzzy decisions are made by a service provider for the needed users with the help of Fuzzy method and queuing theory. To manage the queue's service providers is making fuzzy decisions and as well as service needed users also. A discrete time fuzzy need queues with incomplete cushion sharing is demonstrated and dissected where both need a task and cradle control are liable for fuzzy decisions [18]. Metaheuristic algorithm is in light of Optimization through Fuzzy Bee Colony technique, which coordinates the ideas of Optimization with a Fuzzy Inference System. The multicriteria examine airport terminal doors to booked flights in view of the two travelers' aggregate strolling separation and utilization of remote entryways, to locate an ideal flight-to-entryway task for a given timetable. Examination of the outcomes with the calendars of genuine airplane terminals has enabled us to demonstrate the attributes of ideas and in the meantime, it focused on the adequacy of the strategy [19]. Assemble line workers assignment issue and balancing issue is an augmentation of the customary mechanical assembly line balancing issue in which an optimal section of the get work together between the stations is looking for alongside the assignment of the administrators to the stations. The connection between this issue and a few other very much contemplated issues is investigated, and new lower limits are inferred. Moreover, a correct calculation and identification, which makes utilization of the lower limits and tested by using benchmark sets. It enhances the performance, quality and best optimal solution [20]. A novel fuzzy assignment technique is produced for multi-characteristic cooperative decision making issues. Since the indeterminate nature of numerous decision issues, fuzzy set hypothesis, for example, fuzzy aggregation and arithmetic, fuzzy positioning and fuzzy mathematical programming for a fuzzy similarity based helpful basic decision making process. Fuzziness in the gathering pecking order and quantitative sort criteria is additionally

considered. The strategy is anything but difficult to apply and ready to give successful extra parts inventory classes under unverifiable conditions [21]. A branch-and-bound technique, dynamic programming, and genetic calculation to decide safe ship directions in the collision circumstance in fuzzy condition. In a fuzzy data set is representing as multistage basic decision makings for optimal safe ship direction in collision state. The mobility parameters of the ship and the guide's subjective evaluation in settling on a decision are contemplated in the process models [22]. The novel nature of administration fuzzy logic controlled dynamic routing and wavelength assignment, where the ideal way is picked by a fuzzy run based surmising framework. The fuzzy routing strategy fuses optical system transmission traits such as idleness, the physical length of the connection, information loss, number of bounces and accessibility status of wavelength in the path [23]. They talked about VM arrangement strategy which guarantees that the benefits to the cloud specialist organization are boosted, sets up reasonableness and administration accessibility to the cloud client by powerfully setting a virtual machine to the best accessible physical machine utilizing the idea of groups. VM arrangement procedure maintains a strategic distance from pointless movements in the server farm by adjusting load on all the physical machines present inside a group [24]. Generic algorithm is based a hybrid approach to optimize a fuzzy multiobjective assignment problem by utilizing an exponential function in which the coefficient of the set function is depicted by a triangular plausibility circulation. In addition, in this investigation, fuzzy judgment was characterized utilizing α -level sets for the decision making to all the while optimize the optimization, in all probability, and skeptical situations of fuzzy function. Hybrid approach can oversee fuzzy multi-objective assignment problem proficiently and adequately with a compelling outcome to empower the decision making to take an optimal path [25]. Fuzzy density is an essential piece of fuzzy basic, which is utilized to portray the dependability of classifiers during the time spent combination. A large portion of the fuzzy density assignment techniques depends on the

preparation priori learning of the classifier and disregard the distinction of the testing test them. To better portray the ongoing unwavering quality of the classifier in the combination procedure, the scattering of the classifier is ascertained by the decision data which yielded by the classifier. At that point the detachability of the classifier is through the data entropy of the scattering. The detachability and the priori learning are consolidated to get the fuzzy decision which can be dynamically balanced [26]. The linear assignment problem gets the assurance to optimal permutation vector to using the assignments to the data set. Indeed, even the backtracking execution bolsters a fairly intense bounding function. The principal issue and executing the backtracking is in parallel as well as show changing that into a parallel algorithm with branch-and-bound approach [27]. The estimation of software size or complexity nature by joining or changing key cost drivers for example, function focuses and other noticeable assignments setting factors. In any case, staff factors are from time to time researched or regarded inside and out as an approach to decrease the evaluated software development cost. On commence that a software product is disintegrated in various assignments and that foreordained designers are accessible as resources for it and plans to enhance the allocation of accessible staff to bring down development cost. Enhance Hungarian Algorithm capacity to best allocate with the reasonable task as an unbalanced faculty assignment problem by applying methodologies to an optimal workforce allocation solution for differing requirement [28]. Divide and conquer technique for multiple optimizations. Partition an issue in bringing down into lower dimensional sub problems for which standard calculations are known to perform optimally. Transforming is the successive use of the multi-objective evolutionary algorithm, using the after effects of one sub-optimization as the beginning set for another multi-objective evolutionary algorithm. This system permits modular optimization stages and connected to basic transformative calculations [29]. Genetic Programming strategy is used to optimize real issue with Grouping Constraints as we as

