Computer Networks
COSC 6377
Lecture 20
Fall 2011
November 9, 2011
Announcements

• HW3 due soon
• P2 messages to be standardized this week
Network Neutrality

• What can the Internet users run?
• What can the ISPs offer
  – Restrictions on competing services
  – Enhanced services

• Are there certain rights?
  – Infrastructure mostly maintained by non-government entities
Historial Context

• Different types of services offered and adopted

• Favoritism in phone calls!
Favoritism

- End-to-end service
- Inter-domain routing
- NATs
- Firewalls
- Proxies
• Is it ok to provide better service?
  – At the expense of lower grades of service
  – Leave the lower grades untouched
  – Improve all grades of services
• How to combine last mile and long haul services?
• Do content providers and alternative service provides free ride at the expense of ISPs?
  – Value chain between clients, web sites, search engines, VoIP service providers, ISPs
• Do we need net-neutrality for innovation?
...to ensure that broadband networks are widely deployed, open, affordable, and accessible to all consumers, the Commission adopts the following principles:

• 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.

• To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet, consumers are entitled to run applications and use services of their choice, subject to the needs of law enforcement.

• To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet, consumers are entitled to connect their choice of legal devices that do not harm the network.

• To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet, consumers are entitled to competition among network providers, application and service providers, and content providers.

[FCC, September 23, 2005]
Hammer drops at last: FCC opposes Comcast P2P throttling

Once FCC Chair Kevin Martin announced his support for sanctions against Comcast, penalties looked inevitable. The two Democrats on the Commission, long supportive of network neutrality, seemed set to vote along with Martin and punish Comcast for its P2P "delaying" techniques; late this afternoon at FCC headquarters, they did, and a majority has now spoken.

The Wall Street Journal reports tonight that commissioners Copps, Adelstein, and Martin have decided against the cable giant, paving the way for an official vote when the order is publicly voted on next Friday. US ISPs, take note: the FCC has just used its 2005 Internet Policy Statement to draw a line in the sand. Step across it at your peril.

The agony, the ecstasy

Free Press, which has been behind the complaint against Comcast, must have an office awash in champagne this evening. Marvin Ammori, the group's general counsel, said in a statement sent to Ars, "This vote reflects the bipartisan support for protecting consumers' access to the free and open Internet. Comcast's blocking is a flagrant violation of the online rights established by the FCC. If adopted, this order would send a strong signal to the marketplace that arbitrarily interfering with users' online choices is not acceptable. Internet service providers do not get to decide the winners and losers online."

A Comcast spokesperson contacted Ars with a statement as well, this one clinging to the conviction that Comcast hasn't done anything wrong, shouldn't be punished, and wasn't blocking anyone, anyway.

"It is always hard to respond to rumors," said the statement, "however, we continue to assert that our network management practices were reasonable, wholly consistent with industry practices and that we did not block access to Web sites or online applications, including peer-to-peer services. We do not believe the record supports any other conclusion."

But three FCC commissioners appear to disagree.

The initial report on the vote said nothing about which way Republican commissioners McDowell and Tate might lean. FCC watchers wouldn't be at all surprised to see both vote against the order; the really interesting moment could come if they support it.

Having four or even five commissioners support the order would send a strong bipartisan signal to ISPs that they need to take great care with any sort of discriminatory throttling based on anything more specific than a user's total bandwidth. A 3-2 vote might indicate that the issue is far more contested, and that a future FCC might be more sympathetic to arguments like those made by Comcast.

[arstechnica.com, September 4, 2008]
Comcast sues FCC, wants P2P throttling order overturned

Ever since the FCC handed down its 3-2 decision against cable operator Comcast's network management techniques, Comcast has been expected to sue the FCC. Today, the cable giant made good on those predictions, filing an appeal of the FCC ruling in the DC Court of Appeals, which has jurisdiction over FCC decisions.

The appeal itself is brief: a two-page document, a cover letter, and a $450 check. But the fight that it spawns will no doubt drag on for quite some time, centering on one major question: can the FCC rule against Comcast based on a policy statement that the FCC said was not enforceable at the time?

In a statement today, however, Comcast did admit that the FCC does have the authority to regulate ISPs "in appropriate circumstances and in accordance with appropriate procedures."

As the legal process plays itself out, Comcast has pledged to abide by the order and continue its work to move towards a protocol-agnostic throttling system that could slow "heavy users" down to DSL levels for 20 minutes at a time (another piece of the bandwidth management puzzle, hard bandwidth caps, were also announced last month).

"Although we are seeking review and reversal of the Commission's network management order in federal court, we intend to comply fully with the requirements established in that order, which essentially codify the voluntary commitments that we have already announced, and to continue to act in accord with the Commission's Internet Policy Statement," said David Cohen, Comcast's executive vice president.

"Thus, we intend to make the required filings and disclosures, and we will follow through on our longstanding commitment to transition to protocol-agnostic network congestion management practices by the end of this year."

