Auctioning of Link Capacity

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Motivation

- Increased requirements on large bandwidth
- Adequate supply of network resources by competitive network providers
- An interest in dynamic bandwidth broker mechanism that can be flexibly applied to network resource allocation

Pricing mechanism: auction

- Merits: simplicity to determine market price and efficiency to achieve best market value.
Auction

- Typical types
  - Ascending auction
  - Descending auction
  - Sealed bidding
  - Open bidding
  - Examples:
    - English auction: open outcry, ascending auction
    - Dutch auction: open descending auction

- Auction for network resource allocation
  - Offline auction: traditional methods
  - Online auction: reexamined, improved hybrid methods
Issues

- Auction model
- Price rules of auction
- Payment rules of auction

- User auction strategies
- Provider auction strategies
- Performance evaluation rules
Related work - MIDAS

- Consists of a set of simultaneous multi-unit Dutch auctions, one per link.
- Users simultaneously bid for the quantity demanded at all relevant auctions in order to immediately allocate bandwidth.
- The bidders’ strategies are based on the feedback on spare capacities and prices.
- A special feature of the MIDAS is the prices at various links are reduced at different rate for reflecting the different demand at different links.
- According to the experimental evaluation of two price reduction policies, the authors argued the efficiency of the mechanism in terms of social welfare associated with the resulting bandwidth allocation.
MIDAS – pricing reduction policies

- **Variable reduction rates (VRR):** Price reduction rate per link depends on spare capacity
  - Reduction rates of different links are ordered inversely that spare capacities
  - Faster decrease for lower demand

- **Price freezing policy (PF):** price per link reduces at fixed rate, but after an allocation occurs, the price “freezes” for time proportional to the size of the allocation
  - Price of different links are ordered inversely than spare capabilities except for periods of freezing
Proposal

- **MIDAS**
  - Not a complete self-regulating solution dynamically changed according to demand and supply, only consider descending-price auction
  - Did not consider how to apply it into networking mechanisms

- **A self-regulating auction for intelligent routing in terms of the bandwidth allocation as an important aspect for achieving intelligence**
  - The existing study on the auctioning of link capacity is still based on the simple auction models. The network topology and capacity relationship are quite complicated.
  - Lack a common self-regulating auction mechanism to manage and maintain the network resource that could benefit both the providers and the users in various scenarios.
  - Establish a policy based automatic auction mechanism at the network decision point for intelligent network resources allocation.
Auction structure & procedure

Network Auction Unit
Discussion

- Questions on whether the proposal
  - worth studying
  - significant for intelligent network resource management
  - beneficial for both the users and providers
  - practical to be embedded into network routing and other mechanisms that are related to bandwidth allocation

- Other issues
  - Trust billing
  - Routing Embedment