

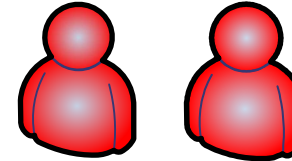
# **P2Pconomics**

**Dan Rubenstein**  
**(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 ...



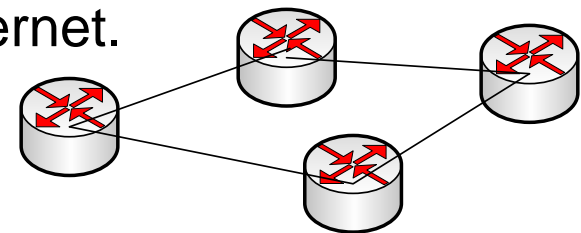
- Content ISPs

- Provide contents via the Internet.
- Serve customers like:

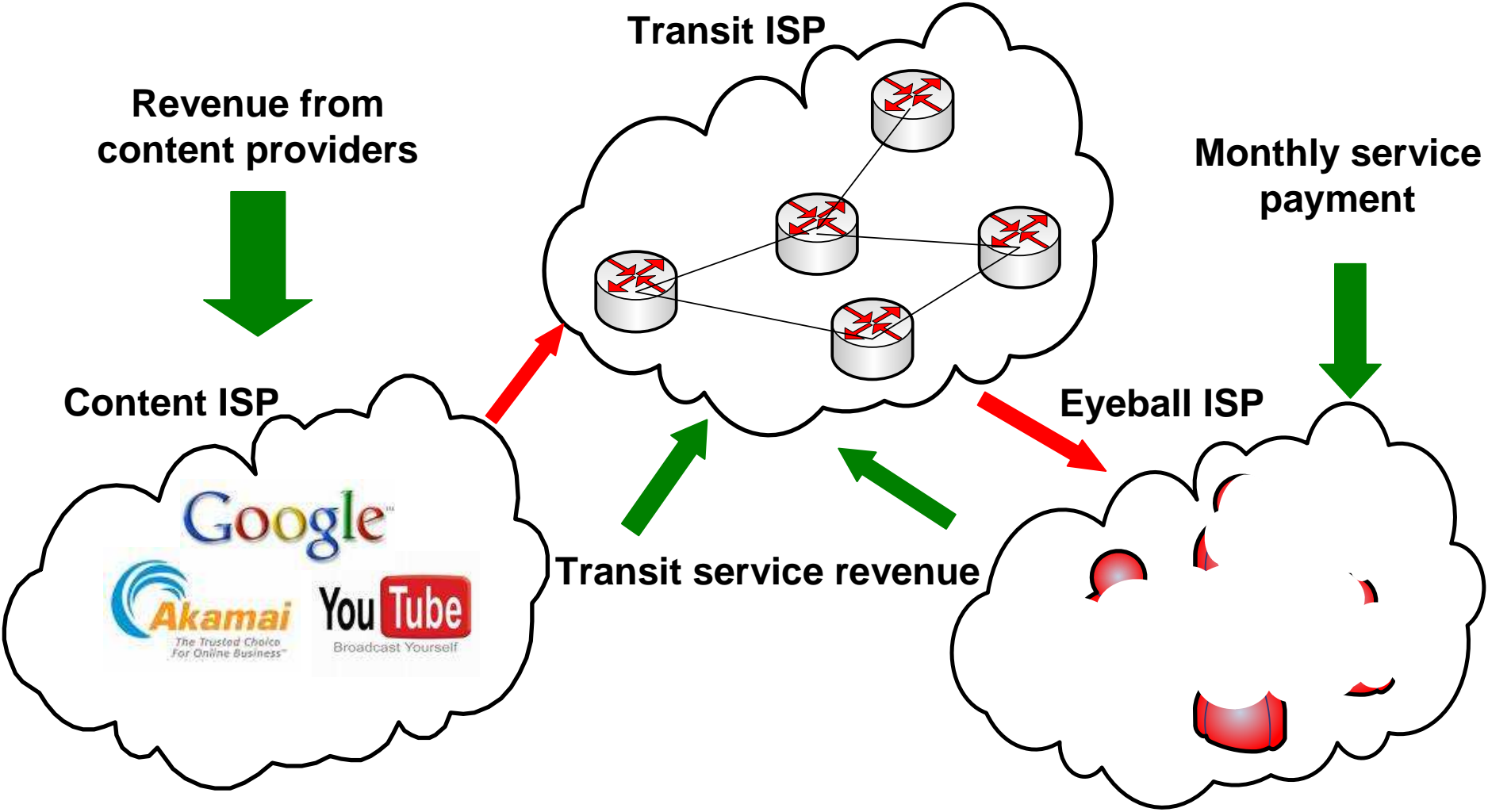


- Transit ISPs

- Tier 1 ISPs: global connectivity of the Internet.
- Provide transit services for other ISPs.
- Cover a large geographic area.

