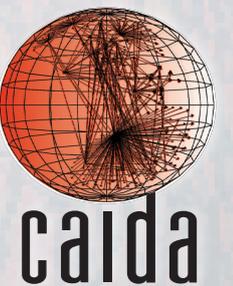


ECONOMICS OF CONTRACTUAL AGREEMENTS IN INTERNET INTERCONNECTION

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IN THE PRESS



France Telecom Accused Of Holding YouTube Videos Hostage Unless It Gets More Money

from the *more-peering-disputes* dept

'Peering' Into AOL-MSN Outage

Level 3 and Comcast Issue Statement

Jul 16, 2013

BROOMFIELD, Colo., July 16, 2013 – Level 3 and Comcast have resolved their prior interconnect dispute on mutually satisfactory terms. Details will not be released.

Confirmed: Comcast and Netflix have signed a paid peering agreement

Netflix packets being dropped every day because Verizon wants more money

Verizon wants to be paid by consumers and Cogent, but Cogent refuses to pay.

Cogent Gearing for Another Peering Battle

by [Stacey Higginbotham](#) FEB. 23, 2014 - 9:27 AM

Verizon denies using net neutrality victory to sabotage Netflix, Amazon

BY **BRIAN FUNG** February 5 at 1:59 pm

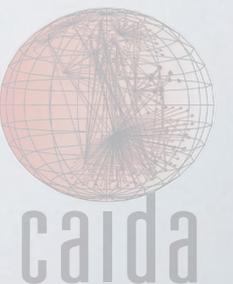
Netflix still sucks on AT&T, and now AT&T plans to offer Netflix clone

AT&T partners with an investment firm to buy and launch streaming services.



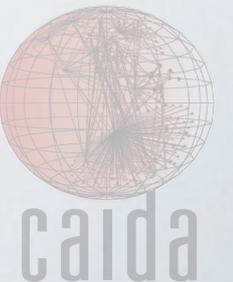
BACKGROUND

- Peering disputes between access, content, and transit providers have been happening for many years
- Modern peering disputes manifest as congested links (rather than outright de-peering)
- Why do peering disputes keep happening?
- What should change to produce more stable peering relationships?