Storage Location Assignment Problem. Self-versatile Tabu Search algorithm is advanced by this approach and it can be utilized as solvers for Storage Location Assignment Problem. A novel self-versatile Tabu Search structure is basic arrangements of the calculation are resolved in light of the issue particular characters, and these setups are changed dynamically during the search procedure [30]. Cloud computing is a model for giving figuring resources as a utility which faces a few difficulties in administration of virtualized resources. In like manner, virtual machine placement and relocation are urgent to accomplish different and clashing objectives. Concerning unpredictability of these assignments and plenty of existing components it's a best in class in the region. A cloud computing foundation, a survey of a few propositions, a discourse of issue details, focal points and weaknesses of evaluating works. Besides, it features the difficulties for new arrangements and gives a few open issues, demonstrating the importance of the point in an expanding and requesting aspect [31]. Cloud computing innovation has changed the data and correspondence innovation industry by approving on-request resource conveyance to the cloud clients. Servers are the real resource storage places from where the resources are spread to the requesters. At the point when a few solicitations are gotten by server farms, the accessible resources are to be taken care of in an optimized way, generally the server farms experience the ill effects of resource wastage. Virtualization is the innovation that encourages the cloud suppliers to deal with a few demands in an upgraded way. This issue of the virtual machine placement, i.e., route toward mapping virtual machines to physical machines is believed to be the genuine research issue. Fuzzy is bio-propelled meta-heuristic methods for taking care of the virtual machine placement issue. The cuckoo search strategy is hybridized with the fuzzy ant colony optimization approach as well as firefly colony optimization approach [32]. The dynamic idea of cloud situations, the workload of virtual machine changes prompting imbalanced load and use of virtual and physical cloud resources. Therefore cloud service provider precisely conjecture VM execution and

resources use so they are suitable deal with their resources to convey better quality cloud benefits on request. Current workload and resource expectation techniques estimate the workload or CPU usage example of the given online applications in view of their chronicled information. This gives cloud suppliers a sign of the required number of resources for these applications to upgrade resource designation for SaaS or PaaS, decreasing their service costs. Chronicled information is utilized as the main information hub for VM workload forecasts as it may not be accessible in each circumstance and recorded information give data about sudden and surprising tops in the client request. To explain these issues, they build up a fuzzy workload forecast strategy that screens both authentic and current VM CPU usage and workload to foresee VMs that is probably going to perform ineffectively. This model likewise foresees the use of physical machine for virtual resource disclosure [33].

Concrete From the above extensive review of work, we find that there is required such mechanisms which compares related techniques or mechanisms and after analysis, we proposed fuzzy branch and bound technique which shows that the cost and time of the VM (Virtual Machine) placement is better than the results of previous work done in the line. The organization of this research paper is as follows: introduction of the VM placement issue and reviewed many literatures have been discussed in Section 1. In section 2 describe the mathematical formulation. Section 3 shows the working example. Results and comparisons have given in section 4. The conclusions of the research work and future works is discussed in section 5.

2. Fuzzy set and Formulations

Fill Fuzzy set \bar{P} , describe on to describe the membership function is said to a fuzzy number if the universal set of different real numbers R has the following characteristics:

1. $\mu_{\bar{P}}$: R [0,1] is continuous.
2. $\mu_{\bar{P}}(x) = 0$ for all $x \in (-\infty, J] \cup [M, \infty)$.
3. $\mu_{\bar{P}}(x)$ is strictly increasing on [J, K] and strictly decreasing on [L, M].
4. $\mu_{\bar{P}}(x) = 1$ for all $x \in [K, L]$, where $J < K < L < M$.

