

# Policy Issues in Data Caps and Usage-Based Pricing

Economic Impacts of Open Internet  
Frameworks Working Group

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# Policy Issues in Data Caps and Usage-Based Pricing

FCC Open Internet Advisory Committee

Working Group on Economic Impacts of Open Internet Frameworks

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The following report on Data Caps was prepared by the Economic Impacts working group in reaction to the press coverage and strong consumer sentiment regarding caps on data plans.

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## Topics Covered

The report examines data caps within the context of the Open Internet Order, primarily in wire-line, non-specialized services Internet access, and seeks to bridge the divide between the vernacular conversation surrounding caps and the perspectives from various stakeholders. Thresholds, caps, and usage-based pricing have been implemented in a variety of ways. This study focuses on providing definitions and identifying concerns/questions, with an emphasis on highlighting concerns and questions of the Open Internet Advisory Committee members.

The working group has chosen to focus on caps, thresholds and usage-based pricing because of questions raised about caps and tiers in many public forums and working papers. The Order expressly approves of usage-based pricing and experiments in pricing. Some members are concerned that this report could be construed as the working group second-guessing the FCC's decision. The Order set up the advisory group to consider whether aspects of the Order remain consistent in its effects on the Internet as the Internet evolves, and it is in that spirit that this conversation was undertaken.

The report considers only one part of a larger topic in detail, while aspiring to summarize many important aspects of this topic. However, it recognizes that it may be difficult or impossible to be comprehensive. Accordingly, the study ends with a section of further reading.

## Definitions

**Specialized Services** – The Order offers a rough definition on paragraph 112.

“...services that share capacity with broadband Internet access service over providers' last-mile facilities, and may develop and offer other such services in the future. These 'specialized services,' such as some broadband providers' existing facilities-based VoIP and Internet Protocol-video offerings, differ from broadband Internet access service and may drive additional private investment in broadband networks and provide end users valued services, supplementing the benefits of the open Internet.”

This report uses these terms merely for one pragmatic purpose, namely, to discuss the policy issues raised by data caps. Further discussion of the exact boundaries of this term are the province of the Specialized Services working group and are beyond the scope of this report.

**Usage-based pricing** - Usage-Based Pricing (UBP) takes many forms. It includes a continuum of practices from metering to discrete steps in price levels. In addition, volume-based pricing can discount or increase with volume. UBP appears in many economic settings and no single characterization will capture all these settings. For example, it describes metered pricing in electricity, as well as tiered pricing in cellular telephony. In general, UBP in the Internet context is based on amount of time online and/or volume of data transmitted. The working group uses UBP as a technical term that includes all form of charging functions that incorporate volume, whether linear or not.

**Data caps** - Data caps are often considered to be a form of UBP. The term “data cap” is characterized by several phenomena. In general, if a user is within a cap, he or she pays a set price. That is, the cap defines a limit on amount of data per month per household (today

expressed in gigabytes). Exceeding the cap could subject a household to alterations to its Internet access, possibly after one or more warnings, such as reduction of access speed, additional charges, suspension of service, or even termination of service.

The termination of service has received particular attention in public discussion, though to date, this appears to be a rare event, as noted below. A cap is rarely, if ever, a hard and fast ceiling on a customer's ability to access the network. A cap is usually better understood as a threshold after which the user is subject to a different set of conditions for access, such as movement to a higher priced tier, different product or different speeds. As discussed below, another way of thinking of this is as the boundary between different "tiers" of service.

The history of dial-up Internet access accounts for the present ambiguity in language. Historically caps referred to limitations on hours of use. It was quite common for dial-up ISPs to place capacity limitations based on hours of use of the ISP service per month, even for services sold as "unlimited." A common level for a cap was 100 to 120 hours of use per month. After exceeding that cap, certain ISPs would discontinue service altogether. Other ISPs used an early version of UBP instead and, rather than terminating service, would simply charge extra additional hour of service. One asserted basis for this practice was that UBP was needed to address capacity issues related to the fixed capacity of modem banks.<sup>2</sup>

Modern caps refer to limitations on downloading and uploading of data. Today, as the tables below show, hourly use is not restricted by any major ISP. Instead, thresholds, if they exist, pertain to monthly limits or tier thresholds on the total transmission and reception of data, and, moreover, the draconian features of historical caps, such as abrupt termination of service, are largely absent from the modern version. Within the United States, no major ISP stops providing service to consumers without notifying consumers and providing additional options in the way of tier upgrades or overage charges.

There are a variety of viewpoints about caps. Mirroring the different perspectives used throughout this document, the following perspectives may be helpful as a start to the discussion:

*From the user viewpoint:* The viewpoints vary depending on if caps or thresholds are actually impacting the user. However, the difference between a high threshold and a cap may be a semantic distinction without a meaningful difference, particularly if the threshold appears to be abrupt, and there is little perceived difference between being terminated, and the alternatives, such as overage charges or throttling. Lack of consumer understanding of how a data caps are impacted by use of various services may impose mental transaction costs that could dissuade consumers from using Internet-delivered services – even if a user does not come near to exceeding a cap. These concerns are particularly acute if the user perceives little option to contract with alternative suppliers of Internet access. Additional questions also arise: can cap information be difficult to find,

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<sup>2</sup> Providers justified these policies by noting that modem banks were dimensioned assuming statistical multiplexing and specific usage patterns. For a history of dial-up access business in the United States, see e.g., Greenstein, Shane. 2008. "The Evolution of Market Structure for Internet Access in the United States." in William Aspray and Paul Ceruzzi, editors, *The Commercialization of the Internet and its Impact on American Business*, MIT Press. pp 47-104.

and relatively opaque to users, who may believe that they are contracting for unlimited Internet access?

*From an ISP's viewpoint:* Usage thresholds in most US broadband ISPs are set so high that they impact very few customers (around 1-2% depending on the ISP). Under most usage thresholds, a broadband user can successfully run many applications, stream video, download music, share photos, surf the web, play games online, etc. The concept of ultra-high end thresholds is to ensure that the low end (1G-10G), average (15G-50G) and even the high end user (100G-250G) is not subsidizing the most extreme bandwidth user (250G-1000G+). Network resources are not unlimited, and the ISP's viewpoint is that, as the Open Internet Order explains, "lighter end users of the network" should not be forced "to subsidize heavier end users" who require more of a dedicated commercial level of service vs. residential broadband.

*From an edge provider's viewpoint:* (An edge provider is a firm that provides online content, applications, or services to end users.<sup>3</sup>) When users and edge providers exchange traffic, the traffic goes over an ISP's facilities. A high threshold or cap may represent an additional factor that shapes the ability of an edge provider to supply its service or conduct business with a user. If an ISP imposes a data cap or other form of UBP, this could affect user demand for the edge provider's service, which, in turn, may shape the ability of the edge provider to market and deliver its service. This is especially so if the ISP offers specialized services that compete with the edge provider, and for which a cap or other UBP does not apply.

The discussion will focus on the implications of these thresholds as one form of UBP, and expand on the different points of view. The study will occasionally use the phrase "caps" or "threshold," depending on context and point of view.

Two words of caution are warranted at the outset. First, assessment of caps is not synonymous with assessment of all forms of thresholds within UBP. This discussion leaves many other topics about UBP uncovered. Second, the study initially will focus on issues in the absence of competing specialized services. In the presence of specialized services, there are additional issues raised concerning selective applications of thresholds to some types of traffic, which will be discussed below.

