

Net Neutrality's Impact on Internet Innovation

Committee on Technology in Government
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Members of the Committee, thank you for the opportunity to discuss the important topic of Net Neutrality regulation. We have closely followed this particular debate over the last six years.

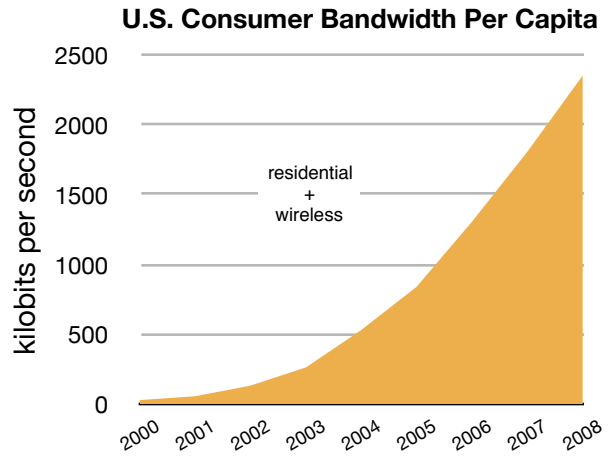
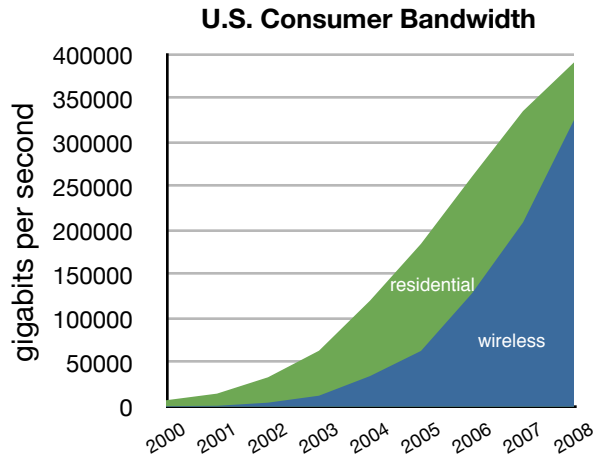
The bottom line is that the Internet today is healthy. Consumer bandwidth is growing fast. Citizens and businesses are accessing rapidly proliferating applications and services over increasingly diverse communications channels and digital devices. Innovations like mobile “apps” and cloud computing flourish. Net neutrality regulation could severely impede this progress, hurt the cycle of innovation, depress investment, and kill jobs. Instead of new regulation, we should maintain the FCC’s existing and effective “Open Web Principles” and let the Internet evolve.

Bandwidth Boom

The United States is on the right broadband path. Consumer bandwidth – our power to communicate – is booming. We estimate that between 2000 and 2008, total consumer bandwidth (including both residential and wireless connectivity) grew by a factor of 91, or 9,000%, reaching a total of 717 terabits per second. Wireless bandwidth grew an astounding 542x, or 54,100%. On a per capita basis, total consumer bandwidth during this period grew 8,300%, good for a compound annual rate of 74%. Per capita, Americans began the decade with just 28 *kilobits* per second of total bandwidth but now, as 2010 draws near, enjoy close to three *megabits*.¹

Having fallen behind other nations in the early years of the decade, America now boasts some of the world’s most advanced fiber-optic and wireless networks. Economist Scott Wallsten has corrected some of the misleading international broadband comparisons and found that the U.S.

¹ Swanson, Bret. “Bandwidth Boom: Measuring U.S. Communications Capacity from 2000 to 2008.” Entropy Economics. June 24, 2009. <http://entropyeconomics.com/wp-content/uploads/2009/07/bandwidth-boom-measuring-us-comm-capacity-2000-08-062409c.pdf>



Sources: FCC, industry reports, Entropy Economics

ranks between 8th and 10th in residential broadband penetration.² But as many developed nations approach their saturation points for broadband penetration, even these corrected rankings become less useful. On other important measures of broadband capability and use, the U.S. leads the way. For example, the U.S. generates more Internet traffic than Europe or Asia and, per capita, consumes far more mobile voice minutes. And because U.S. mobile service prices are far lower than in most other nations, more American consumers connect to the Web via their mobile phones, a phenomenon not captured in the residential rankings.

