



Internet Quality of Service: A Bigger Picture

Joint work by

Thomas Michael Bohnert

E. Monteiro, M. Curado, A. Fonte
University of Coimbra (UoC)

M. Ries

University of Vienna (UoV)

D. Motchanov, Y. Koucheryavy
Tampere University of Technology (TUT)



UoC

What's the paper all about



- Motivation:
 - QoS research was and still is very vivid
 - Update of „Internet QoS: A Big Picture“ by Xipeng Xiao and Lionel M. Ni, IEEE Network, 1999
 - Tutorial-style, comprehensive overview about current practices, recent achievements and trends.
- Outline
 - QoS Architectures for NGN Networks
DiffServ/IntServ/MPLS
 - QoS Issues in Wireless New Generation Networks
802.11 and 802.16
 - Advances in QoS signalling
Next Steps in Signalling (NSIS)
 - QoS Routing in the Internet
Intra and Inter domain QoS routing
 - QoS Assessment for New Generation Networks
From Intrinsic to Subjective QoS

Who knows about?



- Outline (cont'd)
 - Net Neutrality
 - The End of Internet QoS?

- Net Neutrality what? What's that all about?
 - A tennis match in Switzerland?
 - Basketball players who don't choose sides?
 - Tuna fishermen who don't have a position on being dolphin-safe?
 - Absolutely nothing?
 - Arianna Huffington, The Huffington Post

- Online Survey:
 - Who knows about the Net Neutrality debate?

- Is this good or bad? Let's see.

Net Neutrality Genesis



Interview with [SBC CEO Edward Whitacre](#), Business Week Online, 7 November 2005

Business Week Online:

How concerned are you about Internet upstarts like Google, MSN, Vonage, and others?

Edward Whitacre:

“How do you think they're going to get to customers? Through a broadband pipe. Cable companies have them. We have them. Now what they would like to do is use my pipes free, but I ain't going to let them do that because we have spent this capital and we have to have a return on it. So there's going to have to be some mechanism for these people who use these pipes to pay for the portion they're using. Why should they be allowed to use my pipes?”

The Internet can't be free in that sense, because we and the cable companies have made an investment and for a Google or Yahoo! or Vonage or anybody to expect to use these pipes [for] free is nuts!”

You are not alone!



BellSouth CTO, William Smith

“Internet service providers should be able to charge, e.g. Yahoo Inc., for the opportunity to have its search site load faster than that of Google Inc. Or my company should be allowed to charge a rival voice-over-Internet firm so that its service can operate with the same quality as BellSouth’s offering.”

Scott Kriens, chairman and Chief Executive (CE) of California-based Juniper Networks

,It is inevitable that the Internet will split into different data streams, and those who can afford a better quality of service will be able to buy it (...) the internet has to be overhauled, to develop the full potential of technology such as streaming video and voice-over-IP telephony. "It has to change," he says.

Sydney Morning Herald, 21 November 2006

Verizon CEO, Ivan Seidenberg

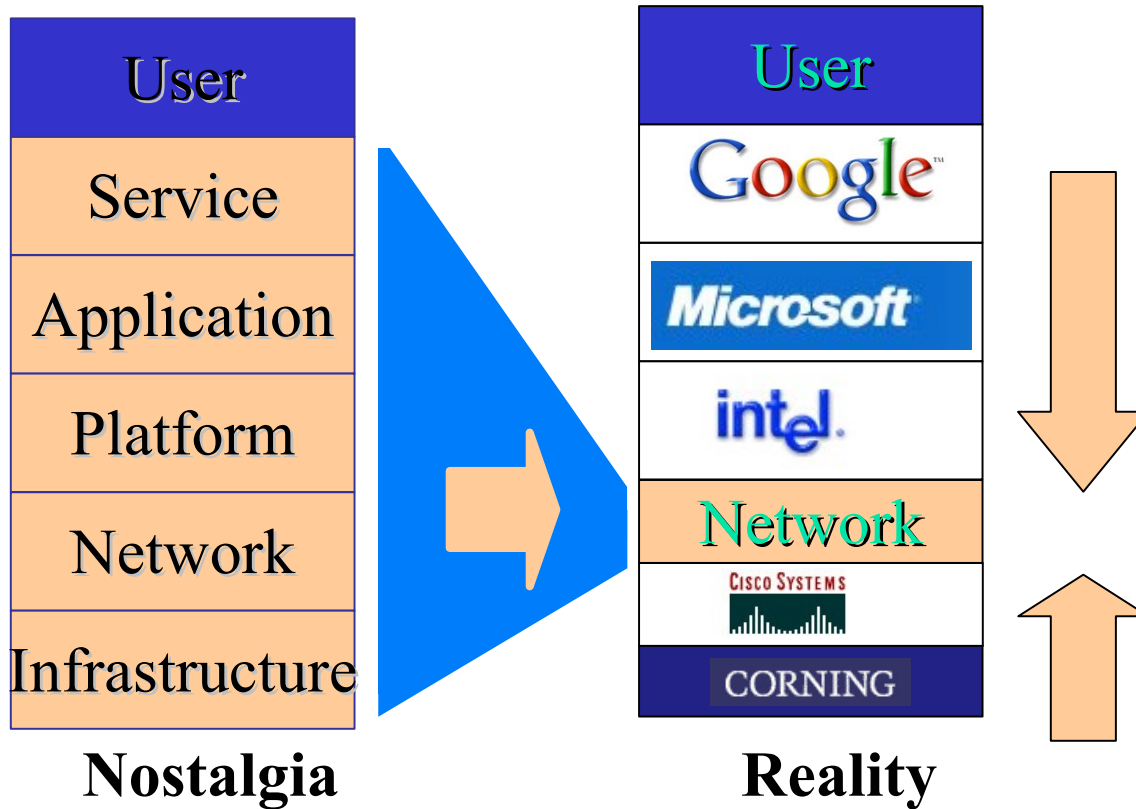
“We have to make sure they don't sit on our network and chew up our capacity. We need to pay for the pipe.”