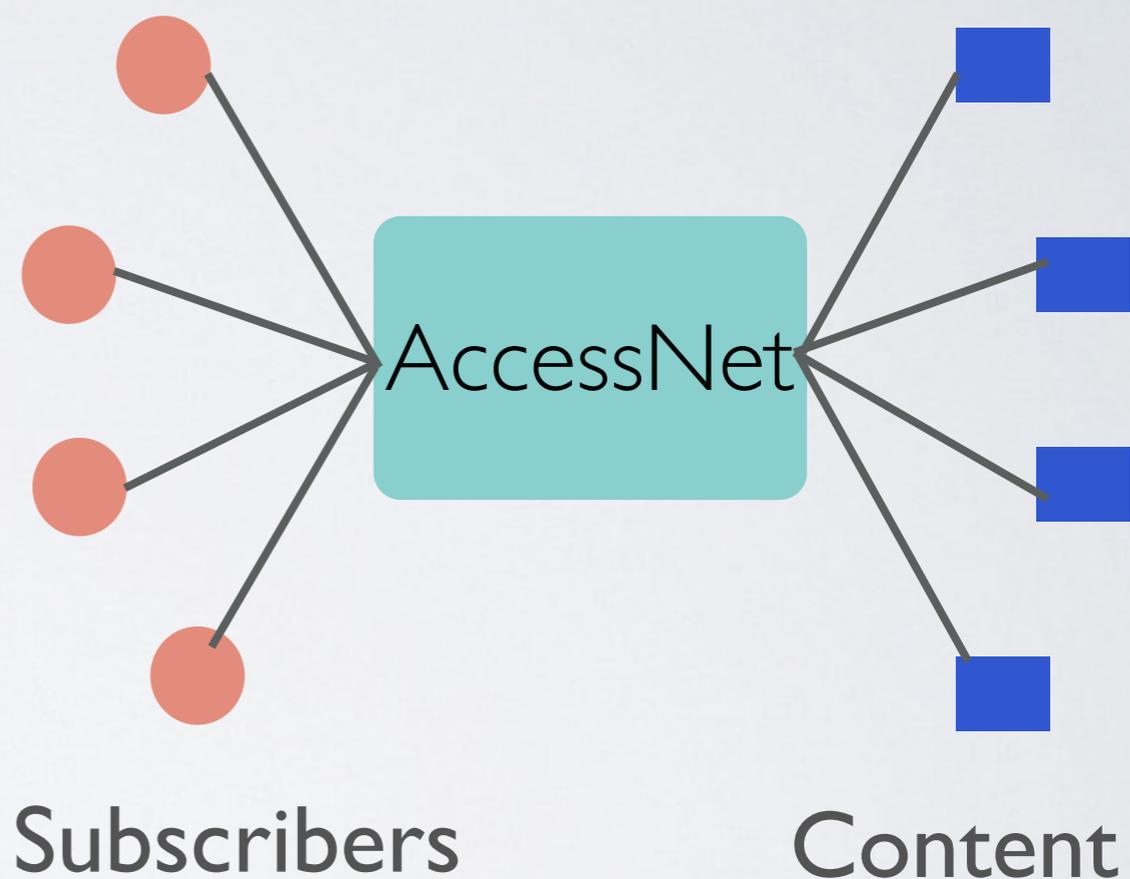
PROPOSED WORK

- New NSF-funded project (2015-2019) to study the economics of contractual agreements for Internet interconnection
- Economic analysis of a series of increasingly complex models, along with agent-based simulation
- Empirical component to parameterize economic models with real-world data
- Propose new interconnection models with better economic properties



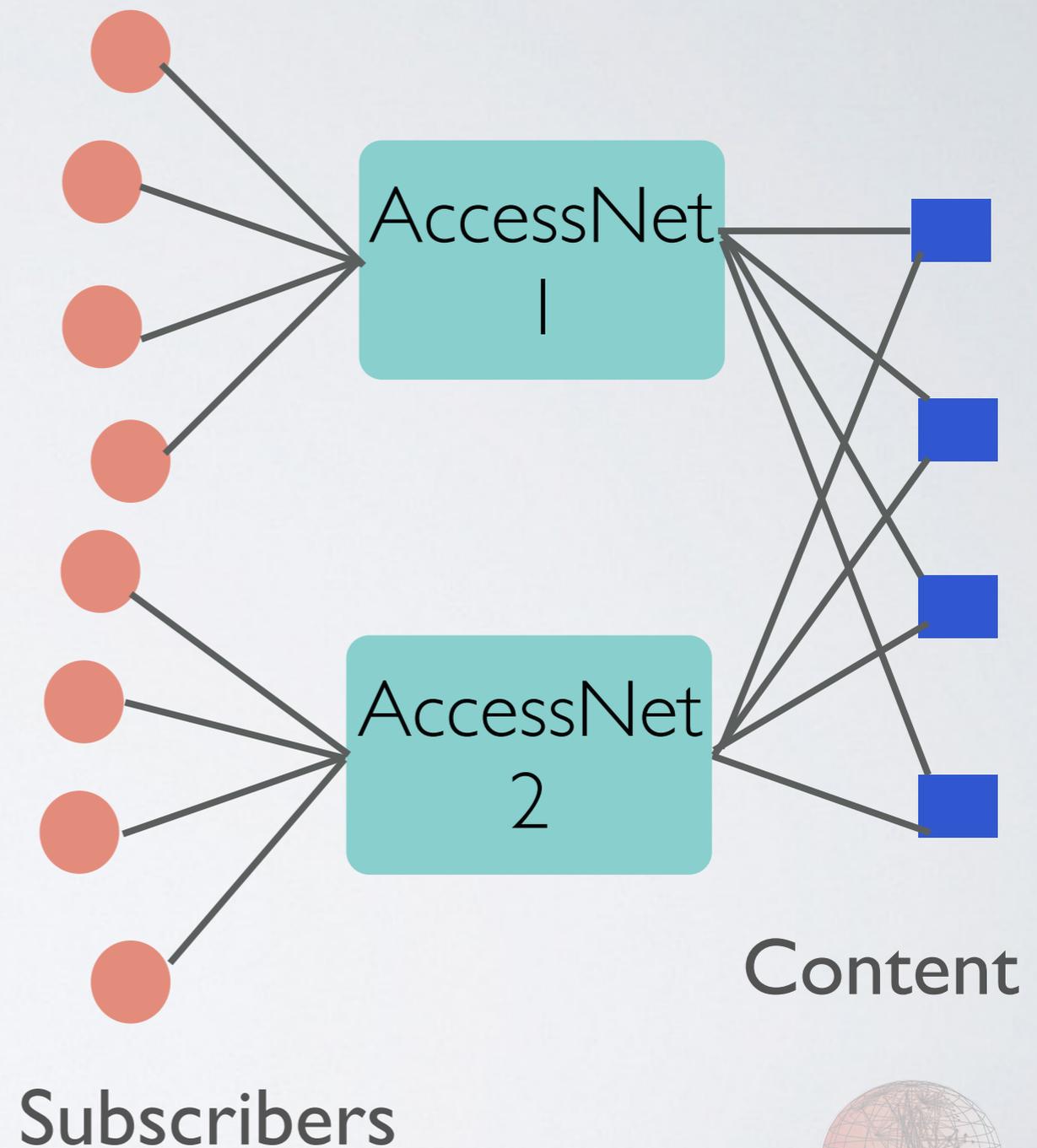
MODEL I

- Single monopoly access provider: two-sided market
- Which side should pay the AccessNet for? How does the outcome depend on elasticity of demand of consumers, costs, and traffic growth rates?
- Variants: what if content providers refuse payment, leading to congestion? Who hurts more?



