T-Mobile's Binge On Violates Key Net Neutrality Principles

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Executive Summary

In November 2015, T-Mobile, the third largest provider of mobile Internet access in the U.S., launched a new service called Binge On that offers "unlimited" video streaming from selected providers. Customers on qualifying plans can stream video from forty-two providers in Binge On – Netflix, Amazon, Hulu, HBO, and others – without using their data plans, a practice known as zero-rating. As currently offered, Binge On violates key net neutrality principles and harms user choice, innovation, competition, and free speech online. As a result, the program is likely to violate the FCC's general conduct rule.

Binge On undermines the core vision of net neutrality: Internet service providers (ISPs) that connect us to the Internet should not act as gatekeepers that pick winners and losers online by favoring some applications over others. By exempting Binge On video from using customers' data plans, T-Mobile is favoring video from the providers it adds to Binge On over other video.

T-Mobile says that it does not intend to become a gatekeeper on the Internet: It says Binge On is open to all legal video streaming providers at no cost, as long as they can meet some "simple technical requirements." The idea is that any discriminatory effects of Binge On disappear as more providers join the program. However, the technical requirements published on T-Mobile's website are substantial. They categorically exclude providers that use the User Datagram Protocol (UDP), making it impossible for innovative providers such as YouTube to join. They discriminate against providers that use encryption, a practice that is becoming the industry standard. While some providers can join easily, a significant number will need to work with T-Mobile to determine whether their service can be part of Binge On. Many will have to invest time and resources to adapt their service to T-Mobile's systems. The smaller the provider, the longer it will likely take for T-Mobile to get to it.

The result: Binge On allows some providers to join easily and creates lasting barriers for others, especially small players, non-commercial providers, and start-ups. As such, the program harms competition, user choice, free expression, and innovation:

First, Binge On distorts competition. Research shows that customers prefer zero-rated content over content that uses their data plans. As a result, Binge On video is automatically more attractive to customers because it is zero-rated. Providers in Binge On enjoy a competitive advantage, not based on merit but simply because T-Mobile added them to its program. Video creators are also more likely to use Binge On providers over other platforms for their video content, further distorting competition. So far, T-Mobile has added only a subset of providers in each market category, giving these services an immediate advantage over competitors.

Second, Binge On limits user choice. Customers on T-Mobile's lowest qualifying plan can watch unlimited video from Netflix and other Binge On providers until they reach their cap, but not more

than 4½ hours of video per month, or 9 minutes per day, from providers not included in Binge On. This is not a meaningful choice.

Third, Binge On stifles free expression. The forty-two providers currently in Binge On deliver mostly commercial video entertainment – not user-generated, educational or non-profit video. If T-Mobile continues to favor entertainment from commercial providers over other content, it turns the mobile Internet offered by T-Mobile into an optimal platform for commercial entertainment at the expense of all other speakers. This undermines the potential of the Internet as a democratic space for free expression.

Fourth, Binge On harms innovation. The Internet was built on a central principle: As long as innovators respect fundamental Internet standards, they can reach people all over the world at low costs. Binge On changes that. It requires video providers to work with T-Mobile to join Binge On and, in many cases, to change their service to meet the ISP's technical requirements.

The above concerns are not hypothetical. Music Freedom, T-Mobile's zero-rating program for music streaming, has created similar harms that continue today. T-Mobile has said that Music Freedom is open to all music streaming services since it launched the program in 2014. Although the program has grown from 7 to 40 providers, it still includes only a fraction of the more than 2,000 licensed online radio streaming services in the US. Some smaller services had to wait 1½ years to be included; some never heard back from T-Mobile at all. In the past three months alone, Twitter users have asked T-Mobile to add at least 109 music streaming providers that are not yet part of the program. Regardless of T-Mobile's intentions, it is not feasible for the ISP to immediately add every music provider that wants to join. So far, T-Mobile has at least in part focused on adding larger, more popular services first. While that is a rational business strategy, it distorts competition in a way that puts small players at a competitive disadvantage. Moreover, the program is limited to commercial providers as a matter of policy. As a result, Music Freedom has created lasting barriers for small players, non-commercial providers, and start-ups.

Even if T-Mobile could somehow add every single video provider to Binge On – large and small, commercial and non-commercial – the program would still violate net neutrality. Binge On favors video streaming over all other Internet uses, even those that use the same amount of bandwidth or less. As long as Binge On gives special treatment to video as a class, it undermines the vision of an open Internet where all applications have an equal chance of reaching audiences, and people, not ISPs, choose how to use the bandwidth available to them.

If left unchecked, Binge On leads us down a slippery slope. As other ISPs offer similar programs, the cumulative harms will change the Internet as we know it. More and more ISPs will become gatekeepers that pick winners and losers online, distorting competition for an increasing number of Internet users. Innovators will now need to work with ISPs around the world to join their zero-rating programs – all just for an equal chance to compete. Small players, non-commercial speakers, and start-ups without the resources to engage numerous ISPs across the globe will be left behind.

This will end the era of "innovation without permission" – an important principle that has allowed innovation to flourish on the Internet up until now.

Binge on in its current form violates net neutrality. However, T-Mobile could offer alternative innovative plans that benefit customers and allow the ISP to compete without violating net neutrality. For example, T-Mobile could offer customers a zero-rated low-bandwidth mode at the same speed as Binge On. Use of that mode would not count against the cap, but customers would be able to use this mode however way they choose: They could watch video or do anything else online. This plan is similar to Binge On in its current form but without the host of net neutrality concerns.

Alternatively, T-Mobile could allow customers unlimited access to the entire Internet after they reach their cap, just at a slower speed – the same speed currently offered through Binge On. After reaching their cap, customers could watch video or do anything else online; again it would be their choice. This option offers customers truly unlimited video, unlike Binge On. Contrary to advertising, Binge On video is limited: Customers can watch video included in the program only until they reach their monthly data cap through other Internet uses that are not zero-rated. As such, advertising Binge On as "unlimited" video might violate the FCC's transparency rule, which requires ISPs to accurately describe their service. In contrast, this alternative option would allow T-Mobile to offer "unlimited video streaming" that stands up to its name and respects net neutrality.

Finally, T-Mobile could increase the monthly data caps on its capped plans to account for the average amount of video that people are watching. Customers could use that additional bandwidth to do anything online, including watching video. Again, it would be their choice. All of these alternative plans are entirely consistent with net neutrality.

In sum, Binge On violates key net neutrality principles that the Open Internet rules are designed to protect and creates harms to Internet openness that the general conduct rule is meant to prevent. Taken together, it is likely that Binge On violates the general conduct rule and is therefore illegal.

Introduction

In November 2015, T-Mobile, the nation's third largest provider of mobile Internet access, launched a new service called Binge On that offers "unlimited" video streaming from selected providers.[1] Customers can stream video from the forty-two providers that are part of Binge On – Netflix, Amazon, Hulu, HBO, and others – without using their data plans, as long as they stay under their monthly data cap.

Binge On is one of several new "zero-rating" programs introduced by Internet service providers (ISPs) in the last few months.[2] Zero-rating, the practice of exempting select applications from customers' monthly bandwidth caps, comes in different forms. Comcast exempts Stream TV, its own Internet TV application, from customers' data caps; all other online video applications continue to count against the caps. AT&T's "sponsored data" program allows any provider to pay to have its content zero-rated. Verizon just announced a similar program.

In its 2015 Open Internet Order, the Federal Communications Commission (FCC) decided not to take a position on zero-rating and instead to evaluate specific instances of the practice case-by-case under the general conduct rule.[3] The general conduct rule prohibits practices by providers of broadband Internet access (ISPs) "that harm Internet openness" by, for example, harming consumer choice, competition, innovation, or free speech online.[4]

Comcast's, AT&T's, and Verizon's zero-rating programs raise clear net neutrality concerns. Comcast's zero-rating favors its own online video service over all competing online video services – a textbook example of an ISP using its position as a gatekeeper to pick winners and losers online.[5] AT&T's and Verizon's plans allow app providers to buy a competitive advantage, causing the same harms to Internet openness as charging companies to be in a "fast lane."[6] During last year's

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[1] T-Mobile USA (2015h).

[2] Brodkin (2015) (Comcast); Fitchard (2014) (AT&T); Brodkin (2016) (Verizon).

[3] Federal Communications Commission (2015), p. 68, para 152.

[4] Federal Communications Commission (2015), p. 60, para 137. See also para 136. 47 C.F.R. §8.11 (A provider of broadband Internet access service "shall not unreasonably interfere with or unreasonably disadvantage (i) end users' ability to select, access, and use broadband Internet access service or the lawful Internet content, applications, services, or devices of their choice, or (ii) edge providers' ability to make lawful content, applications, services, or devices available to end users. Reasonable network management shall not be considered a violation of this rule.").

[5] See generally, van Schewick (2015d), pp. 5-8 (discussing the harms of zero-rating selected applications in a group of similar applications). See also footnote 7. That an ISP has the technical ability and economic incentive to exploit its position as a gatekeeper to advantage its own Internet applications, content, or services is a core concern underlying the FCC's Open Internet rules. See, e.g., Federal Communications Commission (2015), pp. 29-32, paras 78-81 (discussing ISPs' position as a gatekeeper), pp. 32-33, para 82 (discussing ISPs' incentives "to favor their own or affiliated content over other third-party sources"), pp. 47-48, para 111, p. 52, para 123, p. 53, para 125, p. 62, para 140 (discussing ISPs' incentive to favor their own or affiliated content in the context of the three bright-line rules and the general conduct rule). See also Federal Communications Commission (2010), p. 3, para 3, pp. 5-21, paras 13-34, pp. 45-46, para 78, p. 114, para 4.

[6] See generally, van Schewick (2015d), pp. 3-5 (discussing the harms of zero-rating against a fee); Federal Communications Commission (2015), pp. 29-32, paras 80, 81, p. 45, para 103, pp. 53-58, paras 125-129 (discussing the harms of ISPs charging application providers for technical forms of preferential treatment); van Schewick (2015a),

Open Internet proceeding, many stakeholders asked the FCC to prohibit ISPs from zero-rating selected applications in a class of similar applications (as Comcast does) and from offering zero-rating to application providers for a fee (as AT&T and Verizon do or intend to do).[7]

The net neutrality implications of T-Mobile's Binge On program are less obvious but nonetheless significant. Unlike Comcast, T-Mobile welcomes all video streaming providers to join its program. And unlike AT&T and Verizon, T-Mobile allows providers to join its program without paying a fee. As a result, Binge On seems on its face less harmful than these other zero-rated offerings.

However, as this report shows, Binge On violates key net neutrality principles necessary to preserve Internet openness. It limits user choice, harms innovation, distorts competition, and stifles free speech online. As such, the program violates the principles the FCC's general conduct rule is designed to protect and causes the types of harms it's meant to prevent. Therefore, based on what we know about the program, it is likely that Binge On violates the FCC's general conduct rule.

In sum, Binge On is aptly named: it feels good in the short-term but harms consumers in the long run.

Instead of Binge On, T-Mobile could offer alternative innovative plans that benefit customers and respect net neutrality. Two of the three network neutrality-friendly alternatives to Binge On described in this report would allow T-Mobile customers to continue to "binge on" video without endangering net neutrality.

Note: This report focuses on the aspects of Binge On related to zero-rating. In recent weeks, observers have also raised concerns regarding the technical implementation of the program. As part of the program, T-Mobile limits *all* online video to a lower speed, regardless of whether the provider is part of Binge On.[8] Customers can opt out of the rate limits, but those who do so also lose the benefits of the zero-rating program. These rate limits appear to violate the FCC's no-throttling rule, which prohibits ISPs from technically discriminating between similar applications or classes of applications.[9] While important, the question of whether Binge On violates the no-throttling rule is outside the scope of this report.

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pp. 11-17 (discussing the harms of allowing ISPs to charge application providers for any kind of preferential treatment). See also footnote 7.

[7] See, for example, 18MillionRising.org, et al. (2015), incl. fn. 1; Common Cause (2015); Future of Music Coalition (2015), pp. 1-2; van Schewick (2015d), pp. 3-8; Vimeo, et al. (2015), p. 2; Union Square Ventures (2015) (all supporting a ban on zero-rating select applications in a class of similar applications and on zero-rating against a fee); van Schewick (2015e), pp. 6-10 (collecting submissions supporting banning zero-rating of select applications in a group of similar applications), 18-20 (collecting submissions supporting banning zero-rating against a fee); Ananny, et al. (2015) (supporting ban on zero-rating against a fee).

[8] T-Mobile limits all video to a lower speed that allows users to watch video at the lower resolution of 480p. The rate limits are in effect on all of T-Mobile's 4G LTE mobile Internet plans (not only on those that qualify for Binge On) and apply to all online video, regardless of whether the provider is part of Binge On. tmo_marty (2015); Gillula (2016a); Finley (2016).

[9] See, e.g., Ammori (2015); Gillula (2016a); McKinnon & Gryta (2015); The Internet Association (2015); Segan (2016); O'Connor (2016); Masnick (2016); Holly (2016).

I. Contrary to advertising, Binge On does not offer unlimited video streaming, raising transparency concerns.

Binge On is available to T-Mobile customers on mobile 4G LTE Internet plans with a monthly data cap of at least 3 GB. The forty-two providers that are part of Binge On – Netflix, Amazon, Hulu, HBO, and others – do not count against customers' data caps.[10]

According to T-Mobile's advertising, Binge On allows customers on qualifying plans to "stream unlimited video" from providers in the program.[11] (See Figure 1 below and the screenshots in the Appendix.) But the detailed description of the plan discloses otherwise. Customers can only watch video from these providers until they reach their monthly data caps through other Internet uses that are not zero-rated.[12] Their ability to watch Binge On video is inherently limited.

Here's how it works: T-Mobile customers can watch as much video as they want from select providers in Binge On without getting closer to their caps. Everything else they do online – checking e-mail, sharing on Facebook, playing games, using maps, or watching video from providers not included in Binge On – continues to count against their caps. Once customers reach their caps (and have used up any unused rollover data from prior months), all of their Internet traffic, including video from Binge On providers, is slowed down to 2G speeds (about 1/100 of the 4G LTE speeds).[13] These speeds still allow customers to use e-mail and surf the web at very slow speeds, but most applications, including streaming video, become unusable.[14] Customers can only "binge on" video until they reach their monthly data caps.

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[10] The forty-two providers included in Binge On at the time of this writing are listed in footnote 33 below.