What has happened?



- Casting the scene: Carriers, Content, Services, Access, Users
- ~1995
 - Carriers provide connectivity between customers and service providers
 - Customers pay carriers to access services
 - Service providers pay carriers for customer access
 - Access provider-centric closed service
- ~2000
 - Content providers fail in pay-per-view models of content distribution
 - But believe that they are the only reason for customers to access the net
 - Ergo: Access owes Content
- ~2003
 - Network Access Providers attempted to generate their own proprietary content, accessible exclusively within their realms
 - Network enterprises purchased content generators
 - Access owns Content
- ~2007
 - Ubiquitous broadband fosters new generations of content providers
 - Google, Yahoo!, MySpace, Skype, YouTube, etc ...

What has happened? (con't)



Picture by:
Geoff Huston, Chief Scientist,
APNIC, CAIA, Swinburne
University of Technology
Talk on Net Neutrality

- But what if ?
- Hence, ISP its conviction today:
 - Content owes Access!

Flexing muscles

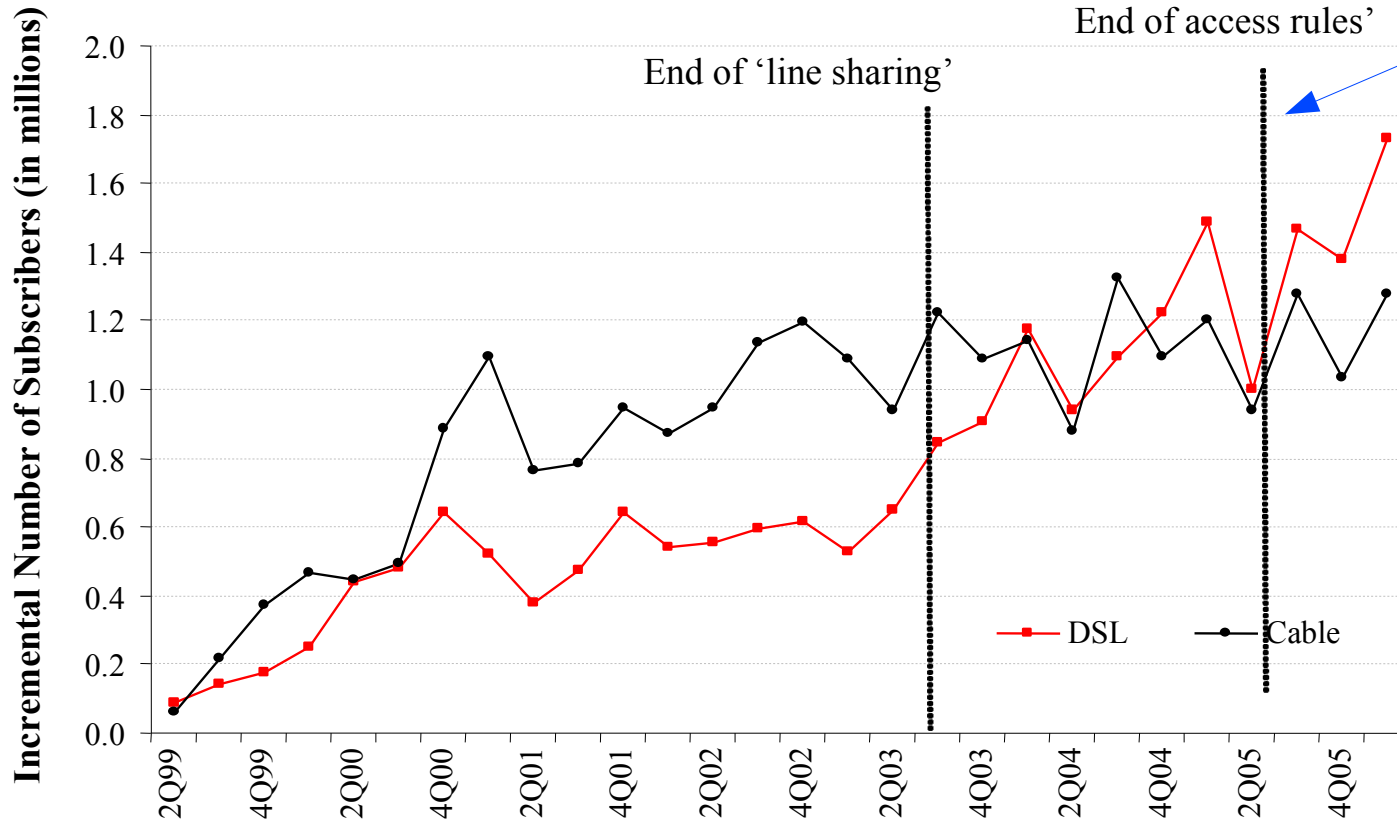


- Carriers claim the right under U.S. law to operate with minimal government interference
 - February 2003, Partial DSL deregulation
 - June 2005, **Brand X vs. Federal Communications Commission (FCC)**
 - Question: "Cable: Telecommunications services" or "Information services."
 - Information services are subject to much less stringent regulations, in particular: **No-line sharing!**
 - Rule: **Regime upheld**, it's an information service
 - August 2005, Full DSL deregulation
 - Cable and DSL, now almost deregulated
 - November 2005
 - Do you remember? **SBC CEO E. Whitacre**, Content Providers have to pay!
- AT&T alone has spent ~ \$100 lobby-millions by today

Flexing muscles (con't)



Quarterly DSL and Cable Modem Subscriber Additions, 2Q1999 - 1Q2006



Full Deregulation

Picture by:
Thomas W. Hazlett
Professor of Law &
Economics

Talk on
"Empirical
Evidence on the
Effect of Broadband
Regulation"

- 95% of U.S. broadband access via Cable or DSL
- Both are today almost deregulated
- Scary perspectives?

An empire strikes back



- Yahoo, Microsoft, Ebay, Amazon believe that this is too much power for „copper-minded“ stone age giants
- „Net Neutrality Lobby Group“
