Vytautas Valancius+ Nick Feamster+ Ramesh Johari^{*} Vijay Vazirani+

MINT: Market for Internet Transit

Presented by Kong Lam Slides adapted from authors'

+ Georgia Institute of Technology, * Stanford Un

Internet Market Inefficiencies

 Networks terminate connections even when users are prepared to pay for the path! October 2005

31 Jul 2005: Level 3 Notifies Cogent of intent to disconnect.

16 Aug 2005: Cogent begins massive sales effort and mentions a 15 Sept. expected de-peering date.
5 Oct 2005 : Level 3 disconnects Cogent. Mass hysteria ensues up to, and including policymakers in Washington, D.C.

7 Oct 2005: Level 3 reconnects Cogent

During the "outage", Level 3 and Cogent's singly homed customers could not reach each other. (~ 4% of the Internet's prefixes were isolated from each other)

Internet Connectivity Inefficiencies

- Denied peering opportunities exist in every exchange
 - Disagreements over payment direction
 - Bilateral nature of contracts introduces information asymmetrise c



MINT in a Nutshell

Replace bilateral contracts with path auctions

- Sellers
 - Sell segments from exchange to exchange
- Buyers
 - Buy multiple segments that form paths



From Pricing Connections to Pricing Segments

- Current market: pricing connections
 - No control to end-networks, coarse granularity
- MINT market: pricing segments
 - High granularity, possibility to value/ construct entire paths
 - Pricing congestion, bw, delay, loss or combinations

Do you agree with such a market structure?

From the Market's Viewpoint

- Market and connectivity efficiency
 - End networks can directly express their valuation of network-to-network paths
 - No incentive to de-peer as long as endnetworks are valuing the paths
- Incentive to end-networks: path control
 Incentive to transit networks: increased revenue, direct policy expression through prices

Forms a flat network. Incentives?

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Market Model

- Modeling Internet as an Auction
 - Sellers advertise prices (offers) for each segment
 - Buyers issue bids for "paths"
- Auction properties:
 - Continuous: ISPs are setting the prices to attract traffic
 - Combinatorial: Buyers issue the bids for set of goods
 - First-price: the lowest cost path is chosen



Mediator

- Mediator runs the auction, matches bids and offers
 - Bidding for price with bandwidth, delay, loss constraints
- What are the mediator's incentives?
 - Charge for path requests
 - Allow multiple mediators to compete

Preliminary Market Evaluation

How fast statistical equilibrium is reached?

- Topology from Peering DB
 - ~170 exchanges,~1000 ISI
 - Capacity information
- Segment pricing
 - Randomized price bootstrap
 - Each ISP runs a heuristic to maximize the utilization
- Bid arrivals and demand curve
 - Uniformly random source destination exchanges, Poisson arrival
 - Three different demand distributions



Implementation

- Ongoing work
- Control Plane
 - Scalability of mediator
- Data Plane
 - Makes use of existing technologies
 - Tunneling, label switching

Summary

- BGP is insufficient for diverse and growing Internet
- MINT alternative way of structuring inter-domain bandwidth trade
 - Rather trading connectivity, trade transit segments
- Multiple benefits
 - More control to the source
 - No notion of customer-provider or peerpeer
 - Policy expression through price