

# The Next Tim Berners-Lee

## Response to Ofcom Discussion on Traffic Management and Net Neutrality

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### I. Traffic Management and Innovation

When Tim Berners-Lee set out to create the World Wide Web two decades ago, Internet service providers had few choices for managing traffic on their networks. They could increase physical network capacity (by adding dial-up lines and network hardware) and they could rely on the burgeoning ability of the Transmission Control Protocol (TCP),<sup>1</sup> implemented at the Internet's endpoints, to detect congestion and respond by adjusting data transmission rates. Both of these traffic management techniques, which are still in wide use today, are "application-agnostic:" their functioning does not depend on which Internet applications are in use on the network.

This application-agnosticism was one central reason why Tim Berners-Lee was able to deploy his web inventions to users across the Internet and across the world.<sup>2</sup> Despite growing amounts of web traffic flowing over their networks, ISPs did not take targeted action to delay or accelerate it. They did not seek to identify the particular protocol associated with the web (HTTP) for any particular traffic management purpose. As a result, Tim Berners-Lee – and all other Internet innovators – could know with some degree of certainty how their inventions would perform on the network, and they need not fear being the targets of particular ISPs' traffic throttles or shapers. Application-agnosticism has shaped the astoundingly innovative history of the Internet, where many of the most revolutionary and popular technologies of our time – including the web, VoIP, instant messaging, web-based email, search, and social networking – were pioneered by tiny companies or individuals with no corporate backing.<sup>3</sup>

An innovator in the UK today – call him the next Tim Berners-Lee – faces a very different landscape. UK ISPs engage in a panoply of "application-specific" traffic management techniques, targeting particular applications or application protocols for reduced or improved treatment. A summary of the traffic management policies of some of the UK's most highly subscribed ISPs is in Table 1.

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<sup>1</sup> Jon Postel, ed., *Transmission Control Protocol, RFC 793*, September 1981, <http://www.rfc-editor.org/rfc/rfc793.txt> (last accessed 5 September 2010).

<sup>2</sup> See Tim Berners-Lee, *Neutrality of the Net*, Decentralized Information Group Breadcrumbs Blog, 2 May 2006, <http://dig.csail.mit.edu/breadcrumbs/node/132> (last accessed 5 September 2010).

<sup>3</sup> For a detailed account of how individual innovators have developed some of the Internet's most successful applications and services, see Barbara van Schewick, *Internet Architecture and Innovation*, 2010, MIT Press, Cambridge, MA, chapter 8.

ISP	Does app-specific management?	Applications/protocols targeted	Hours of application
<b>AOL Broadband</b>	Yes	Policy is unclear	Typically in the "evenings"
<b>BT Retail</b>	Yes	<ul style="list-style-type: none"> <li>• P2P</li> </ul>	Usually 4pm-12am weekdays, 9am-12am weekends
<b>O2</b>	Yes	<ul style="list-style-type: none"> <li>• Streaming video (for all but highest service tier)</li> <li>• P2P</li> <li>• Browsing (for off-net customers)</li> </ul>	Hours vary depending on service tier
<b>Orange</b>	Yes	<ul style="list-style-type: none"> <li>• P2P: BitTorrent, Kazaa, perhaps others (policy is open-ended)</li> </ul>	6pm-12am
<b>PlusNet Broadband</b>	Yes	<ul style="list-style-type: none"> <li>• Download/mirror sites for large downloads</li> <li>• Content distribution networks (CDNs)</li> <li>• VoIP</li> <li>• Gaming</li> <li>• Browsing and email</li> <li>• Streaming</li> <li>• VPN</li> <li>• PlusNet FTP and other FTP</li> <li>• P2P</li> <li>• Binary Usenet</li> </ul>	All times
<b>Sky</b>	Yes (Broadband Connect packages only)	<ul style="list-style-type: none"> <li>• Browsing</li> <li>• Email</li> <li>• Streaming</li> <li>• Instant messaging</li> <li>• Gaming</li> <li>• VoIP</li> <li>• P2P</li> <li>• Newsgroups</li> </ul>	5pm-12am
<b>TalkTalk</b>	Yes	<ul style="list-style-type: none"> <li>• P2P: BitTorrent, Gnutella, eDonkey/eMule, Kontiki</li> <li>• Newsgroups</li> <li>• Perhaps others (policy states that all traffic is identified by application)</li> </ul>	All times
<b>Virgin Media</b>	No	None	Hours vary depending on service tier