 - <http://www.itsournet.org/>
- February 2006: Vinton Cerf, Vice President and "Chief Internet Evangelist" at Google, testimony before Congress
 - "allowing broadband carriers to control what people see and do online would fundamentally undermine the principles that have made the Internet such a success“
- Tim Berners-Lee, Inventor of the World Wide Web
 - „neutral communications medium is essential to our society. It is the basis of a fair competitive market economy. It is the basis of democracy, by which a community should decide what to do. It is the basis of science, by which humankind should decide what is true. Let us protect the neutrality of the net."

Evidence or a bogus issue?



- Net Neutrality proponents
 - Traffic discrimination inhibits innovation
 - Google, Amazon, etc. share humble beginnings
 - Carriers split the Internet in a two-class society, in those who can afford „Premium Service“ and all others
 - Carriers abuse their power to discriminate, block, etc.
- „Some Proof“
 - 2005, Canadian telephone giant **Telus blocked a website** supporting the company's labour union
 - **Shaw Cable**, major Canadian ISP, offers "Quality of Service" upgrade for their VoIP service. Competing providers complain that Shaw **may be downgrading competitor's traffic**
 - **AOL blocked emails** mentioning „www.dearaol.com“, an advocacy campaign opposing the company's pay-to-send e-mail scheme
 - **Cox Cable's customers were unable to access Craig's List**. Save the Internet said this was an intentional act on the part of Cox Cable to protect classified ad services offered by its partners.
 - **Madison River** donates \$15,000 to stop an FCC inquiry into it's **blocking VOIP services**



Evidence or a bogus issue? (con't)



AGAINST NET NEUTRALITY

KEY ARGUMENT: Net neutrality is trying to address a problem that doesn't exist. The future development of the Internet should be left to the competitive market forces without the intervention of government.

OF THE DEBATE:

h, Sprint Nextel, Communications, others.

THE AD CAM-

s Off the Internet, or receives funding from n, Cingular smaller telecom companies. Competition.org is also funded by AT&T, BellSouth and Cingular, as well as Comcast, Sprint Nextel, Verizon and national telecom associations.

