Consumer-Driven Design and Evaluation of Broadband Labels

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Abstract: This study examines the content and layout of the proposed broadband consumer disclosure labels mandated by the U.S. Federal Communications Commission (FCC). Our large-scale user study identifies key consumer preferences and comprehension factors through a two-phase survey of 2,500 broadband internet consumers. Findings reveal strong support for broadband labels, but dissatisfaction with the FCC's proposed labels from 2016. Participants generally struggled to use the label for cost computations and plan comparisons. Technical terms confused participants, but providing participants with brief education made the terms usable. Participants desired additional information, including reliability, speed measures for both periods when performance is "normal" and periods when performance is much worse than normal, quality-of-experience ratings, and detailed network management practices. This feedback informed our improved label designs that outperformed the 2016 labels in comprehension and preference. Overall, consumers valued clear pricing and performance details, comprehensive information, and an easy-to-understand format for plan comparison. Requiring broadband service providers to deposit machine-readable plan information in a publicly accessible database would enable third parties to further customize how information is presented to meet these consumer needs. Our work additionally highlights the need for user studies of labels to ensure they meet consumer demands.

For the latest updates on our broadband label research, see https://cups.cs.cmu.edu/broadband/

¹ This research was completed while the author was a Privacy Engineering Masters student in the School of Computer Science at Carnegie Mellon University



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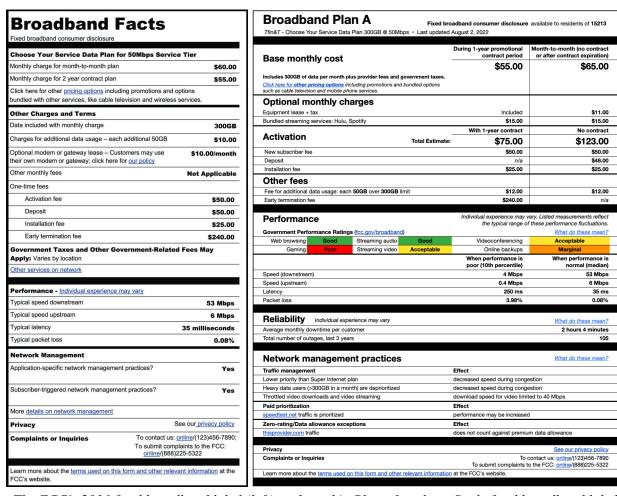
Executive Summary

In January 2022, the Federal Communications Commission (FCC) issued Notice of Proposed Rulemaking (NPRM) 22-7, which proposed requiring internet service providers to display broadband consumer disclosure labels prominently at the point of sale. In response to the FCC's request for comment in their NPRM, the CyLab Usable Privacy and Security Laboratory at Carnegie Mellon University conducted a large-scale user study to gain insight into what information is most important to US consumers when shopping for broadband internet services as well as what terminology and presentation formats make this information most understandable and useful to consumers. In addition, we examined the FCC's proposed 2016 broadband consumer label formats and proposed our own broadband consumer disclosure label formats.

We surveyed broadband internet consumers in a two-phase online study, recruiting from a diverse pool of 32,000 consumers who had previously participated in Consumer Report's consumer initiatives related to broadband internet. Across both survey phases we received a combined total of over 2,500 completed surveys. In the first phase we evaluated the 2016 labels to gain insights into what information was most important to consumers and what information caused confusion. We then created new label designs based on our results from the first phase. In the second phase, we compared the effectiveness of our label designs with the 2016 labels. After analyzing our survey results, we made further revisions to our label designs. This is a report of our findings and recommendations.

Phase 1 key findings

- Participants strongly supported the idea of broadband labels.
- Participants generally cared most about cost, speed, and reliability (a factor not included on the 2016 label) when considering a broadband plan for purchase.
- Participants were interested in metrics for both "normal" broadband performance and for times when performance is much worse than normal.
- Many participants were interested in seeing a score or grade for their plan's performance, but did not want it to replace the reporting of raw numbers.
- Participants expressed interest in using details about providers' network management practices to avoid providers with certain practices.
- Participants struggled to compute total service cost over the span of 2, 3, or 4 years using the information on the 2016 proposed label.
- Participants generally lacked knowledge of more technical terms and performance benchmarks—such as latency, packet loss, network management practices, performance percentiles, and network congestion—but when these terms were briefly explained to them, they often showed some understanding of the concepts.
- Across all comprehension questions, non-technical participants tended to perform worse than those who self-identified as having a technical background.



The FCC's 2016 fixed broadband label (left) evaluated in Phase 1 and our Study fixed broadband label (right) tested in Phase 2. See Appendix C for enlarged versions.

Phase 2 key findings

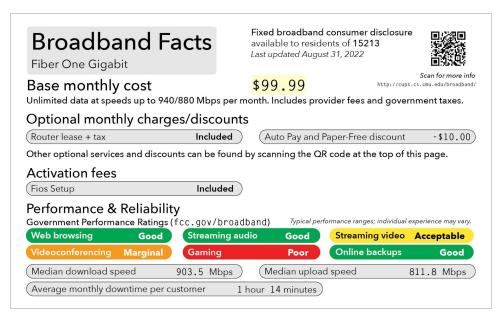
- Our proposed (Study) labels generally performed better than the 2016 labels in enabling
 consumer comprehension of the represented broadband plan (including performance and service
 costs). In addition, consumers found them easier to use and preferred their format.
- Participants wanted to know the total cost of their internet plan and disliked any ambiguity; participants also expressed a desire for in-depth cost explanations, for taxes to be included as part of the label, and for some sense of plan service area.
- Participants requested information about network reliability, when and by how much the listed performance metrics could drop during peak times, and explanations for technical terms.
- Participants expressed interest in having both performance numbers and suitability ratings included on a label.
- Participants generally wanted to see a lot of information on the label, but also wanted a label that would be simple to understand and compare across plans.
- Generally, we saw slightly lower comprehension among non-technical participants than those who self-identified as having a technical background, and non-technical participants were slightly

less likely to find the labels easy to use. These modest differences showed up in both the 2016 and Study labels.

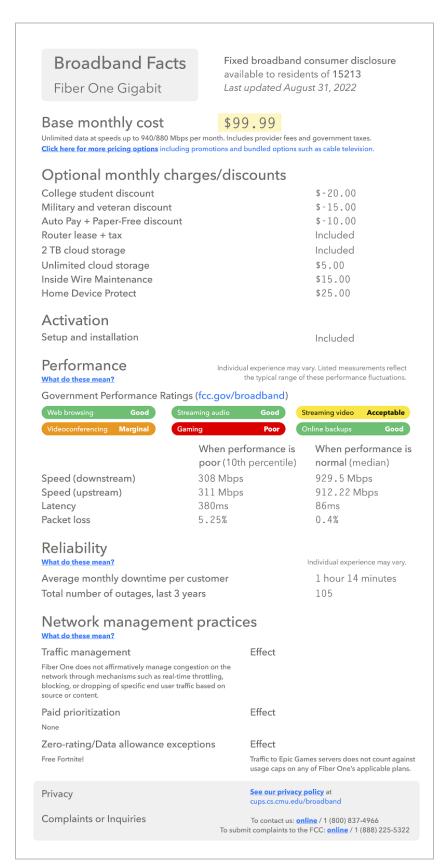
Recommendations

- Broadband labels should include a range of information valued by consumers but should highlight the information they value most, including information on cost, speed, and reliability.
- Broadband labels should balance the needs of consumers who value simplicity and conciseness
 with those who value detailed information. This can be achieved with a standardized label design
 with links to definitions of terms maintained by the FCC in a format conducive to comparing
 multiple plans. A layered label design with a summary and full version may help address the
 needs of a wider range of consumers.
- Broadband service providers should be required to deposit detailed plan information in a standardized computer-readable form in a publicly accessible database to enable third-parties to generate customized labels for consumers and offer comparison shopping tools, quality of experience or suitability ratings, and other value-added services.
- Non-optional costs should be bundled into a total cost where possible, including taxes, to make it easy for consumers to determine how much they will need to pay.
- Performance metrics should be included for downstream speed, upstream speed, latency, and packet loss in both normal and poor performance times.
- Broadband labels should include some measure of reliability, addressing consumer interest in information about outages and downtime.
- All data rate units be kept consistent (e.g. all broadband providers would express throughputs in Mbps and latencies in ms).
- Network management practices should be enumerated on the label in standard groups and accompanied by a standardized glossary with definitions and examples that explain these terms for consumers.
- Labels and accompanying data should be localized so that consumers can readily compare plan details—including total costs, performance at both normal and busy times, reliability, and network management practices—for a particular geographic location.

Our study concludes with a proposal for a broadband label design that takes into account participant feedback on both the 2016 and New label designs we tested. To help balance the need for both simplicity and detail, we propose a layered label design with both summary and detailed views, shown below.



The summary layer of our prototype layered design for a consumer broadband label.



The detailed layer of our prototype layered design for a consumer broadband label.

About the Authors

The CyLab Usable Privacy and Security Laboratory at Carnegie Mellon University (cups.cs.cmu.edu) has done extensive research on consumer labels for website privacy policies, mobile app privacy, and IoT devices. This research was directed by Dr. Lorrie Cranor and Dr. Jon Peha. Dr. Cranor is a professor of computer science and of engineering & public policy at Carnegie Mellon University (CMU) and former chief technologist at the Federal Trade Commission (FTC). Dr. Peha is a professor of electrical & computer engineering and of engineering & public policy at CMU, and former chief technologist at the Federal Communications Commission (FCC). This study was conducted by independent researchers from CMU and is not funded by any external source. Consumer Reports collaborated with CMU to provide access to participants who had previously expressed interest in broadband internet options but had no role in experiment design, data analysis, or formulation of conclusions. For the latest updates on our broadband label research, see https://cups.cs.cmu.edu/broadband/

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1. Introduction

The Infrastructure Investment and Jobs Act of 2021 directs the Federal Communications Commission (FCC) to promulgate regulations for broadband consumer disclosure labels by November 2022 [1]. The Act states that these labels should be as described in the Commission's public notice from April 2016, DA 16–357 [2]. Hereafter, we refer to the label formats proposed in this notice as the FCC's 2016 labels. In January 2022, the FCC issued Notice of Proposed Rulemaking (NPRM) 22-7 which proposed requiring internet service providers to display broadband consumer disclosure labels prominently at the point of sale with the 2016 labels functioning as a safe harbor format for providers [3]. In response to the FCC's request for comment in their NPRM, we conducted a large-scale user study examining the 2016 labels' format, content, and overall usability.

We contribute the following report on what information is most important to US consumers when shopping for broadband internet services as well as what terminology and presentation formats make this information most understandable and useful to consumers. We find that consumers are strongly supportive of broadband internet labels. They are most interested in information about cost, performance, and reliability of broadband plans, but are also interested in seeing a variety of other information on the labels. There is a need to consider label designs that balance simplicity with this desire for information. We propose our own broadband consumer disclosure label formats along with a discussion on how our study's data drive design and content recommendations for future label iterations.

After we sent our study's initial results and recommendations [4] to the FCC, they issued Further Notice of Proposed Rulemaking 22-86 in November 2022 [5]. The FNPRM provides updated safe harbor label formats that we have not tested, but we did comment on [6]. ISPs will be required to comply with the adopted rules within six months to one year after the OMB completes their review. At this time, the OMB has not yet completed their review.

2. Background and Related Work

The idea for broadband labels builds on other types of consumer labels already deployed. However, unique to broadband labels is the need to succinctly express a number of measurements relevant to broadband Internet service. Here we review related work on product labels and broadband measurements.

2.1 Product Labels

In the United States, numerous types of products are required to use standardized informative labels to better inform consumers' purchasing decisions, enable healthier marketplaces, and promote transparency. Notable examples of U.S. product labels include food nutrition labels, energy labels, and bank privacy labels. The White House has also recently announced an effort to standardize Internet of Things (IoT) security and privacy labels [7].

Nutrition labels have an easily recognizable format and widespread use, making them a model for many other product labels, including the broadband labels whose 2016 format closely resembled classic nutrition labels [2]. Nutrition labels were first mandated in 1990 as part of the Nutrition Labeling and Education Act [8] and have since been the subject of many user studies [9]. Past studies have found the labels encourage good competition among food manufacturers [10], improve consumer perceptions of the

products [11], and give governments a way to support healthier consumer behaviors without mandating specific nutritional requirements [12]. Studies also revealed that label use and effectiveness were dependent on a variety of factors including consumers' attentiveness [13], motivation [14], [15], dietary goals [15], [16], number of options [17], and background nutrition knowledge [14], [18]. However, while nutrition education and knowledge could increase use of the labels [19], use of the labels did not necessarily improve consumer health [20]. There are also limits to how much information could be added to the label while still being helpful [15]. Nutrition labels were also found to be difficult to use for consumers especially as they required computation [21], and some researchers have proposed alternative formats like "traffic-light" food labels to help simplify use [22]. Notably however, user studies support having a single standardized format for the nutrition labels as the existence of multiple formats impeded comprehension and discouraged use [23].

Privacy and IoT labels are more recent innovations designed to quickly convey the privacy and security aspects of products and services, especially in the context of banks [24], apps and smart devices. Bank privacy labels were introduced as part of the 1999 Gramm-Leach-Bliley Act. Although no government regulation mandates privacy labels for mobile apps in the US, they became a requirement for apps in the Apple and Android app stores in 2020 and 2022 respectively. Unfortunately, these industry-driven label implementations suffer from numerous problems, including widespread inaccuracies and poor usability[24]–[27]. Studies on website privacy labels found they increased users' accuracy, speed of finding information, and reading enjoyment compared to their full-text privacy policy counterparts, especially when they used a tabular format [28], [29]. Likewise, studies on IoT security and privacy labels have found they can impact a consumer's shopping decision with consumers willing to pay a premium for smart device features like de-identified cloud storage of their personal data [30], [31]. IoT label research has focused on having layered labels with a prominently displayed primary layer and more detailed secondary layer accessed via a QR code [32].

2.2 Broadband Measurements

Measuring broadband performance is difficult with many different methodologies used to determine and represent actual speeds and performance. Standardizing protocols for these measurements has become crucial as they inform broadband equity programs [33] and enforce plan labeling accuracy. Currently, multiple tools, such as Ookla's SpeedTest and Measurement Lab's Network Diagnostic Tool [34] are available for conducting speed tests. However, complexities arise from shifting bottlenecks in the speed test pipeline, inconsistent test conditions, and need for longitudinal collections that include both peak and off-peak hours [35]–[37]. The FCC's Measuring Broadband America (MBA) program attempts to mitigate these confounding variables with custom hardware installations for fixed broadband measurements and smartphone app installations for mobile broadband measurements [38]. Researchers have also recommended best practices such as recording speed test clients' hardware, connection status, and server latency as well as running two different measurement tools in parallel [35].

Aside from the technical challenges of collecting broadband measurements, there is also debate over what measurements should be collected. Although people typically focus on downstream speed when discussing internet performance, research has shown that other measures such as upstream speed, latency, and packet loss are quite important, and collectively can help Internet users know what service quality to expect with different types of applications [39], [40]. A study of internet performance during the Covid-19

pandemic illustrated how focusing solely on downstream speed can lead users to overlook the real cause of poor performance. For some users of highly asymmetric broadband services, downstream speeds remained roughly the same during the pandemic, but the surge in Internet use from home produced poor upstream speeds which degraded quality for the videoconferencing applications that people relied on to work and go to school from home [41]. Some of those users probably responded by paying for better downstream speeds, when they should have switched to services with better upstream speeds.

Interpreting the gathered measurement data is equally complex. Performance for a given measure of broadband quality can be summarized in a single numerical value using common statistics like maximum, mean, and median. However, some experts have also advocated for more intricate metrics like nth percentiles [36] or the FCC's 80/80 consistency metric [42], arguing that these measures better represent how well a service performs under stressful conditions like peak usage hours.

To enhance broadband label usability for consumers who lack the technical expertise or statistical knowledge, researchers have proposed innovative approaches such as Satisfactory Service Levels [39] and other user-friendly measures. Such approaches have the advantage of simplicity, but different users prefer different applications and a service that is excellent for video streaming might be terrible for online gaming and vise versa, so important information is always lost in these simplifications

3. Methods

We conducted our study in two phases. In the first phase we conducted an online survey to evaluate the 2016 labels and gain insights into what information was most important to consumers and what information caused confusion. We then created new label designs based on our results from the first phase. In the second phase, we conducted an online survey to compare the effectiveness of our label designs with the 2016 labels. After analyzing our survey results, we made further revisions to our label designs. All portions of this study were approved by the Carnegie Mellon University (CMU) Institutional Review Board.

3.1 Recruitment

We recruited survey participants from a pool of people who had previously participated in Consumer Reports (CR) consumer initiatives related to broadband internet.² For each phase of the study, CR emailed our recruitment letter to a random sample of people in their pool, inviting them to participate in a voluntary Carnegie Mellon study. This group of people has shown a particular interest in the terms of their broadband internet service and are likely to be especially interested in the information a broadband consumer label would provide. As such, their feedback on labels is especially useful as they are people likely to actually use real-world implementations of the broadband consumer disclosure labels.

The recruitment email invited people to follow an included link to anonymously complete our survey via Qualtrics survey software. Consumer Reports emailed 15,000 people in phase one and 17,000 people in phase two for a total of 32,000 emailed survey invitations. Distribution was done in 4 email

² See Consumer Reports intiatives "Fight for Fair Internet" https://www.consumerreports.org/upload/broadband and "Let's Broadband Together"

 $[\]underline{https://www.consumerreports.org/media-room/press-releases/2021/07/consumer-reports-launches-broadband-togeth\\ \underline{er---a-nationwide-sea/}$

batches (2 pilot batches and 2 large batches) from June to August of 2022. Emails were randomly sampled without replacement such that no emails previously invited to complete our survey would be re-invited in a later distribution batch. CMU was entirely responsible for survey data collection and analysis.

No compensation was offered to participants for their participation in the study and they were made aware of this in our consent form before proceeding to the survey.

3.2 Survey Protocols

Participants first completed a consent form and screening questions. Eligible participants were US-residents aged 18 years or older with fixed home internet or mobile phone internet plans.

For our Phase 1 survey, participants indicated which broadband plan type they had purchased or updated most recently (fixed or mobile) and were accordingly directed to related questions. They were randomly assigned to one of three question subsets focusing on comprehension of broadband concepts and terms, preferences when shopping for broadband, or opinions about the 2016 label drafts. Participants were instructed to consult no external resources aside from what was provided in the survey while answering comprehension questions.

For Phase 2, we compared our own broadband labels against the 2016 labels and used a between-subjects study design to compare the usability of the four formats: 2016-fixed, 2016-mobile, Study-fixed, Study-mobile. The broadband type of their format–fixed or mobile—was determined in the same manner as our Phase 1 survey. The label version of their format–2016 or Study—was determined randomly. Each participant answered a randomly assigned subset of questions focused on either improvement suggestions or comprehension tasks for their assigned label version. All participants answered A/B comparison questions using the 2016 labels and Study labels.

Both surveys collected demographic and broadband plan information from all participants. This information included what categories of activities they engage in while using the internet. Appendix C contains the full list of all our survey questions.

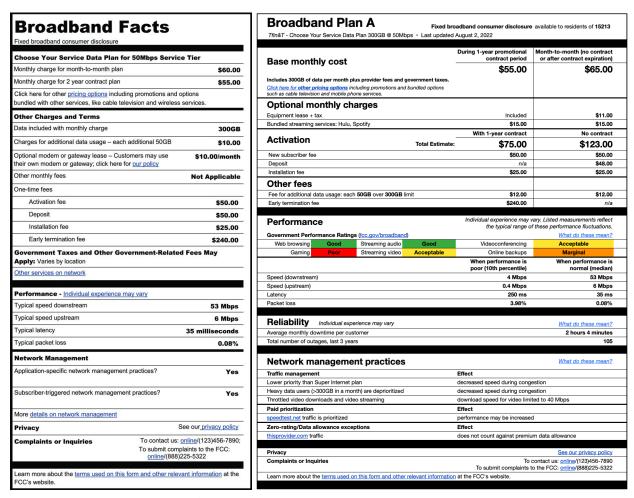


Figure 3-1: The FCC's 2016 fixed broadband label (left) evaluated in Phase 1 and our Study fixed broadband label (right) tested in Phase 2. See Appendix D for enlarged versions.

3.3 Labels

We presented static images of broadband labels representing hypothetical internet plans to participants throughout our surveys. Hyperlinks on the labels were nonfunctional. A link to an external webpage with terminology explanations was provided for certain parts of the Phase 1 survey. See Appendix B for terminology explanations and Appendix D for full images of all labels used in our surveys.

For Phase 1, we created labels mimicking the format and values of the FCC's proposed 2016 labels as closely as possible for both the fixed broadband and mobile broadband (Appendix Figure D1) versions.³ We also created 2 cropped versions of the 2016 fixed broadband label that showed just the header and cost section (Appendix Figure D2). Participants were shown either the full labels or cropped out subsections of the labels when answering relevant questions.

³ Our tested 2016 labels mimicked the example labels taken from https://www.fcc.gov/broadbandlabels, which notably do not follow all of the recommendations listed in the FCC's NPRM 22-7 for the network management practices section.

For Phase 2, we iterated on the 2016 labels to develop two new label formats—one for fixed and one for mobile broadband types—based on the data we received from phase one. Hereafter, we refer to these iteratively improved labels as our Study labels. For each of the four label formats we sought to test—2016 fixed, 2016-mobile, Study-fixed, and Study-mobile (Appendix Figures D4, D5, D6)—we created 2 versions to represent a Plan A and Plan B that would both be shown to participants when answering our comparison comprehension questions. Plan details including cost and performance values were kept as similar as possible between the 2016 labels and their corresponding Study format versions. For all non-plan-comparison questions, participants were shown the Plan A version of the label.

3.4 Data Analysis

We pilot tested our surveys with smaller batches of participants. After our pilot deployment, we made small revisions before conducting large-scale distributions. Phase 1 pilot sample responses were included in all quantitative data except where explicitly noted. In Phase 2, due to extensive revisions, pilot sample responses were not included in the quantitative results, except where explicitly mentioned as a separate pool of data.

Incomplete responses from participants who left a survey untouched for over 24 hours were excluded from the quantitative analysis due to missing demographic data. However, their answers to open-ended free response questions were considered in qualitative analysis.

