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# Changes in Internet Architecture that Challenge Network Neutrality and End-to-End

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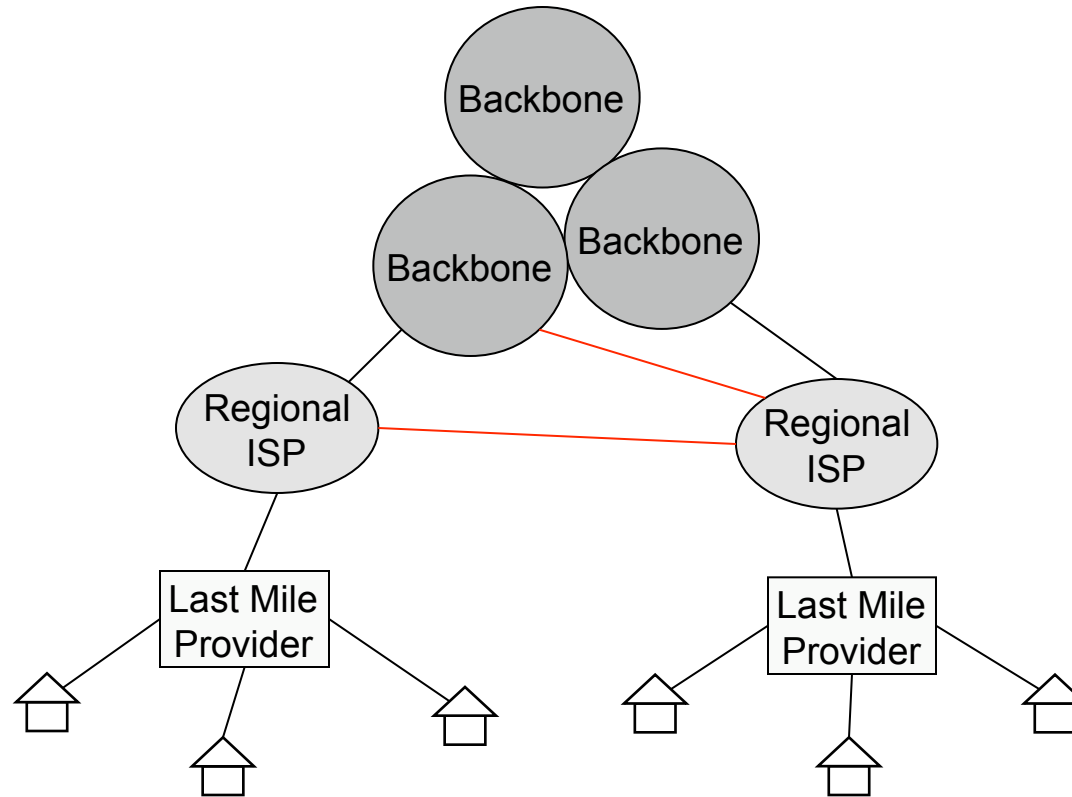