With Comcast pledging to abide by the FCC's decision, what's the point of the lawsuit? The FCC's finding and order are precedent setting, in that the Commission has rendered a decision on how far ISPs can go in managing their networks for the first time. That's a precedent Comcast and its cable and telecom brethren would rather not have, as they would prefer to manage their networks in any manner they see fit without directives from the FCC covering what kinds of management techniques are over the line.

[arstechnica.com, September 4, 2008]
A federal appeals court ruled Tuesday that the Federal Communications Commission lacks the authority to force Internet service providers to keep their networks open to all forms of content, throwing into doubt the agency's status as watchdog of the Web.

The FCC has long sought to impose rules requiring Internet providers to offer equal treatment to all Web traffic, a concept known as network neutrality. But in a unanimous decision, the U.S. Court of Appeals for the D.C. Circuit found that the agency lacked the power to stop cable giant Comcast from slowing traffic to a popular file-sharing site....

[Washington Post, April 7, 2010]
Comcast ruling raises questions on FCC regulation

At first glance, Tuesday's federal court ruling on Comcast looked like a clean win for the cable giant and for competitors including Time Warner and AT&T. The court, after all, ruled that Comcast could regulate high-speed Internet traffic over its own system and that a company that wanted to push its content through Comcast's pipelines could not.

But the ruling might be only the beginning of a long campaign between Internet service providers and companies such as Skype, Google and Microsoft. The outcome is far from certain.

At issue is the wonky-sounding phrase "net neutrality." In 2008, the Federal Communications Commission told Comcast and other big high-speed Internet companies that they must treat content that flows through their pipelines equally, whether it's digitally lightweight e-mail or hefty movie files, by pushing it all through at the same speed.

Comcast complained that certain kinds of Internet traffic are so heavy that they slow down the entire system. Essentially, Comcast wanted to be able to enforce speed limits on its information highway, moving the big, traffic-clogging Internet traffic into a slower lane. Comcast sued the FCC, and Tuesday, the U.S. Court of Appeals for the D.C. Circuit sided with Comcast.

The immediate impact is on the FCC. The agency said Wednesday that the cybersecurity, privacy and consumer-protection policies it had wanted to pursue under its net-neutrality authority could now be in jeopardy. Now the FCC must decide whether it wants to appeal or try to work around the ruling....

[Washington Post, April 8, 2010]
Google/Verizon Policy Recommendations

First, both companies have long been proponents of the FCC’s current wireline broadband openness principles, which ensure that consumers have access to all legal content on the Internet, and can use what applications, services, and devices they choose. The enforceability of those principles was called into serious question by the recent Comcast court decision. Our proposal would now make those principles fully enforceable at the FCC.

Second, we agree that in addition to these existing principles there should be a new, enforceable prohibition against discriminatory practices. This means that for the first time, wireline broadband providers would not be able to discriminate against or prioritize lawful Internet content, applications or services in a way that causes harm to users or competition.

Importantly, this new nondiscrimination principle includes a presumption against prioritization of Internet traffic including paid prioritization. So, in addition to not blocking or degrading of Internet content and applications, wireline broadband providers also could not favor particular Internet traffic over other traffic.

Third, it’s important that the consumer be fully informed about their Internet experiences. Our proposal would create enforceable transparency rules, for both wireline and wireless services. Broadband providers would be required to give consumers clear, understandable information about the services they offer and their capabilities. Broadband providers would also provide to application and content providers information about network management practices and any other information they need to ensure that they can reach consumers.

[Google Public Policy Blog, August 9, 2010]
Google/Verizon Policy Recommendations

Fourth, because of the confusion about the FCC’s authority following the Comcast court decision, our proposal spells out the FCC’s role and authority in the broadband space. In addition to creating enforceable consumer protection and nondiscrimination standards that go beyond the FCC’s preexisting consumer safeguards, the proposal also provides for a new enforcement mechanism for the FCC to use. Specifically, the FCC would enforce these openness policies on a case-by-case basis, using a complaint-driven process. The FCC could move swiftly to stop a practice that violates these safeguards, and it could impose a penalty of up to $2 million on bad actors.

Fifth, we want the broadband infrastructure to be a platform for innovation. Therefore, our proposal would allow broadband providers to offer additional, differentiated online services, in addition to the Internet access and video services (such as Verizon’s FIOS TV) offered today. This means that broadband providers can work with other players to develop new services. It is too soon to predict how these new services will develop, but examples might include health care monitoring, the smart grid, advanced educational services, or new entertainment and gaming options. Our proposal also includes safeguards to ensure that such online services must be distinguishable from traditional broadband Internet access services and are not designed to circumvent the rules. The FCC would also monitor the development of these services to make sure they don’t interfere with the continued development of Internet access services.

[Google Public Policy Blog, August 9, 2010]
• Sixth, we both recognize that wireless broadband is different from the traditional wireline world, in part because the mobile marketplace is more competitive and changing rapidly. In recognition of the still-nascent nature of the wireless broadband marketplace, under this proposal we would not now apply most of the wireline principles to wireless, except for the transparency requirement. In addition, the Government Accountability Office would be required to report to Congress annually on developments in the wireless broadband marketplace, and whether or not current policies are working to protect consumers.