Phase 1 had nine open-ended free-response questions analyzed by three researchers to extract common themes and notable quotes. Phase 2 had 14 open-ended free-response questions, with over 7,500 responses total, analyzed by six researchers using a codebook with 22 observed themes. Researchers coded 148 responses for each question, ensuring balanced distribution among label versions. Two coders independently coded batches of 32 responses for each question and discussed any differences until coding agreement was reached. The remaining items were then coded by a single coder.

Statistical significance testing was performed for select questions to verify the effect of variables like technical background and label versions on responses. We used t-tests or chi-square tests as appropriate with a p-value threshold of 0.05 to determine significance.

4. Results

Across both survey phases we received a combined total of 2,519 completed surveys and 1,737 incomplete surveys—the breakdown by survey is shown in appendix table A3.

4.1 Demographics

We did not aim for a representative US sample. Instead we focussed on surveying a group that had previously expressed interest in consumer issues related to broadband Internet. 80% of participants reported being the primary decision maker in their household's most recent decision to sign up for or change their broadband plan, and 18% reported making the decision jointly with someone else. Survey participants came from all 50 US states and Puerto Rico and include a mix of urban, suburban, and rural residents with diverse income and education levels. However, compared to the U.S. population, our sample had a larger share of participants that self-identified as older, male, and white. Our participant pool

also has higher levels of education than the U.S. population, with 89% of participants having completed schooling beyond high school. Appendix Tables A1 and A2 summarize the demographic characteristics of the 2,519 participants who completed the survey.

Most demographic characteristics did not have a significant effect on participant responses. However, participants who self-reported having a "background in computer science or related technical field" tended to respond differently than other participants on many questions. For comprehension questions in particular, participants without a technical background tended to perform worse.

4.2 Phase 1 Results

We received 1,257 completed Phase 1 survey responses with a median completion time of 15 minutes. 466 answered "opinions about the 2016 labels" questions, 362 answered comprehension questions, and 426 answered "shopping preference" questions. The full Phase 1 population breakdown by survey question subset and broadband type is shown in Appendix Table A4.

4.2.1 Opinions About the 2016 Labels

Questions in this section focused on understanding participant opinions on the 2016 labels, including their initial impressions and what plan details they actually found important. Overall we found that participants liked the 2016 labels and found they were understandable, not overwhelming, and contained the information they expected of a broadband internet plan label. Every plan detail on the labels was rated as important for comparison shopping by a majority of participants. Additionally, a majority of participants stated that they wanted these plan details made available through a broadband label similar to the one they were shown.

Figure 4.2-1 shows that participants found the 2016 labels useful, understandable, and contained expected information. Notably, participants were mixed on whether they wanted a score or grade instead of raw numbers as well as whether the information should be presented in a different format.

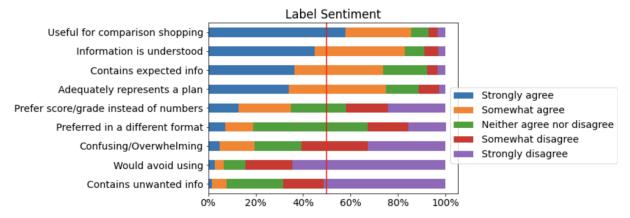
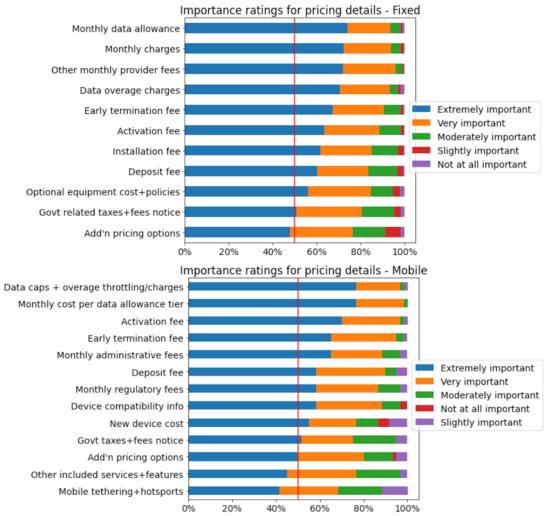


Figure 4.2-1: Participants' initial opinions on the 2016 labels provided through agreement with a series of sentiment statements.

For every field on the 2016 labels, at least 62% of all participants rated it as either "very important" or "extremely important" to have when comparison shopping. Figures 4.2-2 and 4.2-3 show the importance distribution for each detail. Participants were also asked to rate potential new fields not

present in the 2016 labels. These included ratings of plan suitability for specific applications, like online gaming. Participants' assigned importance to these ratings aligned with observed broadband persona trends. For example, 19% rated online gaming suitability (engaged in by 13% of fixed broadband participants) as extremely or very important, while 74% did the same for online video suitability (engaged in by 87% of fixed broadband participants).



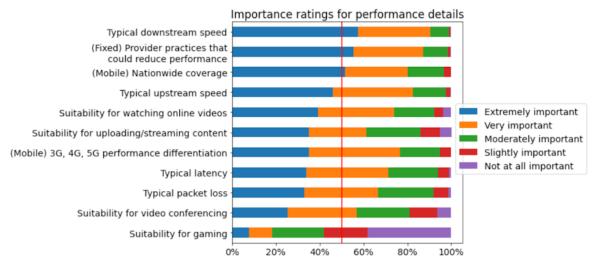


Figure 4.2-2: Participant importance ratings for pricing details on the fixed labels (top) and mobile labels (middle) and for performance details on both labels (bottom) after being shown the 2016 label and brief terminology explanations.

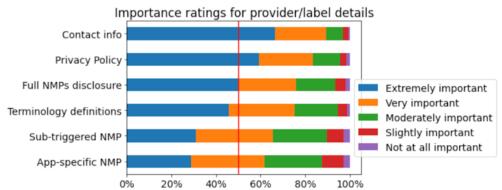


Figure 4.2-3: Participant importance ratings for other details including network management practices and contact information after being shown the 2016 label and brief terminology explanations.

4.2.2 Comprehension of Broadband Concepts and Terms

Questions in this section focused on exploring whether participants could use the 2016 label effectively. We found that participants were generally bad at computing total plan costs for 2, 3, or 4 years, often relying on calculators or pen and paper. Additionally, they lacked knowledge of more technical terms and performance benchmarks. However, when these terms were briefly explained, participants did reasonably well at identifying relevant measurements for specific use cases, such as watching Netflix. Finally, participants did not understand the differences between "application-specific network management practices" and "subscriber-triggered network management practices." However, when given examples, participants demonstrated reasonable accuracy in distinguishing between the two.

Pricing

Participants were shown two different broadband plans in the 2016 label format, with only pricing details varying between them. They were asked which plan would be cheaper after 2, 3, and 4 years assuming nonrenewable contracts and payment of all one-time fees. Only 23% of participants answered all three questions correctly. In addition, 24% of participants used a calculator and 10% used pen and

paper during the task. Participants without a technical background were worse at doing these computations (t-test, p=.0002). Figure 4.2-4 summarizes the full score distributions broken down by the technical background demographic and condition.

Generally, participant accuracy in cost computations decreased as the time frame increased, and at least 15% of participants failed to include one-time fees. Participants reported that they found the task moderately difficult (mean rating 2.9/5.0 with 5 being "extremely difficult") and requested clearer fee applicability and yearly totals. Some participants felt that the pricing information was presented in a way that was difficult to compare while others noted that the standardized disclosure format was an improvement upon what is typically available to them. Additionally, 25% of all participants who dropped out of the survey did so when faced with these computation tasks.

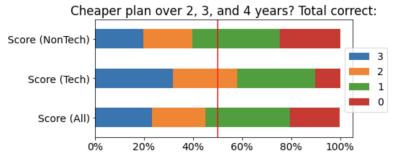


Figure 4.2-4: Number of correct annual cost computations (max 3) broken down by technical (tech) and non-technical (nontech) background.

Broadband performance metrics

Participants were asked several multiple-choice questions to gauge their understanding of broadband performance metrics. Most participants could identify whether higher values were better for downstream speed, upstream speed, latency, and packet loss, but cited more uncertainty about latency and packet loss. Most participants could not correctly do unit conversions between Gbps, Mbps, and Kbps. Similarly, most participants could not accurately identify a packet loss threshold for noticeable inferior videoconferencing, with many unaware of what "packet loss" is. Across all of these comprehension questions, non-technical participants performed worse than participants with a technical background (t-test, p<0.001).

After being given brief definitions of upstream speed, downstream speed, latency, and packet loss (Appendix B1), participants were asked to rate their importance for online gaming, watching online videos, and video conferencing. With the aid of this brief education, participants performed reasonably well at identifying which metrics were generally more important for each use case. For example, they identified that downstream speed was more important than upstream speed for watching online videos, while all measures were relatively important for video conferencing.

Network management practices

Participants were shown the network management practices section of the 2016 proposed labels and asked if they (1) understood the term "network management practices" and (2) could differentiate

between "application-specific" and "subscriber-triggered" practices. The majority of participants (>65%) stated they did not understand those terms.

Participants were then given examples of network management practices and asked them to categorize them. For each of the four examples that were either application-specific or subscriber-triggered, between 46% to 62% of participants answered correctly. When presented with an example that was technically in both categories ("Increasing your YouTube video download speed for the first 5GB every month"), only 9% of participants answered correctly but 60% identified it as application-specific. The final scores are shown in figure 4.2-5.

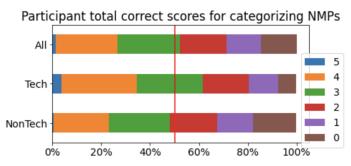


Figure 4.2-5: Number of correct categorizations of example network management practices (max 5) broken down by technical background.

Hyperlinks

Participants were shown the two proposed hyperlinks on the 2016 label and asked if they would click on the links and what they expected to find. Approximately 61% and 68% of participants said they would click on the "Other services on the network" and "Details on network management" hyperlinks, respectively. However, most participants were unsure or incorrect about the content behind the links, often speculating that "Other services on the network" indicated additional fees or advertising for bundling, or admitting they had no idea what "Details on network management" would contain.

4.2.3 Preferences When Shopping for Broadband

Questions in this section focused on discovering what information was most important to participants when comparison shopping for a broadband internet plan. Participants were not shown the 2016 labels prior to answering these questions so that we could gather mostly unprimed user requirements for broadband label information.

Overall, we found that participants generally cared most about cost, speed, and reliability when considering a broadband plan for purchase. However, other information like customer service quality, suitability for multiple internet users in the same household, and suitability for various applications (such as videoconference and video streaming) were rated highly on importance. Participants were interested in knowing a plan's performance metrics both when performance is normal and when it is much worse than normal. Additionally, participants did not want a score or grade for their plan's performance as a replacement for the raw numbers. When presented with examples of network management practices, a

majority of participants expressed interest in using details of network management practices to avoid providers with certain practices.

Factors

Participants expressed interest in many factors when shopping for broadband, including data caps, customer service quality, security and privacy, and upstream-downstream speed symmetry. The most mentioned factors were cost, speed, and reliability. Additionally, participants desired more disclosure from providers, such as information about privacy practices, equipment options, and customer feedback. They further emphasized that information should be presented in plain language and in a standardized format to facilitate comparison shopping before making a purchase decision.

Most participants did not clarify how broadband reliability should be calculated. However, we found in a separate question that "reliability (lack of outages)" was rated highly important by participants and significantly outperformed all other factors we asked about that did not appear on the 2016 labels (chi-square, p<0.01) (Figure 4.2-9).

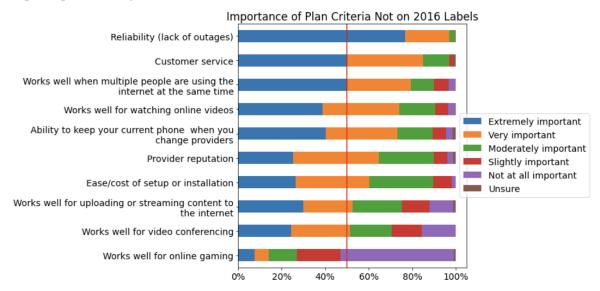


Figure 4.2-9: Participant importance ratings of other factors which may impact shopping decision but are not on the 2016 labels.

Broadband performance metrics

Participants were provided with a list of possible ways to measure a plan's speed including maximum, mean, median, 10th percentile, 25th percentile, suitability for a use case (e.g. "works well for watching online videos"), and a grade or score (e.g. B+ or 3.2 stars). They were asked which measures were most important to them while broadband shopping.

The speed measurements that received the highest ratings of importance from participants were mean, median, and 10th percentile (Figure 4.2-10). When asked to choose just one measurement or combination of measurements, the most popular choices were mean, 10th percentile, and max (Figure 4.2-11). Interestingly, 10th percentile outperformed max in importance (chi-square, p<0.01), but was not chosen at significantly different rates than max when participants were asked to choose a single measure.

Free responses revealed that participants found the concept of percentiles confusing and did not understand that performance can fluctuate. They preferred easier-to-understand language, emphasizing the importance of knowing what minimum performances they could expect throughout the day.

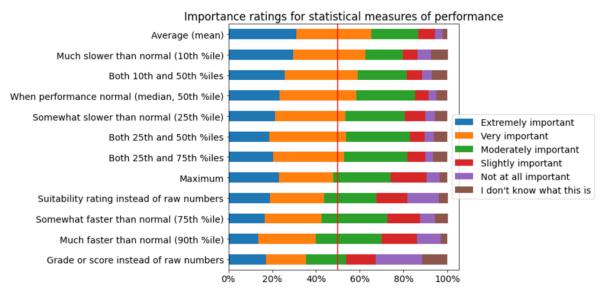


Figure 4.2-10: Participant importance ratings of different measures for network performance.

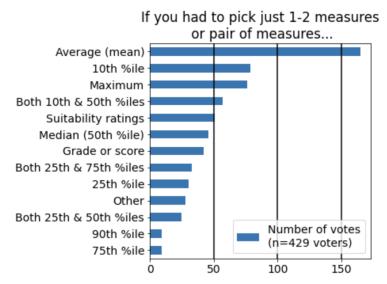


Figure 4.2-11: Number of participants who selected measure or combination of measures as their only measurement to have advertised to them while shopping.

Network management practices

To evaluate how important network management practices (NMPs) were to a participant's consumer shopping decision, participants were given several example practices and asked if they would avoid using a provider which engaged in those practices. A majority of participants indicated they would avoid providers who engaged in application-specific speed throttling, application-specific zero-rating, or

mobile hotspot speed throttling – suggesting that it is useful to provide this information to consumers on a label.

4.3 Phase 2 Results

Phase 2 of our study was designed to measure how well our broadband labels compared to the 2016 labels. We received 1156 total completed survey responses with a median completion time of 22 minutes. Although we tested a mobile version of our labels, we omit those results for brevity as they generally aligned with our fixed broadband label results and were a minor portion of our responses. A full writeup that includes our mobile results can be found online [4]. Appendix Table A5 shows the number of participants who answered each set of survey questions. Appendix D shows the precise labels we tested in this phase.

4.3.1 Comprehension

Questions in this section evaluated how label formats impacted participant comprehension of a single plan's details as well as ability to compare plans between two labels. Both pools of participants performed similarly when using the labels to compare two plans. However, participants using our Study labels had an easier time using it for assigned tasks like cost computation compared to participants using the 2016 labels. Generally, we saw slightly worse comprehension among non-technical participants than those who self-identified as having a technical background. These modest differences showed up in both the 2016 and Study labels.

Cost Calculations

Participants using the Study label were more likely to correctly calculate the total cost of the plan over 2 years compared to those using the 2016 labels (t-test, p<0.01). A majority of 2016 label users (55%) incorrectly calculated the total cost by multiplying the monthly price for a one-year contract by 24 months, while only 17% of Study label participants made this mistake. When calculating total one-time fees, Study label users performed worse than 2016 label users, possibly due to confusion caused by the columnar format showing total one-time fees for both contract and month-to-month plans. Specifically, 17% of Study label users incorrectly assumed they would need to repay activation, deposit, and installation fees when switching from contract to month-to-month plans.

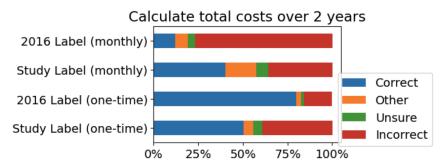


Figure 4.3-1: Share of participants who correctly calculated total cost and total one-time fees of a plan over 2 years broken down by shown label format.

Performance

We asked participants to identify the given plan's expected downstream speeds when performance is normal and slower than normal. Since the 2016 labels do not specify whether "typical speed" is normal or slower than normal on the label, we considered 2016 label participants correct if they selected either unsure or the listed typical speed. There was no significant difference in participant correctness between the two label versions (t-test, p>0.1). Notably, the Study labels initially decreased correctness in the pilot study when columns were labeled as just "10th percentile" and "median." Changing the wording to "When performance is poor (10th percentile)" and "When performance is normal (median)" restored correctness levels to the same as the 2016 labels.

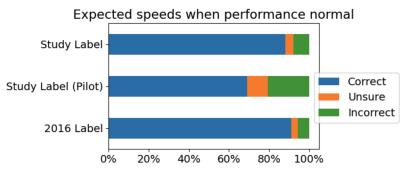


Figure 4.3-2: Share of participants who correctly identified the normal performance speeds from their provided broadband label. Pilot data included to show the effect of changing wording.

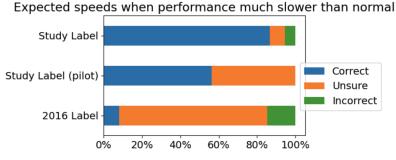


Figure 4.3-3: Share of participants who correctly identified the slower than normal performance speeds from their provided broadband label. Pilot data included to show the effect of changing wording.

Suitability and Reliability

Participants were asked to estimate the given plan's expected reliability (downtime per month) as well as rate the their plan's suitability for streaming audio and videoconferencing. Reliability, a field only on the Study labels, was correctly interpreted by 79% of Study label participants while 76% of 2016 label participants correctly identified their label was missing this information. For application suitability ratings, participants could either do their own rating based on the provided performance metrics, state they were unsure, or agree with the provided rating if they were Study label users. On average, 79% of Study label participants chose the provided rating, while 43% of 2016 label participants selected the "unsure or not enough information" option with the rest selecting from the five rating options. For streaming audio, 38% of 2016 label participants were able to coalesce around either the Good or

Excellent rating. For videoconferencing however, ratings were spread out with only 9% to 15% of participants agreeing on any one option.

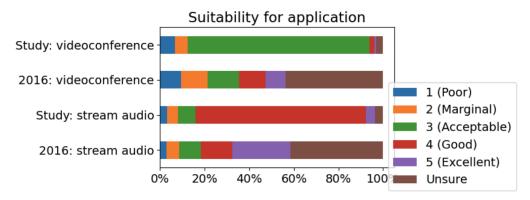


Figure 4.3-4: Participant rating of how suitable the plan is for video conferencing or streaming audio based on the information provided in the labels.

Network management practices

We next gave participants a list of broadband-related actions (e.g. watching online videos, exceeding 300GB of data per month) and asked them to select all the actions that could trigger their provider to throttle their speeds during times of network congestion. Our Study label lists out triggers and actions for a provider's network management practices, but the 2016 labels do not. The Study labels' listing of practices reduced participant uncertainty, with 70% of 2016 label participants and 8% of Study label participants selecting the "unsure or not enough information" option. In addition, Study label participants were able to correctly interpret the label to identify occurring practices 64% of the time on average. For the 2016 labels, as no network management practices are described, there were no correct or incorrect answers from the listed practices. 11% of 2016 label participants selected our "None of the above" option despite the labels indicating that the plans had both application-specific and subscriber-triggered practices active.

Plan comparisons

For the next portion of the comprehension section, participants were shown 2 labels in the same assigned format representing a Plan A and Plan B. We instructed them to use these two labels to answer comparison questions that asked them to evaluate which plan had lower costs, better performance, better reliability, or less restrictive network management practices. Figure 4.3-5 shows a summary of how well participants performed. For comparing cost and performance, label version had no significant impact on participant correctness (t-test, p=0.08). For comparing reliability and network management practices, a majority of Study label participants were able to accurately use these added fields. Interestingly, a large portion of 2016 label participants selected an answer other than "unsure or not enough information," possibly interpreting packet loss as the measure of reliability or misinterpreting the fact that both plans had both application-specific and subscriber-triggered network management practices as them being equally restrictive. At the end of this section, 27% of 2016 label participants and 54% of Study label participants stated that completing these comparisons were easy.

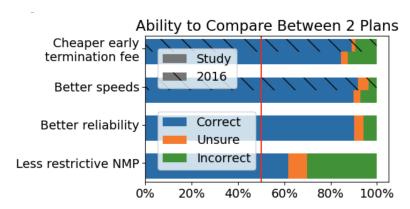


Figure 4.3-5: Ability of participants to compare between a Plan A and Plan B using either the 2016 or Study label formats.

4.3.2 Opinions on Labels

This section solicited participant opinions on their assigned label format including their initial sentiments and suggestions for changes to the information presented for each section. The goal was to gather further data on how both the FCC's 2016 labels and our Study labels could be improved upon from the perspective of users.

Overall, both labels were found useful, understandable, and contained all the information needed to select a plan without being overwhelming according to a majority of participants with neither winning out over the other (Figure 4.3-6). Label versions also had no significant impact (chi-square, p>0.05) on participant confidence that they could use the labels in accomplishing given tasks, except for tasks that needed information not on the 2016 labels like network reliability and detailed network management practices (chi-square, p<0.001) (Figure 4.3-7).

Generally, non-technical participants were slightly less likely to find the labels easy to use than those who self identified as technical. Technical users were also generally more interested in including additional information on the label. These modest differences showed up in both the 2016 and Study labels.

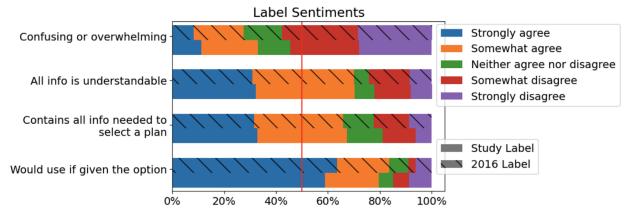


Figure 4.3-6: Participant agreement with label sentiment statements. Statements on figure axis are paraphrased for space

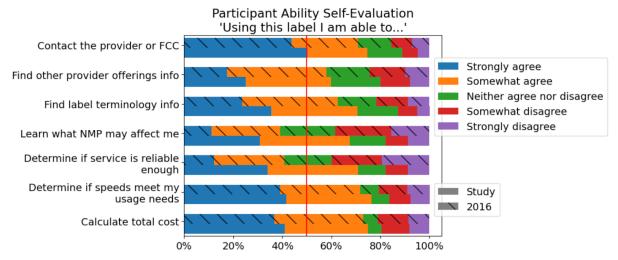


Figure 4.3-7: Participant agreement with label ability statements. Statements on figure axis are paraphrased for space

When shown just the cost and included features section of their assigned label, participants expressed a desire for more in-depth cost explanations, for taxes to be included as part of the label, and for some sense of plan service area. Generally, participants wanted to know the final total cost they would be paying and disliked any ambiguity. Here are some representative responses:

Include what's in the other included services/features. Why leave the consumer in the dark? The same can be said for the additional pricing options, plans and promotions-give most people the same deal instead of hiding it as part of the consumer information package.