Christopher S. Yoo

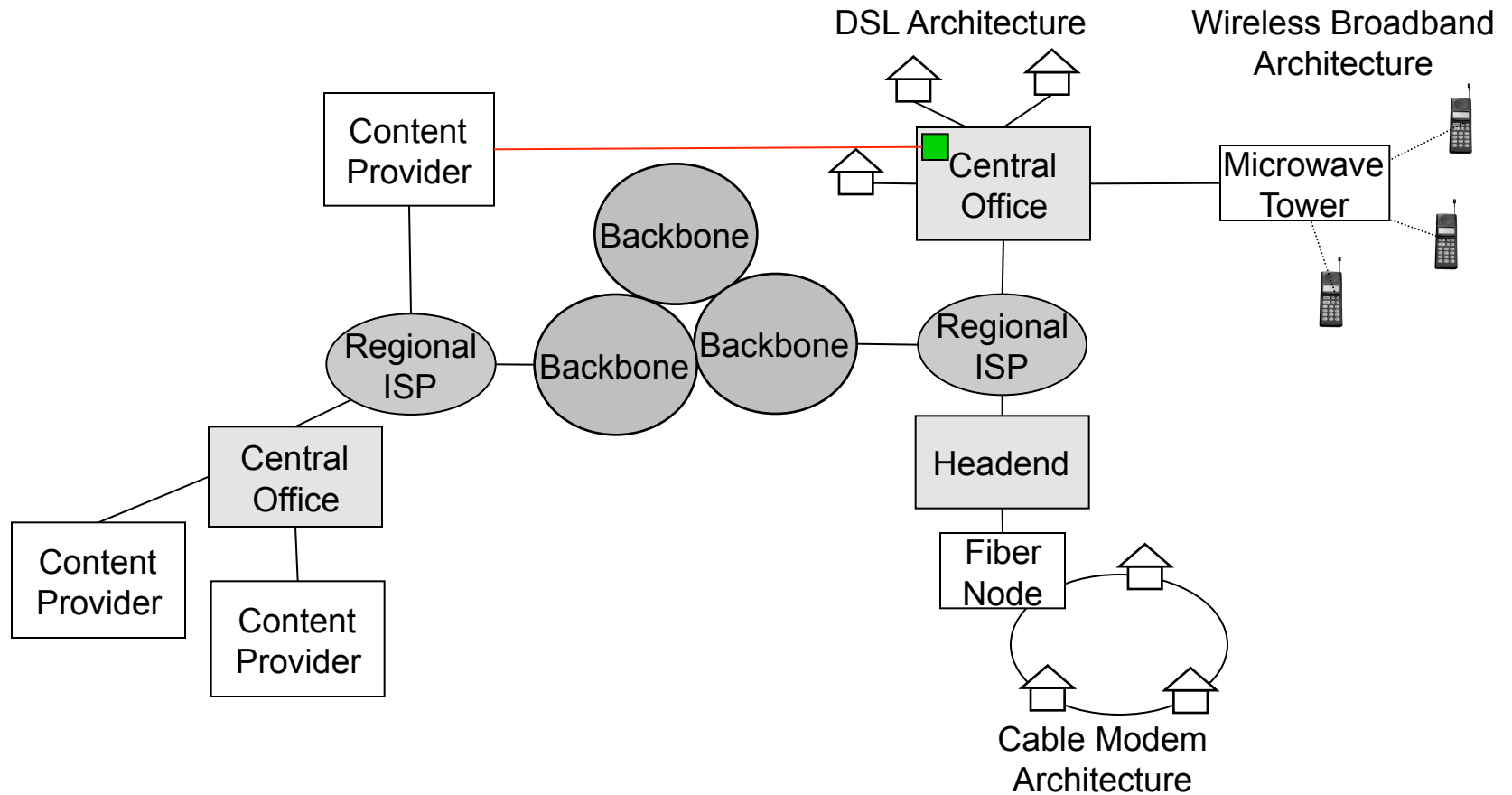
University of Pennsylvania Law School

