Peering Costs and Fees

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The Legacy of Sender Pays

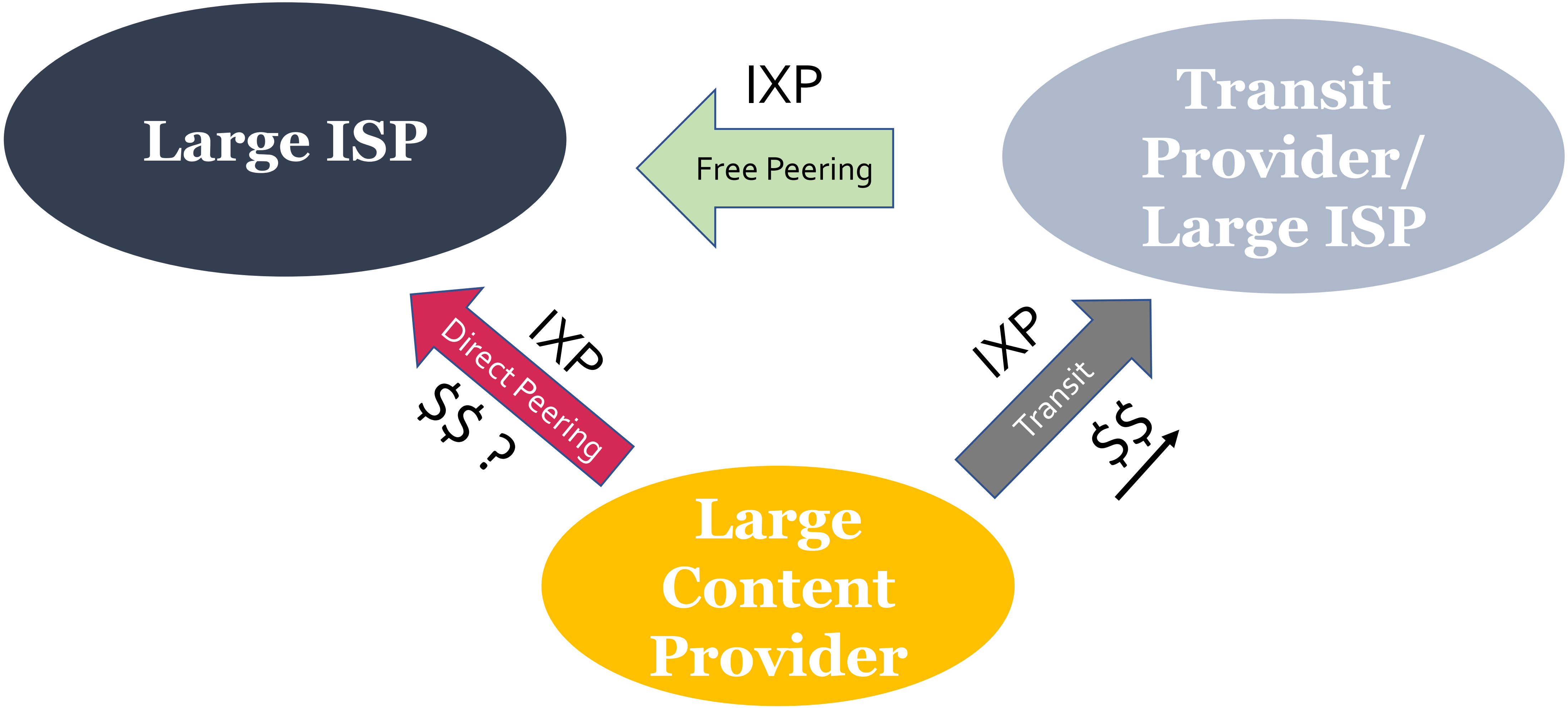
AT&T

NETFLIX

?

COMCAST

Direct Peering



Why does it matter?

Disagreements over who should pay whom

→

Congestion at interconnection points

→

Degraded quality of service

→

Consumers bear the harm

Interconnection Disputes

United States

- 2013-2014: A dispute between Comcast and Netflix over terms of interconnection
- 2014: Netflix and a few transit providers brought the issue to the attention of the FCC
- 2015: The FCC asserted oversight over interconnection arrangements in the 2015 Open Internet Order
- 2018: The FCC reversed itself ended its oversight
- It is almost certain that the FCC will revisit the issue in the next few years

Interconnection Disputes

Around the World

- South Korea is currently considering a proposal to require paid peering between content providers and ISPs based on traffic volume

- The European Union is also considering proposals that content providers be required to pay usage fees to ISPs based on the traffic volume

Research Questions

Investigate conflicting claims by ISPs and Content Providers over paid peering

Effect of paid peering on broadband and video streaming prices, and consumer surplus

When are large content providers qualified for free peering?

Outline

- Peering: Conflicting Claims
- Model
- Effect of Paid Peering on ISPs, CPs, and Customers
- Effect of peering policy on paid peering