Would want to see the "total" cost. Given my lack of knowledge on most "tech" issues, I would likely ask for additional explanations to most of the items on the label.

Make it more clear what I will actually pay per month. Are there taxes or anything other tricky things don't know about?

It's a good guide representing costs and the services you will get. I would also like to see a place to enter zip code so that all charges calculated and are known prior to signing up.

Additionally, we asked participants directly if they would like to see taxes included on the label. An overwhelming majority of participants (97%) stated that they would. However, they were divided on whether taxes should be listed as a separate row on the table (55%) or wrapped into the listed price for each item on the label (42%).

For the performance section, the most frequent information requests we observed were for reliability information, quality of experience ratings, and explanations for technical terms.

I'd like an actual range (best and worst) of reliability/performance, preferably for my locale. Perhaps typical availability or "up-time" expressed as an average percentage of total time each month internet service has been available vs. down-time for the service in the past year.

Give example of possible speed req'd to do zoom call per minute, how many mbps meeded to do online research for kids homework. Watch a movie/streaming high res vs low res. Give a rough idea of what's needed for common use cases... Add service levels guaranteed if any, or historical uptime vs downtime that people can expect with the service.

What I want to know is would the service support my uses. Will it work for texting and email? Will it play music well? Can I use it to have video meetings? Can I stream movies?

The word "typical" is undefined and its use and meaning may vary between providers. Moreover, how is a consumer to know whether their installation location or conditions are typical or exceptional or how often exceptional conditions happen or where they happen, etc.?

Include a glossary of terms and include each reference. For example, explain MBPs, speed (downstream), speed (upstream), latency, packet loss. A customer should not have to be looking up every other word on his/her computer in reading this label.

Although the Study label actually had some reliability information represented as lack of outages, participants were vocal about wanting even more reliability information, including information on how many customers were affected by outages and some basis of comparison either to other providers or some national average.

It would be helpful to see scheduled vs unscheduled outage info for past 12 months listed under the Reliability section.

Maybe this needs a comparative analysis to other providers to become meaningful. From this data, average monthly downtime of 2h 4m, with 105 [outages] over 3 years, seems to be a lot of downtime.

A guarantee of some % (maybe 75%) of the stated speed and a sliding scale refund when it's not achieved; instead of the Blue Link "Individual experience may vary" statement...

I'd also like some indication of who did the testing and rating - whether the FCC does its own studies, whether the provider self-reports, or whether it's a third party (commercial or otherwise) who collects and organizes the reliability and performance data.

We also asked Study label participants whether they found the numbers or suitability ratings to be the most useful part of the performance section, and we asked 2016 label participants if they'd like suitability ratings added as an addition or replacement for the numbers. In combining the responses to those two questions, we observe that a majority of all participant groups (65-75%) wanted to have both numbers and ratings in the label performance section (Table 4.3-1).

Label Version	Just numbers	Just suitability ratings	Both numbers and ratings	Neither or Unsure
2016-fixed	7%	9%	75%	10%
2016-mobile	15%	8%	65%	13%
Study-fixed	11%	9%	70%	11%
Study-mobile	3%	11%	69%	17%

Table 4.3-1: Participant support for performance represented as numbers, ratings, both, or neither broken down by the label format they were looking at.

Participants next commented on what changes they wanted for the network management practices section. Many 2016 label participants wanted more details on what network management practices are

and examples of their impact on consumers. Both 2016 label and Study label participants had a large share of participants who expressed confusion over the terminology in this section and wanted either less technical language or a more thorough explanation—possibly through the provided hyperlink. Some Study label participants wanted quantitative specifics to describe the effects of the various practices on their network experience.

Words are highly technical. The information is important, but needs to be presented at a lower level of comprehension.

In the Effect column [of the Study label], there should be a percentage performance change. For example, when data speeds are decreased during congestion, what percentage of the advertised speed will be cut?

"Deprioritized" and "throttled" are not defined and are probably variable in severity so that the consumer really does not know what the net effect might be on their own use of the service.

How often does congestion happen? How much is performance decreased by? What amount would next plan up (Super Internet in example) get me in terms of improvement?

4.3.3 A/B Section Comparisons

In this section, participants directly compared subsections of the 2016 and Study label formats to determine overall preference and advantages of each format. We specifically focused on soliciting feedback for the cost, performance, and network management practices sections of the labels. Overall, we found that the Study labels were significantly more preferred than the 2016 labels across all three subsections (see Figure 4.3-8).

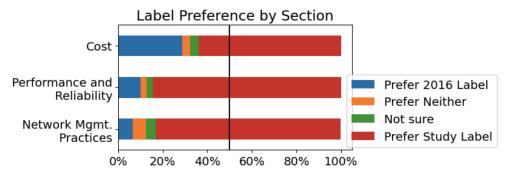


Figure 4.3-8: Participant preferences for 2016 vs Study label subsections broken up by broadband type and subsection—cost, performance, or network management practices (NMP).

The most common reasons participants gave for preferring the 2016 format were larger font size and simpler, more concise layout. The most common reasons participants gave for preferring the Study format were that it had more information and was better for side-by-side comparisons. Here are some representative responses for each:

I can't emphasize enough the important of keeping it simple so that the label is easily understood by the average non-tech person. The average person says: "this is what I am going to do with my devices, will this service let me do that."

All the jargon on the label doesn't mean anything to me if I don't understand how it will affect my usage of the service. I liked the labels that included the very detailed information. Even the ones

with more text/information were far more informative and helpful than pages of fine print no one ever reads.

[2016 label] appears less busy and has larger, easier to read font.

[2016 label is a] very simple presentation, but actually dismally incomplete for a sound decision

[Study label is] much more comprehensive. Allows one to understand what the service will support.

[Study label]'s well ordered... The format is uncluttered and easy to read & find info. The differences in font size and bolding are very helpful in separating things.

The cost section comparisons were particularly contentious. Some participants really liked the two-column format of the Study label as it made it easier for them to compare between contract and month-to-month payment options, but others found it confusing and unnecessary. Several participants were also confused by the Study label's removal of the "Government taxes and fees, and Other carrier surcharges may apply" field believing that instead of the taxes being included with the listed fees as we intended, they were being dropped altogether.

[Study label has] more cost comparison, shows costs involved with contract vs no contract, helps to make a better decision

[Study label] makes it easier to determine the first year vs additional year cost. I might choose an ISP based on first year cost with the intention to switch as soon as the contract is up, depending on the installation/termination fees.

Even though it is somewhat confusing, [Study label] is better because you can compare costs side by side.

[2016 label is] more concise, no side by side comparison, and it gives more information. I prefer a linear format.

[2016 label] follows normal, conventional communication practices. [Study label]- which is like xfinity, gives totals ABOVE the individual charges in multiple sections. Its illogical and designed to confuse. [2016 label] is great.

The performance and network management practices sections' feedback were less conflicting and consistent with the overall trends: the 2016 label is simpler with bigger font whereas the Study label had more detailed information overall. Feedback for these sections also frequently praised the suitability ratings and explanation of what network management practices there were. Notably, the 2016 label's network management practices section was based on the FCC's example labels [43] which, for both subscriber-triggered and application-specific network management practices, simply state "yes" with no further description.⁴

[Study version] gives me ideas of how the performance will affect various common internet activities. The colors give an instant visual cue about service. The differentiation between normal and poor performance is also helpful.

⁴ This does not align with the FCC's NPRM guidance which states that those fields should have provided "a brief description and a link to a full discussion that identifies... network management practices, when such practices are triggered, and the effect such practices could have on performance."

[2016 version network management practices section] is pretty much useless. Every provider will have the same information there. [Study version] gives me actual information on the provider's practices.

5. Discussion

In this section we synthesize into overarching themes and actionable design recommendations for the broadband consumer disclosure labels. We divide this section into five subsections aimed at discussion points that extend across (5.1) all label sections, (5.2) the cost section, (5.3) the performance and reliability sections, (5.4) the network management practices section, and (5.5) other recommendations. Finally, we examine the FCC's updated label design from their 2022 order [5] and note what elements are consistent or inconsistent with our recommendations.

5.1 General Sentiments

5.1.1 Strong Support for Broadband Labels

We strongly encourage continued development and eventual implementation of the broadband labels. Throughout our study, participants frequently expressed their enthusiastic support for broadband consumer disclosure labels—many viewed them as a way to combat providers' lack of transparency and manipulative pricing models. Even though participants expressed their share of frustrations with both the 2016 and Study labels' formats and terminology, they strongly supported the implementation of these labels over the current status quo. Here are some representative responses:

God (or whoever is running this show here), BLESS you for doing this! Nowadays it's like having a part-time job to get through all the legalese in everything we do. These labels would alleviate a LOT of stress and wasted time, and help people make better decisions. Thank you again.

I hope this is something that will actually happen. Broadband providers currently make it very difficult to compare plans within one provider's catalog as well as between providers. This labeling would greatly increase consumers' understanding of what they would be paying for.

While I find [the Study labels] to be the clearest, most accessible version of a consumer information label, either of them would be a huge improvement over the way providers currently provide information about their various plans. I hope this can actually be put into practice!

I cannot wait for labels like this to become available. Several times I have signed up for service only to find later that the carrier has constant outages, bad internet service and lousy customer service. How great to know at least SOME of this when making the initial choice to sign up for a service!

I really wish it was Federal law that purchasing broadband or cellular services had to be laid out for people like this. Good luck!

5.1.2 Most Important: Cost, Speed, and Reliability

When evaluating a broadband plan for purchase, participants frequently noted their decision making involved examining the cost, speed, and/or reliability of the plan. In other words, participants care the most about knowing how much they are going to pay, what they are going to get, and how much of the time they will not get what they paid for. However, broadband labels should not be reduced to just these

details as we observed participants find many other plan details important to know when comparison shopping. We recommend that cost, speed, and reliability be highlighted among the larger set of plan attributes disclosed to broadband consumers.

5.1.3 Concise AND Informative

We observed from our participant responses in section 4.3.3 that participant preferences tended to align with whichever label had more information. However, we also observed that they valued design simplicity and conciseness; they wanted to be able to extract their desired information from the label as quickly as possible. In addition, more numbers on the label whether they were for costs or performance values tended to result in more label comprehension mistakes. These preferences for more detailed information and conciseness can conflict but are not mutually exclusive and future label design should strive to achieve both.

5.1.4 Make Label Information Available to Third-parties

We strongly recommend that all information found on the labels be made available to independent third parties. Information would be ideally accessed via API requests to a publicly-accessible computer-readable database. These information flows are necessary to satisfy consumer demands shown by our results. Specifically, consumers want pricing totals that include their specific optional add-ons and local taxes. They want quality of experience ratings tailored to their personal use cases and expectations. They want comparison tables with all plan options available to their location. And they want to know how their cost effectiveness competes against local and nationwide averages. A one-size-fits-all, FCC-mandated static label realistically cannot accomplish this—especially for quality of experience ratings for all applications that a consumer cares about (see section 5.3.4). Providers themselves also cannot provide this without having access to other providers' information and overcoming consumer mistrust. Here are some representative responses which either directly or indirectly call for third-party tooling:

These disclosure labels are a great innovation for consumers. If this advancement could be paired somehow with an ancillary list of available service providers in one's geographical area, the consumer would be much better able to make smart choices.

It would be useful to have an independent agency, like FTC, provide a website where consumers could specify their household needs are and see what internet speeds and options would be ideal for them. Next you would specify your location to see what internet providers and plans are available; then be able to compare between them.

It would be great to have a site where one could go to do a side by side comparison of plans available to your area!

Instead of a standardized label, I would prefer a requirement for a web site where I could provide information about how and where I use the internet and what details I would like to know, and the site would display output that is tailored to my needs. Better yet, would be a web site that all vendors supplied information to, so that I could request a comparison of the cost and performance measures I want.

The subjective appraisals for different uses of broadband should be evaluated by a third party, not the vendor of the service.

5.1.5 FCC Standardized Glossary

We recommend that the FCC release and maintain a glossary of broadband label terminology that can be accessed through a mandatory hyperlink on the label. Participants frequently complained that the labels used too much technical jargon and that they couldn't understand the various terminology, much less how the information presented would impact their internet experience. This was especially true for participants without a technical background. Terms we found were frequently misunderstood or cited as technical "gobbledygook" included latency, packet loss, and network management practices (both application-specific and subscriber-triggered), performance percentiles, and network congestion. However, our results show that participants are highly interested in having all these plan details available to them. Therefore, consumers' lack of immediate understanding of terminology should not be considered a deterrent to their inclusion on the labels. Rather, lack of understanding should indicate a need for rewording with less technical jargon or for providing an explanation elsewhere–like in a glossary. This is supported by our results that show many participants, including those with a technical background, want explanations on what broadband terms meant and why they mattered.

We specifically recommend that the FCC be responsible for the glossary for two reasons. First, participants frequently doubted the credibility of their internet service providers, which extended to any provider-controlled content accessed through label hyperlinks, including glossaries. Second, official definitions would promote more consistent terminology usage across the industry, making it easier to compare services from different providers.

5.2 Cost Section Takeaways

We found that consumers generally want to know what they can expect to pay when they purchase a plan, and they hate when there are unexpected hidden fees or price increases. Creating labels with comprehensive cost sections that include all pricing options for a given plan would appear to meet this need. However, we also found that consumers generally struggled with cost computations and wanted fewer numbers to contend with. They preferred totals where possible: being presented with "just one number" made it easier not only to understand what they could expect to pay, but also to compare across plans. However, common providers' pricing schemas include a large selection of possible discounts (e.g. promotional, contract, student, paperless billing, autopay) and optional add-ons (e.g. equipment, television, voice, additional lines) that make providing a one-price-estimate-fits-all value difficult, if not impossible. Although we provided participants with a total activation cost estimate on the Study labels we tested, this total was based on a predetermined notion of what optional costs would be included (e.g. installation) and explained to users prior to asking them to compute a 2 year total. Attempting to give a total price estimate based on a predetermined bundle of options in reality may push consumers into paying for services they do not require or frustrate consumers who end up purchasing more than estimated. In summary, creating a usable cost section is difficult. Nonetheless, we put forward the following design recommendations for the broadband labels' cost section.

5.2.1 Total Costs

Non-optional costs should be bundled into a total where possible as participants strongly preferred to just have one number representing what they need to pay where possible. This includes

bundling applicable taxes into all listed prices. Participants strongly wanted taxes to be present on the label and having them as a separate row for a non-universal combination of optional costs is impractical. We did not explicitly ask participants if they want precise cost breakdowns accompanying total values. However, we tested having a total cost with accompanying breakdown for activation on the Study labels and found it performed well with participants.

In a more ideal world, consumers could toggle discounts, add-ons, and taxes to affect a total cost value on a dynamic version of the label. Although individual providers may implement such a feature, the primary goal of the broadband labels is to enable comparison shopping across providers. This suggests the need for third-parties that can implement this tooling. Therefore, we again strongly recommend that this information be made available through a machine-readable interface (see section 5.1.4).

5.2.2 Cost Explanations

Cost explanations should be made easily accessible to consumers directly from the broadband label. Participants strongly expressed a desire for cost explanations both after their cost computation task and after being shown a label's cost section. Based on their feedback, a cost explanation would detail for each item: what the cost is for, when the consumer would pay it, what populations are exempt from paying it (e.g. legacy customers, customers switching from contract to month-to-month), and when the cost will increase.

We further recommend that the cost explanations not be directly on the label but instead be accessed through either a label hyperlink to an external webpage or tooltips. The FCC's 2016 labels do not currently have an explicit place for this beyond potentially the "other pricing options including promotions and options bundled with other services" hyperlink. We recommend the addition of a "cost explanations" hyperlink if this approach is taken. One other approach could be to have tooltips provide this information on electronic versions of the broadband labels so that this information is readily available without being nested in yet another hyperlink for consumers to navigate.

5.3 Performance Section Takeaways

5.3.1 Which Measurements to Include

Several parties have argued that packet loss and latency are esoteric measurements that should be removed from required inclusion on the label. However, our results show that even if consumers' a priori understanding of the terms was lacking, they still desired having these measurements and could use them after they are given short explanations. We recommend that the FCC require inclusion of all four performance measurements: downstream speed, upstream speed, latency, and packet loss.

5.3.2 What Measurements Should Reflect

The FCC proposes that label measurements should reflect the typical values during peak usage periods [3]. However the word "typical" is undefined and therefore means different things to different people; most of our participants assumed that "typical speed downstream" reflects the times when performance is normal. In addition, "peak usage periods" is also not defined in the NPRM. This vagueness leaves room for providers to potentially manipulate their metrics to appear more favorable, thus

making direct comparisons across providers problematic, misleading the consumer and fostering mistrust of the labels. To mitigate this, we recommend the FCC provide a precise definition of all metrics that appear on the label in a glossary.

Overall, we found consumers are most interested in knowing a plan's expected performance during normal operation and when their service is operating much worse than normal (see section 4.2.3). Notably, they found knowing normal and much worse than normal performance more important than other values including best, better than normal, and just worse than normal (figure 4.2-10). Some participants also expressed wanting something like a worst-case guaranteed performance. We therefore recommend that whichever measures are decided upon, they reflect both the plan's expected normal and poor performance.

Although we tested participants' preferences for percentile measures, they were initially confused by those terms and it wasn't until we added less precise, non-technical language that they became highly interested in having these measurements. Since consumers generally lack knowledge of statistical measures in the context of broadband internet performance, our survey responses cannot be used to conclusively recommend which precise statistical measures should be used. Both the FCC and external parties have proposed several statistical measures including mean of all speed samples, median of all speed samples, 80/80 consistency, and 95% consistency [44]. We urge the FCC to determine what is the best statistical measure to represent "poor performance." We also recommend that the labels augment any statistical language with more non-technical language even at the cost of some conciseness or perceived precision; the measurements themselves should be rigorously precise.

5.3.3 Data Rate Unit Consistency

Our results show that non-technical participants especially struggled with data rate unit conversions between Kbps, Mbps, and Gbps. Since this can lead to critically flawed comparisons between plan options, we recommend the FCC require the data rate units be kept consistent (e.g. all broadband providers would express speeds in Mbps and latencies in ms).

5.3.4 Quality of Experience Ratings

Participants without a technical background largely did not understand the raw metrics reported in the Performance section of the 2016 label. Our results support including application suitability ratings in addition to measurement numbers. Our application suitability ratings are otherwise known as Quality of Experience (QoE) ratings and may realistically be difficult to provide on a standardized label as they are both subjective and highly application-dependent. Other factors outside of the provider's control, including number of users on the network and the subscriber's hardware, can also drastically affect quality of experience. Several participants initially distrusted the suitability ratings on the Study labels because they came on a provider-authored label despite our "Government Performance Ratings (fcc.gov/broadband)" header. They believed providers would use these to make a plan appear better than it actually is or to nudge consumers towards buying a more expensive plan than they actually needed. Finally, even if the FCC could publish standards for quality of experience ratings, they would likely require frequent updates as technologies and demands evolve.

That being said, ratings and guides are not new to government labels. The Nutrition Facts label created by the FDA includes a Percent Daily Value (%DV) which is a quick way to see whether the

amount of nutrients in a particular food is in line with what the average adult needs in a day, regardless of whether they know anything about nutrition science. The Energy Star label from the U.S. Department of Energy includes an estimated yearly operating cost so that consumers don't have to do math on kWh to understand the practical impacts of purchasing energy-efficient appliances. Window stickers on new cars include a similar fuel price estimate from the EPA as well as 5-star safety ratings from the National Highway Traffic Safety Administration (NHTSA). The NHTSA's labels are of particular interest because like broadband internet performance (and unlike nutrition or energy labels), assessing a car's safety in a collision requires synthesis of many different technical measurements. Also like broadband internet performance, it's impossible to determine a car's safety in every possible crash scenario, so the NHTSA selected only a few representative scenarios to test.

QoE ratings are highly desired by consumers as supplemental information to the raw number metrics. For non-technical users especially, they cited the suitability ratings on our Study label prototypes as the most understandable and helpful portions of the label. A potentially more realistic way to provide these is for independent third-parties to develop and maintain tools that can intake household consumer requirements, application preferences, household usage patterns, and label information and output ratings. To make this possible, the data contained in the broadband labels must be made available to third-parties. We therefore recommend that the FCC take steps to enable such functionality (see section 5.1.4).

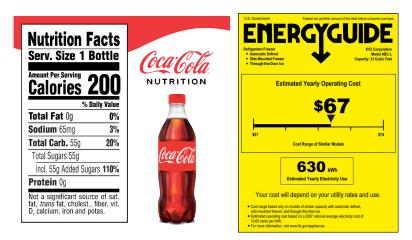


Figure 5-1: A soda nutrition label's (left) percent daily value (%DV) contextualizes 55g of added sugar for non-expert as more added sugar than they need in a day. The Energy Star label's (right) scale bar shows this fridge's annual operating cost is slightly above average.

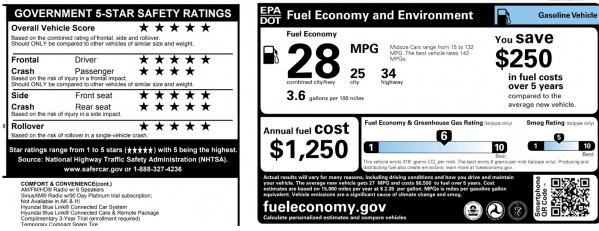


Figure 5-2: NHTSA safety ratings (left) and environment information (right) for a single car.

The safety star ratings concisely indicate this car is very safe except for passengers in a frontal crash who are only mostly safe. The fuel economy section shows this car is slightly cheaper to fuel than most cars.

This label also includes a QR code which leads to a more detailed label.