## **The Report and Order on UBP**

The Open Internet Report and Order discusses usage-based pricing, but does not expressly mention data caps except by implication in that data caps can be considered a form of UBP. The most direct mention of UBP is in Paragraph 72 of the Order:

"Some commenters suggest that open Internet protections would prohibit broadband providers from offering their subscribers different tiers of service or

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<sup>3</sup> See footnote 2 of the Order. The Order uses "... 'edge provider' to refer to content, application, service, and device providers, because they generally operate at the edge rather than the core of the network."

from charging their subscribers based on bandwidth consumed. We are, of course, always concerned about anti-consumer or anticompetitive practices, and we remain so here. However, prohibiting tiered or usage-based pricing and requiring all subscribers to pay the same amount for broadband service, regardless of the performance or usage of the service, would force lighter end users of the network to subsidize heavier end users. It would also foreclose practices that may appropriately align incentives to encourage efficient use of networks. The framework we adopt today does not prevent broadband providers from asking subscribers who use the network less to pay less, and subscribers who use the network more to pay more.”

The Order left open the possibility of many experiments in business models and pricing. Moreover, the Internet had evolved over time, and the Order anticipated that the Internet would continue to evolve in unexpected ways, including in pricing for mobile broadband services (see especially paragraph 94).

## **Competition**

Data caps are a source of concern in settings where there are no or few substitutes for Internet access. That reduces the discipline affiliated with competitive markets. Limited competition gives a supplier the ability to make take-it or-leave-it offers to users, and users cannot leave for another supplier if they find the service or contracts unsatisfactory. As noted in the data section, there is no indication that ISPs are offering different policies in areas with limited competition.

Resolving any such question, however, requires defining the extent of competition, which, in turn, requires a precise definition of the size of the market. It is the typical first step in any textbook policy analysis. In practice, however, a precise definition can be elusive.<sup>4</sup>

That matters for discussions of caps, thresholds, and UBP. While there are a variety of issues with UBP, most of the issues with thresholds do not arise when the prices are low. Many interesting policy questions concern the highest thresholds and the biggest charges, especially those that (effectively) determine the difference between unlimited service and limited service.<sup>5</sup>

While that makes it seem like it might be possible to reduce many questions to a narrow issue, it turns out that even narrow questions contain challenges. For example, there is simply no general definition for “demand for high bandwidth,” which varies by supplier, by geography, and technology. No simple definition – e.g., all markets for services above 5GB, 20GB or 50GB or some other arbitrary floor – will work in all settings. In addition, as will be shown below, because demand is growing rapidly, policy is shooting at a moving target, so it is also hard to describe a general rule for the size and scope of the market in which the policy issues arise.

Consider concerns about caps and thresholds that focus on the “high end,” or users who consume a significant amount of data. There is a perception that users at the “high end” are more likely to

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<sup>4</sup> See the National Broadband Plan, particularly chapters 3 and 4, for an extensive discussion of questions pertaining to defining the structure of the market. See <http://www.broadband.gov/plan/>.

<sup>5</sup> This section focuses on the policy issues at “the high end” for purposes of illustration. The discussion below will discuss further issues about thresholds across a range of bandwidth levels.

exceed caps and find no alternative source of Internet access that meets their high-usage demands. This usage pattern could be considered more typical of business-class users. However, even this perception is difficult to substantiate, partially because it is difficult to estimate what “high end” usage consists of now, or what it will consist of in the future. The size and definition of “high” is a moving target. It is also difficult to estimate what high or low end use consists of because estimations of usage distributions also vary widely, with no definitive standard. In addition, the lack of definitive data reflects real underlying variance in situations in which firms deploy wireline broadband in the United States – variance in access technology (cable, DSL and FTTH), vendors (different local pairings of rivals, if any), regulatory treatment, and geographic features (city/rural and flat/hilly). The National Broadband Plan discusses this variance extensively, as does the Order.

Growth in data traffic also reflects real underlying variance in the data-intensive applications that users deploy (e.g., YouTube, Hulu, Netflix, peer-to-peer, multiplayer gaming). Usage of data by these applications grows at different rates because there is variance in the rate of adoption – and intensity of use – of these and related applications. All of these variations confirm the need to refrain from sweeping generalities for all settings and times about the state of competitive alternatives.

Hence, there is no consensus on the definition for “high” either now or in the near future. This means that it’s very difficult to draw conclusions about whether high end users would switch from wireline broadband providers with a lower cap to ones with a higher cap. This lack of data about even the user population, let alone their behavior in the marketplace makes it difficult to draw conclusions about the role of data caps in competition.

This does not mean it is impossible to discuss and analyze caps and related matters. However, it does imply that it is usually challenging to come to sweeping and general conclusions. This theme will arise in several places throughout the report.

### **Caps: The Facts**

Many types of data charges exist in United States residential wireline Internet access. Table 1.1 shows data from an October 2012 article in GigaOm. Table 1.2 shows data collected by a working group member in February of 2013, based on publicly available data, which breaks out some of the thresholds by pricing tiers. The section will present these facts, and later sections will offer overlapping and competing interpretations.

Examination of the tables shows several things. First, the highest thresholds typically range between 150 and 300GB per month. Second, a number of ISPs do not have any caps at all. Third, many thresholds that resemble caps are part of a system of many-step thresholds, often within one pricing plan or tier. Fourth, some ISPs offer many tiers, and the highest thresholds vary by tiers. Fifth, when an overage charge arises (see appendix), firms tend to use similar levels, generally around \$10 for 50 additional GBs beyond the threshold (See appendix. This is not reflected in the Tables).

These observations reinforce the conclusion that there is considerable variance and experimentation in the market by ISPs. Note, however, that these are observations of firms and

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contracts, not subscribers. This table does not address questions about how much data most users actually consume and what thresholds, if any, most users actually face.

**Table 1.1. Caps quoted in GigaOm**

• ISP	Cap	• ISP	Cap
Comcast	300GB per month	Charter	100GB – 500 GB per month
AT&T	250GB or 150 GB per month	Frontier	No
TWC	No	Windstream	No
Verizon	No	SuddenLink	150GB to 350 GB per month
CenturyLink	150 GB per month to 250 GB per month	MediaCom	150 GB to 999 GB per month
Cox	30GB-400GB per month	Cable One	1GB, 50 GB and 100 GB per month
Cablevision	No	FairPoint	No
		Cincinnati Bell	No

Source: [See http://gigaom.com/2012/10/01/data-caps-chart/](http://gigaom.com/2012/10/01/data-caps-chart/).<sup>6</sup>

**Table 1.2. Highest thresholds, Recent sampling of Company sites**

Provider	Use Threshold - GBs <sup>7</sup>
Comcast	min 300 GB (increasing by speed tier) <sup>8</sup>
AT&T - U-Verse HSIA	250
AT&T – DSL	150
Time Warner Cable	None
Verizon - FiOS / DSL	None
CenturyLink - 1.5 Mbps	150
CenturyLink - >1.5 Mbps	250
Cox - Ultimate (100 Mbps)	400

<sup>6</sup> The article includes additional details on exceptions, tiers, and overages. The appendix consists of more recent and accurate data, and corrects several inaccuracies in this article.

<sup>7</sup> Gigabytes per month, unless otherwise noted.

<sup>8</sup> At the time of writing Comcast does not have any caps in place but is trialing two UBP plans. See appendix for further details.