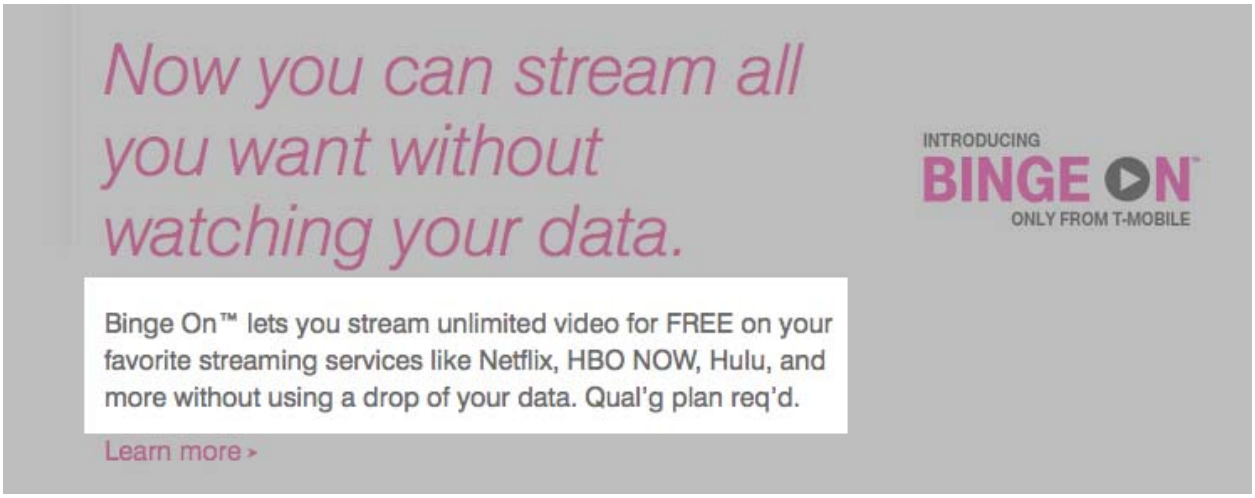
[11] See, for example, the description on the Binge On product page: "With Binge On™, Simple Choice users on a qualifying plan are FREE to stream unlimited video on your favorite services like Netflix, HBO NOW, Hulu, and many more without using a drop of your data." (T-Mobile USA (2015c)), or the description on the product page for mobile Internet plans: "With Binge On™ - stream unlimited video on the most popular streaming services like Netflix, HBO NOW, Hulu, and others for FREE without using your high speed data." (emphasis removed) (T-Mobile USA (2015g)). For screenshots and additional examples, see the Appendix, Section 1.

[12] T-Mobile USA (2015c), Section "Questions about this Plan?" ("What happens when I run out of high-speed data? Because video streams free from your favorite video streaming services and almost all other video streaming is optimized so you can watch 3 times more video with your data plan, we think it will be hard to run out of data. But if you do, you will first draw from your Data Stash. If you exhaust your Data Stash your data, including all video streaming, will be slowed to 2G speeds, but you'll never get hit by an overage. EVER!"). See also the fine print at the bottom of the page (Ibid.) ("Video streaming from included services does not count toward full-speed data allotment on our network. Third party content and subscription charges may apply. Once high-speed data allotment is reached, all usage slowed to up to 2G speeds until end of bill cycle.") and the fine print on the bottom of the product page for mobile Internet plans. (T-Mobile USA (2015g)). For screenshots, see the Appendix, Section 2.

[13] According to T-Mobile's Open Internet Disclosure page, 2G speeds offer typical download rates of 40Kbps-200Kbps, upload speeds of 20-80 Kbps, and significantly higher delays than 4G LTE. T-Mobile USA (2015a).

[14] Lo (2012); Sullivan (2015); Merritt & Aydin (2014).

Figure 1: T-Mobile's Website Advertises Binge On as "Unlimited Video"



Source: T-Mobile USA (2015g) as of January 28, 2016 (highlight added).

The limits on streaming video through Binge On are likely to affect a considerable number of T-Mobile customers. According to Pew Research, 15% of smartphone owners in the US reach their caps frequently; 37% do so occasionally. Young people, Blacks, and Latinos are even more likely to have their Binge On video throttled to 2G speeds. About 20% in each of these groups exhaust their data caps frequently, and even more do so occasionally: 43% of smartphone owners who are Black, 49% who are Latino, and 48% who are young people between 18 and 29 years.[15]

Customers need to understand the limits of Binge On in order to make informed choices about their Internet use or data plans. For example, informed customers who want to preserve the ability to watch Binge On video might decide to carefully monitor all other Internet uses to ensure they stay below their data cap. Some customers who frequently go over their cap might choose to upgrade to a plan with a higher cap.

Describing Binge On as "unlimited" video streaming might mislead consumers in a way that violates the FCC's transparency rule. To allow consumers to make informed choices, the transparency rule prohibits ISPs from making assertions about their Internet access service that are inaccurate, misleading, or deceptive.[16] As the FCC has explained in the past, the transparency rule requires any public statements about the service to be accurate; it is not sufficient to describe a service accurately only in more detailed disclosures or in the fine print.[17] This suggests that it doesn't matter that T-Mobile discloses the limited nature of Binge On in less visible parts of the

[15] Pew Research Center (2015), p. 16.
[16] 47 C.F.R. §8.3. As the text of the FCC's 2015 Open Internet Order explains, "the transparency rule 'prevents a broadband Internet access provider from making assertions about its service that contain errors, are inconsistent with the provider's disclosure statement, or are misleading or deceptive.' Federal Communications Commission (2015), p. 71, para 160, citing Federal Communications Commission (2014), p. 8607.
[17] Federal Communications Commission (2015), p. 71, para 160; Federal Communications Commission (2014), p. 8607.

website that customers are less likely to read.[18] (See the examples in the Appendix, Section 2.) As long as T-Mobile calls Binge On "unlimited" video streaming in advertisements and on its website, it potentially violates the transparency rule.

It is important to note that T-Mobile is actually required to throttle all data, including video from Binge On providers, once customers hit their cap, in order to comply with the FCC's no-throttling rule. This rule prohibits ISPs from technically discriminating between similar applications or classes of applications.[19] Allowing customers who reach the cap to continue to stream Binge On video, while slowing all other uses to a crawl, would violate that rule. Unlike video streaming, streaming music is still possible at 2G speeds. As a result, T-Mobile customers can continue to stream music through Music Freedom, T-Mobile's other zero-rating program, even after they have used up their monthly data.[20] Unlimited music streaming does not involve technical discrimination among applications and therefore does not violate the FCC's no-throttling rule.

II. Binge On gives providers in the program a competitive advantage.

A core principle of net neutrality is that ISPs should not pick winners and losers online by favoring some applications over others.[21] But that's exactly what Binge On does. Customers have a greater incentive to watch videos that are included in Binge On than those that are excluded. As a result, providers in the program can be more successful than providers that T-Mobile leaves out.

1. The video available through Binge On is more attractive to consumers than video that is not.

Customers are more likely to watch video that is available through Binge On than video that is not. Research shows that people strongly prefer zero-rated content over content that counts against

[18] To get to the question addressing the limits on Binge On after customers reach their caps, consumers need to scroll to the section "Questions about this plan?" at the bottom of the Binge On product page and click on "View more questions." The relevant question ("What happens if I run out of high-speed data?") is the 10th question in this section. (T-Mobile USA (2015c)). The limits are also disclosed in the fine print on the bottom of the product pages for mobile Internet plans and for Binge On (T-Mobile USA (2015g); T-Mobile USA (2015c)). See also footnote 12 above. For screenshots, see the Appendix, Section 2.

[19] 47 C.F.R. § 8.7; Federal Communications Commission (2015), fn. 17 ("To be clear, the protections of the no-blocking and no-throttling rules apply to particular classes of applications, content and services as well as particular applications, content, and services.") and para. 120.

[20] T-Mobile (2015), Section "Questions about Music Freedom?" ("Will my music streaming be slowed to 2G speeds after reaching a certain data limit? No. Music Freedom is just that, the freedom to stream all of the music you want to your smartphone without affecting your 4G LTE data bucket while you are on our blazing fast network. If you reach your 4G LTE data limit through other means your on-network data will be slowed to 2G speeds but music streaming through included services will not be slowed down.") See also Ham (2015) (on file with the author).

[21] That an ISP has the technical ability and economic incentive to exploit its position as a gatekeeper to favor some applications over others is a core concern underlying the FCC's Open Internet rules and the general conduct rule. See, e.g., Federal Communications Commission (2015), pp. 29-32, paras 78-81 (discussing ISPs position as a gatekeeper), p. 62, para 140, pp. 63-64, para 144. See also Federal Communications Commission (2010), p. 3, para 3, pp. 5-21, paras 13-34, pp. 45-46, para 78, p. 114, para 4. See also the discussion in footnote 5 above and footnotes 36 and 37 below.

their cap. In one study commissioned by the CTIA, 74% of users said that they would be more likely to watch videos offered by a new provider if the content did not count against their monthly bandwidth caps.[22] In an experiment, the online magazine Slate told some users that a podcast did not count against their cap. Those who were offered the zero-rated podcast were 61% more likely to click on the link.[23]

This is not surprising. Many consumers are wary of going over their cap. They know that videos use a lot of data, but most don't know how much data a specific video will use, and how much monthly data they have left.[24] So the safer approach for customers is to watch videos that do not count against their cap.[25] As a result, T-Mobile customers will prefer videos available through Binge On over others – a preference based on a provider's inclusion in Binge On, not on the merits of the provider.

We can already observe this effect with respect to Music Freedom, T-Mobile's zero-rating program for music. On Twitter, Reddit, and Medium, T-Mobile customers have reported that Music Freedom affects which music streaming provider they use when streaming music over their mobile 4G LTE Internet connection. When customers find that their preferred provider is not included in the program, they instead use a different streaming provider that is part of Music Freedom – only because it will not count against their monthly cap.[26] Binge On is likely to have the same effect on video streaming.

2. Binge On directly limits user choice among video streaming providers.

Binge On plans directly limit the ability of customers to make meaningful choices among video providers.[27] Until they reach their cap, customers can watch as much video from Binge On

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[22] CTIA - The Wireless Association (2014), p. 12.

[23] Knutson (2014).

[24] Various studies have documented that customers have trouble understanding how much bandwidth specific applications use and how much data they have already used. See, e.g., Chetty, et al. (2012), pp. 3025 (study of South African households); Chetty, et al. (2015), p. 6 (study of US, South African, and Indian households); Union des Consommateurs (2013), pp. 29-30 (survey of Canadian Internet users); United States Government Accountability Office (2014), pp. 13, 16-17 (US focus groups).

[25] Studies show that Internet customers adjust their online behavior in order to avoid going over the cap, e.g., by reducing their use of the Internet service when they get closer to the cap (Nevo, Turner & Williams (2015), p. 8 (empirical study based on data set of Internet usage data of 55,000 users from an ISP)), by avoiding the use of applications known to be bandwidth-intensive (e.g., streaming video applications) on mobile Internet plans subject to caps (Chetty, et al. (2012), pp. 3025-3026; Horrigan (2014), p. 5 (survey of online Americans); United States Government Accountability Office (2014), pp. 17-18 (US focus groups)) or by waiting to engage in such activities on mobile devices until the device is connected to the Internet via WiFi (Horrigan (2014), p. 5 (survey of online Americans); United States Government Accountability Office (2014), pp. 16-17 (US focus groups)). A recent survey of online Americans found that "[o]ut of 55% of smartphone users with a data cap, more than half – 52% - have altered their online behavior because of the cap – either by not doing some online activities out of concern for hitting the limit or by waiting until they were within Wi-Fi range." (Horrigan (2014), p. 5).

[26] Trinition (2015); Trinition (2015); Trinition (2015); cocobandicoot (2015); travysh (2015); Sam (@Sammy1AM) (2015); Mad Hatman (@madhatman) (2015); Yiakoumis (2015).

[27] Protecting user choice is an explicit purpose of the Open Internet rules. See 47 C.F.R. §8.1. The FCC's general conduct rule explicitly protects Internet "users' ability to select, access, and use … the lawful Internet content,

providers as they want over their mobile 4G LTE Internet connection, but their ability to watch video from providers not included in Binge On is severely limited.[28]

For example, customers on T-Mobile's lowest qualifying plan with a 3 GB bandwidth cap can watch only 4½ hours of video per month from these other providers, and that's only if they use their entire capped bandwidth to watch video and do nothing else online.[29] That means they can watch about 9 minutes of video a day, or about one hour-long show per week, from Vimeo, Apple iTunes, or any other provider not included in Binge On. Customers on the plan with the highest cap, 10 GB, can watch at most 15 hours of video from other providers per month, or about 30 minutes per day. Most people use their mobile Internet connection for more than watching video, so the amount of video from other providers that customers can realistically watch in a month before they reach their cap is likely to be much lower.

In contrast, customers can watch as much video as they want from Netflix and other Binge On providers. Choosing between unlimited video from Netflix and less than 9-30 minutes a day (depending on the cap) from a non-Binge On provider is not a real choice. As a result, these capped providers simply cannot compete with companies included in Binge On, no matter how good their offerings.

3. Binge On makes video distribution platforms included in the program more attractive to video creators than platforms that are not.

Just as consumers are more likely to watch zero-rated videos than videos that count against their monthly caps, video content creators are likely to prefer distribution platforms that are zero-rated over platforms that are not. That means video creators might now choose a Binge On platform, not for its merits but simply because their videos will be more attractive to viewers if they don't use up viewers' data plans.

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applications, services, and devices of their choice." 47 C.F.R. §8.11. Whether a practice promotes consumer choice is one of the factors the FCC will consider when evaluating ISP conduct under the general conduct rule. Federal Communications Commission (2015), pp. 61-62, para 139. Promoting consumer choice has been a longstanding principle underlying Commission policy even before the advent of the Internet. Federal Communications Commission (2015), pp. 18-20, paras 60-65. User choice, i.e. that users are free to use the applications of their choice without interference from ISPs, is one of the key principles that has allowed the Internet to serve as an open platform for application innovation and free speech. See, e.g., Federal Communications Commission (2010), pp. 5-6, para 13, pp. 40-41, para 71; Cerf (2006), pp. 8-9, 13; van Schewick (2010b), pp. 144, 152-155, 293-295, 349-351, 362-364 (both discussing the importance of user choice for innovation). On the importance of user choice for the Internet's social, cultural, and political potential, see, for example, Balkin (2009) and van Schewick (2010b), pp. 359-65.

[28] However, data consumed when a subscriber connects to the Internet via Wi-Fi does not count against the cap. Thus, a T-Mobile customer could watch additional video from any provider on her phone by connecting to the Internet via Wi-Fi.

[29] The calculations in the text assume that video from providers not included in Binge On is limited to a rate of 1.5 Mbps. Unless a customer has opted out of Binge On, T-Mobile limits all video to a slower speed, regardless of whether the video streaming provider is part of Binge On. See text accompanying footnote 8 above. According to tests by the Electronic Frontier Foundation, video that is not included in Binge On is limited to a speed of 1.5 Mbps on T-Mobile's network. Gillula (2016a) and Gillula (2016b).

Video creators often prefer to upload their video to a video platform. This maximizes viewer count, which often drives additional viewer interest and increases the video's rank in search engines.[30] An independent filmmaker interested in monetizing her video might now use Binge On's Vessel over alternative platforms like Vimeo, Maker.tv, or YouTube, which are not included in Binge On. An event organizer might choose Ustream to live stream an event instead of other providers that are not part of Binge On. If Binge On companies attract more video creators than other streaming services, this would further disadvantage video streaming services that are not part of T-Mobile's program.