5.3.5 Reliability

Participants were highly interested in having some indication of reliability on the broadband labels. Notably, reliability can have several meanings in the context of broadband internet. The interpretation we tested with the Study labels and surveyed interest for in Phase 1 was a lack of network outages. We know from our results that lack of outages is important to participants and representing this with average monthly downtime per customer and number of outages over the last three years was easily understood. Free responses also indicated that some consumers wanted additional reliability details like percent uptime, differentiation between scheduled versus unscheduled outages, and how the listed reliability compares to other providers both in the area and nationwide. We recommend that a reliability section be added to the broadband labels with some indication of outage frequency and duration.

5.4 Network Management Practices Section Takeaways

We recommend that network management practices be enumerated on the label in standard groups and the network management section be accompanied by a standardized glossary with definitions and examples that explain these terms for consumers.

5.4.1 Enumerate Network Management Practices in Standard Groups

Network management practices should be enumerated on the label because our results indicate that consumers want this information disclosed and they find the section functionally useless without the actual practices listed out. Practices can be disclosed as either a brief description like the NPRM specifies [3] or a table as some experts have recommended [36]. We tested the table format in our Study label mockups and found participants liked it (see section 4.3.3).

Practices listed on the label should be grouped into standard groups (described in a standardized glossary) established by the FCC to promote consistency across providers, and to prevent potentially objectionable practices from being buried in a long list. We grouped practices into traffic management, paid prioritization, and zero-rating/data allowance exceptions on our Study labels and found it performed

well with participants. Subscriber-triggered and application-specific practices may be combined, as this is not a distinction that was readily understandable to participants.

5.5 Other Recommendations

5.5.1 Location-specific Labels

Providers' pricing, performance measurements, and network management practices for a given plan may vary with the customer's location or service area. Additionally, several recommendations we make for the broadband labels—including taxes with pricing items, reliability information, and increased label availability—require a specific location to be declared. We therefore strongly recommend that labels include an indication of the location to which the information on the label applies.

5.5.2 One Plan per Label

Some participant responses noted feeling initially overwhelmed by the amount of numbers on the label. We also observed slight decreases in comprehension when label rows were given multiple columns or values; we would expect this issue to compound as more columns are added. To minimize confusion, labels should be plan-specific. In practice, this would mean a provider could list the contract and month-to-month options on the same label, but they should not attempt to cram multiple cable internet speed tiers onto the same label. Of course, providers or third-parties could also provide plan comparison tables based on label information.

5.6 FCC 2022 Label

In November 2022, the FCC released an order detailing updated label content and format requirements for ISPs along with an example template (Figure 5-3). Consistent with our recommendations, the 2022 label has fewer cost numbers, better cost explanations, required links to discounts and bundle details, speed and latency included, consistent data units, a link to an FCC standardized glossary, and one plan per label. The FCC is also requiring plan information be made available in a machine-readable format, which we strongly support. However, there are many points where the updated labels are inconsistent with our recommendations. For the cost section, there is no total cost of non-optional charges and listed costs do not include taxes. For the performance section, packet loss is missing from the label, service reliability is not included, measurement methodologies are not standardized across providers, and there is no requirement for both normal and poor performance values. For the network management section, practices are not detailed on the label and are instead hidden behind hyperlinks. Additionally, there is no mention of the label's applicable location, which we believe is crucial for enabling third-party tooling along with machine-readable formats. In February, we submitted a comment to the FCC further detailing these inconsistencies and reasonings for why they should be revisited [6].

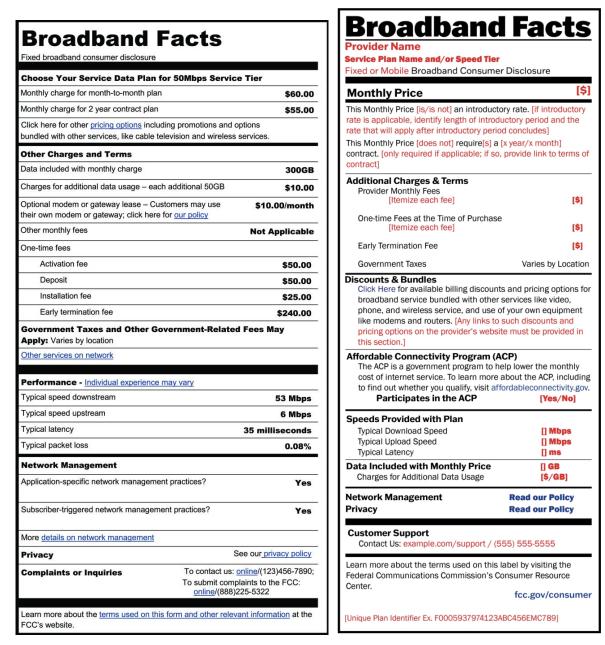


Figure 5-3: FCC broadband labels from the 2016 NPRM (left) and 2022 Order (right).

6. Future Work

Given the dynamic nature of broadband technology and ever-changing needs of consumers, it is important to continue collecting user feedback while making iterative improvements to the broadband labels. User studies like ours can reveal important gaps in comprehension while also highlighting what details are most important or confusing to consumers. We strongly encourage further user testing be done for both the FCC's latest 2022 labels and our own latest prototype described below.

In line with our findings and recommendations, we propose a broadband label design prototype (Figure 6-1, Appendix E) that further addresses the consumer preferences and comprehension needs

discovered in phase 2. This prototype uses a layered label design to strike a balance between participants' desire for quick information access and their need for detailed information. This approach has seen popularity in other label applications [32] and features both a summary layer and detailed layer. The summary layer contains essential plan details with a clearly marked QR code and url to the detailed layer. The detailed layer contains all mandated broadband label information with links to external resources such as terminology definitions or additional plan add-ons. Note that for this approach, regulation must exercise caution to avoid critical information omissions from the summary layer.

In the course of our study, we identified other areas for further research and expert thought, especially as they regarded label implementation details. Here are a few key questions we came across while considering how to best design our latest broadband prototype:

- Labels should be location-specific, but should they be as local as exact street address or as broad as service area?
- How should labels represent broadband plans included as part of a bundle?
- How should optional monthly charges/discounts be ordered if at all? Should more common ones like equipment rental and autopay be listed towards the top?
- What use cases would best represent quality-of-experience categories? How should those rating threshold be determined and updated?
- What measures of broadband reliability are feasible to provide and most desired by users?
- How should network management practices be categorized and sorted if at all?

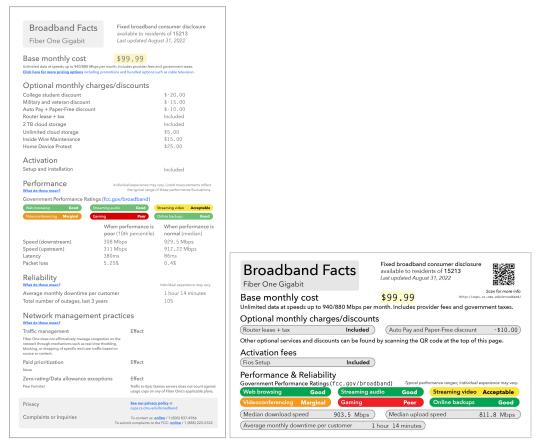


Figure 6-1: Prototype design for a layered, consumer-driven label design with a detailed layer (left) and summary layer (right). See Appendix E for full-scale versions of these labels.

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Appendix A: Participant Populations

Table A1: Demographics of all participants who completed our surveys

Category	Demographic	Phase 1 (n=1257)	Phase 2 (n=1262)
Gender	Male	74.3%	76.0%
	Female	22.2%	21.2%
	Prefer to self-describe	0.5%	0.8%
	Prefer to not answer	3.0%	2.0%
Age	75+ yrs. old	21.0%	19.2%
	65-74 yrs. old	41.4%	45.2%
	55-64 yrs. old	18.4%	17.5%
	45-54 yrs. old	8.2%	7.4%
	35-44 yrs. old	6.0%	5.4%
	18-34 yrs. old	2.0%	2.0%
	Prefer to not answer	3.2%	2.2%
Race (multiple select)	White or Caucasian	86.83%	85.5%
(multiple select)	Asian	3.0%	2.4%
	Black or African American	1.8%	1.7%
	Hispanic or Latino	1.7%	2.2%
	Native American or Alaskan Native	0.9%	1.3%
	Native Hawaiian or Pacific Islander	0.4%	0.2%
	Not listed above	2.0%	1.5%
	Prefer not to answer	6.3%	5.3%
English proficiency	Native English speaker	95.4%	95.1%
	Fluent at English, non-native	2.7%	3.0%
	Non-native, non-fluent	0.3%	0.5%
	Prefer not to answer	1.6%	1.4%
Annual Income	More than \$200,000	9.2%	8.1%
	\$100,000 - \$200,000	23.0%	25.4%
	\$50,000 - \$100,000	26.3%	26.6%
	\$25,000 - \$50,000	11.5%	9.9%
	Less than \$25,000	4.0%	5.3%
Education (highest completed)	Some High School	0.1%	0.3%
completed)	High School	10.7%	10.9%

Category	Demographic	Phase 1 (n=1257)	Phase 2 (n=1262)
	Trade School	4.8%	4.8%
	Professional Degree	8.1%	6.7%
	Bachelor's Degree	39.8%	36.9%
	Master's Degree	24.0%	26.4%
	Doctorate Degree	8.0%	8.7%
	Prefer not to answer	4.6%	5.4%
Technical Background	Technical	35.4%	40.7%
	Non-technical	62.0%	56.5%
	Unsure	1.1%	1.3%
	Prefer to not answer	1.6%	1.6%
Locale	Rural	22.8%	21.4%
	Suburban	55.3%	59.8%
	Urban	20.3%	16.9%
	Unsure or Prefer not to answer	1.7%	2.0%

Table A2: Broadband personas of all participants who completed our Phase 1 survey.

Broadband Detail	Demographic Demographic	Fixed (n=1088)	Mobile (n=169)
Recently Updated	Within the last 2 years	43.7%	55.2%
Plan	Not within the last 2 years	55.8%	43.0%
	Unsure	0.5%	1.8%
Special pricing	Paying an introductory rate	16.2%	n/a
	Not paying an intro rate	79.5%	n/a
	On a family plan	n/a	46.1%
	Not on a family plan	n/a	50.3%
	Unsure	4.3%	3.6%
Monthly Cost	Less than \$40.00	4.9%	23.0%
	\$40.00 - \$79.99	46.0%	22.4%
	\$80.00 - \$119.99	25.2%	17.6%
	\$120.00 - \$159.99	8.9%	14.5%
	\$160.00 - \$199.99	4.8%	6.7%
	\$200.00 or more	7.2%	10.3%
	Unsure or prefer to not answer	3.1%	5.5%

Broadband Detail	Demographic	Fixed (n=1088)	Mobile (n=169)
Internet Type	Cable	54.1%	n/a
	Fiber	25.8%	n/a
	DSL	10.9%	n/a
	Fixed wireless	5.3%	n/a
	Satellite	2.1%	n/a
	Starlink/Low-Earth Orbit	0.7%	n/a
	Unsure or prefer to not answer	1.24%	n/a
Internet Uses (select all that apply)	Casual web surfing	97.2%	85.5%
	Watching online videos	86.7%	47.3%
	Videoconferencing	71.1%	40.0%
	Regular online backups	46.7%	33.3%
	Watching 4K quality videos	39.4%	15.2%
	Real-time video streaming from device	30.0%	14.6%
	Online multiplayer gaming	12.6%	1.2%
	Connecting to a VPN	37.2%	n/a
	Peer-to-peer file sharing	7.0%	n/a
	Mobile tethering	n/a	30.9%
	None of the above while not connected to wifi	n/a	13.3%
	Other	5.2%	5.5%

Table A3: Distribution of complete and incomplete responses for each survey. In Phase 1 the pilot study participants were combined with the main study participants for most of our analyses.

	Complete	Incomplete
Phase 1 (incl. pilot sample responses)	1257	718
Phase 2	1156	1019
Phase 2 Pilot	106	n/a

Table A4: Distribution of completed survey responses for Phase 1 by broadband type and survey question subset.

Survey Subset	Fixed	Mobile	Total
Comprehension	320	42	362
Preferences	362	67	426

Opinions	406	60	466
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Table A5: Distribution of completed, non-pilot-sample Phase 2 survey responses for each survey subsection separated by assigned label type.

	2016-fixed	Study-fixed	2016-mobile	Study-mobil e	Total
Comprehension	224	204	21	21	470
Opinion on Label	303	307	40	36	686
A/B Comparisons	10	38	11	18	1156

Appendix B: Broadband Definitions

Glossary of definitions provided to participants prior to answering some of the Phase 1 survey questions. Glossary was provided through a mixture of in-survey text and a link to an external webpage we hosted in our research lab's subdomain (cups.cs.cmu.edu/broadband/definitions.html).

Appendix B1: Brief Definitions for Performance Metrics

- Upstream speed = speed at which your internet connection is able to send information to the internet.
- Downstream speed = speed at which your internet connection is able to receive information from the internet.
- Latency = the time it takes for information to move from its source to its destination; delay time between a user's action and the web application's response.
- Packet loss = measure of how much information that is sent over the internet never reaches its destination due to any number of factors including network congestion or faulty connections. This affects both your downstream and upstream speeds.

Appendix B2: Terms Describing Broadband Internet Performance

Upstream/downstream speeds

Upstream and downstream speeds measure how fast information can flow between you and the internet. In general, the higher the speed, the better your internet experience.

Downstream speed matters most when a lot of information is flowing from the internet to your device, such as when watching Netflix or downloading large files to your computer. Upstream speed matters when a lot of information is flowing from the user to the internet, such as when you are participating in a videoconference or uploading photos to the cloud.

Upstream/downstream speeds matter very little for applications that don't involve the flow of large amounts of information. For example, if you are only browsing the web, reading email, or listening to audio, you don't need to care about either speed as almost any modern internet plan's speeds will be good enough.

Latency

Latency measures how long it takes to move information from one place to another. It is essentially "lagâ€:⁵ so, for example, when you're on a phone call, latency is the time delay from when you speak to when the other person hears your voice. It is usually measured in milliseconds (ms). In general, lower latency means better quality, but a small amount of latency is unavoidable. Latency matters in highly interactive applications such as online games, video chat, and phone calls. Latency doesn't really matter for non-interactive applications, like reading email or watching movies online.

Packet loss

-

⁵ Due to an encoding error with our HTML quotation marks, this word was shown to participants as $\hat{a} \in alg\hat{a} \in alg\hat{a}$. It is meant to say "lag"

Packet loss measures how much information that is sent over the internet never reaches its destination. If we imagine the internet to be a highway and information to be the cars on that highway, packet loss measures how many cars break down and never reach the other side of the highway. In general, lower packet loss is better, but most applications can tolerate some packet loss. If packet loss is too high, it may be difficult or unpleasant to use real-time applications such as phone calls, video chat, online games, and video streaming. High packet loss can also reduce speed when transferring a lot of information, such as when backing up many files to the cloud. Packet loss usually doesn't matter for less interactive activities that do not involve transferring a lot of information, such as web browsing or email.

Application-specific network management practices

A network practice is application-specific if it treats internet use differently based on the content, application or device. An example of this is your broadband provider increasing your speed for Netflix but decreasing your speed for Hulu.

Subscriber-triggered network management practices

A network practice is subscriber-triggered if it treats internet use differently based on who is using it. Subscribers may be treated differently based on which service plan they've purchased, the amount of data they use, or their location. An example of this is your broadband provider reducing your download speed when you use more than a certain monthly data allowance.

Broadband Label Extended Glossary

Activation fee: A fee you pay to create your new customer account. You pay this only once: when you first become a customer of a broadband provider.

Deposit: A one-time deposit is a fee you may pay when you first set up your new internet service. It is similar to a security deposit you might pay when renting an apartment. The deposit will be refunded to you if you comply with your provider's terms and conditions (e.g., pay your internet bill in full and on time) for a certain amount of time.

Installation fee: A fee you pay to install internet service in your home. This includes the equipment and professional technician support required for installation. You pay this only once: at (or just prior to) the time of installation.

Early termination fee: If you decide to cancel your internet service prematurely (i.e., before your contract plan ends), you may pay an early termination fee.

Monthly Administrative fees: A monthly fee that your provider may charge to cover expenses associated with servicing and maintaining your account.

Monthly Regulatory fees: A monthly fee that your provider may charge to help fund and comply with regulatory requirements, usually imposed by either the federal or state government.

Government Taxes and other Government-Related Fees May Apply: This is a general disclaimer notifying you that additional taxes and fees associated with government programs will be charged to you.

Device Compatibility: In some situations, you cannot switch your mobile internet provider or plan without buying a new mobile device. In this case, your mobile device is $\hat{a} \in \text{colocked}$; $\hat{a} \in \text{colocked}$ you can only continue to use it if you remain on your current plan or with your current provider. If your device is $\hat{a} \in \text{colocked}$, $\hat{a} \in \text{colocked}$ you can use it with any mobile internet provider and plan.

Data allowance per month: The data allowance for your plan determines how much you can use the internet before you're charged additional fees, forced to use lower speeds, or cut off entirely. You will pay a certain monthly charge according to the data allowance tier you have chosen. Typically, a higher data allowance will be more expensive.

When you exceed the data allowance: Your provider limits how much you can use the internet each month. If you exceed your data cap (i.e., use the internet more than your provider allows), you will either experience speed throttling or pay overage charges. Speed throttling is when your provider deliberately slows your internet speed, and overage charges are extra fees you will pay on your monthly internet bill for exceeding your data cap.

Mobile tethering and hotspots: Both mobile tethering and hotspots allow you to connect devices to the internet in areas where they could otherwise not access the internet. Mobile tethering is when you use your phone (or other mobile device) to share internet service with other devices. This requires your phone to be connected to the other device through Wi-Fi, Bluetooth, or a USB cable. A hotspot is a dedicated device that connects to cellular internet service and then shares it with nearby devices.

3G, 4G, and 5G: The 'G' in 3G, 4G, and 5G stands for 'generation;' 5G is the fifth and newest generation of cellular internet technology. 4G internet is the current standard for cellular networks and will support just about anything you will need it for, including HD video streaming and conferencing. In general, 4G is faster than 3G, and 5G is faster than 4G.

Appendix C: Survey Questions

Appendix C1: Phase 1 Survey

From these questions, our current plan is to create 3 surveys which subsample specific sections from this comprehensive list. For each of these 3 surveys, there are 2 versions – one for fixed broadband, one for mobile broadband – making 6 survey versions in total. From our initial pilot testing, each of these surveys should take ~15min. to complete.

- 1. **Comprehension** participants answer questions meant to gauge their understanding of broadband concepts and terms.
 - a. Demographics
 - b. Terminology Comprehension
- 2. **Utility** participants answer questions related to their shopping preferences.
 - a. Demographics
 - b. Terminology Utility
 - c. Other/Misc.
- 3. **Opinion** participants answer questions given the context of the 2016 labels.
 - a. Demographics
 - b. Opinion on 2016 Labels

Introduction [Q1]

Welcome! Thank you for taking part in this survey. The purpose of this study is to better understand how
consumers choose between broadband providers and plans. Participating in this study will aid research in
developing a standardized consumer broadband label.

The following survey should take between 10-15 minutes. Participation is voluntary, and you have the right to withdraw at any time by closing this web browser page. There is no compensation for participation in this study. The data captured for this research does not include any personally identifiable information about you. Your IP address will not be captured.

This research is being conducted by CyLab at Carnegie Mellon University in collaboration with Consumer Reports. Should you have any questions or concerns regarding your participation or data, you may contact **broadband-study@andrew.cmu.edu** and refer to **STUDY2022_201**. If you have questions pertaining to your rights as a research participant; or to report concerns to this study, you should contact the Office of Research Integrity and Compliance at Carnegie Mellon University. Email: irb-review@andrew.cmu.edu. Phone: 412-268-1901 or 412-268-5460.

Please answer the following questions to determine eligibility and provide or deny your consent to participate.

