Net Neutrality

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Abstract. The Internet is designed to be a "dump pipe": routers handle all traffic equally, because they just don't know what content is inside the transmitted packages. They just care for the destination and forward the package to the next router.

However, this implicit "net neutrality" is undermined by Internet service providers for different reasons. On the other side, people fear to lose the freedom of the Internet.

This paper was written for the purposes of the Internet Traffic and Content Distribution Course at Stuttgart Media University (HdM) in 2012 and looks into the debate of net neutrality as well as the current state of the Internet in terms of net neutrality and "freedom".

Keywords: Net Neutrality, Internet Traffic, Quality of Service

1 Definition

Basically, Network Neutrality (referenced to as Net Neutrality from now on) is the principle to treat all traffic in the Internet – regardless of the transported content or the user – equally. However, there are different ideas subsumed under the term of Net Neutrality. [1]

Hard-liners argue that the Internet is maximally useful, if all content, sites and platforms are treated equally. This would allow the network to support every kind of application and to carry every form of information, says Tim Wu, who coined the term "net neutrality" in the first place. [2] In simple terms, this "non-discrimination" idea would result in an Internet always forwarding packets on a first-come, first served basis and with no "Quality of Service" whatsoever.

"Quality of Service", or QoS, basically means prioritization of "important" packages, or just preferring certain packages over others. This way, things like a guaranteed bandwidth can be realized.

If Quality of Service is to be allowed, there are two popular opinions of what Net Neutrality may be: some American Lawmakers would allow Quality of Service as long as no special fee for higher-quality service is charged. This way, you could not get a worse Quality of Service when paying less. [1, 3]

Tim Berners-Lee, inventor of the world wide web, sees Quality of Service in accordance with Net Neutrality: "Net Neutrality is NOT saying that one shouldn't pay more money for high quality of service. We always have, and we always will." [4] But Net Neutrality (according to Berners-Lee) precludes any exclusivity to access – so, for example, there must not be a website or Internet service one can only access with a more expensive Internet access. If two people are connected to the Internet, they may run any Internet application they want, regardless of who they are or what they are doing. [5]

So we see, the common ground in all Net Neutrality definitions is "no exclusivity".

2   Arguments in favor of Net Neutrality

Net Neutrality is not something to be introduced for a better Internet, instead the Internet was "neutral" since the beginning. The pro-side of the Net Neutrality discussion fears to lose this neutrality and hence often argues with rather conservative arguments: the Internet grew and became what it is today because it was neutral. So for continuous growth and success, the Internet has to stay neutral and nothing should be changed.

Lawrence Lessig and Robert W. McChesney [6] argue the importance of the end-to-end principle of the Internet. Users and content producers control the web, and not the network connecting them. The data tells the network where to go, and not the other way round. They fear the network owners and Internet service providers (abbreviated to ISPs from now on) will become "content gatekeepers" and extort protection money from websites to deliver their content with a higher Quality of Service or just not slowed down or even blocked. Without legislation, the ISPs just have to be trusted to "behave".

They compare an Internet without Net Neutrality to cable TV – where some huge corporations control access and distribution of content. The benefits of the Internet, that basically everybody can become a publisher, and the resulting diversity of information sources would be lost. [6]

Another fear is that there will be a rise of pseudo-services for end users for things that come free with an Internet access today. For example, it would be possible for ISPs to block services like YouTube, Skype, VPN or simple online banking by default and charge extra for usage of these services. [?]

3   Arguments against Net Neutrality

The opponents of Net Neutrality are the ones that profit from a non-neutral web: the ISPs and the network operators. While the amount of traffic in the Internet is evermore increasing, prices for end-users as well as content providers keep getting cheaper. With the rise of mobile networks, ISPs have a lot of expenses for the expansion of their networks, while end-users expect their mobile internet connection to be equally fast, reliable and cheap as the land line connection. ISPs argue that they cannot bear the full cost and "have to" charge large content providers. When this is not happening, they say, innovation will stagnate: while ISPs won't have the money to build new broadband networks, the limited bandwidth available will limit innovation for traffic-intensive services like YouTube. [8, 9]

Richard Bennett of the San Francisco Chronicle points out that the Internet has a "fundamental inequality": on the server side. Running large server farms enables huge content providers to deliver data faster than smaller competitors, thus affecting them adversely. The call for net neutrality from companies like Google, he says, is just an approach to preserve this inequality. [10]

As Bennet states in an article from 2012, there is clearly a desire for Quality of Service on the Internet due to the different applications with their different requirements (large amount of data in one direction for video streaming, or small amount of data in two or more directions with low latency for voice and video telephony). This desire conflicts with the "all packets are equal" approach of pure Net Neutrality. [11]

4   Net Neutrality in the real world

While the arguments against and especially in favor of Net Neutrality are mainly vague and based on assumptions and fear, we'll now look into what the state of Net Neutrality actually is today.

