Colocation Games

And Their Application to Distributed Resource Management

Jorge Londoño

Azer Bestavros *and* Shang-Hua Teng

Computer Science Department

Boston University

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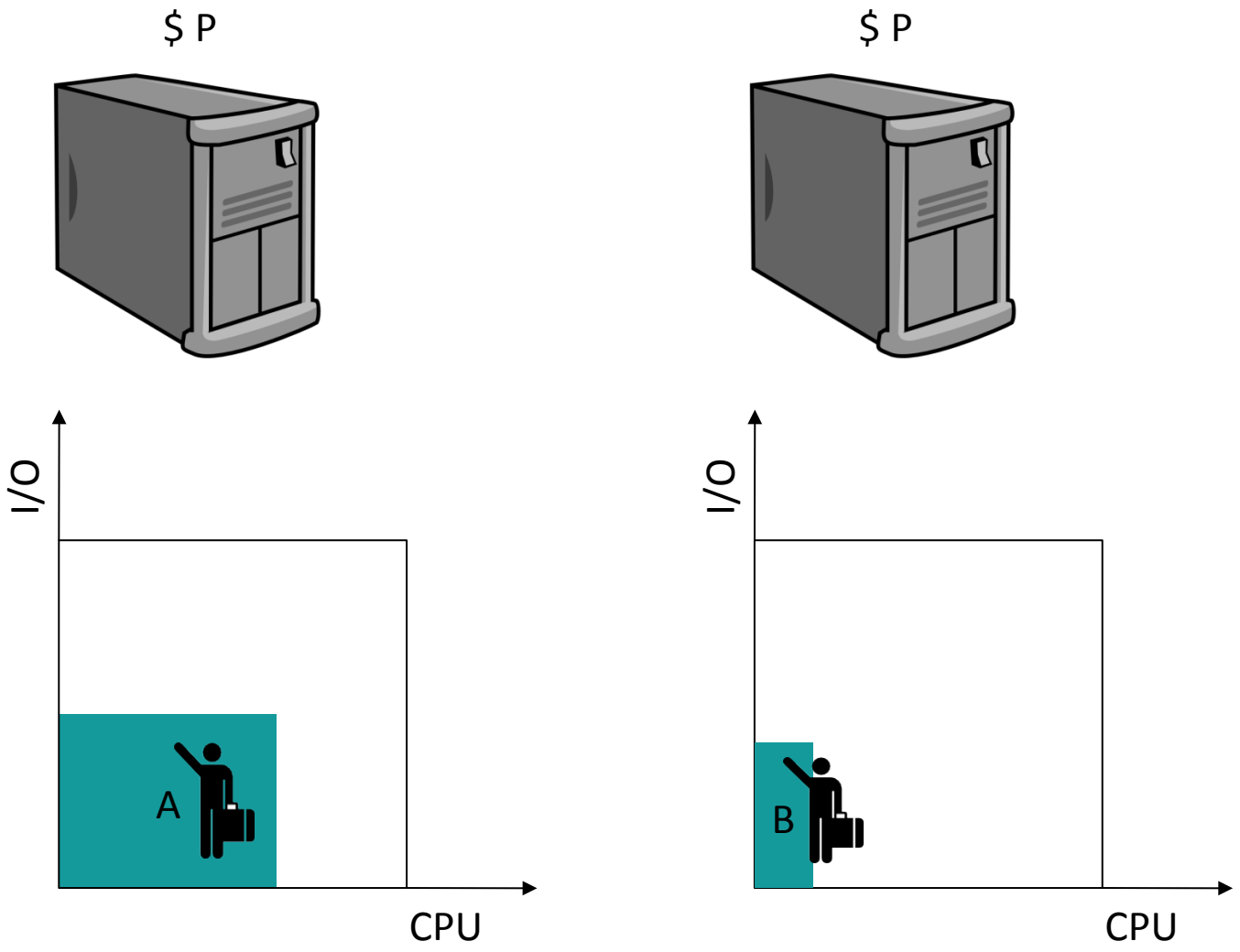
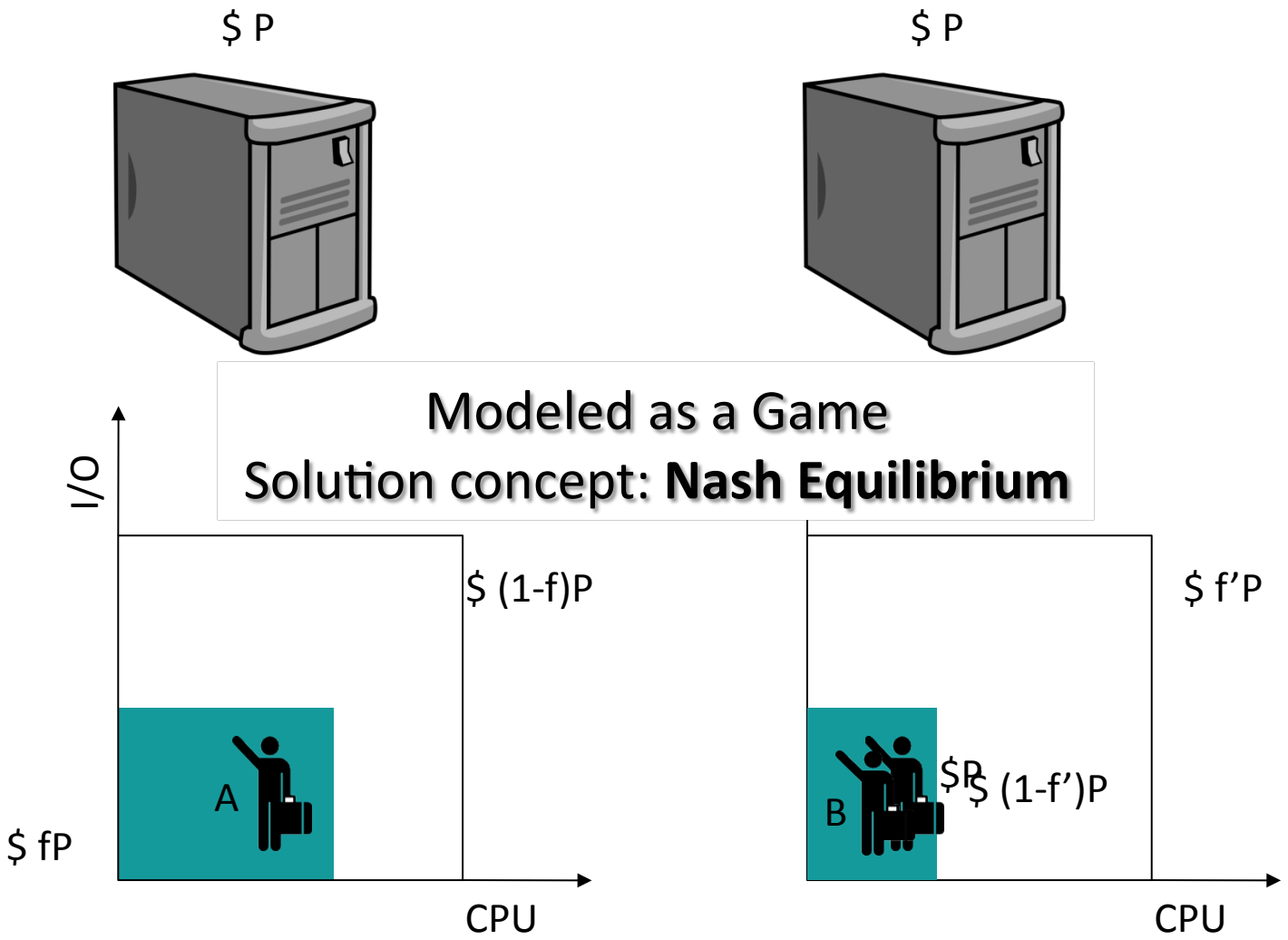
Motivation

