

Wireless Network Management

A dose of engineering reality

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What is end-to-end

- A paper that started life as an “argument” in system design
- Later became a “principle”
- Hijacked as the end-user empowerment religion
 - Called “e2e” by Larry Lessig
 - Redubbed “Network Neutrality”
 - Taken to extreme means zero intelligence in the network PERIOD and that “all packets are created equal”

Debunking the myth of e2e

- End-to-end is an engineering philosophy that does **NOT** mandate a dumb Internet, it merely argues FOR smart end-points whenever possible.
- QoS already exists on the Internet
- Engineering philosophy is all about tradeoffs; not what’s “right” or “wrong”

Pro	Con
The personal computer and the Internet is unquestionably a resounding success	Dumb terminal remains better for certain environments IP Phones and IP PBX security problems

Net Neutrality on Capitol Hill

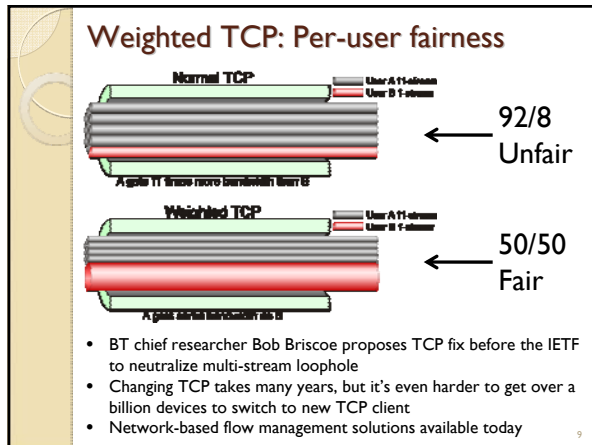
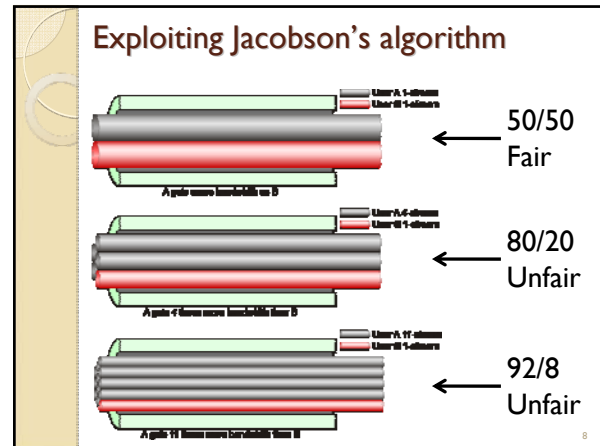
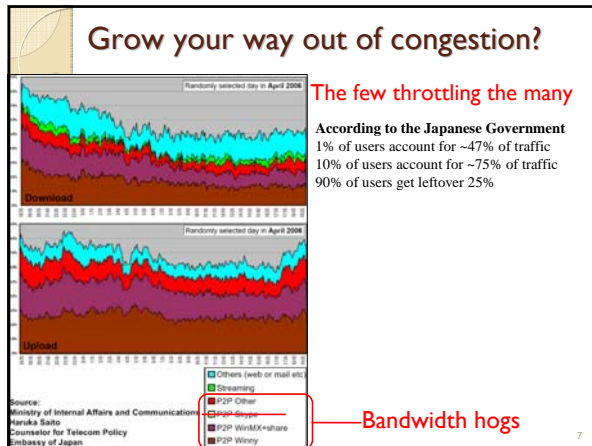
- 2006 Markey amendment in congress would ban charges on QoS (Quality of Service) prioritization
- 2006 Snow-Dorgan amendment in Senate would ban charges on QoS prioritization
- Politicians bought in to the myth that the Internet is supposed to be dumb
- This would ban existing QoS contracts on corporate Internet connections in place today
- Force bundling of QoS or no QoS at all
- US Internet becomes unsuitable for real-time applications like VoIP (Voice over IP)