4.1   Legislation

In June of 2012 there are only two countries in the world enforcing Net Neutrality by law. Chile introduced a law in 2010 forbidding ISPs to interfere with internet user's rights to send or receive any legal content. [12]

The Netherlands were the second country to introduce a Net Neutrality law. Since May of 2012 it is prohibited to block or filter content, to use deep packet inspection and to track customer behavior in the Netherlands. However, illegal content may still be blocked. [13]

Legislation attempts in other parts of the world, including the European Union and the United States, failed to date.

4.2   Regulation attempts

In the United States, the Federal Communications Commission (FCC) tries to enforce Net Neutrality. As of 2010, wireline ISPs may not prevent access to competitor's content websites like the movie steaming portal Netflix. However, ISPs can still charge extra for faster access. The FCC's rules are highly controversial, and members of the Republican Party announced to introduce legislation reversing those rules. [14]

The European Parliament approved wanting Net Neutrality in 2011 and assigned the Body of European Regulators for Electronic Communications (BEREC) to evaluate if further regulation is needed. [15] The BEREC's report states that, while Internet access for most EU citizens works mostly well, up to half of mobile users have restricted contracts where services like Skype or Peer-to-Peer is blocked. However, most ISPs also offer unrestricted contracts. EU Commissioner Neelie Kroes stated in May of 2012 that consumer protection has to be improved, so users see if they have restricted access or real Internet. Also, ISPs should clearly communicate to their users if they do deep packet inspection or similar measures. However, free market and demand will suffice, so no further regulation or legislation enforcing Net Neutrality is needed, she says. [16]

The German Bundesnetzagentur draws similar conclusions. While they see no acute Net Neutrality violations, they say Net Neutrality can be assured by competition and demand. Possible regulations should however apply to fixed as well as mobile lines, unlike FCC's rules, which only apply to the wireline.[17]

4.3   Net Neutrality violations

The main Net Neutrality violation worldwide is deep packet inspection and filtering or throttling of file sharing traffic. As early as 2007 the US ISP Comcast started filtering file sharing. However, filtering is not increasing in the US. In Canada and UK however more and more ISPs filter file sharing traffic, whereas in many other filtering countries deep packet inspection decreases, for example in Brazil and Poland. In Germany the main cable provider Kabel Deutschland slows down file sharing traffic at peak times.[18]

Mobile ISPs are widely blocking competing services like Voice of IP (VoIP). For example, German Telekom blocks Skype in their cheaper data plans. German Vodafone blocks instant messaging, VoiP, tethering and peer to peer by default. A rate option ("InternetPlus") for about 30 Euros enables those services. [19, 20]

In France, mobile ISP Bouygues Telecom sells a contract called "internet illimité" ("unlimited internet") with a volume limit of 50 MB where connections over 10 MB are cut and services like VPN, IMAP, UDP, streaming, news groups and instant messaging are blocked. This is justified with "unallowed professional usage". [21]

Because US' FCC's rules only apply to the wireline internet, mobile ISPs in the US also widely block "unwanted" services in their mobile networks. [22]

Technically, the categorization of packets is mainly done with deep packet inspection. Because TCP headers don't contain any information about the package content, looking at them is not sufficient. With deep packet inspection you can analyze the full package including its payload in realtime. [23]

5   Conclusion

Internet Service Providers are mainly former telephone companies. Back in the days, they were used to gain a huge amount of money for providing relatively simple services: first only voice telephony, later text-messaging. With the rise of the internet, these services keep becoming more and more obsolete, because they can simply be done online and for free. So naturally, ISPs want to sell new services besides simple internet access.

Because of that, absolute non-discrimination will not happen with ISPs, as they clearly will continue selling different quality of service levels.

So the solution can only be introducing rules and/or laws to bridle the ISPs for internet freedom and consumer protection. The approaches in Chile and The Netherlands are already pointing in the right direction.

In his article from 2012, Richard Bennet [11] cites Barbara van Schewick of the Stanford Center for Internet and Society who proposed some rules for a non-neutral Internet. She proposes Quality of Service on a user-controlled level. ISPs should be forbidden to charge content providers for higher Quality of Service and should be obligated to deliver a baseline quality to end users. However, ISPs should be able to offer higher QoS levels for end users, but these levels should be "offered equally to all applications". This way, a free internet would be maintained while ISPs had the chance to finance their networks by offering *even better* Quality of Service for interested users. [24]

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