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Cox - Premier (25 Mbps)	250
Cox - Preferred (15 Mbps)	200
Cox - Essential (3 Mbps)	50
Cox - Starter (1 Mbps)	30
Cablevision	None
Charter - Lite & Express ( )	100
Charter - Plus & Max (30 Mbps )	250
Charter - Ultra100 (100 Mbps)	500
Frontier	100 / 250 in selected trial mkts
Windstream	None
SuddenLink (>30 Mbps)	350
SuddenLink (10-30 Mbps)	250
SuddenLink (<10 Mbps)	150
MediaCom - Launch (3 Mbps)	150
MediaCom - Prime (15 Mbps)	250
MediaCom - Prime Plus (30 Mbps)	350
MediaCom - Ultra/Ultra plus (50/105 Mbps)	999
Cable One – Economy	Monthly: 1GB <sup>9</sup>
Cable One - Preferred (50 Mbps)	Monthly: 50 GB <sup>5</sup>
Cable One - Elite (50 Mbps)	Monthly: 100 GB <sup>5</sup>

<sup>9</sup> Daily limits also apply. See appendix.

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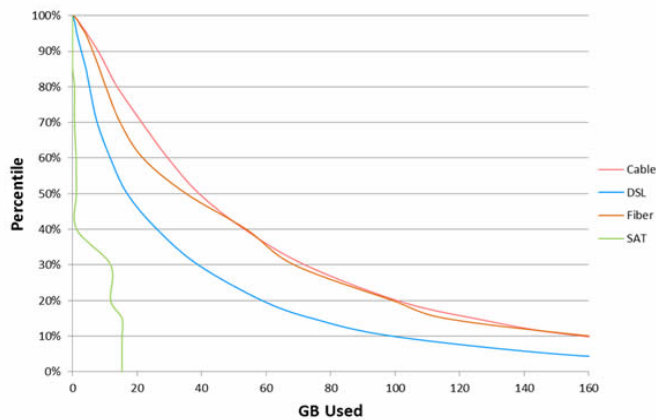
Cable One - Standard (5 Mbps)	Daily: 3 GB
Cable One - Premium (10 Mbps)	Daily: 5 GB
Cable One - Ultra (12 Mbps)	Daily: 10 GB
FairPoint	None
Cincinnati Bell	None
Google Fiber	None

Sources: See Appendix.

It is difficult to interpret even the highest thresholds in the situations in which they arise, as there is no definitive public source on household usage per month to use as a benchmark. Several different sources are available. Usage varies depending on ISP and technology. All public measurements show great skew in usage, and suggest that caps do not yet impact users other than the highest users. A first look at the usage distribution is offered by Figure 1.1., which comes from the July 2012 Broadband Report.

Figure 1.1 puts the median at approximately 15 GB for DSL, 25 GB for Fiber, and 30 GB for cable users. Other estimates vary, but are in a “similar neighborhood.” For example, another estimate puts the median at 14 GB, and an average at 47 GB. (Bauer, Clark, Lehr, 2012). A Cisco study last year put the average at 26.2 GB average in 2011, with a forecast of 84 GB by 2016.

**Figure 1.1. Distribution of monthly use of data**



Source: <http://www.fcc.gov/measuring-broadband-america/2013/February#Chart20>.

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In addition to data collected by various studies, it is also possible to think of caps in terms of hypothetical use rates. One committee member offered a “cord cutter” benchmark: the Internet usage equivalent of the five hours per TV per day. Consider the following: 5 hr/day (television viewing) x 2 GB/hr (high quality video) x 30 days. That would yield 300 GB/month in use. Recognize that this is a speculative simulation, and considerable variance is possible. Many factors could change the outcome at a household – e.g., DVR use with HD antenna, type of viewing, live news and sports over the air. This also does not include other Internet usage.

This leads to a number of conclusions. For one, most thresholds in wire-line today in the US appear to affect only high end users. The lack of subscriber data makes it impossible to provide an estimate of the precise percentage of users affected by high thresholds, but at this point a high threshold, such as 150-300 GB, appears to affect a small percentage of households.

Despite that, there is some evidence that caps may be binding on users, if set low enough. For example, many Canadian ISPs have set caps in the range of 25/40/60 GB per month.<sup>10</sup> According to Netflix, streaming video at normal or high definition quality caused users to exceed their data allowances. Netflix reported that these low caps seemed to have an effect on household demand for its services and that it observed a noticeable response in its business. The same response would have been anticipated in the best of circumstances, but it was further magnified by the poor measurement of traffic at the household level and the lack of transparency to users. In reaction to these low caps, Netflix reduced the default quality of the videos it sent to Canadian users. Netflix set a lower quality bitrate limit (625kbps vs. 4800kbps) as the default for all users, to prevent users from accidentally hitting their caps. According to Netflix, streaming of high-definition content on the ISPs that cap in Canada is essentially non-existent, and the quality of the user experience has been reduced.

Will caps within the United States ever affect more than a small percentage of US households? Here we review two perspectives.

To begin, experts disagree on predictions for the likely rate of future growth in data usage due to (expected) growth in cloud-based services and video services at the level of household and in the marketplace overall (more discussion below). Even predictions for the near future vary heavily. Committee members were familiar with predictions as low as 20% and as high as 40-50% growth per year. This report draws from Sandvine Global Broadband trends, Cisco Visual Networking Index, SamKnows, and the FCC’s Measuring Broadband Report. While all such reports provide a similar outlook of the broad picture, these reports can differ significantly in the specific numbers provided.

Even this simple presentation of facts illustrates a point of disagreement between distinct perspectives. Though more will come in later sections of this report, here is a brief illustration:

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<sup>10</sup> The outline of these events has been reported in the trade press. See, e.g., Nate Anderson, March 29, 2011, “Data caps claim a victim: Netflix cuts streaming video quality,” *Arstechnica*. <http://arstechnica.com/tech-policy/2011/03/data-caps-claim-a-victim-netflix-streaming-video/>, and Richard Lawler, March 28, 2011, *Engadget*, “Netflix Canada announces new bandwidth management settings for capped users,” <http://www.engadget.com/2011/03/28/netflix-canada-announces-new-bandwidth-management-settings-for-c/>,

<sup>10</sup>both accessed April 28, 2013.

Some non-profit advocacy groups argue that caps will become binding assuming a constant rate of growth of bandwidth usage without corresponding cap adjustment. Some point out that “yesterday’s so called “bandwidth hogs” are today’s typical users.”<sup>11</sup> A bit of simple speculation can illustrate the circumstances in which the claim is valid or not. If growth rates are at the lower end of projections, say, 20% growth rates, there would be a doubling of use in a little less than four years. With such growth rate, a 150GB cap would become relevant to the behavior of much more than 10% of cable and fiber households portrayed in figure 1.1. Additionally, advocacy groups express concern that so called “extreme” users tend to be disproportionately early adopters of new technologies, and as such, caps that affect them may prove to have a large impact on innovation in the field, independent of the sheer number of users they affected.

Suppliers counter that the highest thresholds are unlikely to ever affect more than “extreme” users. Some ISPs determine their thresholds in reference to usage—often the threshold is either explicitly set as a certain percentage of their subscriber base’s usage, or is set so as to only affect an estimated percentage of the subscriber base. Under either methodology, by definition, the threshold can only affect that top percentage of users that are using the most bandwidth, and will not affect the vast majority of subscribers.<sup>12</sup> These thresholds are often established and periodically re-assessed, specifically to focus any effect on only the uppermost percentile of users. Therefore, by definition, these will only affect “extreme” users. For example, Comcast has raised its thresholds over time.<sup>13</sup> In addition, some ISPs have stated publicly that these “extreme” users tend to be those that are utilizing 24x7 file sharing or operating content or application servers from their homes. This usage pattern ties up infrastructure in a dedicated fashion that is similar to a reserved capacity of commercial service offering.

