Comments on BEREC Draft Report on the IP Interconnection Ecosystem

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Introduction

I welcome the opportunity to submit comments to the BEREC Consultation on its Draft Report on the IP Interconnection Ecosystem.[1]

I submit my comments as a professor of law and, by courtesy, electrical engineering at Stanford University whose research focuses on Internet architecture, innovation, and regulation. I do not speak for Stanford University.

I have a Ph.D. in computer science and a law degree and have worked on net neutrality for the past 24 years. My book Internet Architecture and Innovation, which was published by MIT Press in 2010, is considered the seminal work on the science, economics, and politics of network neutrality. My papers on network neutrality have influenced discussions on network neutrality all over the world.

I have testified on matters of Internet architecture, innovation, and regulation before the California Legislature, the US Federal Communications Commission, the Canadian Radio-Television and Telecommunications Commission, and BEREC, including on proposals to force applications to pay ISPs for terminating traffic to the ISPs customers.

The FCCs 2010, 2015, and 2024 Open Internet Orders relied heavily on my work. My work also informed the European Union's 2015 and 2020 guidelines implementing the European Union's net neutrality law, the E.U.s 2022 update that banned harmful zero-rating, and the 2016 and 2017 Orders on zero-rating by the Telecom Regulatory Authority of India and the Canadian Radio-Television and Telecommunications Commission, respectively.

I have not been retained or paid by anyone to participate in this proceeding.

Terminology

Throughout these comments, I use the terms internet access provider, last-mile ISP and ISP interchangeably.

I use the term “unpaid connections” to denote connections for which the ISP does not receive payment; instead, the ISP either pays a transit provider or peers with the interconnection partner settlement free.

[1] I submit this response as an independent academic and net neutrality expert. I have not been retained or paid by anyone to participate in this consultation. Additional information on my funding is available here: http://cyberlaw.stanford.edu/about/people/barbara-van-schewick.
Parts of this response to this consultation draw on my earlier writings. For a list of my recent writings on network fees, see http://cyberlaw.stanford.edu/about/people/barbara-van-schewick.

The vast majority of last-mile ISPs do not get paid for terminating the traffic their customers requested.

The internet has flourished using an economic model called bill and keep. Large ISPs have long wanted to replace that model with the antiquated one used by traditional voice-calling networks,[2] and the large ISPs like DT propose to do so through the back door in this proceeding.

In the voice calling model, phone network A gets paid a per minute/call rate for completing incoming calls to A's customers from any other network (a "termination fee"). So if my mom is on phone network A and I call her from my network, phone network B, then network A charges my network for completing the call to my mom, and my network passes the cost on to me.[3]

But phone network A knows that the only way I can call my mom is through its network. So it says completing calls to its network cost EUR 5 a minute. All the other networks also have a monopoly over completing calls to *their* customers (a "termination monopoly"), so they charge high termination fees too. Countries recognize they have a termination monopoly over everyone in their country, so they add a surcharge for anyone outside of their country to call into their country.

This is the mechanism that made long-distance and international calls incredibly expensive.

But since communication is good for commerce and social health, nations then have to set up regulatory agencies to keep the prices for completing calls from being too high, and so you get a complicated bureaucracy that has to set termination fees.

Then the new pricing models create bizarre arbitrage opportunities, where a small network might find a way to get lots of calls into its network so that other networks have to pay them.[4]

This was and remains how the phone system works. It's messy, makes calls expensive, and requires lots of regulation.

This is the model the large ISPs like DT want to adopt for the internet, by pretending that peering agreements between eyeball networks and transit/CAP providers have to have a traffic balance.

The internet (with the exception of a handful of large ISPs) uses a very different model called bill-and-keep. Under this model, the access networks that people and businesses use to connect

[2] https://arstechnica.com/information-technology/2012/12/dear-itu-please-dont-bill-internet-use-like-phone-calls/.
[3] This model is also called "calling-party network pays."
[4] There are hundreds of examples of this. Here are two: https://www.fastcompany.com/90304830/why-800-numbers-are-getting-their-own-robocalls; https://www.techdirt.com/2007/02/07/phone-call-arbitrage-is-all-fun-and-games-and-profit-until-att-hits-you-with-a-2-million-lawsuit/.

to the internet are not paid by others for accepting the data their ISPs' customers requested and delivering it to their customers. That's what their customers' internet subscription fees pay for.

In this model, every access network pays to connect its network to all the other networks that are part of the internet. Generally, this is through a so-called transit provider which lets the access network reach the rest of the internet.

Access networks get a pipe from the transit provider that lets them send and receive data, and they pay for how much capacity they get or in some cases, how much they use in a month. This works almost exactly like your mobile phone or home network where you pay X Euros for a 100Mbps or 1Gbps connection.

When I send my mother an email or call her on a video calling app, neither my home broadband network nor the email provider or video calling app pay my mother's broadband network for transporting the email or video data over its network to my mother.

One of the brilliant side effects of this model is that since each access network has a big pipe they pay for to send and receive traffic to the rest of the internet, every network has an incentive to connect, for free, with neighboring networks.

So for example, assume 25% of the traffic on my network goes to the network in the next town, and 40% of their traffic comes to my network. Instead of sending that traffic through the pipe I'm paying for and for them to send it through the pipe they are paying for, the two networks can just connect directly.

Now, I'm sending 25% less traffic through the pipe I pay for (so I have more capacity or can negotiate to buy a smaller pipe) *and* the traffic gets there faster since the networks are directly connected. The same goes for the other network.

And it doesn't matter *at all* whether I send more traffic than I receive or vice versa. Both parties benefit either way.[5]

The only traffic sent through this kind of connection is the traffic sent and requested by each network's customers to the other network's customers (this is called "peering").

Network interconnection also adds resiliency. If my big pipe to the internet goes down, my customers can at least still reach the neighboring network, and if the connection between the neighbor networks goes down, we can just reroute traffic through our big pipes.

[5] For a more detailed discussion, see the section on ratio requirements below.

And if my internet access customers like to watch lots of cat videos on a popular video application, I can connect my network directly to the video provider; then my big-pipe bill goes down and their traffic reaches my customers faster.

That's why the vast majority of access networks worldwide interconnect with big providers like Facebook, Netflix, YouTube, Cloudflare, Akamai and others for free. Doing so is in the interest of the access network, because it saves money.

In other words, the bill-and-keep model encourages network interconnection and cooperation, which increases network capacity, increases resilience, and reduces the cost of an access network's big pipe.

That's why 99.9996% of peering agreements around the world involve no payment and simple handshake agreements.[6] All the networks have to do is set up a connection or meet up in a central spot (known as Internet Exchange Points or IXPs) where lots of networks interconnect in one building.

For internet access providers, this also makes for a sweet business. Thanks to permissionless innovation, hordes of people make websites, publish online news, create videos, build apps and put cat videos on the internet. And the more sites and apps they put online, the more people want to get online, so more people want to buy my (the access network's) broadband connection.

Basically, as an ISP, everyone else in the world is creating the demand for my product, and more and more of them are using hosting services that want to connect directly to my network, lowering my cost of running a network.

In addition, the tech for running a network gets better and better every year, so I can constantly increase the amount of data and bandwidth that customers can get, while costs remain the same or even fall.[7]

It's a great model for ISPs, innovators, and everyday people.

And even if ISPs aren't making as much money as some of the largest online services, they still massively benefit with free demand creation for their online services - demand so strong that a huge percentage of the population pay for two or more broadband connections.

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[6] Packet Clearing House, 2021, 2021 Survey of Internet Carrier Interconnection Agreements, p. 4, which analyzed more than 15 million peering agreements by 17,000 networks in 192 countries, https://www.pch.net/resources/Papers/peering-survey/PCH-Peering-Survey-2021/PCH-Peering-Survey-2021.pdf.

[7] See, e.g., van Schewick, 2023, Comments to Commission 2023 Exploratory Consultation, https://cyberlaw.stanford.edu/sites/default/files/van_Schewick_2023_Comments_EU_Network_Fees_Consultation_Online.pdf, pp. 4-5.

But the largest ISPs, often phone companies, remember the good old days of getting paid both by their own phone customers and by those trying to reach them, and they want to get paid twice on the internet, too – once by their own internet service customers and once by the apps and sites these customers are using.

So instead of being happy that the services their customers want to use the most will deliver traffic right to their network doors for free, the biggest ISPs want to get paid by those big services for accepting the data the ISPs' customers requested and delivering it to these customers.

All ISPs have a termination monopoly.

Internet access providers claim they have no termination monopoly, because there are many ways to reach their network, but all end at the doorsteps of the ISP.

All internet access providers have a termination monopoly – a monopoly over access to their internet access subscribers. While an application provider has many ways of reaching an ISP's network, at some point the traffic needs to cross over to the ISP's network for delivery to the ISP's internet access customer who requested the data.

When an internet access customer visits a website or tries to watch a movie online, their device sends out a request to the site or app via their IAS provider and the app sends back the data. An app or site has many ways to deliver that requested content back to an IAS provider's network, and often uses multiple routes for redundancy's sake.

It can buy transit from one of the many transit providers such as Lumen (formerly Level 3), Arelion (formerly Telia), Cogent, or NTT, that takes the content provider's traffic to all points on the internet.

It can use one of many Content Delivery Networks (CDNs) such as Akamai, Amazon Cloudfront, or Cloudflare that host its content in multiple locations around the world to make it load faster and decrease transit costs.

Or it can build its own network or CDN and transport the traffic to the internet access provider's network itself.

The markets for transit and CDNs are highly competitive and the cost of delivering traffic around the world keeps falling at a remarkable rate. But this competitive ecosystem ends at the interconnection doorstep of the internet access provider's network.

That's because only the internet access provider can transport the content from the edge of its network across its own access network to its subscribers that requested it.

Thus, no matter how the content provider delivers requested content to the doorsteps of the internet access provider, it cannot deliver the content to its final destination – to the customer who requested it.

This gives the internet access provider a monopoly – total and exclusive control – over access to its IAS customers. This monopoly is called a "termination monopoly."

In the internet context, the internet access providers' termination monopoly has not been a problem historically. That's because internet access providers traditionally have not received payment for delivering content to their subscribers from anyone other than their subscribers: they either pay a transit provider to connect them to the entire internet or they exchange data with transit providers, CDNs, or content providers without payment ("settlement-free").[8]

Settlement-free peering is still the norm for the vast majority of internet access providers, both in the US and globally. In the US, only the five largest ISPs in the US have been able to exploit their termination monopoly to force interconnection partners to pay them termination fees as part of their interconnection contracts.[9] According to a 2021 study of more than 15 million peering agreements covering 17,000 networks in 192 countries, 99.9996% of the peering agreements exchanged traffic settlement-free.[10]

Large ISPs are exploiting their termination monopoly to force companies to pay termination fees.

The Playbook

In the past fifteen years, the largest ISPs in the US and Europe have exploited their termination monopoly to force their interconnection partners to pay termination fees for delivering the data that the ISPs' customers requested.

The playbook is simple.

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[8] See, e.g., FCC 2016 Charter Merger Order, para. 99; Cogent/Schaeffer 2020 Declaration, para. 8.
[9] See, e.g., FCC 2016 Charter Merger Order, para. 99; Cogent/Schaeffer 2020 Declaration, paras. 8-12.
[10] Packet Clearing House, Packet Clearing House, 2021, 2021 Survey of Internet Carrier Interconnection Agreements, p. 4 (the study uses the term "symmetric terms" to denote settlement-free peering agreements, ibid., p.4), https://www.pch.net/resources/Papers/peering-survey/PCH-Peering-Survey-2021/PCH-Peering-Survey-2021.pdf.

Large ISPs create a situation where all unpaid connections into the ISP's network are either degraded or unable to take on additional traffic.[11] For example, a common degradation strategy is to let all available unpaid connections into the network congest.

Undegraded connections are reserved for interconnection partners that pay the ISP a recurring termination fee or ISPs make clear these connections won't be upgraded so those networks allowed to use that connection are unable to take on additional traffic.

That forces content providers, other network providers such as transit providers and intermediaries such as CDNs that need reasonable quality to pay the ISP a termination fee for undegraded paths into the ISP's network.[12] Companies can pay termination fees either directly or indirectly -- by paying a transit provider or CDN that pays the ISP's termination fees.

Termination fees can be difficult to spot.

They can show up in interconnection agreements as explicit fees for terminating traffic to an ISP's customers or paid peering; that's what generally happened in the US.

Some large ISPs in Europe hide the termination fees in transit fees: They force companies that need undegraded interconnection to buy transit services from the ISP, even if the only service the company wants, needs, and uses from the ISP is the termination of traffic to the ISP's internet access customers.

In the US, the five largest ISPs used this playbook to force interconnection partners to pay termination fees.

From at least 2013 to 2015, the five largest ISPs in the US serving more than 75 percent of American broadband customers – Comcast, Time Warner Cable, AT&T, Verizon, and CenturyLink – exploited their termination monopoly to extract termination fees from application providers, other network operators and intermediaries such as CDNs for delivering the data that the ISPs' customers requested.

[11] Again, "unpaid connections" are connections for which the ISP does not receive payment; instead, the ISP either pays a transit provider or peers with the interconnection partner settlement free.
[12] Transit providers can avoid paying termination fees when they are willing to abide by the ISP's strict interconnection policies, which limits their ability to take on content providers and CDNs as customers. See the discussion below.

These ISPs did so by deliberately letting all available unpaid connections into their network congest. They then refused to remove the congestion by widening the interconnection doors into their network until the company delivering the traffic paid them a recurring fee termination fee.[13]

As a result, customers of these ISPs experienced significant performance problems in the afternoon and evening: Internet applications, websites and services entering the ISPs' networks through these congested connections became effectively unusable, even though customers had paid their ISPs for good connections to the Internet. Employees couldn't connect to their company's network. (The story of NEPC, a midsize investment consultancy firm, illustrates these problems.)[14] Schools couldn't upload their payload data. Skype calls dropped. And online video stuttered.[15]

The five large ISPs engaged in this strategy were the only internet access providers in the US experiencing this severe, sustained congestion of the available unpaid connections into their network.[16]

The congestion only ended when the company delivering the traffic paid the requested fee. That left content providers with a choice:

They could refuse to pay termination fees. That meant being willing to suffer the consequences of congestion, by using transit providers or CDNs that (1) did not pay termination fees to the five ISPs and (2) were willing to take on the content provider's traffic.

Or they could pay the termination fees directly as part of a direct interconnection agreement with the internet access provider; or they could do so indirectly, by using a transit provider or CDN that did pay the termination fees. For content providers that wanted their application to function as expected on the internet access provider's network, paying the fee was the only option.