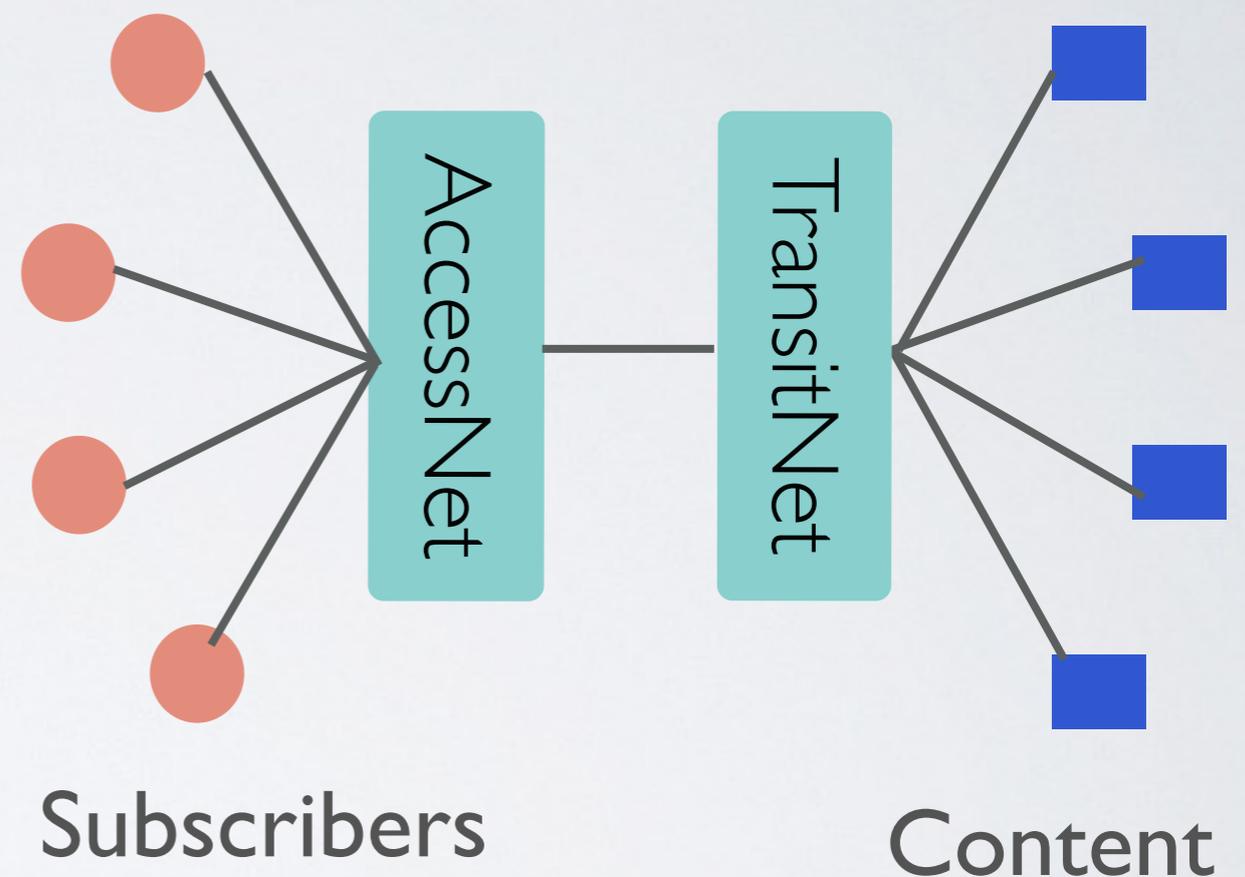
MODEL 2

- Similar to previous two-sided market scenario, but with oligopoly in access market
- Competition between access providers makes things more complex, subscribers can switch with an associated cost
- Interconnections can be dynamic