From the facts and examples listed above, we can reach only tentative conclusions. Although caps do not seem to be affecting a large number of US users now, the situation may change in the future, as user habits, supplier experimentation, vendor policy, and applications all change. As such, the FCC should monitor the situation. The committee makes no recommendation about which, of many factors, would be the most useful to monitor. Among the candidates for potential monitoring: definitions of tiers by data download limit; whether those limits are packaged with other features of a contract, such as bandwidth and speed; contractual provisions for what happens when users bump up against a tier (see, e.g., the appendix); and whether systematic differences arise across categories of service (fiber, DSL, etc).

In addition, it may be valuable to consider what warning signs of increasing effects by caps would look like. In addition, the reports about the Canadian experience with caps generally lacked verifiable data or other surveys of user response. It would be interesting to compare usage

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<sup>11</sup> The New America Foundation, “Capping the Nation’s Broadband Future?” [http://www.newamerica.net/publications/policy/capping\\_the\\_nation\\_s\\_broadband\\_future](http://www.newamerica.net/publications/policy/capping_the_nation_s_broadband_future), accessed May, 17, 2013.

<sup>12</sup> For example, AT&T describes: “In fact, less than 2% of AT&T High Speed Internet users utilize more than 150GB per month. We estimate that 98% of our customers will not be affected by this change because our data plans include so much bandwidth.” (<http://www.att.com/esupport/article.jsp?sid=KB409045#fbid=kiJ0SSZjH9l>).

<sup>13</sup> See e.g., Nate Andresen, May 17, 2012, “Comcast suspends 250 GB cap for now,” *Ars Technica*, <http://arstechnica.com/business/2012/05/comcast-suspends-data-caps-for-now/>, accessed April 29, 2012.

before and after caps were imposed, and to further learn what general lessons, if any, this situation can teach.

### **The Perception of Users**

From a consumer standpoint, caps and high thresholds are generally more appealing when their properties are knowable and predictable. Additionally, user behavior may be impacted substantially by incorrect understanding of contractual obligations or data use. Thus, the questions about the effects of caps can only really be answered if we understand what users know and think.

Policies for caps and thresholds should be concerned about user understanding because many household surveys find rather poor knowledge of speed/usage of own broadband and applications (see, e.g., the Pew Surveys<sup>14</sup>). In addition, there are changing norms for software usage and users may have a limited ability to understand the typical GB per hour of use of an application. Application and service owners bear some responsibility here as well, as they can make efforts to understand their own efficient and inefficient use of network resources, and its cost.

Lack of user understanding of how many GB may be used by applications could lead to two sub-optimal scenarios: (1) Users could underestimate the amount of data consumed and exceed their monthly data allotment, thereby incurring penalty fees or unanticipated upgrade charges; (2) Users could overestimate the amount of data consumed, thereby dissuading them from using Internet-delivered services even though they are well below their cap thresholds.

The history of unlimited dial-up can possibly explain some of the lack of user understanding of data use. The lack of limitation (i.e., unlimited use) is usually regarded as better for users than the presence of a limitation (i.e., a cap on use). Some commentators perceive an association between the lack of unlimited pricing and the lack of competitive alternative. In part, one of the most prominent historical examples reinforces the perception, namely, AOL's experience moving from usage-based pricing (specifically, metering of hours of use) to unlimited contracts. This change came about in response to competitive pressure.<sup>15</sup> Hence, in the minds of some commentators the increasing use of usage-based pricing with thresholds is affiliated with the decreasing use of unlimited plans, which, in turn, is presumptively affiliated with a decrease in competitive alternatives.

Unfortunately, much information about user understanding of caps and thresholds is missing. Some open questions that could be useful to answer: Do users have an ability to measure their

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<sup>14</sup> See the Pew Internet and American Life Project. <http://www.pewinternet.org/>.

<sup>15</sup> The perception partly arises from the reminiscing many years later. The CEO for AOL at the time, Steve Case, states that AOL had studied the potential switch for quite some time, but not acted on it because management could anticipate a difficult transition. Competition eventually forced his hand. Said Case, "It came to a head over a weekend as Microsoft announced they were offering MSN on a flat rate basis, and it was clear they were planning to steal a lot of market share from AOL. So I decided within hours of their announcement that we had to match them, and the company worked throughout a weekend so we could make an announcement." See <http://www.quora.com/AOL/How-did-AOL-make-the-decision-to-go-to-an-all-you-can-eat-pricing-strategy/>. For a longer account of these events, see Swisher, Kara, 1998, *aol.com: How Steve Case Beat Bill Gates, Nailed the Netheads, and Made Millions in the War for the Web*, Random House, New York.

own data use in real time? While some tools for aiding user measurement are beginning to emerge, how widely are they used and are they effective? What is the accuracy of some typical data meters?<sup>16</sup> Can users measure own usage by application? If so, how to encourage their use? Can users manage to monitor their use in households with multiple users and multiple devices?

The move from unlimited data to capped plans in wireless suggests some users can adjust over time to caps. However, it is difficult to predict whether that experience would carry over to wireline households, with its different applications, and in particular, whether households where multiple users of different ages occupy the residence will be able to adjust to a communal limit. However these questions of user experiences and ability to control raise questions about whether caps or thresholds that are set too low could lead to a world where the average user carefully monitors her bandwidth use, rather than leaving the average user well enough alone while only forcing “extreme” users to make changes to their use.

This topic also has implications for common notions of fairness. Typical users may be paying the same price for their Internet access as heavy users. Caps also need to be updated to match current usage patterns in order to continue to only impact “high users.” From an ISP’s perspective, someone who uses a steady and moderate stream of data is very different from someone who uses heavy data at peak moments of heavy use of capacity. Yet, a threshold pricing scheme hits them the same.

Another equity concern from the user perspective has to do with some models of steady data use, such as for medical purposes, which also can have implications for peak load and non-peak load use. These questions require more information about peak load pricing, a topic we take up below. For the time being, we defer more discussion.

To conclude in a similar manner to the previous section, this topic may require future monitoring, especially given the importance of consumer education to user perceptions of caps and thresholds. It is not yet apparent whether the issues in this topic are a transitory or permanent concern. The experience of ISPs with providing customers with tools to monitor or control data usage could also be valuable to insights about the perceptions of caps by consumers.

## User Control

If users do not have enough control over their data usage to adequately respond, even if well informed, to caps and thresholds set by ISPs, “punishment” of users by caps or thresholds may become a problem. For example, data-intensive video commercials are increasingly being embedded in web pages by edge providers. Automated nightly/weekly updates of software are also increasingly common from software vendors. In addition, most users operate software over which the user has little control.<sup>17</sup>

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<sup>16</sup> See, e.g., Stacey Higginbotham, Feb. 7, 2013, “More bad news about broadband caps: many meters are inaccurate,” *GigaOM*, <http://gigaom.com/2013/02/07/more-bad-news-about-broadband-caps-many-meters-are-inaccurate/>, accessed May, 17, 2013.

<sup>17</sup> See e.g., Peter Sevcik, 2012, “Empowering Internet users to manage broadband consumption,” Netforecast, [http://www.netforecast.com/wp-content/uploads/2012/06/NFR5109\\_Empowering\\_Internet\\_Users\\_to\\_Manage\\_Broadband\\_Consumption.pdf](http://www.netforecast.com/wp-content/uploads/2012/06/NFR5109_Empowering_Internet_Users_to_Manage_Broadband_Consumption.pdf), accessed April 28, 2013.