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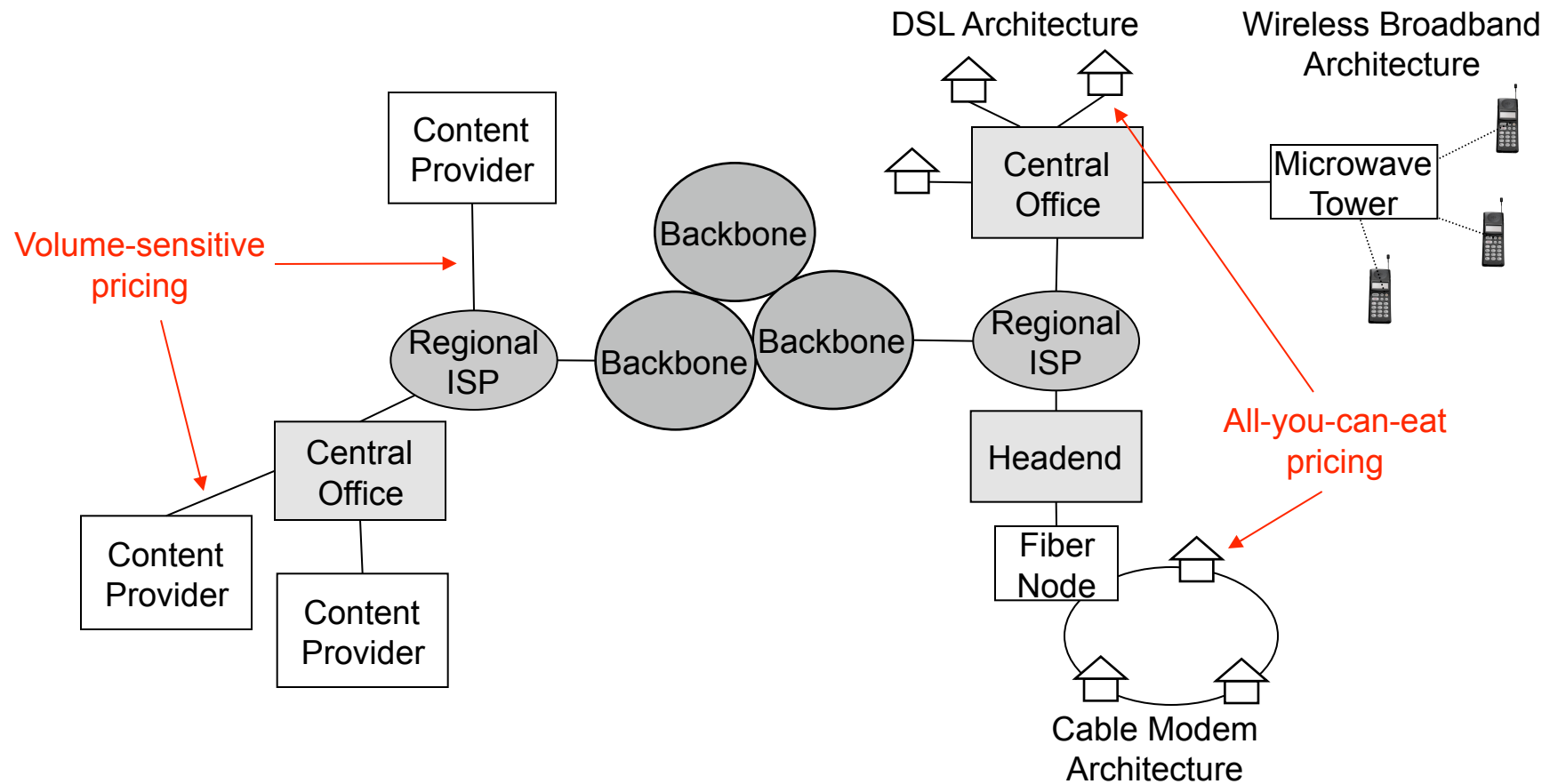
# Secondary Peering/Multihoming