A Fuzzy set $\bar{P} = (a,b,c)$ is a triangular fuzzy set if its membership function is given by:

$$\mu_{\bar{A}}(x) = \begin{cases} (x-J1)/(J2 - J1) & \text{if } J1 \leq x \leq J2 \\ (J3 - x)/(J3 - J2) & \text{if } J2 \leq x \leq J3. \\ 0 & \text{otherwise} \end{cases}$$

Yager's ranking methodology fulfills remuneration, Linearity and added substantial property which gives comes about that is steady with human instinct. If $Y(s) \leq Y(I)$ then $s \leq I$.

Branch and bound is a technique for exploring an implicitly directed graph. This graph is generally non-cyclic or levels a free. They are searching for the optimal solution for some issue. At every hub, they compute bound on the conceivable estimations of any arrangements that may lie more remote on in the graph besides. The computed bound is additionally used to pick which open way looks the most encouraging so it can be explored primarily. For the estimated lower or upper

VM/AT	Allocation Time				
	1	2	3	---	n
Resources (VM)	C ₁₁	C ₁₂	C ₁₃	---	C _{1n}
	C ₂₁	C ₂₂	C ₂₃	---	C _{2n}
	---	----	---	---	---
	----	----	---	---	----
	C _{n1}	C _{n2}	C _{n3}		C _{nm}

bound has been optimized by the branch and bound using the combinatorial and discrete optimization as well as discarding the large subset.

Assignment problem is denoted with the matrix (n*m) which represented by the real matrix [C_{ab}] and table 1 representation as follows.

Table 1. Shows the real matrix representation

$$\text{Minimize } F = \sum_{a=1}^n \sum_{b=1}^n C_{ab} X_{ab} \dots\dots\dots(1)$$

Subject to

$$\sum_{b=1}^n X_{ab} \quad \text{For every } a=1, \dots, n$$

$$\sum_{a=1}^n X_{ab} \quad \text{For every } b=1, \dots, n$$

$$X_{ab} = 0 \text{ or } 1 \text{ a, b}=1, \dots, n$$

$X_{ab} = 1$ if the job is assign to the virtual machine.

$X_{ab} = 0$ if the job is not to assign to the virtual machine.

When time \hat{C}_{ij} is fuzzy numbers, then the total time becomes a fuzzy number.

$$\bar{F} = \sum_{a=1}^n \sum_{b=1}^n C_{ab} X_{ab} \quad \text{For every } a,b=1, \dots, n$$

hence it can't be minimized directly.

$$\text{Minimize } \bar{F} = \sum_{a=1}^n \sum_{b=1}^n C_{ab} X_{ab}$$

Yager's approach gets the minimum value using formulation.

$$R \bar{F} = \text{Minimize } \bar{F} = \sum_{a=1}^n \sum_{b=1}^n C_{ab} X_{ab} \dots\dots\dots(2)$$

Subject to

$$\sum_{b=1}^n X_{ab} \quad \text{For every } a=1, \dots, n$$

$$\sum_{b=1}^n X_{ab} \quad \text{For every } b=1, \dots, n$$

$X_{ab} = 0$ or 1 a, b=1, ..., n

$X_{ab} = 1$ if the job is assign to the virtual machine.

$X_{ab} = 0$ if the job is not to assign to the virtual machine

3. Working Example and implementation

Fill Let us consider fuzzy assignment problem with rows representing five virtual

machines V1,V2,V3,V4,V5 and columns representing the five resources R1,R2,R3,R4,R5 with assignment time varying between 1 sec to 20 sec.

Fuzzy numbers are replaced with the linguistic variable for the given matrix $[C_{ab}]$ after that this problem is solved by branch and bound to get an optimal solution. Virtual machine placements and allocation status with their ranking are presented in **table 2**.

Assignment value considers minimum value 1 sec and the maximum value is 20 sec and convert the quantitative data into the tabular form according to their ranking shows in the **table 3**.

The data represented in **table 4** by triangular fuzzy numbers.

A Fuzzy number $\bar{P} = (a,b,c)$ is a triangular fuzzy number now calculate the fuzzy set using the Yager's approach and calculate the all possible tabular α -cut for the C_{ab} are follows:

$$\mu \bar{A}(x) = \begin{cases} (x-J1)/(J2 - J1) & \text{if } J1 \leq x \leq J2 \\ (J3 - x)/(J3 - J2) & \text{if } J2 \leq x \leq J3. \end{cases}$$

Extremely low: For the fuzzy set is (1,1.125,1.75)

$$\mu \bar{A}(x) = \begin{cases} (x-1)/(1.125 - 1) & \text{if } 1 \leq x \leq 1.125 \\ (1.75 - x)/(1.75 - 1.125) & \text{if } 1.125 \leq x \leq 1.75 \end{cases}$$

It will give the $\mu \bar{A}(x) = 0.6$ value.