Faced with that choice, large content providers like Google, Facebook, or Microsoft quickly started paying the requested fees as part of direct interconnection agreements.[17]

Others – transit providers like Cogent or Level 3 or content providers like Netflix and Riot Games – refused to pay termination charges. They argued, correctly, that the ISPs' internet

[13] For this strategy to be successful, the ISPs only needed to congest those unpaid congestions that were willing and able to take on additional traffic. See, e.g., Cogent/Schaeffer 2020 Declaration, para. 29.
[14] See Declaration of Devan F. Dewey, NEPC, LLC, Exhibit 9 of Opposition of Intervenors to Petitioners' Motion for Stay (2015), US Telecom v. FCC (Court of Appeals for the D.C. Circuit) (filed as an attachment to this ex parte).
[15] See, e.g., Susan Crawford, 2014, The Cliff and the Slope, https://www.wired.com/story/jammed/.
[16] See, e.g., the discussion and references in Cogent/Schaeffer 2020 Declaration, paras. 23-24 and note 13.
[17] https://www.wsj.com/articles/for-web-firms-faster-access-comes-at-a-price-1391717444.

access customers were already paying their ISP for transporting their traffic to and from the rest of the internet and that the fees circumvented the FCC's ban on termination charges.

While that was true, the FCC was powerless to address these problems. The FCC's 2010 Open Internet Order prohibited ISPs from charging content providers termination fees, including fees "for delivering traffic to or carrying traffic from the broadband provider's end-user customers."[18]

However, the FCC's 2010 Open Internet rules did not apply to the point of interconnection.[19]

Some services, most notably Netflix, tried to fight with a public campaign to put pressure on the ISPs. The problems affected two hundred million internet subscribers, plus the corporate customers of transit providers like investment consulting firm NEPC that were directly affected by the congestion. The dispute repeatedly made the front page of the Wall Street Journal. But despite howls of protests by angry customers to their ISPs, the ISPs did not relent.

The congestion problems only ended when affected companies decided to pay, as Netflix did in early 2014 or Riot Games, the maker of the highly popular video game League of Legends, did in 2015.[20]

For those that refused to pay, like transit providers Cogent and Level 3, the problems only ended when the FCC's 2015 Open Internet Order went into effect.[21] The Order explained that the FCC would review ISPs' interconnection practices case-by-case under Sections 201 and 202 of the Communications Act. That would prohibit ISPs from engaging in unjust and unreasonable practices and unjust and unreasonable discrimination via interconnection practices and agreements.

The text of the 2015 Open Internet Order clarified that the FCC would use this case-by-case review to ensure that last-mile ISPs cannot use practices related to interconnection to evade the FCC's network neutrality protections.[22]

ISPs like to claim that it's unclear who was at fault during this period. Indeed, much was foggy during the time when tens of millions of Americans were not getting the internet performance

[18] 2010 Open Internet Order, paras. 24-26, 67.
[19] 2010 Open Internet Order, para. 67 fn. 209.
[20] NY AG Charter Complaint, paras. 325-329 (describing Riot Games' experience with Time Warner Cable).
[21] See, e.g., Cogent/Schaeffer 2020 Declaration, para. 41 (attached); Level 3, 2017 Open Internet Comments, pp. 11-12, https://www.fcc.gov/ecfs/search/search-filings/filing/107171850225629; Brodkin, 2015, Net neutrality takes effect Friday; ISPs scramble to avoid complaints, https://arstechnica.com/information-technology/2015/06/net-neutrality-takes-effect-friday-isps-scramble-to-avoid-complaints/; Brodkin, 2015, Broadband industry fears come true: FCC rules are costing them money, https://arstechnica.com/information-technology/2015/05/broadband-industry-fears-come-true-fcc-rules-are-costing-them-money/;.
[22] 2015 Open Internet Order, para. 206.

they were promised and that they were paying for. The interconnection system of the internet is wrapped in secrecy and NDAs, and peering partners of big ISPs are both bound by NDAs and fearful of retaliation.

There's no such confusion anymore. It's clear who caused this, how they caused it and why.

I strongly recommend reading the pages in the New York Attorney General lawsuit against the giant ISP Spectrum (now even bigger after merging with Time Warner Cable), which lays out the evidence with details, quotes and diagrams - including damning internal emails that Spectrum was intentionally allowing the doors into their network congest in order to extract payment from online services.

Here's the intro from the lawsuit:

> The second component of Spectrum-TWC's scheme consisted of promising its subscribers that they would obtain reliable access to online content. Spectrum-TWC refused to invest in additional ports where its network connected with online content providers when those ports became heavily congested.
>
> The company's failure to add more port capacity to its network connections with online content providers meant that Spectrum-TWC would not make whole on its promises to its subscribers.
>
> During the Relevant Period, Spectrum-TWC promised consumers, including its subscribers, that they would receive reliable access to content on the Internet with "no buffering," "no slowdowns," "no lag," "without interruptions," "without downtime," and "without the wait." As a direct result of Spectrum-TWC's failure to add more ports, its subscribers encountered all of these things – buffering, slowdowns, lags, interruptions, and down times.
>
> In fact, Spectrum-TWC deliberately took advantage of its control over port capacity where its network connected to online content providers to extract more revenue for the company. To do so, Spectrum-TWC used its leverage over access to subscribers to extract fees from online content providers in exchange for granting such access. Spectrum-TWC lined its pockets by intentionally creating bottlenecks in its connections with online content providers, despite knowing that these negotiating tactics would create problems for its subscribers in accessing online content.
>
> While Spectrum-TWC engaged in disputes with online content providers, its subscribers experienced a number of adverse effects, including interrupted Internet service, buffering,

> slowdowns, lags, and issues with streaming video content that Spectrum-TWC's advertisements specifically promised them they would avoid.

https://ag.ny.gov/sites/default/files/summons_and_complaint.pdf

Spectrum settled that lawsuit for $184 million dollars.

There's simply no question about who was responsible for this chapter in U.S. internet history.

This is exactly why the 2015 U.S. Open Internet Order, California's Open Internet Law, and the 2024 Open Internet Order are written to prevent such shakedowns from happening again.

The largest ISPs in Europe are currently using the same playbook to force companies to pay them termination fees.

For example, in Germany, Deutsche Telekom (DT), the incumbent phone company, is using the same playbook to leverage its termination monopoly to extract termination fees.

With a market share of 39%, DT is the largest provider for fixed broadband internet access in Germany.[23] Just like the five largest ISPs in the US that successfully used the same tactics, Deutsche Telekom controls access to so many internet access customers that no application provider can afford to not serve these customers.

DT is using a variety of tactics to force companies requiring uncongested interconnection to pay DT for delivering the data its internet access customers requested.

In particular, all unpaid connections into DT's network are either congested or unable to take on additional traffic. That forces network and content providers that need reasonable quality to pay DT termination fees for uncongested paths into DT's network, either directly (by paying DT) or indirectly, by paying a network operator, CDN, or hosting provider that pays DT.

The cases of the German Research Network, hosting provider Hetzner, and the European CDN operator described by ACM (all documented in the WIK study) are all successful examples of this strategy. To avoid having to enter DT's network through congested connections, they all ended up interconnecting with DT directly in exchange for an termination fee.[24]

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[23] Bundesnetzagentur, 2023, Telecommunications Annual Report 2022, p. 13, https://www.bundesnetzagentur.de/SharedDocs/Downloads/EN/BNetzA/PressSection/ReportsPublications/2023/AR2022.pdf?__blob=publicationFile&v=1.

[24] See WIK Consult, 2022, Competitive conditions on transit and peering markets: Implications for Implications for European digital sovereignty (Final Report), Study for the Federal Network Agency Germany, pp. 74-75, 76 ("WIK Study," attached).

The problems that the German Research Network encountered were widely reported in the press.[25] The German Research Network provides internet access to universities, independent research institutions, and R&D-oriented companies in Germany. During the pandemic, students, faculty and staff of German universities had to study and work from home. They used their Deutsche Telekom home internet connections to access their university's websites and online resources, which were stored on computers connected to the German Research Network.

Naturally, all of these requests for university content increased the amount of data that German Research Network delivered to Deutsche Telekom through GRN's transit provider, congesting that provider's connections into Deutsche Telekom's network. For Deutsche Telekom customers, accessing university resources took forever or didn't work at all, even though they had paid Deutsche Telekom for a fast connection to the entire internet.

Deutsche Telekom refused to upgrade the congested connections between its own network and GRN's transit provider, a Tier 1 transit provider which peered with Deutsche Telekom settlement-free. To solve the problem, GRN offered to interconnect with Deutsche Telekom directly for free, so Deutsche Telekom's customers could access their university's resources at good quality.

But Deutsche Telekom refused to interconnect directly until GRN bought an expensive uncongested connection to Deutsche Telekom's network directly from Deutsche Telekom.

According to posts in DT user forums and market participants, these practices continue to this day. At the same time, DT is the only ISP in Germany whose interconnection partners encounter these problems.

When the large US ISPs charged their interconnection partners, they did so (and sometimes still do so) explicitly for access to their internet service subscribers.

By contrast, DT attempts to hide the charge. It forces companies that need uncongested interconnection to *buy transit* from DT, even if the only service the company wants and needs from DT is the termination of traffic to DT's internet access customers. This allows DT to hide its termination fee in the transit fee.[26]

A transit provider connects its transit customers to the entire internet, including to any customers of the transit provider's internet access service. Thus, buying transit from Deutsche Telekom allows companies to reach customers of Deutsche Telekom's internet access service. But large

[25] WIK-Consult 2022 Report, p. 75.
[26] WIK 2022 Study, pp. 43-44.

content providers like Google, Meta, or Netflix have their own network infrastructure and transit providers. They do not need and don't use DT to carry their traffic to other networks around the world. Still, before Meta terminated its contract with DT in 2021, it bought "transit" from Deutsche Telekom, but used the service only to reach only to reach DT's internet service customers.[27]

Similarly, at the time of its problems with Deutsche Telekom, the German Research Network did not need or want transit service from Deutsche Telekom: It already paid two transit providers to connect its network to the rest of the world. It only needed uncongested connections into Deutsche Telekom's network to deliver the traffic that Deutsche Telekom's internet service customers had requested. Nevertheless, German Research Network was forced to buy transit service from Deutsche Telekom; it was the only way to get uncongested interconnection with DTAG.

While the termination fees charged by the large US ISPs are not public, the charges documented in the WIK study clearly reflect DT's termination monopoly. According to industry participants, the current market price for transit is 5-8 c/Mbps. By contrast, the average price DT charges for transit according to the WIK study is 20c/Mbps. Interconnection partners say that they pay or are quoted rates by DT that are as high as 10 to 20 times the market rate for transit.

One provider is being charged a full Euro per Mbps for DT's "transit" vs 5 cents charged per Mbps by other Tier 1 providers.

DT's transit price is so much higher than the market transit price, because it reflects DT's termination monopoly.

DT is not the only big European ISP using the playbook. While some of the details may differ (for example, an ISP might upgrade unpaid connections more slowly than paid ones rather than letting all unpaid connections congest completely or only peer settlement-free outside of its home country), the overall strategy is the same.

Termination fees are the exception in Europe, not the rule. But the largest telcos, all of them members of ETNO, are using this playbook.

And just like in the US, these ISPs' own internet access customers are paying the price. Apps and services that enter the network through unpaid connections work less well than those coming in through paid connections. And content providers wanting to reach these customers need to choose between paying the termination fee or being punished with worse performance.

[27] Court decision, Deutsche Telekom v. Meta.

Large ISPs using the Playbook are able to charge monopoly termination fees that reflect the ISPs' termination monopoly.

Large ISPs using this playbook are able to charge termination fees that are supra-competitive. For example, as explained above, Deutsche Telekom charges prices for its "transit" service that are multiples of the market price for transit. While Deutsche Telekom charges a range of transit prices, market participants report Deutsche Telekom prices that are more than ten times the market price for transit services.

Deutsche Telekom's transit prices hide its termination fees. Deutsche Telekom forces companies delivering data that Deutsche Telekom's internet access customers requested to buy Deutsche Telekom's transit service, even if the only "service" the companies need from Deutsche Telekom is accepting the traffic destined for its internet access customers through uncongested interconnection links. After all, Deutsche Telekom's internet access customers already pay Deutsche Telekom for transporting their traffic to and from the internet; that's what their internet subscription fees are for.

Similarly, according to Level 3, one of the transit providers involved in the 2012-2015 interconnection disputes in the US, the five largest ISPs in the US that used the playbook requested "supra-competitive" termination fees that exceeded what Level 3 charged its clients for transit to the entire internet:[28]

> "While the tolls demanded varied among these big consumer ISPs, they frequently equaled or exceeded the price that Level 3 charges its customers to provide connectivity to the entire global Internet—notwithstanding that the consumer ISP was charging only for "opening the door" to its network rather than for global connectivity and was already being paid by its own customer to provide that customer with access to the global Internet. These tolls would likely have been just the beginning, because the rational price for an ISP exploiting its gatekeeper power to charge is the profit-maximizing price: a price reflecting the ISP's control over access to its users and the value those users represent to the edge providers that make services available to them."[29]

Thus, the size of large ISP's termination fees reflects their termination monopoly.

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[28] See, e.g., Lumen (formerly Level 3) 2024 Ex parte submitted to the FCC's 2024 Open Internet Proceeding, filed March 5, 2024, pp. 2-3 ("Lumen, unfortunately, can confirm that the fees large BIAS providers attempt to impose are indeed supracompetitive. In fact, the fees demanded can exceed what Lumen charges for transit service. The transit market is highly competitive. That these large BIAS providers charge access fees in excess of what Lumen charges for transit conclusively demonstrates that their charges are supracompetitive."); Level 3, 2017, Net Neutrality Reply Comments filed August 30, 2017, pp. 2-4; Level 3, 2014, Open Internet Comments filed March 21, 2014), pp. 7-8. See also, Cogent/Schaeffer 2020 Declaration, p. 6.

[29] Level 3, 2017, Net Neutrality Comments filed July 17, p. 9.

Large European ISPs make it impossible for Tier 1 transit providers to prevent ISPs from exploiting their termination monopoly.

Large ISPs often argue that the competitive market for transit makes it impossible for them to charge monopoly termination fees. According to them, companies that do not like the termination fees can reach the ISP's internet access customers by buying transit services from one of the many transit providers.

BEREC's 2017 Internet Interconnection Report made a similar argument, noting that "the availability and pricing of transit might be expected to constrain negotiations over the settlement basis of peering agreements."[30]

These arguments are wrong.

First, they are directly contradicted by the evidence. As noted above, large ISPs using the playbook *are* able to charge supracompetitive termination fees. No company would pay 4 times the going rate if they could simply use some other transit provider.

As explained above, these fees can take the form of explicitly paying termination fees for traffic destined to the ISP's internet access customers in exchange for direct interconnection, entering into a paid peering agreement, or buying paid transit from the internet access provider (where the termination fees are hidden in the transit fees).

Second, while transit providers can constrain an ISP's ability to charge monopoly termination fees in a well-functioning market, the large ISPs using the playbook use strategies that make it impossible for Tier 1 transit providers to prevent ISPs from exploiting their termination monopoly.

