Multiple Distributed Auctions for Allocating Grid Resources

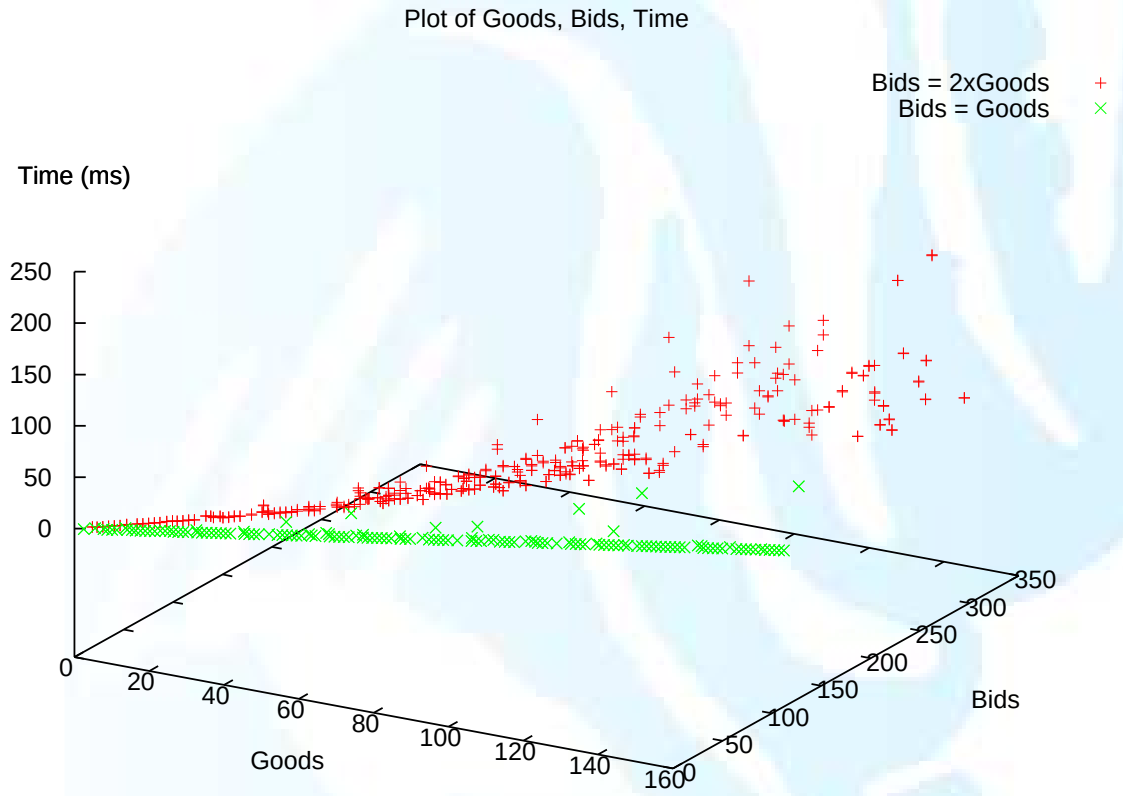
Peter Gradwell and Julian Padget

Department of Computer Science,
University of Bath, Bath, UK

Market-based Resource Allocation

- Trading systems are no use if they are slower
- Need for an accurate empirical model of Combinatorial Auctions:
  - Algorithms CABOB, CASS, LP Solve
  - NP-Complete
  - Hard increasing the number of goods makes the computation time much longer than increasing the number of bids (Fujisima, Leyton-Brown, Shoham)
- Aid understanding of when to use different market mechanisms (CAs, CDA, Distributed Markets etc.)

Parameters and Complexity

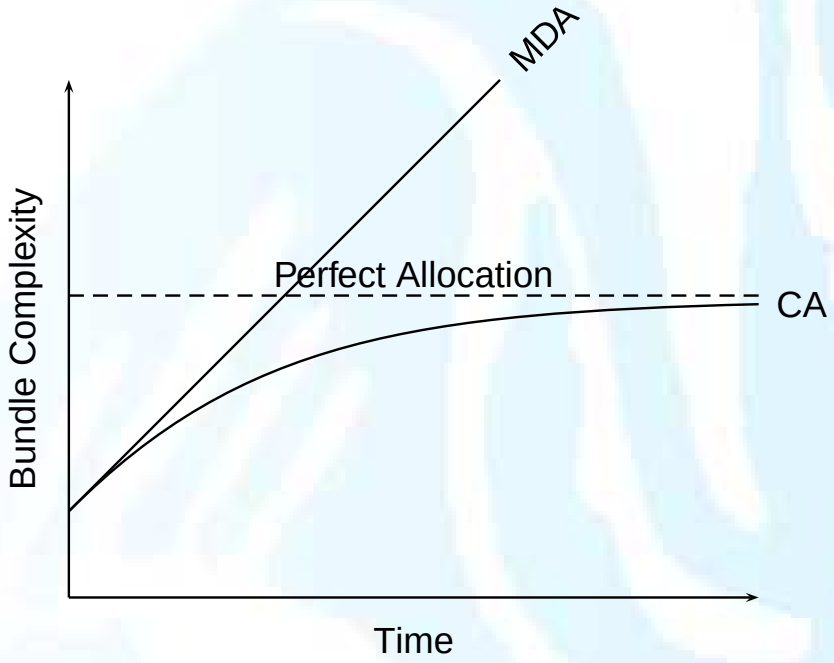


- Number of goods has more impact on computation than number of bidders.
- Literature demonstrates that some problems respond to heuristics, but others do not
- Criteria for choosing market or auction still unclear

Distributed Auctions

- A market-based solution
- Distributed Auctions enable cross-fertilisation of a wide range of traders and buyers — as found in grids.
- Intelligent (middle) agents assemble bundles against customer requirements (actual or prospective)
- Trader agents are profit motivated.
- Traders may not sell all their bundles — so there is natural wastage in the system.
- Multiple Distributed Auctions (MDAs) are suitable for open grids as no relationship is required between trading parties

CAs vs Distributed Systems



- Complexity can neither be created nor destroyed
- If we remove the single combinatorial auction, who does the computation?
- Intelligent (middle) agents assemble bundles against customer requirements (actual or prospective)
  - Cost is distributed
  - Optimality is forfeited
  - Worse is better?

Approaching Optimality

- Current work: investigating the proximity of a MDA bundle to the (strongly) Pareto-optimal bundle.
- The depth of search (and speed of result) obtainable by a CA clearing algorithms are highly dependent on the heuristics used in the computation (CABOB).
- The MDA approach is very unlikely to produce a Pareto-optimal solution because has it has incomplete information
- Can heuristics be used to improve the MDA bundling mechanism?
- Could MDA traders remember popular bundles and assemble them pre-emptively? Market memory.
- How does re-sale/re-circulation of items impact market dynamics?