Conversely, some available tools -- today used by some sophisticated users -- allow ad-blocking and other user-traffic management. Ad-blocking and flash-blocking tools are the methods most commonly discussed in online forums.<sup>18</sup>

User control also plays a role in discussions about overage charges. Overages only arise when a threshold is exceeded, and actual charges can depend on specific details about how overages are enforced.<sup>19</sup> For many users there is only downside as that threshold becomes closer. Do households consider that monitoring burdensome, particularly multi-dweller households? Do multi-dweller households perceive the monitoring as a hassle or perceive the increased uncertainty in billing as a burden? There is not enough experience yet to suggest how to characterize most households.

The working group did not further explore this topic. This issue seems largely irrelevant for the average user, as few users are affected by caps, as a practical matter. In addition, many issues in user control are too small to matter, and if they become a problem, providers typically have conversations with users, and offer amnesty. This includes issues linked to several phenomena, such as automated syncing, spam, denial of service, and compromised machines that send out messages as part of denial of service attacks. Generally speaking, the committee did not perceive these issues to be big at this time.

This may change over time. If data use grows without a commensurate increase in caps, these concerns may become urgent for policy deliberation. If this occurs, a more accurate labeling system for software applications and monitoring system that take into account caps may be a way to educate users and increase awareness of the necessity of controlling bandwidth use.

### **The Perception of ISPs**

ISPs generally explain the use of thresholds (caps) as providing a simple pricing mechanism for matching demand for bandwidth consumption with purchasing behavior. ISPs view pricing and product choices as consumer options that are just as important to the delivery of Internet services to end users as content or technical innovations in those services.

Speed tiers also match demand for bandwidth, and most ISPs correlate speed tiers with usage thresholds. Suppliers argue that UBP with a few thresholds balances the efficiency of metered pricing without creating the stress or mental costs associated with such metering. Thus, suppliers emphasize that UBP with a few thresholds, or some forms of tiered pricing, provides a measure of bill stability, predictability, and “peace of mind” to the vast majority of consumers relative to more linear usage pricing (i.e. metered, or per KB/MB/GB, or finer-grained use tiers).

Depending on how it is structured, UBP can also enable additional lower-cost broadband plans to be offered to consumers, spurring adoption or better meeting the underserved demand from the

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<sup>18</sup> For example, see the second comment at <http://www.dslreports.com/shownews/Why-is-ATT-Capping-DSL-Users-but-Not-UVerse-Users-123692>, accessed April 29, 2013.

<sup>19</sup> Some care is required in drawing sweeping conclusions without precise data. For example, in plans being trialed by Comcast (at the time of this writing) a user must exceed a threshold for three months in a twelve month period before overages are imposed.

low-end of the market. ISPs can afford to offer lower usage plans at a lower price point (e.g. Cable One's Economy plan): they do not add as much to the aggregate bandwidth demand for the ISP. This is one approach to manage long run bandwidth-sensitive costs.

In this sense, UBP generally serves two functions. It may affect a small number of users who use large amounts of resources. It also may shape the use of resources among the vast majority of users. As the tables showed, there are examples of ISPs pursuing policies that lend themselves to each interpretation in wireline broadband today. However, the most common so far is the use of UBP to limit a small number of users who use a large amount of resources.<sup>20</sup>

Beyond these generalities, more detailed analysis of the issues from a supplier's perspective falls into three categories: how to arrange prices so "high end users" pay for the additional investment they use (i.e., price discrimination in the economics literature), managing network growth (e.g., managing long run capacity investment) and managing instantaneous congestion (e.g., managing peak load pricing). The report summarizes each of these in turn.

### **UBP and price discrimination**

Generally, in a high fixed and high sunk cost setting (such as network provision), usage based pricing is about raising revenue over incremental costs and recouping substantial fixed costs. This is generally called the economics of non-linear pricing, or price discrimination in common economic parlance.<sup>21</sup>

The economics literature on price discrimination provides two motives for UBP: (1) associating higher prices with higher costs and higher willingness to pay, while (2) avoiding the potential losses when some users do not buy at all. Such association can come closer to common notions of fairness and also reinforces the incentives to save on costs by showing users the price of inputs.

The Order has already made clear that usage-based pricing ensures that lighter end users are not forced to subsidize heavier end users. Charging distinct prices aligns incentives to encourage efficient use of networks. The Order also has made clear that the FCC will continue to monitor the marketplace. Thus, as the marketplace continues to develop, presumably the FCC will take these issues into account in its decision-making.

### **Managing Network Growth**

If measurement and transparency issues were satisfactorily addressed, could a cap or threshold at a high end of downloading (e.g., less than 1% or 2% of households) reduce data use? There is little evidence (outside of Canada, as noted), so it is difficult to judge. The answer is necessarily speculative.

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<sup>20</sup> We note the interesting contrast with the use of UBP in wireless contracts, where it is much more common to use UBP to shape the use of resources among the majority of users. This difference motivates open questions about why the difference arises, and what lessons can be learned from those differences.

<sup>21</sup> A side note about vernacular interpretation of economic terms: The word "discrimination" has a pejorative meaning in common language, though none is meant in the economics literature on price discrimination.



Generally speaking, it is thought that a data cap (in this context, a threshold with discrete changes in speed) can incentivize those near the cap to behave differently. If so, then a household that uses much more than a typical user can build more efficient usage into its own network or decrease its usage upon nearing the cap. Some of these changes may not interfere with normal Internet usage by merely optimizing bandwidth heavy behavior— for example, users streaming video footage could alter the use of uncompressed HD cameras streaming to the Internet 24x7, when on-demand will do. Users also can reduce use of peer-to-peer servers, e.g., BitTorrent, substituting partial uptime for full time. Users who run servers out of the house on a household contract could switch to a business offering that better matches needs and usage. Also, as discussed below, potentially users can take advantage of bandwidth efficiencies as they become available from edge providers. However, households that are already using bandwidth efficiently may be forced to make changes that do impact day-to-day usage.

Access providers also ask whether data caps and related means of linking price to use can encourage edge providers to innovate more efficient means of delivering their services. There is a perception that data caps and usage-based billing are not potential barriers to entry but, rather, potential drivers of greater efficiency in the delivery of edge services. They point to the incentives on Netflix and other edge service providers to innovate their services, for example, Netflix improving efficiency in Canada and licensing innovative technology like EyeIO.<sup>22</sup> Access providers also raise questions about the extent to which prices are misaligned and resources are misallocated because all the obligations for carriage of content is passed onto consumers (and the ISP) by edge providers. (Edge providers have a different perspective, which is discussed below.)

At most, we can draw a tentative conclusion. Over the long run a data cap or a UBP threshold can help manage network growth if users and/or edge service providers respond to the cap or threshold with less or more efficient data use; a carrier would then incur less costly operations and may be able to make less expensive infrastructure upgrades over longer periods. However, this conclusion is mostly theoretical – there is no quantitative data to suggest to what extent how much long run costs increase with growth in use or how much of a difference carrier contributions to provisioning have made to growth over time. Both the broad and specific questions cannot be answered because there is no quantitative evidence – to accept or refute – propositions about how caps and thresholds shape usage.

### **Managing Instantaneous Congestion**

Generally speaking, instantaneous congestion management is not a stated rationale behind use of tiers, metering, or caps. There are other techniques in TCP/IP to address congestion caused by unexpected demand, outages, or major traffic shifts. Caps provide no direct incentive to heavy users to reduce traffic at peak times because there is no differential pricing across time periods. For example, monthly caps generally count traffic from the middle of the night (when traffic in general is low) against a cap.<sup>23</sup>

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<sup>22</sup> See e.g., Janko Roettgers, 2012, “EyeIO: Netflix’s secret weapon against bandwidth caps?” GigaOm, Feb 1, 2012, <http://gigaom.com/2012/02/01/eyeio-video-encoding-netflix/>, accessed April 28, 2013.