Ecosystem Innovation

This bandwidth boom has unleashed a wave of innovation in Web applications, network services, and digital devices. It is a collaborative interplay of network providers, content creators, and hardware designers, each building on the others' new offerings.

Consumers now upload 20 hours of video to YouTube . . . *every minute*. YouTube streams more than one billion videos per day. And next week YouTube will begin supporting 1080p high-definition (HD) video. Other video services like Hulu take advantage of this new bandwidth and are disrupting the entire entertainment arena.

The Apple iPhone, which runs on AT&T's 3G wireless network, has transformed the mobile world. With close to 100,000 "apps," the software now available on your most personal mobile device now rivals, and in many cases excels, the capabilities of your desktop or laptop PC. Palm, Motorola, Blackberry (RIM), HTC, Samsung, LG, Nokia, Google, Microsoft, and others have launched their own super-smart-phones and "app stores." Amazon is changing the world of books with its wireless Kindle device, and dozens of new form factors, from tablets and pads to

² Wallsten, Scott. "Understanding International Broadband Comparisons: 2009 Update." Technology Policy Institute. June 2009. <http://www.techpolicyinstitute.org/files/international%20broadband%20comparisons%202009%20update%20final.pdf>

the tiniest of wireless sensors, will transform education, health care, and most industries. The wireless sector has never been this dynamic, diverse, and open.

Investment

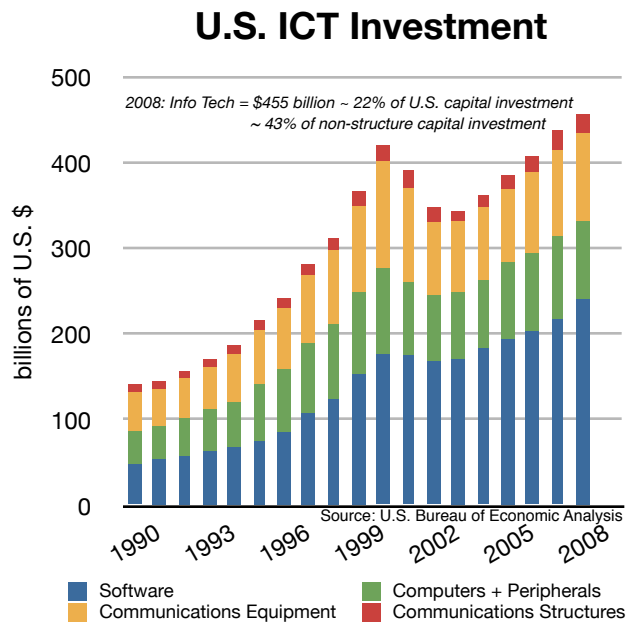
All this new consumer connectivity and Web innovation took place without a Net Neutrality law. It would not have been possible without massive investment in broadband networks. In 2008, investment in U.S. communications networks, software, and computers totaled \$455 billion. That was 22% of all U.S. capital investment, or 43% of the nation's non-structure capital investment. The network operators alone invested around \$65 billion, an investment level they will repeat in 2009. Between 2000 and 2008, U.S. ICT info-tech investment totaled around \$3.5 trillion. This is what it takes to build a knowledge economy.

But the network is not complete. Nowhere near, in fact. The FCC estimates it would take \$350 billion to build a network capable of delivering 100 Mbps service to every home in America. This number may be conservative and does not include all the data centers, core and metro capacity, wireless antennas, and other network nodes that will be needed both to accommodate rapid data traffic increases . . . and drive new innovations.