**Table 1. Summary of UK residential broadband ISP traffic management policies.<sup>4</sup>**

<sup>4</sup> See Fair Use Policy for AOL Broadband, [http://help.aol.co.uk/help\\_uk/documentLink.do?cmd=displayKC&docType=kc&externalId=uk\\_2264599212](http://help.aol.co.uk/help_uk/documentLink.do?cmd=displayKC&docType=kc&externalId=uk_2264599212); BT Broadband Fair Usage Policy, [http://bt.custhelp.com/app/answers/detail/a\\_id/10495/c/346,402](http://bt.custhelp.com/app/answers/detail/a_id/10495/c/346,402); What are the technical details of your traffic management? (O2), <http://service.o2.co.uk/IQ/SRVS/CGI->

As the table shows, Virgin Media is the lone major UK wireline ISP that does not engage in application-specific traffic management of any kind. Some ISP policies are more specific than others, but what is abundantly clear is that many of the Internet's most popular applications and protocols are targeted for various kinds of traffic shaping at various hours of the day or night by various ISPs.

For potential innovators, this situation creates significant uncertainty about whether the investments they make in bringing new applications and services to the public will just as soon be squelched by ISP traffic management. For example, given the current traffic management policy landscape, innovators may be reluctant to involve peer-to-peer technology in their work in any way, as it is a target of many of the ISP policies. Ofcom research shows significant user interest in Internet video and other bandwidth-intensive forms of content,<sup>5</sup> and peer-to-peer technologies can be incredibly efficient at transferring high traffic volumes, but the potential for products built on top of peer-to-peer protocols to be squeezed out by network operators could easily deter potential innovators. Since ISPs can arbitrarily select which protocols they target, and since their traffic management policies can change at any time, this deterrent likely acts against the pursuit of new innovations using any peer-to-peer technology, even those that are designed to be "network-friendly" by limiting their own transfer rates when they detect congestion.<sup>6</sup> Innovators may be deterred from experimenting with other kinds of applications and services, or with entirely new protocols, for exactly these reasons.

Of course, the Internet is not what it was when the web was invented, and broadband network operators have a legitimate need to manage the increasing volume and diversity of traffic on their networks. Luckily, they have many application-agnostic tools at their disposal that can achieve the goals of ensuring a high-quality experience for their customers without deterring application innovation. These mechanisms are based on the volume of data being sent, the rate at which it is sent, or some other objective criteria. For example, some operators have introduced volume caps into their broadband Internet service plans, charging users extra or slowing their service if the volume of data they send or receive meets a pre-defined threshold during some period of time (15

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<sup>5</sup> Ofcom, *The Communications Market 2010*, 19 August 2010,

<http://stakeholders.ofcom.org.uk/market-data-research/market-data/communications-market-reports/cmr10/> at 263.

<sup>6</sup> See, e.g., Simon Morris, *Changing the game with  $\mu$ TP*, BitTorrent blog, 5 October 2009, <http://blog.bittorrent.com/2009/10/05/changing-the-game-with-%CE%BCtp/> (last accessed 5 September 2010).

minutes, one day, one month or some other time frame).<sup>7</sup> There are a wide variety of ways in which such application-agnostic mechanisms can be used, giving network operators a substantial amount of flexibility to achieve their traffic management goals. These sorts of mechanisms have already been in use for many years by large and small operators in the UK (in combination with application-specific approaches), the US and elsewhere.

Traffic management policies based on objective criteria put the developers of Internet applications and services back in charge of deciding how to design their products without the fear that they may be arbitrarily targeted. As long as they understand the performance characteristics of their products, they can establish reasonable expectations of how those products will perform across different ISPs' networks. This is precisely the kind of innovative environment that gave birth to the Internet of today, and it is the one that will do the most to foster continued innovation in the UK in the future.