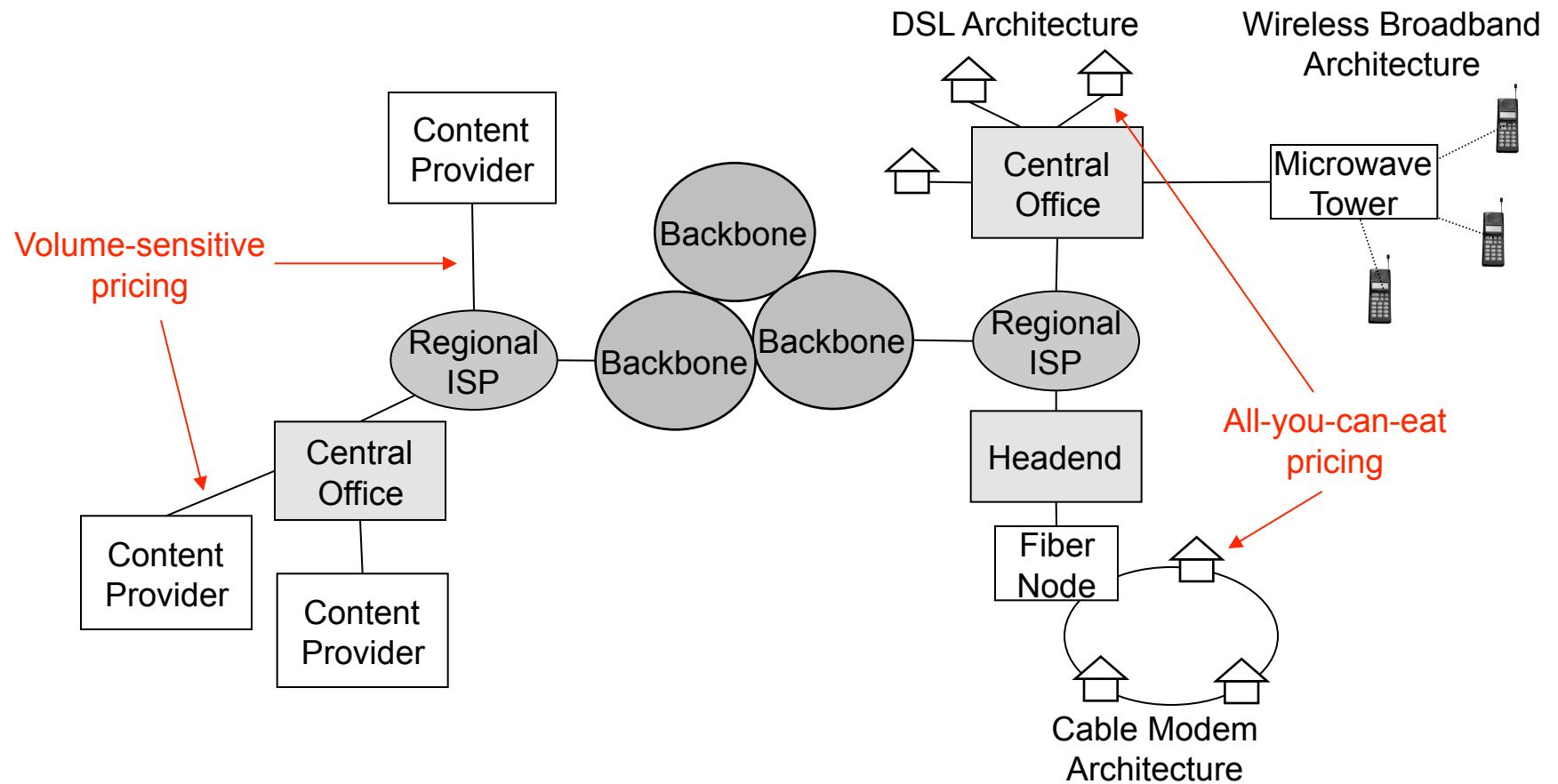
# Local Caching/Content Delivery Networks



