

Colocation Games

And Their Application to Distributed Resource Management

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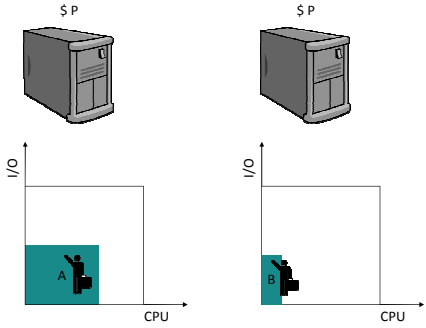
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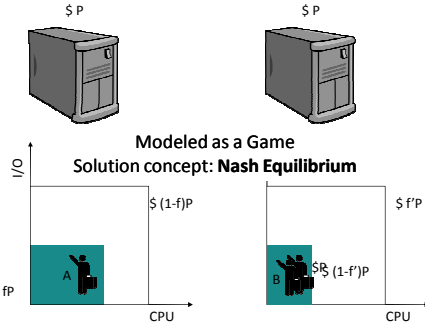
Motivation

- In the Infrastructure as a Service market, providers offer fixed-sized instances
- Provider's profit = number of instances sold; no incentive to colocate customers
- Virtualization enables customers to colocate to reduce costs without QoS compromises
- Customers' selfishness reduces colocation to a strategic game

Current Model



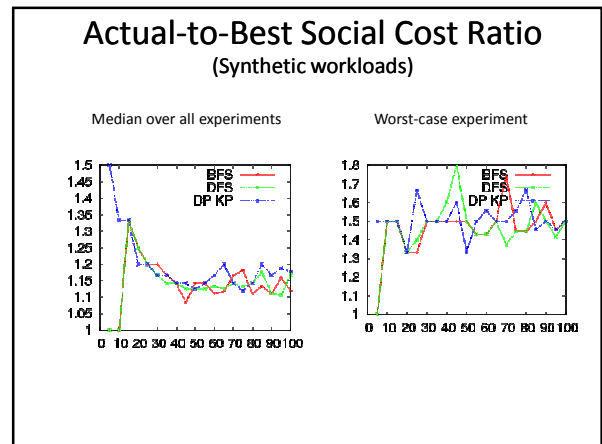
Customers' Strategic Actions



Modeled as a Game
Solution concept: **Nash Equilibrium**

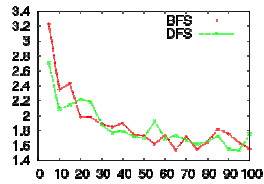
Formal Classification and Analysis

- **General Colocation Game:** Multiple resources over multiple processes per customer
 - No guarantee of Nash Equilibrium (NE)
- **Process Colocation Game:** Multiple resources over a single process (e.g., VM) per customer
 - Converges to a NE
 - Price of Anarchy = $\frac{3}{2}$ (if homogeneous resources)
 2 (otherwise)

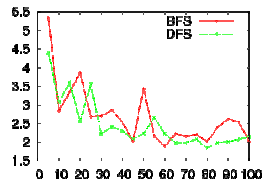


Worst-to-Best Social Cost Ratio (PlanetLab traces)

Median over all experiments



Worst-case experiment



CLOUDCOMMONS (On-Going Work)

- Strategic Services: To facilitate colocations, e.g., allowing users to find each other, compute strategic responses, ...
- Operational Services: To enforce outcomes of colocation game, e.g., reconfiguration, accounting, ...

Questions ?

Thanks!