Network Neutrality
The Evolving Global Debate

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“Innovative uses of that copper pair (e.g., DSL) and advanced technologies such as hybrid fiber-coax (HFC), fiber and wireless, have led to definitional confusion, litigation and a dauntingly complex poorly understood networked ecosystem” (Claffy & Clark, 2013, p. 1)
Main points

• The net neutrality debate is a response to the fundamental transformation of the Internet.
• There is considerable evidence that some form of differentiation is desirable.
• However, important political and economic goals need to be safeguarded.
• Several countries have adopted net neutrality principles but more rely on other safeguards.
• The biggest challenge in the US is finding a solution that can survive judicial review.
Overview

• Background
• Early Internet and its transformation
• The evolving global debate
• Ways forward for the U.S.
Background
Benefits of openness and neutrality

• Political benefits
  – A neutral Internet supports free speech, democratic participation, and empowers citizens.

• Economic benefits
  – An open Internet facilitates “permission-free” innovation at the edges of the network.

• Societal benefits
  – An open Internet contributes to harnessing the benefits of the Internet for education, health care, and society at large.
The net neutrality debate

• Historically, the technical architecture of the Internet and regulatory policy safeguarded the relatively equal treatment of datagrams.
• Political, economic, and technological forces are presently transforming these arrangements.
• Although most stakeholders in the net neutrality debate agree that preserving an open Internet is important, there is wide disagreement as to how this can best be done.
Openness

“It is of the utmost importance that, if I connect to the Internet, and you connect to the Internet, that we can then run any Internet application we want, without discrimination as to who we are or what we are doing.”

Tim Berners-Lee, inventor of the WWW
Innovation

“Telephone companies cannot tell consumers who they can call; network operators should not dictate what people can do online.”

Vint Cerf, Google Internet Evangelist (right, here shown with fellow Internet pioneer and mastermind Bob Kahn)

“Creativity, innovation and a free and open marketplace are all at stake in this fight.”

Eric Schmidt, CEO Google
Three principal positions

• “Strict” net neutrality
  Proponents of a stringent approach assert that realizing the benefits of the Internet requires a network architecture in which all datagrams are treated equally, independent of the source, destination, application.

• “Weak” net neutrality
  Proponents of a more modest vision suggest that the benefits are optimized in a network organization in which quality of service differentiation is acceptable as long as it serves a reasonable purpose and discrimination is avoided.

• “Market-based” net neutrality
  Proponents suggest that an unregulated market-based solution is the most efficient way to allocate and price bandwidth.
The early Internet and its current transformation
The historical constellation

• The Internet’s end-to-end architecture emerged from a series of pragmatic design decisions among the engineers and scientists running it.
• From these choices, a unique layered “end-to-end” architecture emerged in which applications and services are logically at the edge of the network and the core network serves mainly as a transportation platform.
• In that spirit, the community of engineers has dealt with quality of service differentiation pragmatically (e.g., discussions within IETF since the early 1990s).
Pragmatic solutions

“We reject: kings, presidents, and voting. We believe in: rough consensus and running code.”

David D. Clark, MIT, in a presentation at a conference of the Internet Engineering Task Force (IETF) in 1992
Original end-to-end architecture

Source: Inspired by B. Van Schewick, 2010, S. 100
Supportive policy environment

• Telecommunications policy
  – Telecommunications Act of 1996 established competition as overarching sector organization
  – Declared that the Internet should remain “unfettered by state and federal regulation” (47 U.S. Code § 230)
  – Unbundling to facilitate access to incumbent’s networks
  – Access providers were treated as common carriers (Title II of the Communications Act)

• Internet governance
  – Self-regulatory model in which stakeholders developed voluntary standards, protocols, operational practices
  – W3C, IETF, ICANN, ISOC, ...
Forces of change