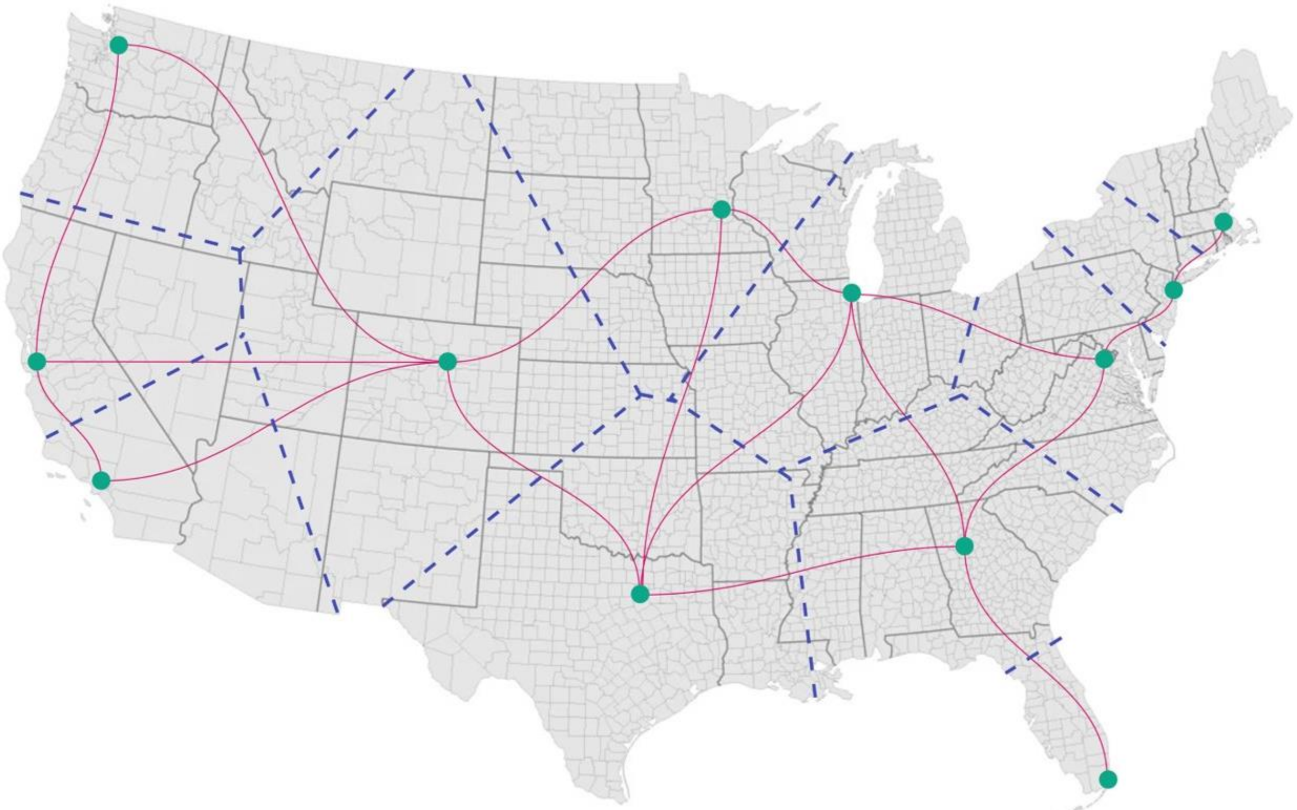
Interconnection: Conflicting Claims

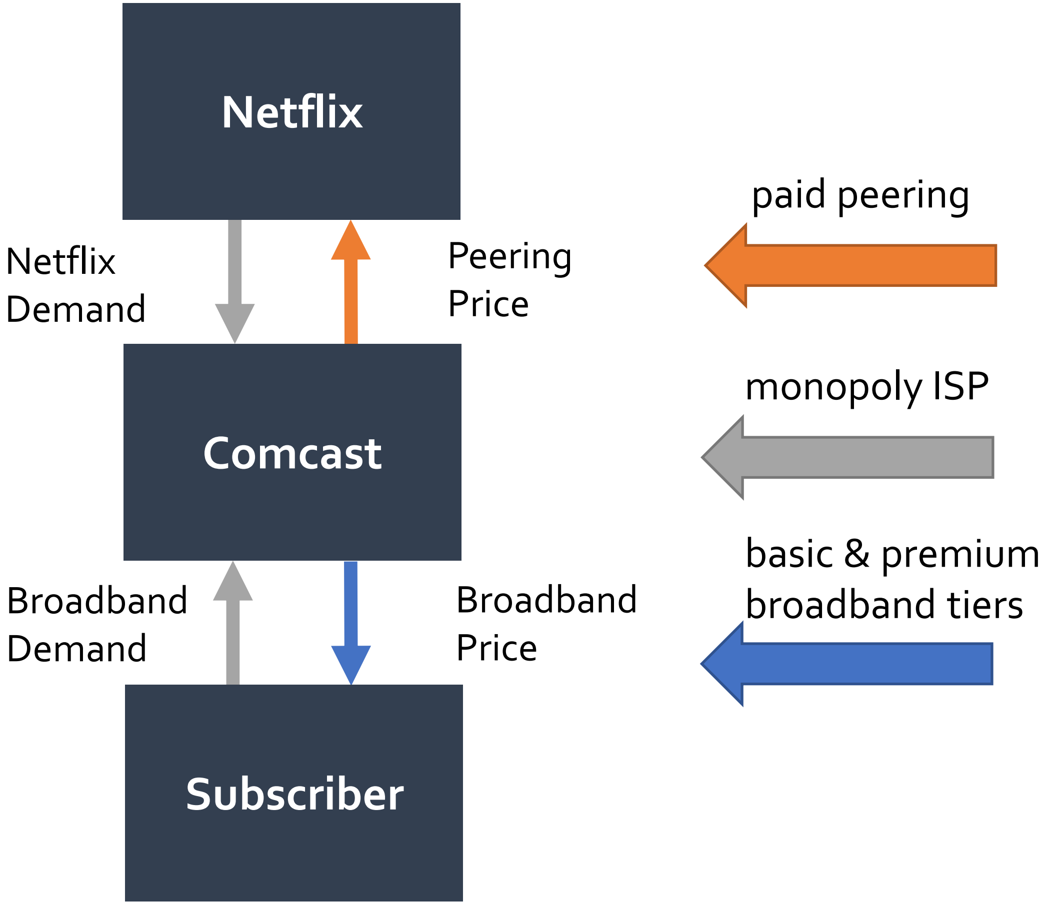
	ISP
Peering prices	**Prices reflect access and core network costs**
Who should pay	**content providers should pay** (may be passed on to users of video streaming services**)**
Competition	**less expensive than transit**
Effect on consumers	**lowers broadband prices**
Settlement-free Peering Requirements	**Same requirements for both large ISPs and content providers**