In sum, Binge On encourages users to choose certain video streaming applications over others, and also leads video creators to prefer providers included in Binge On over those that are not. Thus, Binge On distorts competition and restricts user choice—outcomes that network neutrality seeks to prevent.[31]

III. T-Mobile's selection of services harms competition and stifles free expression.

T-Mobile says it welcomes all video providers to join Binge On and doesn't want to "play gatekeeper,"[32] but that's what it has done: Before launching Binge On, T-Mobile had to decide which services to reach out to and work with to make sure they were included from day one. T-Mobile launched the program on November 15, 2015 with twenty-four providers. It added fourteen more on January 7, 2016, and an additional four providers on January 28, 2016.[33]

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[30] Film Shortage (2012); Archer (2014); Nottingham (2012).

[31] See footnote 27 (user choice) and footnotes 36, 37, and 109 (competition).

[32] Coldewey (2015).

[33] The current list of Binge On providers include (providers added in January are listed in italics):

- Initially six, now nine free, ad-supported video streaming services (Crackle, *Fox News*, Fox Sport, Go90, *Newsy*, *ODK (On Demand Korea) Media*, Ustream, Vessel, and Vevo);
- Initially eight, now eighteen stand-alone, Internet-only subscription video streaming services (*Amazon Video*, *Curiosity Stream*, *Fandor*, *fuboTV*, HBO Now, Hulu Plus, *Kidoodle.TV*, *Lifetime Movie Club*, Major League Baseball, Netflix, *Playstation Vue*, SlingTV, Showtime Streaming, *Tennis Channel Everywhere*,* T-Mobile TV, *Univision Now*, VUDU, and *WWE Network*); and
- Initially ten, now sixteen video streaming services that require a cable or satellite subscription to the corresponding channel (*A&E*, DirecTV, Encore, ESPN, Fox Sport Go, *FYI*, HBO Go, *History*, *Lifetime*, Movieplex, NBC Sports, *Showtime Anytime*, SlingBox, Starz, *Tennis Channel Everywhere*,* and Univision Deportes).

*Tennis Channel Everywhere is counted twice. The online subscription to Tennis Channel Everywhere does not include access to the portion of the application that allows customers with a cable or satellite subscription to the Tennis Channel to live stream the Tennis Channel via the Tennis Channel Everywhere service. Customers with a cable or satellite subscription to the Tennis Channel can live stream the Tennis Channel, but they need to pay the subscription fee for Tennis Channel Everywhere to get access to Tennis Channel Plus and the corresponding on-demand content. (Tennis Channel). For the current list of providers, see T-Mobile USA (2016d). See also T-Mobile USA (2015h) (announcing Binge On); T-Mobile USA (2016c) (announcing the addition of 14 new providers); T-Mobile (2016e) (announcing the addition of 4 new providers).

The forty-two providers currently in Binge On represent only a subset of providers in each market category, giving these providers an immediate advantage over their competitors.[34] Only eight providers offer free video streaming services supported by ads. The rest require customers to subscribe separately. Nearly all are providers of commercial entertainment. Consequently, T-Mobile's selection distorts competition among video providers and stifles free expression by favoring commercial entertainment over other forms of video content.

1. Binge On harms competition by favoring some video streaming providers over others.

T-Mobile's selection of services immediately distorts competition among video providers that compete head-to-head in specific segments of the market. For example, if I am a T-Mobile customer interested in streaming television shows, I can watch unlimited Netflix or Amazon Video until reaching my cap, but I can't really watch Anchor TV, Crunchyroll, Spool or Yaveo. If I'm interested in documentaries, I can binge on Curiosity Stream but not Sundance Now Doc Club. If I want to pay for movies individually, I can watch as many as I want from VUDU or Amazon but not Apple iTunes or Google Play Store. The same is true for watching music videos, live streams, sports, or video on platforms that allow video creators to monetize their content.

In each of these categories, Binge On includes only some video streaming services, but not others, giving those that are "in" an immediate competitive advantage. (See Table 1 below.) Video streaming services like Twitch or YouTube Gaming that stream video games, video game tournaments, or video game talk shows are not included at all.

[34] With respect to the following statements, see the grouping of current providers included in Binge On in footnote 33 above.

Table 1: Video Providers Included In and Excluded From Binge On – By Category

Video category	Part of Binge On	Not part of Binge On
All-you-can-eat, Internet-only subscription services to movies and TV shows	Amazon Prime Instant Video, Netflix, HBO Go, Hulu Plus, Lifetime Movie Club, Playstation Vue, Showtime Anytime, Curiosity Stream (documentaries), Fandor (indie, foreign and cult films), Kidoodle.TV (kids movies and TV shows), ODK Media Plus Membership (Korean content)	Anchor TV (British movies and TV), Crunchyroll (anime, manga, or East Asian cinema), Spool (Bollywood), Sundance Now Doc Club (documentaries), Viki (international TV), Yaveo (Spanish language movies and TV shows)
Pay-per-view movies or TV shows	VUDU, Amazon	Apple iTunes, Google Play Store, M-Go
Live streams	Ustream	Livestream, Meerkat, Periscope, YouNow, YouTube Live
Music video	Vevo TV	Vimeo, YouTube
Sports	Fox Sport, sports channels that are part of Sling TV, fuboTV (soccer), Major League Baseball, Tennis Channel Everywhere, WWE (wrestling)	College Sports Live, KlowdTV (soccer), MSL Live (soccer), NGSN (soccer), NBA League Pass (basketball), NFL Game Pass (football), NHL Game Center Live (ice hockey)
Platforms that allow video creators to monetize their content	Vessel	Facebook, Maker.tv, Vimeo, YouTube

2. Binge On harms free expression by favoring commercial entertainment over other forms of video content.

The majority of services currently in Binge On deliver commercial entertainment – not user-generated, educational, or non-profit video.[35] Binge On does not offer any of the popular platforms for user-generated content such as YouTube or Vimeo. Nor does it include any live video streaming apps such as Periscope, Meerkat, or YouNow that allow anyone with a smart phone or camera to broadcast live video to the world. In addition, Binge On does not offer online education sites like Coursera, Udacity, EdX, Khan Academy, Udemy, or Treehouse. Videos on individual websites – including large platforms like the New York Times – are not included, either.

Consequently, Binge On encourages the consumption of commercial entertainment but effectively limits consumers' ability to watch other kinds of video. Until they reach their monthly cap, T-

[35] See the current list of providers included in Binge on footnote 33 above.

Mobile customers on qualifying plans can watch as much Netflix or HBO as they want. But they have to think twice before watching an independent film on Vimeo, an online lecture on Coursera, or a church sermon on sermon.net or streamingfaith.com.

The result: In its current form, Binge On turns the mobile Internet delivered by T-Mobile into a space for watching commercial entertainment. It gives commercial speakers an advantage over non-commercial speakers that use alternative video streaming platforms. And it hurts T-Mobile's subscribers as listeners, making it harder for them to benefit from the breadth and depth of video content on the Internet.

Network neutrality rules protect the vision of the Internet as a space where all Americans have an equal opportunity to express themselves, organize politically, and connect with one another. They foster a space where everyday people, independent musicians and filmmakers, educators, activists, non-profits, and faith groups can speak and be heard online, creating an alternative to commercial mass media. Just as net neutrality rules don't allow ISPs to pick winners and losers among competing applications, they don't allow them to pick winners and losers among different kinds of speakers or different types of speech.[36] The former is vital for the future of our economy; the latter is vital for the future of our democracy.[37]

It is not clear whether T-Mobile has a formal policy to exclude non-commercial video from Binge On or whether it was simply biased in its initial selection of providers. However, we do know that T-Mobile has a policy that only commercial providers of licensed music can join Music Freedom, its zero-rating program for music. Non-commercial music providers and providers of informational content like podcasts cannot become part of the program.[38] As a result, Music Freedom favors music entertainment over all other forms of streaming audio, and commercial

[36] The FCC's no-blocking rule and the no-throttling rule prohibit ISPs from blocking or technically discriminating among applications, content, and services, or classes of applications, content, and services. Federal Communications Commission (2015), p. 49, para 113, p. 51, para 120. When evaluating ISP practices under the general conduct rule, the FCC will consider whether the behavior is application-agnostic (i.e. does not discriminate among applications, content, and services, or among classes of applications, content, and services). Federal Communications Commission (2015), pp. 63-64, para 144 and fn. 344. An ISP that favors entertainment content over other content or content from commercial speakers over content from non-commercial speakers discriminates among classes of content; such practices are therefore not application-agnostic. See, e.g., van Schewick (2015c), pp. 124-126. In addition, the FCC's Open Internet rules as well as the general conduct rule are explicitly intended to protect the Internet as a platform for free expression. See generally 47 C.F.R. §8.1. and Federal Communications Commission (2015), pp. 25-27, paras 76-77. On free expression and the general conduct rule, see Federal Communications Commission (2015), p. 60, para 137, p.63, para 143.

[37] On the economic impact of application-agnostic networks, see, e.g., van Schewick (2010), pp. 215-81, 286-95, 349-53, 355-65. On the social, cultural, and political impact of application-agnostic networks, see, e.g., Balkin (2009); van Schewick (2010), pp. 359-65; Benkler (2000), pp. 565-568; Benkler (2006), chapters 5-10.

[38] T-Mobile USA (2016a), Section "Questions about Music Freedom?" ("I want to know if my favorite application is eligible to be added, how do you define 'Streaming Music Services'? Commercial music streaming services provide licensed content from various sources. Sources may include some or all of the following platforms: platforms serving digital rights management-restricted content from record labels, aggregated live radio platforms, or other commercial platforms offering streaming music content. Excluded services include but are not limited to: Music streaming sources from private or unlicensed sources.")

providers over non-commercial providers. Note that this policy choice does not reflect people's preferences: On Twitter, customers regularly ask T-Mobile to include podcast services or cloud-based media players.[39] It is possible that T-Mobile has adopted a similar commercial entertainment-only policy to guide its selection of video providers in Binge On. Regardless, T-Mobile's intentions do not affect the FCC's evaluation of the program: Net neutrality rules focus on the effect of an ISP's practice, not on its intention.[40] Here the effect is clear: Through Binge On and Music Freedom, T-Mobile turns the mobile Internet offered to its customers into a platform that favors entertainment content from commercial speakers, undermining the potential of the Internet as a democratic space for free expression.

IV. Binge On's discriminatory effects are here to stay.

T-Mobile argues that Binge On's discriminatory effects are just temporary, because any legal video streaming provider can join the program, as long as they meet T-Mobile's "simple technical requirements."[41] Further, providers do not have to pay to be part of the program. This keeps Binge On in line with the net neutrality principle that prohibits ISPs from offering content providers preferential treatment for a fee.[42]

But the reality is not that simple. The technical requirements published on T-Mobile's website are substantial and establish real hurdles to joining the program. The technical requirements allow some video streaming services to join Binge On easily: These services are given a competitive advantage.[43] But the requirements categorically exclude other innovative streaming providers from joining Binge On at all, permanently undermining their ability to compete. The requirements also discriminate against providers that use encryption, a practice that is becoming the industry standard.

Finally, a large group of video streaming providers will have to work with T-Mobile to determine whether their service can be part of Binge On. These providers will often need to invest significant time and resources to adapt their service to T-Mobile's systems. Even if providers are willing to

[39] A Twitter search for "#musicfreedom" during a time period beginning Oct 17, 2015 through Jan 17, 2016 produced 58 user requests for 13 podcast services not currently included in Music Freedom (parenthesis show the number of requests for each service): NPR (15), Beyond Pod (11), Pocket Casts (11), Apple Podcast App (7), Podcast Addict (4), BBC (2), Overcast fm (2), Audiofil.es (1), Downcast Player (1), Player FM (1), PRI (1), WNYC (1), Antenna Radio (1). The same search produced 13 user requests for 6 cloud-based streaming media players (parenthesis show the number of requests for each service): Plex (4), Cloud Music Player (3), Subsonic (2), iCloud Music Library (1) iTube (1), StreamToMe (1), VOX Player (1).
[40] Federal Communications Commission (2010), pp. 45-46, para 78; van Schewick (2015c), pp. 61-64.
[41] Coldewey (2015); T-Mobile USA (2015h); Legere (2015).
[42] van Schewick (2015a), pp. 11-17; van Schewick (2015d), pp. 3-5. The FCC's bright-line rule against paid prioritization prohibits only payments for technical forms of preferential treatment. Payments for other forms of preferential treatment like zero-rating are subject to the general conduct rule. See 47 C.F.R. §8.9. and §8.11; Federal Communications Commission (2015), p. 68, para 152. See also footnotes 6 and 7.
[43] See Section II above.

make the necessary changes, their inclusion depends on T-Mobile's willingness to work with them. The smaller the provider, the longer it will likely take for T-Mobile to get to it.

For providers in this group, Binge On not only increases the costs of innovation, but also delays their ability to compete on an equal footing. As the experience with T-Mobile's Music Freedom shows, the delays are likely to be substantial. Although Music Freedom has grown from 7 to 40 providers in the 1½ year since its launch, it still only includes a fraction of the more than 2,000 licensed online radio streaming services in the U.S. Some smaller music streaming services had to wait 1½ years to be included; some small providers never heard back from T-Mobile at all. Many Internet applications are subject to first mover advantages, economies of scale and network effects:[44] Therefore, providers' inability to join Binge On quickly, while their competitors are already in the program, may translate into a lasting competitive disadvantage.[45]

Binge On also violates one of the key principles that has allowed innovation on the Internet to flourish – the freedom to "innovate without permission." As long as their apps respect fundamental Internet standards, innovators with great ideas can reach people all over the world at low costs. They do not have to contact ISPs around the globe and convince them to admit a new application to their networks. Nor do they have to create different versions of their apps for different ISPs. Binge On changes that. It requires video streaming providers to contact T-Mobile to be included in the program, and in many cases, to change their service to meet T-Mobile's technical requirements so that they can join Binge On—all just to compete on an equal footing.

Notwithstanding its good intentions, T-Mobile is acting as a gatekeeper that picks winners and losers online. Its guidelines define who can and cannot be part of the program. These guidelines directly discriminate among streaming providers, translating providers' technical design decisions into competitive advantages and disadvantages. And by deciding which Binge On applicants to work with and in which order, T-Mobile determines how quickly providers will be able to compete and whether they will be able to compete at all.

1. T-Mobile's technical requirements are substantial.

T-Mobile's technical requirements are designed to allow T-Mobile to implement Binge On:[46] T-Mobile needs to identify video streams from Binge On providers to ensure that they are not counted against users' bandwidth caps. In addition, T-Mobile wants to limit the speed of all video traffic on its network so that video takes up less bandwidth, and some of the technical requirements to join Binge On are designed to make that easier.[47]

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[44] van Schewick (2010), pp. 231-232.
[45] See generally, van Schewick (2010), pp. 227-232.
[46] The technical requirements for joining Binge On are set out in T-Mobile USA (2015d).
[47] In recent weeks, observers have argued that lowering the speed of all video, regardless of whether the provider is part of Binge On, violates the FCC's no-throttling rule. See footnotes 8 to 9 and accompanying text.

