Computers and Society

Net Neutrality

Chris Brooks

Department of Computer Science
University of San Francisco
Net Neutrality

- Net neutrality is an issue that could have wide-ranging implications on the way the Internet works.
- Most people don’t hear much about it.
  - Too “complex”
  - No easy video, sound bite
- It’s not really that complicated.
What is net neutrality about?

- Fundamentally, it’s about rights
  - Do all content providers have the right to have their traffic treated equally?
  - Do network owners have the right to choose what traffic can travel over their network?
- To answer these questions, we need a little background.
IP - review

- Recall that the IP layer is responsible for transferring datagrams across the Internet.
- IP does not provide guaranteed delivery
- IP does not provide Quality of Service
- No guaranteed route
- Data travels across multiple providers’ networks
Quality of service

- Quality of service can mean a number of different things
  - Reserved bandwidth
  - Guaranteed bandwidth
  - Guaranteed maximum delay
  - Guaranteed in-order delivery
  - Bounds on jitter
  - Guaranteed error rate
Next-generation applications

Many next-generation apps could benefit from QoS
- Video
- Gaming
- VoIP
- Alarm systems
- Remote surgery
Global vs Local Needs

- The Internet is designed to use traffic shaping algorithms such as TCP flow control to deal with congestion.
  - When bandwidth is scarce, all applications back off.
- Problem: TCP is not appropriate for applications like video.
  - They opt out of global flow-control.
  - Can actually make congestion worse.
Types of Applications

- Some people are also concerned the inability to give priority to different types of applications.
- Arguably some applications are more important than others
  - Email
  - Spam
  - BitTorrent
  - Video
  - Teleconferencing
Providers vs Carriers

- The fundamental debate over net neutrality is between content providers and content carriers.

- Content providers (or creators) are people or companies who create or organize the websites we browse.
  - ESPN.com, YouTube, Google, MySpace, etc.

- Carriers are the companies (or ISPs) that own the network used to deliver content to you.
  - SBC, Comcast, Sprint, etc.
Payment

- You pay your ISP a monthly fee
  - Maybe you also pay for excess bandwidth
- Your ISP pays a backbone provider for a connection
  - Possibly based on capacity, or else on amount transferred.
- Content providers also pay their Internet provider.
Making Internet Law

Typically, when lawmakers or courts must decide how to treat some new technology or medium, they use older technology as a guideline.

In this case, there are several technologies that might be applicable.
- Telephone
- Radio
- Cable TV
Telephone history

- The telephone was invented in the 1870s.
- After 1910, residential service became more popular.
- At the time, there were many different local networks.
- No guarantees about interoperability.
- No guarantees of service.
Universal Service

- In 1934 Congress passed the Telecommunications Act
- Mandated universal service
  - Subsidized service to rural areas.
- Precedent: Congress can mandate private business behavior when there is an overriding public interest.
The Rise of Ma Bell

- By 1940, most phone lines were controlled either by Bell Systems
- Bell became a monopoly.
- Bell placed some fairly stringent requirements on users.
  - Cannot connect to outside networks
  - Cannot connect unauthorized devices.
- Note - why is a monopoly bad?
Breakup

- In 1984, Bell was broken up as a result of lawsuits alleging unfair business practices.
  - AT&T has been re-acquiring Bell pieces.
- New companies able to re-enter marketplace.
- Law requires all telecommunications companies to interoperate.
- If I call you from a Sprint-owned network, and you’re on AT&T, neither company can discriminate based on content or destination.
Properties of the telephone model

- If I call someone with different long-distance service, the phone call goes through as usual. I don’t pay anything different.

- The owners of the phone network are not allowed to give preferential treatment to packets with particular content or specific destinations.

- Anyone with the wherewithal can create a new long-distance service.
Cable TV

- Cable has had a different path, and different results.
- Each cable provider owns its own network.
- A cable provider can choose what channels it wants to carry.
  - Cable is considered an information network
- If you want something they don’t have, tough.
Why are these different?

- Normally, the rule is that a company can choose to do whatever it wants, and the market is used to reward "good" behavior and punish bad behavior.

- In the case of the phone company (as well as radio and television) the medium of transfer is considered public property.
  - Infrastructure built by Federal gov’t.
  - Airwaves were traditionally also thought of owned by the people.

- Cable networks were built privately. They are not governed by the FCC.
Open vs Closed

- Today, the telephone system is an *open* network.
- Anyone with a valid phone can talk to anyone else.
- Companies cannot refuse to carry traffic from another company’s customers, or degrade their service.
- Cable is a *closed* network.
- A cable provider can choose to carry or not carry a particular channel.
- If you want a channel your cable company doesn’t carry, there’s not much you can do besides switch providers.
Internet

- So should the Internet be open, or closed, or somewhere in-between?
- Recall that IP traffic travels across a number of networks owned by different companies.
- Do those companies have to carry all your traffic?
- What about Internet over phone lines? Over cable?
Current status

Today, the answer is yes.

ISPs and network providers are governed by rules similar to the phone companies.

They must treat all packets equally, and cannot discriminate based on where a packet is from (Yahoo vs Google) or what kind of data it contains (email vs VoIP).

Historically, this is the way the Internet has worked.
Express lanes

Network providers would also like to add something equivalent to express lanes on the Internet.

- Content providers can pay more to get their packets delivered first.
- Guaranteed QoS

Providers worry that next-generation services will require a huge upgrade in infrastructure.

- The “last mile”

They argue that differential pricing is needed to help offset these costs.
Net neutrality

- Advocates of net neutrality are concerned about the power this would give to network owners.
- A provider would be able to slow or throttle the traffic of sites or applications it didn’t like, or was competing with.
- Providers would be likely to make preferential deals with other large companies.
  - This would make it harder for small web sites (such as YouTube) to gain traction.
Corporate relationships

Further muddying this debate is the corporate relationship between network owners and content providers.

For example, AT&T owns SBC and Yahoo!

If net neutrality is repealed, AT&T could potentially make Yahoo!’s search engine respond much more quickly than Google’s.

There’s a larger concern about concentration of power in the Internet here...
Violation of net neutrality

There are already lots of examples of organizations violating “pure” net neutrality.

- Universities block file-sharing apps
- ISPs filter spam
- China and Saudi Arabia block objectionable content
- UAE blocks Skype traffic
- AOL has blocked sites that criticize its pay-for-email policy. (it claims this was unintentional)
Current legislation

- Last May, the House passed a major telecom bill that did not have net neutrality included.
- The bill also cleared Senate committees last summer, but was later killed.
- This issue will probably come up again in the next Congress.
- Call or write your Senator.
Arguments against net neutrality

- Unnecessary government intervention
- QoS is needed for next-generation services - bandwidth is scarce
- Investment in infrastructure needed - corporations will be reluctant if they think they can’t recoup costs.
- Stifles innovation
Arguments for net neutrality

- Concerns about monopoly power
- Protect small sites
- End-to-end principle
- Don’t change existing working system
- Consumer protection
Sides

Who’s on each side?

Pro-net neutrality:
- Google, eBay, Yahoo, Microsoft, religious right, many liberals, librarians

Anti-net neutrality:
- Telecommunications companies (AT&T, Sprint, Cisco), libertarian groups, pro-free-market groups.
Questions

Do you think providers should have the right to filter or slow content travelling on their networks?

Do you think that legislation (as opposed to the market) is the right way to ensure net neutrality?

Could net neutrality potentially harm innovation?

If net neutrality is repealed, how do you see the Internet changing?

What are the advantages and disadvantages of the telephone model? The cable model?