In a well-functioning market, Tier 1 transit providers can serve as an alternative to direct interconnection with an internet access provider. That limits the internet access provider's ability to exploit its termination monopoly and charge monopoly rates for terminating traffic to its subscribers.

If a content provider or CDN does not like the deal it is offered by the internet access provider (e.g., because the internet access provider requests termination fees or charges termination fees that are significantly higher than the price of transit), it can use a Tier 1 transit provider that does not pay termination fees to reach the internet access provider's subscribers instead.

[30] Draft Report, citing BoR (17) 184, p. 4.

In the vast majority of cases, Tier 1 transit providers do not pay termination fees to internet access providers. Tier 1 transit providers either (1) get paid by the internet access provider (if the internet access provider buys transit from them), or (2) if the internet access provider is vertically integrated with a Tier 1 transit provider, unaffiliated Tier 1 transit provider generally peer with the internet access provider or its vertically integrated Tier 1 transit provider settlement-free.

The transit market is highly competitive, so content providers or CDNs can reach the internet access provider's subscribers via Tier 1 transit providers at competitive transit prices without paying a termination fee.

That constrains the internet access provider's ability to exploit its termination monopoly and charge monopoly rates for terminating traffic to its subscribers.

To prevent this from happening, large ISPs are using strategies that make it impossible for unaffiliated Tier 1 transit providers that do not pay them termination fees to provide this disciplining effect: they either (1) degrade the connection quality or (2) make it impossible for them to take on additional traffic by refusing to widen the connection to accommodate new clients.

In essence, these strategies make it impossible for unaffiliated Tier 1 transit providers to serve as substitutes for direct interconnection with these large ISPs. As a result, content providers and CDNs that need good quality and do not like the terms the ISP offers for direct interconnection can no longer use unaffiliated Tier 1 transit providers that do not pay termination fees to reach the ISP's subscribers. Those routes are either already congested or unable to take on new traffic without getting congested. That's not a real alternative.

As a result, the only way to get good-quality interconnection to the large ISP's subscribers is to interconnect directly with the ISP for a fee (or to use a provider that does so). This allows the ISP to exploit its termination monopoly by charging termination fees that are above the market rate for transit.

Transit providers and CDNs that pay the ISP's termination fees do not limit large ISPs' ability to exploit their termination monopoly, either. Because they pay the ISP, they have undegraded interconnection with the ISP, so their service provides an alternative to directly interconnecting with the ISP with respect to interconnection *quality*. However, charging their customers less for delivering traffic to the large ISP than they pay the large ISP is unlikely to be sustainable.

As a result, their price *includes* the ISP's termination fee, so they cannot limit the ISP's ability to exploit its termination monopoly by charging monopoly prices, either. Companies that use a

transit provider or CDN that itself pays the ISPs termination fees are not avoiding the termination fees; they are simply *paying them indirectly*, as part of the price for transit or CDN.

Transit can serve as a substitute for peering, even for traffic that needs low delay or high bandwidth.

Large content providers and CDNs generally prefer to interconnect directly with an internet access provider because it gives both parties more control over how the traffic is exchanged between them.

However, technically, transit *can* serve as a substitute for direct interconnection even for traffic that needs low delay or high bandwidth. That's because transit can be provided in a way that makes direct interconnection and transit completely interchangeable.

For example, technically, a content provider's router can sit in a data center next to the transit provider's router, which in turn can sit next to the internet access provider's router. This setup is not difficult to realize, and it is quite common for large content providers, transit providers and a large internet access provider to be collocated in the same data center.

In such a setup, the provision of transit consists of traffic traveling from the content provider's router to the transit provider's router to the internet access provider's router. If the capacity of the interconnection interfaces between the routers is well-dimensioned, using the transit provider has virtually no impact on the performance of the traffic.

More generally, if the transit network is well-dimensioned and reliable and has enough interconnection capacity with the internet access provider, it can serve as an adequate alternative to peering with the internet access provider, even for traffic that needs low delay or high bandwidth.

Large ISPs degrade the quality of Tier 1 transit providers that do not pay the ISP's termination fees, so they can't serve as an alternative to directly interconnecting with the ISP.

As explained above, a Tier 1 transit provider may not pay termination fees because (1) it is the ISP's transit provider and gets paid by the ISP or (2) it peers with the ISP settlement-free.

If traffic delivered via a Tier 1 transit provider that does not pay termination fees has lower quality than traffic exchanged directly with the ISP for a fee, that transit provider cannot serve as an alternative for content providers and CDNs that need good-quality connections to the ISP's internet access customers.

Large ISPs can degrade the quality of traffic delivered via a Tier 1 transit provider in various ways.

First, as described above, they can let their unpaid interconnection points with a Tier 1 transit provider congest by refusing to cooperate in upgrading the interconnection points.[31]

The amount of traffic requested by internet access customers is constantly growing, so if the internet access provider does not cooperate in upgrading the interconnection links with the transit provider, the link will become congested. This reduces the performance of many of the applications, content, and services that enter the network through these congested connections.

Second, some large ISPs upgrade their unpaid connections with settlement-free peers (and potentially, the ISP's unaffiliated transit provider) more slowly than connections for which they receive a termination fee. This increases the risk that traffic entering the ISP's network through these unpaid connections encounters congestion, reducing the relative quality of unpaid connections.

Third, large ISPs can refuse to peer settlement-free in their home country, and only peer settlement-free outside of that country. Peering with an ISP outside its home country degrades the quality of traffic destined for the ISP's subscribers in that country by increasing the distance that this traffic needs to travel to reach these subscribers. It's just a law of physics. Distance adds latency.

For example, some industry participants report that Telefonica refuses to peer settlement-free in Spain. A Tier 1 transit provider who is subject to this restriction needs to exchange traffic destined for Telefonica's internet access customers in Spain in another country such as France.

If a Spanish business that is a customer of such a transit provider needs to send traffic to a Telefonica internet access customer in Spain, the transit provider carries that traffic from Spain to the interconnection point with Telefonica in France. Telefonica then carries the traffic from France back to Spain and delivers it to the IAS customer in Spain. By contrast, traffic delivered by companies that interconnect with Telefonica in Spain for a fee does not have to be transported to another country and back to Spain.

[31] In a peering relationship, peers usually cooperate with each other to upgrade the capacity of their interconnection links when the utilization of the links reaches a certain level. That ensures that traffic can pass from one network to the other without congestion.

Just as driving longer distances takes longer even if the highway is not congested, carrying traffic over longer distances takes longer even in an uncongested network. As a result, traffic for Telefonica's IAS customers that is exchanged in Spain for a fee has lower delay than if that traffic were exchanged settlement-free outside of the country.

Peering settlement-free only outside their country increases ISPs' costs and harms their internet access customers by reducing the performance of affected traffic. An ISP that refuses to peer settlement-free inside its own country has to accept the settlement-free traffic destined for its internet access customers outside of the country and bears the cost of transporting the traffic into the country and there to the customer who requested it. By contrast, if traffic is exchanged within the country, the ISP only has to transport the traffic destined for its internet access customers within the country. In addition, exchanging traffic outside of the country instead of within the country increases delay by increasing the distance that traffic destined for the ISP's customers has to travel.

Refusing to peer settlement-free in the country makes no sense unless it is designed to force interconnection partners into paying termination fees to be able to exchange traffic in the country. In that case, the strategy is rational if the costs of the strategy are offset by the termination fees. And the more content providers, hosting providers, CDNs, and transit providers are paying to exchange traffic in the country, the less traffic is exchanged outside of the country, which reduces the costs associated with this strategy in the long run.

Large ISPs limit the ability of Tier 1 transit providers to take on additional traffic, so they can't serve as an alternative to directly interconnecting with the ISP.

However, large ISPs do not have to degrade the quality of *all* unpaid connections into their network to limit transit providers' ability to constrain the ISP's ability to exploit its termination monopoly.[32]

For example, a large ISP that peers settlement-free with a Tier 1 transit provider might do so subject to strict ratio requirements (an artificial constraint that has no connection to value or cost to either party). As long as the ratio between incoming traffic and outgoing traffic does not exceed a certain maximum, traffic is exchanged settlement free. However, if incoming traffic exceeds the ratio, the ISP might charge for it or even completely replace the settlement-free peering with a transit relationship.

Or a large ISP might upgrade interconnection capacity only according to a contractually set schedule (rather than doing so dynamically in response to increases in utilization).

[32] For real-world examples of this phenomenon, see Section "Large ISPs don't have to degrade settlement-free connections with providers that are unwilling and unable to take on additional traffic" below.

In both cases, a Tier 1 transit provider might have good-quality, settlement-free interconnection with the large ISP, but will be unwilling or unable to take on additional traffic.

In the first case, taking on additional traffic would bring the transit provider's traffic out of ratio, triggering an obligation to pay termination fees for the out-of-ratio traffic or even converting the peering relationship into a paid transit relationship, depending on the ISP's peering policy.[33]

In the second case, taking on additional traffic would congest the connection with the large ISP ahead of the schedule without an opportunity to dynamically upgrade the capacity in response to the increase in traffic.

Finally, large ISPs using the playbook in the US and Europe reportedly put pressure on certain transit providers to prevent them from taking on certain content providers or CDNs as customers. For example, Netflix' economic expert reported that "Comcast […] was able to pressure REDACTED into not providing Netflix with its available capacity."[34]

Taken together, these strategies limit the ability of Tier 1 transit providers to prevent large ISPs from exploiting their termination monopoly by charging monopoly termination fees.

Content providers or CDNs that need traffic to be delivered to the ISP's internet access customers at good quality cannot use Tier 1 transit providers that do not pay termination fees to reach the ISP's internet access customers because (1) the Tier 1 transit providers that are willing to take on the content provider's traffic cannot provide the needed quality because of the ISP's interconnection strategies and (2) the Tier 1 transit providers who do not experience these problems are unable to take on the content provider's traffic.

As a result, the only way to reach the large ISP's internet access customers at good quality is by exchanging traffic directly in exchange for a termination fee or by paying a provider that pays the termination fee.

The Playbook is technically and commercially viable.

Large ISPs claim the playbook is not technically or commercially viable. They are wrong.

[33] For example, according to the WIK study, under Deutsche Telekom's peering agreements, a settlement-free peering agreement "turns into commercial transit and payouts occur in one direction or the other" "as soon as the ratio of 1:1.8 is exceeded."
[34] Evans Declaration II, para. 93.

Experience shows the Playbook works.

The large ISPs using these practices are generally the only ones that are paid termination fees.[35]

When the FCC in 2016 surveyed the US market as part of its review of the Charter/Time Warner Cable Merger, it found that only the five largest ISPs – Comcast, Time Warner Cable, AT&T, Verizon, and CenturyLink – were charging termination fees as part of their interconnection agreements;[36] between 2013 and 2015, they had been the only ones experiencing the congestion problems.

Similarly, Deutsche Telekom is the only internet access provider in Germany requesting termination fees, hidden in transit fees; no other internet access provider is refusing to cooperate in increasing interconnection capacity when utilization reaches certain thresholds.

Both in the US and Europe, industry participants that pay these fees consistently explain, publicly and privately, that they decided to pay termination fees, because it was the *only* way to get undegraded access to the large ISPs' customers.

In the US, that was true both for the large content providers such as Google, Facebook, and Microsoft that started to pay termination fees without a fight as well as for companies such as Netflix or Riot Games that tried to fight the fees, but later caved.

As the Wall Street Journal reported at the time:

> "Some Web companies feel they have little choice [but to pay termination fees to ISPs such as Comcast, AT&T and Verizon], people close to the companies say. If Microsoft stopped paying Comcast "tomorrow," said a person familiar with the matter, its Web performance would "go downhill and the pages wouldn't load as fast." Google's decision came down to whether the Internet giant would put advertising revenue amounting to "tens of billions at risk" for the "millions" Google would have to pay Comcast, some of the people said."[37]

In declarations submitted as part of the challenge to the Comcast/Time Warner Cable Merger, Netflix' economic expert and Netflix's Vice President of Content Delivery explained why Netflix decided to pay:

[35] Again, France is an outlier.
[36] FCC, 2016, Charter/TWC Merger Order, para. 99.
[37] https://www.wsj.com/articles/for-web-firms-faster-access-comes-at-a-price-1391717444.

> "Netflix began negotiating over terminating access fees with these large ISPs because of the impact that these large ISPs could have on Netflix's business."[38]
>
> "[From October to February 2014,] [f]or many subscribers, the bitrate was so poor that Netflix's streaming video service became unusable. […] December and January are critical months for Netflix's net subscriber additions. It is also one of our busiest times because consumers spend more time at home over the holidays and therefore request more streaming video from Netflix and other online video distributors ("OVDs"). It became clear that Comcast would continue to allow congestion across its network to negatively affect its customers' online video streaming experience. […]
>
> [W]e had to do something to make the congestion stop.
>
> Netflix was therefore left with three choices. It could pay Comcast's terminating access fee indirectly, through CDNs who had already been forced to capitulate to the imposition of such a fee; it could continue to use transit providers who were experiencing congestion that made Netflix's service virtually unviewable; or it could pay Comcast a terminating access fee directly.
>
> After several cold starts to negotiating terms to a direct interconnect agreement between the parties, in January 2014, Netflix reluctantly – and with no other choice – recommenced interconnection negotiations with Comcast, with the understanding that Netflix would be forced to pay Comcast's terminating access fee. Netflix saw that there was no end in sight to the degradation Comcast was willing to inflict on our traffic at the expense of Comcast's own customers' user experience, and we needed long-term protection to prevent any future degradation.
>
> Netflix reached an agreement [to pay termination fees in exchange for direct interconnection] with Comcast in February 2014."[39]

Over the next months, Netflix entered into similar agreements with Verizon (April 2014), AT&T (May 2014), and Time Warner Cable (August 2014).[40]

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[38] Evans Declaration I, para. 143 (Netflix economic expert).
[39] Florance I, paras. 52-56 (Netflix Vice President of Content Delivery).
[40] https://arstechnica.com/tech-policy/2014/04/netflix-and-verizon-reach-interconnection-deal-to-speed-up-video/ (Netflix/Verizon); https://www.washingtonpost.com/news/the-switch/wp/2014/07/29/netflix-and-att-have-signed-an-interconnection-deal/ (Netflix/AT&T); https://www.latimes.com/business/technology/la-fi-tn-netflix-time-warner-cable-20140820-story html (Netflix/Time Warner Cable)

Even before the 2013-2015 interconnection fights, between 2008 and 2010, CDNs like Akamai, Limelight, and Level 3 started to pay Comcast only after Comcast started to let the connections through which their traffic entered Comcast's network congest.[41]

Similarly, both German Research Network and hosting provider Hetzner started paying Deutsche Telekom for direct interconnection (in the form of transit agreements) after reports explained that the performance problems for Deutsche Telekom's internet access customers resulted from congestion at the links over which their traffic was entering Deutsche Telekom's network and that Deutsche Telekom refused to cooperate in upgrading interconnection capacity at these links unless they were paid a recurring fee.