According to the technical requirements, a video streaming provider's ability to join Binge On depends on three aspects of its service:

- the protocols used by the service;
- how closely the service's video content is integrated with other parts of the service; and
- the streaming technology used by the service.

As Table 2 shows, these aspects of how an application works technically affect how quickly and easily it can join Binge On, and whether it can join at all. T-Mobile's technical requirements directly translate a streaming provider's design choices into competitive advantages and disadvantages.

Table 2: Favored, Discriminated, & Excluded Practices: T-Mobile's Technical Requirements for Binge On

	Favored: *Meets technical requirements; can be added easily and without changes*	**Discriminated:** *Requires additional assessment by T-Mobile; likely to require changes to the service in cooperation with T-Mobile to be included*	**Excluded:** *Excluded from the Binge On*
Protocols	Use of well-known streaming protocols that T-Mobile's systems can identify as video easily; *and* Use of TCP; *and* No encryption using protocols like HTTPS	Use of encryption protocols like HTTPS; *or* Use of other protocols "that make detection of video streams difficult"	Use of UDP; *or* Use of other protocols "that are demonstrated to prevent video stream detection"
Streaming technology	Use of adaptive bit rate technology	Use of other streaming technologies (e.g., progressive download)	None as of now
Integration with other content	Video streams are delivered in a way that is distinguishable from non-video content	None as of now	Video streams are delivered in a way that is not distinguishable from non-video content

Source: T-Mobile USA (2015d).

2. Only video streaming applications that automatically meet T-Mobile's technical requirements can be added to Binge On quickly and easily.

The technical requirements favor applications that (1) use well-known streaming protocols running over the Transmission Control Protocol (TCP), (2) do not encrypt their traffic using protocols like HTTPS, (3) deliver the video traffic in a way that is distinguishable from the non-video content, *and* (4) use adaptive bit rate technology.[48] (See Table 2 above.)

[48] T-Mobile USA (2015d) ("Video must be streamed over T-Mobile's network in a way that allows T-Mobile to identify the traffic as streaming video. This requires that video detection signatures be present."). T-Mobile's technical requirements exclude services that use UDP, so the service has to use TCP (see Section IV.3 below). On encryption, see Section IV.4.

These streaming providers still need to pass T-Mobile's review process, which includes a review of whether the provider is a "legal provider,"[49] but can be added relatively easily and without changes.

3. T-Mobile's technical requirements categorically exclude applications that use innovative protocols.

According to T-Mobile's guidelines, providers that use the transport protocol User Datagram Protocol (UDP) cannot be part of Binge On.[50] This requirement directly constrains innovation in video streaming. Many innovative streaming protocols run over UDP, one of the two main transport protocols used on the Internet. UDP allows applications to establish connections faster, which can benefit real-time applications like streaming video or online gaming that are sensitive to delay.[51] For example, Google has developed a protocol called QUIC that needs UDP.[52] YouTube uses this protocol to stream video, because it drastically reduces the time needed to establish secure connections between a user's browser and YouTube's servers. It works well even if there is congestion. According to Google, videos delivered to people using QUIC saw 30% less re-buffering (an interruption in the streaming of the video indicated by a spinning wheel).[53] In addition, live streaming applications often use UDP to minimize delay.[54]

The technical requirements categorically exclude applications using UDP and therefore make it impossible for major providers such as YouTube to join Binge On. They also limit innovation in video streaming. Anybody developing video streaming applications now has a choice: Use UDP, which might be the best technical option for their application, or forgo the benefits of UDP just to qualify for Binge On.

Providers who use UDP are not the only ones unable to join Binge On. If T-Mobile decides that a provider's protocol is "demonstrated to prevent video stream detection" and the ISP does not have the technology to recognize it, then the provider is automatically excluded.[55] Finally, providers that are unable to separate their video streams from non-video traffic cannot become part of Binge

[49] Coldewey (2015); T-Mobile USA (2015d), ("Only lawful and licensed video content is eligible for the offering.")
[50] T-Mobile USA (2015d) ("Use of technology protocols that are demonstrated to prevent video stream detection, such as User Datagram Protocol "UDP", on any platform will exclude video streams from that content provider.")
[51] Kurose & Ross (2013), pp. 199-200.
[52] Google Chrome Developers (2015); QUIC Geek FAQ (for folks that know about UDP, TCP, SPDY, and stuff like that) .
[53] Google Chrome Developers (2015).
[54] How-To-Geek; Parker (2015).
[55] T-Mobile USA (2015d) ("Use of technology protocols that are demonstrated to prevent video stream detection, such as User Datagram Protocol "UDP", on any platform will exclude video streams from that content provider.")

On, either.[56] For example, this might include online education platforms whose offerings closely integrate video and non-video components like lecture videos and interactive quizzes.[57]

4. T-Mobile's technical requirements discriminate against applications that use encryption and certain other technologies.

Encrypting online content is quickly becoming the industry standard. More than half of the Internet traffic in North America is estimated to be encrypted, and more than two-thirds of traffic is likely to be encrypted by the end of 2016.[58] Video streaming providers like YouTube, Vimeo, and Netflix are increasingly encrypting video streams to protect users' privacy.[59] What a person watches online often reveals deeply personal information such as religious beliefs, political preferences, or sexual orientation. It's also valuable business intelligence that streaming providers may not want their competitors to know about.

Yet, T-Mobile's technical requirements make it more difficult for streaming providers that use encryption to join Binge On. Encryption protocols like HTTPS make it harder for T-Mobile's system to identify the traffic as streaming video.[60] In these cases, T-Mobile will assess whether it

[56] T-Mobile USA (2015d) ("Content that is eligible under the program will be delivered by the content provider to T-Mobile in such a way that is distinguishable from non-video content that is not qualified as eligible under the offering.")

[57] For example, Coursera has created custom technology that allows it to integrate online quizzes into the video lectures. Quora (2012); Quora (2015).

[58] Sandvine (2015a), pp. 5, 9.

[59] YouTube and Vimeo already encrypt all of their traffic, including video streams. Netflix announced in April 2015 that it is moving towards encrypting all video streams over the course of the next year. Sandvine (2015a), pp. 3-4 (YouTube); Fastly, Section "TLS Termination at the Edge" (Vimeo); Netflix (2015), p. 3; Goodin (2015) (both Netflix).

[60] HTTPS is another name for using HTTP over TLS/SSL. When a video stream is encrypted using HTTPS, the video is streamed using the Hypertext Transfer Protocol (HTTP) over a TCP connection secured by Transport Layer Security (TLS) or its predecessor Secure Socket Layer (SSL). TLS encrypts the application-layer messages that are being exchanged over TCP. As a result, an ISP's deep packet inspection devices cannot "see" those application-layer messages, making it harder to identify the type of traffic. TLS/SSL can be used by any application that runs over TCP, so any application that uses TLS/SSL to encrypt traffic is going to create the same problems for ISPs interested in identifying traffic. Kurose & Ross (2013), pp. 711-717.

Encrypting an application's traffic with TLS/SSL does not hide all information about the connection. *First*, the ISP can still "see" the IP addresses of the source and destination of the traffic. *Second*, it can "see" the port numbers at the source and destination, which may allow the ISP to make inferences about the protocol that is using TLS (e.g., HTTPS often uses port 443). GSM Association (2015), pp. 21-22. Thus, an ISP may be able to infer from the port numbers that the application is using HTTPS, but it cannot see the content of the messages transferred by HTTP, so it doesn't know whether the application is using HTTP to transfer text, audio, or video. *Third*, if the client uses TLS and uses the server name indication (SNI) option, the ISP is also able to observe the name of the server (e.g., https://cyberlaw.stanford.edu) that the client is trying to contact as part of the connection set up, but not the full path of the content that is being transferred (e.g., https://cyberlaw.stanford.edu/blog). *Finally*, even if the application is encrypted using TLS/SSL, a deep packet inspection device may still be able to infer the type of data being transferred by using heuristics that do not depend on observing the content of the application-layer messages (for example, by looking for patterns in, e.g., the size and spacing of the data packets). Sandvine (2015b), pp. 9-15.

is technically feasible to include the service in the program.[61]

There are no standard solutions to deal with this problem.[62] Each solution needs to be tailored to the particular service. Whether a solution exists at all, and how much work is required to find and implement it, depends on how the service is structured and delivered. Some work-arounds (e.g., sending your video from a dedicated set of IP addresses that are known to T-Mobile) will be easier to realize for large companies like Netflix that have their own server infrastructure.

The process of finding a solution, which will often be technically challenging and require work, will be particularly taxing for start-ups with limited engineering resources. Instead of working on exciting new features for an application, start-up engineers will need to focus on ensuring that the application can be detected by T-Mobile. Non-commercial entities or entities hosting their own video might lack the resources and expertise to work with T-Mobile on making the necessary changes at all.

T-Mobile's resources are not unlimited, either. This makes it likely that T-Mobile will prioritize working with larger, more popular applications first, creating a disadvantage for smaller providers.[63]

The result: Small players that use encryption will need to wait for T-Mobile to work with them at some point. While they wait or work to find a solution, established competitors already included in Binge On are enjoying the first mover advantage, increasing their market share, and benefiting from network effects and economies of scale. To avoid this disadvantage, small players may feel pressure to remove encryption altogether just to be more easily included in the program.

Services using encryption aren't the only ones that face this problem. In fact, any services that use "protocols that make detection of video streams difficult" (a category not further defined by T-Mobile's guidelines) cannot be automatically included in Binge On.[64] This problem is likely to affect video providers using different or novel protocols – a hallmark of innovation.[65]

Services that do not use adaptive bit rate technology cannot automatically be included in the program, either.[66] This technology dynamically adjusts the data rate at which an application

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[61] T-Mobile USA (2015d) ("Use of technology protocols which makes detection of video streams difficult such as https will require additional T-Mobile assessment of the technical feasibility to qualify or inclusion in the offering.").
[62] The following discussion is based on interviews with industry participants.
[63] The history of T-Mobile's other zero-rating program suggests that T-Mobile at least in part prioritizes adding larger popular providers. See Section IV.6 below.
[64] T-Mobile USA (2015d) ("Use of technology protocols which makes detection of video streams difficult such as https will require additional T-Mobile assessment of the technical feasibility to qualify or inclusion in the offering.").
[65] Deep packet inspection technology can usually detect applications that behave like other streaming video applications that the technology has been taught to detect. But if an application behaves in ways that differ from what the deep packet inspection device expects, the device will have trouble detecting the application.
[66] T-Mobile USA (2015d) ("The content provider will provide video over T-Mobile's network using adaptive bit rate technology in which the server sending streaming video content will automatically adapt video resolution of the stream based on the capabilities of the data connection or as otherwise indicated by the T-Mobile network. In the event that

streams content in response to changes in network conditions. White this technology offers many benefits, it is complex and costly to implement and operate. [67] As a result, many smaller providers and websites that host their own video continue to use alternative streaming technologies such as progressive download technology. Other services use progressive download technology because it's a better fit for their business model.[68]

If they want to be able to compete on an equal footing with providers already included in Binge On, all of these providers will now need to change their service so that it meets T-Mobile's requirements, e.g., by using protocols that allow easy video detection or by switching to adaptive bit rate technology. Or they will need to work extensively with T-Mobile to find a workaround. Either way, these providers will face the same competitive disadvantages as those who use encryption.

5. T-Mobile's technical requirements threaten the freedom to innovate without permission.

T-Mobile's technical requirements threaten one of the key principles that has allowed the Internet to serve as an engine of innovation and economic growth: "the freedom to innovate without permission."[69] As long as innovators respect the foundational Internet protocols, the applications they build work anywhere on the global Internet. Innovators do not need to negotiate with ISPs around the world to get to users. Nor do they need to create different versions of their application

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the content provider is unable to meet this requirement, T-Mobile will work with the content provider to explore alternative technical means for video resolution adaptation."). To limit the impact of video traffic on its network, T-Mobile limits the speed at which video can be streamed over its network to 1.5 Mbps or less. T-Mobile wants services to use adaptive bit rate technology, because these services will automatically respond to the slowed speed and send video at a lower resolution. Even services using adaptive bit rate technology might experience quality issues in response to T-Mobile's rate limits. For example, the service might test the connection, find that the user is on a 4G LTE connection, and might start sending the video at a resolution appropriate for that speed, only to find that the video is rate-limited to a lower speed, creating problems until the application adjusts to the lower speed. See, e.g., O'Connor (2016); Holly (2016) (describing the impact of the rate-limits on YouTube, which is not part of the Binge On zero-rating program, but uses adaptive bit rate technology). For more on the rate limits, see footnote 8 and accompanying text above and footnote 29 above. Throttling all video might violate the FCC's no-throttling rule. See footnote 9 and accompanying text above.

[67] Lopez (2012); Narang (2015); Chave (2012). See also the discussion in the text surrounding footnote 71 in the next section.

[68] For example, a service that delivers video not just for instantaneous consumption, but also gives its users a copy of the video to keep on their hard drives, will be best served by progressive download technology.

[69] Protecting the principle of innovation without permission is an explicit purpose of the FCC's Open Internet rules. See 47 C.F.R. § 8.1 Purpose. "The purpose of this Part is to protect and promote the Internet as an open platform enabling consumer choice, freedom of expression, end-user control, competition, and *the freedom to innovate without permission*, and thereby to encourage the deployment of advanced telecommunications capability and remove barriers to infrastructure investment." (emphasis added) See also Federal Communications Commission (2010), p. 3, para 3, p. 10, para 4, pp. 5-6, para 13, pp. 18-19, para 39, pp. 45-46, para 78, p. 52, para 93 (discussing the importance of innovation without permission for innovation). On innovation without permission in the original Internet, see van Schewick (2010), pp. 204, 211, 293. On the impact of innovation without permission on innovation, see *id.* at 345-48. See also Cerf (2006), pp. 8-10; Balkin (2009) (focusing on the social, cultural, and political implications). For an overview of the other key factors that have been central to the Internet's ability to foster innovation and free speech online, see, e.g., van Schewick (2015c), pp. 19-26.

for different ISPs. This principle enables any innovator with a great idea but little resources – students in dorm rooms, entrepreneurs in garages, and start-ups – to reach people around the world at low costs. And by removing gatekeepers that could create bottlenecks for innovation, "innovation without permission" increases the chances that innovators can bring their ideas to market.

Binge On turns this principle on its head. If a video streaming provider wants to compete for T-Mobile customers on an equal footing, it's no longer enough to build a streaming video application that respects the Internet's standards. Instead, the provider needs to contact T-Mobile and convince the company to include it. If its service does not meet T-Mobile's technical requirements, the provider must change its service so that it meets the criteria or work with T-Mobile to find a workaround. Both require a significant investment of time and resources. This increases the costs of innovation and also the time it takes to become competitive.