Very low: for the fuzzy set is (2,2.25,2.5)

$$\mu \bar{A}(x) = \begin{cases} (x-2)/(2.25 - 2) & \text{if } 2 \leq x \leq 2.5 \\ (2.5 - x)/(2.5 - 2.25) & \text{if } 2.25 \leq x \leq 2.5. \end{cases}$$

It will give the $\mu \bar{A}(x) = 0.186$ value.

Low: for the fuzzy set is (3.33,3.5,3.6)

$$\mu \bar{A}(x) = \begin{cases} (x-3.33)/(3.5 - 3.33) & \text{if } 3.33 \leq x \leq 3.5 \\ (3.6 - x)/(3.6 - 3.5) & \text{if } 3.5 \leq x \leq 3.6. \end{cases}$$

It will give the $\mu \bar{A}(x) = 1.87$ value.

Fairly low: for the fuzzy is (3.75,4,4.5)

$$\mu \bar{A}(x) = \begin{cases} (x-3.75)/(4 - 3.75) & \text{if } 3.75 \leq x \leq 4 \end{cases}$$

Table 2. Shows the ranking of the matrix

VM/AT	Allocation Time					
Resources (VM)	Extreme low	Low	Fairy High	High	Fairy low	Extreme low
	Low	Very low	High	Very high	Extremely low	Low
	Medium	High	Very low	Extremely low	Very low	Medium
	Very high	Low	Fairy low	Fairy low	High	Very high
	Fairy high	Medium	Low	High	medium	Fairy high
	Extreme low	Low	Fairy High	High	Fairy low	Extreme low

$$(4.5 - x)/(4.5 - 4) \quad \text{if } 4 \leq x \leq 4.5$$

It will give the $\mu_{\bar{A}}(x) = 2.33$ value.

Medium: for the fuzzy set is (5,5.85,7)

$$\mu_{\bar{A}}(x) = \{(x-5)/(5.85 - 5) \quad \text{if } 5 \leq x \leq 5.85$$

$$(7 - x)/(7 - 5.85) \quad \text{if } 5.85 \leq x \leq 7.$$

It will give the $\mu_{\bar{A}}(x) = 3.75$ value.

Fairly high: for the fuzzy set is (7.2,8,8.33)
 $\mu \tilde{A}(x) = \{(x-7.2)/(8 - 7.2) \quad \text{if } 7.2 \leq x \leq 8$
 $(8.33 - x)/(8.33 - 8) \quad \text{if } 8 \leq x \leq 8.33.$
 It will give the $\mu \tilde{A}(x) = 4.45$ value.
 High: for the fuzzy set is (9,10,12)
 $\mu \tilde{A}(x) = \{(x-9)/(10 - 9) \quad \text{if } 9 \leq x \leq 10$
 $(12 - x)/(12 - 10) \quad \text{if } 10 \leq x \leq 12.$
 It will give the $\mu \tilde{A}(x) = 3.75$ value.
 Very high: for the fuzzy set is (14,14.4,20)
 $\mu \tilde{A}(x) = \{(x-14)/(14.4 - 14) \quad \text{if } 14 \leq x \leq 14.4$
 $(20 - x)/(20 - 14.4) \quad \text{if } 14.4 \leq x \leq 20.$
 It will give the $\mu \tilde{A}(x) = 11.5$ value.

Table 3. Shows ranking of the triangular data set

Ranking	Triangular data set
Extremely low	(1,1.125,1.75)
Very low	(2,2.25,2.5)
Low	(3.33,3.5,3.6)
Fairly low	(3.75,4,4.5)
Medium	(5,5.85,7)
Fairly high	(7.2,8,8.33)
High	(9,10,12)
Very high	(14,14.4,20)
Extremely low	(1,1.125,1.75)
Very low	(2,2.25,2.5)
Low	(3.33,3.5,3.6)
Fairly low	(3.75,4,4.5)
Medium	(5,5.85,7)