<sup>23</sup> There has been some experimentation with time-sensitive lifting of cap restrictions. See for example, this description of a satellite broadband provider’s recent policy. <http://www.dslreports.com/shownews/Exede-Caps-Lifted-For-Overnight-Use-120776>.

However, if there is a rough correlation between total use and peak use – i.e., the largest total users over the month are also the biggest users at peak moments – then a data threshold might have some of the properties of a peak load pricing scheme by inducing a large data user to reduce their data usage. This is an open question, as there is little public analysis of the correspondence between data consumption and bandwidth usage.<sup>24</sup> In addition, there is little experience with alternative arrangements, as many ISPs do not perceive users calling for the option to manage data use over time.

There is no evidence, one way or another, that caps leads heavy users to reduce activity at peak moments any more than at any other moment. It would be illustrative to see if there are systematic differences between usage in the United States and Canada because of the imposition of caps and thresholds. Again, no particular data speaks to this specific question one way or another, or to the broad questions motivating it. There has not been much experience with peak load capacity management thresholds for users. Historical experience with peak load management suggests the timing for data usage and peaks would shift, but there is no evidence to suggest which applications will shift their usage patterns, or by how much they would shift them.<sup>25</sup>

### **Perception of Edge Providers<sup>26</sup>**

A data cap or high threshold from broadband provider can shape other providers of services in broadband ecosystem, e.g., entrepreneurs who provide applications, build web pages, and operate other services in the cloud. Edge providers are concerned that a widely used cap reduced – rationally or irrationally – demand for data-intensive services and reduced entry of new data-intensive software firms, decreasing the commercialization of innovation. This concern is partially motivated by Netflix’s example in Canada, which illustrates the phenomenon when a cap does bind.

Some of the power of data caps to affect edge providers that serve video or other high bandwidth media content might be offset by improvements in codecs. A codec encodes a data stream of signal for transmission, storage or encryption, and decodes it for playback and editing. (The word is a portmanteau of COder and DECoder.) There are many codecs in use today. Would improvement in codecs – i.e., to higher resolution using fewer resources with more efficiency – occur regardless of the presence/absence of caps? ISPs argue that edge providers have incentives to improve codecs when faced with caps and high thresholds. The alternative view argues that improvements arise for largely exogenous reasons, and have little relationship with the policies of ISPs.<sup>27</sup>

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<sup>24</sup> One of the earliest studies of the correspondence between data consumption and bandwidth usage examined one ISP’s traffic in 2011. It found a small correlation, not consistent with using caps to manage bandwidth. It is at <http://www.fiberevolution.com/2011/11/do-data-caps-punish-the-wrong-users.html>.

<sup>25</sup> For example, AOL experimented changes in pricing for different times of the day in order to save on phone line costs, and experienced changes in the time of day in which the “peak” usage occurred.

<sup>26</sup> As elsewhere in this study, we focus on the perception of “Edge Providers,” as in the Order, rather than focusing on other groups of providers, such as “over the top providers,” or “application service providers.”

<sup>27</sup> The working group noted that parallel arguments take place in wireless applications.

Once again, these questions are necessarily speculative, as caps do not yet bind most households in the US, and, at present there is no decline in the demand for data-intensive services. In addition, as noted above, the experience with data limits in Canada has not been measured, so there is no data to assess the impact the caps had in that setting.

It is unclear how much entrepreneurs target already-data-intensive users. For such open questions, it is also important to recognize an asymmetry between the perspectives of edge providers and ISPs – namely, what is small to an ISP may be large to an edge provider. For example, thresholds or caps applied to a small number of households for an ISP, such as 10% to 20% of access users, can have substantial impact on the business of edge providers. A small fraction of customers to an ISP can be a large fraction of demand to a provider of data-intensive services. Fear and uncertainty could exacerbate any response, which appears to have occurred in Canada. Hence, the answer from an edge provider to these open questions could diverge from the answer from an ISP to the same open questions.

Edge providers also express a different perspective on the effects of data caps on their incentive to innovate more efficient means of delivering their services. They stress that caps could impact the deployment of new innovative services and competitors because caps disincentivize the use of more data-intensive applications. For example, in 2012, a Sony executive suggested that the company was holding off its release of an Internet video service because of ISPs data cap implementation practices.<sup>28</sup> Edge providers also stress that the services provided by Internet applications and websites create the value from the broadband access product offered by ISPs. Edge providers do not deliver data unless it is requested by the customers of ISPs. ISPs have an obligation for carriage of content.

We have noted elsewhere that the user response to a data cap could be exacerbated by the absence of widely used measurement tools. Here too the perspective of an edge provider may differ from that of an access provider. If users knew the “data-intensity” for various applications, they could use that information to measure the incremental contribution of each application to additional capacity use and, accordingly, adapt their own use. So there may be a consumer information dimension to this topic. For example, many edge providers offer streams of content at multiple bitrates and detect connection speed to show users a higher or lower bitrate. It’s possible that edge providers could experiment with charging different prices for streams with different bitrates. What can be learned from experiments with such programs in mobile and low-bit-rate DSL?

These questions may become salient at some point for entrants who might anticipate growth in data use among US households. At what point do these concerns become urgent? If so, whose responsibility are they?

### **Specialized services and edge providers**

In some settings, an ISP is vertically integrated into the provision of services that substitute for services a user may access over the public Internet. Thus caps may provide a method for

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<sup>28</sup> Timothy B. Lee, May 2, 2012, “Sony: Internet video service on hold due to Comcast data cap,” *Ars Technica* <http://arstechnica.com/tech-policy/2012/05/sony-warns-comcast-cap-will-hamper-video-competition/>, accessed May 17, 2013.

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differential treatment of traffic or partners' traffic in order to favor certain applications provided by the ISP, like Voice Over IP (VoIP is a low-bandwidth application, in general).

Many aspects of this topic have been discussed by the Specialized Services working group, and we do not seek to replicate those findings here. That group has discussed questions related to incentives to build specialized services, different traffic metering to reflect different costs, difficulties with benchmarking performance in specialized services, and the different needs of distinct applications.

Here we focus on one key concern for competition policy. In general, competition policy is concerned about situations where one firm provides a service and also controls aspects affiliated with the cost, performance, and user-experience in a competing service. In public conversation this concern is often framed as a metaphor about the slope of the pitch: Does a cap or threshold tip the playing field by slanting consumers to an ISP or another online supplier? Said another way, what is a "level playing field" when a specialized service competes with an edge provider attempting to sell services that operate over the public Internet?

Despite the generality of the concerns, the answers are not sweeping or general. The specific details of this situation play an important role in determining appropriate policy. These concerns arise in a setting where managed service and Internet service use similar infrastructure, and the threshold or cap does not apply to a managed service but does apply to a range of arguably substitutable services. In such a setting, there is one set of prices and conditions for broadband service and another for the specialized service. Users pay a different price for each and have a different experience. Data caps may play a role in the prices users face and the experience they have between the two services.

This is another place where the ISP's perspective and the edge provider's perspective diverge. To see the divergence, it is useful to contrast these perspectives side-by-side.

