

Practical Consequences of the Elimination of Net Neutrality for the Research & Education Community: A Speculation

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On December 14, 2017, in a monumentally craven vote, the Federal Communications Commission (FCC) eliminated the net neutrality rules that had been in place for many years; after publication in the *Federal Register*, a portion of this action will go into effect on April 23, 2018, with the remainder of the repeal set to go into effect later this year after final approval by the Office of Management and Budget (OMB). In the companion piece in this issue of *Research Library Issues*, Krista Cox discusses the broader public policy implications of this decision, including the prospects for reversing it through legislative action or litigation by state attorneys general, or of at least mitigating some effects through state-level legislation or regulation. This brief and admittedly speculative piece will simply take the reversal of net neutrality as a starting point, and attempt to predict the practical, operational consequences for research and education (R&E) institutions, and consider some possible strategies to work around these consequences.

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de-prioritize that traffic in preference to other traffic, or to monitor, record, and resell that traffic to anyone it pleases. The ISP can also attempt to modify traffic (for example, to insert advertising). To be clear, it remains to be seen which of these appalling practices various ISPs will choose to adopt, though the track record of some parts of the industry over the last decade or so is not encouraging. Note

Fundamentally, the FCC’s decision to eliminate net neutrality allows any internet service provider (ISP) to block traffic that transits that ISP’s network, to delay or

that some of these behaviors may be hard to detect, and under other circumstances might be considered as criminal activities or cyber-warfare.

So what does this mean in practice for the R&E community? I'll look at three situations: what it means on campus, what it means for R&E community members using networked resources at home, and what it means for smaller content providers that may be important to the R&E community.

The Impact on Campus

Universities, major corporations, government research labs, and other organizations negotiate for their commercial internet access wholesale in a very competitive market. In addition, they often use Internet2's backbone, perhaps through a regional optical network (RON) that is typically controlled by and accountable to the R&E community, to carry traffic to other members of the R&E community. It seems unlikely that any of these networks will indulge in the sort of bad practices that the elimination of net neutrality enables; such practices can be explicitly prohibited in contracts, and the highly competitive marketplace for the most part ensures that there won't be a problem. And certainly the R&E RONs and Internet2 are not going to engage in this sort of bad behavior. What this means is that the elimination of net neutrality is going to have very little effect indeed on **organization-to-organization** operations within the R&E community (and indeed well beyond—traffic to almost any large organization, including commercial and government sites should see little change). Note also that institutions with international campuses or other facilities are unlikely to see much impact from this decision, as it only covers US ISPs.

Reaching Members of the R&E Community at Home

R&E institutions frequently need to reach people at home who are connected through ISPs that service **consumers**—typically

cable companies like Comcast, or fiber-based or DSL services from telecommunications providers like AT&T or Verizon. Right now the data suggests that most consumers have just one medium-to-high-speed ISP that offers service to their home; sometimes there is actually a meaningful duopoly.¹ Within a five-year time horizon wireless 5G service will likely alter this picture somewhat, at least to the point where duopoly service rather than monopoly service will become much more commonplace, and a reasonable number of consumers will actually be able to choose from among a small oligopoly of vendors.

R&E institutions may need to interact with these individuals for lots of reasons: they may be students trying to access bandwidth-intensive video materials for remote coursework, students or faculty trying to work from home, interested members of the public trying to look at cultural materials from institutional libraries or museums, or streaming lectures or cultural events. Perhaps they are using telehealth applications involving a university medical center. While there's every reason to expect that non-real-time, non-bandwidth-intensive applications like electronic mail or most kinds of routine web browsing will continue to function more-or-less normally, bandwidth- or latency-sensitive applications may be more at risk (which might include video and some kinds of online instruction, or telehealth devices).

Further, the R&E community will need to educate users and promote additional practices such as the use of virtual private networks (VPNs) to ensure privacy when that is important. My guess is that performance and privacy will be the major areas of contention rather than outright blockage. Note that if consumers are able to establish a properly configured VPN connection, site blocking by the "last-mile" ISP ceases to be an issue; if the user at home can reach the university VPN server, he or she can route through there to anywhere on the internet without fear of last-mile ISP interference.