• Rapid growth of users (>3 billion by end 2014) and traffic, especially of entertainment (video, games, ...)
• Increasing heterogeneity of traffic
  – Time sensitive (e.g., emergency, streamed video, online games, voice, financial transactions)
  – Not time-sensitive (e.g., e-mail, backend data processing, transfer of non-urgent medical data)
• New concerns, such as cybercrime and online privacy
• Elimination of historical protections that safeguarded an open Internet in the U.S.
• Changing dynamics of value creation and innovation in the new Internet ecosystem and emergence of private IP networks (a parallel “private” Internet)
U.S. fixed access network traffic
(1H2013-actual to 1H2018-estimated)
U.S. mobile access network traffic
(1H2013-actual to 1H2018-estimated)
US regulatory policy changes

• Elimination of unbundling policy (2003-2005)
  – Seen as detrimental to investment in network infrastructure
  – Reduced the number of service-based competitors
• Reclassification of broadband access providers as information service providers
  – Eliminated common carrier non-discrimination obligations
  – Traditional regulation seen as overly burdensome and detrimental to competition
  – Cable modem service (2001), DSL (2005), mobile broadband (2007)
• Legally non-binding open Internet policy statement (2005) articulated first by Michael Powell in 2004
Open, multi-layer system

Past locus of value-added

Advertisers

Bloggers

Comcast, EarthLink, Google, Apple, NOKIA

Future locus of value-added

Users

at&t, CISCO, verizon
Economics of the Internet ecosystem

• Drivers of investment
  – High up-front costs, low incremental costs
  – Requires high mark-ups and differentiation

• Drivers of different types of innovation
  – Modular (“edge”) innovation is stimulated by an open, neutral Internet
  – Coupled innovation is stimulated by temporary exclusive arrangements (e.g., iPhone)
Economics of the Internet ecosystem

• Vertical and horizontal integration
  – Support for complementary applications and services
  – Risk of sabotage of competitive applications and services

• Pricing in multi-sided markets
  – Single or multiple participants may be charged
  – On each side, demand will respond to price changes

• Dynamic competition in technologically dynamic markets with high sunk costs looks can be effective despite high concentration
Emergence of a “private Internet”

• Increasing use of the Internet for media and entertainment purposes (Noam, 2014).
• Network operators and other players have rolled out private IP networks to support these uses (e.g., CDNs) and provide higher quality of service.
• Initially, these networks were for internal use only (e.g., to deliver VoIP) but they will increasingly interconnect, starting to form a private multi-firm Internet (Claffy & Clark, 2013).
Parallel Internets

Private platform with option for discrimination. Improved service

The Web
Multi-firm IP network

Public Internet
Private IP
Single-firm IP platform

Firm 1

Facebook

“open” non-discriminatory platform

The Web
Global interconnected Internet

Public Internet
Private IP
Single-firm IP platform

Firm 2

Source: Claffy & Clark, 2013. p. 9
The new Internet

Inspired by T. Wu, NYT, May 11, 2014
Main points thus far

• Both network management and economic considerations suggest that differentiation increases network performance and investment.
• At the same time, broadband access markets and content markets are increasingly vertically integrated and concentrated, raising concerns about unfair competition.
• Important political (free speech) and economic goals (edge innovation) could be affected detrimentally unless safeguarded.
• Is there a framework that can balance these multiple objectives?
The evolving global debate
Approaches to NGN investment

• U.S. has adopted a model with primary reliance on private sector investment.

• European Union (EU) on average suffers from lack of investment in next-generation infrastructure.

• Several European countries have overcome this problem with municipal investment and public-private partnerships (PPPs) (e.g., Switzerland, Nordic countries, Netherlands).

• Several Asian countries (e.g., South Korea, Japan, Singapore) have subsidized networks and/or used heavy-handed government direction.
Council of Europe

• Europe’s leading human rights organization, 47 members (28 are also EU members)

• Declaration of the Committee of Ministers on network neutrality, September 29, 2010
  – “Commitment to the protection and promotion of human rights on the Internet”
  – “Rights to freedom of expression and information regardless of frontiers, the right to respect for private life and correspondence, the right to freedom of thought and religion, the right to freedom of association, the right to education and the right to the protection of property”
  – “Significant reliance on the Internet as an essential tool for their everyday activities (communication, information, knowledge, commercial transactions)”
Council of Europe ...