- 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

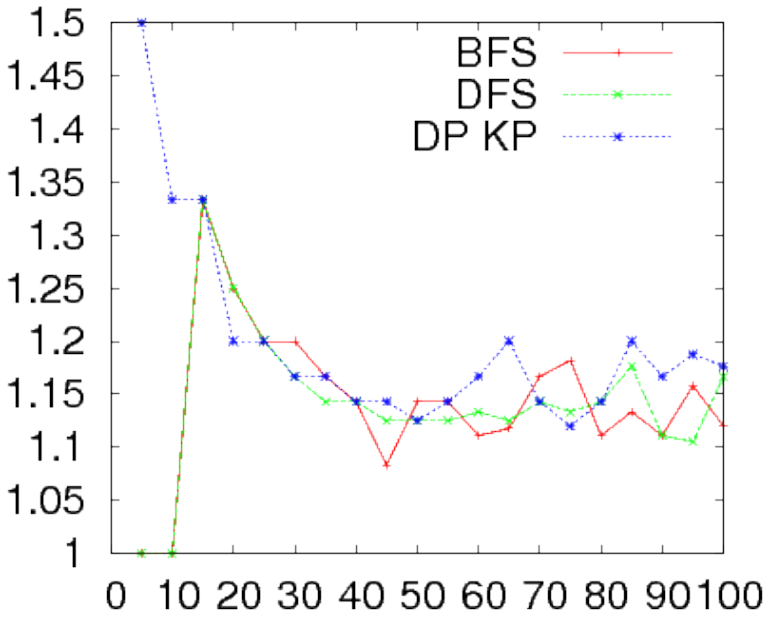


Formal Classification and Analysis

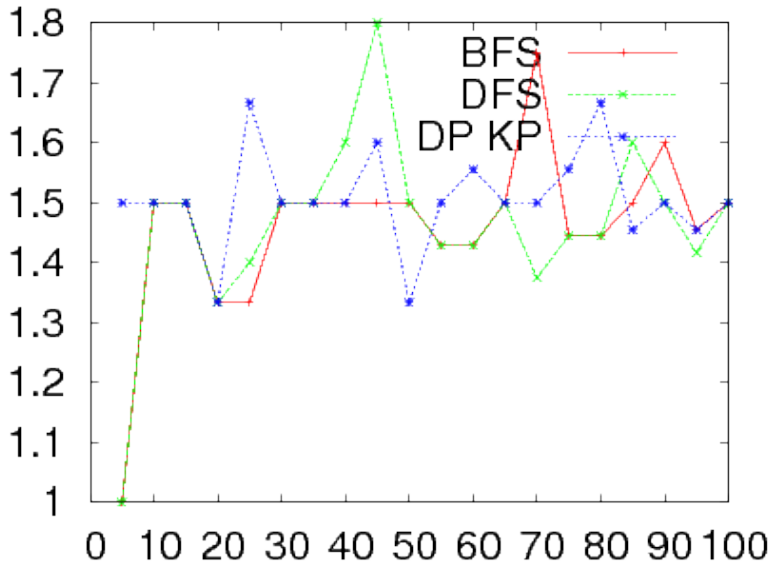
- **General Colocation Game:** Multiple resources over multiple processes per customer
  - No guarantee of Nash Equilibrium (NE)
- **Process Colocation Game:** Multiple resources over a single process (e.g., VM) per customer
  - Converges to a NE
  - Price of Anarchy = 3/2 (if homogeneous resources)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

Actual-to-Best Social Cost Ratio
(Synthetic workloads)

Median over all experiments

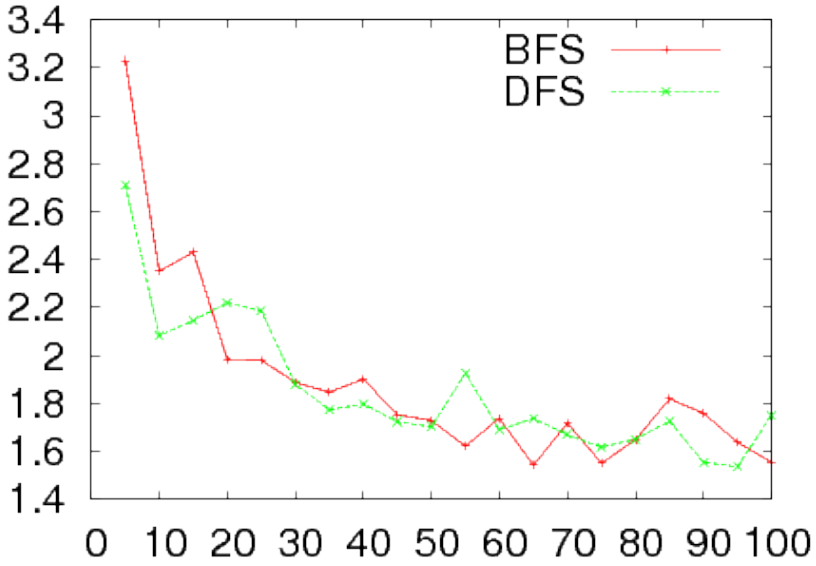


Worst-case experiment

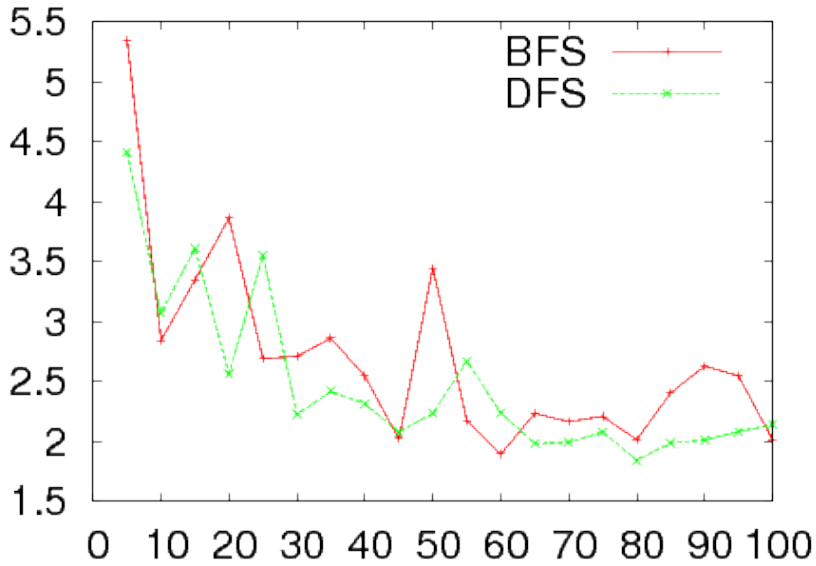


Worst-to-Best Social Cost Ratio
(PlanetLab traces)

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!