Interconnection: Conflicting Claims

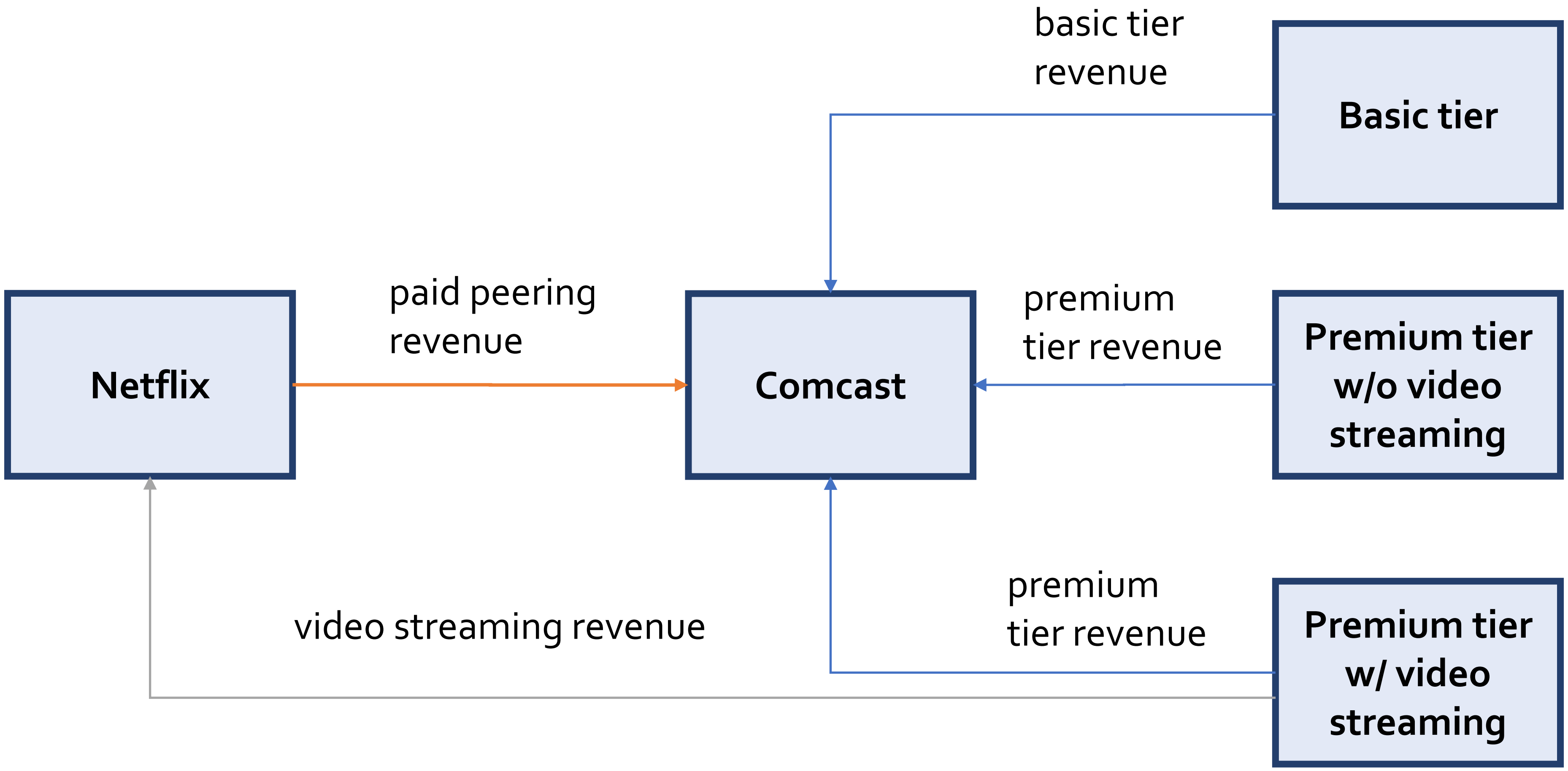
	ISP	Content providers
Peering prices	**Prices reflect access and core network costs**	**prices reflect content provider willingness-to-pay for access to ISP's customers**
Who should pay	**content providers should pay** (may be passed on to users of video streaming services**)**	**consumers have already paid**
Competition	**less expensive than transit**	not an option
Effect on consumers	**lowers broadband prices**	**harmed by double charging**
Settlement-free Peering Requirements	**Same requirements for both large ISPs and content providers**	**Content providers are qualified if the IXPs are sufficiently close to consumers**

Two-sided Model





Revenue flow



ISP profit maximization

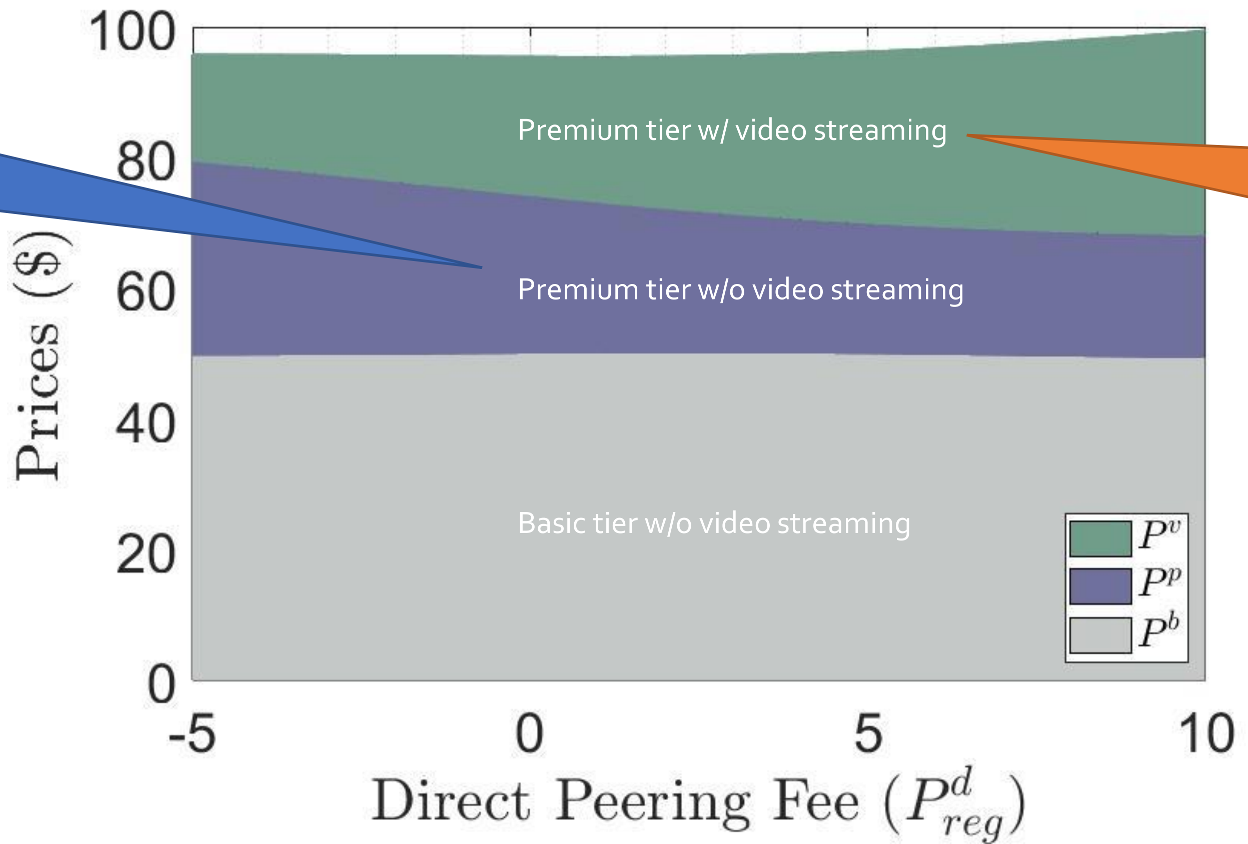
- ISP chooses prices to maximize profit
  - consumer prices (basic, premium)
  - peering price