If the monopolistic or duopolistic consumer last-mile ISPs do choose to behave badly in terms of performance, the possible responses of the

R&E institutions that need to reach consumers connected by these ISPs are very limited. The ISPs that provide backbone access to the R&E institutions (including Internet2) could attempt to negotiate contracts with the consumer broadband providers to ensure faithful, private, and timely carriage. It's not clear whether the consumer broadband providers would be willing to do this, or what it would cost; further, while there are a fairly small number of major consumer broadband providers that cover the vast majority of homes in the US, there is also a long tail of smaller consumer last-mile providers that would need to be considered.

Additionally, there are all sorts of special arrangements currently in place between universities and ISPs serving the local consumer markets near major universities. Contractual arrangements involving Internet2 or a commercial tier 1 internet provider on a national scale may not be helpful here; the university will need to renegotiate terms with the local ISPs as part of their peering arrangements.

Another strategy would be to move bandwidth- or latency-sensitive materials to large-scale commercial services, which have the scale and the clout to negotiate with last-mile consumer services; for example video could be placed on YouTube or Vimeo, depending on what services were most effective in setting up good arrangements with the last-mile consumer ISPs. (There are issues about authentication, access control, and user privacy that need to be considered when using such video-hosting services, however.) Note also that very large vendors that provide bandwidth- or latency-sensitive materials to consumers (for example, large courseware providers) will likely negotiate with the last-mile ISPs to the consumer when necessary, or use strategies very similar to what have been outlined for R&E institutions.

Small Content Providers Important to the R&E Community

Consider a website operated by a small, independent, scholarly or arts organization, or perhaps a small public interest organization. Often

the content provided by such organizations is important to the R&E community. The small organization's web server might well be running on a machine at someone's residence. If these kinds of organizations are using relatively inexpensive consumer connections, they may find that they cannot stream video material off the server, or that the video material is throttled. This might also apply to file-transfer archives or other kinds of bandwidth- and latency-sensitive materials. Limited access to these sites is certainly not in the interests of the R&E community, and the small organizations that provide them have little recourse except to convert to much more expensive commercial-grade ISP contracts—if they can even obtain them. Here the issue is more abstract; it is very much in the interest of the R&E community for such sites to flourish, and the elimination of net neutrality may make this much harder. It may be that the R&E community will want to reach out to some of these sites, when necessary, and offer to host them directly on R&E networks, or to provide ways to quickly move their traffic onto R&E networks.

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Summary

In the near term, there are a few obvious steps. It is the home user who is most at risk. For privacy, the R&E community needs to make VPN-based connections from home much more commonplace. And it will be vital to carefully monitor the behavior of the consumer-oriented last-mile ISPs under the new, largely unregulated, regime, and to be prepared to take action as necessary.

Endnote

¹Note that the Trump-era Federal Communications Commission has indulged in a great deal of manipulation and fabrication of data to try to argue that there is actually a genuine competitive marketplace

in consumer broadband in most of the United States as part of its justification for reversing net neutrality. See Jeff Dunn, “America Has an Internet Problem—But a Radical Change Could Solve It,” *Business Insider*, April 23, 2017, <http://www.businessinsider.com/internet-isp-competition-net-neutrality-ajit-pai-fcc-2017-4>; and Jon Brodtkin, “FCC Report Finds Almost No Broadband Competition at 100Mbps Speeds,” *Ars Technica*, February 12, 2018, <https://arstechnica.com/information-technology/2018/02/fcc-report-finds-almost-no-broadband-competition-at-100mbps-speeds/>.

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Editor’s note: This piece was revised slightly on April 23, 2018, to update information regarding the date the net neutrality rules will be repealed. A portion of the Federal Communications Commission’s (FCC) order reversing the rules will go into effect today, 60 days after publication in the *Federal Register*, but the bulk of the new order that impacts net neutrality will not go into effect until the Office of Management and Budget (OMB) has approved the FCC’s actions.