For example, in 2020, hosting provider Hetzner clearly linked its decision to pay Deutsche Telekom for direct interconnection to the congestion problems the websites and services hosted by Hetzner were experiencing for Deutsche Telekom internet access customers:

> "Up until now, we offered our customers a Double Paid Traffic Option for a small fee so that customers who really needed a high-performance connection to DTAG could get one. DTAG has not been open to cost-neutral peering agreements that are common in the telecommunications industry. We disapproved of their policy because it pays them for data tranfer twice: once from DTAG customers, and a second time from providers. Unfortunately, for some time, a growing number of customers have been experiencing massive connectivity issues and are looking for alternatives. And this naturally caused us concern. That is why we decided to enter an agreement with DTAG and set up a direct connection to their network.
>
> Starting on 1 March 2020, all of our customers gained access to direct peering with DTAG's network free of charge!"[42]

The Playbook does not require an ISP to degrade all *connections into its network.*

The large ISPs using the playbook often argue that this strategy is not commercially viable, because it would require them to congest or degrade all connections into its network, which would make their internet access unusable.

[41] Florance Declaration I, para. 29 ("Comcast began a practice in 2009 to 2010 in which it allowed its ports with certain settlement-free transit networks and CDNs to congest, which in turn caused some of those networks and CDNs to begin paying Comcast for interconnection."), para. 32 (Akamai CDN, 2009), paras. 33-35 (Limelight CDN, 2010), paras. 36-38 (Level 3 CDN, 2010).
[42] https://web.archive.org/web/20200313073021/https://www hetzner.com/news/03-20-dtag/.

However, large ISPs do not have to degrade *all* connections into their network to extract termination fees from interconnection partners that need to deliver traffic to the ISPs' internet access customers at reasonable quality.

As explained above, it is sufficient to degrade all *unpaid* connections with interconnection partners that are *willing and able to take on additional traffic* (throughout these comments, I call these connections *"available"* unpaid connections).

By contrast, an ISP does not need to degrade (1) connections for which it already receives termination fees or (2) unpaid connections with interconnection partners that are unwilling or unable to take on additional traffic.

The strategy works if the only way for companies to reach the ISP's internet access customers through undegraded connections is by paying termination fees, either directly or indirectly – that's what forces companies that need good-quality access to the ISP's internet customers to pay the fee.

Large ISPs don't have to degrade connections with providers that already pay termination fees.

As explained above, if a content provider uses a transit provider, hosting provider or CDN that already pays termination fees, the large ISPs receives termination fees for accepting the content provider's traffic that its customers requested; the content provider simply pays these fees indirectly. Thus, these connections do not need to be degraded.

To the contrary, charging termination fees in exchange for undegraded connection is the core of the playbook.

For example, in 2013 some CDNs such as Limelight and Akamai had uncongested connections with Comcast because they had started paying termination fees to Comcast earlier in response to a similar degradation-by-congestion strategy.[43] However, if Netflix had used them, it would simply have been paying the termination fee indirectly, as part of the price it paid the CDN.[44]

[43] See Florance Declaration I, pp. 10-13, paras. 32-39.
[44] See Florance Declaration I, pp. 10-13, paras. 32-39.

Large ISPs don't have to degrade settlement-free connections with providers that are unwilling and unable to take on additional traffic.

If a provider that peers settlement-free with the ISP is unable or unwilling to take on additional traffic, it does not matter that the ISP's connection with that partner is undegraded, since a content provider, CDN, or hosting provider cannot use this provider to deliver traffic to the ISP's internet access customers.

This is not hypothetical.

We saw this in the US.

For example, in 2013, Netflix was buying transit services from all of the major transit providers in the US that were not paying termination fees to Comcast and were willing and able to take on Netflix as a transit customer: Cogent, Level 3, NTT, TeliaSonera, Tata, and XO.[45] The connections between each of these transit providers and Comcast subsequently became congested; Comcast refused to cooperate in increasing its interconnection capacity with these providers unless it was paid recurring termination fees.

While there were other domestic and international transit providers that were peering with Comcast settlement-free, none of them was able or willing to sell settlement-free interconnection capacity with Comcast to Netflix, as Netflix' Vice President of Content Delivery explained:

> "Some other [domestic and international transit providers], including { { } } , told us that they did not have sufficient capacity.
> [O]ther carriers, such as { { } } , would not sell us capacity because they were concerned about damaging their relationship with Comcast."[46]

Netflix also tried, without success, to buy additional interconnection capacity with Comcast from other networks that were peering with Comcast settlement-free:

> "Network operators meet regularly-at least once a quarter-at conferences organized by the North American Network Operators' Group ("NANOG") and the Pacific Telecommunications Council ("PTC"). These conferences are convenient for coordinating network operations, including the buying and selling of transit services, and coordinating changes in transit routes with affected ISPs.

[45] Florance Declaration I, p. 16, para. 48 ("Three of those transit providers, Cogent, Level 3, and Tata, interconnected directly with Comcast. NTT, Telia, and XO connected to Comcast through settlement-free routes with Cogent and Tata." Ibid.).
[46] Florance Reply Declaration, p. 11, para. 32.

> Prior to our agreeing to pay Comcast for interconnection, Netflix scoured these conferences seeking additional capacity to augment what we had been able to use from the six largest transit providers. Netflix purchased all the settlement-free capacity we were able to reasonably obtain."[47]

Foreign transit providers, niche-service providers, and domestic internet access providers were generally unwilling or unable to sell transit routes to large ISPs to others because they generally reserve their settlement-free interconnection capacity with large ISPs for their own traffic. Some large internet access providers, while peering settlement-free with Comcast, were also using the playbook; they were only willing to sell Netflix some of their settlement-free interconnection capacity with Comcast, if Netflix agreed to pay them termination fees for access to the large ISP's own internet access customers:

> "For example, terminating ISPs and transit providers lacking a robust presence in the United States will generally reserve their settlement-free capacity for their own international traffic. The same is true of small operators providing niche services, such as application specific backhaul or enterprise services. […]
>
> While we approached many of them to find additional paths into the Comcast network, most declined to sell us this capacity. Those providers that would offer routes into Comcast's network, offered too little capacity to be usable and at prices significantly higher than what was typically offered by large transit providers for services into ISPs that do not artificially constrain settlement-free capacity into their networks.
>
> Similarly, domestic terminating ISPs usually do not have significant settlement-free transit routes for sale because they reserve their settlement-free routes for their own traffic.
>
> Other large terminating ISPs [that were also using the playbook], like AT&T, seek terminating access fees – for access to *their* subscribers – as part of any agreement to access Comcast's network. This means neither is a viable option."[48]

In sum, Comcast and the other large US ISPs that were using the playbook did not – and needed not – let all of the connections into their network congest. They only had to congest the connections of the six transit providers that were peering with Comcast settlement-free *and* were willing and able to take on additional traffic.

[47] Florance Reply Declaration, p. 10, para. 27.
[48] Florance Reply Declaration, p. 10, paras. 29-30.

By contrast, Comcast and the other large ISPs did not congest the connections with companies that paid termination fees, so content from Google, Facebook, and Microsoft or content delivered via CDNs such as Akamai, Limelight, and Level 3 continued to work well. Similarly, connections with Comcast's settlement-free peers that were unable or unwilling to take on additional traffic were not congested, either, so traffic coming in through these connections continued to work as well.

But even though some of the unpaid connections into Comcast's network were not congested, the only way for content providers and CDNs to reach Comcast's internet access customers through uncongested connections was to pay termination fees directly or indirectly – by interconnecting directly with Comcast in exchange for a termination fee or paying a transit provider or CDN that paid termination fees.

We are seeing the same pattern in Germany.

Industry participants report that all *available* unpaid connections into Deutsche Telekom's network in Germany are congested.

All transit providers that peer with Deutsche Telekom settlement-free and are willing to take on traffic experience congestion on their connections with Deutsche Telekom.

While some providers have settlement-free connections with Deutsche Telekom that are uncongested, these providers are unwilling or unable to take on additional traffic destined for Deutsche Telekom.

For example, industry participants report that Orange peers with Deutsche Telekom settlement-free; the peering agreement is subject to Deutsche Telekom's strict ratio requirements. According to them, the connections between Orange and Deutsche Telekom in Germany are currently not congested.

However, Orange is unable to sell transit services to content providers that need significant uncongested access to Deutsche Telekom's internet access customers because that would bring Orange out of balance; Deutsche Telekom would then stop upgrading its connection with Orange. start charging Orange for the out-of-ratio traffic, or could even convert the entire relationship into a transit agreement.

The problem is particularly severe for large content providers. The largest content providers all currently interconnect with Deutsche Telekom directly. According to industry participants, none of the Tier 1 transit providers that peer with Deutsche Telekom settlement-free has enough

unused interconnection capacity with Deutsche Telekom available to take on significant traffic from one of the large content providers.

Degrading the quality of internet access is commercially viable.

Finally, ISPs using the playbook argue that using the playbook would not be commercially viable, because it would harm their own internet access customers by reducing the quality of their internet access service. According to them, customers who experience performance problems because the connections into the ISP's network are congested would simply switch to another internet access provider that does not engage in these practices and that would make the playbook unprofitable.

These arguments are directly contradicted by the evidence.

The playbook works *exactly because* (1) the ISP's customers are unable to access the affected applications at the necessary quality, (2) not enough customers switch ISPs in response to the degradation, (3) the ISPs using the playbook control access to so many internet access customers in their country that content providers cannot afford to have bad performance for that many customers, so they start paying termination fees, and (4) for the ISPs, the long-term benefits of receiving termination fees are larger than any costs associated with the strategy.

Degrading performance for the ISP's internet access customers is the point.

That's what the New York State Attorney General found when it investigated the performance problems that customers of ISPs operating in New York State were experiencing:

> "[The ISPs' internal] documents establish for the first time that the long-running interconnection disputes that harmed consumers and edge providers were the result of [broadband internet access] providers' deliberate business decisions *to use degraded service to consumers as leverage* to extract payments from backbone and edge providers.[49] […]
>
> [These internet access] providers [made the] deliberate decisions *to put their profit ahead of consumer service quality*."[50]

[49] NY AG Comments, pp. 5-6.
[50] NY AG Comments, p. 1.

> "[The ISPs' internet access] subscribers were effectively pawns in the company's deliberate strategy to extract fees from backbone and content providers in exchange for granting access to [the ISP's] subscribers."[51]

This wasn't just a report. The NY Attorney General sued over this behavior, and the two ISPs later settled the lawsuit by paying $184 million.

Consumers generally don't switch ISPs in response to degraded performance.

ISPs claim that customers who experience performance problems because the connections into the ISP's network are congested would switch to another internet access provider that does not engage in these practices.

These arguments are directly contradicted by the evidence.

Evidence submitted in the merger proceedings between Comcast and Time Warner Cable, AT&T and DirecTV, and Charter and Time Warner Cable shows that customers of Comcast, Time Warner Cable, and AT&T did not leave these ISPs during the time they experienced bad performance as a result of these ISPs' decision to let all available unpaid connections into their network congest.[52]

Comcast

For example, after carefully analyzing the customer churn data provided by Comcast in the challenge against the merger between Comcast and Time Warner Cable, Dish's economic expert concluded:

> "The analysis fatally undermines the Applicants' repeated claim that … they have no incentive to sabotage [online video distributors] because such sabotage would substantially increase the churn of their broadband subscribers is without merit.[53]
>
> The data provide no support whatsoever for Comcast's claim. To the contrary, the data provide strong evidence that Comcast can sabotage [online video distributors] with virtual impunity.[54]

[51] NY AG Interconnection Complaint, para. 269.
[52] See, e.g., FCC 2016 Charter/Time Warner Merger Order, paras. 111, fn. 367 & 368 (citing evidence related to Comcast and Time Warner Cable, respectively), and paras. 64-67. See also FCC 2016 AT&T/DirecTV Merger Order, fn. 577 (citing internal AT&T documents).
[53] Sappington, Comcast Reply Declaration, para. 5.
[54] Sappington, Comcast Reply Declaration, para. 14.

> Comcast documents only an increase in customer calls to its service centers during this period. Comcast is strangely silent on the question of whether these angry customers actually terminated their [broadband internet access] service with Comcast.[55]
>
> **[The analysis of the data shows that] even when 'Comcast experienced a surge in Netflix- related customer-service calls with customers complaining about Comcast's broadband service,' few{{ }} of these angry customers left Comcast.**"[56]

AT&T

In the AT&T/DirecTV Merger Order, both Netflix and AT&T relied on AT&T's internal documents to reject AT&T's argument that intentionally congesting interconnection links was against its own interests and would give AT&T's internet access service a competitive disadvantage.

> "Despite the clear evidence, AT&T maintains that such a strategy of intentional congestion would be neither practical nor in its own interests. For example, AT&T argues that "to win and retain broadband customers, the combined company must continue to offer them high-quality access to the OTT options they want . . . any provider that fails to facilitate OTT offerings would suffer a competitive disadvantage in the marketplace.
>
> **AT&T's own documents contradict this assertion and demonstrate that AT&T had the ability to degrade Netflix's traffic with impunity despite the harm to its own customers**."[57] (Netflix)
>
> **"AT&T's internal documents confirm this view."** (FCC, citing statements by AT&T's Chief Technology Officer "[w]hen Netflix was suffering from congestion in interconnecting to AT&T's last-mile network.")[58]

Ultimately, the FCC concluded:

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[55] Sappington, Comcast Reply Declaration, para. 13.
[56] Sappington, Comcast Reply Declaration, para. 20 (the phrase in quotation marks was a quote from Comcast's economic expert, see ibid., fn. 14).
[57] Netflix, AT&T DirectTV Merger Reply Comments, p. 10 ("Despite the clear evidence, AT&T maintains that such a strategy of intentional congestion would be neither practical nor in its own interests. For example, AT&T argues that "to win and retain broadband customers, the combined company must continue to offer them high-quality access to the OTT options they want . . . any provider that fails to facilitate OTT offerings would suffer a competitive disadvantage in the marketplace.")
[58] FCC 2015 AT&T/DirecTV Merger Order, fn. 577 (after noting that switching costs impede customers' ability to switch broadband providers in response to strategies that limit consumers' access to online video services, ibid. para. 205 and fn. 577).