Net Neutrality supporters

- **Larry Lessig**
 - Claims e2e religion is the status quo; burden on those proposing to “change” Internet to prioritized network.
 - Wants to ban tiered pricing for content providers
 - For consumers, Lessig argues for consumer-rejected Metered Internet. Masks support for Metered Internet with cryptic language like “bandwidth commitments”.
- **Tim Wu**
 - Tim Wu repeatedly says “NN legislation is not important” during debate with me at USF law school.
 - When pushed, Wu says it’s “spirit” of Net Neutrality that counts
- **Susan Crawford and DPSPProject**
 - First in first out “rule” from the school of: Make-it-up-as-we-go-along network engineering

Internet pioneers

- **Bob Kahn**
 - Says “Net Neutrality” is a slogan
 - Believes that any ban on network intelligence is a bad idea
- **Tim Berners-Lee**
 - Says no one should be able to “pay for exclusive access to me”. No blocking of websites.
 - Says paying extra for higher QoS is legitimate
 - Refuses to clarify position actual legislation
- **Vint Cerf and Google**
 - Says congressman Markey knows issue best
 - Claimed Net Neutrality only applies to Access Layer in debate with David Farber
 - Google backs down when pushed on issue of ban on QoS charges



- ### Network management ensures harmonious coexistence
- P2P applications need volume, not priority
 - Interactive applications (Web) and real-time applications (VoIP) want priority and not volume
 - P2P, Interactive, and real-time applications each get what they want under a managed network
 - Interactive and real-time apps have small/fixed volume so no matter how much they're prioritized, they cannot slow down a P2P download.
 - Unmanaged networks regardless of capacity will always be unfair and hostile to interactive and real-time applications
- 10

Limitations of shared medium networks

	Upstream	Downstream	# of BitTorrent 24x7 seeders to kill unmanaged network
Cable DOCSIS 1.1	10 Mbps	40 Mbps	Less than 26 ⁽¹⁾
Cable DOCSIS 3.0 ⁽⁴⁾	30 Mbps	80 Mbps	Less than 30 ⁽²⁾
Wireless 802.11b ISP	4 to 6 Mbps shared		One ⁽³⁾

1. Fewer than 26 fulltime P2P seeders saturating their upstream at 384 kbps 24x7 kills an unmanaged DOCSIS 1.1 network.
 2. Fewer than 30 fulltime P2P seeders saturating their upstream at 1 Mbps 24x7 kills an unmanaged DOCSIS 3.0 network.
 3. One fulltime P2P seeders OR P2P uploaders/downloaders can kill an unmanaged Wireless 802.11g network.
 4. First implementations of Comcast's DOCSIS 3.0 use 2 bonded-channels downstream and a single upstream channel.

- ### Movement to kill the wireless industry
- Openly state that cell phone industry and business model should be destroyed
 - Carriers have no right to profit; they should spend money on capacity instead
 - Wireless network providers should be dumb "fat pipe" transport
 - Skype + Wireless dumb transport + Open device = Utopia

Dumb versus smart wireless voice

- A dumb Wi-Fi 802.11b network using 20 MHz of spectrum might support 4 VoIP (Voice over IP) calls using Skype or SIP
- With WMM, 802.11g might support around 20 VoIP callers
- 2/3 of VoIP is overhead
- Latest mobile phone technology supports 500 wireless callers on 10 MHz of spectrum
 - Smart radio scheduling avoids collisions and allows you to pack transmissions closer

Wireless open access

- Those who espouse Open Access the most spent **\$0** on spectrum
- Industry naturally progressing to open access anyways
- Mandated open access in 700 MHz block C cost the US treasury billions in revenue
- Even open access must require device and application certification
- Building an open wireless voice network is far more complicated than a carter phone for land lines

Conclusions

- Policy makers need to learn about the realities of network engineering
- Wireless industry should continue to prioritize and schedule voice traffic
- Wireless industry should look at flow management technologies that are protocol agnostic
 - Share unscheduled bandwidth equitably amongst equal paying customers
 - Applications that use too much bandwidth will simply fail to operate instead of hogging the net
 - Then there's no need to block access to applications