## II. Potential for Ofcom to Act

Establishing application-agnosticism as a principle that UK ISPs must follow in crafting their traffic management policies is well within Ofcom's remit. Ofcom's discussion document downplays its duties under Section 3 of the Communications Act of 2003 to further the interests of both citizens and consumers,<sup>8</sup> but preserving the Internet as a platform for innovation is of direct interest to both of those constituencies. The incredible wealth of content and services that the Internet supports is what drives ever-increasing broadband demand, which in turn has served as the underpinning for the UK's next-generation access strategy. Continued innovation is key to ensuring that consumers and citizens alike will continue to turn to the Internet to satisfy their communications needs.

Crucially, competition has failed to safeguard consumer and citizen interests in this regard. While Internet users in the majority of UK markets may have a significant number of choices for broadband Internet service, Table 1 suggests that users in more competitive and less competitive markets may have limited choices if they desire Internet service whose traffic management is application-agnostic. Ofcom asserts that "consumers will tend to punish attempts at exclusionary behaviour by simply shifting their business to an alternative provider who does not engage in the same exclusionary practices,"<sup>9</sup> but this belies the reality that a substantial fraction of UK consumers will have few or no ISPs to switch to if they seek an application-agnostic service. Ofcom's focus on transparency and service migration<sup>10</sup> are warranted, but Ofcom should recognize

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<sup>7</sup> See, e.g., Traffic management (Virgin Media), <http://shop.virginmedia.com/help/traffic-management.html>; Comcast Acceptable Use Policy for High-Speed Internet Services, <http://www.comcast.net/terms/use/#network>; SaskTel Internet Service Acceptable Use Policy, <http://www.sasktel.com/about-us/legal-and-regulatory/sasktel-internet-services-acceptable-use-policy.html#fairaccess> (all last accessed 5 September 2010).

<sup>8</sup> Ofcom Discussion Document at 9.

<sup>9</sup> Ofcom Discussion Document at 26-27.

<sup>10</sup> Ofcom Discussion Document at 34-46.

that being able to understand ISP traffic management policies and easily switch among ISPs are of little use to consumers if real choice is simply not available.

The failure of the market to safeguard the innovative underpinnings of the Internet is not altogether surprising. Innovation can be viewed as a positive externality associated with the offering of Internet service in the marketplace. Many Internet users see innovative benefits only indirectly, by making use of the fruits of innovation – content, applications, and services. Indeed, innovation is a benefit to the public that is not directly paid for by consumers. In the short term, without realizing the link between application-agnostic traffic management and the eventual products that may come to market because of it, many consumers see roughly the same direct benefit from networks that do and do not make use of application-agnostic traffic management. By extension, they are willing to pay the same for each, thus failing to provide the demand that would be required for more ISPs to pursue application-agnostic approaches. Meanwhile, the benefits to the public of application-agnosticism are lost. As such, even a competitive marketplace is unable to supply the public benefit derived from application-agnosticism.

It is under precisely these circumstances that regulatory intervention can help to support the positive externalities of innovation. Ofcom claims that regulatory concerns are only triggered when ISPs have some degree of market power and when they use that power to engage in exclusionary conduct to the detriment of their rivals.<sup>11</sup> But it is a different kind of market failure – the failure to capture the positive externalities associated with application-agnosticism – that should compel Ofcom to act. While its competition powers may only provide such authority under findings of market power, its authority under Section 3 fills in the gap. By acting under Section 3 to establish a principle of application-agnostic traffic management for ISPs to follow, Ofcom can create the conditions that competition could not.

### **III. Conclusion**

When traffic management and net neutrality issues are discussed in the press, the debate is often explained as a battle among Internet giants, with big network operators on one side and big content and service providers on the other. What this framing overlooks is the importance of fostering the giants-to-be: those companies, products, and ideas that may not even exist yet, but that, like so many before them, will come to permeate the Internet experience. The UK gave birth to one of the great innovations of our time, the World Wide Web. The fate of the next Tim Berners-Lee hangs in the balance, but with Ofcom's help, he and all other innovators like him can follow in the footsteps of today's Internet giants.

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<sup>11</sup> Ofcom Discussion Document at 26-27.