- Video streaming providers
  - market determines price w/o paid peering
  - a portion of the peering price is passed through to consumers

Effect of paid peering on Prices

	ISP claim	Content Provider claim
Broadband Prices	Decrease	No Change

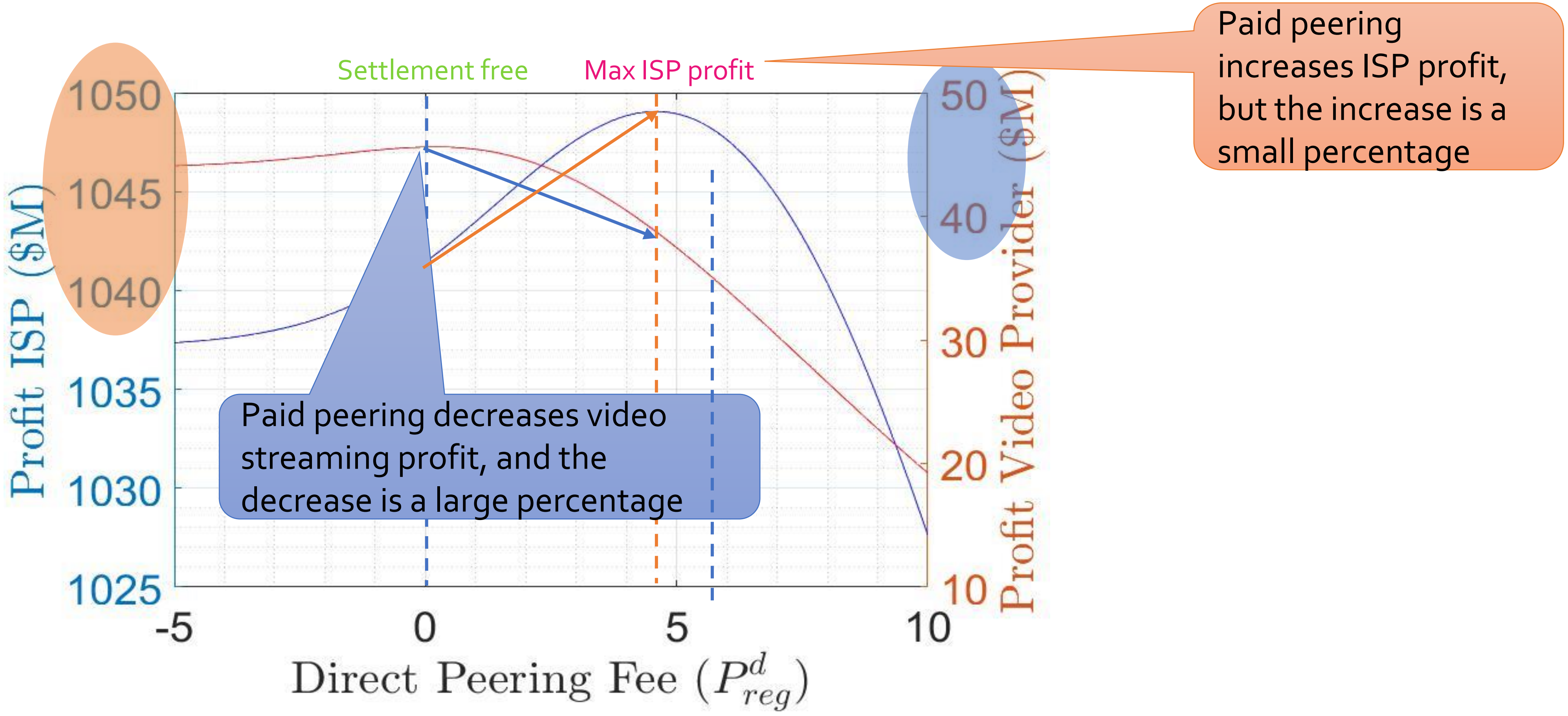
Paid peering reduces the premium tier price



Paid peering increases video streaming prices, and by more than the decrease in the premium tier price