– Implies a “legitimate expectation that Internet services be accessible and affordable, secure, reliable and ongoing”
– “Users should have the greatest possible access to Internet-based content, applications and services of their choice, whether or not they are offered free of charge, using suitable devices of their choice”
– “Traffic management should not be seen as a departure from the principle of network neutrality”
– “Users and service providers should be adequately informed about any network management measures that affect in a significant way access to content, applications or service”
– Establishment of avenues “to challenge network management decisions”
– Additional “elaboration of guidelines with and for private sector actors in order to define more precisely acceptable management measures and minimum quality-of-service requirements”
European Union

• European Union Telecom Package (2009)
  – “Consumers will [have to] be informed—even before signing a contract—about the nature of the service to which they are subscribing, including traffic management techniques and their impact on service quality, as well as any other limitations (such as bandwidth caps or available connection speed)”

• Body of European Regulators of Electronic Communications (BEREC) entrusted to use existing framework to ascertain an open Internet.
European Union ...

Source: BEREC, 2012
European Union ...

• In 2013, the Commission introduced a legislative proposal “Connected Continent: Building a Telecoms Single Market”
  – Intended to end discriminatory blocking and throttling and deliver effective net neutrality.
  – Traffic management has to be non-discriminatory, proportionate and transparent.
  – Companies are allowed to differentiate their offers (for example by speed) and compete on enhanced quality of service.
  – To meet end-users' demand for better service quality, content providers may agree deals with internet providers to assure a certain quality of service.
  – Specialized services must not lead to quality degradation of the "normal"/best effort Internet. They are coherent with the way the internet was engineered.

• Adopted in first reading by EU Parliament in April 2014
Netherlands

• In 2011, KPN, the incumbent Dutch telecom provider announced plans to block VoIP and instant messaging unless users paid an additional fee.

• Netherlands adopted a law in support of net neutrality in 2011 (amended in 2012)
  – Network management allowed to preserve network security, in times of congestion, to avoid distribution of spam and malware, and to comply with a court order.
  – Differentiated pricing allowed for different service tiers but not to discriminate against specific uses and applications.
  – Minimum quality requirements may be imposed.

• Criticized as being too restrictive by the head of OPTA, the Dutch agency overseeing the sector.
Chile

- Chile was one of the first Latin American countries to liberalize and establish a strong market-based framework.
- Citizen group Neutralidad Sí, not least using a social media campaign, pointed out throttling and blocking of traffic.
- In 2010, the Chilean Congress amended the General Telecommunications Law
  - “No [ISP] can block, interfere with, discriminate, hinder, nor restrict the right of any Internet user of using, send, receive, or offer any content, application, or legitimate service through the Internet, as well as any activity or legitimate use conducted through the Internet’.
  - Law also has articles that force ISPs to provide parental control tools, clarify contracts, guarantee users’ privacy and safety when surfing, and forbids them to restrict any liberty whatsoever.
- Carriers more concerned about recent changes to interconnection and access pricing.
Internet governance

• **Dynamic Coalition on Net Neutrality** within the Internet Governance Forum (IGF)
  – Seeks to develop a elaborate a “model framework” on network neutrality, which can be deemed as consistent with international human-rights standards.

• At Net Mundial, São Paolo, net neutrality was discussed as a topic for future meetings.
Neutrality revisited

• Some stakeholders demand “strict” net neutrality
  – A network architecture in which all datagrams are treated equally, independent of the source, destination, application.