For example, T-Mobile's technical criteria require streaming providers to use adaptive bit rate technology, a streaming technology that dynamically adjusts the data rate at which an application streams content in response to changes in network conditions. A provider that uses progressive download technology and therefore doesn't meet that requirement must either transition its service to adaptive bit rate technology.[70] This is a major undertaking that includes changing the programming of the service as well as transcoding and storing all videos in additional resolutions. It also increases ongoing storage costs.[71] Alternatively, the provider can work with T-Mobile to find a way to lower the resolution of video streams using progressive download technology. Both options will take time and valuable engineering resources.

Providers already in Binge On will also face barriers to innovation. Many start-ups and technology companies innovate continuously and often test new features on a subset of their users. T-Mobile requires every Binge On provider to communicate any changes to its service that might affect T-Mobile's ability to identify video or lower video resolution. The provider must then work with the ISP so that it can continue to detect the service, which may require additional adjustments to the streaming service and/or T-Mobile's systems.[72] This process can slow down innovation considerably. For its part, T-Mobile must invest time and resources to adapt its systems and may not find it cost-effective to engage in this process with every provider, or as often as providers need.

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[70] See the text of the technical requirements in footnote 66 above. A provider might be using progressive download technology because the costs of transitioning to and operating a service using adaptive bit rate technology outweighs the benefits, or because the provider delivers the video not just for instantaneous consumption, but also gives its users a copy of the video to keep on their hard drives. See also the discussion in the preceding section.

[71] See footnote 67 above.

[72] T-Mobile USA (2015d) ("To ensure a good customer experience, any changes to a content provider's streaming formats and/or mechanisms that could impact T-Mobile's ability to include the provider's content in the offering must be communicated to T-Mobile in advance") and ibid. ("T-Mobile will continue to work with content providers as new video detection signatures are needed in the event of future technology enhancement or changes.")

All of these problems disproportionately affect start-ups, small providers, and non-commercial speakers. It will often be difficult for them to find the resources to make necessary changes. When they do, they will likely have to wait longer for T-Mobile to work with them. In this way, Binge On favors larger, established providers over smaller players with limited resources.

6. The experience with T-Mobile's Music Freedom shows that these are real concerns.

T-Mobile's technical requirements create lasting barriers for innovation and competition that specifically harm start-ups and small businesses. The story of T-Mobile's Music Freedom shows that these are not hypothetical concerns. As with Binge On, T-Mobile says that Music Freedom is open to all commercial music streaming providers. Providers can apply to be part of the program, and T-Mobile customers can suggest providers to add through Twitter.[73] At its launch in June 2014, Music Freedom included seven providers. Today T-Mobile has grown the program to include 40 providers, but this number falls far short of the more than 2,000 licensed online radio streaming services in the U.S.[74] T-Mobile has not said how many providers have applied to join the program since its launch, but we do know that it has not added all music providers that people have asked it to include. For example, in the past three months alone, Twitter users have asked T-Mobile to add at least 109 music streaming providers that are not yet part of the program.[75] Many of them are smaller players. Thus, Music Freedom continues to limit user choice and distort

[73] T-Mobile USA (2016a), Section "Questions about this Plan?", Question "Will you add more streaming providers over time?".

[74] T-Mobile USA (2014c) (announcing launch of Music Freedom); T-Mobile USA (2014a) (listing seven providers initially included in the program); T-Mobile USA (2016b) (current list of 40 services included in Music Freedom); SoundExchange (2015) (listing the more than 2,078 online radio stations ("webcasters") that have paid SoundExchange a license fee in the third quarter of 2015).

[75] A Twitter search for "#musicfreedom" during the time period beginning Oct 17, 2015 through Jan 17, 2016 produced 674 requests for 109 unique music services not currently included in Music Freedom (parenthesis show the number of requests for each service): Amazon Prime (311), TuneIn (135), YouTube Music (43), Mixcloud (27), Deezer (13), The Hype Machine, Gaana.com (6), Audiomack (5), Stitcher (5), Earbits (4), Radio FM (3), Rock My Run (3), XiiaLive (3), 8k Radio Tamil (2), AH.FM (2), Aha Radio (2), Air1 (2), Beastmode fm (2), Beats Music (2), ESPN Radio (2), hearthis.at (2), iTunes Match (2), iTunes Radio (2), radio net (2), Relisten (2), Subsonic (2), 101 the BEAT (1), 181.fm (1), 22tracks (1), 935KDAY-FM (1), Agogo (1), Alternative Buffalo (1), Audiotube (1), BABOOM (1), be-at.tv (1), bigreggaemix.com (1), Capital FM (1), ChristianNetcast (1), Commotion (1), Concert Vault (1), Daytrotter (1), Divine Office (1), DJ Lobo (1), doubleTwist (1), DriodHop Radio (1), En Vivo Radio (1), enlefko.fm (1), Folk Alley (1), Grooveshark (1), Guvera (1), Idisciple (1), Indie Shuffle (1), KEXP (1), KEXP Radio (1), KISW App (1), KSJF NetRadio (1), KTRU Rice Radio (1), KXOJ (1), KXOJ2 (1), LaMusica (1), LiveMixtapes.com (1), LivePhish.com (1), LocalXRadio (1), lutheranpublicradio.org (1), mediaU (1), Melody FM (1), Ministry of Sound (1), miRoamer (1), Mixify (1), Mixlr (1), MLB Audio (1), Mormon Channel (1), Morow (1), Music Choice (1), Naxos Music Library (1), New Release Tuesday (1), NextRadio (1), NGen Radio (1), Nobex Radio (1), Nugs net (1), OneSong (1), Patari (1), Pirate Radio Treasure Coast (1), Planning Center Music Stand (1), Raaga (1), Radio Batanga (1), Radio Javan (1), Radio League (1), Radio Music One (1), Radio U (1), Radium (1), Rascal Radio (1), RedCharts (1), SBS PopAsia (1), Scanner Radio (1), smoothjazz.com (1), Stingray Music (1), Streamingthe.net (1), Streema (1), The Overflow (1), thebeast980.com (1), theblast.fm (1), THUMP (1), Vevo (1), vk.com (1), WEFUNK Radio (1), WGR 550 (1), WRIF 101.1FM (1), WWOZ New Orleans (1). In addition, Twitter users regularly ask T-Mobile to include services in Music Freedom that would allow them to stream audio content other than music: For example, the Twitter search described above produced 58 user requests for 13 podcast services not currently included in Music Freedom and 13 user requests for 6 cloud-based streaming media players. For a breakdown of the result, see footnote 39.

competition among streaming music providers 1½ years after its launch – an eternity in the fast-moving Internet marketplace.

The history of Music Freedom reveals that T-Mobile at least in part determines which providers to add based on popularity, a practice that favors larger established players. Immediately after launching Music Freedom, T-Mobile polled its customers on Twitter to help determine who it should include in the program. Google Play Music won the first poll and was added within three months in November 2014, along with 13 other services.[76] T-Mobile added Apple Music to the program in July 2015, less than a month after its release. To explain its rapid inclusion, CEO John Legere stressed that Apple Music had become the "single most requested new addition" to Music Freedom.[77]

While T-Mobile added large players relatively quickly, smaller players often had to wait much longer to join the program. For example, Soma.FM, an independent Internet radio company well-known in the indie music community, waited a year and a half before it was added to Music Freedom.[78] The radio company contacted T-Mobile in order to join Music Freedom in June 2014. From June 2014 to September 2015, there were significant delays in response on T-Mobile's end, and Soma.FM had to send repeated reminders to get the ISP's attention. T-Mobile began working with the company to add it to the program starting in September 2015.[79] Adding Soma.FM wasn't easy. "It was a bit more complex for them to configure their network to work with us," reported Soma.FM's founder Rusty Hodge. He noted that the radio company's "complex distribution, spread across multiple servers and bitrates" slowed down its inclusion on T-Mobile's end.[80] The company was added to Music Freedom in December 2015. Soma.FM's experience shows that smaller providers may find it harder to get T-Mobile's attention, and that a provider's technical

[76] In addition to the larger, popular services, T-Mobile also added some smaller players. According to T-Mobile's press release, "[t]hree of the new services added [that day] – Google Play, Xbox Music and SoundCloud – were voted for by close to one million people in an online poll. Three were submitted directly by T-Mobile customers, and the other services responded to T-Mobile's open invitation to join Music Freedom." T-Mobile USA (2014c); T-Mobile USA (2014a) (announcing Google as the winner of the poll); T-Mobile USA (2014b) (announcing addition of 13 services).

[77] T-Mobile USA (2015b).

[78] Naughton (2015); Hill (2013); Myers (2012), Spence (2013). On Soma FM, see also footnote 79.

[79] Soma.FM is a "commercial-free, listener-supported Internet-only radio station" that runs more than 20 channels with a team of one full-time staff, volunteers and part-time contractors. (Soma FM (2016a); Soma FM (2016b); Hodge (2015)). According to Soma.FM's founder Rusty Hodge, the radio company asked T-Mobile how it could be included in Music Freedom in an email on June 19, 2014. Soma.FM received no response and resent the email on August 27, 2014. T-Mobile responded with a request to fill out an excel form. The email went into Soma.FM's spam filter, and it took some time for Soma.FM to find it. The company e-mailed the form back to T-Mobile in March 2015 and received no response. Soma.FM resent the form on July 6, 2015 and received an out-of-office reply. When the company sent the form again on September 29, 2015, T-Mobile began actively working with the company to determine how to add it to Music Freedom. Soma.FM was added to Music Freedom in December 2015. (Hodge (2016); T-Mobile USA (2015e)).

[80] Washenko (2015). See also Hodge (2015).

structure affects how easily it can join.[81] If it's complicated, both sides will need to invest time and resources to find a solution.

Some smaller providers never heard back from T-Mobile at all. For example, Rockradio.gr, a popular Greek radio station, contacted T-Mobile in March 2015 at the e-mail address T-Mobile provides for requests to join Music Freedom and sent a reminder in November 2015. The radio station never received a response.[82]

Despite its best intentions, T-Mobile cannot immediately include every service that applies. The history of Music Freedom suggests that T-Mobile at least in part focuses on adding larger, more popular services first. While that is a rational business strategy, it distorts competition in a way that puts small players at a competitive disadvantage.

V. Binge On favors video streaming over other Internet uses.

Even if T-Mobile could somehow add every single video provider to Binge On – large and small, commercial and non-commercial – the program would still violate net neutrality. Binge On favors video streaming as a class over all other Internet uses. Only video streaming services can become part of Binge On and be exempted from bandwidth caps; all other applications (except for music streaming) count against the cap. T-Mobile customers on qualifying plans can binge on Game of Thrones without a second thought, but have to monitor their time and data allowance if they want to video chat with friends and family via Skype or Google Hangout, play an online game, or access large documents for work or school.

On the Internet, applications constantly compete for people's time and attention, even if they are in different categories: Do I use my time to watch a video or play an online game? Do I call my grandmother or check Facebook?[83] Zero-rating that favors one class of applications over others distorts this competition among different kinds of applications.[84] It makes video consumption more appealing than other bandwidth-intensive uses. Applications that people can use without worrying about reaching their caps are likely to see more use, more engagement, higher advertising revenue, and therefore are more attractive to investors.[85]

Zero-rating one class of applications but not others also limits customers' ability to use the applications of their choice. T-Mobile customers on qualifying plans can watch as much video from Binge On providers as they want until they reach their cap, but their ability to use other applications is directly limited by the cap. Apparently, T-Mobile believes its network can tolerate

[81] See also Finley (2015); Hill (2014).
[82] Yiakoumis (2015); Yiakoumis (2016).
[83] Evans (2013); Yao (2014); Palmer (2013); Schulson (2015).
[84] See generally, van Schewick (2015c), pp. 113-115.
[85] See Section II.1 and II.2 (discussing people's preference for zero-rated content over content that counts against their data caps).

the additional traffic created by Binge On.[86] But customers can use this additional data only for Binge On video, not for other kinds of applications, even if the applications have exactly the same or even a smaller impact on the network. A customer who has used almost all of her data could still binge on HBO, but would be unable to make an important video call with her doctor. Thus, T-Mobile's decision to limit the use of this additional bandwidth to Binge On video might not meet users' needs.

For these reasons, the FCC's net neutrality no-throttling rule prohibits ISPs from technically discriminating between individual applications *and* between classes of applications.[87] That means ISPs cannot discriminate between apps in a class of similar apps, e.g. by slowing down only some streaming video applications, but not others. Nor can they discriminate between different classes of apps, e.g., by slowing down or speeding up all streaming video applications, but not online telephony applications.

Just like technical discrimination, zero-rating one class of applications but not others distorts competition among classes of applications and limits user choice. The same considerations that led the FCC to ban technical discrimination among classes of applications apply equally here.[88]

VI. Binge On sets us on a slippery slope.

T-Mobile is the first mobile ISP in the US to offer an unlimited video streaming plan. In recent months, three additional mobile carriers – Virgin Mobile, Boost Mobile, and MetroPCS – have introduced plans that are similar to T-Mobile's Music Freedom.[89] If ISPs continue to create similar plans, the harms to competition and innovation will quickly worsen.

Some observers are less concerned about Binge On, because T-Mobile has less market share (16%) than the two biggest mobile carriers Verizon (33%) and AT&T (34%).[90] Providers excluded from Binge On are disadvantaged only with respect to T-Mobile customers on qualifying plans – a segment of the market – and can still compete for other ISPs' customers on an equal footing.

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[86] Dano (2015); Hamblen (2015).

[87] Federal Communications Commission (2015), p. 49, para 113, p. 51, para 120. When evaluating ISP practices under the general conduct rule, the FCC will consider whether the behavior is application-agnostic (i.e. does not discriminate among applications, content, and services, or among classes of applications, content, and services). Federal Communications Commission (2015), pp. 63-64, para 144 and fn. 344. On the rationale for a non-discrimination rule banning discrimination among applications and classes of applications (even if the classes of applications are not alike), see van Schewick (2015c), pp. 102-152; van Schewick (2015b), Section "Problem #3."

[88] van Schewick & Weiland (2015), pp. 88-90.

[89] Three months after its launch in October 2015, Virgin Mobile's zero-rated music streaming program still includes only the five streaming providers that were already included at launch: Pandora, iHeart Radio, Slacker Radio, Slacker Radio, Samsung Milk Music, and 8tracks. (Virgin Mobile USA (2015); Virgin Mobile USA (2016)) Boost Mobile, one of Sprint's prepaid brands like Virgin Mobile, launched its zero-rated music plan in December; the plan includes the same providers as Virgin Mobile. (Sprint (2015); Boost Mobile (2016)) By contrast, Music Freedom grew from seven to thirteen providers in its first two months. (T-Mobile USA (2014a)). MetroPCS, T-Mobile's prepaid brand, introduced its zero-rated music program in November; its program includes the same music providers as T-Mobile's Music Freedom. (T-Mobile USA (2015f); MetroPCS (2016)).

[90] Statista (2015).