• Seventh, and finally, we strongly believe that it is in the national interest for all Americans to have broadband access to the Internet. Therefore, we support reform of the Federal Universal Service Fund, so that it is focused on deploying broadband in areas where it is not now available.

[Google Public Policy Blog, August 9, 2010]
EFF Analysis

• Good
  – Limited FCC Jurisdiction

• Troubling
  – Reasonable Network management, Additional Online Services

• Fail
  – “Lawful” Content and Wireless Exclusion

• Interesting
  – Standard-Setting Bodies

[eff.org, August 10, 2010]
The Netherlands on Wednesday became the first country in Europe, and only the second in the world, to enshrine the concept of network neutrality into national law by banning its mobile telephone operators from blocking or charging consumers extra for using Internet-based communications services like Skype or WhatsApp, a free text service.

The measure, which was adopted with a broad majority in the lower house of the Dutch Parliament, the Tweede Kamer, will prevent KPN, the Dutch telecommunications market leader, and the Dutch units of Vodafone and T-Mobile, from blocking or charging for Internet services. Its sponsors said that the measure would pass a pro-forma review in the Dutch Senate without hitches.

Analysts said that the legal restrictions imposed in the Netherlands could shape Europe’s broader, evolving debate over network neutrality, pushing more countries on the Continent to limit operators from acting as self-appointed toll collectors of the mobile Internet.

“I could also see some countries following the Dutch example,” said Jacques de Greling, an analyst at Natixis, a French bank. “I believe there will be pressure from consumers to make it clear what they are buying, whether it is the full Internet or Internet-light.”

Advocates hailed the move as a victory for consumers, while industry officials predicted that mobile broadband charges could rise in the Netherlands to compensate for the new restrictions.

“We support network neutrality,” said Sandra de Jong, a spokeswoman for Consumentenbond, the largest Dutch consumer organization, based in The Hague. “We don’t think operators should be able to restrict the Internet. That would be a bad precedent.”

Luigi Gambardella, the chairman of the executive board of the European Telecommunications Network Operators’ Association, an industry group based in Brussels, warned that the Dutch legislation could deter operators from making needed investments in high-speed networks for fear of building expensive but unprofitable infrastructure.
Obama Pledges to Veto Anti-Net Neutrality Legislation

WASHINGTON — The White House said Tuesday that President Barack Obama likely would veto upcoming legislation that would unwind net-neutrality rules the Federal Communications Commission adopted last year.

Senate Journal Resolution 6, (.pdf) which is expected to go to the Senate floor perhaps as early as this week, “would undermine a fundamental part of the Nation’s Open Internet and innovation strategy — an enforceable, effective but flexible policy for keeping the internet free and open,” the White House said. (.pdf) The House passed a similar measure last spring, and Obama had threatened to veto that, too, if it landed on his desk.

The Senate measure, which mirrors the House resolution, says Congress “disapproves” of the FCC’s net neutrality rules, which “shall have no force or effect.” The rules, which don’t go into effect until Nov. 20, bar broadband providers like Comcast and Time Warner Cable from playing favorites with internet traffic, while a lighter set of rules applies to mobile broadband providers like Verizon.

The Obama administration said the measure, floated by Sen. Kay Bailey Hutchison (R-Texas), threatens “the very foundations of innovation in the internet economy and the democratic spirit that has made the Internet a force for social progress around the world.”

The net-neutrality dispute harkens to 2008, when the FCC ordered Comcast to stop interfering with the peer-to-peer service BitTorrent, which can use a lot of bandwidth and is often associated with online piracy.

That marked the first time the FCC officially tried to enforce fairness rules put in place in 2005 by Republican FCC head Michael Powell. Oddly, those rules, which differ only slightly from the ones the FCC put into place, were not opposed by Republicans or Democrats at the time.

That 2008 FCC action came as a response to complaints that Comcast was sending forged packets to broadband customers to close their peer-to-peer sessions, which was first discovered by a technologist who was trying to download out-of-copyright barbershop quartet tunes.

Comcast appealed the decision, and the U.S. Court of Appeals for the District of Columbia Circuit last year set aside the agency’s net-neutrality rules, saying the FCC was powerless to adopt the rules.

FCC Chairman Julius Genachowski said the agency was enforcing a set of agency principles dating to 2005 that supposedly guarantee that cable and DSL subscribers have the right to use the devices, services and programs of choice over their wireline connections.

The FCC, however, adopted the rules again in December, hoping to put them on stronger legal grounds. Those rules however are tied up in the courts, where the issue is likely to be resolved, following the White House’s veto threat. Verizon is already suing the FCC over the rules, which mostly apply to cable and DSL providers.

The rules prohibit companies from unfairly blocking services they don’t like and require them to be transparent about how they manage their networks during times of congestion. Mobile carriers like AT&T and Verizon face fewer rules but are banned from interfering with alternate calling services such as Skype.

[wired, November 8, 2011]
Enforcing Net Neutrality

• Do ISP discriminate?

• Challenges
  – Performance degradation due to other reasons
    • Transients factors like network and load dynamics
    • Static factors like topology and location
  – Discrimination could be complex
    • More complex than port==x and size>y