> "[W]e find that broadband Internet access providers have the ability to use terms of interconnection to disadvantage edge providers and that consumers' ability to respond to unjust or unreasonable broadband provider practices are limited by switching costs."[59]

Time Warner Cable

In the merger proceeding between Charter and Time Warner Cable, the merging companies had argued, just like large ISPs in Europe, that a substantial number of internet access subscribers would leave the merged company if it degraded unpaid connections into its network to motivate companies to pay termination fees.[60]

The FCC rejected this claim based in part on record evidence regarding customers' lack of switching in response to Comcast's and Time Warner Cable's interconnection strategies, which degraded the performance of their internet access service:

> "Applicants' claims about switching in these situations assume without support that: (1) consumers have suitable alternatives; (2) consumers are willing to absorb the switching costs associated with changing their BIAS provider; and (3) if a BIAS provider engages in certain practices that affect distribution quality, consumers are able to determine that their BIAS provider, rather than the OVD (or other edge provider) in question, is responsible for the poor performance. **The available evidence suggests that consumers, possibly for a combination of these aforementioned reasons, do not switch BIAS providers when confronted with poor edge provider performance [citing empirical evidence showing Comcast's internet access subscribers did not leave Comcast when Comcast's customers experienced degraded performance due to Comcast's interconnection practices].** […]
>
> We find that the Applicants have failed to demonstrate that BIAS subscribers would leave New Charter if the company manipulated interconnection to degrade the performance of an edge provider.
>
> **Indeed, the evidence in the record indicates that consumers did not abandon Time Warner Cable during the time period when Netflix's service was degraded on Time Warner Cable's network [citing empirical analysis of Time Warner Cable's churn data by Dish's expert economist]. We note that [Dish's expert economist] produced two separate analyses with different methodologies but similar conclusions, and the Applicants did not dispute the results of either study.**[61]

[59] FCC 2015 AT&T/DirecTV Merger Order, para. 297.
[60] See FCC 2016 Charter/TWC Merger Order, para. 111 (summarizing the merging arguments' arguments).
[61] FCC Charter/Time Warner Cable Merger Order, para. 111.

> [T]he evidence suggests that any subscriber departures, if they occur, would be minimal."[62]

Europeans sometimes wonder whether the evidence that American internet access customers did not switch ISPs when they experienced performance problems as a result of their ISP's interconnection practices is transferrable to Europe, because there is often more competition among internet access providers in Europe than in the US.

The available evidence suggests that internet access customers generally don't switch providers in response to service degradation due to congested interconnection links, even if their ISP competes with other internet access providers.

For example, during the Comcast/Time Warner Merger Cable proceeding, Netflix reported that:

> "Netflix has found through market testing and firsthand experience that even when a consumer does have a broadband alternative to its current provider, consumers are highly unlikely to switch ISPs. This is true even when consumers have an option to switch, because they are unsure of whether the alternative really will provide them with better value than their current provider, and because switching costs are high."[63]

Econometric analysis confirms this. Dish's economic expert performed a detailed econometric analysis of Comcast's churn data of consumers' switching behavior in "competitive regions" where Comcast was competing with other broadband internet access providers.[64] He concluded that even in those regions, Comcast did not experience a significant increase in customers switching to another provider during the time when Netflix' performance was degraded:

> "Thus, the available data fatally undermine Comcast's claim that it would experience a significant increase in customer churn if it sabotaged [online video distributors], even if attention is restricted to regions in which such increased churn seems particularly likely to arise."[65]

Similarly, Deutsche Telekom's customers have been experiencing problems resulting from congested connections into Deutsche Telekom's network for years. Some of these, like the performance problems experienced by websites hosted by German hosting provider Hetzner and the German Research Network, received significant public attention. Nevertheless, as countless complaints in Deutsche Telekom user forums and elsewhere suggest, the congestion problems

[62] FCC Charter/Time Warner Cable Merger Order, para. 112.
[63] Florance Declaration I, para. 61.
[64] Sappington, Dish Comcast Merger Reply, paras. 21-23 (describing the results of the detailed analysis).
[65] Sappington, Dish Comcast Merger Reply, para. 23.

persist and significantly interfere with customers' ability to use the applications, content, and services of their choice. Both Hetzner and the German Research Network ultimately ended up paying termination fees to Deutsche Telekom in return for uncongested connections into Deutsche Telekom's network.

At a minimum, this suggests that Deutsche Telekom does not lose enough customers to make the overall strategy unprofitable, even though it faces significantly more internet access competition than the large US ISPs.

It is not surprising that the vast majority of customers do not switch ISPs when they experience performance problems as a result of their ISP's interconnection practices – even when their ISP competes with other providers.

The market for Internet services is characterized by a number of factors – incomplete customer information, product differentiation in the market for Internet access and for wireline and wireless bundles, and switching costs – that limit the effectiveness of competition and reduce consumers' willingness to switch. Even if a consumer can choose among competing internet access providers, these factors still leave the network provider with a substantial degree of market power over its customers, enabling it to restrict some applications and content on its network without losing too many Internet service customers.[66]

Put differently, for sufficient customer switching to occur, customers need to realize that the network provider is discriminating against an application they want to use and that it's not the application's fault or their computer, the browser they are using to run web apps, or their home router. They need to be able to know the difference between all of these things. They even need to know they have an ISP.

They need to know they can switch how they get online and get better performance. They need to be able to switch to another provider that meets their needs and does not impose a similar bad performance. They need to know that when they call their ISP to complain about a slow video app and the ISP authoritatively blames the video app, that the ISP is lying. They need to know how to evaluate if a different provider will actually be better. They need to be able to switch at low cost and with little disruption to their lives, even though the amount of disruption is unknowable before switching. They need to be not locked into a contract. They need to be not afraid to make the change.

Even if there is competition in the market for Internet access services, these conditions will often not be met. Policy makers that are technically adept need to understand, just as ISPs do, that

[66] For a detailed analysis with links to literature, see van Schewick, 2014, Network Neutrality and Quality of Service, pp. 83-98. The following text draws in part on that article, sometimes quoting text verbatim.

people are busy, many are not technically literate, many don't have the time and energy to make the switch even if they are part of the small percentage of people who can accurately attribute the slowness of a particular app to the interconnection practices of the company they pay to get online.

Europe experienced this firsthand. When discussions about net neutrality first emerged in the 2000s, European policy makers concluded that Europe did not need substantive net neutrality regulations, because Europeans benefited from significantly more competition among ISPs than Americans.

The market proved them wrong. Several studies, including by BEREC, showed widespread blocking and discrimination in Europe. They showed that competition among ISPs and the threat of customers switching ISPs does not prevent ISPs from interfering with the applications, content, and services on their networks.[67] These insights were a key reason why the European Union subsequently adopted its net neutrality law, the Open Internet Regulation.

The same factors that give ISPs the market power to degrade the performance of their internet access service without losing too many customers when the ISP directly blocks or slows down applications on its network limit consumers' willingness to switch when the degradation results from an ISP's interconnection practices – if not more so.

Asymmetric information

ISPs suggest that customers will generally blame their ISP for any performance problems they experience.

That's not consistent with the evidence.

Most consumers have no idea why an application is not working as expected. It's not uncommon for people having trouble using a particular app to say that their computer is broken or Chrome is slow. Some people realize that network congestion, shoddy application programming, or insufficient server capacity might all cause performance problems. Few know that congested connections into the network might be to blame, let alone that their ISP might deliberately let this congestion occur and persist in order to increase its profits.

Performance problems resulting from degraded connections into the network are particularly confusing to diagnose for consumers, including technically proficient ones, because they affect

[67] For a summary of the evidence, see, e.g., van Schewick, 2015, Network Neutrality and Quality of Service, pp. 114,

only some applications – those entering the network through congested connections -- and sometimes only during specific times of day.

By contrast, applications that pay termination fees, either directly or indirectly, work well. For example, large content providers such as Meta, Google, or Netflix all interconnect directly with Deutsche Telekom and are therefore not experiencing these problems.

That makes it easy for a person to assume that it's a problem with the specific application rather than with the internet access service. If Netflix is slow but DT's video service is fast, who are you likely to blame?

Users who do complain to DT in the forums are told that the applications are to blame.

For instance, a review of numerous consumer complaints in Deutsche Telekom user forums and on social media suggests that Deutsche Telekom employees often ask customers to submit trace routes.

If the trace routes suggest a problem with congested interconnection, they acknowledge that peering problems exist, but say the content provider or CDN is responsible for the problem.

The issue arises so often that Deutsche Telekom has even created a post that its employees routinely refer to.[68]

> "Telekom has agreements with the major providers on this and switches on the necessary capacities. **However, we have no influence if a few manage their traffic in such a way that bottlenecks and thus disruptions occur.** Content providers can take measures of their own and deliver their data to their customers via other channels or provide more direct connections themselves."[69]

Discussions in ISP user forums, provider forums, forums related to the application on Reddit or Discord, or other social media show widespread confusion.

Some commenters clearly understand the interconnection market and the source of the problem. For instance, one user was challenged by other users to prove their assertion that Deutsche Telekom's interconnection policies are the source of the problem and that none of the other German ISPs has similar policies; the user responded by posting excerpts from the WIK study.[70]

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[68] https://telekomhilft.telekom.de/t5/Festnetz-Internet/Peeringprobleme-Probleme-bei-Datenuebertragung-hohe-PING-Zeiten/ta-p/4265259.
[69] https://telekomhilft.telekom.de/t5/Festnetz-Internet/Peeringprobleme-Probleme-bei-Datenuebertragung-hohe-PING-Zeiten/ta-p/4265259 (translated via Google Translate).
[70] https://telekomhilft.telekom.de/t5/Festnetz-Internet/canva-com/m-p/6531175#M2195813.

However, these contributions generally encounter vocal opposition from ISP employees and others. As a result, most customers don't know what to think.

While it's heartening that some non-regulators read this work, it's also telling that even among those that are self-professed geeks and nerds, very few actually know how to tell what's going on when an application is slow, and other geeks and nerds will dismiss them or fight them.

In other words, the percentage of customers who are on the receiving end of bad application performance intentionally caused by the company they are paying to get online who actually know it's the ISP's fault and are immune to the ISP blaming the application is incredibly small.

A customer who isn't sure that its internet access provider is responsible for the performance problems, which is the overwhelming majority, is unlikely to incur the significant costs of switching to another provider.

After all, if the content provider is responsible for the problems, switching to another provider would not solve the problem.

Evidence suggests that attempts to educate customers about the source of the problem are unlikely to be successful.

During the 2013-2015 interconnection disputes in the US, content providers such as Netflix and transit providers such as Cogent and Level 3 tried to put pressure on ISPs with a public campaign – without success.

Netflix published an internet speed index and published performance data clearly demonstrating that the problems were limited to the large ISPs that were trying to pressure it to pay termination fees.

Cogent and Level 3 published blog posts explaining the problem, along with technical evidence such as port utilization data. The press finally caught on and discussed that the congestion was related to ISPs' attempt to receive termination fees; the dispute repeatedly made the front page of the Wall Street Journal.

Netflix even tested pop-up messages for consumers experiencing buffering or reloading that blamed the ISP:[71]

[71] https://qz.com/216609/netflixs-video-error-message-is-a-clever-attack-on-cable-companies; https://www.washingtonpost.com/news/the-intersect/wp/2014/06/04/everything-you-really-need-to-know-about-net-neutrality-in-one-passive-aggressive-netflix-error-message/; https://www.washingtonpost.com/news/the-switch/wp/2014/06/05/verizon-to-netflix-heres-a-cease-and-desist-letter-can-you-hear-me-now/;

But as discussed above, the data shows clearly that, in spite of these significant efforts, customers of the five large ISPs generally did not leave their ISP in response to these problems.

When I speak about this time with students or members of the public, almost everyone remembers the time in 2013/2014 when they were unable to watch Netflix, play League of Legends, and use many other apps and services.

However, almost no one knows that congested connections into their ISPs' networks were at fault, let alone that their ISP deliberately allowed these connections to congest in order to force companies like Netflix and Riot Games, the maker of League of Legends, to pay termination fees.

Similarly, companies like Hetzer and German Research Network tried to educate their customers and the public about the source of the performance problems they were experiencing. Press reports explained the underlying dynamics in the interconnection market, linking the problems to congested links into Deutsche Telekom and to Deutsche Telekom's request for termination fees.

In the end, both Hetzner and German Research Network ended up paying the termination fees.

That tells you all you need to know.

Product differentiation in the market for Internet access and for wireline and wireless bundles

In order for switching to discipline internet access providers, customers that are unhappy with their providers' practices need to be able to switch to another provider that meets their needs and does not impose a similar restriction.

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https://www.washingtonpost.com/news/the-switch/wp/2014/06/09/netflix-well-drop-the-anti-verizon-error-messages-for-now/.

Whether this is possible depends in part on the amount of competition in the market for internet access.

Focusing solely on the number of providers in the market, however, will often overestimate the number of viable alternatives available to a consumer who is willing to switch in response to discriminatory conduct. The Internet service offerings of various providers differ substantially in price, performance, and other characteristics on which providers compete. In mobile offerings, they can even differ on what devices they support.

As a result, even if there is another provider, switching in response to the discrimination may require a customer to switch from her most preferred Internet access offering to another offering that may meet fewer of her needs, creating an ongoing cost that will reduce the customer's willingness to switch. In the worst case, the other providers do not meet the needs of the customer at all, making it impossible for her to switch.[72]

For example, an ISP whose users experience performance problems due to the ISP's interconnection practices may generally have more network capacity than another ISP that does not let the connections into its network congest.

As a result, while applications affected by the congested connections of the first ISP do not face these problems on the network of the competing ISP, the competing ISP's network might generally be congested more often during peak hours.

More generally, differences in network architecture, speed, coverage, available internet plans, bundled services, and pricing all might reduce a consumer's willingness to switch.

Understanding switching costs

Finally, switching internet access providers is difficult, time-consuming and costly. The significant impact of switching costs on consumers' willingness and ability to switch internet access providers has been well documented.

They include "early termination fees; the inconvenience of ordering, installing and setup, and associated deposits or fees; the difficulty in returning equipment and the cost of replacing incompatible customer-owned equipment; the risk of temporarily losing service; problems

[72] van Schewick, 2015, Network Neutrality and Quality of Service, pp. 88-92. Again, the text includes some direct quotes from the article.

learning how to use the new service; and the loss of a provider specific email address or website."[73]

Users can also be encumbered in other ways. They may be on a family plan where switching entails switching all the devices over, which can be a huge hassle even if all the family members happen to live in the same household. Good luck switching over when one or more of your family members are remote, such as off at university.

Others may be on special discount or legacy plans that they don't want to give up. Or they are using a plan on their business phone that they don't control. Or they are using an ISP connection set up for them by a helpful family member or neighbor, and have no idea how they actually get online.

Even in the best case scenario where a user knows what ISP they use; has, can find, and is technically capable of evaluating other options; can find a solution for possibly being without connection for a few days or a week; and has the time and energy for all of this, switching is still a gamble and requires time and energy.

Each individual consumer's decision to switch will be influenced by an idiosyncratic interplay of these factors.

But the evidence is clear that in the end, consumers are unlikely to leave their ISP when they experience degraded performance due to their ISP's interconnection practices, even if their ISP faces competition in the market for internet access services.

Degrading the ISP's internet access service to gain termination fees is rational, even if some consumers switch to another ISP.

Even if an ISP loses some subscribers as a result of the playbook, the decision to degrade the performance of customers' internet access service is rational, as long as the net benefit is positive.