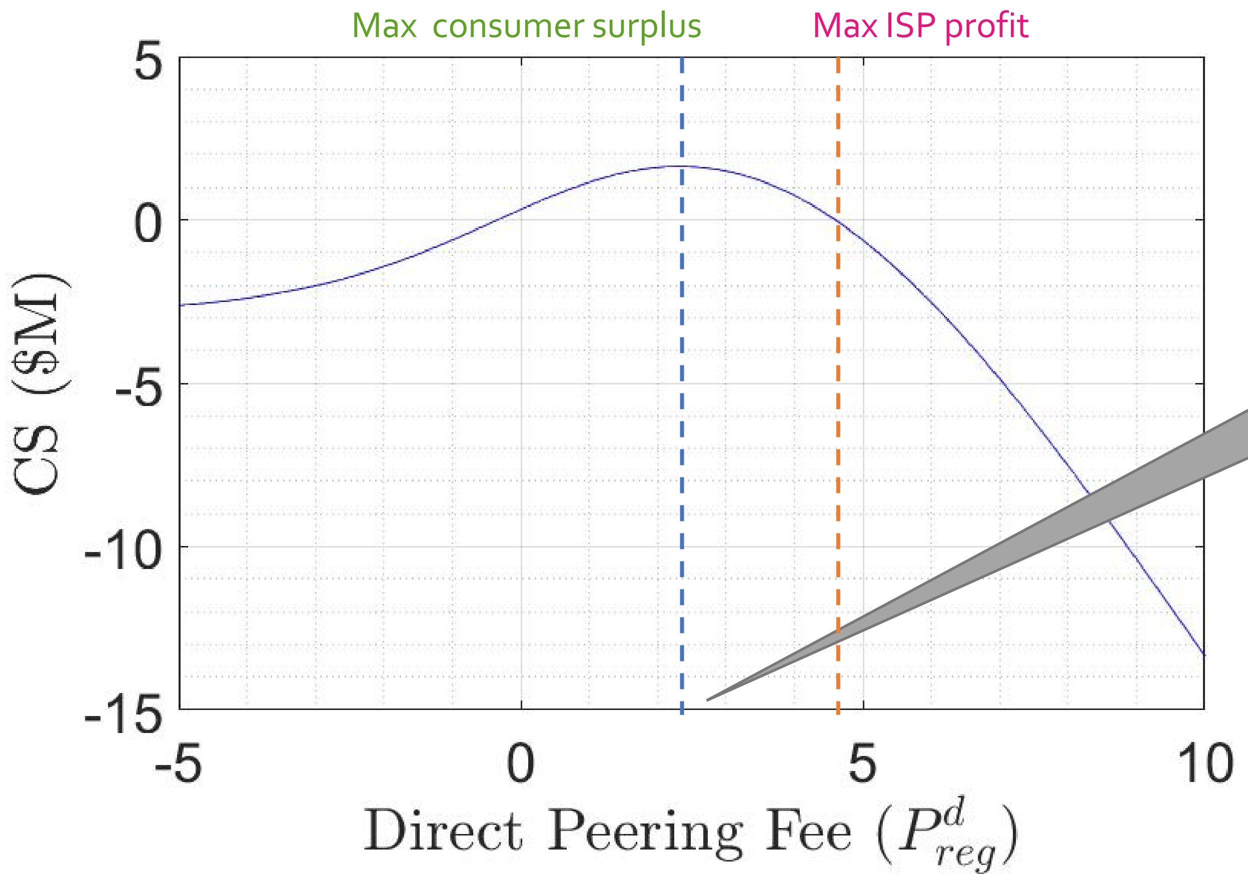
Effect of paid peering on Profits

	ISP claim	Content Provider claim
Profit	No Change in ISP Profit	Increase ISP Profit



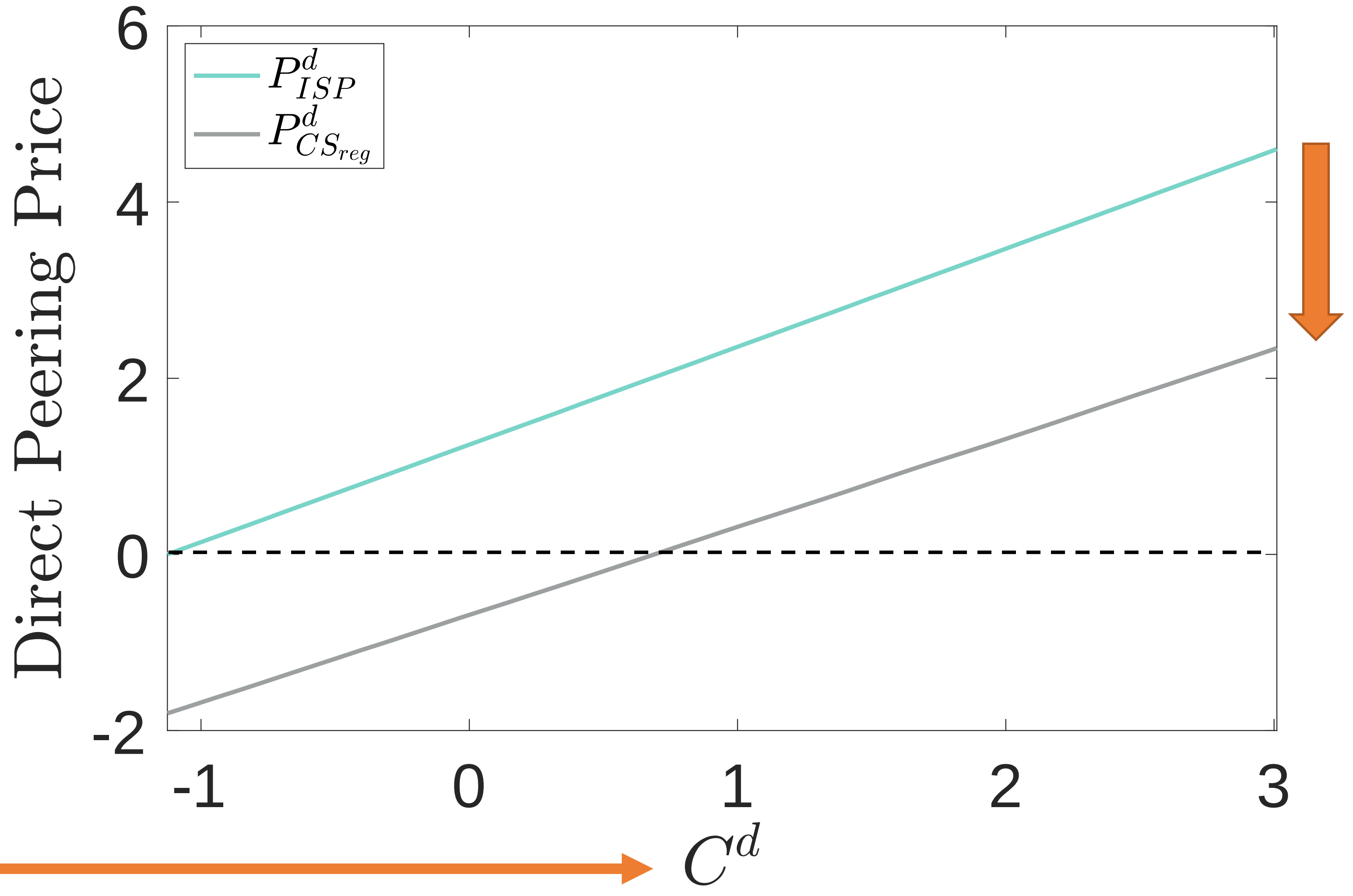
Effect of paid peering on Consumer Surplus