However, net neutrality rules apply to all ISPs, regardless of market share, and protect all users, including those of smaller ISPs.[91] Moreover, allowing the program sets a dangerous precedent. If either AT&T or Verizon create similar programs, video providers that cannot join any of the zero-rating programs will immediately be disadvantaged with respect to half of the nation's mobile Internet users. The harms to competition would quickly add up.

The more ISPs offer similar zero-rated plans for video, the harder it becomes for video streaming providers to keep up. Right now, video streaming providers that want to compete on an equal footing have to work only with T-Mobile and adapt their service to T-Mobile's proprietary technology. As more zero-rating programs emerge, providers will need to work with ISPs around the world, adjusting their service to each ISP's idiosyncratic requirements. Once a streaming provider has been admitted to these programs, the provider must continue to communicate technical changes to its service to numerous ISPs, which may then require further coordination and adjustments to the service. That's the opposite of innovation without permission. The resulting increase in the costs of innovation will hurt all streaming providers regardless of their size.

Large providers that are able to manage the burden will be able to join multiple zero-rating programs. But small players that don't have the resources to work with every ISP will be left behind. As a result, the proliferation of zero-rating programs like Binge On would seriously distort competition, reinforcing the competitive advantage of established video streaming providers.

Competition among ISPs would also suffer. At some point, large players such as Netflix, YouTube, or HBO may decide to focus their resources and apply only to the most powerful ISPs with the largest customer bases for inclusion in their zero-rating programs. Small ISPs would not have as many services in their zero-rated programs, making it harder for them to attract customers. Here too we see the same effect: zero-rated programs give large established ISPs an advantage over small players.

In sum, the proliferation of zero-rating programs like Binge On would change competition and innovation on the Internet as we know it. If the FCC permits Binge On, other ISPs will have the green light to offer similar programs. Thus, when evaluating Binge On, the FCC should focus not just on T-Mobile's individual program, but also assess the cumulative effect that several similar programs would create.

[91] Federal Communications Commission (2015), p. 30, para 84, pp. 35-42, paras 88-99. Federal Communications Commission (2010), pp. 11-21, paras 20-34. See also van Schewick (2015c), pp. 60-61, 83-98, 131.

VII. Consumers can "binge on" video without endangering net neutrality.

Binge On as currently offered violates net neutrality. However, T-Mobile could adopt alternative competitive plans that benefit consumers and respect net neutrality. Here are three options for how T-Mobile and other carriers can offer similar plans without endangering net neutrality principles:

First, T-Mobile could offer customers a zero-rated low-bandwidth mode at the same speed as Binge On. Use of that mode would not count against the cap, but customers would be able to use this mode however way they choose: They could watch video *or* do anything else online. This plan is similar to Binge On in its current form but without the host of net neutrality concerns.

Second, T-Mobile could allow customers unlimited access to the entire Internet after customers reach their cap, just at a slower speed – the same speed currently offered through Binge On. After reaching their cap, customers could watch video *or* do anything else online; it would be their choice. This plan offers customers truly unlimited video.

Third, T-Mobile could increase the monthly data caps on its capped plans to account for the average amount of video that people are watching. Customers could use that additional bandwidth to do anything online, including watching video. Again, it would be their choice.

Each of these options is entirely consistent with net neutrality. Each plan preserves user choice: T-Mobile would no longer steer customers to a set of video-only applications of its choosing. Users would be free to choose how they use the network. These plans do not require T-Mobile to act as a gatekeeper: The ISP would no longer need to identify video applications on its network or admit them into a special program. Providers would not have to contact T-Mobile or change their offerings just so they can be included in Binge On. As a result, each of these plans preserves the freedom to innovate without permission. And since T-Mobile would not have to police access to its program, the ISP would no longer be choosing winners and losers online. Apps would compete on an equal footing, and consumers would be the ones in control.

Here's how each of the options would work.

Option 1: A Zero-Rated Low-Bandwidth Mode

T-Mobile could offer its customers a zero-rated low-bandwidth mode that can be used for anything.

Currently, T-Mobile sells its customers two pipes: a large (high-speed) pipe that has a cap but can be used for everything, and a smaller (lower-speed) pipe to watch as much video as customers want from select providers until they reach their cap. Rather than giving customers a small, zero-

rated pipe that can be used only for Binge On video, T-Mobile could give them a similar pipe – but allow customers to use it for anything they want.[92]

In T-Mobile's current Binge On plans, data in the large pipe travels at 4G LTE speeds. Once customers reach their cap, this pipe is reduced to a trickle – to 2G speeds (about 1/100 of the 4G speeds).[93] These slow speeds still allow customers to use e-mail and surf the web, but most applications become unusable.[94] By contrast, all data in the small pipe – the "Binge On pipe" – is limited to approximately 1.5 Mbps.[95] This is enough to watch a video at the lower resolution of 480p, but still 4 to 13 times slower than the 4G LTE speeds customers get for other uses. Restricting the size of this small pipe allows T-Mobile to limit the impact of Binge On video traffic on its network: No matter how much Binge On video a customer watches, it will never take up more than 1.5 Mbps.[96]

In the alternative net neutrality-friendly plan, T-Mobile would still give customers the small zero-rated pipe, but allow them to use it for anything, not just for video. To implement this option, T-Mobile could allow customers to switch to a zero-rated low-bandwidth mode where customers can still send and receive data, just at a lower speed. For example, T-Mobile could allow customers to switch to a zero-rated "1.5 Mbps mode." This mode would allow the customer to use up to 1.5 Mbps but not more, thereby limiting the impact of that individual on the network. This speed would still allow customers to watch video or do almost anything else online without it counting toward their cap. The impact of this option would be similar to the current version of Binge On. But contrary to Binge On, deciding how to use this option would be entirely up to the customer.

Another carrier might offer customers a zero-rated "200 kbps mode" that would let customers use up to 200kps without using their data plan. Customers could use this mode to stream music or engage in other low-bandwidth activities.

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[92] For a similar proposal, see Yiakoumis (2015).

[93] According to T-Mobile's Open Internet Disclosure page, 4G LTE speeds offer typical download rates of 6-20 Mbps, upload speeds of 2-5 Mbps, and delays of 35-90 ms. 2G speeds offer typical download rates of 40Kbps-200Kbps, upload speeds of 20-80 Kbps, and significantly higher delays than 4G LTE. T-Mobile USA (2015a).

[94] See footnote 14 above.

[95] For more on the rate limits, see footnote 8 and accompanying text above and footnote 29 above. T-Mobile limits the rate of all online video (unless customers opt out), but that is irrelevant for the purposes of this section. Throttling all video might violate the FCC's no-throttling rule. See footnote 9 and accompanying text above.

[96] Dano (2015); Dano (2016). Although users can use this pipe to watch as much Binge On video as they want until they reach their cap through other Internet uses that are not zero-rated, T-Mobile counts all data a subscriber uses overall, whether it travels through the large pipe or through the small pipe. Once a subscriber has used 23 GB overall, all of her traffic will receive lower priority during times of congestion than the traffic of other users, which may affect her ability to watch video. (T-Mobile USA (2015a), Section "Network Management for Extremely High Data Usage.") Users on a 3 GB plan can get close to their cap and watch about 30 hours 20 minutes of video streaming before they hit this limit; users on a 10 GB plan who are close to their cap will reach it after about 19 hours 40 minutes hours of video streaming. Since they have a higher cap, they only have 13 GB of Binge On watching "left" once they have used almost all of their capped data; by contrast, users on a 3 GB plan still have 20 GB of Binge On traffic left when they get close to the cap.

Option 2: Truly Unlimited Video

Binge On currently gives customers a small zero-rated pipe that can be used for Binge On video until customers reach their cap through other Internet uses that are not zero-rated.[97] Instead, T-Mobile could let customers reach their cap and then give them the small pipe to use for anything they want. This would offer customers unlimited access to the Internet, albeit at a slower speed. Customers could still watch video, or do anything else online. Because the speeds after reaching the cap would be slow, but not crippling, this plan would still encourage customers to upgrade to the T-Mobile plan that gives them the right amount of high-speed bandwidth for their needs.

This plan gives customers truly unlimited video. Currently, once a customer reaches her cap, all uses (including streaming video) are slowed down to 2G speeds. Customers are no longer able to watch video or do most other things online at this speed.[98] By contrast, under this plan, people can still stream video or do anything else online after they have reached their cap. This option benefits customers far more than T-Mobile's current plans.

At the same time, customers would not be able to overload the network – important for T-Mobile's ability to reasonably manage its network. Customers would not be able to send more traffic than if they were watching a video with Binge On.

Option 3: More Data for Everyone

Contrary to T-Mobile's marketing claims, Binge On does not allow users to stream video for "free" – customers pay for it with their T-Mobile subscription.[99] T-Mobile has determined that its network can support the additional video traffic of Binge On and still make a profit.[100] That means that T-Mobile could increase the monthly data caps on its capped plans to account for the average amount of video that people are watching.

Thus, instead of giving customers additional data that can only be used for Binge On video, which limits their ability to use the applications of their choice, T-Mobile would give customers additional data that can be used for anything. Customers who would prefer to use this additional data for video could continue to do so, but customers with different needs and preferences would be free to use that data in the way that is best for them. This option not only restores user choice,

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[97] See Section I.
[98] See footnote 14.
[99] See, for example, the description on the Binge On product page: "With Binge On™, Simple Choice users on a qualifying plan are FREE to stream unlimited video on your favorite services like Netflix, HBO NOW, Hulu, and many more without using a drop of your data." (T-Mobile USA (2015c)), or the description on the product page for mobile Internet plans: "With Binge On™ - stream unlimited video on the most popular streaming services like Netflix, HBO NOW, Hulu, and others for FREE without using your high speed data." (emphasis removed) (T-Mobile USA (2015g)). See also the screenshots in the Appendix, Section 1.
[100] Goldman (2015); Baumgartner (2015); Gryta (2015).

but would also make more explicit to customers how much extra data they actually get. That would make it easier for people to compare plans across providers.

Conclusion: Based on what we know, Binge On is likely to violate the FCC's general conduct rule.

The FCC's 2015 Open Internet rules are designed to preserve the Internet as an open platform for competition, innovation, and free expression. They contain three bright-line rules that prohibit ISPs from engaging in practices that the FCC has identified as harmful to Internet openness: (1) blocking, (2) throttling: technically discriminating against applications or classes of applications, and (3) paid prioritization: charging application providers for technical forms of preferential treatment such as "fast lanes." But as the Open Internet Order explains, an ISP can exploit its position as a gatekeeper "through a variety of technical and economic means."[101] Therefore, the Open Internet rules include a "general conduct rule" to prohibit practices that harm Internet openness but are not already banned by the bright-line rules.[102]

Zero-rating is not explicitly prohibited by the bright-line rules. Instead the Order states that the FCC will use the general conduct rule to evaluate specific instances of zero-rating on a case-by-case basis.[103] The FCC will determine whether such practices "harm Internet openness" and "cause the type of harms [the Open Internet] rules are intended to address."[104]

Based on the findings of this report, Binge On harms Internet openness as defined by the Order. The program violates key net neutrality principles that the Open Internet rules are designed to protect. Binge On puts T-Mobile in the position of a gatekeeper that picks winners and losers online, regardless of the ISP's intentions.[105] The program constrains how people use the Internet: It limits users' ability to use the applications, content, and services of their choice.[106] The program is not application-agnostic:[107] It favors video providers included in the program over those that are not, commercial entertainment over other forms of video content, and online video over other kinds

[101] Federal Communications Commission (2015), p. 9, para 21.
[102] Federal Communications Commission (2015), pp. 8-9, paras 20-22, pp. 59-60, paras 133-137.
[103] Federal Communications Commission (2015), p. 68, para 152.
[104] Federal Communications Commission (2015), pp. 59-60, paras 136 and 135.
[105] That an ISP has the technical ability and economic incentive to exploit its position as a gatekeeper to pick winners and losers online is a core concern underlying the FCC's Open Internet rules. See the discussion in footnotes 21, 36 and 37 above. See also footnote 5.
[106] Protecting user choice is an explicit purpose of the Open Internet rules. 47 C.F.R. § 8.1. In addition, the FCC's general conduct rule explicitly protects Internet "users' ability to select, access, and use … the lawful Internet content, applications, services, and devices of their choice." 47 C.F.R. §8.11. Whether a practice promotes consumer choice is one of the factors the FCC will consider when evaluating ISP conduct under the general conduct rule. Finally, promoting consumer choice has been a longstanding principle underlying Commission policy even before the advent of the Internet. See the discussion in footnote 27 above.
[107] That the network is application-agnostic is one of the key factors that have fostered innovation and free speech in the past. Whether a practice is application-agnostic is one of the factors the FCC will consider when evaluating ISP conduct under the general conduct rule. See the discussion in footnotes 36 and 37 above.

of Internet uses. And it violates the principle of innovation without permission.[108] As a result, Binge On harms competition, innovation, and free speech– all harms that the general conduct rule is meant to prevent.[109] Taken all together, it is likely that Binge On violates the general conduct rule and is therefore illegal.