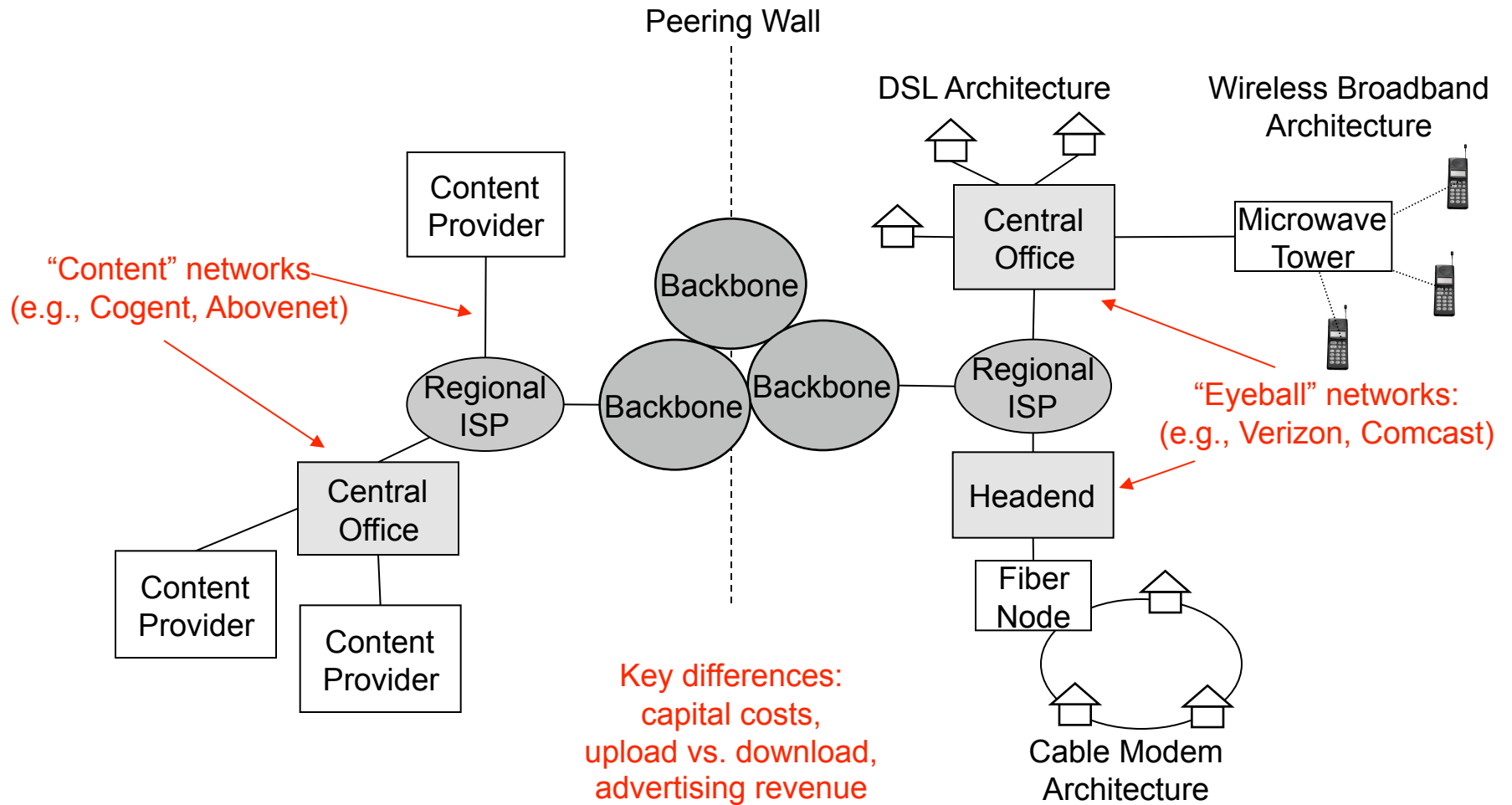
# Pricing in a Client-Server Architecture



# Pricing in a Peer-to-Peer Architecture



# Economics of Two-Sided Markets



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# How End-to-End Obscures Analysis: Web Error Redirection (WER)

- Three possibilities: networks, search engine, browser
- End-to-end: not appropriate for network provider
- Real issue in WER: advertising revenue
- Antitrust: focus on product market
  - Largest search engine has 70%+ of ad market
- Antitrust: focus on geographic market (national)
  - Search engines have national footprint
  - Last-mile providers limited to 30% of the country