P2Pconomics

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(Ideas from Richard T.B. Ma)
In the Internet: Different classes of players

- **Eyeball ISPs**
  - Provide Internet access to customers:
  - Place Large investment on infrastructure.
  - E.g. AT&T, Verizon …

- **Content ISPs**
  - Provide contents via the Internet.
  - Serve customers like: Google, Akamai, YouTube

- **Transit ISPs**
  - Tier 1 ISPs: global connectivity of the Internet.
  - Provide transit services for other ISPs.
  - Cover a large geographic area.
Everyone wants to make MONEY!!!

Revenue from content providers

Content ISP

Transit ISP

Transit service revenue

Monthly service payment

Eyeball ISP
Problems of the current settlement model

Transit

Not enough revenue to recover investments. Other ISPs are free-riding on our facilities.

Eyeball

Home-users’ monthly fees do not cover costs. We should be able to generate more revenue.

Content Providers

We have paid enough for deploying networks and buying bandwidth from other ISPs.
What if Shapley Value were imposed?

- Shapley Value is a mathematical construct
  - Each participant is paid the average of what they add to the system without them there
  - E.g.
    - With Google participating, network makes $100M
    - Google drops out: Google makes nothing, remaining network makes $70M
  - Fair: Google and the rest of the network should somehow split $30M, while remaining $70M goes to rest of network

- Shapley Value determines how to do this “fairly”

Transit service revenue

Non-Google: $ $ $ $ $ $ $ $ + $ $
How does P2P change things?

• Traditional Flow: All content flows through transit to eyeball

• P2P Flow: More eyeball to eyeball: thus less content, less transit
Under Shapley

• Eyeball ISPs should love P2P
  – They become better connected, hence more important
  – Shapley profits shift toward them

• What about Content and Transit
  – Bandwidth costs drop ➔ aggregate network profit rises
  – Still get a piece of the profit
Conclusion

• Everyone can benefit from P2P (if payment implemented a la Shapley)
  – Aggregate profits increase
  – “Fair” split gives everyone a raise, though eyeball sees it more

• Problem: How to get network players to implement the Shapley value?
  – Complex mechanism (no easy distributed solution)
  – May not work with bilateral agreements