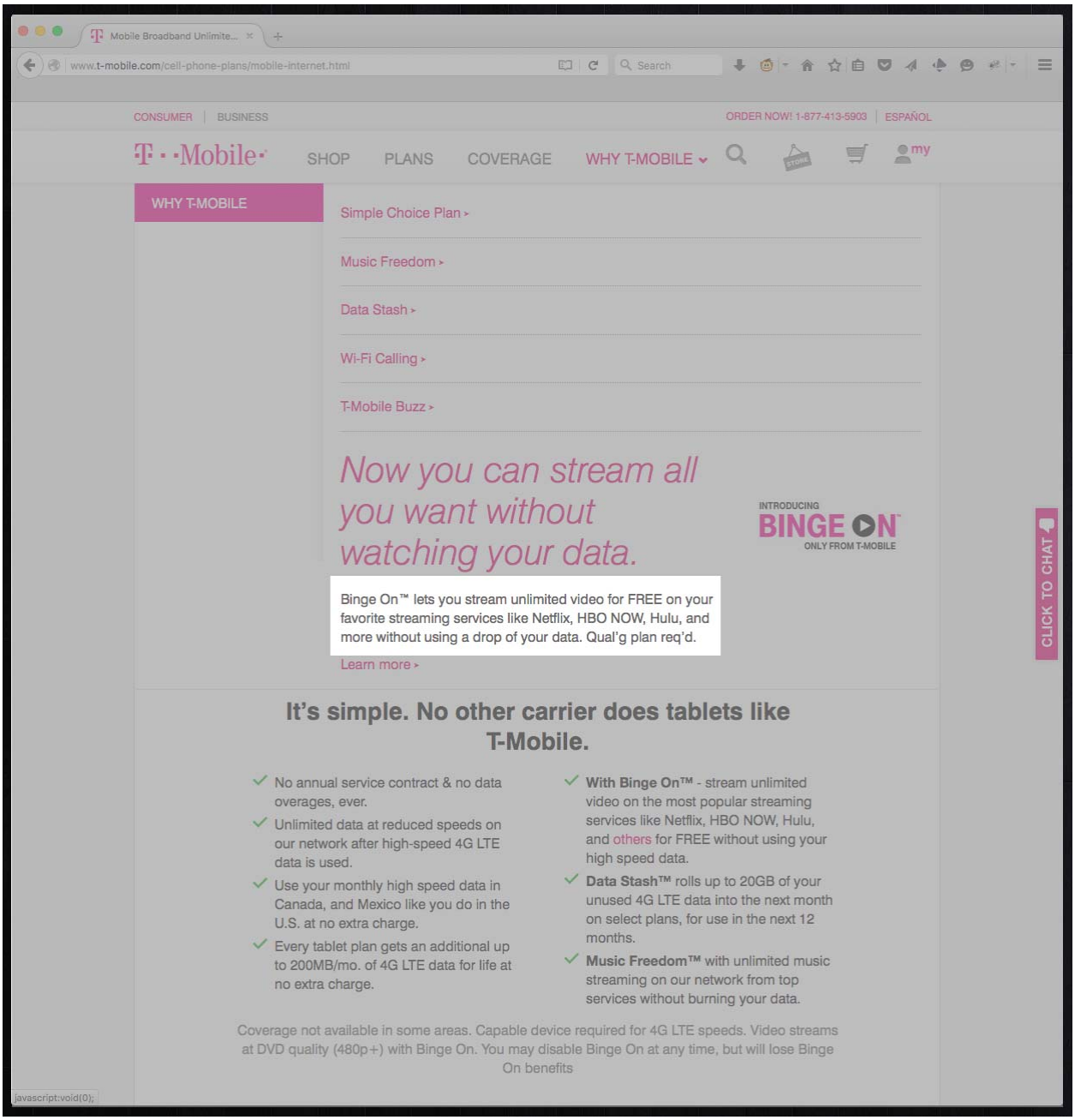
[108] Protecting the freedom to innovate without permission is an explicit purpose of the Open Internet rules. See the discussion in footnote 69 above.

[109] Preserving the Internet "as an open platform enabling […] freedom of expression, […] competition, and the freedom to innovate without permission" is an explicit purpose of the Open Internet rules. 47 C.F.R. §8.1. See also Federal Communications Commission (2015), pp. 25-27, paras 76-77. The justification for the general conduct rule specifically calls out the protection of application innovation and free expression as overarching goals of the general conduct rule. The general conduct rule explicitly aims to preserve the virtuous cycle by promoting innovation in Internet content, applications, and services, which in turn increases people's demand for more and better network infrastructure. The increased demand, in turn, motivates providers of Internet access to expand and improve their networks. Federal Communications Commission (2015), pp. 8-9, paras 20-21, pp. 59-60, paras 136-137. And by protecting the open Internet as a platform for free expression, the general conduct rule "fulfill[s] the congressional policy" expressed in 47 U.S.C. §230(a)(3) that "the Internet offer[s] a forum for a true diversity of political discourse, unique opportunities for cultural development, and myriad avenues for intellectual activity." Federal Communications Commission (2015), p. 9, para 22 (citing 47 U.S.C. §230(a)(3)), pp. 59-60, paras 136-137. On free expression and the general conduct rule, see also the discussion in footnotes 36 and 37 above. Finally, how a practice affects competition, innovation, and free expression are all factors that the FCC will consider when evaluating conduct under the general conduct rule. Federal Communications Commission (2015), pp. 62-63, paras 140, 142, 143.

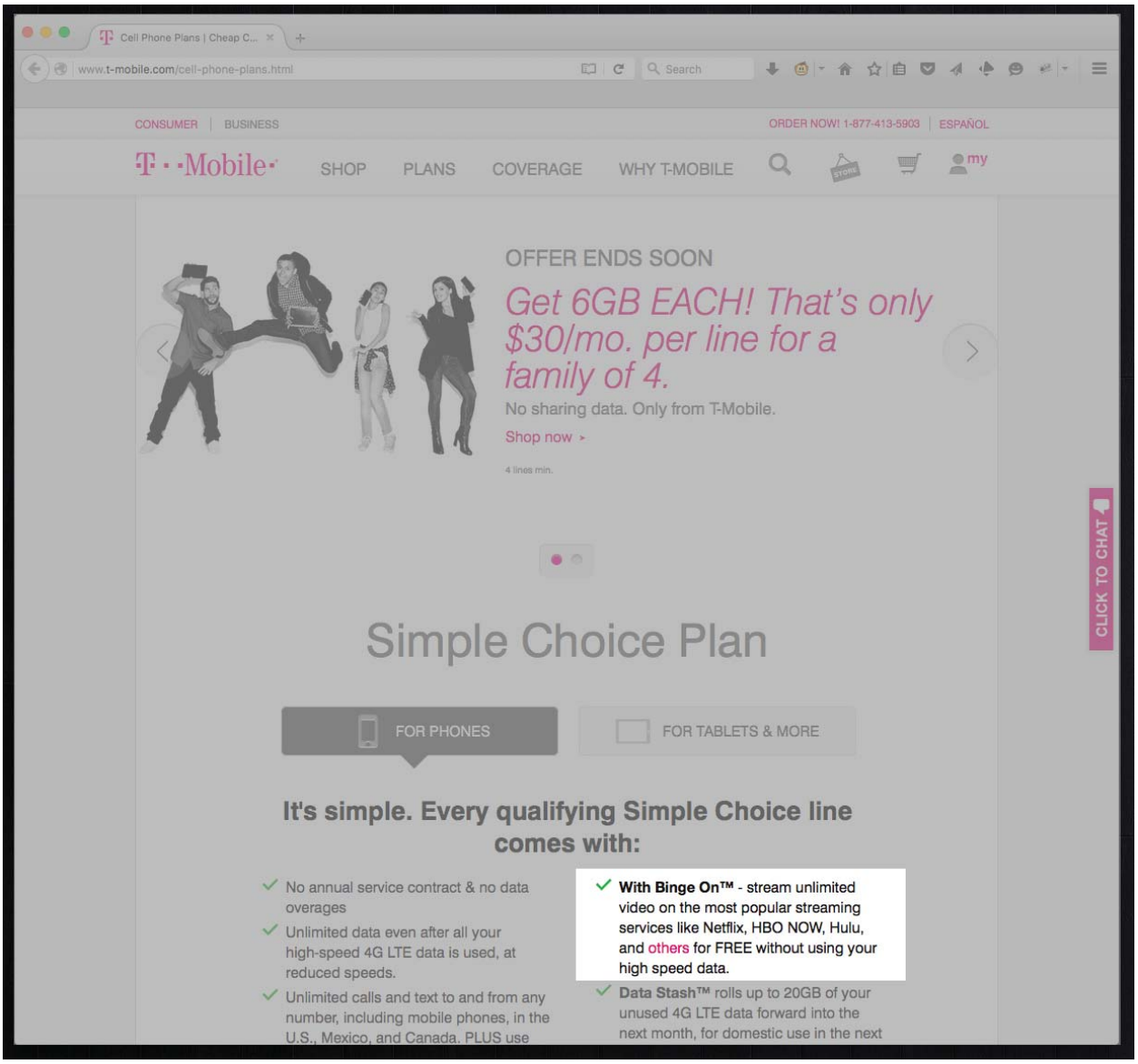
Appendix: Illustrating the Transparency Concerns with Binge On

1. T-Mobile advertises Binge On as "unlimited video" on highly visible parts of its website.

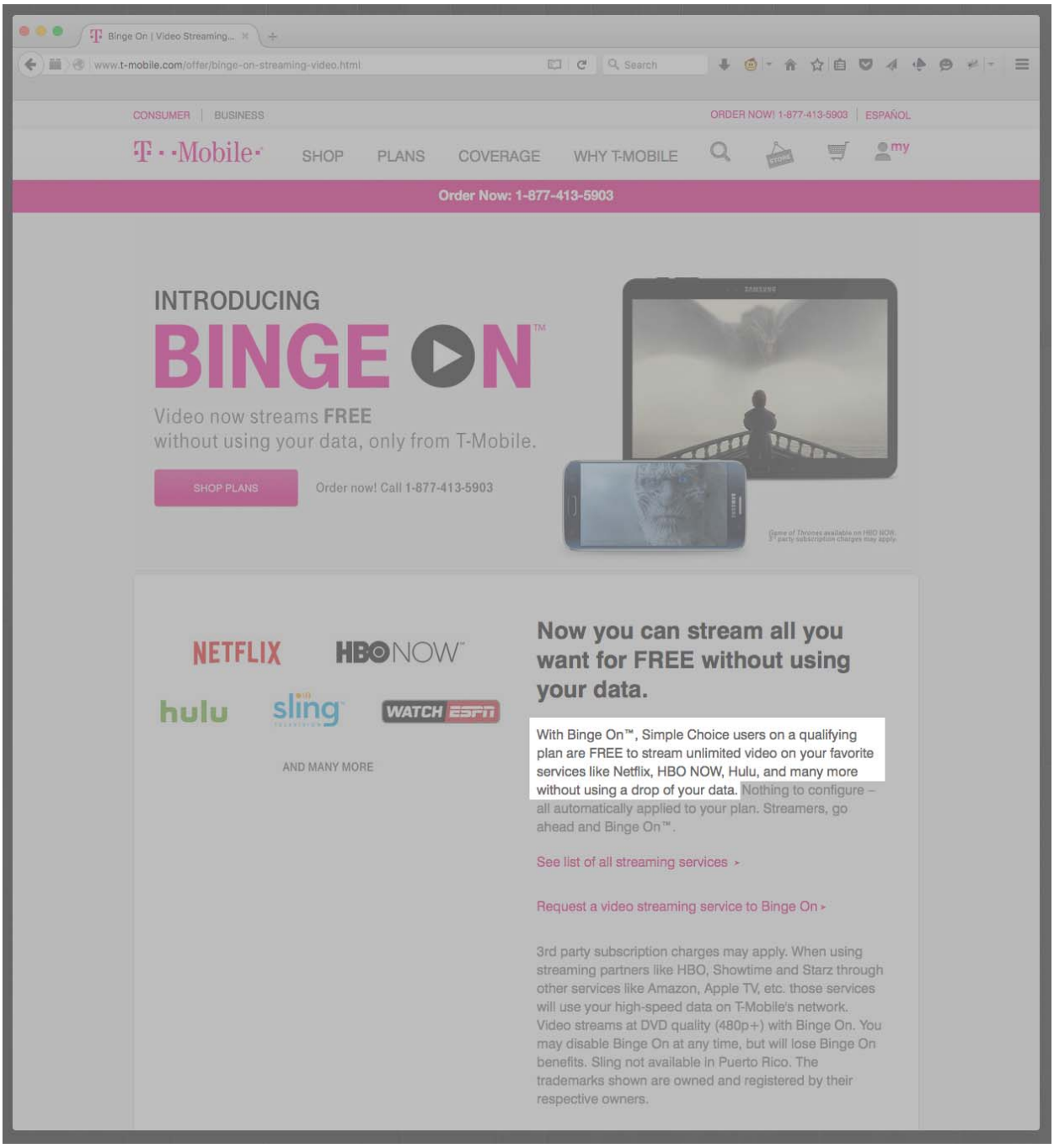
T-Mobile advertises Binge On as "unlimited video" on highly visible parts of its website. However, customers can only watch Binge On video until they reach their data cap through other Internet uses that are not zero-rated. Here are some examples of T-Mobile's online advertisements.



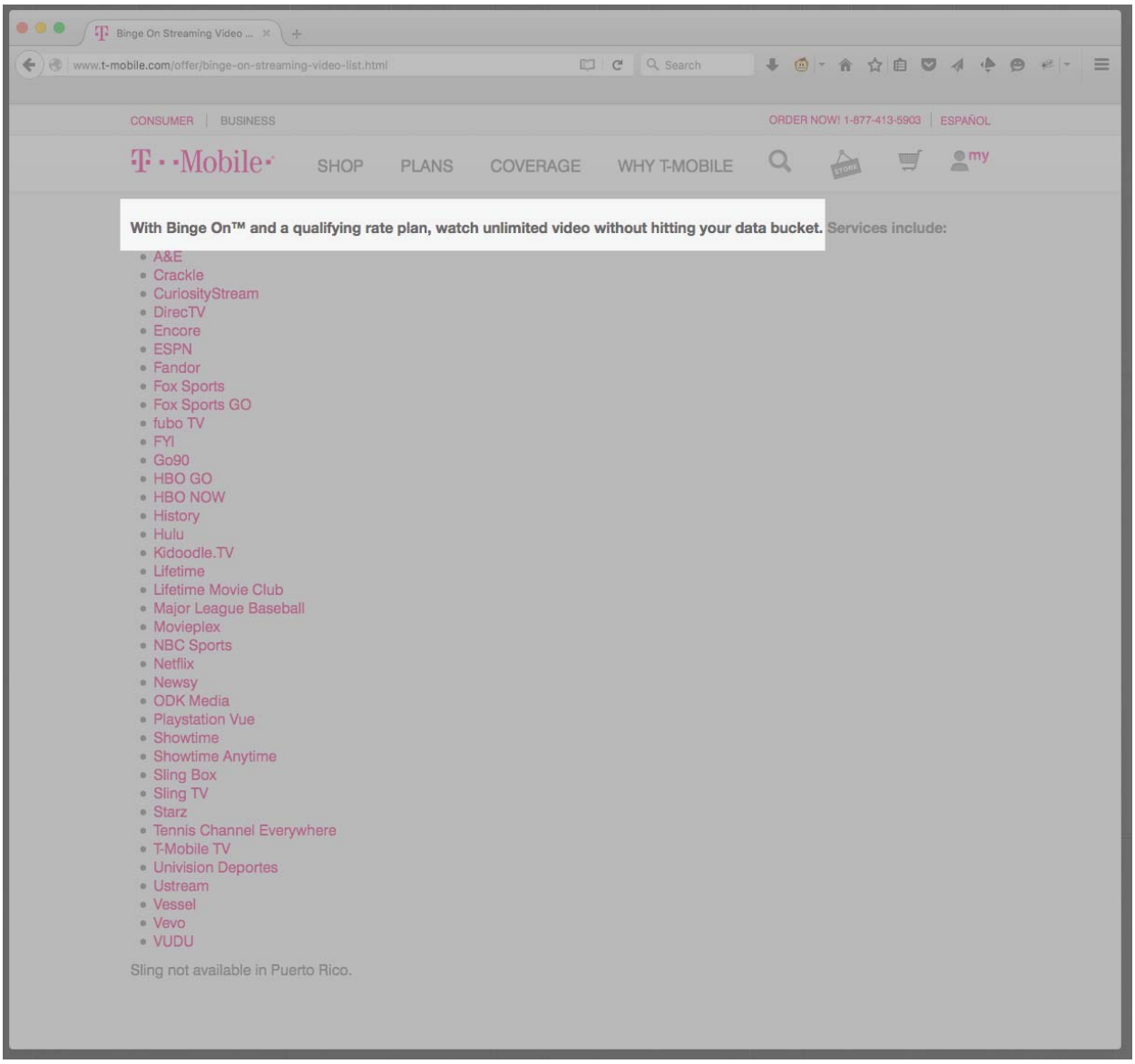
Source: T-Mobile USA (2015g) as of January 28, 2016 (highlight added).