Table 4. Shows the ranking places with triangular dataset

VM/AT	R1	R2	R3	R4	R5
V1	(1,1.75,1.125)	(3.33,3.5,3.6)	(7.2,8,8.33)	(9,10,12)	(3.75,4,4.5)
V2	(3.33,3.5,3.6)	(2,2.25,2.5)	(9,10,12)	(14,14.4,20)	(1,1.125,1.75)
V3	(5,5.85,7)	(14,14.4,20)	(2,2.25,2.5)	(1,1.75,1.125)	(2,2.25,2.5)
V4	(14,14.4,20)	(3.33,3.5,3.6)	(3.75,4,4.5)	(3.75,4,4.5)	(9,10,12)
V5	(7.2,8,8.33)	(5,5.85,7)	(3.33,3.5,3.6)	(9,10,12)	(5,5.85,7)

Table 5. Fuzzy allocated data using the Yager’s approach

VM/AT	R1	R2	R3	R4	R5
V1	0.6	1.87	4.45	3.75	2.33
V2	1.87	1.86	3.75	11.5	0.6
V3	3.75	11.5	1.86	0.6	1.86
V4	11.5	1.87	2.33	2.33	3.75
V5	4.45	3.75	1.87	3.75	3.75

Now solve the resulting assignment problem by branch and bound technique and optimize the result with the minimum branches. Five assignments are there so five branches take place. Find the lower bound for the given assignments
 $R1V1+R2V4+R3V5+R4V3+R5V2=5.54$ and further iterate this.

STEP 1: The allocated node for the V1R1 point follows:

- $R1V1+R5V2+R4V3+R2V4+R3V5=5.54$
- $R2V1+R5V2+R4V3+R3V4+R3V5=7.27$
- $R3V1+R5V2+R4V3+R2V4+R2V5=11.73$
- $R4V1+R5V2+R3V3+R2V4+R3V5=9.95$
- $R5V1+R1V2+R4V3+R2V3+R2V4+R3V5=8.54$

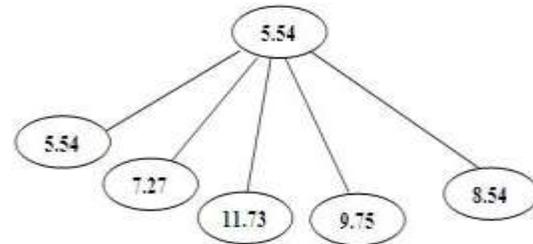


Fig. 1. Shows the first level tree branch

STEP 2: After the first step we get the most lower bound (from previous iteration -1) also neglect the current lower bound for the selection of branch and bound. Take most lower bound for further iteration.

- $R2V2+R1V1+R3V5+R4V3+R5V3=6.79$
- $R3V2+R1V1+R2V1+R4V1+R4V3+R5V3=8.68$
- $R4V2+R1V1+R2V1+R3V5+R5V3=17.7$
- $R5V2+R1V1+R2V1+R3V5+R4V3=5.54$

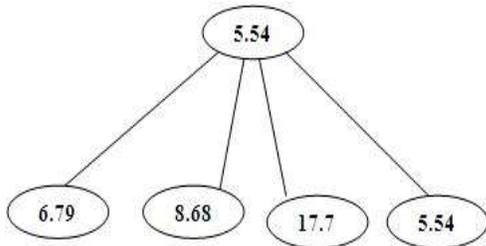


Fig. 2. Shows the second level tree branches

STEP 3: After the second step we get lower bound and (from previous iteration -1) also neglect the current lower bound for the selection. Take the most lower for the further iteration.

$$R2V3+R1V1+R3V5+R4V4+R2V2=16.9$$

$$R3V3+R1V1+R2V1+R4V4+R5V2=7.26$$

$$R4V3+R1V1+R2V1+R3V5+R5V2=5.54$$

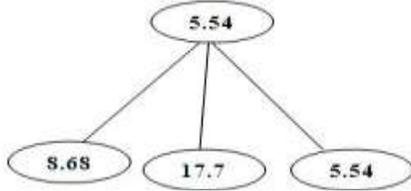


Fig. 3. Shows the third level tree branches

Step 4: After the third iteration we get the lower bound and (from previous iteration -1) also neglect the current lower bound for the selection. Take the lower bound for the next iteration.

$$R2V4+R1V1+R3V5+R4V3+R5V2=5.54$$

$$R3V4+R1V1+R2V1+R4V3+R5V2=6$$

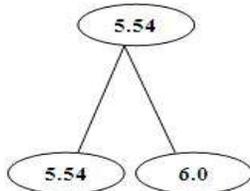


Fig. 4. Shows the fourth level tree branches

STEP 5: After the fourth iteration we get the lower bound and (from previous iteration -1) also neglect the current lower bound for the selection. Take the lower bound for the next iteration.

$$R3V5+R1V1+R2V1+R4V3+R5V2=5.54$$

After this iteration we get the most minimum allocation time for the best placement in the virtual machine, which is 5.54sec. So it is more effectively allocate the resources at the

minimum time and represented in the final figure.