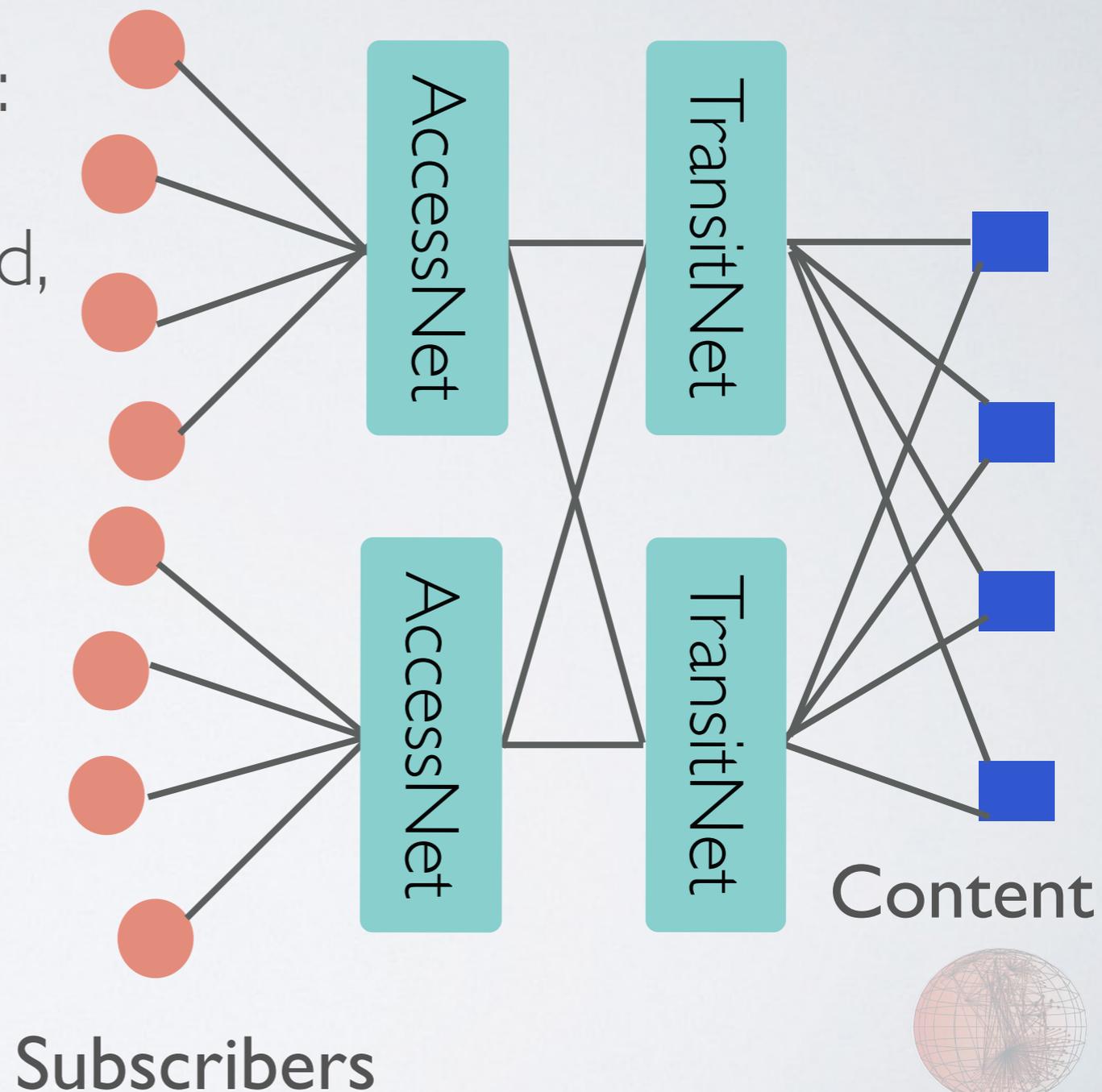
MODEL 3

- No longer a two-sided market, intermediate transit network
- Both the access and transit networks are platforms which have customers and must decide on the settlement between them
- Bilateral bargaining framework with the possibility of incomplete contracting?



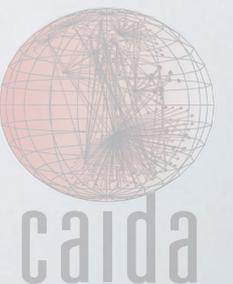
MODEL 4

- Access oligopoly with competition in transit market:
- Content typically multi-homed, subscribers typically single-homed.
- May be too complex to approach analytically: use agent-based simulations with our GENESIS model



EMPIRICAL COMPONENT

- The previous models need to be parameterized with real-world data
- Elasticity of demand from consumers, sensitivity to congestion, usage vs. service plan, competition in the access, content, and transit markets, density of connectivity and colocation, cost data, traffic growth data, performance/congestion
- Some of these can be estimated from data we collect at CAIDA: BGP data, AS relationships, colocation data, AS types, congestion
- Comcast has agreed to provide anonymized data about consumer usage



PROPOSED PEERING SCHEME

- AS relationships are too rigid
 - peers don't pay for any traffic, customers pay for all traffic
 - customers usually pay same price regardless of traffic type or destinations
- Could relationships between networks be more flexible? How about a different price for each route?
 - Set prices based on costs, demand, location, traffic type, competition...
 - The price of traffic between two networks can be zero for some routes, non-zero for other routes



THANKS!