As the FCC explained in the 2016 Charter/Time Warner Cable Order:

> "[E]ven if we accepted [the] claim that [internet access] subscribers would leave New Charter if the company [manipulated interconnection to degrade the performance of an

[73] FCC 2015 AT&T/DirecTV Merger Order, fn. 577 (summarizing Netflix' description of switching costs). See generally, e.g., van Schewick 2015 Network Neutrality and Quality of Service, pp. 92-96; FCC 2015 Open Internet Order, para. 81 ("The broadband provider's position as gatekeeper is strengthened by the high switching costs consumers face when seeking a new service. … These costs may limit consumers' willingness and ability to switch carriers, if such a choice is indeed available.").

> online video provider], the threat of those departures would not necessarily disincent New Charter from foreclosing [online video distributors] if doing so created a net monetary benefit. Furthermore, as just discussed, the evidence suggests that any subscriber departures, if they occur, would be minimal."[74]

Ultimately, large internet access providers stand to gain significant income from termination fees. The large ISPs using the playbook want to be paid twice for delivering the traffic their internet access customers request – once by their internet access customers, and again by the applications their customers want to use.

Putting ethics aside, business decisions are rational as long as the benefits are larger than the costs.

Internal business documents reviewed by the New York Attorney General show that that's exactly how Time Warner Cable was thinking about the degradation-by-congestion strategy.

> "A 2011 strategy presentation titled "Internet Economics," described Spectrum-TWC's approach. The document made clear that the company intended to shift its interconnection strategy from a "cost recovery model to a full business model" by converting "some legacy settlement-free peers to Paid Interconnect."[75]

To increase its interconnection revenue in the long term, Time Warner Cable was willing to incur higher costs in the short-term, including higher routing costs and a significant degradation of its internet access service:

> "Spectrum-TWC had already deliberately "frozen port upgrades" with one interconnection peer at settlement-free interconnection points, causing overflow traffic to be redirected through other routes into Spectrum-TWC's network. These alternate routes were more expensive for both the interconnection peer and Spectrum-TWC. Spectrum-TWC recognized that, as both sides were incurring additional costs, it had effectively started a "game of chicken." It expected, however, that the interconnection peer would ultimately yield and agree to a paid arrangement in order to avoid the more expensive routing options.
>
> *"[T]he short-term costs"* that Spectrum-TWC incurred from the more expensive routing *would therefore "eventually lead to longer-term revenue growth and cost containment.""*[76]

[74] FCC 2016 Charter/TWC Order, para. 112.
[75] NY AG Comments, p. 7.
[76] NY AG comments, pp. 8-9, citing Time Warner Cable internal strategy presentation.

Time Warner Cable knew its strategy was harming its customers and might even reduce demand for its internet access service.

> "Spectrum-TWC was well aware that its customers suffered significant service degradation as a result of its interconnection disputes."[77]

> "A Spectrum-TWC executive acknowledged in an internal email that the company's new contentious relationships with backbone providers "may be artificially throttling [subscriber] demand" for broadband services.[78]

Internal documents reviewed by Netflix as part of the challenge to AT&T's merger with Time Warner Cable show the same calculus – a deliberate decision by AT&T to accept performance problems for its internet access service customers to reach its larger goal of charging termination fees:

> "AT&T's internal documents show that the company made a specific choice to stop augmenting capacity on settlement-free routes in order to force traffic onto paid ones.[79]

This decision created an "extremely high level of congestion" on these routes.[80]

> "While Netflix was increasingly concerned about the performance of its services, AT&T's internal documents show that, not only was it aware that its strategy was harming its customers, it made the *deliberate decision to allow such harm to continue to pursue its larger strategy of extracting a terminating access fee from Netflix*."[81]

Large ISPs deliberately degrade unpaid connections, not content providers.

ISPs using the playbook publicly claim that the problems customers are experiencing are the content providers' fault. They say content providers deliberately route their traffic in a way that creates congestion.[82]

That's what Comcast, Time Warner Cable, AT&T, and Verizon said in the US, and it's what large ISPs like Deutsche Telekom are saying in Europe.[83]

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[77] NY AG comments, p. 8.
[78] NY AG comments, p. 8, citing an internal email.
[79] Netflix, AT&T/DirecTV Merger Reply Comments, p. 8.
[80] Netflix, AT&T/DirecTV Merger Reply Comments, p. 9.
[81] Netflix, AT&T/DirecTV Merger Reply Comments, p. 9 (emphasis added).
[82] Interestingly, large ISPs never say what content providers should do instead.
[83] See, e.g., ETNO, 2024, Comments on Commission Digital Infrastructure White Paper, p. 26.

Large ISPs in Europe are using the same playbook to force companies to pay them termination fees, and they are using the same "public response playbook."

European regulators shouldn't fall for it.

We know these claims are false because investigations by the New York Attorney General found the smoking gun – internal business documents that confirmed that the congested connections into the ISPs' networks were the result of a deliberate business strategy designed to force companies delivering traffic the ISPs' customers requested to pay termination fees. As the New York Attorney General put it, the congestion problems were "the result of [the ISP]'s deliberate business decision to use congestion to strong-arm backbone providers and edge providers into "paying [] for access" to the [ISP]'s subscribers:"

> "These investigations have uncovered documentary evidence revealing – for the first time – that from at least 2013 to 2015, major [internet access] providers made the deliberate business decision to let their networks' interconnection points become congested with Internet traffic and used that congestion as leverage to extract payments from backbone providers and edge providers [i.e. providers of internet content, applications, and services], despite knowing that this practice lowered the quality of their customers' Internet service.
>
> This practice was not limited to a single instance or locality: NYOAG has found that this practice was used for years by at least two of the country's biggest [internet access] providers who operate in New York and in many other states."[84]

While we don't have internal business documents for Europe's ISPs, all the other evidence lines up.

First, both in the US and Europe, large ISPs are the only ISPs using the playbook:[85] They are the only ISPs refusing to upgrade unpaid congested connections into their network or peer settlement-free in their own country. All other ISPs in the country are cooperating to upgrade connections into their network before they get congested and peer in the country settlement-free.

Second, the large ISPs are the only ones experiencing problems with degraded connections into their networks. Companies affected by the congestion say they are using all available options for handing off data to the ISP that do not involve a termination fee. Companies that pay termination

[84] NY State 2017 Open Internet Comments, p. 1

[85] In the EU, France is an outlier. Some French ISPs other than Orange are using a variation of the playbook that allows them to charge termination fees as well.

fees don't experience these problems. Once companies that had experienced the problems pay, the problems end.

In the US, Comcast, Time Warner Cable, AT&T, Verizon and Century Link were the only ISPs experiencing congestion on unpaid routes into their network. The problems affected multiple transit providers and degraded the quality of all content, applications, and services that were entering the ISPs' networks through congested connections. Content providers such as Netflix were using all transit providers that were interconnecting with these ISPs settlement-free and willing and able to take on traffic destined for these ISPs.

In Germany, Deutsche Telekom is the only German ISP experiencing regular congestion on unpaid routes into its German network.[86] Just as in the US, the problems affect multiple transit providers and degrade the quality of all content, applications, and services that are entering Deutsche Telekom's network through congested connections. Industry participants that are experiencing the congestion say they are using all of the transit providers that interconnect with Deutsche Telekom settlement-free and are willing and able to take on the traffic destined for Deutsche Telekom's internet access customers.

Third, industry participants say the *only* way for them to get undegraded access to these ISPs' internet access customers is to pay recurring termination fees – either directly, by paying the ISP, or indirectly, by paying a transit provider, CDN, or hosting provider that pays the ISP. Companies that have decided to pay these fees say *that's why they pay*. That's what Netflix said in the US, and Hetzner and German Research Network said in Germany, and many more are saying it privately.

Fourth, these large ISPs are the only ISPs in the country that are paid recurring termination fees. That's what we saw in the US. It's what we see in Europe and around the world.

By contrast, all of the other ISPs in the country don't use the playbook, don't experience the problems with degraded connections into their network, and don't get paid termination fees. If content providers were creating the congestion, wouldn't we expect to see the problems with other ISPs, too?

It is not difficult to see that all of these facts are connected. The large ISPs in the US and Europe are the only ones getting paid termination fees *because* they are the only ones using the playbook, and they are large enough to make it work: They control access to so many internet access customers in their country that providers cannot afford to have degraded performance for

[86] It's worth noting that these unpaid connections into Deutsche Telekom's network are congested even though all of the large content providers seem to buy transit from Deutsche Telekom and interconnect directly with Deutsche Telekom. (See Court Decision in Deutsche Telekom v. Meta) Thus, large content providers cannot be the source of the ongoing congestion.

all of them. The problems with degraded unpaid connections into their network are a core part of their strategy: the desire to avoid these problems is what motivates companies that need undegraded access to these ISPs' internet access customers to pay the fees.

Other parts of the ISPs' story don't add up, either.

In the US, data showed that the congestion was limited to the interconnection links with the networks of the five large ISPs; both the transit provider's networks and the ISPs' networks had enough capacity to transport the traffic destined for the ISPs' internet access customers without congestion. (This is similar to two uncongested, multi-lane highways that are connected by one lane. Cars moving from one highway to the other can experience congestion on the connecting lane, even though both highways are not congested.)[87]

Interconnection partners cannot upgrade interconnection links unilaterally. Both partners need to have an open door to their network that is large enough (a so-called "port"), and both need to attach the connection that connects the two doors (a so-called "cross-link") to their own door, so traffic can flow from one door to the other.

Upgrading the capacity of the interconnection links between two networks doesn't cost a lot of money.

Commonly, each interconnection partner pays for the upgrades on their side of the connection such as adding an additional port when needed, and the partners take turns paying for any additional cross-links that connect the ports.

In the US, affected transit providers such as Cogent offered to pay all of the costs of upgrading their connections with these ISPs, which would have removed the congestion.

All five ISPs refused; they were only willing to cooperate in upgrading the connections if they were paid a recurring termination fee.[88]

In Germany, traffic that enters Deutsche Telekom's German network via Deutsche Telekom's transit service does not experience congestion, and industry participants say transit providers networks have enough capacity to deliver all of the traffic to Deutsche Telekom's doorstep. Thus, just as in the US, the congestion seems to be limited to congested interconnection links with Deutsche Telekom.

[87] Cogent/Schaeffer 2020 Declaration, para. 17.
[88] Cogent/Schaeffer 2020 Declaration, para. 18.

Just as in the US, several industry participants report that they have offered to pay for all of the costs of upgrading the congested interconnection links, but that Deutsche Telekom refused the offer.

In sum, industry participants offer to take steps that would end the congestion, but Deutsche Telekom refuses to accept the offer.

But if others are deliberately creating the congestion, why do they offer to end it? And if Deutsche Telekom does not *want* the congestion, if it is the victim of others' deliberate attempts to create the congestion, as it claims, why does it refuse to accept the offers that would end it? Ultimately, we don't have internal telecom documents proving that Deutsche Telekom is using the playbook, unlike in the US. But if it looks like a duck, swims like a duck, and quacks like a duck, then it's probably a duck.

Ratio requirements are fake, and introduce sending-party-network-pays through the backdoor. They are the exception, not the norm.

Large ISPs using the playbook commonly justify the restriction of undegraded interconnection to companies that pay them termination fees with an argument about traffic ratios.

In essence, they claim they should receive termination fees whenever the companies delivering the data that the ISP's internet access customers requested deliver more data to the ISP than vice versa.

But that's the sending-party-network-pays principle by another name, and it's not how the internet at large works.

These large ISPs generally have strict peering policies that restrict settlement-free peering to peers that deliver roughly as much data as they receive. For example, as the WIK study explained:

> "Deutsche Telekom's peering agreements contain a strict traffic ratio for ingoing and outgoing traffic. As soon as the ratio of 1:1.8 is exceeded, settlement-free peering turns into commercial transit and payouts occur in one direction or the other."[89]

The large ISPs using the playbook create the impression that requesting termination fees for traffic that is "asymmetric" – i.e. where the interconnection partner delivers more data to the ISP than vice versa – is the norm.[90]

[89] WIK Study, p. 43.

[90] See, e.g., ETNO 2024 Comments on Commission Digital Infrastructure White Paper, p. 25 ("Private peering is generally subject to charges. The reason why charges for IP data transport services are sometimes not levied is the

They are wrong.

The vast majority of internet access providers do not receive payments for terminating the traffic that their internet access customers requested. As explained above, they either pay a transit provider or peer settlement-free – even though CDNs, hosting providers, and content providers generally deliver more data to the internet access provider than the internet access provider sends to them.

That's normal. So-called eye-ball networks – the ones that individuals and businesses use – have always had more traffic come into their network than they send out. Nearly all individuals and businesses download more than they upload.

If peering relationships actually worked on a ratio level, then every application, CDN and transit network would be paying every eyeball network in the world. While that's clearly the internet that the biggest ISP would like to live in, where they get paid twice for the same service, it's not the internet we've had for 30 years.

In fact, you can go back to the 2005 meeting of NANOG (North American Network Operators' Group), the globally respected professional association for internet engineering, architecture, and operations professionals.

In a session with hundreds of participants, the idea of ratios applying to internet peering was debated and thoroughly debunked.

> Peering traffic ratios are irrelevant; eventually this traffic traverses your network to get to your customers. The asymmetry is merely a side effect of the type of traffic requested by or served on behalf of your customers.
>
> One discussion with a large backbone provider highlighted the folly. This Peering Coordinator was proud that the peering ratio required a peer to "adjust" traffic to maintain an "appropriate" traffic ratio. How did the peer accomplish this shift? They redirected some portion of traffic to a transit provider who in turn forwarded that traffic directly back to the large backbone provider, onto the same router as the peer! There was no change in backbone load, simply a shift of traffic from one interface card to the other. The ISP mandating peering traffic ratios realized no cost savings, enhanced revenue, or performance benefits from this mandate. In fact, traffic now takes a more circuitous path to reach their customers yielding slightly worse performance.[91]

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fact that the amount of traffic in both directions is rather symmetric and respective payments would largely offset each other. This relationship is generally referred to as "settlement-free peering". Network operators are typically not inclined to provide IP data transport services on a settlement-free basis to a network with a significant traffic asymmetry, which is the case between large CAPs and ISPs.").

[91] https://drpeering.net/white-papers/The-Folly-Of-Peering-Ratios html.

The full writeup of the session is worth a read as traffic ratios were as useless in 2005 as they are today.

The writeup also makes it clear that peering ratios were imported from the Sending-Party-Network-Pays model of voice communications:

> Peering Traffic Ratios emerged years ago in the Internet as a peering candidate discriminator, but appear to have their roots in the PSTN world. Ratios reflect the telephony settlement model of buying and selling minutes, where the traffic difference between in and out is used for settling at the end of the month. However, the Peering Traffic Ratio discriminator model for the Internet interconnection fails because traffic ratios are a poor indicator of relative value derived from the interconnect.

For the vast majority of internet access providers, the ratio of incoming to outgoing traffic is irrelevant to the decision whether to peer settlement-free.[92] End-user networks that peer gain value from the peering no matter what the ratio is. The only thing that really matters is whether the amount of traffic through the peering point is worth their time to set up and pay for the peering point.