- 2. I am age 18 years or older AND currently reside within the United States of America.
 - a. Yes
 - b. No
- 3. I have read and understood the above text, and I consent to my continued participation in this study.
 - a. Yes
 - b. No

- 4. Which of the following broadband plan types have you signed up for or made changes to most recently?
 - a. Fixed home internet
 - b. Mobile phone internet
 - c. Unsure
 - d. I do not have any of the above plan types
- 5. When making your most recent decision to sign up for or change a broadband plan, who was the primary decision maker?
 - a. I was the primary decision maker
 - b. I made the decision jointly with someone else
 - c. Someone else was the primary decision maker
 - d. Unsure

Demographics [Q6]

- 1. What gender do you identify as?
 - a. Male
 - b. Female
 - c. Non-binary
 - d. Prefer to Self-describe:
 - e. Prefer not to answer
- 2. What is your age?
 - a. 18-24 yrs. old
 - b. 25-34 yrs. old
 - c. 35-44 yrs. old
 - d. 45-54 yrs. old
 - e. 55-64 yrs. old
 - f. 65-74 yrs. old
 - g. 75+ yrs. old
 - h. Prefer not to answer
- 3. Which of the following best describes your race or ethnic identity? (Select all that apply)
 - a. Asian
 - b. Black or African American
 - c. Hispanic or Latino
 - d. Native American or Alaskan Native
 - e. Native Hawaiian or Pacific Islander
 - f. White or Caucasian
 - g. Not listed above: _____
 - h. Prefer not to answer
- 4. Are you a native English speaker?
 - a. Yes
 - b. No, but I consider myself a fluent English speaker
 - c. No
 - d. Prefer not to answer
- 5. What is your annual household income?
 - a. Less than \$25,000
 - b. \$25,000 \$50,000
 - c. \$50,000 \$100,000
 - d. \$100,000 \$200,000

- e. More than \$200,000
- f. Prefer not to answer
- 6. What US state or territory do you currently reside in?
 - a. Prefer to not disclose
 - b. [Dropdown menu of states/territories to select from]
 - c. I do not currently reside in the US
- 7. What type of area do you currently reside in?
 - a. Urban
 - b. Suburban
 - c. Rural
 - d. Unsure or Prefer not to answer
- 8. What is the highest degree or level of education you have completed?
 - a. Some High School
 - b. High School
 - c. Bachelor's Degree
 - d. Master's Degree
 - e. Doctorate Degree
 - f. Professional Degree
 - g. Trade School
 - h. Prefer not to answer
- Do you have a background in computer science or related technical field? This could include an education
 or career in software engineering, computer engineering, computing technology, information technology, or
 management information systems.
 - a. Yes
 - b. No
 - c. Unsure
 - d. Prefer not to say

P1: Persona - Fixed

- 10. Within the last 2 years, have you switched or updated your fixed (a.k.a. home) internet provider or plan?
 - a. Yes
 - b. No
 - c. Unsure
- 11. Are you currently paying an introductory rate? This is a discounted rate that's typically given to new customers for the first 1-2yrs of their subscription, after which the price will increase.
 - a. Yes
 - b. No
 - c. Unsure
- 12. How much do you pay for your home internet plan per month? This price may include any bundled services, taxes, administration fees, or promotional discounts.
 - a. Less than \$40
 - b. \$40.00 \$79.99
 - c. \$80.00 \$119.99
 - d. \$120.00 \$159.99
 - e. \$160.00 \$199.99
 - f. \$200.00 or more

- g. Unsure or prefer to not disclose
- 13. Which of the following home internet options does your home use?
 - a. Cable internet internet access is fed through a coaxial cable network (same network used by your cable TV) to a cable modem in your home. Common providers in this category: Comcast Xfinity, Spectrum, Cox Communications, Astound Broadband
 - b. **Fiber internet** internet access is fed through a fiber-optic cable to a modem in your home. This type of connection often comes with gigabit speeds. Common providers in this category: AT&T Fiber, Verizon Fios, Earthlink Fiber, Google Fiber
 - c. DSL (digital subscriber line) services internet access is fed through your phone lines to a modem in your home. Common providers in this category: EarthLink, Verizon DSL High Speed Internet, CenturyLink.
 - d. Fixed wireless internet signal is transmitted through radio waves from a broadcast tower to a fixed antenna on your home (eg. mounted on your roof or exterior wall). Common providers in this category: AT&T Fixed Wireless Internet, T-Mobile 5G Home Internet, Ultra Home Internet, EarthLink 5G Home Internet, Rise Broadband.
 - e. **Satellite internet** internet access is through a satellite connection with a dish mounted on or nearby your home. Common providers in this category: HughesNet, Viasat.
 - f. **Starlink** or other LEO (Low-earth orbit) Satellite internet.
 - g. Unsure or prefer to not disclose.
- 14. When you are using your home network, which of the following activities do you or other members of your household engage in? (Select all that apply)
 - a. **Casual web surfing.** This includes activities like visiting news websites, checking your email, or viewing social media content.
 - b. **Watching online videos**. This includes watching video services like Netflix, Hulu, Twitch, YouTube, Tiktok, or Instagram.
 - c. Watching online videos in 4K quality. This includes watching high resolution videos.
 - d. Real-time video streaming from your device. This includes streaming a real-time video of yourself, surroundings, or device screen to services like YouTube Live, Twitch.tv, or Instagram Live.
 - e. **Video conferencing**. This includes using services like Zoom, Skype Video Chat, Microsoft Teams, Google Meet, Cisco Webex, Discord, or FaceTime to have a video call with one or more people.
 - f. **Online multiplayer gaming.** This includes games like Fortnite, League of Legends, Halo, Call of Duty, Minecraft, FFXIV, or Super Smash Bros Online.
 - g. Regular online backups. This includes semi-frequently backing up your computer's files to an external server or cloud storage solution such as Apple iCloud, Google Photos, or Microsoft OneDrive.
 - h. **Peer-to-peer file sharing** with services like BitTorrent and Gnutella.
 - i. **Connecting to Virtual Private Networks (VPNs)** with services like Cisco AnyConnect, ExpressVPN, NordVPN, or Surfshark.

Other	

P2: Persona - Mobile

- 15. Within the last 2 years, have you switched or updated your **mobile** (a.k.a. cellular) internet providers or plans?
 - a. Yes
 - b. No

- c. Unsure
- 16. Are you part of a family plan bundle provided by your mobile phone carrier?
 - a. Yes
 - b. No
 - c. Unsure
- 17. How much do you pay for your mobile phone data plan per month? This price may include any bundled services or products, taxes, administration fees, or promotional discounts.
 - a. Less than \$40
 - b. \$40.00 \$79.99
 - c. \$80.00 \$119.99
 - d. \$120.00 \$159.99
 - e. \$160.00 \$199.99
 - f. \$200.00 or more
 - g. Unsure or prefer to not disclose
- 18. When you are using your mobile phone's data, which of the following activities do you engage in? (Select all that apply)
 - Casual web surfing. This includes activities like visiting news websites, checking your email, or viewing social media content.
 - b. **Watching online videos**. This includes watching video services like Netflix, Hulu, Twitch, YouTube, Tiktok, or Instagram.
 - c. Watching online videos in 4K quality. This includes watching high resolution videos.
 - d. Real-time video streaming from your device. This includes streaming a real-time video of yourself, surroundings, or device screen to services like YouTube Live, Twitch.tv, or Instagram Live.
 - e. **Video conferencing**. This includes using services like Zoom, Skype Video Chat, Microsoft Teams, Google Meet, Cisco Webex, Discord, or FaceTime to have a video call with one or more people.
 - f. **Online multiplayer gaming.** This includes games like Among Us, Pokemon Go, PUBG Mobile, Genshin Impact, Fortnite, Minecraft, or Forza Street.
 - g. Regular online backups. This includes semi-frequently backing up your phone's files to an external server or cloud storage solution such as Apple iCloud, Google Photos, or Microsoft OneDrive.
 - h. **Mobile Tethering.** This involves sharing your phone's mobile Internet connection with connected devices. The connected device will use up a portion of your mobile device's data allowance.
 - i. I avoid all of the above while my phone is not connected to wi-fi.
 - j. **Other** _____

Comprehension [Q2]

Charges and Terms

- 1. *Directions:* For these questions, please refrain from consulting any outside resources and instead answer to the best of your ability. There is no penalty for answering incorrectly and some questions have no correct answer.
- 2. {{ Graphics of just cost sections from Plan A and Plan B in fixed broadband format }} Directions: Imagine that you are shopping for a new internet plan for the next few years. You are considering the above 2 plans, which offer a non-renewable contract plan that switches to a monthly plan after the contract period. For both plans, you will need to pay activation fees, installation fees, and a deposit.

- 3. If you will cancel your subscription after **2 years** from activation, which of the above fixed broadband plans is cheapest?
 - a. Plan A
 - b. Plan B
 - c. Both plans are the same cost in this scenario
 - d. Unsure
- 4. If you will cancel your subscription after **3 years** from activation, which of the above fixed broadband plans is cheapest?
 - a. Plan A
 - b. Plan B
 - c. Both plans are the same cost in this scenario
 - d. Unsure
- 5. If you will cancel your subscription after **4 years** from activation, which of the above fixed broadband plans is cheapest?
 - a. Plan A
 - b. Plan B
 - c. Both plans are the same cost in this scenario
 - d. Unsure
- 6. How did you go about answering the three comparison questions above? (Select all that apply)
 - a. Guessed randomly
 - b. Made an educated guess
 - c. Did some math in my head
 - d. Used pen/pencil and paper
 - e. Used a calculator
 - f. Used a spreadsheet and/or graph
 - g. Other
- 7. How easy or difficult was it for you to answer the three comparison questions above? [rate 1-5, with 1 being very easy and 5 being very difficult]
- 8. Please comment further on your experience in answering the three comparison questions. [free response]
- 9. Could the information needed to answer the comparison questions have been presented better in any way? If so, how?[Free response]

Performance

- 10. For each of the following network performance metrics, select whether it is generally better to have a higher or lower value for the metric. [*Matrix w columns: Higher, Lower, Unsure*]
 - a. Downstream speed
 - b. Upstream speed
 - c. Latency
 - d. Packet loss
- 11. Which of the following represents the **highest** data transmission speed?
 - a. 200 Xbps
 - b. 1500 Mbps
 - c. 1.20 Gbps
 - d. 15,000 Kbps
 - e. Both b and d
 - f. I don't know

- 12. After which of the following packet loss rate thresholds would you estimate that real-time videoconferencing applications (e.g. Zoom video conference call) start to become noticeably lagged or unintelligible?
 - a. I don't know what "packet loss" is
 - b. 0.08%
 - c. 3%
 - d. 18%
 - e. 32%
- 13. Please utilize the following definitions for answering the 4 questions in this section:

Upstream speed = speed at which your internet connection is able to send information to the internet. **Downstream speed** = speed at which your internet connection is able to receive information from the internet.

Latency = the time it takes for information to move from its source to its destination; delay time between a user's action and the web application's response.

Packet loss = measure of how much information that is sent over the internet never reaches its destination due to any number of factors including network congestion or faulty connections. This affects both your downstream and upstream speeds.

- 14. Please rate how important you find each metric for the purposes of **online gaming**. [*Likert importance matrix*]
 - a. Downstream speed
 - b. Upstream speed
 - c. Latency
 - d. Packet loss
- 15. Please rate how important you find each metric for the purposes of watching online videos (e.g. Netflix, Hulu, YouTube). [Likert importance matrix]
 - a. Downstream speed
 - b. Upstream speed
 - c. Latency
 - d. Packet loss
- 16. Please rate how important you find each metric for the purposes of **video conferencing (e.g. Zoom, Teams, Webex)**. [*Likert importance matrix*]
 - a. Downstream speed
 - b. Upstream speed
 - c. Latency
 - d. Packet loss
- 17. Please rate how important you find each metric for the purposes of **posting videos and photos to social media**. [*Likert importance matrix*]
 - a. Downstream speed
 - b. Upstream speed
 - c. Latency
 - d. Packet loss

Network Management

18. *Direction:* For the following questions, please imagine you have encountered the following content on a label describing a broadband internet plan you are considering purchasing.

{{ Graphic of network management practice section from 2016 labels (same for both fixed and mobile) }}

- 19. Please rate your agreement with the following statements: [Likert agreement matrix]
 - a. I understand what broadband provider "network management practices" refer to.
 - b. I understand the difference between "application-specific" and "subscriber-triggered" network management practices.
- 20. Would you click on the "details on network management" link while considering this plan?
 - a. Yes
 - b. No
 - c. I need more context information before deciding
- 21. If you did click on the "details on network management" link, what would you expect to find or learn from it? [Free response]
 - Page Break -
- 22. How would you categorize each of the following provider network management practices? [Matrix with columns: application-specific, subscription-triggered, neither, both, I don't know]
 - a. Deliberately decreasing the quality of all videos from Netflix to your device
 - b. Charging you \$10 for every GB you use beyond your plan's data allowance
 - c. Decreasing your internet speeds after you exceed your data allowance
 - d. Waiving your data usage costs used to access the provider's website
 - e. Increasing your YouTube video download speed for the first 5GB every month

Other

Installation fee	\$25.00
Early termination fee	\$240.00
Government Taxes and Other Government-Related Fe Apply: Varies by location	es May
Other services on network	
Performance - Individual experience may vary	
Typical speed downstream	53 Mbps
Typical speed upstream	6 Mbps
Typical latency	35 milliseconds

- 24. If you encountered the above label for a broadband internet plan you are considering purchasing, would you click on the "Other services on network" link?
 - a. Yes
 - b. No
 - c. I need more context information before deciding
- 25. If you did click on the "Other services on network" link, what would you expect to find or learn from it? [Free response]

Utility [Q3]

- 1. When you are shopping for a broadband provider or plan, what factors are you most interested in? (*Free response*)
- 2. Directions: The speed listed for your internet plan tier is typically not what you will actually experience all of the time. Internet speeds often vary due to factors outside of your provider's control (e.g. the time of day and number of people in your area using the internet at the same time). This has created debate regarding what advertised internet speeds should actually represent. These next questions seek to understand your opinion on the matter.

For the non-statisticians among us, an "nth percentile speed" indicates the maximum speed you will

experience n% of the time and minimum speed for the rest of the time. These values are particularly useful compared to average values as they help us understand expected network speeds during specific situations. In general, lower percentiles let us know the minimum speeds we'll be getting a majority of the time regardless of network conditions, and higher percentiles let us know the upper speeds we'll be getting when network conditions are particularly good.

3. When examining a broadband plan for purchase and considering its advertised network speeds, how important to you are the following speed metrics?

(*Likert importance matrix + IDK column. Randomize statement order*)

- a. The maximum speed possible. This is normally the upper speed cap set by your provider.
- b. The average (mean) speed across your entire time period(s)
- c. Typical speeds during the parts of the day when the internet speed is **much slower** than normal (10th percentile)
- d. Typical speeds during the parts of the day when the internet is **somewhat slower** than normal (25th percentile)
- e. Typical speeds during the parts of the day when the internet speed is **normal** (50th percentile, median)
- f. Typical speeds during the parts of the day when the internet speed is **somewhat faster** than normal (75th percentile)
- g. Typical speeds during the parts of the day when the internet speed is **much faster** than normal (90th percentile)
- h. Typical speeds during the parts of the day when internet speed is **much slower** than normal (10th percentile) AND when the internet speed is **normal** (50th percentile, median)
- i. Typical speeds during the parts of the day when the internet speed is **somewhat slower** than normal (25th percentile) AND when the internet speed is **normal** (50th percentile, median)
- j. Typical speeds during the parts of the day when the internet speed is **somewhat slower** than normal (25th percentile) AND when the internet speed is **somewhat faster** than normal (75th percentile)
- k. A grade or score (e.g. B+ or 3.5/5.0) rather than raw speed values
- 1. A rating of suitability for specific applications (e.g. "suitable for watching HD videos") rather than raw speed values
- 4. If you had to pick just one speed measurement or combination of measurements to be advertised to you while shopping for a plan, which would you pick?
 - a. Insert options from above
 - b. Other speed measurement or combination of measurements _____
- 5. Please comment on your above choices. Why is your selected speed metric (or combination of metrics) more important than others? (*Free response*)
 - Page Break -
- 6. For each of the following categories, please specify how important each of these criteria are to your decision when selecting a **fixed broadband** internet service provider or plan. [*Likert importance matrix* + *IDK column*]
 - a. Reliability (lack of outages)
 - b. [mobile-only] Ability to keep your current phone when you change providers
 - c. Ease/cost of setup or installation
 - d. Provider reputation

- e. Customer service
- f. [fixed-only] Works well when multiple people are using the internet at the same time
- g. Works well for online gaming
- h. Works well for video conferencing
- i. Works well for watching online videos
- j. Works well for uploading or streaming content to the internet

- Page Break -

- 7. Directions: Please rate your agreement with the following statements on this page
- 8. I am likely to switch providers or plans once my introductory contract and pricing option expires.
 - a. Strongly disagree
 - b. Somewhat disagree
 - c. Neither agree nor disagree
 - d. Somewhat agree
 - e. Strongly agree
- 9. For some broadband plan metrics, I would prefer a score or grade (e.g. B+, 3.3 out of 5.0) over raw values (e.g. 25 mbps downstream speed, 0.08% packet loss).
 - a. Likert agreement (same as above)
- 10. I would use a website unaffiliated with broadband providers (e.g. Consumer Reports) which compares and recommends a broadband provider or plan for me when shopping.
 - a. Likert agreement (same as above)
- 11. I would AVOID using a provider if they... [Likert agreement matrix]
 - a. Increase my network speed from some specific applications and services (e.g. Netflix, YouTube, Twitch), but decrease my network speed from other applications and services (e.g. Hulu, TikTok)
 - b. Do not count watching videos from specific content providers (e.g. Netflix) against my data allowance, but do count others (e.g. YouTube) against my data allowance
 - c. [Mobile-only] Reduce my download speed anytime I use a mobile hotspot
 - d. [Mobile-only] Block mobile tethering

- Page Break -

- 12. What **other details** would you like internet providers to disclose to you when shopping for an internet service provider or plan? (*Free response*)
- 13. What other suggestions or preferences do you have for how broadband internet providers should notify users of their plans, performance metrics, and practices? (*Free response*)

Other/Misc. [Q4]

- 1. Have you heard of the Affordable Connectivity Plan?
 - a. Yes, I'm aware of the details including definition and eligibility
 - b. Yes, I've seen or heard it mentioned, but do not know the details of what it is
 - c. No
- 2. When would you like to be notified of the following broadband service plan details? [Matrix with select-all-that-apply columns: (1) While browsing prior to purchase, (2) During or immediately after purchase as part of my plan contract, (3) With every monthly bill, (4) Once every year, (5) Immediately after any changes to this detail in my purchased plan, (6) Never, (7) No opinion]
 - a. Monthly pricing
 - b. One-time fees (e.g. activation, deposit, installation, or termination)
 - c. Fees or service throttling for data overages
 - d. Discounts, promotional rates, and bundles

- e. Expected upstream and downstream speeds
- f. Reliability metrics like frequency of outages
- g. Provider terms of service and privacy policy
- 3. Would you like to be directly notified by either electronic or physical mail of any changes to your service plan?
 - a. Yes, by electronic mail (e-mail) only
 - b. Yes, by physical mail only
 - c. Yes, by both electronic and physical mail
 - d. No, having the changes published to the provider's website is enough
 - e. No, I am not interested

Opinion [Q5]

- 1. *Directions:* The US Federal Communications Commission is currently considering requiring broadband service providers to display a "nutrition label" similar to the one below that describes their plan offerings. Briefly look over this label and reference it as needed when answering the following questions.
- {{ Graphic of full label for either fixed or mobile broadband type }}
 Show label depending on fixed or mobile survey route.

3. Upstream/downstream speeds

Upstream and downstream speeds measure how fast information can flow between you and the internet. In general, the higher the speed, the better your internet experience. Downstream speed matters most when a lot of information is flowing from the internet to your device, such as when watching Netflix or downloading large files to your computer. Upstream speed matters when a lot of information is flowing from the user to the internet, such as when you are participating in a videoconference or uploading photos to the cloud.

Upstream/downstream speeds matter very little for applications that don't involve the flow of large amounts of information. For example, if you are only browsing the web, reading email, or listening to audio, you don't need to care about either speed as almost any modern internet plan's speeds will be good enough.

Latency

Latency measures how long it takes to move information from one place to another. It is essentially "lag": so, for example, when you're on a phone call, latency is the time delay from when you speak to when the other person hears your voice. In general, lower latency means better quality, but a small amount of latency is unavoidable. Latency matters in highly interactive applications such as online games, video chat, and phone calls. Latency doesn't really matter for non-interactive applications, like reading email or watching movies online.

Packet loss

Packet loss measures how much information that is sent over the internet never reaches its destination. If we imagine the internet to be a highway and information to be the cars on that highway, packet loss measures how many cars break down and never reach the other side of the highway. In general, lower packet loss is better, but most applications can tolerate some packet loss. If packet loss is too high, it may be difficult or unpleasant to use real-time applications such as phone calls, video chat, online games, and video streaming. High packet loss can also reduce speed when transferring a lot of information, such as when backing up many files to the cloud. Packet loss usually doesn't matter for less interactive activities that do not involve transferring a lot of information, such as web browsing or email.

Application-specific network management practices

A network practice is application-specific if it treats internet use differently based on the content, application, or device. An example of this is your broadband provider increasing your speed for Netflix but decreasing your speed for Hulu.

Subscriber-triggered network management practices

A network practice is subscriber-triggered if it treats internet use differently based on who is using it. Subscribers may be treated differently based on which service plan they've purchased, the amount of data they use, or their location. An example of this is your broadband provider reducing your download speed when you use more than a certain monthly data allowance.

For additional terms' definitions and if you would like to reference the above information later in the survey, we recommend opening this external webpage (cups.cs.cmu.edu/broadband-definitions) in a separate tab.

- 4. Please rate your agreement with the following statements. [*Likert agreement matrix with random statement order*]
 - a. This label would be useful to me while comparison shopping for broadband providers or plans.
 - b. This label is confusing or overwhelming.
 - c. I would AVOID using this label when deciding which broadband plan to choose.
 - d. I understand the information found on this label.
 - e. This label contains the information I expect it to.
 - f. This label contains information I do NOT want it to.
 - g. This label adequately represents a broadband internet plan offering.
 - h. I would prefer the content of this label in a different format.
 - i. For some of these plan metrics, I would prefer a score or grade (e.g. B+, 3.3 out of 5.0) over raw values (e.g. 25 mbps downstream speed, 0.08% packet loss).
- 5. How important are each of the following **cost details** to you when comparison shopping between **fixed broadband** internet service providers and plans? [*Likert importance matrix*]
 - a. Monthly charges
 - b. Additional pricing options including promotions and bundles
 - c. Data included with monthly charge
 - d. Charges for additional data usage
 - e. Optional modem or gateway lease cost and policies
 - f. Other monthly fees imposed by your provider
 - g. One-time Activation fee
 - h. One-time Deposit
 - i. One-time Installation fee
 - j. One-time Early termination fee
 - k. Government-Related taxes and fees notice
- 6. How important are each of the following **cost and feature details** to you when comparison shopping between **mobile broadband** internet service providers and plans? [*Likert importance matrix*]
 - a. Information about whether your current mobile device is compatible with this provider/plan
 - b. Cost of a new mobile device purchased from this broadband provider
 - c. Monthly charges for each data allowance tier
 - d. Data caps and associated speed throttling or overage charges
 - e. Information on mobile tethering and hotspots

- f. Information on other included services and features like voice and text
- g. Additional pricing options including promotions and bundles
- h. Monthly Administrative fees
- i. Monthly Regulatory fees
- j. One-time Activation fee
- k. One-time Deposit fee
- 1. One-time Early termination fee
- m. Government-Related taxes and fees notice
- 7. How important are each of the following **network performance details** to you when comparison shopping between broadband internet service providers and plans? [Likert importance matrix]
 - a. *[fixed-only]* Information on the provider's practices which could cause periodic, reduced performance of your broadband service.
 - b. [mobile-only] Differentiation between 3G, 4G, and 5G network performance
 - c. [mobile-only] Nationwide coverage information
 - d. Typical downstream speed
 - e. Typical upstream speed
 - f. Typical latency
 - g. Typical packet loss
 - h. Information about how well this plan works for online gaming
 - i. Information about how well this plan works for video conferencing
 - j. Information about how well this plan works for watching online videos
 - k. Information about how well this plan works for uploading or streaming content to the internet
- 8. How important are each of the following **provider and label details** to you when comparison shopping between broadband internet service providers and plans? [Likert importance matrix]
 - a. Application-specific network management practices
 - b. Subscriber-triggered network management practices
 - c. Full disclosure of all network management practices
 - d. Privacy policy
 - e. Contact information for complaints or inquiries
 - f. Definitions for terms used on the broadband label and other relevant information
- 9. Would you want the broadband label information made additionally available through a website or service unaffiliated with broadband providers (e.g. Consumer Reports)?
 - a. Yes
 - b. No
 - c. Unsure or no opinion
- 10. Where would you want the following information categories made available? (Select all that apply) [Matrix with columns:
 - On a label with a format standardized across providers similar to a nutrition label like the one above
 - On a more detailed external webpage or document referenced by the "nutrition label"
 - Through an independent party like Consumer Reports
 - Through a government agency like the FCC or FTC
 - Not made available or No preference
 - I don't know what this is]
 - a. Monthly pricing
 - b. Promotional options and bundles
 - c. One-time fees
 - d. Performance metrics

- e. Network management practices
- f. Provider privacy policy
- g. Provider contact information
- h. Terminology definitions
- 11. How could the proposed label be improved? (Free response)

Appendix C2: Phase 2 Survey

Survey Flow Logic

- Between-subjects survey design
- Participants will be randomly assigned to answer questions for either the FCC's 2016 label (abbv. 2016) or our new version of the label (abbv. Study)
- Depending on their answer to Q1.4, participants will additionally be assigned to answer questions for either the fixed or mobile version of the label they've been assigned
- Participants will answer for either the opinions section or comprehension section; all other sections will be shown to all participants. Assignment is random. Based on pilot results, this should reduce our median completion time from 36 minutes to 25 minutes.