• Some stakeholders demand market based neutrality

• The majority of countries seeks “weak” net neutrality
  – Differentiation of applications and services is permitted (e.g., higher quality at higher prices, lower quality at lower prices).
  – Network operators and ISPs have to avoid unwarranted discrimination (e.g., must not sign exclusive contracts with single content providers).
  – Network management is allowed to achieve desirable goals such as increased security and reliability.
Ways forward for the U.S.
Nearly a decade of U.S. efforts

• Broadband policy statement by FCC (2005)
• Numerous unsuccessful attempts to legislate net neutrality
  – Internet Nondiscrimination Act of 2006 (Ron Wyden, D-OR)
  – Internet Freedom and Nondiscrimination Act of 2008 (proposed to amend Clayton Act) (John Conyers, D-MI; Zoe Lofgren, D-CA)
  – Internet Freedom Preservation Act of 2009
• Regulatory decisions (Madison River Communications, 2005; Comcast, 2008)
• FCC Open Internet Order (2010), overturned in January 2014 on mainly legal grounds (i.e., at present NO explicit policy to safeguard net neutrality)
• Protecting and Promoting the Open Internet Notice of Proposed Rulemaking (FCC, May 15, 2014)
FCC policy statement

“To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet, consumers are entitled to

— access the lawful Internet content of their choice
— run applications and use services of their choice, subject to the needs of law enforcement
— connect their choice of legal devices that do not harm the network
— competition among network providers, application and service providers, and content providers.”

_FCC Policy Statement, August 5, 2005_
### FCC Open Internet Order (2010)
(overturned in January 2014)

<table>
<thead>
<tr>
<th>Principle</th>
<th>Fixed broadband service providers</th>
<th>Mobile broadband service providers</th>
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<tr>
<td>Transparency</td>
<td>“Providers must disclose the network management practices, performance characteristics, and terms and conditions of their broadband services?” (FCC, 2010)</td>
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<tr>
<td>No blocking</td>
<td>“Providers may not block lawful content, applications, services, or non-harmful devices” (FCC, 2010)</td>
<td>“Providers may not block lawful websites, or block applications that compete with their voice or video telephony services” (FCC, 2010)</td>
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<tr>
<td>No unreasonable discrimination</td>
<td>“Providers may not unreasonably discriminate in transmitting lawful network traffic” (FCC, 2010)</td>
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May 2014 NPRM

• On May 15, 2014, the FCC adopted a Notice of Proposed Rulemaking (NPRM) on Protecting and Promoting the Open Internet
  – Proposes to preserve the 2010 definitions (i.e., only covers public not private Internet).
  – Proposes enhanced transparency obligations.
  – Proposes to renew no-blocking rule.
  – Suggests a rebuttable assumption that priority service offered to an affiliate should be considered illegal.
  – Asks for input on multi-factor test to assess commercial reasonableness.
  – Asks for input on whether Section 706 or Title II would better serve as the legal foundation for open Internet policy.
  – Proposes a new dispute resolution process and Ombudsman for consumers, small businesses, and start-ups.
Balancing political & economic goals

- No blocking (with minimal exceptions) to ascertain free speech and expression.
- Differentiation of services (at wholesale and retail) to allow innovative services and align pricing with cost drivers.
- Safeguards to avoid that differentiation degenerates to discrimination and anticompetitive behavior.
- Possibly need provisions to secure minimum quality of service.
- Allow for institutional competition (e.g., non-profit, municipal versus for-profit ISPs).
- Net neutrality as a framework for advanced communication markets with ex post enforcement.
Recap
Main points

• The net neutrality debate is a response to the fundamental transformation of the Internet.
• There is considerable evidence that some form of differentiation is desirable.
• However, important political and economic goals need to be safeguarded.
• Several countries have adopted net neutrality principles but more rely on other safeguards.
• Political and economic goals can be balanced.
• The biggest challenge in the US is finding a solution that can survive judicial review.
Thank you!
References

• BEREC (2012), A view of traffic management and other practices resulting in restrictions to the open Internet in Europe, BoR (12) 30.
• Van Schewick, B. (2010), Internet architecture and innovation. Cambridge, MA: MIT Press.