Utility-based Uploading Strategy in Cloud Scenarios

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Outline

1. Introduction
2. Problem Formulation
3. Models
4. Analysis
5. Simulation Results
6. Conclusions and Future Work
Introduction

• Why do we need to upload tasks to Cloud?
  – Limitation of our own devices
  – Powerful Cloud
User’s view

• What really matters for users?
  – Time
  – Money

• What does a good scheduler need to do?
  – Balance Time and Money
Problems

• How to save money for users?
  – We rent devices in the Cloud together!
  – However, we need to wait and find enough people to share

• With a limited budget
  – If you want to go quickly, go alone
  – If you want to go far, go together

• Key issue
  – Should I wait for others?
  – How long should I wait?
Simplification

- Balance customers’ satisfaction and data center cost
- Simplification (time vs cost):
  - Task Finishing Time $\rightarrow$ Customers’ Satisfaction
  - Running Machines Cost $\rightarrow$ Data Center Cost
Utility-based VM Model

- Utility Cost Model

Our objective for users:
- minimize the utility cost.
Utility-based VM Model

• Utility Cost Model

\[ U = f(t) - C \]

• \( f(t) \) is the time cost, i.e., \( f(t) = b - at \)
• \( C \) denotes the money cost
• Utility decreases with respect to time
Utility-based VM Model (Cont’d)

- More VMs -> run jobs faster.
- However, the processing speed does not linearly increase with the number of machines.

Figure 5.5: Pentomino
Analysis

• Arrival rate estimation
  – Learn the pattern

• Fixed Arrival Rate
  – Easy to solve.
  – No one comes, go alone
  – Crowded users, go together

• Decision under dynamic Arrival
  – Set an observation window
  – Then apply the former idea
Analysis

• In some cases, users only care about the time, and pay little attention to the rent price.
  – minimize the time cost first, then consider minimizing the machine rent price.

• In some cases, users only care about the Price

• In general, we want to maximize the utility.
  – We provide a greedy algorithm to make a balance between performance and time complexity.
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Simulation results of 3 algorithms under hybrid speedup pattern.
Simulations (cont’d)

Trace-based results of 3 algorithms under hybrid speedup pattern.
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Conclusions

• We consider the design and analysis of utility-based scheduler in the cloud environment. Unlike all existing works, we propose the notion of utility for the Virtual Machine management.

• The model presented here opens the door for an in-depth study of how to schedule in the presence of phase overlapping. There are a wide variety of open questions remaining with respect to the design of algorithms that minimize response time.
Thank you!

Questions?

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