Note: any *italicized text* below is purely for internal note keeping purposes and will not be shown to participants once imported into qualtrics.

1 Introduction

1.1 Welcome! Thank you for taking part in this survey. The purpose of this study is to better understand how consumers choose between broadband providers and plans. Participating in this study will aid research in developing a standardized consumer broadband label.

The following survey should take between 20 and 30 minutes. Participation is voluntary, and you have the right to withdraw at any time by closing this web browser page. There is no compensation for participation in this study. The data captured for this research does not include any personally identifiable information about you. Your IP address will not be captured.

This research is being conducted by CyLab at Carnegie Mellon University in collaboration with Consumer Reports. Should you have any questions or concerns regarding your participation or data, you may contact **broadband-study@andrew.cmu.edu** and refer to **STUDY2022_201**. If you have questions pertaining to your rights as a research participant; or to report concerns to this study, you should contact the Office of Research Integrity and Compliance at Carnegie Mellon University. Email: irb-review@andrew.cmu.edu. Phone: 412-268-1901 or 412-268-5460.

Please answer the following questions to determine eligibility and provide or deny your consent to participate.

- 1.2 I am age 18 years or older and currently reside within the United States of America.
 - 1.2.i Yes
 - 1.2.ii No
- 1.3 I have read and understood the above text, and I consent to my continued participation in this study.
 - 1.3.i Yes
 - 13 ii No
- 1.4 Which of the following broadband plan types have you signed up for or made changes to most recently?
 - 1.4.i Fixed home internet
 - 1.4.ii Mobile phone internet
 - 1.4.iii Unsure

- 1.4.iv I do not have any of the above plan types
- 1.5 When making your most recent decision to sign up for or change a broadband plan, who was the primary decision maker?
 - 1.5.i I was the primary decision maker
 - 1.5.ii I made the decision jointly with someone else
 - 1.5.iii Someone else was the primary decision maker
 - 1.5.iv Unsure

2 Opinions on Format X

For this section, we want to understand participant opinions on a specific label's content and format. How might the existing labels be improved upon?

- 2.1 Timing Question 1: question item which tracks how long a participant stays on this page; this block is not visible to participants.
- 2.2 *Directions:* Imagine that the following consumer disclosure label has been made mandatory for broadband providers to display prominently to customers as they shop for broadband plans. Please note that the hyperlinks (blue underlined text) shown on the label images in this survey are nonfunctional, but they would take you to a new page with relevant additional information on a real world version of these labels. {{ Graphic with full Plan A label for either 2016-fixed, 2016-mobile, Study-fixed, or Study-mobile format }}
- 2.3 Please rate your agreement with the following statements. [Likert agreement matrix. Random statement ordering]
 - 2.3.i I would use this label while examining a broadband plan if given the option.
 - 2.3.ii This label is confusing or overwhelming.
 - 2.3.iii I understand all of the information found on this label.
 - 2.3.iv This label has all of the information I need to choose a broadband internet plan.
- 2.4 Using the information on this label I am able to... [Likert agreement matrix.]
 - 2.4.i Calculate how much this plan will cost me in total.
 - 2.4.ii Determine if this plan's performance speeds will meet my internet usage needs.
 - 2.4.iii Determine whether the service offered under this plan is reliable enough to meet my needs.
 - 2.4.iv Learn what network management practices may affect my broadband experience with this plan.
 - 2.4.v Find additional information on the terms used in this label.
 - 2.4.vi Find any additional information I need on the provider's offerings.
 - 2.4.vii Contact the provider or Federal Communications Commission (FCC) should I have any questions or complaints.
- 2.5 What other initial impressions do you have about this label? [Free response]
- 2.6 What portions of the label are confusing to you, if any? [Free response] page break –
- 2.7 Timing Question 2: question item which tracks how long a participant stays on this page; this block is not visible to participants.
- 2.8 What plan **cost and feature information** would you add, modify, or remove from this label section to make it more useful to you? Please write "n/a" if you would change nothing about this section. [Free response] {{ Graphic with just the cost section for either 2016-fixed, 2016-mobile, Study-fixed, or Study-mobile format }}
- 2.9 Would you like taxes to be included in the listed costs?

- 2.9.i Yes, the listed cost for each row (e.g. activation fee) should include any applicable taxes or fees.
- 2.9.ii Yes, however the taxes should be listed as their own separate row.
- 2.9.iii No, I would not like taxes to be included
- 2.10 What plan **performance information** would you add, modify, or remove from this label section to make it more useful to you? Please write "n/a" if you would change nothing about this section. [Free response] {{ Graphic with just the performance section (incl. reliability) for either 2016-fixed, 2016-mobile, Study-fixed, or Study-mobile format }}
- 2.11 [Study only] Which parts of this performance section are most useful to you?
 - 2.11.i The performance ratings
 - 2.11.ii The performance numbers
 - 2.11.iii Both the ratings and numbers are useful
 - 2.11.iv Neither the rating nor the numbers are useful
 - 2.11.v Not sure
- 2.12 [Study only] What plan **reliability information** would you add, modify, or remove from this label section to make it more useful to you? Please write "n/a" if you would change nothing about this section. [Free response]
- 2.13 [2016 only] Would you like performance ratings (good/acceptable/marginal/poor) for some common internet activities (video conferencing, video streaming, gaming, etc.) included on the label?
 - 2.13.i Yes, I would like performance ratings in addition to performance numbers
 - 2.13.ii Yes, I would like performance ratings **instead of** performance numbers
 - 2.13.iii No, I would not like performance ratings included
 - 2.13.iv Not sure
- 2.14 [2016 only] Would you like to see reliability information (such as average downtime or number of outages) added to this label?
 - 2.14.i Yes
 - 2.14.ii No
 - 2.14.iii Not sure
- 2.15 What plan **network management information** would you add, modify, or remove from this label section to make it more useful to you? Please write "n/a" if you would change nothing about this section. [*Free response*]
 - {{ Graphic with just the network management information section for either 2016, Study-fixed, or Study-mobile format }}
- 2.16 What **other information** would you add, modify, or remove from this label section to make it more useful to you? Please write "n/a" if you would change nothing about this section. [Free response] {{ Graphic with just the footer section for either 2016-fixed, 2016-mobile, Study-fixed, or Study-mobile format }}

3 Comprehension

For this section, we want to see if there are any differences in ability to use and understand the label between subjects who are shown the old version and subjects who are shown the Study version(s). Do our proposed formats perform better or worse?

- 3.1 Timing Question 3: question item which tracks how long a participant stays on this page; this block is not visible to participants.
- 3.2 *Directions:* Imagine that the following consumer disclosure label has been made mandatory for broadband providers to display prominently to customers as they shop for broadband plans. Next, imagine you have

received the following label that describes a broadband plan offering from your provider. Please **closely examine the label** and reference it as needed to answer the following questions. Note that the hyperlinks (blue underlined text) shown on the label images in this survey are nonfunctional, but they would take you to a new page with relevant additional information on a real world version of these labels. {{ Graphic with full Plan A label for either 2016-fixed, 2016-mobile, Study-fixed, or Study-mobile format }} Click here to open this label in a new window for your reference throughout the remaining questions on this

- 3.3 [fixed only] If you purchased the above plan, what is the lowest amount you could expect to pay in total over 2 years in **only monthly charges**? Assume that the contract plan is nonrenewable, you do not need the "optional modem/equipment" add on, and the listed prices include any applicable taxes.
 - 3.3.i \$1320.00 (contract only)

page.

- 3.3.ii \$1440.00 (1yr contract, 1yr month-month) [correct answer]
- 3.3.iii \$1560.00 (monthly only)
- 3.3.iv \$1620.00 (*monthly+hulu*)
- 3.3.v Unsure or label does not provide enough information to answer
- 3.3.vi Other (please briefly describe how you calculated this number)
- 3.4 [fixed only] If you purchased the above plan, how much would you expect to pay in total over 2 years in **only applicable one-time fees**? Include any applicable new subscriber/activation fees, deposits, and installation fees as part of this calculation. Assume that the contract plan is nonrenewable, you will incur no overage charges, and the listed prices include any applicable taxes.
 - 3.4.i \$50.00 (activation)
 - 3.4.ii \$75.00 (activation+install) [correct if no month-to-month deposit]
 - 3.4.iii \$98.00 (activation+deposit)
 - 3.4.iv \$123.00 (activation+install+deposit) [correct]
 - 3.4.v \$150.00 (new activation \$75+\$50+\$25)
 - 3.4.vi \$198.00 (Study label, both activations)
 - 3.4.vii \$363.00 (all one-time fees)
 - 3.4.viii Unsure or label does not provide enough information to answer
 - 3.4.ix Other (please briefly describe how you calculated this number)
- 3.5 [mobile only] If you purchased the above plan for 1 line with 10GB of premium high speed data, what is the lowest amount you could expect to pay in total over 2 years in only monthly charges and fees? Assume that you will not be paying extra for additional mobile hotspot usage and the listed prices include any applicable taxes.
 - 3.5.i \$840.00 (5GB only)
 - 3.5.ii \$1080.00 (missing fees)
 - 3.5.iii **\$1164.00** [correct]
 - 3.5.iv \$1214.00 (*added activation*)
 - 3.5.v \$1262.00 (added activation+deposit)
 - 3.5.vi Unsure or label does not provide enough information to answer
 - 3.5.vii Other (please briefly describe how you calculated this number) _____
- 3.6 [mobile only] If you purchased the above 10GB plan, how much would you expect to pay in total over 2 years in **only applicable one time fees or deposits**? Include any applicable activation fees and deposits as part of this calculation. Assume that you will not be paying extra for any international calls or mobile hotspot usage or upgrade fees, and the listed prices include any applicable taxes.
 - 3.6.i \$15.00 (upgrade only)
 - 3.6.ii \$48.00 (*deposit only*)

```
3.6.iii
                     $50.00 (activation only)
           3.6.iv
                     $63.00 (deposit+upgrade)
            3.6.v
                     $98.00 (activation + deposit) [correct]
           3.6.vi
                     $338.00 (all)
           3.6.vii
                     Unsure or label does not provide enough information to answer
          3.6.viii
                     Other (please briefly describe how you calculated this number) _
 3.7 [fixed only] What downstream internet speed could you roughly expect with this plan during the parts of the
      day when internet performance is normal?
             3.7.i
                     53 Mbps [correct answer]
            3.7.ii
                     50 Mbps
           3.7.iii
                     21 Mbps
           3.7.iv
                     4 Mbps
            3.7.v
                     Unsure or label does not provide enough information to answer
 3.8 [fixed only] What downstream internet speed could you roughly expect with this plan during the parts of the
      day when internet performance is much slower than normal?
             3.8.i
                     53 Mbps
            3.8.ii
                     50 Mbps
           3.8.iii
                     21 Mbps
           3.8.iv
                     4 Mbps [correct answer]
            3.8.v
                     Unsure or label does not provide enough information to answer
 3.9 [mobile only] What 5G downstream internet speed could you roughly expect with this plan during the parts
      of the day when internet performance is normal?
             3.9.i
                     58 Mbps [correct answer]
            3.9.ii
                     47 Mbps
           3.9.iii
                     22 Mbps
           3.9.iv
                     10 Mbps
            3.9.v
                     Unsure or label does not provide enough information to answer
3.10 [mobile only] What 5G downstream internet speed could you roughly expect with this plan during the parts
      of the day when internet performance is much slower than normal?
           3.10.i
                     58 Mbps
           3.10.ii
                     47 Mbps
          3.10.iii
                     22 Mbps
          3.10.iv
                     10 Mbps [correct answer]
           3.10.v
                     Unsure or label does not provide enough information to answer
3.11 How suitable is this plan for streaming audio on a scale of 1 to 5?
           3.11.i
                     1 (Poor)
           3.11.ii
                     2 (Marginal)
          3.11.iii
                     3 (Acceptable)
          3.11.iv
                     4 (Good) [correct]
           3.11.v
                     5 (Excellent)
          3.11.vi
                     Unsure or label does not provide enough information to answer
3.12 How suitable is this plan for videoconferencing on a scale of 1 to 5?
           3.12.i
                     1 (Poor)
           3.12.ii
                     2 (Marginal)
          3.12.iii
                     3 (Acceptable) [correct]
```

- 3.12.iv 4 (Good)
- 3.12.v 5 (Excellent)
- 3.12.vi Unsure or label does not provide enough information to answer
- 3.13 What level of reliability (lack of outages) would you expect from this plan?
 - 3.13.i 1 Very poor. I would expect over 10 hours of total network downtime every month. [<98.5% uptime]
 - 3.13.ii 2 Somewhat poor. I would expect 1 to 10 hours of total network downtime every month. [99% uptime = 7hrs down] [Correct]
 - 3.13.iii 3 Moderate. I would expect 10 to 59 minutes of total network downtime every month. [99.9% uptime = 43min down]
 - 3.13.iv 4 Somewhat good. I would expect 1 to 9 minutes of total network downtime every month. [99.99% uptime = 4.3min down]
 - 3.13.v 5 Very good. I would expect less than 1 minute of total network downtime every month. [99.999% uptime = 26s down]
 - 3.13.vi Unsure or label does not provide enough information to answer
- 3.14 According to this label, the provider of this plan may slow your internet speeds during times of network congestion if you do which of the following? (Select all that apply)
 - 3.14.i Do not enroll in autopay and paperless billing
 - 3.14.ii Exceed 300GB of data per month
 - 3.14.iii Mobile tethering
 - 3.14.iv Exceed your premium data allowance
 - 3.14.v Browsing the web
 - 3.14.vi Watch online videos
 - 3.14.vii Have a plan with lower priority than the Super tier
 - 3.14.viii None of the above
 - 3.14.ix Unsure or not enough information to determine
- 3.15 How easy or difficult was it for you to use the above labels to answer all of the above questions on this page of the survey?
 - 3.15.i Extremely difficult
 - 3.15.ii Somewhat difficult
 - 3.15.iii Neither difficult nor easy
 - 3.15.iv Somewhat easy
 - 3.15.v Extremely easy
- 3.16 How would you improve the format or language on this label to be more usable and easily understood? [Free response]
 - page break –
- 3.17 Timing Question 4: question item which tracks how long a participant stays on this page; this block is not visible to participants.
- 3.18 For the following section, imagine you have just moved to a new location and must choose between the only two broadband plans available there. The details for those plans are presented as the following two labels: {{insert qualtrics hyperlinks to relevant labels}}
 - Clicking on each of the above links will open a view of the plan labels in a new window. Please use these labels in answering the following questions.
 - {{ Graphics with full Plan A and Plan B labels in either 2016-fixed, 2016-mobile, Study-fixed, or Study-mobile format }}
 - {{ Provide 2 links for each set so that users can open the images in a new tab }}
- 3.19 Which plan has a cheaper early termination fee if you have a contract plan?
 - 3.19.i Plan A [correct]

- 3.19.ii Plan B 3.19.iii Both early termination fees are the same 3.19.iv Unsure 3.20 Which plan has the least restrictive network management practices? 3.20.i Plan A [correct] 3.20.ii Plan B 3.20.iii Both are equally restrictive 3.20.iv Unsure 3.21 Which plan has better speeds? 3.21.i Plan A 3.21.ii Plan B [correct] 3.21.iii Both are equal 3.21.iv Unsure 3.22 Which plan is better for videoconferencing? 3.22.i Plan A 3.22.ii Plan B [correct] 3.22.iii Both are equally good for videoconferencing 3.22.iv Unsure 3.23 Which plan has better network reliability? 3.23.i Plan A 3.23.ii Plan B [correct] 3.23.iii Both are equal
- 3.24 How easy or difficult was it for you to use the above labels to answer all of the above questions on this page of the survey?
 - 3.24.i Extremely difficult

Unsure

- 3.24.ii Somewhat difficult
- 3.24.iii Neither difficult nor easy
- 3.24.iv Somewhat easy
- 3.24.v Extremely easy
- 3.25 Which plan would you choose and why? [free response]

4 AB Comparisons

3.23.iv

For this section of the survey, we want to learn what participants specifically like or dislike for each part of the label they saw in section Q2. May result in a lot of qualitative data to crawl through, so try to condense free responses where possible and word them specifically enough to avoid gathering too many extraneous rants and unrelated responses. Randomize subsections to avoid ordering bias. Understand: How could future label designs be better?

- 4.1 Directions: This next section will ask you to compare between different formats for conveying information about a broadband plan. Please note that the hyperlinks (blue underlined text) shown on the label images in this survey are nonfunctional, but they would take you to a new page with relevant additional information on a real-world version of these labels.
 - page break –
- 4.2 Timing Question 5: question item which tracks how long a participant stays on this page; this block is not visible to participants.

- 4.3 The following excerpts represent 2 different formats for conveying the **cost information** for a broadband plan. Please examine them closely before answering the following questions.
 - {{ Graphics with cost sections of 2016-fixed and Study-fixed labels or 2016-mobile and Study-mobile labels. Graphics annotated with Version A for 2016 labels and Version B for Study labels }}
 - Which of the above formats would you prefer to see for the **cost information section** while comparison shopping for a broadband plan?
 - 4.3.i Version A
 - 4.3.ii Version B
 - 4.3.iii None of the above
 - 4.3.iv Not sure
- 4.4 What, if anything, about version A do you like better than B? [Free response]
- 4.5 What, if anything, about version B do you like better than A? [Free response] page break –
- 4.6 Timing Question 6: question item which tracks how long a participant stays on this page; this block is not visible to participants.
- 4.7 The following excerpts represent 2 different formats for conveying the **performance information** for a broadband plan. Please examine them closely before answering the following questions.

 {{ Graphics with performance sections (incl. reliability) of 2016-fixed and Study-fixed labels or 2016-mobile and Study-mobile labels. Graphics annotated with Version A for 2016 labels and Version B for Study labels }} Which of the above formats would you prefer to see for the **performance information section** while

comparison shopping for a broadband plan?

- 4.7.i Version A
- 4.7.ii Version B
- 4.7.iii None of the above
- 4.7.iv Not sure
- 4.8 What, if anything, about version A do you like better than B? [Free response]
- 4.9 What, if anything, about version B do you like better than A? [Free response] page break –
- 4.10 Timing Question 7: question item which tracks how long a participant stays on this page; this block is not visible to participants.
- 4.11 The following excerpts represent 2 different formats for conveying the **network management information** for a broadband plan. Please examine them closely before answering the following questions.
 - {{ Graphics with network management practices section of 2016-fixed and Study-fixed labels or 2016-mobile and Study-mobile labels. Graphics annotated with Version A for 2016 labels and Version B for Study labels }} Which of the above formats would you prefer to see for the **network management information section** while comparison shopping for a broadband plan?
 - 4.11.i Version A
 - 4.11.ii Version B
 - 4.11.iii None of the above
 - 4.11.iv Not sure
- 4.12 What, if anything, about version A do you like better than B? [Free response]
- 4.13 What, if anything, about version B do you like better than A? [Free response] page break –
- 4.14 Please leave us with any additional comments you have on the content or format of the broadband disclosure labels you saw here today. [Free response]

5 Demographics

- 5.1 Timing Question 8: question item which tracks how long a participant stays on this page; this block is not visible to participants.
- 5.2 *Directions:* To finish the survey, please answer the following demographic questions. This information helps us ensure we collect responses from a wide range of participant backgrounds. As a reminder, your responses here are collected anonymously and cannot be used to personally reidentify you.
- here are collected anonymously and cannot be used to personally reidentify you. 5.3 What gender do you identify as? 5.3.i Male 5.3.ii Female 5.3.iii Non-binary 5.3.iv Prefer to Self-describe: ___ 5.3.v Prefer not to answer 5.4 What is your age? 5.4.i 18-24 yrs. old 5.4.ii 25-34 yrs. old 5.4.iii 35-44 yrs. old 5.4.iv 45-54 yrs. old 5.4.v 55-64 yrs. old 5.4.vi 65-74 yrs. old 5.4.vii 75-84 yrs. old 5.4.viii 85+ yrs. old 5.4.ix Prefer not to answer 5.5 Which of the following best describes your race or ethnic identity? (Select all that apply) 5.5.i 5.5.ii Black or African American 5.5.iii Hispanic or Latino 5.5.iv Native American or Alaskan Native 5.5.v Native Hawaiian or Pacific Islander 5.5.vi White or Caucasian 5.5.vii Not listed above: 5.5.viii Prefer not to answer 5.6 Are you a native English speaker? 5.6.i Yes 5.6.ii No, but I consider myself a fluent English speaker 5.6.iii No 5.6.iv Prefer not to answer 5.7 What is your annual household income? 5.7.i Less than \$25,000 5.7.ii \$25,000 - \$50,000 5.7.iii \$50,000 - \$100,000 5.7.iv \$100,000 - \$200,000 5.7.v More than \$200,000 5.7.vi Prefer not to answer

Electronic copy available at: https://ssrn.com/abstract=4528761

[Dropdown menu of states/territories to select from]

5.8 What US state or territory do you currently reside in?

Prefer to not disclose

5.8.i

5.8.ii

5.8.iii I do not currently reside in the US 5.9 What type of area do you currently reside in? 5.9.i Urban 5.9.ii Suburban 5.9.iii Rural 5.9.iv Unsure or Prefer not to answer 5.10 What is the highest degree or level of education you have completed? 5.10.i Some High School 5.10.ii High School 5.10.iii Bachelor's Degree 5.10.iv Master's Degree 5.10.v Doctorate Degree 5.10.vi Professional Degree Trade School 5.10.vii 5.10.viii Prefer not to answer 5.11 Do you have a background in computer science or related technical field? This could include an education or career in software engineering, computer engineering, computing technology, information technology, or management information systems. 5.11.i Yes 5.11.ii No 5.11.iii Unsure 5.11.iv Prefer not to say 5.12 [Fixed only] When you are using your home network, which of the following activities do you or other members of your household engage in? (Select all that apply) 5.12.i Casual web surfing. This includes activities like visiting news websites, checking your email, or viewing social media content. 5.12.ii Watching online videos. This includes watching video services like Netflix, Hulu, Twitch, YouTube, Tiktok, or Instagram. 5.12.iii Watching online videos in 4K quality. This includes watching high resolution videos. 5.12.iv **Real-time video streaming from your device.** This includes streaming a real-time video of yourself, surroundings, or device screen to services like YouTube Live, Twitch.tv, or Instagram Live. 5.12.v Video conferencing. This includes using services like Zoom, Skype Video Chat, Microsoft Teams, Google Meet, Cisco Webex, Discord, or FaceTime to have a video call with one or 5.12.vi Online multiplayer gaming. This includes games like Fortnite, League of Legends, Halo, Call of Duty, Minecraft, FFXIV, or Super Smash Bros Online. 5.12.vii Regular online backups. This includes semi-frequently backing up your computer's files to an external server or cloud storage solution such as Apple iCloud, Google Photos, or Microsoft OneDrive. 5.12.viii **Peer-to-peer file sharing** with services like BitTorrent and Gnutella.