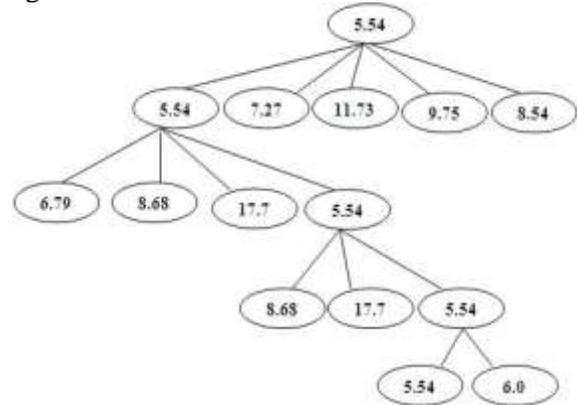


Fig. 5. Shows the final tree branches

4. Results and comparisons

Fill In previous works, we consider the different parameters as per the problem and give the solutions towards to find the optimal solutions with the usage of analytical methods. After analysis of the results we compare the all the techniques as FCFS, Hungarian, branch and bound and get the better results respectively in order to get the optimal resource placement in a virtual machine at a minimum time in the virtual environment. The algorithms, methods as well as techniques with working examples is describes in my previous research work [32]. Finally we introduce a approach named Fuzzy Branch and Bound method and get the better results from any other of the techniques for the virtual machine placement in the cloud computing environment.

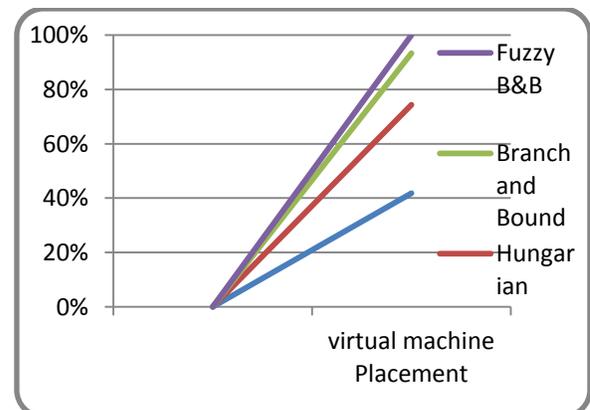


Fig. 6. Comparison between various techniques

The figure 6, shows the different techniques like FCFS, Hungarian, branch and bound and locate the ideal arrangement yet to get the more ideal arrangement as we proposed the best strategy to upgrade the resource allocation in the base cost/time to virtual machine. Right off the bat we figured optimal solution utilizing the FCFS procedure and get the value is 34.75 sec. From that point onward, we utilized another procedure named Hungarian which gives the more ideal arrangement and gives the value is 26.95 sec. At that point we utilize Branch and Bound technique to get the more effective value which is 15.805 in my past work [32]. At that point after we proposed the technique and get the more productive optimal solution which demonstrates the optimal resource allocation conspire at the base time in the virtual machine and get the streamlined cost/time is 5.54 sec which demonstrates the most elevated pinnacle point in the diagram. Utilizing this optimization approach, it takes minimal effort/time to assign the resources for the virtual machine placement in the cloud environment.

6. Conclusion

Now a days, Cloud computing is the most slanting exploration subject. So the research works done are more significant to resource allocation. In the resource allocation for VM placement is the most imperative issues in the cloud computing. VM placement is one of the issues to deal with servers. There are different objectives to be accomplished, while some of them are clashing and should be exchange off clear and precisely. The plenty of concerns and computational unpredictability is to comprehend these issues and make an arrangement significantly with more troublesome. Several virtual machine allocations related works are surveyed and get various techniques to make them more efficient optimal utilization for the resource allocations. In this paper, an assignment time is explained by fuzzy numbers. Here, the fuzzy assignment has been changed over into minimum allocating time utilizing variables with the help of Yager's approach after that we used fuzzy branch and bound method for optimization. We get the optimized data set from using the Branch and bound system for the

minimum time to assign the resource. This can be used for all kind of assignment problems and get the optimal resource allocation in minimum optimizations result. As future perspectives, there may be take some other techniques for comparison and analyse the other parameters to find the solutions as per the nature of the problems.

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