Matching Theory and Virtual Machines

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***Abstract*—Insert abstract here.**

I. Introduction

This project is focused on applying matching theory to a virtual machine job assignment problem.

II. Related Work

Most similar topics: VM Cosheduling and VM Migration papers.

Related to VM Coscheduling: Distributed Selfish Load Balancing

Related to VM Migration: Seen As Stable Marriage and Online VM Shuffling (continuation of VM Migration work).

III. Method Description

High level description if needed.

A. Problem Formulation

The problem this paper is exploring is how to optimize job assigment to separate computer clusters. Each of these jobs perform differently on different cores types. These core types can be graphical processors, computational processors, or something else. Each of these clusters have different core types. Each job can only be divided into a finite number of threads, and each job is assigned to one computer at a time.

(probably a good place to introduce matching theory and the college admissions game). This problem can be formed as a college admissions game. The differences are that the institutions have multiple quotas, each applicant can fill multiple slots of different types, applicants prefer different slot types over others, and an applicant cannot be divided among multiple institutions.

Key assumptions for this problem are: the virtual machines will be treated like flexible computers, jobs are submitted at the same time, chosen jobs are completed simulatenously, unchosen jobs will be submitted with the next round, no indifference, and no externalities.

B. Proposed Algorithm

Things to do: Write the math and assumptions, state why we are doing this, and show that this will be stable as well.

1) Stability of Algorithm: The proposed algorithm produces a stable matching because in each iteration, the college admissions game is used to find a set of stable matchings. Out of the jobs listed in the resultant set of stable matchings, the job that can use the most processors is preferred most by every computer. Thus, that job will be matched with its first choice and its matching to a computer is a stable matching. Thus, each pair produced by an iteration of the proposed algorithm is stable and therefore the final matching is stable.

2) Optimality of Algorithm: Whether the matching is optimal can be understood in multiple senses. In this section, three different approaches to optimality are discussed as they apply to the proposed algorithm.

Resource Utilization: A simple goal of the proposed algorithm would be to maximize processor utiliztion so that no computing resources go unused/wasted.

The proposed algorithm does not alway maximize processor utilization. However, it does in every iteration where the preferred computer of the job with the greatest possible processor utilization has at least as many processors available as either i) that job can use or ii) any other computer has. This situation is common because, often, a computer with more available processor will outperform one with fewer. The exceptions occurs where there is a computer that has special purpose procesors that significantly outperform those availabl at other computers and this computer does not meet either of conditions i) or ii) listed above.

IV. Results and Discussion

Show results and discuss what they represent.

V. Conclusion

The conclusion goes here.

VI. Future Work

List possible future work here.

VII. Individual Contributions

Enumerated individual contributions.

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REFERENCES

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