Fast-Changing Web

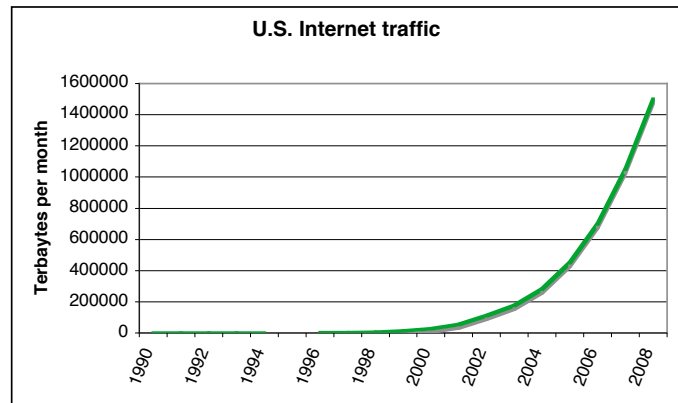
Internet traffic is growing, and its nature is changing. Once upon a time, almost all traffic was voice calls. Then the Internet came, and simple data entered the mix: Web pages, file transfers, email. But now we are moving far beyond simple data and voice calls to include streamed video, peer-to-peer video, video conferencing, blogs, cloud computing, software-as-a-service, social networks, gaming, virtual worlds, super-high-resolution photos, remote back-up, wireless texting, mobile video, and many more. The types of data, and the network requirements thus imposed, are proliferating with the number and diversity of applications and network endpoints and channels.

U.S. Internet traffic continues to grow at an annual rate of 50-60%, requiring large capacity increases. But as important as the capacity increases are the technologies and architectures needed to get specific traffic to the right place at the right time. Some data (email) can wait hundreds of milliseconds, or even seconds. Other data (voice calls and real-time video) cannot



tolerate more than a fraction of a second. Some data can be stored close to end users. Other real-time and transactional data must travel long distances. Our research suggests Internet traffic will continue to grow at a 50-60% annual rate for at least the next five years.³ Cisco estimates wireless data traffic will grow 66-fold through 2013, or 131% per year.

A new two-year study by Arbor Networks analyzed 264 exabytes of network traffic.⁴ Arbor found rapid data traffic growth and fast-changing Web architectures. Internet traffic continues to grow between 50% and 60% per year. Streaming Web video now accounts for 52% of Internet traffic, while peer-to-peer (P2P) video, although declining as a percentage of Net traffic, still accounts



Sources: MINTS, Entropy Economics

for perhaps another 30-35%. Content delivery networks like Akamai and Limelight, which cache content closer to end-users to cut latency and improve the consumer experience, now account for 10% of Internet traffic. Google, which runs its own vast networks and data centers, now carries 6% of Internet traffic and has quickly become the third largest network operator on the planet. Arbor found there are “increasingly blurred lines between content, consumer ISP, transit, CDN, etc.” “The Internet is at an inflection point,” and these “[c]hanges mean significant new commercial, security, and engineering challenges.”

Net Neutrality

These challenges would only be exacerbated by a Net Neutrality law. We need to scrub the network to find and kill dangerous “botnet” cyber-attacks. We need to speed latency-sensitive video and audio streams to end-users around the globe in real-time. We need successful new business models to replace the entertainment and news models of the pre-digital age. Wireless networks of all sorts require sophisticated traffic management to ensure robust service in their bandwidth-constrained shared environments. Security, real-time video, promising new business models, and wireless: all require technologies and pricing plans that could “violate” Net Neutrality regulation.