	ISP claim	Content Provider claim
Consumer Surplus	Increases	Decreases



The surplus-maximizing peering fee is less than the ISP profit-maximizing peering fee

Effect of Cost on Paid Peering



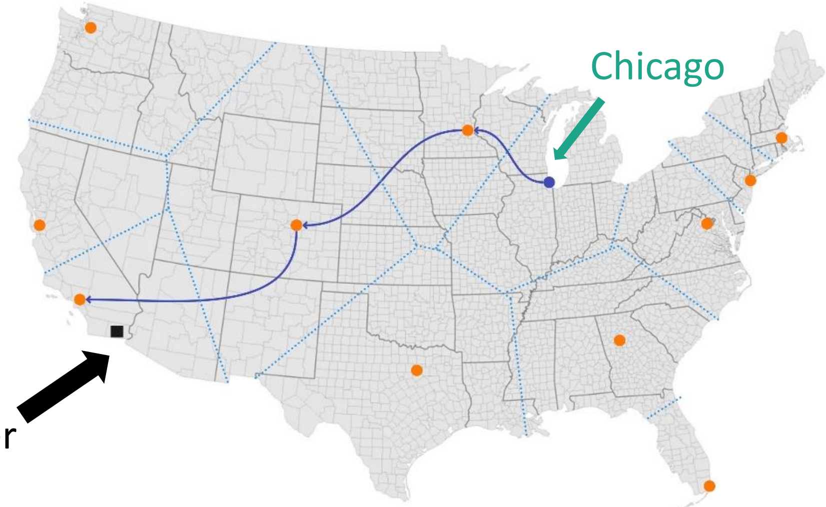
ISP Max > Surplus Max peering price

Settlement-free peering

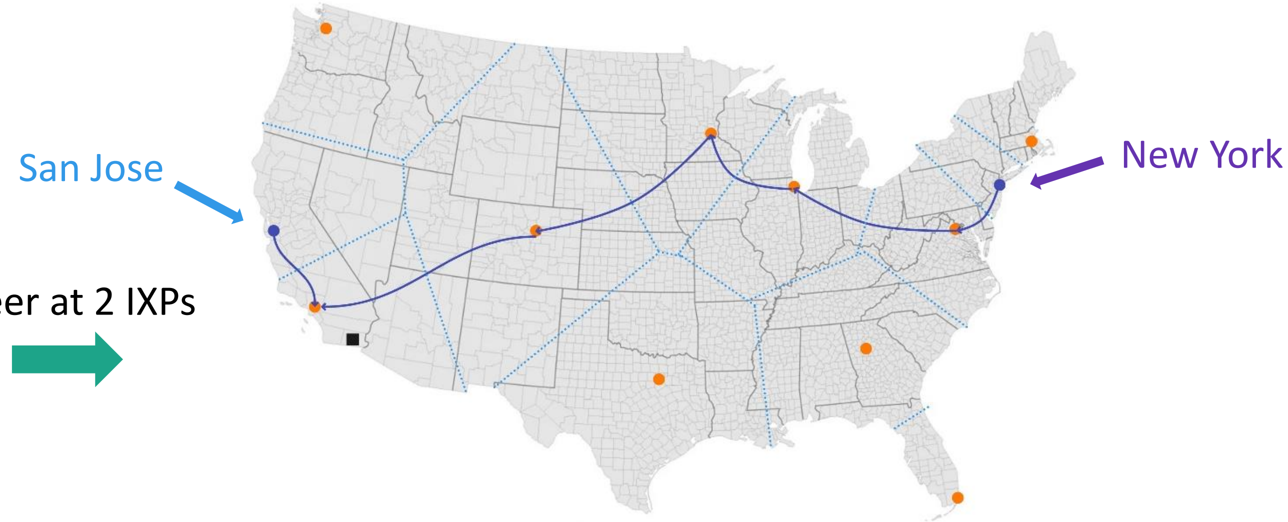
Incremental cost to the ISP of video streaming subscribers