ExpressVPN, NordVPN, or Surfshark.

Other

Connecting to Virtual Private Networks (VPNs) with services like Cisco AnyConnect,

5.12.ix

5.12.x

- 5.13 [Mobile only] When you are using your mobile phone's data, which of the following activities do you engage in? (Select all that apply)
 - 5.13.i **Casual web surfing.** This includes activities like visiting news websites, checking your email, or viewing social media content.
 - 5.13.ii **Watching online videos**. This includes watching video services like Netflix, Hulu, Twitch, YouTube, Tiktok, or Instagram.
 - 5.13.iii Watching online videos in 4K quality. This includes watching high resolution videos.
 - 5.13.iv **Real-time video streaming from your device**. This includes streaming a real-time video of yourself, surroundings, or device screen to services like YouTube Live, Twitch.tv, or Instagram Live.
 - 5.13.v Video conferencing. This includes using services like Zoom, Skype Video Chat, Microsoft Teams, Google Meet, Cisco Webex, Discord, or FaceTime to have a video call with one or more people.
 - 5.13.vi **Online multiplayer gaming.** This includes games like Among Us, Pokemon Go, PUBG Mobile, Genshin Impact, Fortnite, Minecraft, or Forza Street.
 - 5.13.vii **Regular online backups**. This includes semi-frequently backing up your phone's files to an external server or cloud storage solution such as Apple iCloud, Google Photos, or Microsoft OneDrive.
 - 5.13.viii **Mobile Tethering.** This involves sharing your phone's mobile Internet connection with connected devices. The connected device will use up a portion of your mobile device's data allowance.
 - 5.13.ix I avoid all of the above while my phone is not connected to wi-fi.
 - 5.13.x **Other** _____

Appendix D: Survey Graphics

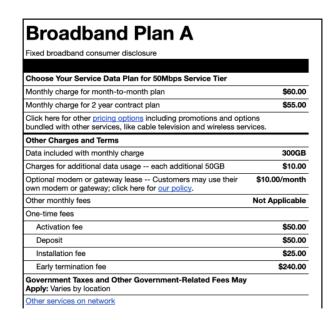
Phase 1 Graphics

Figure D1: 2016 fixed (left) and mobile (right) broadband labels

		Mobile broadband consur	101 0100100010		
		Device Compatibility	Ę.		
		If you want to use your ex	isting device, learn mo	re about compat	bility.
Broadband Facts		If you want to obtain a de-	vice, learn more about	prices and other	options.
ixed broadband consumer disclosure	Choose Your Data Pl device from us.	an - These prices do r	not include costs	for obtaining a	
hoose Your Service Data Plan for 50Mbps Servic	ce Tier		High Speed I	Data allowance p	er month
lonthly charge for month-to-month plan	\$60.00	24	1GB	3GB	5GB
lonthly charge for 2 year contract plan	\$55.00	Monthly charge	\$35.00	\$45.00	\$60.00
lick here for other pricing options including promotions and		When you exceed the	\$10.00/Additio	Slowed	NA
undled with other services, like cable television and wireles		data allowance	nal GB	speeds	C.
ther Charges and Terms	Į.	Learn more about other in	7.5		
ata included with monthly charge	300GB	Additional pricing options,	plans and promotions	can be found he	re.
harges for additional data usage – each additional 50GB	\$10.00	Coverage Map			
		Charges and Terms (Common to All Plan	ns	
ptional modem or gateway lease – Customers may use leir own modem or gateway; click here for our policy	\$10.00/month	Monthly fees			
other monthly fees	Not Applicable	Administrative fee			\$1.2
ne-time fees	Постириновин	Regulatory fee			\$0.1
Activation fee		One-time fees			
900 WE	\$50.00	Activation fee			\$50.00
Deposit	\$50.00	Deposit			\$50.00
Installation fee	\$25.00	Early termination fee	9		\$240.00
covernment Taxes and Other Government-Relate apply: Varies by location other services on network	- I rees may	Also Apply: Varies by k		<u>y</u>	
erformance - Individual experience may vary		Typical spee	.d	Typical S	ineed
ypical speed downstream	53 Mbps	1.5 Mbps downstre		6-12 Mbps dov	·
ypical speed upstream	6 Mbps	600-900 Kpbs upst	tream	3-6 Mbps up	ostream
ypical latency	35 milliseconds	Typical laten	S (7)	Typical la	
ypical packet loss	0.08%	Less than 120 millise		Less than 120 r	VIV. A. S. A. CONTOUR STATE OF
• CORPOS • PODDO - NERRO QUEI DA POD	5,500 %	0.08%	Loss	0.089	
letwork Management		Network Managemen	st.		
pplication-specific network management practices?	Yes	Application-specific netwo		ces?	Yes
	o	10-10 to - Harris Maria (10-00) (10-00 (10-00 (10-00 (10-00 (10-00 (10-00 (10-00 (10-00 (10-00) (10-00 (10-00 (10-00 (10-00 (10-00 (10-00 (10-00) (10-00 (10-00) (10-00 (10-00) (10-00) (10-00 (10-00) (10-00	AND THE PROPERTY OF THE PROPER	and the same of th	22204
ubscriber-triggered network management practices?	Yes	Subscriber-triggered netw	ork management prac	tices?	Yes
ubscriber-triggered network management practices?	Yes	12		tices?	Yes
lore <u>details on network management</u>	Yes See our_privacy policy	Subscriber-triggered network number details on network number of the subscriber of t		20.0000000	Yes

Broadband Facts

Figure D2: Plan A and Plan B cost sections for cost comparison questions



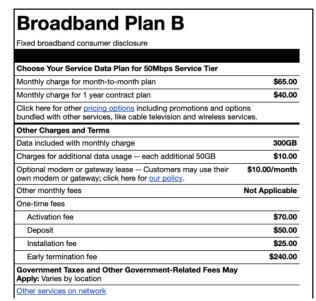
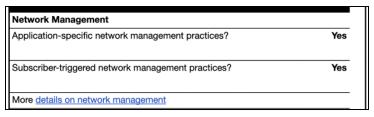
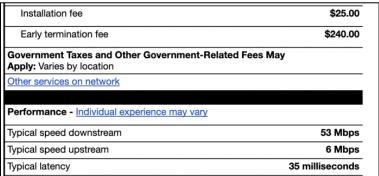


Figure D3: Label portions shown to participants when asking if they would click on the shown hyperlinks and what they believed laid beyond them.





Phase 2 Graphics

Figure D4: 2016 fixed (left) and mobile (right) label, Plan A full

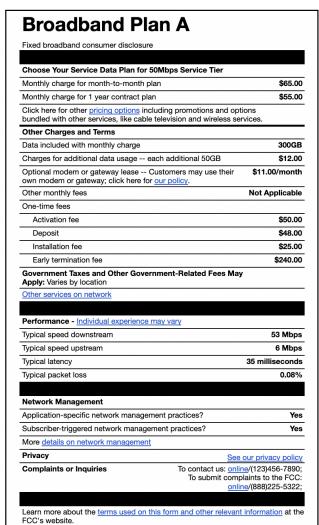




Figure D5: Study fixed label, Plan A full

Paga monthly aget			During 1-year promotional contract period	Month-to-month (no contract or after contract expiration)
Base monthly cost			\$55.00	\$65.00
ncludes 300GB of data per month p	olus provider fees and go	overnment taxes.	400.00	400.00
Click here for other pricing options in	ncluding promotions and b			
such as cable television and mobile ph	one services.			
Optional monthly ch	arges			
Equipment lease + tax			Included	\$11.00
Bundled streaming services: Hulu,	Spotify		\$15.00	\$15.00
A attivation			With 1-year contract	No contract
Activation		Total Estimate:	\$75.00	\$123.00
New subscriber fee			\$50.00	\$50.00
Deposit			n/a	\$48.00
Installation fee			\$25.00	\$25.00
Other fees				
Fee for additional data usage: eac	h 50GB over 300GB lin	nit	\$12.00	\$12.00
Early termination fee			\$240.00	n/a
·				
Performance Government Performance Rating	us (fcc.gov/broadband)		,	vary. Listed measurements reflect f these performance fluctuations. What do these mean?
Web browsing Good	Streaming audio	Good	Videoconferencing	Acceptable
Gaming Poor	Streaming video	Acceptable	Online backups	Marginal
			When performance is poor (10th percentile)	When performance is normal (median)
Speed (downstream)			4 Mbps	53 Mbps
Speed (upstream)			0.4 Mbps	6 Mbps
_atency			250 ms	35 ms
			3.98%	0.08%
Packet loss				
	erience mav varv			What do these mean?
Reliability Individual exp	perience may vary			What do these mean?
	stomer			What do these mean? 2 hours 4 minutes 105
Reliability Individual exp Average monthly downtime per cus fotal number of outages, last 3 year	stomer			2 hours 4 minutes 105
Reliability Individual exp Average monthly downtime per cur fotal number of outages, last 3 year Network manageme	stomer		Effect	2 hours 4 minutes
Reliability Individual exp Average monthly downtime per cur fotal number of outages, last 3 year Network management	ent practices		Effect decreased speed during cong	2 hours 4 minutes 105 What do these mean?
Reliability Individual exp Average monthly downtime per cur fotal number of outages, last 3 yea Network management Lower priority than Super Internet	ent practices		decreased speed during cong	2 hours 4 minutes 105 What do these mean?
Reliability Individual exp Average monthly downtime per cur fotal number of outages, last 3 year Network management	ent practices plan onth) are deprioritized			2 hours 4 minutes 105 What do these mean? estion
Reliability Individual exp Average monthly downtime per cur fotal number of outages, last 3 year Network management Lower priority than Super Internet Heavy data users (>300GB in a month)	ent practices plan onth) are deprioritized		decreased speed during cong decreased speed during cong	2 hours 4 minutes 105 What do these mean? estion
Reliability Individual exp Average monthly downtime per cus Total number of outages, last 3 year Network management Lower priority than Super Internet pleavy data users (>300GB in a month of the company of the comp	ent practices plan onth) are deprioritized		decreased speed during cong decreased speed during cong download speed for video limi	2 hours 4 minutes 105 What do these mean? estion estion ted to 40 Mbps
Reliability Individual exp Average monthly downtime per cus Total number of outages, last 3 year Network management Lower priority than Super Internet Heavy data users (>300GB in a monthrottled video downloads and video paid prioritization	ent practices plan onth) are deprioritized eo streaming		decreased speed during cong decreased speed during cong download speed for video limi Effect	2 hours 4 minutes 105 What do these mean? estion estion ted to 40 Mbps
Reliability Individual exp Average monthly downtime per cus Total number of outages, last 3 year Network management Lower priority than Super Internet pleavy data users (>300GB in a month of the company of the compa	ent practices plan onth) are deprioritized eo streaming		decreased speed during cong decreased speed during cong download speed for video limi Effect performance may be increase	2 hours 4 minutes 105 What do these mean? estion estion ted to 40 Mbps
Reliability Individual expansion of the property of the proper	ent practices plan onth) are deprioritized eo streaming		decreased speed during cong decreased speed during cong download speed for video limi Effect performance may be increase Effect	2 hours 4 minutes 105 What do these mean? estion estion ted to 40 Mbps

Figure D6: Study mobile label, Plan A full

Broadband Plan A	A		Mo	bile broadband cor	nsumer disclosure
Tfin&T Magenta · Last updated August	2, 2022				
		4	50D	1000	500D
	'	Monthly High Speed Data Allowance	5GB with no mobile hotspot	10GB with 1GB mobile hotspot	50GB with 5GB mobile hotspot
Base monthly cost	avec	Cost for first line	\$38.50	\$48.50	\$63.50
ncludes provider rees and government ta	ixes.	When you exceed the data allowance	\$11.00/Additio	Slowed speeds	NA
Click here for other pricing options inclu	iding promotio	_			
Activation fees				Total Estimate:	\$98.00
SIM card activation					\$50.00
Deposit					\$48.00
Other fees					
Fee for additional mobile hotspot usage-	-each 1GB ov	er limit			\$13.50
Early termination fee					\$240.00
5G Performance		measurements		factors outside prov ange of these perfor	
Government Perform					nat do these mean?
Web browsing Videoconferencing A	Good	Streaming audio Gaming	Good	Streaming video Online backups	Acceptable Marginal
Videocomerencing	cceptable	5	en performance is		en performance is
			r (10th percentile)	••••	normal (median)
Speed (downstream)			10 Mbps		58 Mbps
Speed (upstream)			0.4 Mbps		6 Mbps
atency			250 ms		35 ms
Packet loss			3.98%		0.08%
4G LTE Performance	ance Ratings	measurements		factors outside prov ange of these perfon Wi	mance fluctuations.
Government Perform Web browsing	Good	measurements (fcc.gov/broadband) Streaming audio	reflect the typical re	ange of these perform Who Streaming video	mance fluctuations. nat do these mean? Marginal
Government Perform Web browsing		measurements (fcc.gov/broadband) Streaming audio Gaming	reflect the typical reflect the typical re	ange of these perform When Streaming video Online backups	mance fluctuations. nat do these mean? Marginal Marginal
Government Perform Web browsing	Good	measurements (fcc.gov/broadband) Streaming audio Gaming Whe	reflect the typical re	ange of these perform When Streaming video Online backups	mance fluctuations. mat do these mean? Marginal Marginal en performance is
Government Perform Web browsing Videoconferencing A Speed (downstream)	Good	measurements (fcc.gov/broadband) Streaming audio Gaming Whe	Good Poor en performance is r (10th percentile) 2 Mbps	ange of these perform When Streaming video Online backups	mance fluctuations. nat do these mean? Marginal Marginal en performance is normal (median) 12 Mbps
Government Perform Web browsing Videoconferencing A Speed (downstream) Speed (upstream)	Good	measurements (fcc.gov/broadband) Streaming audio Gaming Whe	Good Poor en performance is r (10th percentile) 2 Mbps 0.4 Mbps	ange of these perform When Streaming video Online backups	mance fluctuations. nat do these mean? Marginal Marginal en performance is normal (median) 12 Mbps 6 Mbps
Web browsing Videoconferencing A Speed (downstream) Speed (upstream) Latency	Good	measurements (fcc.gov/broadband) Streaming audio Gaming Whe	Good Poor en performance is r (10th percentile) 2 Mbps 0.4 Mbps 250 ms	ange of these perform When Streaming video Online backups	mance fluctuations. nat do these mean? Marginal Marginal en performance is normal (median) 12 Mbps 6 Mbps 35 ms
Government Perform Web browsing Videoconferencing A Speed (downstream) Speed (upstream)	Good	measurements (fcc.gov/broadband) Streaming audio Gaming Whe	Good Poor en performance is r (10th percentile) 2 Mbps 0.4 Mbps	ange of these perform When Streaming video Online backups	mance fluctuations. nat do these mean? Marginal Marginal en performance is normal (median) 12 Mbps 6 Mbps
Government Perform Web browsing Videoconferencing A Speed (downstream) Speed (upstream) Latency	Good cceptable	measurements (fcc.gov/broadband) Streaming audio Gaming Whe	Good Poor en performance is r (10th percentile) 2 Mbps 0.4 Mbps 250 ms	ange of these perform Will Streaming video Online backups Wh	mance fluctuations. nat do these mean? Marginal Marginal en performance is normal (median) 12 Mbps 6 Mbps 35 ms
Government Perform Web browsing Videoconferencing A Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience Coverage Map	Good acceptable	measurements (fcc.gov/broadband) Streaming audio Gaming Whe	Good Poor en performance is r (10th percentile) 2 Mbps 0.4 Mbps 250 ms	Streaming video Online backups Wh	mance fluctuations. nat do these mean? Marginal Marginal en performance is normal (median) 12 Mbps 6 Mbps 35 ms 0.08%
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Government Perform Web browsing Videoconferencing A Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience	may vary Dractices deprioritized paming	measurements (tcc.gov/broadband) Streaming audio Gaming Who poo	Effect decreased speed didecreased speed didecr	Streaming video Online backups Wh Will Will Wing congestion r video limited to 1.5 uring congestion r video limited to 1.5 uring congestion de increased inst premium data all inst premium data a	mance fluctuations. nat do these mean? Marginal Marginal en performance is normal (median) 12 Mbps 35 ms 0.08% nat do these mean? 2 hours 4 minutes nat do these mean? Mbps

Figure D7: 2016 fixed (left) and (mobile) labels, Plan B for comparison questions

Broadband Plai	ם ו	
Fixed broadband consumer disclosure		
Choose Your Service Data Plan for 150	Mbps Service Tier	
Monthly charge for month-to-month plan		\$80.00
Monthly charge for 2 year contract plan		\$60.00
Click here for other <u>pricing options</u> including bundled with other services, like cable telephone.		
Other Charges and Terms		
Data included with monthly charge		500 GE
Charges for additional data usage each	additional 50GB	\$20.00
Optional modem or gateway lease Custown modem or gateway; click here for ou		\$11.00/month
Other monthly fees		Not Applicable
One-time fees		
Activation fee		\$50.00
Deposit		N/A
Installation fee		\$25.00
Early termination fee		\$480.00
Government Taxes and Other Governm Apply: Varies by location	ent-Related Fees May	•
Other services on network		
Performance - Individual experience may	vary vary	
Typical speed downstream		145 Mbps
Typical speed upstream		22 Mbps
Typical latency		35 milliseconds
Typical packet loss		0.20%
Network Management		
Application-specific network managemen	t practices?	Yes
Subscriber-triggered network management	nt practices?	Yes
More details on network management		
Privacy	See	our privacy policy
Complaints or Inquiries	To contact us: onling To submit comp	ne/(123)456-7890 plaints to the FCC

Mobile broadband con	sumer disclosure		
Device Compatibility			
If you want to use you	existing device, le	arn more about cor	mpatibility.
If you want to obain a			
Choose Your Data Pla	an - These prices d	o not include costs	for obtaining a
device from us.			
		ed Data allowance	
	5GB	10GB	50GB
Monthly charge	\$45.00	\$55.00	\$70.00
When you exceed the data allowance	\$20.00/Addition al GB	Slowed speeds	NA
Learn more about other	er included services	/features.	
Additional pricing option	ons, plans and pror	notions <u>can be fou</u>	nd here.
Coverage Map			
Chages and Terms C	ommon to All Plar	ıs	
Monthly fees			
Adminstrative fee			\$2.50
Regulatory fee			\$1.00
One-time fees			
Activation fee			\$50.00
Deposit			\$48.00
Early termination fe	е		\$480.00
Government Taxes an Apply: Varies by locati Performance - Individ	on		,
4G		5	G
Typical s 18-26 Mbps do 6-10 Mbps u	wnstream /	82-101 Mbps	speed downstream / s upstream
Typical la			latency
Less than 120 n	nilliseconds	Less than 120) milliseconds
Typical Pack 0.20%	cet Loss	Typical Pa 0.2	cket Loss
Typical Pack	ket Loss %	Typical Pa	cket Loss
Typical Pack 0.209	ket Loss 6 nt	Typical Pa 0.2	ocket Loss 0%
Typical Pack 0.209 Network Managemen	ket Loss 6 ht etwork managemen	Typical Pa 0.2 t practices?	ocket Loss 0% Yes
Typical Pact 0.209 Network Managemen Application-specific ne	ket Loss 6 ht etwork managemen etwork manageme	Typical Pa 0.2 t practices?	ocket Loss 0% Yes
Typical Pact 0.209 Network Managemer Application-specific ne Subscriber-triggered n	ket Loss 6 ht etwork managemen etwork manageme	Typical Pa 0.2 t practices? nt practices?	cket Loss
Typical Pacl 0.209 Network Managemer Application-specific ne Subscriber-triggered n More details on netwo	ket Loss 6 ht etwork managemen etwork managemen rk management	Typical Pa 0.2 t practices? nt practices? To contact us: onli	cket Loss 0% Yes Yes our privacy policy