From an ISP's perspective, since limitations do not apply to any but a small percentage of users, there is plenty of headroom for growth in competing services today and tomorrow. There is a rationale for separately provisioning between the specialized and non-specialized services, usually to achieve some engineering or market objective, such as improve the quality of service (e.g., reduce user perceptions of delay). In addition, one service often has a set of regulatory requirements associated with it, and one often does not. ISPs also note that the environment should promote innovation. For example, an ISP that is also an Incumbent Local Exchange Carrier (ILEC) transitioning to Voice over Internet Protocol (VoIP) may prioritize its VoIP traffic and exempt it from any usage threshold. In these instances, that ISP's exemption of its VoIP traffic is entirely consistent with how its traditional telephone service traffic has always been treated and should not be counted toward a cap. Any contrary conclusion would create a disincentive for the ILEC to migrate to IP and potentially stifle that migration.

From the perspective of an edge provider, similar services compete, using similar capacity, and the edge providers are providing innovative services. However, one has a threshold – say, from Hulu, Netflix, YouTube, Crackle, and competitors – and the other does not – from the ISP. The key concern is whether the rationale for distinct treatment of traffic in specialized services and

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non-specialized services makes sense for the improvement of user performance, or is merely an excuse to put an edge provider competitor at disadvantage.

Does the concern arise when the thresholds are set comparatively high, as they tend to be for most ISPs today? The competition policy questions appear to be most salient in streaming of video services today, but may arise in services other than streaming. Similar issues may arise in home security systems and home video conferencing, for example. What is a level playing field in those cases?

It is difficult to forecast what users will want in a few years, and whether data caps will have any impact on those demands. It is also difficult to forecast what new applications edge providers will invent, what new specialized services ISPs will invent, and whether data caps will be relevant to their market experiences. There are both gains from flexible policy – to allow for new invention and the new situations created by invention – and gains from certainty – to allow edge providers and ISPs to plan for long-term investments. Therefore, the situation yields no easy answers in general, and, at a minimum, merits further monitoring.

### **Summary**

This study reviewed concerns with data caps and thresholds in the context of usage-based pricing in wire-line broadband services. The report focused on providing definitions, identifying the concerns of participants, and identifying the policy issues these raised. Many open questions emerged, and full or complete answers would require considerably more discussion.

### **Working Group on Economic Impacts of Open Internet Frameworks**

#### **Chair:**

Shane Greenstein, Professor and Kellogg Chair of Information Technology, Kellogg School of Management, Northwestern University

#### **Members:**

Brad Burnham, Founding Partner, Union Square Ventures

Neil Hunt, Chief Product Officer, Netflix

Kevin McElearney, Senior Vice President for Network Engineering, Comcast

Marc Morial, President & CEO, National Urban League

Dennis Roberson, Vice Provost & Research Professor, Illinois Institute of Technology  
(representing TMobile)

Charles Slocum, Assistant Executive Director, Writers Guild of America, West

## Further Reading

- Atkinson, Robert C., Ivy E. Schultz, Travis Korte, and Timothy Krompinger, 2011, *Broadband in America, 2<sup>nd</sup> Edition, Where It Is and Where It Is Going (According to Broadband Service Providers), An Update of the 2009 Report Originally Prepared for the Staff of the FCC's Omnibus Broadband Initiative*, CITI, Columbia University. May 2011.
- Bauer, Johannes, and Steven Wildman, 2012, *The Economics of Usage Based Pricing in Broadband Markets*, Michigan State University, December 14, 2012.  
[http://i.ncta.com/ncta\\_com/PDFs/Wildmanreport\\_web.pdf](http://i.ncta.com/ncta_com/PDFs/Wildmanreport_web.pdf).
- Bauer, Steve, David Clark, and William Lehr, 2012. *Understanding Broadband Speed Measurements*, (August 15, 2010), TPRC 2010, Available at SSRN:  
<http://ssrn.com/abstract=1988332>
- Cisco, 2013, *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2012 - 17*, White Paper, Cisco Public, San Jose, CA. February 6, 2013.  
[http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white\\_paper\\_c11-520862.html](http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html)
- Federal Communications Commission, 2010. *National Broadband Plan: Connecting America*. Washington, D.C. March, 2010. <http://www.broadband.gov/>.
- Federal Communications Commission, 2013, *2013 Measuring Broadband America February Report A Report on Consumer Wireline Broadband Performance in the U.S.*, Washington, D.C. February 2013. <http://www.fcc.gov/measuring-broadband-america/2013/February>.
- Higginbotham, Stacey, 2012, "Which ISPs are Capping Your Broadband and Why?" GigaOm, October 1, 2012. <http://gigaom.com/2012/10/01/data-caps-chart/>
- Hussain, Hibah, Kehl, Danielle, Lennett, Benjamin and, Lucey Patrick (2013), *Capped Internet: No Bargain for the American Public*, The New America Foundation.  
[http://www.newamerica.net/publications/policy/capped\\_internet\\_no\\_bargain\\_for\\_the\\_american\\_public](http://www.newamerica.net/publications/policy/capped_internet_no_bargain_for_the_american_public)
- Hussain, Hibah, Kehl, Danielle, Lennett, Benjamin and , Lucey Patrick (2012), *Capping the Nation's Future?* The New America Foundation.  
[http://www.newamerica.net/publications/policy/capping\\_the\\_nation\\_s\\_broadband\\_future](http://www.newamerica.net/publications/policy/capping_the_nation_s_broadband_future)
- Lyons, Daniel A., 2012, "The Impact of data caps and other forms of usage based pricing for broadband access." Mercatus Center, George Mason University, Working Paper 12-27, October, 2012.
- Odlyzko, A., Arnaud, B. S., Stallman, E., and Weinberg, M. (2012). *Know Your Limits: Considering the Role of Data Caps and Usage Based Billing in Internet Access Service*. Washington, DC: Public Knowledge. [http://publicknowledge.org/files/UBP\\_paper\\_FINAL.pdf](http://publicknowledge.org/files/UBP_paper_FINAL.pdf)
- SandVine, 2012, *Global Internet Phenomena Report*, Revision 11-06-2013, Waterloo, Ontario, Canada.

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Wallsten, Scott, and James Riso, 2010, *Residential and Business Broadband Prices Part 1: An Empirical Analysis of Metering and Other Price Determinants*, Technology Policy Institute, Washington, D.C., November 2010.

### Appendix 1.

	<b>Provider</b>	<b>Use Threshold – GBs</b>	<b>Excepted Traffic</b>	<b>Overage Charge</b>
1	Comcast	min 300GB (increasing by speed tier)	XFINITY Voice or Comcast Digital Voice (VoIP)	\$10 / 50GB (per tier)
2	AT&T - U-Verse HSIA	250	AT&T 3G MicroCell	\$10 / 50GB
	AT&T – DSL	150		
3	TWC	None	n/a	n/a
4	Verizon - FiOS / DSL	None	n/a	n/a
5	CenturyLink - 1.5 Mbps	150	Upload	None
	CenturyLink - >1.5 Mbps	250		
6	Cox - Ultimate (100 Mbps)	400	Cox Digital Voice (VoIP)	None
	Cox - Premier (25 Mbps)	250		
	Cox - Preferred (15 Mbps)	200		
	Cox - Essential (3 Mbps)	50		
	Cox - Starter (1 Mbps)	30		
7	Cablevision	None	n/a	n/a
8	Charter - Lite & Express ( )	100	None	None
	Charter - Plus & Max (30 Mbps )	250		

