



IBM Research

Software Economies



David F. Bacon, Eric Bokelberg,

Manu Sridharan



Yiling Chen, Ian Kash,
David Parkes, Malvika Rao

Software Development Challenges

Correctness

- Traditionally: specification, testing, verification
- Intellectual foundation: logics, proof techniques
- Problem: **doesn't scale**

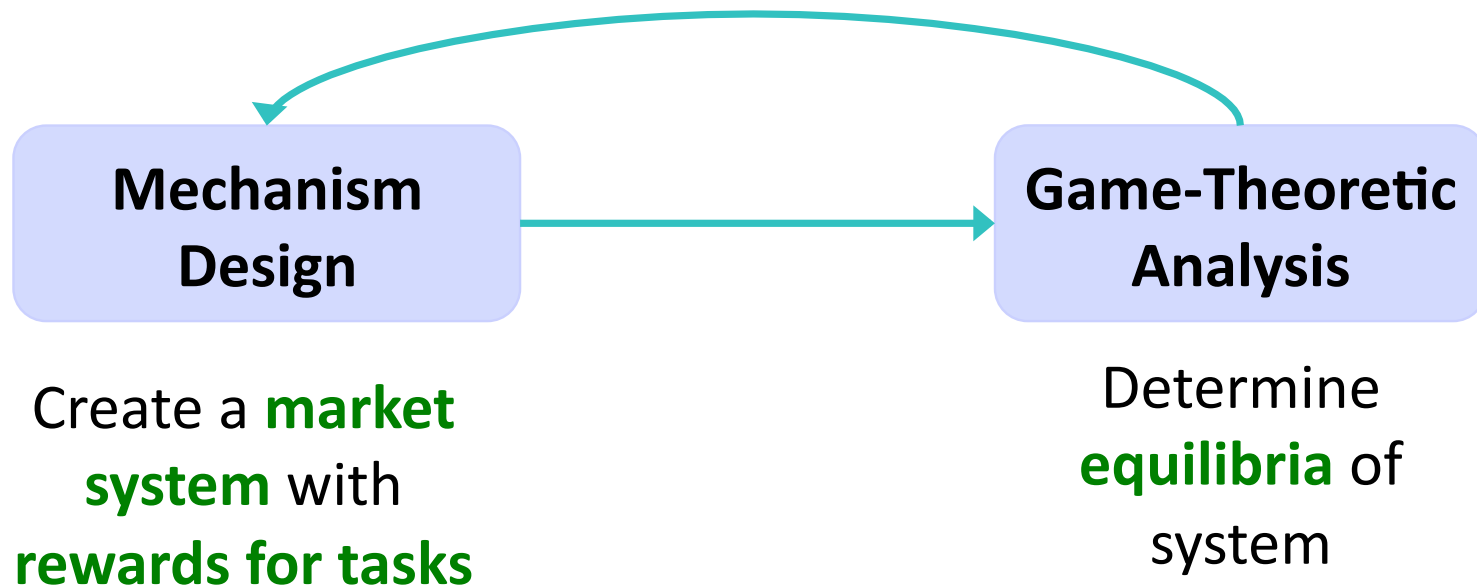
Budgeting

- Traditionally: centralized allocation of resources to tasks
- Problem (again): **doesn't scale**

Tradeoffs

- Going back to mythical man-month

An Economic Approach



Advantages

- **Decentralized and self-regulating**
- **Explicit (quantitative) tradeoffs**

Nascent Software Economies

Vulnerability Markets



Freelance Marketplaces



App Stores



Public Software Economies

Definition: large-scale project, direct connection to users

Key idea: users bid for bug fixes / features

- Market aggregates demand for fixes
- Developers compete to implement profitable fixes

Correctness equilibrium: no bugs with sufficient demand to be worth fixing

See “A Market-Based Approach to Software Evolution,”
OOPSLA Onward! 2009

Private Software Economies

Definition: smaller projects / user bases, but many projects

Competition Systems (à la Topcoder): reduce idle time,
improve quality

Scoring Systems: can incentivize, e.g.,

- Faster task completion by developers (with sufficient quality)
- Accurate prediction by managers
- Component reuse

Current work: game-theoretic re-design of IBM-internal
scoring system

Conclusions

Proposing an **economic approach to software development**

- **Decentralized and self-regulating**
- Via **mechanism design** and **game theory**

Preliminary instantiations in public and private setting

Many open (exciting!) challenges and opportunities