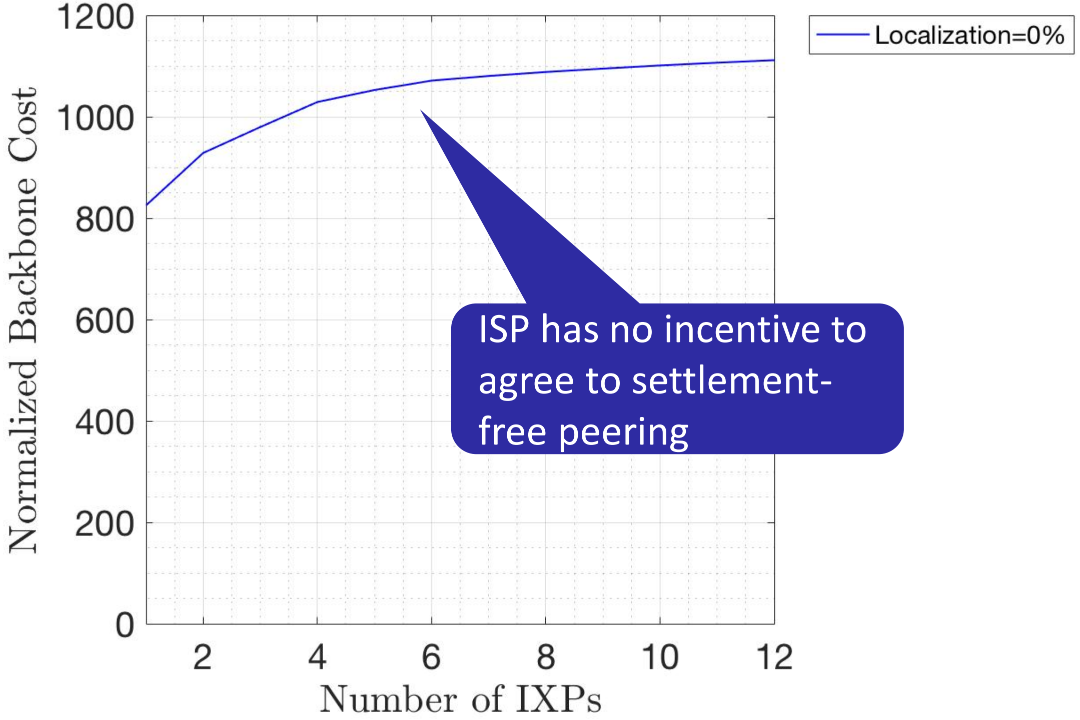
No Content Replication

Peer at 1 IXP



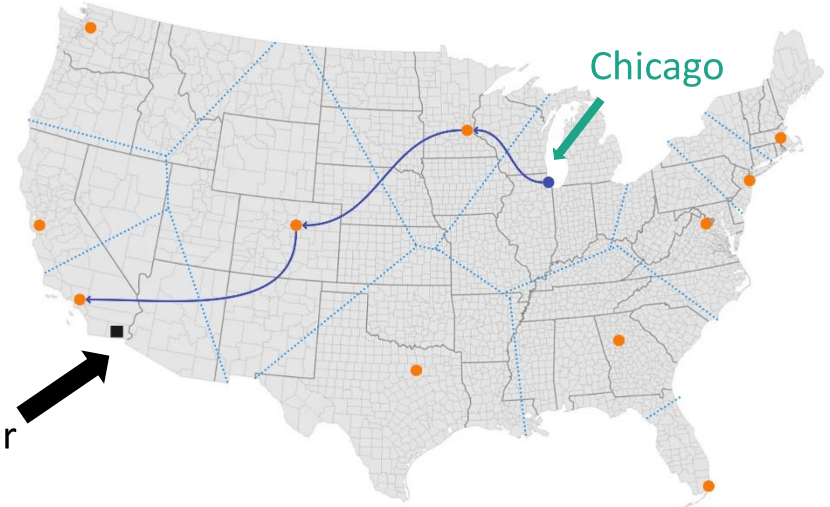
Peer at 2 IXPs



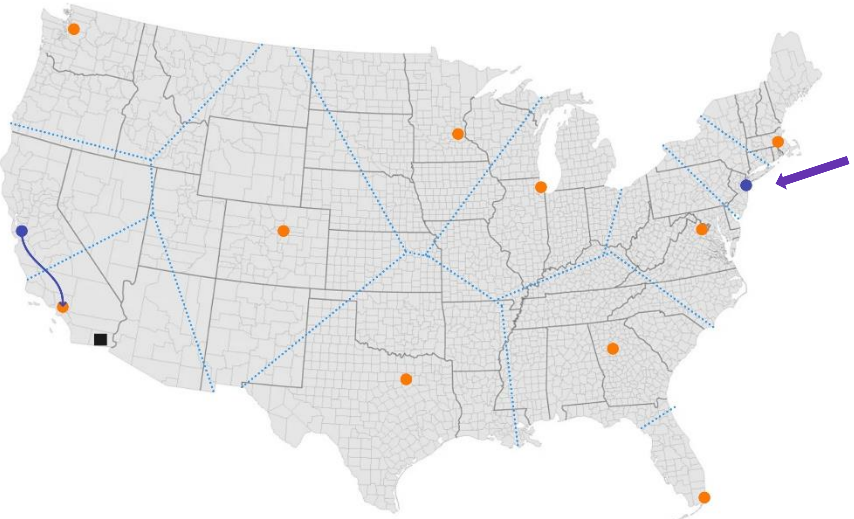


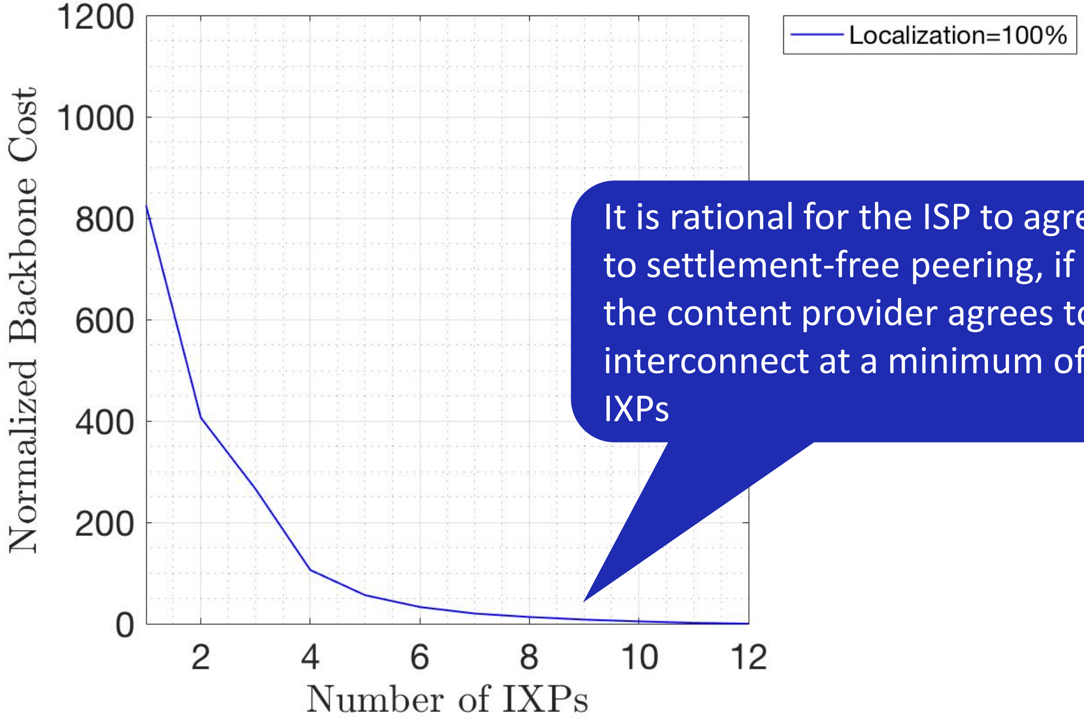
Full Content Replication

Peer at 1 IXP



Peer at 2 IXPs

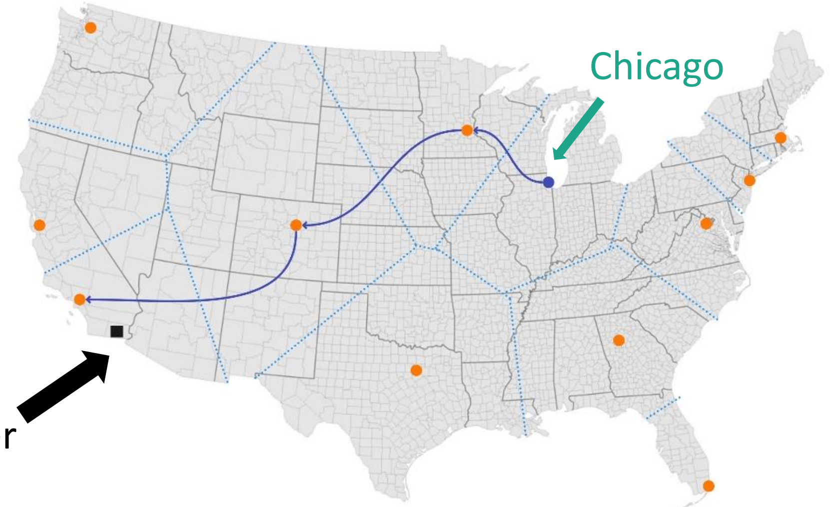




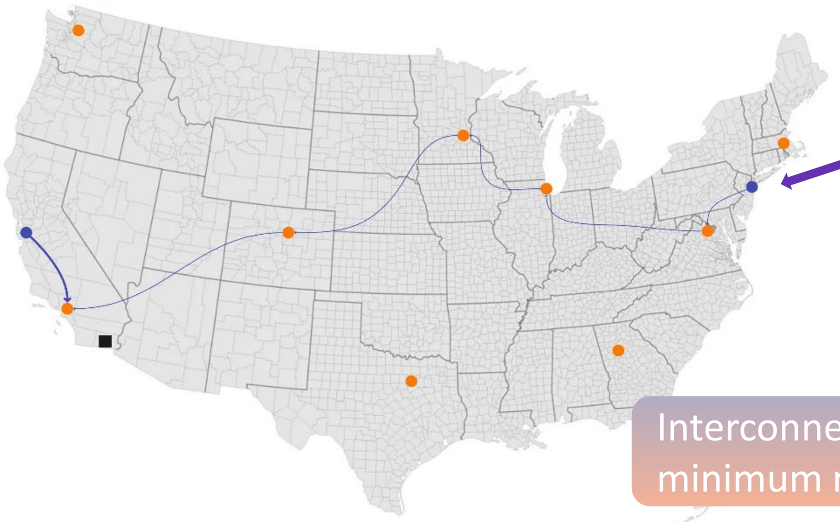
It is rational for the ISP to agree to settlement-free peering, if the content provider agrees to interconnect at a minimum of 9 IXPs

Partial Content Replication

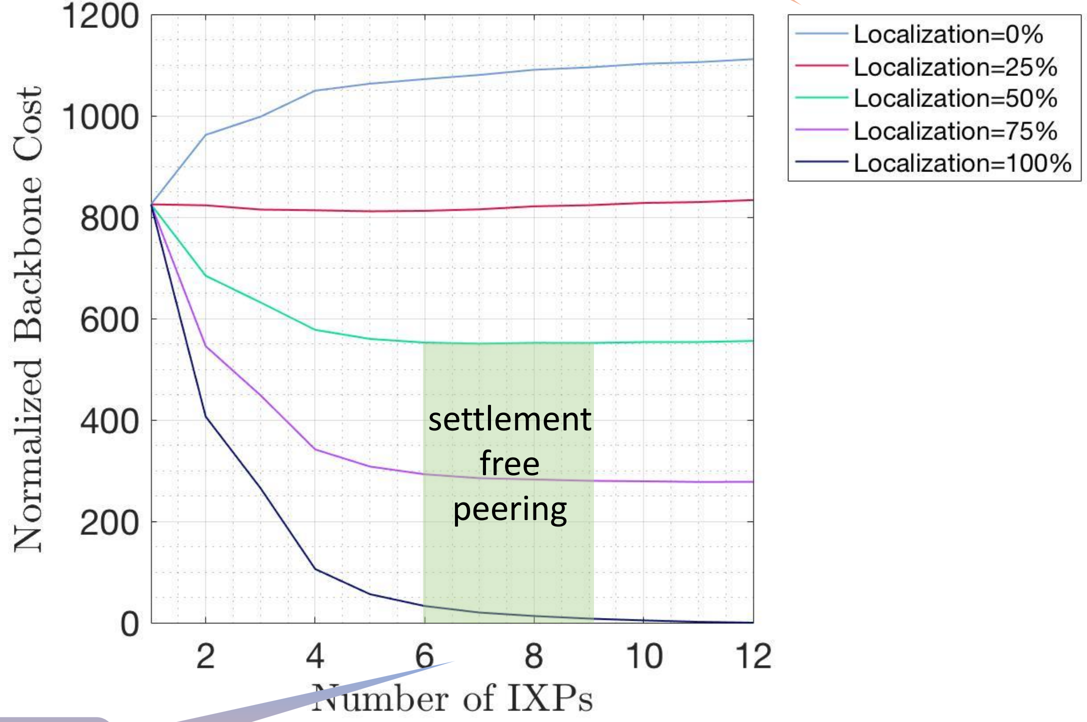
Peer at 1 IXP



Peer at 2 IXPs



Deliver a specified minimum percentage of traffic locally.



Interconnect at a specified minimum number of IXPs

Results

	ISP	Edge providers and transit providers
Broadband Prices	**Lowers consumer prices**	**Paid Peering doesn’t affect prices, it is just additional profit for ISP**
Effect on consumers	**Increases consumer surplus by charging only Netflix users**	**Consumer surplus harmed by double charging**
Settlement-free Peering Requirements	**Content Providers need to pay for direct peering because of their traffic volume**	**Content providers are qualified free peering if the IXPs are sufficiently close to consumers**

Consumer Surplus is unimod… paid pe…

We disagree because the traffic ratio is irrelevant

The s…

We kind of agree but what matters is what percentage of traffic, how close?

More Resources

- Nikkhah, Ali, and Scott Jordan. "A two-sided model of paid peering." Telecommunications Policy (2022): 102352.

- A. Nikkhah and S. Jordan, “Requirements of settlement-free peering policies,” in 2022 IEEE Global Communications Conference (GLOBECOM), 2022

Thank You!