Source: T-Mobile USA (2015g) as of January 28, 2016 (highlight added).



Source: T-Mobile USA (2015c) as of January 28, 2016 (highlight added).



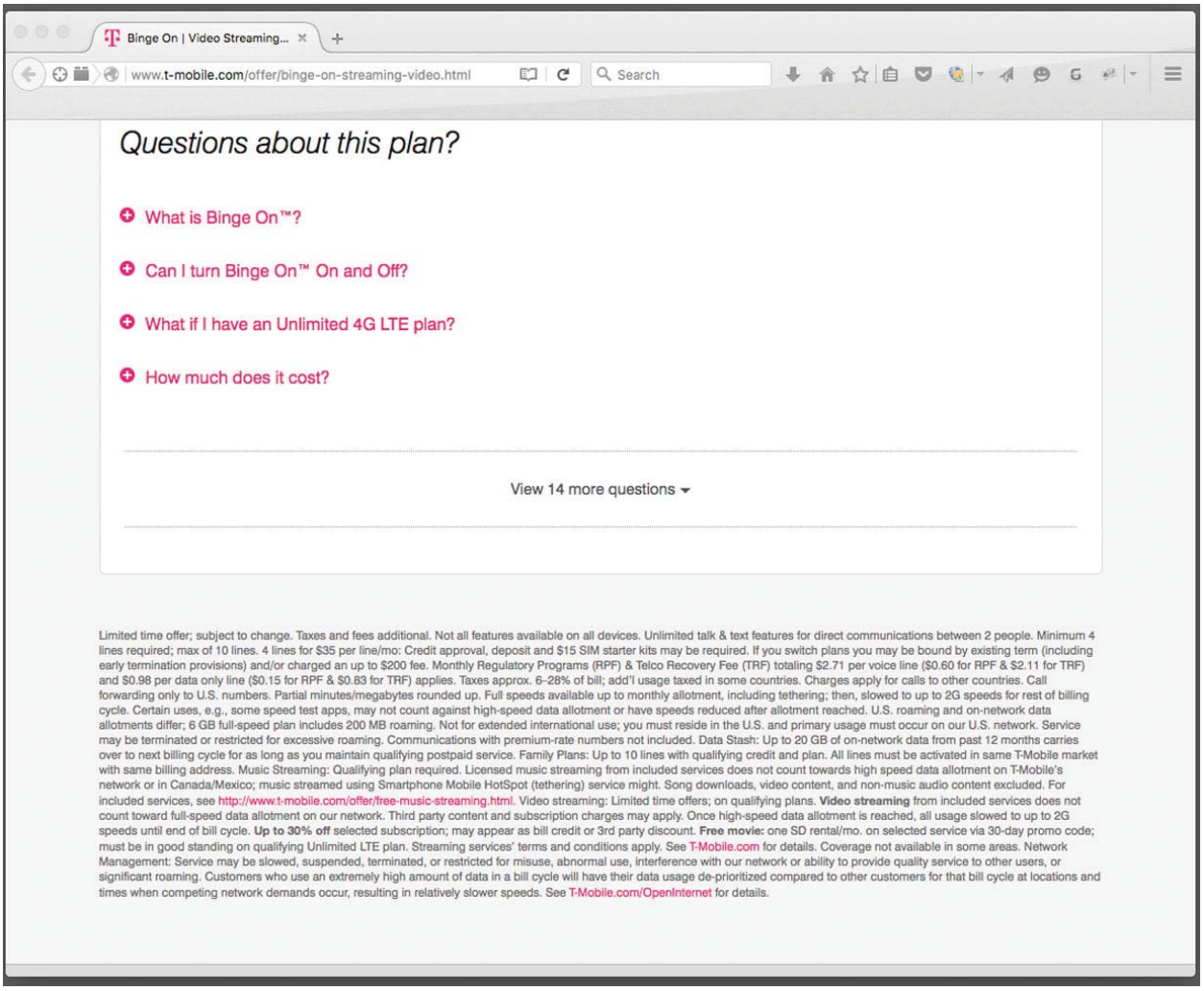
Source: T-Mobile USA (2016d) as of January 28, 2016 (highlight added).

2. T-Mobile discloses the limited nature of Binge On on less visible parts of its website.

By contrast, the accurate descriptions of the program which disclose its limited nature appear on parts of T-Mobile's website that customers are less likely to see.

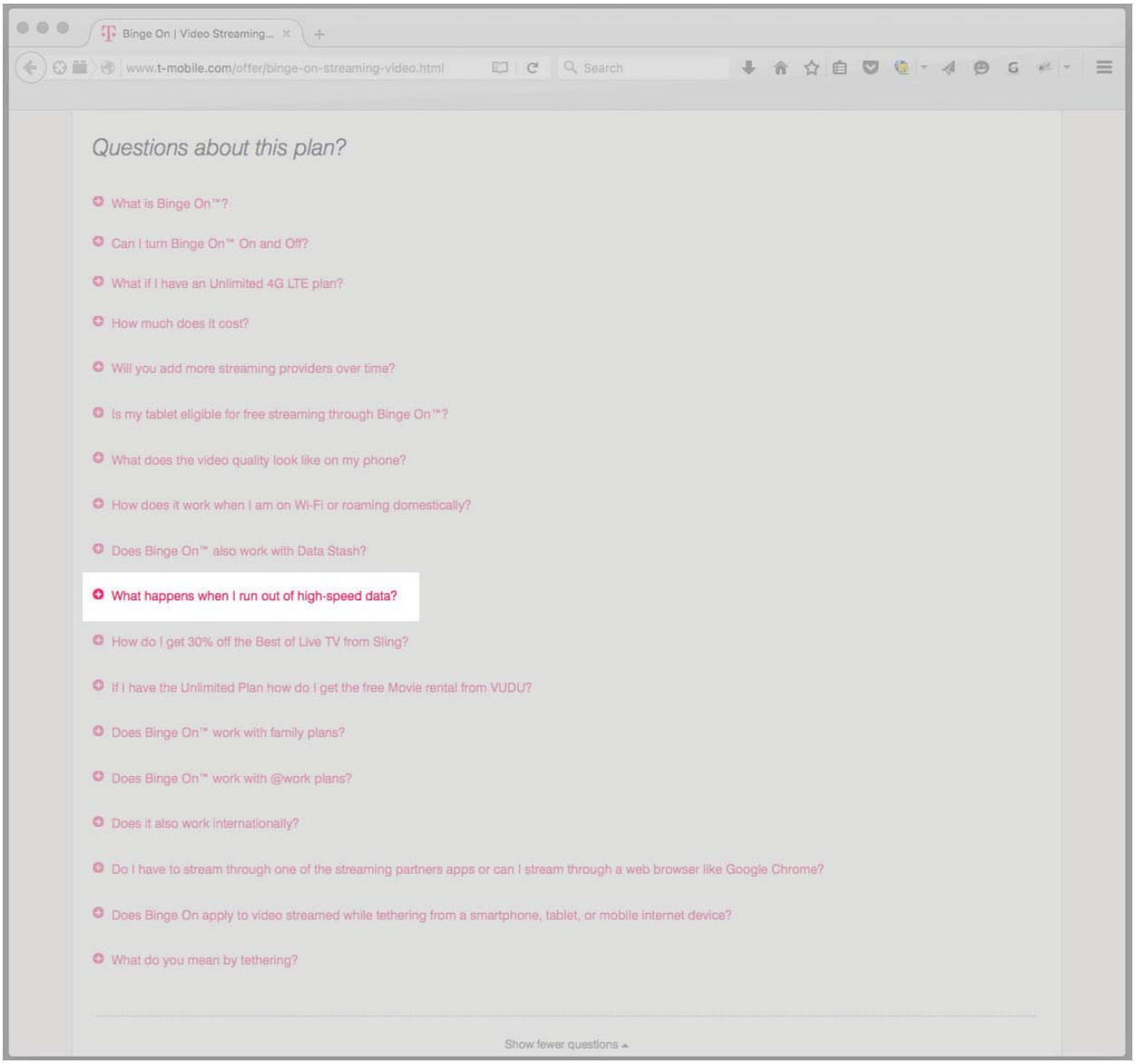
The product page for Binge On includes a question that describes the limited nature of Binge On. To get to this question, consumers need to take three steps.

First, they need to scroll to the section "Questions about this plan?" at the bottom of the Binge On product page.



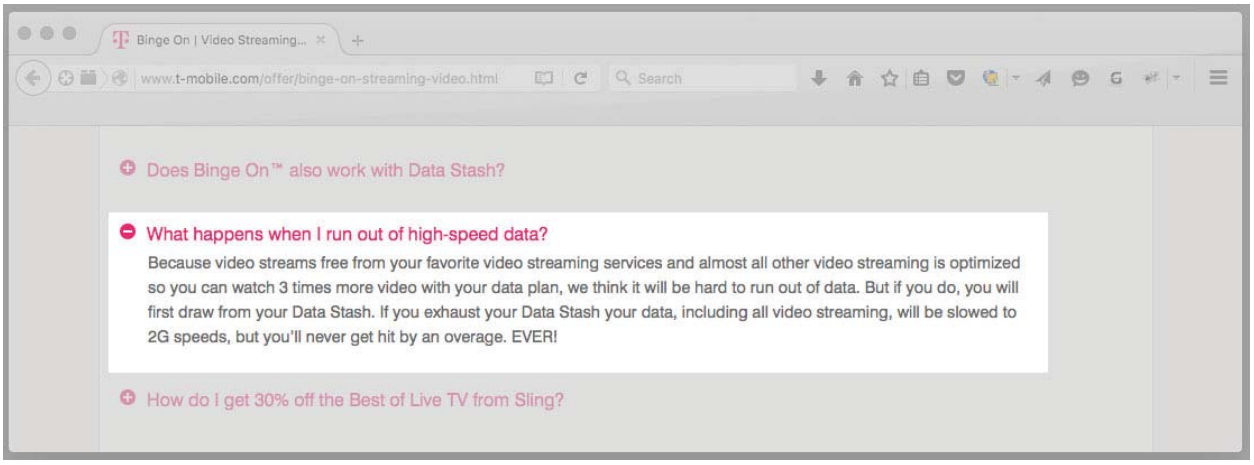
Source: T-Mobile USA (2015c) as of January 28, 2016 (highlight added).

Second, they need to click on "View more questions." The relevant question ("What happens if I run out of high-speed data?") is the tenth question in this section.



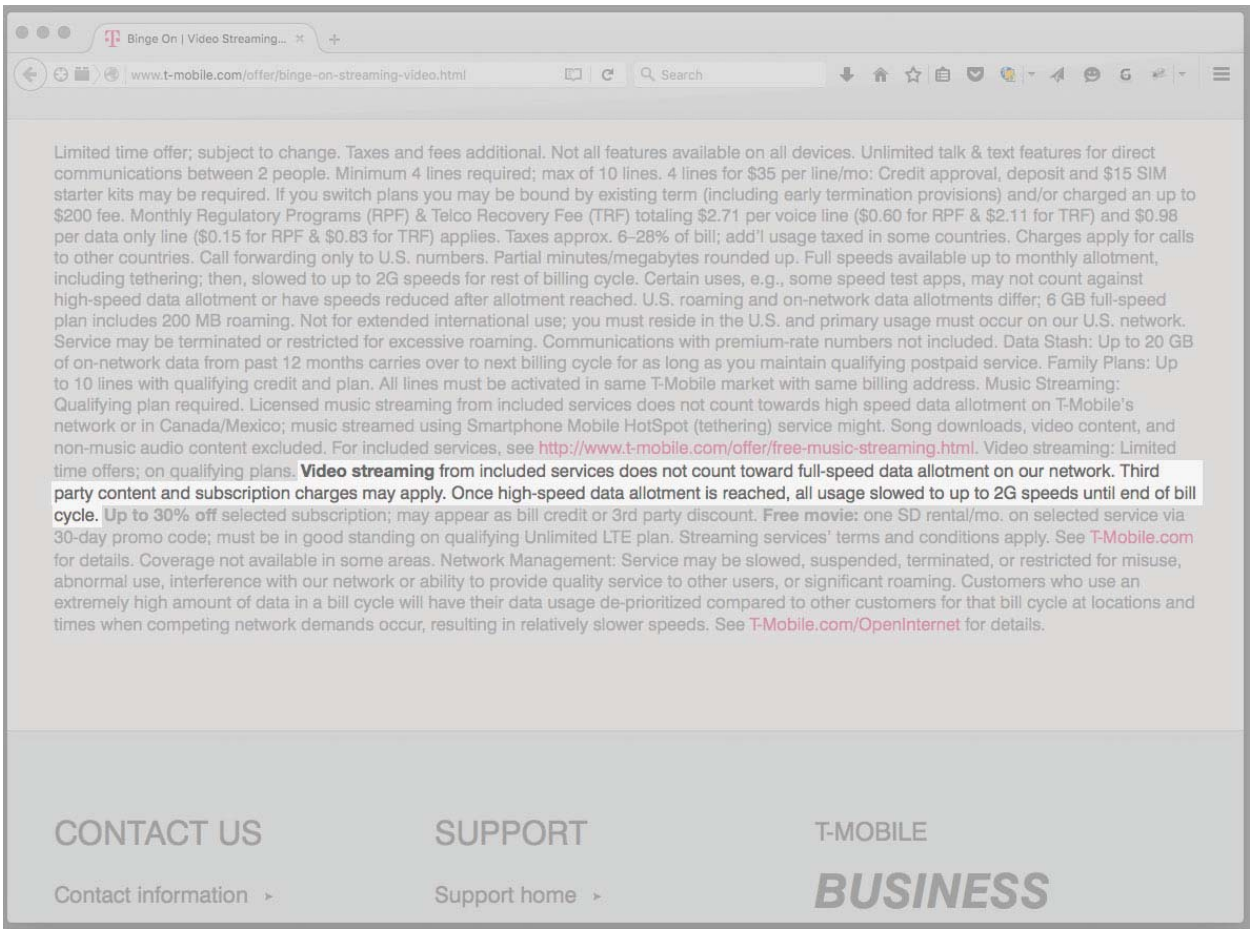
Source: T-Mobile USA (2015c) as of January 28, 2016 (highlight added).

Third, they have to click on the question to see the answer, which discloses the limits.



Source: T-Mobile USA (2015c) as of January 28, 2016 (highlight added).

The limits of Binge On are also disclosed in the fine print at the bottom of the Binge On product page. The same sentences can be found in the fine print at the bottom of the product page for T-Mobile's mobile Internet plans.[110]



Source: T-Mobile USA (2015c) as of January 28, 2016 (highlight added).

[110] T-Mobile USA (2015g).

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