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	Charter - Ultra100 (100 Mbps)	500		
9	Frontier	100 / 250 in selected trial markets	None	None
10	Windstream	None	n/a	n/a
11	SuddenLink (>30 Mbps)	350	We prioritize Suddenlink voice packets in order to provide quality service to our phone customers.	\$10 / 50GB
	SuddenLink (10-30 Mbps)	250		
	SuddenLink (<10 Mbps)	150		
12	MediaCom - Launch (3 Mbps)	150	None	\$10 / 50GB
	MediaCom - Prime (15 Mbps)	250		
	MediaCom - Prime Plus (30 Mbps)	350		
	MediaCom - Ultra/Ultra Plus (50/105 Mbps)	999		
13	Cable One – Economy	Monthly: 1GB	0000-1200 Daily	?
	Cable One - Standard (5 Mbps)	Daily: 3GB	None	None
	Cable One - Preferred (50 Mbps)	Monthly: 50 GB	0000-0800 Daily	\$0.50 / 1 GB
	Cable One - Elite (50 Mbps)	Monthly: 100 GB	0000-0800 Daily	\$0.50 / 1 GB
	Cable One - Premium (10 Mbps)	Daily: 5GB	None	None
	Cable One - Ultra (12 Mbps)	Daily: 10GB	None	None



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14	FairPoint	None	n/a	n/a
15	Cincinnati Bell	None	n/a	n/a

15	Google Fiber	None	n/a	n/a
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	<b>Overage Treatment</b>	<b>Cite</b>
1	Comcast does not have a cap or usage threshold but is trialing two usage based pricing plans: one with a 300 GB threshold and another with varying thresholds (the lowest being 300 GB) based on service tier.	<a href="http://corporate.comcast.com/comcast-voices/comcast-to-replace-usage-cap-with-improved-data-usage-management-approaches">http://corporate.comcast.com/comcast-voices/comcast-to-replace-usage-cap-with-improved-data-usage-management-approaches</a>
2	Notice after 1st month; notices @ 65% & 90% in following months	<a href="http://www.att.com/esupport/article.jsp?sid=KB409045#fbid=kiJ0SSZjH9l">http://www.att.com/esupport/article.jsp?sid=KB409045#fbid=kiJ0SSZjH9l</a>
3	n/a	<a href="http://help.twcable.com/html/twc_sub_agreement.html">http://help.twcable.com/html/twc_sub_agreement.html</a>
4	n/a	<a href="http://www22.verizon.com/about/terms/networkmanagementguide/">http://www22.verizon.com/about/terms/networkmanagementguide/</a>
5	"Customers will be given options to reduce their usage, subscribe to a higher speed residential plan, or migrate to an alternative business class high-speed Internet service."	<a href="http://www.centurylink.com/Pages/AboutUs/Legal/InternetServiceManagement/">http://www.centurylink.com/Pages/AboutUs/Legal/InternetServiceManagement/</a>
6	If you do exceed your allowance, Cox will attempt to notify you by one or more methods: email, phone, or message on your computer before action is taken. We will then work proactively with you to resolve the problem. In many cases, customers are not even aware of their usage because they have an unsecured Wi-Fi network used by others or a computer virus. Cox can work with you to ensure that these issues are identified and corrected. In other cases, customers may choose to reduce their usage or switch to another plan that provides a higher usage allowance as Cox has assigned a different usage allowances to each of its Internet packages. In rare cases of extremely high usage Cox will suspend the user's service until they call Cox. In even rarer cases, Cox will terminate a customer's service if they do not decrease their usage after consultation with Cox.	<a href="http://ww2.cox.com/aboutus/northernvirginia/policies/speedsusage.cox">http://ww2.cox.com/aboutus/northernvirginia/policies/speedsusage.cox</a>
7	n/a	<a href="http://www.optimum.net/Privacy/AUP">http://www.optimum.net/Privacy/AUP</a>
8	Customers who exceed the "No Excessive Use of Bandwidth" section in the AUP may be notified by Charter that they have exceeded their monthly threshold and informed of Charter's Excessive Use policy. Charter Customer Care Representatives will help identify possible causes and offer suggested ways the customer can reduce bandwidth consumption. If the customer exceeds the "No Excessive Use of Bandwidth" policy and is notified three times in a six-month period, the customer's Internet service may be suspended after the delivery of the third notice.	<a href="http://myaccount.charter.com/customers/support.aspx?supportarticleid=2124">http://myaccount.charter.com/customers/support.aspx?supportarticleid=2124</a>
9	"In the affected markets, high bandwidth users (e.g. usage over 100Gb or 250Gb of data per month) are advised to either limit usage or convert to a high user service plan."	<a href="http://www.frontier.com/networkmanagement">http://www.frontier.com/networkmanagement</a>
10	n/a	<a href="http://www.windstream.com/Terms-and-Conditions/">http://www.windstream.com/Terms-and-Conditions/</a>

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11	<p>After the first overage, the customer's Web browser will be directed to a Suddenlink notification page. The customer will be required to read that page, select how he or she wants to receive future notifications (by Web browser or email), enter the account number, and then save the information.</p> <p>From that point forward, future notifications on this subject will be sent each time an account reaches 80% of its monthly allowance and again when it exceeds 100%. Those notifications will be delivered through the means selected on the first overage, unless customers change their notification preference by visiting their Internet usage summary page at Suddenlink.net.</p> <p>Customer accounts will not be billed for exceeding their monthly allowance until the third overage. On the third and subsequent overages, the monthly allowance will be increased in installments of 50 GB at a cost of \$10 per installment.</p>	<p><a href="http://www.suddenlink.com/allowanceplan/">http://www.suddenlink.com/allowanceplan/</a></p>
12	<p>The data customers send and receive each month will contribute to monthly data usage. Speeds and usage allowances remain subject to change. Greater usage will result in additional charges of \$10, excluding taxes and fees, for every increment of up to 50 additional Gigabytes used. For example, if usage exceeds the allowance by 51 Gigabytes, an additional charge of \$20 will result.</p>	<p><a href="http://mediacomcable.com/site/internet.html">http://mediacomcable.com/site/internet.html</a></p>
13	<p>If a user that subscribes to the Economy plan exceeds the allocated monthly bandwidth of one gigabyte, Cable One automatically will allocate a second Gigabyte to the user for a fee set forth in the subscriber agreement. If the user exceeds the bandwidth allocated by this second Gigabyte, then Cable One automatically will allocate a third Gigabyte to the user for a fee set forth in the subscriber agreement, and so on. This incremental allocation of gigabytes is valid only for the billing cycle during which it was allocated and cannot be carried forward. The total number of Gigabyte allocations and related fees charged to the user in the Economy plan is capped in the subscriber agreement.</p>	<p><a href="http://www.cableone.net/Pages/internetaup.aspx">http://www.cableone.net/Pages/internetaup.aspx</a></p>
	<p>[I]f Cable One in its sole but reasonable discretion determines that a customer has exceeded the Excessive Use threshold or is using the Service in a manner significantly uncharacteristic of a typical residential user, Cable One reserves the right to (a) adjust, suspend or terminate Service accounts at any time and without notice; or (b) require the user to upgrade his service level or pay additional fees in accordance with Cable One's then-current, applicable rates and charges for such Service; or (c) use any technology to be chosen by Cable One at its sole discretion to slow the user's service for purposes of conserving bandwidth.</p>	
14	n/a	<p><a href="http://www.fairpoint.com/document/Residential_HSI_Terms_of_Service_tcm12-4842.pdf">http://www.fairpoint.com/document/Residential_HSI_Terms_of_Service_tcm12-4842.pdf</a></p>
15	n/a	<p><a href="http://www.cincinnati-bell.com/customer_support/consumer_information/network_management/wireline.pdf">http://www.cincinnati-bell.com/customer_support/consumer_information/network_management/wireline.pdf</a></p>
16	n/a	<p><a href="https://fiber.google.com/legal/network.html">https://fiber.google.com/legal/network.html</a></p>

Source: First fifteen observations accessed on February 6, 2013. Observation 16 accessed May 3, 2013.