This is true in the US,[93] in Europe,[94] and around the world.[95] For example, in Germany, Deutsche Telekom is the only internet access provider that conditions the decision to peer on ratio requirements.[96]

Computer Science Professor Scott Jordan got a deep, inside view of interconnection agreements and practices as the FCC's Chief Technologist from 2014 to 2016. While at the FCC, he reviewed hundreds of interconnection agreements as part of the FCC's review of the mergers between Comcast/Time Warner Cable, AT&T/DirecTV, and Charter/Time Warner Cable, and was deeply involved in the enforcement of the interconnection merger conditions adopted in the AT&T/DirecTV and Charter/Time Warner Cable mergers.[97]

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[92] Large ISPs often point to ratio requirements in the peering policies of large backbone providers to justify the use of ratio requirements in the peering policies of internet access providers. But interconnection among two backbone providers is not comparable to interconnection involving an internet access provider. In particular, when backbone providers use "hot-potato routing," ratio requirements might serve as a proxy to ensure a roughly equal amount of effort by both parties. However, these considerations do not carry over to interconnection with internet access providers, where content providers and CDNs generally hand off data to the internet access provider close to the customer who requested it. For a more detailed explanation, see, e.g., Lumen 2024 Open Internet Comments, pp. 15-19.

[93] See, e.g., FCC 2016 Charter/Time Warner Cable Order, para. 99 (only the five largest ISPs in the US charge for paid peering; all other ISPs either pay a transit provider, and potentially also exchange data with some content providers settlement free). See also Jordan Declaration, para. 51, quoted below.

[94] See industry participants and BEREC Draft Report. Again, France is an outlier.

[95] See Packet Clearing House, 2021 Study, p. 4.

[96] See WIK Report, p. 46.

[97] See Jordan Declaration, para. 2.

He explains:

> "[Peering agreements where neither party pays the other] are the most common type of peering agreement between broadband providers and CDNs or edge providers for all but the largest broadband providers. In addition, in the vast majority of interconnection agreements between broadband providers and transit providers, either no party pays the other or the broadband provider pays the transit provider.[98]
>
> Although AT&T asserts that an imbalanced traffic ratio in traffic exchange between a broadband Internet access service provider and an edge provider or transit provider necessarily implies that the edge provider or transit provider should pay the broadband Internet access service provider […], an imbalanced traffic ratio […] indicates no such thing.[99]

Instead, internet access providers generally exchange data settlement-free if both parties derive sufficient value from the exchange.[100]

> "Peering agreements between a broadband provider and an edge provider, CDN, or another network operator may or may not include a charge for the traffic exchanged. When the two parties perceive an approximately equal value to the peering service they offer to one another, it is common for the peering agreement to be settlement-free (i.e., not to require payment from either party to the other)."[101]

As Cogent's CEO Dave Schaeffer explained in a declaration submitted by the California Attorney General in its defense of California's net neutrality law, this condition is easily satisfied:

> "Settlement-free peering is appropriate when both parties each receive sufficient value from the exchange. When a BIAS provider interconnects with an edge provider, content delivery network, or transit provider, an imbalance in traffic ratios does not mean that the exchange is not valuable to the BIAS provider.
>
> [A]ll of the traffic (including the out-of-balance traffic) that edge providers, content delivery networks, or the transit providers acting on their behalf deliver to a BIAS provider, is traffic requested by the BIAS provider's customers. Accepting and delivering that traffic is essential if the BIAS provider wants to fulfill its obligation to its customers. Thus, the traffic is highly valuable to both the BIAS provider and its customers."[102]

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[98] Jordan Declaration, para. 51.
[99] See also, e.g., Cogent/Schaeffer 2020 Declaration, para. 57; Lumen 2024 Open Internet Comments.
[100] Jordan Declaration, para. 60.
[101] Jordan Declaration, para. 58.
[102] Cogent/Schaeffer 2020 Declaration, paras. 57-58.

Large ISPs' insistence on traffic ratios is particularly ironic given that they have designed their networks in a way that makes it virtually impossible for most companies to meet the ISPs' ratio requirements:

> "[T]he traffic imbalance is a direct consequence of how BIAS providers have built their networks. BIAS customers have always downloaded more data than they send, and BIAS providers have designed their networks so customers can download more than they upload.
>
> That's because many of the content and applications that residential consumers use receive more data than they send. For example, requesting a website or an online video only requires a small amount of data; receiving the actual website or video in response to the request involves a significantly larger amount of data.
>
> Reflecting these use patterns, most BIAS plans are asymmetric, too: consumers receive higher download speeds than upload speeds. As a result, a BIAS network necessarily receives more traffic for its BIAS customers from the Internet than these customers send to the Internet."[103]

In fact, these imbalances came back to bite many ISPs during the COVID shutdown, when people turned to video conferencing for school, work and socializing. This led to much more uploading as video conferencing sends the users video out, but many networks often lacked the upstream bandwidth to handle this traffic,

Take for example, this Reddit user whose Comcast cable network plan was 1 Gbps down and 30 Mbps up:

> I have a package that is 1 GBPS down but only 30 MBPS up. I spoke to the customer care and they couldn't give me any reason why this is the case - except its "Asymmetric".
>
> Asymmetry to me would be 1GBps down and maybe 500MBps up. Heck I'll take 1GBps/100MBps in the worst case!
> But 1GBPS/30MBps? [104]

Deutsche Telekom is a good example of the asymmetric nature of many EU ISP's networks.

Deutsche Telekom's fixed internet access plans are highly asymmetric, with ratios of download speed to upload speeds, or incoming traffic to outgoing traffic, ranging from 2.5 : 1 to 6.67 : 1. That's significantly above the 1.8 : 1 ratio of incoming to outgoing traffic that triggers a duty to

[103] Cogent/Schaeffer 2020 Declaration, paras. 59 and fn. 40.

[104] https://www.reddit.com/r/Comcast_Xfinity/comments/rm8u0q/whats_the_reason_behind_the_asymmetric_package/

pay termination fees (in the form of an obligation to buy transit) under Deutsche Telekom's peering policy:[105]

Download Speed in Mbps	**Upload Speed in Mbps**	**Ratio of Download to Upload Speed**
250 Mbps	40 Mbps	6:25 : 1
100 Mbps	40 Mbps	2.5 : 1
50 Mbps	20 Mbps	2.5 : 1
16 Mbps	2.4 Mbps	6.67 : 1

This imbalance is not an outlier. For example, BEREC found that "the inbound-outbound traffic ratio across all [internet access providers submitted data to BEREC] is 5,6 : 1." In other words, the European internet access providers in BEREC's study received, on average, almost six times more data than they sent.

But when large ISPs' internet access customers use their plans as sold and receive more data (the download) than they send (the upload), the large ISP will refuse to accept the majority of the traffic that these customers have requested, unless the company delivering the traffic pays a recurring termination fee.

It's deeply hypocritical to claim that traffic exchange needs to be symmetrical when your own network is purposefully designed to handle 6 times the amount of inbound data than outbound data.

But the point of having a ratio requirement and pretending that ratio requirements are an industry standard is simply to have some justification for charging content providers and other networks in order to get paid twice.

Large ISPs want to be paid twice for delivering the data their customers requested – once by their own internet access customers, and again by the applications and services their customers want to use. A nonsensical ratio requirement gives them cover to do so.

Ultimately, by forcing companies that deliver more data to the ISP than they receive to pay termination fees, peering policies based on strict ratios effectively introduce the sending-party-network-pays principle through the backdoor.

[105] https://www.telekom.de/festnetz/tarife-und-optionen/internet-dsl?samChecked=true.

The interconnection problems harm content providers, innovation, and competition.

The Playbook harms are widespread and often hidden.

Surprisingly, the Draft Report suggests that small content providers are unlikely to be affected by large ISPs' use of the playbook.

That's not correct.

Small and medium-size content providers, CDNs, and hosting providers suffer disproportionately from ISPs' use of the playbook.

In essence, when large ISPs degrade unpaid connections into their network to extract termination fees from companies that need undegraded access to the ISPs' customers, they effectively create fast lanes and slow lanes to their customers – just via their interconnection practices.

CDNs are no longer a luxury item used by only the biggest companies. Nearly every website, application and blog uses some sort of CDN. It's de rigeur in 2024. Every WordPress site in the world has access to a free CDN, powered by WordPress's parent company Automattic, via its free JetPack extension.[106]

Cloudflare alone has 197,000 paying customers[107] and an estimated 7.59 million websites using its technology.[108] Every one of Cloudflare's customers, free and paid, as well as those using services like Akamai, AWS, Google Cloud Hosting, Azure, etc. are affected by congested ports by getting slow performance. And if they aren't getting slow performance because their CDN or hosting provider has paid the demanded fee, the cost gets still get passed onto customers.

When the largest ISPs in the U.S. ran this playbook, it wasn't just Netflix and League of Legends that got hit. School districts couldn't upload payroll. Small companies' IT departments wasted countless hours trying to diagnose the issue. Remote workers couldn't connect reliably to their corporate network and had to commute or shift work hours to the wee hours of the morning when the interconnection points weren't congested.[109]

In another case, a small game development firm had users complaining about slow downloads and employees couldn't work from home, but only if the users and employees were using

[106] https://jetpack.com/features/design/content-delivery-network/.
[107] https://www forbes.com/sites/robertdefrancesco/2024/05/30/why-cloudflare-shares-have-tumbled-41-from-the-recent-52-week-high/.
[108] https://backlinko.com/cloudflare-users.
[109] https://www.wired.com/story/jammed/.

Comcast which was running its playbook against Cogent. The download speeds during peak time were 300Kbs.[110]

The harms are real and distributed when ISPs run this playbook, even if regulators can't see them and only a tiny fraction are featured in news stories.

The Playbook creates fast lanes and slow lanes that harm competition, innovation and free speech.

Companies that directly or indirectly pay termination fees receive uncongested access to the ISPs' customers – a "fast lane"; companies that use a CDN, hosting provider or transit provider that doesn't pay termination fees suffer the consequences of congestion, remaining in the "slow lane."

The Open Internet Regulation banned fast and slow lanes for good reasons, and they all apply here, too.

In particular, charging content providers (and the intermediary providers that serve them) for enhanced access to the ISPs' customers harms innovation, competition, and free speech.

Apps that don't pay have bad performance, which hurts their ability to compete. But some apps and sites can't afford a fast lane or don't know better. They have to use a transit provider or CDN whose connection to Deutsche Telekom is congested all or some of the time.

The reduced performance harms companies and speakers without deep pockets, including startups, small businesses, and non-profits, making it harder for them to compete and be heard.

Congestion hits some applications particularly hard, including those like online gaming, video calling, video conferencing and more, as they have fewer ways to work around being mired in a slow lane.

Smaller apps that need good quality and can afford it can pay Deutsche Telekom directly or switch to a transit provider or a CDN that pays Deutsche Telekom.

Some CDNs and providers, offer a paid option, over and above their usual fees, for an application to get good connections into Deutsche Telekom. These companies have two connections, an unpaid one that's congested at least some of the time, and one that is not. In other words, there's a slow lane and fast lane.

[110] https://arstechnica.com/information-technology/2018/03/comcast-and-cogent-fight-again-and-customers-lose-with-slow-downloads/ and https://blog.panic.com/mystery-of-the-slow-downloads/.

For these CDNs and providers, customers that don't pay the extra fee go through the congested slow lane connection, while those that pay for the de facto fast lane do not experience congestion.

But deciding to pay the termination fee doesn't mean the problem is solved.

Paying for a fast lane to Deutsche Telekom by buying transit from Deutsche Telekom is expensive. It's 3 to 20 times more expensive to reach a Deutsche Telekom customer than a customer of other German ISPs.

Thus, smaller players have to make a choice: pay higher rates for a fast lane to Deutsche Telekom's customers or stay in the slow lane and live with the pain. Or they can give up on serving Deutsche Telekom customers entirely.

By contrast, the large, dominant internet platforms interconnect with Deutsche Telekom directly and generally don't experience congestion. While the specifics of their agreements with Deutsche Telekom and other large ISPs are unknown, it is likely that those companies do pay at least some of the time, and that when they do pay, they have enough market power to keep the cost down.

That doesn't mean the platforms want to pay for a fast lane. But they need good quality access to Deutsche Telekom's customers and have deeper pockets to pay the termination fees.

So even if a startup does decide to pay Deutsche Telekom for a fast lane directly or through an intermediary provider, they are still at a disadvantage because they will be paying more per bit than their larger competitors.

Thus, the use of the playbook not only increases the costs for companies that pay termination fees, it directly distorts competition among content providers and harms small innovators without deep pockets.

Bargaining power

Whether an ISP is able to use the playbook to force companies to pay termination fees depends on a number of factors.

Large ISPs v. small ISPs

An ISP's size determines whether the ISP is able to charge termination fees at all and how large the fees are.

In general, only the largest ISPs in a country can successfully use the playbook to force companies delivering the data the ISPs' customers requested to pay termination fees.

That's because the playbook only works if the ISP controls access to so many subscribers that content providers (or CDN and transit providers delivering traffic on their behalf) cannot afford to forgo access to or suffer degraded performance for that many subscribers.[111]

In the US, only the five largest ISPs – Comcast, Time Warner Cable, AT&T, Verizon, and CenturyLink – were engaging in these practices, and they were the only ones able to charge termination fees.[112]

The largest European telcos have similar numbers of internet access customers as the five ISPs that ran this playbook in the US and have even higher market shares.

	Fixed internet access market share in million / market share percent		**Fixed internet access market share in million / market share in percent**
Comcast (2014)	21 M / 23%	**Deutsche Telekom, Germany (2022)**	22 M / 39%
Time Warner Cable (2014)	12 M / 13%	**Orange, France (2022)**	11,9 M / 39%
CenturyLink (2014)	6 M / 7%	**Telefonica, Spain (2022)**	5,7 M / 35%

Exactly how large an ISP has to be in order to successfully use the playbook might vary depending on the content provider.

For example, Deutsche Telekom controls access to 22 million fixed broadband customers in Germany; that's 39% of the market. Even large content providers like Google or Meta likely cannot afford to forego access to that many customers in one of the largest markets in Europe.

By contrast, while the largest provider of fixed internet access in Croatia, Hrvatski Telekom, has a market share of about 60%, its fixed retail internet access service serves only 666,666 customers.[113] While a Croatian content provider might not be commercially viable without access to 60% of the fixed internet access customers in Croatia, the commercial viability of large global content providers like Google or Meta is unlikely to be affected by the inability of Hrvatski Telekom's 666,666 customers to access Google or Meta properties.