POLITICAL CONTRIBUTIONS:

\$9.1 million

SOURCE: Center for Responsive Politics

IN FAVOR OF NET NEUTRALITY

KEY ARGUMENT: Net neutrality keeps the Internet on a level playing field for those who create Web prevents cable and phone from giving priority to sites afford to pay for faster deli

ON THIS SIDE OF THE DE

Tech companies such as M Google, Yahoo, eBay and Amazon.com, as well as o tions such as MoveOn.org Action, Christian Coalition, Consumers Union and the Civil Liberties Union.

WHO'S BEHIND THE AD CA

ItsOurNet.org, with fundin Microsoft, Google, Yahoo, IAC/Interactive Corp.; SavetheInternet.com is run Press, a nonprofit group th advocates more public-interest involvement in media policy; MoveOn.org Civic Action, a nonprofit organization that supports liberal causes.

POLITICAL CONTRIBUTIONS:

\$2.7 million

SOURCE: Center for Responsive Politics

SAVE THE INTERNET

Don't let Congress gut the Internet's First Amendment.

CLICK HERE TO PRESERVE NET NEUTRALITY



And then the worst: Politics



- U.S. Senate
 - R. Wyden: March 2006, „*Internet Non-Discrimination Act of 2006*“
 - Prohibits blocking or modification of data in transit - **Open**
 - O. Snowe: May 2006, „*Internet Freedom Preservation Act of 2006*“
 - Ban on blocking/degradation, and a ban on QoS deals between network providers and specific content providers. States that FCC would be responsible for enforcing complaints - **Open**
- U.S. House of Representatives
 - E. Markey: April 2006 „*Network Neutrality Act of 2006*“
 - Amends the Communications Opportunity, Promotion, and Enhancement Act of 2006 (COPE) to make its existing neutrality provisions more strict. - **Defeated**
 - J. Sensenbrenner, May 2006, „*Internet Freedom and Non-discrimination Act of 2006*“
 - Prohibits to discriminate against any web traffic, refuse to connect to other providers, block or impair content; prohibits the use of admission control to determine network traffic priority. - **Defeated**

Friendly Fire



- February 2007, Gary Bachula, Vice President for External Affairs for Internet2, testimony, U.S. Senate
 - „For a number of years, we seriously explored various “Quality of Service” schemes“ (...)
 - „Our research and practical experience supported the conclusion that it was far more cost effective to simply provide more bandwidth (...) providers should focus on providing (...) abundance of bandwidth and the QoS will take care of themselves”
 - “priority is going to be given to commercial interests (...) and not educational institutions”
- A real-life paradox ?
 - By today, the „Hawks“ (Republicans) „BUllSHness“ embodies the most resistant and reliable „Bastion“ in defending a non-„Net Neutrality“ regulated Internet
- But power distribution has recently changed
 - House and Senate now controlled by Democrats



- But what if Net Neutrality lobby eventually succeeds and the U.S. gives in ?
 - Quality of Service forbidden by law, enforced by fierce regulation?
 - Or exceptionally tolerated but stifled by a heavy regulatory burden?
 - We know „Premium Service“ is an all or nothing game
- The worst down the road - „Twilight of the Gods“
 - Years and years of QoS research in vain?
- Yet the trend points in the opposite direction
 - Politicians remain reluctant „There is a solution in search of a problem“
 - Proponents yet fail to provide compelling evidence
- **March 22, 2007**, FCC launches a new inquiry about current ISP practices

Globalisation issues (con't)



- The European stance
 - Regulation is sufficient, QoS included, no evidence to intervene
 - But a **study group** has been **commissioned**
 - „There is a **risk that**, in some situations, the **Quality of Service could degrade to unacceptably low levels**. It is therefore proposed to give regulators the power to set minimum quality levels for network transmission services in an NGN environment“
- June 2006, „Review of the EU Regulatory Framework for electronic communications networks and services“*
- Current practice in Germany
 - T-Mobile prohibits VoIP and IMS by terms of contract
 - Vodafone Germany announced block of VoIP over UMTS by 2007
- Also Japan
 - Nippon Telegraph and Telephone, serves VoD with QoS level superior to common Internet traffic
- And South Korea
 - VoIP blocked on high-speed networks unless the network operator is likewise service provider

Closing remarks



- Let's keep level head
- There is no obvious need for “Net Neutrality” extensions for something that has never been „neutral“
- Or is Best-Effort any truly fair?
- By now, free market forces are proven to be the best policy enforcement
 - They prevented, for instance, the advent of QoS!
- Why should this has recently turned to be different for Internet ethics?
- But nevertheless, we must not turn the blind eye
- First Net Neutrality moderate activists can meanwhile be found in Europe too (Germany)
 - e.g. Dr.-Ing. Barbara van Schewick, Ass. iur.

Thank you



- Questions?