A Net Neutrality law would nominally prohibit “discrimination” among data packets and applications. But in half a decade’s worth of arguments and the FCC’s new Notice of Proposed

³ Swanson, Bret, and George Gilder. “Estimating the Exaflood – The Impact of Video and Rich Media on the Internet – A ‘Zettabyte’ By 2015?” Discovery Institute. January 2008. <http://www.scribd.com/doc/6483200/Estimating-the-Exaflood-012808-by-Bret-Swanson-George-Gilder>

⁴ Labovitz, Craig, et al. “2009 Annual Report.” ATLAS Internet Observatory and Arbor Networks. NANOG47. October 2009. http://www.nanog.org/meetings/nanog47/presentations/Monday/Labovitz_ObserveReport_N47_Mon.pdf

Rule Making (NPRM), Net Neutrality's fiercest advocates (let alone its skeptics) have not been able to define discrimination. "Discrimination" among data packets and applications is already widespread across the network, and has been so for many years. And for good reason. We tag bits for timely delivery and we store bits closer to where they are needed. These are "discriminatory" actions, and consumers and companies pay for these improved services.

When objections to Net Neutrality are raised on technical or economic grounds, proponents will often answer, "Well, we didn't mean that. Of course that should be allowed." At times, advocates have sought to ban tiered pricing, only later to retreat. Sometimes Quality of Service (QoS) is allowed, sometimes not. So numerous are the caveats, hedges, and possible exemptions in the NPRM, and so frequent the use of the term "reasonable network management" ("what is reasonable today may be unreasonable tomorrow")⁵, one assumes any law will end up meaning whatever an FCC chairman, litigious company, or baffled judge says (guesses) it means. The inability to define "discrimination" in particular and Net Neutrality in general is a sure sign of a bad law.

A Net Neutrality law will not make the Internet more "open." The Internet is already very open. More people create and access more content and applications than ever before. And with the existing Four Principles in place, the Internet will remain open. In fact, a Net Neutrality law could close off large portions of the Internet for many consumers. By intruding in technical infrastructure decisions and discouraging investment, Net Neutrality could decrease network capacity, connectivity, and robustness; it could increase prices; it could slow the cycle of innovation; and thus shut the window to the Web on millions of consumers. Net Neutrality is not about openness. It is far more accurate to say its is about closing off experimentation, innovation, and opportunity.

If Net Neutrality is not about openness, neither is it even about neutrality. This is a supreme irony of the proposal.

If Net Neutrality applies neutrally to all players in the Web ecosystem, then it would regulate every component and entrepreneur in a vast and unknowable future. If Neutrality applies selectively (oxymoron alert) to only one sliver of the network, then it is merely a political tool of one set of companies to cripple its competitors. But even if a Neutrality law initially targets just a few companies, it will eventually spread to all corners of the Net because of the "increasingly blurred lines" among network competitors, collaborators, and components. Along the way, we will likely endure a decade or more of expensive and wasteful litigation that will promote uncertainty and discourage investment. This is a recipe for either far-reaching micromanagement of the fast-changing Web, or for endless permission-seeking and litigation among network and content companies who find it impossible to operate their networks. Or more likely, both.

⁵ "In the Matter of Preserving the Open Internet." Notice of Proposed Rule Making. Federal Communications Commission. October 22, 2009. p. 94. http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-09-93A1.pdf

Burden of Proof

The economy remains in a parlous state. Unemployment sits at 10.2%. Small businesses find credit difficult to obtain. Historically important sectors like automobiles and finance are wounded.

But the Internet is healthy, growing, vibrant. Unlike so many other U.S. industries, the Internet is not only surviving but thriving. Internet companies are investing hundreds of billions of dollars in American infrastructure. The Internet is our best chance to vault out of the current rut and bring jobs to millions of out-of-work Americans. It is the best platform for entrepreneurship and low-cost education. It holds the possibility of helping to transform our health care problem into a high-growth opportunity. It can provide the large productivity gains and entirely new products, services – even whole new sectors of the economy – that can help overcome long-term social and budgetary challenges.

With all the Internet's current prosperity and future promise, the burden of proof falls heavily on those who would make a dramatic change to current policy. Because the Internet is already "open," a Net Neutrality law offers no discernible benefits but many potential pitfalls. The U.S. should not toy with its successful model of Internet innovation. Our economy cannot afford it.