As a result, a large ISP in a small country such as Hrvatski Telekom might be able to use the playbook to force local content providers into paying termination fees, but have a harder time

[111] See also, e.g., FCC, 2016, Charter/TWC Merger Order, para. 100 ("The success of a BIAS provider charging paid peering depends on the two factors: the number of subscribers (or "eyeballs") that the BIAS provider serves (and thus the portion of an edge provider's business that those BIAS subscribers represent) and the BIAS providers' control over interconnection capacity into its network.")
[112] FCC, 2016, Charter/TWC Merger Order, para. 99.
[113] https://www.t ht.hr/en/about-us/profile. Henry Lancaster, Paul Budde Communication PtyLtd, Croatia. Hrvatski Telekom's market share of fixed broadband subscribers, July 31, 2024 (Document on file with the author).

with large global players, and might therefore be willing to interconnect directly with larger global content providers without payment.

Data suggests that even among ISPs that are able to charge termination fees, an ISP's bargaining power increases with the number of subscribers.

Larger ISPs are able to negotiate more favorable terms. In particular, the larger the ISP, the higher the per-subscriber termination fee the ISP can charge.[114]

Large ISPs v. CAPs

Large ISPs v. large CAPs

Large ISPs claim that they are powerless against the large American CAPs; that's the premise of the ETNO proposal.

As we saw in the US, that's not true. When faced with the threat of bad performance on networks that controlled access to tens of millions of internet users, all the large CAPs paid the termination fee.[115]

Again, the largest European telcos have similar numbers of internet access customers as the five ISPs that ran this playbook in the US and even higher market shares, giving them similar, and potentially even higher leverage than the ISPs in the US.

Large ISPs nevertheless claim that they would be hurt more than large content providers if the traffic of these providers entered their network through congested connections, arguing that if large content providers' apps and services were degraded for the ISPs' customers, customers would switch to another ISP. This threat, they claim, limits their ability to force large companies to pay them termination fees at all, or forces them to charge lower termination fees than they would like.

First, it's not clear why that would be a problem. The vast majority of internet access providers in Europe do not charge termination fees and are able to function, compete, and invest perfectly well without them.

[114] FCC, 2016, Charter/TWC Merger Order, para. 115 ("Our economic analysis suggests that the ability of a BIAS provider to charge for access to subscribers increases with the number of subscribers; the greater the number of subscribers, the more the BIAS provider can charge on a per-subscriber basis."). As part of the merger review, the FCC analyzed 136 interconnection contracts by five large internet access providers – Comcast, Time Warner Cable, AT&T, Verizon, and Charter – that were in effect at the time, including for settlement-free and paid peering and transit. For a detailed analysis, see FCC, 2016, Charter/TWC Merger Order, Appendix C, Section II.B.2., paras. 32-44.

[115] https://www.wsj.com/articles/for-web-firms-faster-access-comes-at-a-price-1391717444. See also Section "The Playbook works."

Only large ISPs want to be able to charge network fees, and are currently using the playbook to force companies to do so. However, as the overwhelming majority of commenters in last year's Commission consultation on the topic showed, network fees are unnecessary and harmful. Thus, we should not be particularly concerned if large ISPs were unable to charge termination fees (which are indistinguishable from network fees).

Thus the focus on which party has more bargaining power in network fee negotiations is both misguided and harmful. The inquiry makes no sense unless one accepts the underlying notion that online services should be paying ISPs. As we've repeatedly noted, and the draft report itself notes, this kind of payment arrangement in peering is an abnormality. 99.9996 percent of peering agreements are unpaid.

Only the largest ISPs are trying to demand these kinds of fees. Inquiring into which party has the upperhand in the negotiations accepts the premise that should be network fee negotiations in the first place. That's a huge assumption given all the evidence that network fees and the playbook used to coerce them cause real harm and are unnecessary.

Second, like all monopoly fees, monopoly termination fees introduce all sorts of economic inefficiencies. That's why termination fees in telephony were heavily regulated. As explained earlier, large ISPs such as Deutsche Telekom are able to charge a multiple of the transit price for uncongested access to their network, leveraging their termination monopoly. *That's* a problem – not the large ISPs' potential inability to charge everyone monopoly fees.

Having said that, the ISPs' arguments about the effects of congested connections into their network are directly contradicted by the evidence.

As discussed in detail above, the evidence shows that customers in the US and Europe generally don't switch providers when they experience degraded performance as a result of congested connections into the ISPs' network, due to a combination of asymmetric information, differentiation in the market for internet access services, and switching costs. These factors prevent consumers from switching providers even when there is competition in the market for internet access. In fact, the lack of customer switching in response to ISP interference with the applications, content, and services of their choice is one of the key reasons Europe replaced its disclosure-only net neutrality regime with an actual net neutrality law with substantive net neutrality protections.

And as explained above, it's this fact – that consumers don't switch to another provider if their ISP uses the playbook – that allows ISPs to effectively take their consumers hostage in order to extract termination fees from companies whose applications need good performance.

This, combined with ISPs' control over access to a large number of customers in a market, gives ISPs significant bargaining power, even relative to large content providers.

ISPs often argue that large content providers have must-have content so there's no way they could intentionally degrade those services.

But in the US, the degradation affected incredibly popular services that people were passionate about.

As described in the Attorney General's lawsuit, Riot Games' popular League of Legends was effectively unusable on Time Warner's network for years. Gamers are highly passionate and often quite technically sophisticated. But Time Warner Cable was able to degrade the game for years.

Similarly, when the highly anticipated second season of House of Cards became available, Netflix was effectively unusable at peak hours on the networks of the five large ISPs.

The experience in the US suggests that ISPs can afford degraded performance, but that even large content providers cannot.

The experience of Comcast and Netflix illustrates this dynamic.

In response to the degraded performance, "Comcast experienced a surge in Netflix-related customer-service calls with customers complaining about Comcast's broadband service."[116]

Anecdotal evidence suggests that these calls resulted in customers buying a new modem or upgrading to a faster, more expensive internet access plan.[117] When that – predictably – didn't improve Netflix' performance, Comcast's customer support suggested contacting Netflix:

> "For many subscribers, the bitrate was so poor that Netflix's streaming video service became unusable.
>
> A number of Comcast's customers complained to Comcast about the poor video streaming quality they were experiencing. My understanding is that Comcast suggested to some customers that perhaps their modern was faulty and recommended that they replace it with a new one. When Comcast's customers complied with those suggestions and they continued to experience poor quality or unwatchable Netflix video streams, my understanding is that Comcast told its customers to contact Netflix."[118]

As Netflix' quality deteriorated, calls to Netflix' customers support center increased dramatically, with the number of calls complaining about rebuffering and slow-loading growing more than 8 times between June 2014 and February 2015.[119]

[116] Sappington Comcast Reply Declaration, para. 20 (citing Comcast's economic expert).
[117] See Florance Declaration I; Evans Declaration II, fn. 200 (noting that his analysis of transcripts of Netflix customer service chats suggests that customers were "more likely to attempt to upgrade their broadband speeds, thereby providing a benefit to Comcast" than cancel their Comcast internet subscription).
[118] Florance Declaration I, para. 52.
[119] Florance Declaration I, para. 51.

> "Those customers complained to Netflix and some of them canceled their Netflix subscription on the spot, citing the unacceptable quality of Netflix's video streams and Netflix's inability to do anything to change the situation."[120]

The experience of this subscriber represents the experience of many American internet access customers at the time:

> "The bottleneck has made Netflix unwatchable for Jen Zellinger, an information-technology manager from Carney, Md., who signed up for the service last month. She couldn't play an episode of "Breaking Bad" without it stopping, she said, even after her family upgraded their FiOS Internet service to a faster, more expensive package.
>
> "We tried a couple other shows, and it didn't seem to make any difference," she said. Mrs. Zellinger said she plans to drop her Netflix service soon if the picture doesn't improve, though she will likely hold on to her upgraded FiOS subscription.
>
> She and her husband thought about watching "House of Cards," but she said they probably will skip it. "We'd be interested in getting to that if we could actually pull up the show," she said."[121]

In the end, while the significant degradation of Comcast's internet access service caused a surge in Netflix-related calls to Comcast's customer support line, few of these angry customers actually terminated their Comcast subscription.

By contrast, for Netflix, the performance degradation was a critical threat to its business.

In the end, Netflix ended up paying Comcast the demanded fees to end the congestion[122] and soon after raised prices on its base service.[123]

Large ISPs v. small CAPs

Whatever the relative bargaining power between large ISPs and large content providers, small content providers and networks have it worse. They are effectively at the mercy of the ISPs.

Just like large content providers, smaller and medium-size content providers and networks have to pay the termination fee if they (or their clients) need undegraded performance and can afford it.

But compared to larger content providers, they pay termination fees that are much higher, reflecting their lower bargaining power.

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[120] Florance Declaration I, para. 52.
[121] https://www.wsj.com/articles/SB10001424052702304899704579391223249896550.
[122] https://www.wsj.com/articles/SB10001424052702304834704579401071892041790.
[123] https://www.cnbc.com/2016/04/08/netflix-disclosed-price-hike-in-2014 html.

So that means that the network fees tilt the playing field against smaller companies and networks competing against the largest CAPs, CDNs and hosting providers.

However much the largest ISPs want to frame their network fees as a blow against the largest US applications, in reality, the fees harm smaller players even more, making it even harder for small and local competitors to compete with and try to displace the net's largest players.

Take for example, the Croatia example above where local networks and applications have to pay a termination fee, but the largest CAPs are immune. If local networks have to pay termination fees, homegrown hosting companies now have to pay a connection fee that the largest, non-Croatian networks and hosting companies don't. That means it becomes a better deal for Croatian-centric websites and apps to host with non-Croatian businesses - the biggest players in the world - than with the smaller local players that previously had advantages in price, service and interconnection.

The problems discussed throughout this section – large ISPs' ability to leverage their termination monopoly and control over large numbers of subscribers into supra-competitive termination fees, the resulting distortions in competition among large and small ISPs (and even among large ISPs able to charge network fees, depending on their size), or the various distortions of competition between content providers, depending on their size – exist only when large ISPs charge termination fees.

By contrast, when internet access providers peer settlement-free with companies that deliver the traffic the ISP's customers requested, these problems don't arise.

Thus, the answer here is not that all CAPs, CDNs and networks should pay network fees. Large ISPs have tried to push the internet down this path many times, and the idea of flipping the internet's incredibly successful economic model to the retrograde economic model of the phone system has been rejected over and over.

The answer here is that it's clear that network fees are harmful and that no one should be coerced into paying them, whether through regulation, mandatory dispute resolution to determine the size of the fee, or the use of the playbook.

Interconnection practices can violate the Open Internet regulation.

As the Draft Report recognizes, the market for IP interconnection in Europe generally works well.

Only some of the large ISPs in Europe degrade unpaid connections into their network in order to extract termination fees from companies that deliver the traffic their customers requested.

While these practices cause significant harm to consumers, content providers, and the intermediary providers that serve them, they can be addressed case-by-case by the Open Internet Regulation. Thus, there is no need for new regulation.

The Open Internet Regulation covers internet access provider's interconnection practices, either directly or indirectly.

The Open Internet Regulation does not mention interconnection, but it applies to the provision of internet access service. Thus, the Regulation directly applies to an internet access provider's interconnection practices if connecting internet access customers to the rest of the internet is part of the provision of internet access service.

The Open Internet Regulation is silent on this question.

Europeans buy internet access services to get access to the entire internet, not just to their ISP's network. Consistent with that, the Regulation defines internet access service as a service that "provides access to the internet, and thereby connectivity to virtually all end points of the internet."[124] The Regulation explicitly protects end users' right to access and use the applications of their choice, "regardless of the location, origin or destination of the information, content, application or service."[125]

However, an internet access provider's network only includes a subset of end points on the internet. Thus, to provide connectivity to virtually all end points of the internet, as the definition of internet access requires, an internet access provider *necessarily* needs to interconnect with other providers in a way that allows subscribers to interact with virtually all end points on the internet. Given the nature of the internet as a "network of networks," it's impossible to provide internet access without interconnection.

This suggests that interconnecting with other providers so an internet access provider's customers can access all endpoints on the internet is an integral part of the provision of internet access service and, therefore, directly subject to the Regulation.

However, it's not necessary to decide this question. That's because at a minimum, the Open Internet Regulation prohibits ISPs from using interconnection practices to circumvent the Open Internet Regulation.

[124] Art. 2(2): "'[I]nternet access service' means a publicly available electronic communications service that provides access to the internet, and thereby connectivity to virtually all end points of the internet, irrespective of the network technology and terminal equipment used."
[125] Art. Art. 3(1).

This interpretation follows directly from the text and goals of the regulation.

According to Art. 3(2), "any commercial practices conducted by providers of internet access services shall not limit the rights of end-users" under Art. 3(1) and "thus circumvent the provisions of this regulation safeguarding open internet access."[126] Interconnection practices clearly constitute "commercial practices."

Consistent with this interpretation, BEREC's net neutrality implementation guidelines rightly note that this prohibits ISPs from circumventing the provisions of the Open Internet Regulation via interconnection:

> "NRAs may take into account the interconnection policies and practices of ISPs in so far as they have the effect of limiting the exercise of end-user rights under Article 3(1). For example, this may be relevant in some cases, such as if the interconnection is implemented in a way which seeks to circumvent the regulation."[127]

ISPs can block or discriminate when data enters their networks (i.e. at the point of interconnection) or when data is traveling over those networks. The impact on users and websites is the same either way, as is the harm to innovation and free speech. Thus, banning blocking, throttling, and paid prioritization on the access network, but not at the point of interconnection, would allow ISPs to easily evade the Regulation by engaging in these practices at the point of interconnection instead.

Thus, interpreting the Regulation in a way that allows ISPs to circumvent the Regulation's open internet protections through interconnection practices would create a huge loophole that would make it impossible for the regulation to reach its stated goal of "protect[ing] end-users and simultaneously to guarantee the continued functioning of the internet ecosystem as an engine of innovation."[128]

As the Draft Report recognizes, whether specific interconnection practices violate the Regulation requires a case-by-case determination.

For example, as explained above, in the US, large ISPs' practices of allowing unpaid connections into their networks to congest in order to extract termination fees from companies delivering traffic that these customers requested effectively made it impossible for internet access customers to use Netflix or play League of Legends during peak times.

[126] Recital 7.
[127] BEREC 2022 NN Implementation Guidelines, para. 6 (citing Recital 7).
[128] Recital 1.

Large ISPs' use of the playbook thus made it impossible for end users to exercise their right under Art. 3(1) "to use the applications and services … of their choice … via their internet access service," likely violating Art. 3(1) either directly or in connection with Art. 3(2).

Some interconnection practices might circumvent the OIR's non-discrimination rule in Art. 3(3), e.g., by discriminating between apps that pay and those that enter the network through unpaid connections based on commercial considerations.[129]

[129] In this respect, see also BEREC 2022 NN Implementation Guidelines, paras. 37a and 49, which, as BEREC has noted, "point out (and contain elements to underpin) that typically, violations of Article 3(3) of the OIR will also limit the exercise of end-users' rights, thereby breaching Articles 3(2) and 3(1) of the OIR." (BoR (23) 131d, p. 15, fn. 35).