Figure D8: Study fixed label, Plan B for comparison questions

CoxtrumCN - Choose Your Service				
Base monthly cost			During 2-year promotional contract period	Month-to-month (no contract or after contract expiration)
base monthly cost			\$60.00	\$80.00
ncludes 500GB of data per month p	lus provider fees and gove	ernment taxes.	·	
Click here for other pricing options in		ndled options		
such as cable television and mobile ph				
Optional monthly ch	arges			
Equipment lease + tax	0 - 1"		Included	\$11.00
Bundled streaming services: Hulu,	Spotify		\$15.00	\$15.00
Activation			With 2-year contract	No contract
		Total Estimate:	\$75.00	\$123.00
New subscriber fee			\$50.00	\$50.00
Deposit			n/a	\$48.00
Installation fee			\$25.00	\$25.00
Other fees				
Fee for additional data usage: eac	h 50GB over 500GB limit		\$20.00	\$20.00
Early termination fee			\$480.00	n/a
Web browsing Good	Streaming audio	Good	Videoconferencing	What do these mean?
Gaming Marginal	Streaming video	Good	Online backups	Marginal
			When performance is poor (10th percentile)	When performance is normal (median)
Speed (downstream)			16 Mbps	145 Mbps
Speed (upstream)			3 Mbps	22 Mbps
atency			250 ms	35 ms
Packet loss			4.98%	0.20%
Reliability Individual exp	erience may vary			What do these mean?
i Cii a Bii Ly Ii laiviaaa exp				TITION OF THE OWNER.
Average monthly downtime per cu	stomer			1 hours 24 minutes
				1 hours 24 minutes 42
Average monthly downtime per cur Fotal number of outages, last 3 year	nrs			
Average monthly downtime per cu	nrs		Effect	42
Average monthly downtime per cur fotal number of outages, last 3 year Network manageme	ent practices		Effect decreased speed during cong	What do these mean?
Average monthly downtime per cur fotal number of outages, last 3 year Network management	ent practices			What do these mean?
Average monthly downtime per cur fotal number of outages, last 3 year Network management Lower priority than Super Internet	ent practices plan nth) are deprioritized		decreased speed during cong	What do these mean? estion
Average monthly downtime per cur Total number of outages, last 3 year Network management Lower priority than Super Internet Heavy data users (>100GB in a month)	ent practices plan nth) are deprioritized		decreased speed during cong decreased speed during cong download speed for video limi	What do these mean? estion
Average monthly downtime per cut Fotal number of outages, last 3 year Network management Lower priority than Super Internet places of the company of the c	ent practices plan inth) are deprioritized eo streaming		decreased speed during cong decreased speed during cong download speed for video limi	What do these mean? estion estion ted to 20 Mbps
Average monthly downtime per cur Fotal number of outages, last 3 year Network management Lower priority than Super Internet in the leavy data users (>100GB in a month of the leavy data users (>10	ent practices plan inth) are deprioritized eo streaming		decreased speed during cong decreased speed during cong download speed for video limit upload speed for video limited	What do these mean? estion estion ted to 20 Mbps I to 5 Mbps during congestion
Average monthly downtime per cur Fotal number of outages, last 3 year Network management Lower priority than Super Internet present deavy data users (>100GB in a month of the tribute of tribute of the tribute of th	ent practices plan inth) are deprioritized eo streaming		decreased speed during cong decreased speed during cong download speed for video limit upload speed for video limited Effect does not count against premit	What do these mean? estion estion ted to 20 Mbps I to 5 Mbps during congestion
Average monthly downtime per cur Fotal number of outages, last 3 year Network management Lower priority than Super Internet in the leavy data users (>100GB in a month of the leavy data users (>10	ent practices plan inth) are deprioritized eo streaming		decreased speed during cong decreased speed during cong download speed for video limit upload speed for video limited Effect does not count against premit	What do these mean? estion estion ted to 20 Mbps I to 5 Mbps during congestion um data allowance

Figure D9: Study mobile label, Plan B for comparison questions

Broadband Plan B CoxtrumCN Basic · Last updated August 2, 20.	22	Mo	obile broadband co	nsumer disclosure
	Monthly High Speed	5GB with no	10GB with 1GB	50GB with 5GB
	Data Allowance	mobile hotspot	mobile hotspot	mobile hotspot
Base monthly cost	Cost for first line	\$48.50	\$58.50	\$73.50
	When you exceed the data allowance	\$20.00/Additio nal GB	Slowed speeds	NA
Click here for <mark>other pricing options</mark> including pr	omotions, additional lines, an	d bundled options.		
Activation fees			Total Estimate:	\$98.00
SIM card activation				\$50.00
Deposit				\$48.00
Other fees				
Fee for additional mobile hotspot usageeach 1	GB over limit			\$13.50
Early termination fee				\$480.00
5G Performance Government Performance R Web browsing Good Videoconferencing Good	measurements atings (fcc.gov/broadband) Streaming audio		o factors outside provange of these perform W// Streaming video Online backups	
		en performance is	Wh	en performance is
Speed (downstream)	poo	r (10th percentile) 18 Mbps		normal (median)
Speed (upstream)		2 Mbps		19 Mbps
atency		250 ms		35 ms
Packet loss		4.98%		0.20%
	measurements atings (fcc.gov/broadband)		o factors outside prov ange of these perfor W/ Streaming video	
4G LTE Performance Government Performance R	measurements atings (fcc.gov/broadband) Streaming audio ble Gaming	Good Poor	ange of these perform Will Streaming video Online backups	mance fluctuations. hat do these mean? Acceptable Marginal
4G LTE Performance Government Performance R Web browsing Good	measurements atings (fcc.gov/broadband) Streaming audio ble Gaming Whe	reflect the typical r	ange of these perform Will Streaming video Online backups	mance fluctuations. hat do these mean? Acceptable
4G LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream)	measurements atings (fcc.gov/broadband) Streaming audio ble Gaming Whe	Good Poor en performance is r (10th percentile) 3 Mbps	ange of these perform Will Streaming video Online backups	mance fluctuations hat do these mean? Acceptable Marginal en performance is normal (median) 26 Mbps
4G LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream) Speed (upstream)	measurements atings (fcc.gov/broadband) Streaming audio ble Gaming Whe	Good Poor en performance is r (10th percentile) 3 Mbps 0.8 Mbps	ange of these perform Will Streaming video Online backups	mance fluctuations hat do these mean? Acceptable Marginal en performance is normal (median) 26 Mbps 10 Mbps
4G LTE Performance Government Performance R Web browsing Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency	measurements atings (fcc.gov/broadband) Streaming audio ble Gaming Whe	Good Poor en performance is r (10th percentile) 3 Mbps 0.8 Mbps 250 ms	ange of these perform Will Streaming video Online backups	mance fluctuations hat do these mean? Acceptable Marginal en performance is normal (median) 26 Mbps 10 Mbps
4G LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream) Speed (upstream)	measurements atings (fcc.gov/broadband) Streaming audio ble Gaming Whe	Good Poor en performance is r (10th percentile) 3 Mbps 0.8 Mbps	ange of these perform Will Streaming video Online backups	mance fluctuations hat do these mean? Acceptable Marginal en performance is normal (median) 26 Mbps 10 Mbps
4G LTE Performance Government Performance R Web browsing Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency	measurements atings (fcc.gov/broadband) Streaming audio ble Gaming Whe poo	Good Poor en performance is r (10th percentile) 3 Mbps 0.8 Mbps 250 ms	ange of these perform Will Streaming video Online backups Wh	mance fluctuations hat do these means Acceptable Marginal en performance is normal (median 26 Mbps 10 Mbps 35 ms 0.20%
4G LTE Performance Government Performance R Web browsing Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency Packet loss	measurements atings (fcc.gov/broadband) Streaming audio ble Gaming Whe poo	Good Poor en performance is r (10th percentile) 3 Mbps 0.8 Mbps 250 ms	ange of these perform Will Streaming video Online backups Wh	mance fluctuations hat do these mean? Acceptable Marginal en performance is normal (median) 26 Mbps 10 Mbps
4G LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may visited.	measurements atings (fcc.gov/broadband) Streaming audio ble Gaming Whe poo	Good Poor en performance is r (10th percentile) 3 Mbps 0.8 Mbps 250 ms	ange of these perform Will Streaming video Online backups Wh	mance fluctuations hat do these means Acceptable Marginal en performance is normal (median 26 Mbps 10 Mbps 35 ms 0.20%
AG LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may videocorage Map Average monthly downtime per customer	measurements atings (fcc.gov/broadband) Streaming audio Gaming Whe poo	Good Poor en performance is r (10th percentile) 3 Mbps 0.8 Mbps 250 ms	ange of these perform W/W Streaming video Online backups Wh	mance fluctuations hat do these means Acceptable Marginal en performance is normal (median 26 Mbps 10 Mbps 35 ms 0.20% hat do these means
AG LTE Performance Government Performance R Web browsing Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may we coverage Map Average monthly downtime per customer Network management pract	measurements atings (fcc.gov/broadband) Streaming audio ble Gaming Who poo	Good Poor en performance is r (10th percentile) 3 Mbps 0.8 Mbps 250 ms	ange of these perform W/W Streaming video Online backups Wh	mance fluctuations hat do these means Acceptable Marginal en performance is normal (median) 26 Mbps 10 Mbps 35 ms 0.20%
AG LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may we coverage Map Average monthly downtime per customer Network management pract Traffic management Lower priority than Super Internet plan	measurements atings (fcc.gov/broadband) Streaming audio ble Gaming Whe poo	Good Poor en performance is r (10th percentile) 0.8 Mbps 250 ms 4.98%	streaming video Online backups Wh	mance fluctuations hat do these means Acceptable Marginal en performance is normal (median 26 Mbps 10 Mbps 35 ms 0.20% hat do these means
AG LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may victory Coverage Map Average monthly downtime per customer Network management pract Traffic management Lower priority than Super Internet plan Heavy data users (>5GB in a month) are depriority	measurements atings (fcc.gov/broadband) Streaming audio ble Gaming Whe poo	Good Poor en performance is r (10th percentile) 3 Mbps 0.8 Mbps 250 ms 4.98%	Streaming video Online backups Wh wiring congestion uring congestion	mance fluctuations hat do these means Acceptable Marginal en performance is normal (median) 26 Mbps 10 Mbps 35 ms 0.20% hat do these means
AG LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may we coverage Map Average monthly downtime per customer Network management pract Traffic management Lower priority than Super Internet plan Heavy data users (>5GB in a month) are depriorit Throttled video downloads and video streaming	measurements atings (fcc.gov/broadband) Streaming audio Gaming Whe poo	Good Poor Poor Poor Poor Poor Poor Poor P	Streaming video Online backups Wh with the stream of the	mance fluctuations hat do these means Acceptable Marginal en performance is normal (median) 26 Mbps 35 ms 0.20% hat do these means I hours 24 minutes hat do these means
AG LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may viceoverage Map Average monthly downtime per customer Network management pract Traffic management Lower priority than Super Internet plan Heavy data users (>5GB in a month) are depriorit Throttled video downloads and video streaming Tethered device traffic is blocked	measurements atings (fcc.gov/broadband) Streaming audio Gaming Whe poo	Good Poor Poor Poor Poor Poor Poor Poor P	Streaming video Online backups Wh wiring congestion uring congestion	mance fluctuations hat do these means Acceptable Marginal en performance is normal (median) 26 Mbps 35 ms 0.20% hat do these means I hours 24 minutes hat do these means
AG LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may viceorage Map Average monthly downtime per customer Network management pract Fraffic management Lower priority than Super Internet plan Heavy data users (>5GB in a month) are depriorit Frottled video downloads and video streaming Frethered device traffic is blocked Paid prioritization	measurements atings (fcc.gov/broadband) Streaming audio Gaming Who poo	Good Poor Poor Poor Poor Poor Poor Poor P	Streaming video Online backups Wh with the stream of the	mance fluctuations hat do these means Acceptable Marginal en performance is normal (median) 26 Mbps 35 ms 0.20% hat do these means I hours 24 minutes hat do these means
AG LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may viceory Average Map Average monthly downtime per customer Network management pract Fraffic management Lower priority than Super Internet plan Heavy data users (>5GB in a month) are depriorit Frottled video downloads and video streaming Fethered device traffic is blocked Paid prioritization speedtest.net traffic is prioritized	measurements atings (fcc.gov/broadband) Streaming audio Gaming Whe poo	Good Poor Poor Poor Poor Poor Poor Poor P	Streaming video Online backups Wh with the stream of the	mance fluctuations hat do these means Acceptable Marginal en performance is normal (median) 26 Mbps 35 ms 0.20% hat do these means I hours 24 minutes hat do these means
AG LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may videocompact and provided acceptance of the provid	measurements atings (fcc.gov/broadband) Streaming audio Gaming Whe poo	Good Poor Poor Poor Poor Poor Poor Poor P	Streaming video Online backups Wh Will uring congestion uring congestion r video limited to 0.5 t permitted as part of	mance fluctuations hat do these mean's Acceptable Marginal en performance is normal (median) 26 Mbps 10 Mbps 35 ms 0.20% hat do these mean's I hours 24 minutes hat do these mean's
AG LTE Performance Government Performance R Web browsing Good Videoconferencing Accepta Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may viceorage Map Average monthly downtime per customer Network management pract Fraffic management Lower priority than Super Internet plan Heavy data users (>5GB in a month) are depriorit Frottled video downloads and video streaming Frethered device traffic is blocked Paid prioritization	measurements atings (fcc.gov/broadband) Streaming audio Ble Gaming Who poo	Good Poor Poor Poor Poor Poor Poor Poor P	Streaming video Online backups Wh with the stream of the	mance fluctuations hat do these mean's Acceptable Marginal en performance is normal (median) 10 Mbps 35 ms 0.20% hat do these mean's I hours 24 minutes hat do these mean's Mbps f this plan
Government Performance Web browsing Videoconferencing Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may videorerage Map Average monthly downtime per customer Network management pract Traffic management Lower priority than Super Internet plan Heavy data users (>5GB in a month) are depriorit Throttled video downloads and video streaming fethered device traffic is blocked Paid prioritization Speedtest.net traffic is prioritized Zero-rating/Data allowance exceptions hisprovider.com traffic Video traffic associated with our WatchOn feature	measurements atings (fcc.gov/broadband) Streaming audio Ble Gaming Who poo	Good Poor Poor Poor Poor Poor Poor Poor P	Streaming video Online backups Wh Will uring congestion uring congestion r video limited to 0.5 t permitted as part of e increased	mance fluctuations hat do these mean's Acceptable Marginal en performance is normal (median) 10 Mbps 35 ms 0.20% hat do these mean's I hours 24 minutes hat do these mean's Mbps f this plan
Government Performance Web browsing Good Videoconferencing Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may videocorage Map Average monthly downtime per customer Network management pract Fraffic management Lower priority than Super Internet plan Heavy data users (>5GB in a month) are depriorit Frottled video downloads and video streaming Fethered device traffic is blocked Paid prioritization Speedtest.net traffic is prioritized Zero-rating/Data allowance exceptions hisprovider.com traffic Video traffic associated with our WatchOn feature Device Compatibility	measurements atings (fcc.gov/broadband) Streaming audio Ble Gaming Who poo	Good Poor In performance is reflect the fypical reservation of the percentile) 3 Mbps 250 ms 4.98% Effect decreased speed didecreased speed didecreased speed didecreased speed for device tethering not effect performance may be effect does not count agality and count again	Streaming video Online backups Wh Will uring congestion uring congestion r video limited to 0.5 t permitted as part or e increased inst premium data al inst premium data al inst premium data al inst premium data al	mance fluctuations hat do these means from the manual fluctuations hat do these means from the manual fluctuations from the manual f
Government Performance Web browsing Videoconferencing Speed (downstream) Speed (upstream) Latency Packet loss Reliability Individual experience may videorerage Map Average monthly downtime per customer Network management pract Traffic management Lower priority than Super Internet plan Heavy data users (>5GB in a month) are depriorit Throttled video downloads and video streaming fethered device traffic is blocked Paid prioritization Speedtest.net traffic is prioritized Zero-rating/Data allowance exceptions hisprovider.com traffic Video traffic associated with our WatchOn feature	measurements atings (fcc.gov/broadband) Streaming audio Ble Gaming Who poo	Good Poor In performance is reflect the fypical reservation of the percentile) 3 Mbps 250 ms 4.98% Effect decreased speed didecreased speed didecreased speed didecreased speed for device tethering not effect performance may be effect does not count agality and count again	Streaming video Online backups Wh Will uring congestion r video limited to 0.5 t permitted as part of the increased inst premium data all inst premium d	mance fluctuations hat do these means hat do these means normal (median). 26 Mbps 10 Mbps 35 ms 0.20% hat do these means hat do the hat do these means hat do the h

Appendix E: Latest Label Prototypes

Figure E1: Detailed label (demonstrative example)

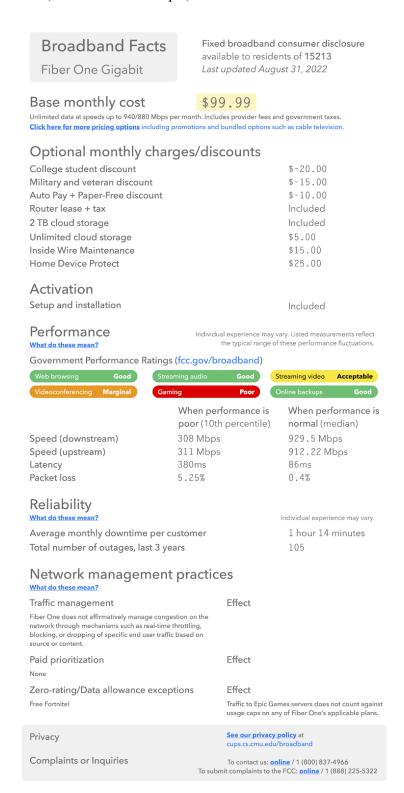


Figure E2: Detailed label (Real-life example)

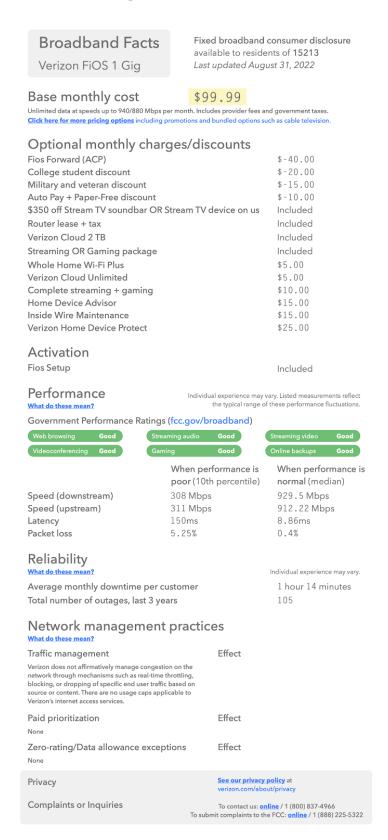


Figure E3: Summary label (real-life example)

Note: This label is printable

Broadband Facts

Verizon FiOS 1 Gig

Fixed broadband consumer disclosure available to residents of 15213 Last updated August 31, 2022



Base monthly cost

\$99.99

ttps://verizon.com/fcc-broadband

Unlimited data at speeds up to 940/880 Mbps per month. Includes provider fees and government taxes.

Optional monthly charges/discounts

Router lease + tax Included Auto Pay and Paper-Free discount -\$10.00

Other optional services and discounts can be found by scanning the QR code at the top of this page.

Activation fees

Fios Setup Included

Performance & Reliability

Government Performance Ratings (fcc.gov/broadband)

Typical performance ranges; individual experience may vary.

Web browsing	Good	Streaming audio	o Good	Streaming vid	deo Good
Videoconferencing	Good	Gaming	Good	Online backu	ps Good
Median download sp	peed	903.5 Mbps	Median uploa	ad speed	811.8 Mbps

Average monthly downtime per customer 1 hour 14 minutes

Appendix F: Codebooks

Code	Definition	Examples
Approval of label	Likes label or section of label FORMAT as presented	"This format gives 1000% more information than my present provider gives me."
Disapproval of label	Dislikes label or section of label FORMAT as presented. May cite it's overwhelming, confusing, or deliberately misleading.	
Supports label concept	Likes the NOTION of a label for broadband plans; even if they don't like the format/content specifically as is.	"if all providers had the same label it would help compare services. I think it would be helpful."
Dislikes labels concept: Mistrust label	Dislikes the NOTION of a label for broadband plans. May see it as a non-starter or encouraging poor provider practices. Distrust that the label is accurate and there aren't extra hidden fees	"If it were "real life" dealing with Comcast, I would not believe either version"
Dislikes labels concept: Doubts utility for non-technical users	Concerned for other people's ability to use this label either bc they won't find is understandable or useful. Hard to understand how label will impact user-experience for non-technical. Some terms fundamentally non-accessible to public.	
Dislikes labels concept (other)	Lack of options makes labels mostly useless. No one would use these. Etc.	
Glossary for technical terms	Participants wants non-technical definitions/explanations for terms used, possibly with examples.	
Hyperlinks bad	Dislikes the presence of hyperlinks/prefers that information be presented upfront rather than hidden behind link. May cite alternative like tooltips	
Text format/readability	Pertains to text font/color/size/general appearance formatting things. i.e., does not have to do with the content of the text	
Simplify/Make concise	Participant prefers a label with less text and/or a more "streamlined" format	"Streamlined information. Version B has way too much information."
Less technical language	Participant prefers language used in the label to be less technical and instead use layman's terms or "human" language summaries	"The easiest part to understand was the chart with colors. Need plainer language on the rest." "Tell people "exactly" what they will pay for, right off the block

Code	Definition	Examples
		e.g. You will pay \$38.50 per month, which includes all taxes and fees. If you go over your monthly quota, and/or [], your data stream will be reduced to 1.5Mbs"
Likes more information	Participant preferred version because it had more information on the label (in general). Wants more information on the label.	
Desire to easily compare	Sentiment that people want to compare these values across providers or plans	"Reliability has no context. 2hours down/mo does not sound "somewhat poor" unless it's compared to some standard which the question provided. Is 53 Mbs good or bad or average across the industry."
Off-label Request	Things people ask for that don't make sense as part of label. Eg. an explanation of which costs they need to pay when.	
Tool justification	Participant wants a tool for recommending them a plan or otherwise comparison shopping. Justifies information accessibility by third-parties	
Just one number	Sentiment that people want less numbers. Particularly in cost-related fields, but may apply to performance	
Add total costs	Wants summary costs like yearly totals. Does NOT include responses which want providers to change the pricing models themselves.	"If you sign a 2 yr contract, the pricing should show the two year amounts. Having this split into two different sections made it too confusing to calculate the total cost. (and I'm a CPA)"
Add taxes/government fees	Participant wants to know the taxes that will be added in either as separate row or combined into costs.	"A section on taxes would be helpful. OR make the description a bit clearer that the Base monthly cost INCLUDES taxes."
Cost explanation	Participant confused on if they should pay a particular fee and would need provider to disclose when they would outside of what's presently on the label. Wants more details regarding costs and what other charges there could be	"An explanation that Optional monthly charges are indeed optional and that the user may decline them without affecting the rest of the pricing.
Add reliability info	Wants information regarding downtime, uptime, outages, etc. May also want info regarding	"Maximum and minimum downtimes or a chart showing

Code	Definition	Examples
	compensation for outages.	downtimes dates and durations." "cash back for outages"
Suitability rating concerns	Concerned about the ratings' source of truth, relativity (someone's good is another's poor), or formatting	"Performance" was easy to read, but again, context is lacking. Who created the grading scale?" "Without reading an explanation via the What do these mean link, listing performance as Acceptable in yellow may dissuade customers from choosing that plan as opposed to a more expensive/higher tier plan when in reality, Acceptable may be just fine for their needs."
Add poor performance info	Wants information on minimum expected speeds or % slowdown when throttled or when congestion might occur	