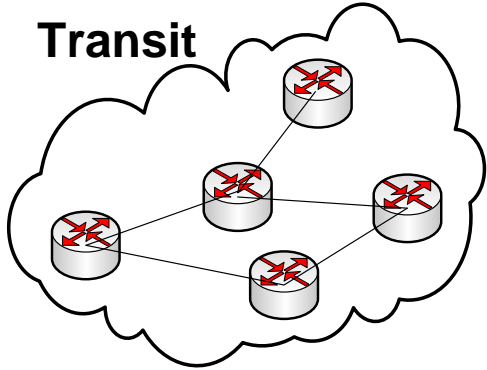


# Everyone wants to make MONEY!!!



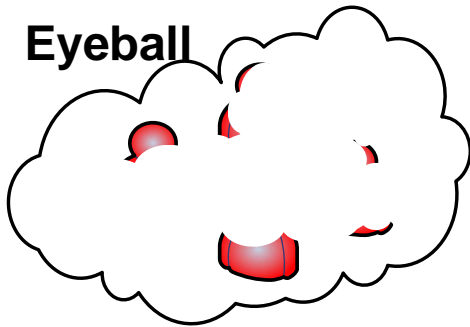
# Problems of the current settlement model

**Transit**



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

**eyeball**



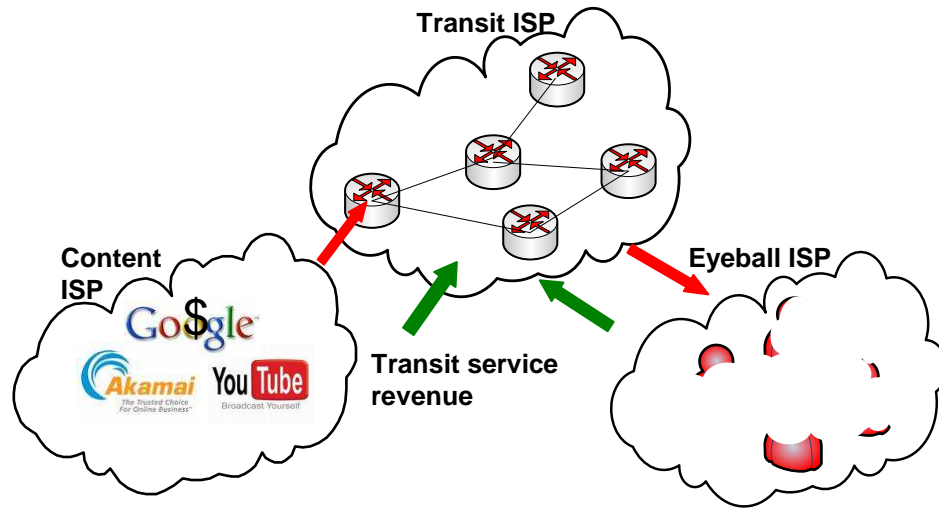
**Home-users' monthly fees do not cover costs.  
We should be able to generate more revenue.**

**Content Providers**



**We have paid enough for deploying networks  
and buying bandwidth from other ISPs.**

# What if Shapley Value were imposed?



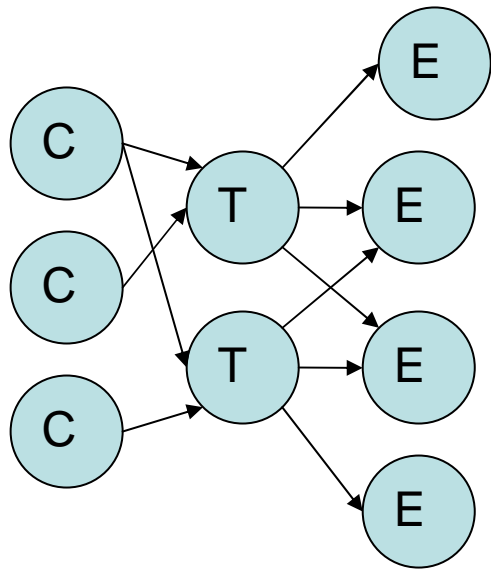
\$\$\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$

Non-Google: \$ \$ \$ \$ \$ \$ \$ \$ + \$ \$ \$

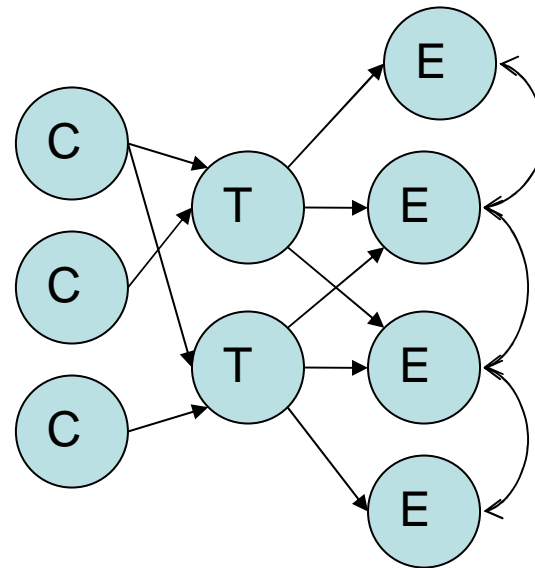
- Shapley Value is a mathematical construct
  - Each participant is paid the average of what they add to the system without them there
  - E.g.
  - With Google participating, network makes \$100M
  - Google drops out: Google makes nothing, remaining network makes \$70M
  - **Fair:** Google and the rest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

# 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