Data Caps
A Progress Report
Sub-committee on Economic Impact

Open Internet Access Committee Meeting
Stanford University
1/16/13
Outline

• Defining terms
  – Topics covered
  – Defining terms
  – Motivation for concerns
  – Facts

• Questions
  – User understanding
  – Managing capacity
  – User control
  – Edge providers

• Summary
The topic covered by these slides

• What is the source of concern with data caps in wireline non-specialized services?
• Why this became the focus.
  – There have been questions raised about caps & tiers in many public forums and working papers.
  – Policy deliberation must consider all claims & all sides.
    • The committee can serve a useful function by framing the issues, defining terms, and organizing the claims and counterclaims.
  – The sub-committee started where it perceived the least complex set of issues, focusing on caps, not tiers.
    • Turns out to be complex enough and fills a whole slide deck.
    • Considers only one part of larger topic. Not comprehensive.
What the Order said

- What Order said about Usage Based Pricing (paragraph 72).
  - “Some commenters suggest that open Internet protections would prohibit broadband providers from offering their subscribers different tiers of service or from charging their subscribers based on bandwidth consumed. We are, of course, always concerned about anti-consumer or anticompetitive practices, and we remain so here. However, prohibiting tiered or usage-based pricing and requiring all subscribers to pay the same amount for broadband service, regardless of the performance or usage of the service, would force lighter end users of the network to subsidize heavier end users. It would also foreclose practices that may appropriately align incentives to encourage efficient use of networks. The framework we adopt today does not prevent broadband providers from asking subscribers who use the network less to pay less, and subscribers who use the network more to pay more.”

- Why the Order left open many questions.
  - At the time of the Order many experiments in business models and pricing.
  - The Internet had evolved over time, and the Order expects that the Internet would continue to evolve in unexpected ways, including in pricing (para 94).
  - Data caps not mentioned specifically.
Why focus on wireline & non-specialized services?

• The Order distinguishes b/w wireline/wireless, and b/w specialized/non-specialized services.
  – Why? Capacity/management/technical issues very different in wireless/wireline. Some overlap in supply & demand for wireless/wireline, but also different enough.
    • See e.g., National Broadband Plan & footnotes of the Order.
  – Why? Additional set of issues with specialized services.
    • E.g., concerns about discriminatory practices (among other anticompetitive concerns) are prominent in the public discussions about specialized services. Such issues are distinct from some of the concerns discussed in this set of slides.

• A result of specialization. Other sub-committees making some progress in discussing wireless issues & specialized services.

• Time constraints. Only so much can be presented in one slide deck at a time.
Defining terms, part I

- **Usage based pricing (UBP)** takes many forms.
  - On a continuum from metering to discreet steps in price levels.
  - Volume-based pricing can discount or increase w/volume.
  - Based on amount of time and/or volume of data.
- **UBP** appears in many settings. No single characterization.
  - E.g., Metered pricing in electricity.
  - E.g., Tiered pricing in cellular telephony.
- "**Data caps**: a colloquial term for a business practice that falls under broad umbrella of UBP. A special case.
  - These slides from the sub-committee focus only on caps.
    - Assessment of caps not synonymous with assessment of all UBP.
    - Leave many other topics about UBP uncovered.
    - Conclusions pertain only to caps, not other forms of UBP.
Defining terms, part II

• Data caps characterized by:
  – A price for data usage within the cap, i.e., below a threshold.
  – Threshold defines limit on amount of data per month per household.
  – After exceeding threshold a household faces different terms of service, such as throttling or termination or larger charges.

• One typical case in wireline broadband is a monthly cap on total monthly usage of data. That will be the focus of discussion.
  – More evidence coming.
  – These slides do not focus on all the general effects of tiered pricing.
    • Overlapping concerns motivates the use of tiered pricing and caps, but caps are a special case. The assessment of caps specifically can be separated from the assessment of tiers in general.
  – A related case that we do not examine: pricing tiers within a cap.
    • Ability to purchase additional usage or change to higher tier under a cap.
  – These slides focus on case of a single cap on all traffic.
    • Does not focus on selective applications of cap to some traffic but not other traffic. Sub-committee has not fully discussed many facets of that practice.
When to be concerned about caps? In less competitive settings

• Why? No or few substitutes a general concern in any policy assessment.
  – Perception that limited competition in some areas gives supplier ability to make take-it-or-leave-it offer to user. User cannot leave for another supplier.
    • Precaution against sweeping generality for all settings & time. Again, see NBP. Variance across vendors, geographies – city/rural, and access modes (e.g., cable/dsl/ftth).
  – Perception of limited discipline on supplier behavior from market competition.
    • Less need to retain customer with transparent & visible description of vendor policy.
    • Incentives to shape menu of choices for user and/or steer user understanding.
  – Opportunity to use pricing model to protect service from future competition.

• Concerns about caps tend to specifically focus on “high end.” Why?
  – Perception that more substitution available at “low end,” especially in dense locations. Less supply at “high end,” where caps have their effect.
    • Another source of caution: The size and definition of “high” a moving target.
    • Experts disagree on predictions for likely rate of future growth in data usage due to (expected) growth in cloud-based services & video services at level of household or overall. A common prediction: 20% growth/year at households.
  – Why no definitive definition for high or low? No definitive data. Moving target.
    • These slides: Combine data from Sandvine Global Broadband trends, Cisco Visual Networking Index, SamKnows, and FCC Measuring Broadband Report.
Who do caps impact today?
An illustration.

- Usage varies depending on ISP and technology, but all public measurements show great skew in usage, and suggest that caps do not yet impact users other than the highest users.

http://www.fcc.gov/measuring-broadband-america/2012/july
Precaution: Data at highest end below granularity of graph.
What are the facts about caps?

• What type of data charges exist in US wireline supply?
  – Table in article in GigaOm. (See next slide) Typically range b/w 150-300GB.
    • If there is a cap at all. No cap is also common.

• What is the relevant benchmark?
  – Household usage per month? No definitive data source.
    • Approximate today: Median 14GB, average 47GB. (Bauer, Clark, Lehr, 2012)
    • Cisco study: 26.2 GB average in 2011, forecast to go to 84GB by 2016.
  – Most wireline caps today affect only extreme high users
    • Much less than 1% use data where the high caps apply, such as 150GB-300GB.
  – One benchmark: “Hypothetical cord cutter w/five hrs of TV viewing per day”
    • What would that be? 5hr/day (television viewing) x 2GB/hr (high quality video) x 30 days = 300GB/month. This is speculative. Considerable variance possible. Many mitigating factors – e.g., DVR use, type of viewing, local news and sports, over the air, and so on.

• Can a cap be “binding” on more than extreme users?
  – Yes, if set low enough. Example: Canadian experience w/cap.
    • Set at 60/40/25, and, in addition, because it was poorly measured & not transparent to users, it had effect on household demand for third party data-intensive services, such as NetFlix.
### Chart from news article in GigaOm

<table>
<thead>
<tr>
<th>ISP</th>
<th>Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comcast</td>
<td>300GB per month</td>
</tr>
<tr>
<td>AT&amp;T</td>
<td>250GB or 150 GB per month</td>
</tr>
<tr>
<td>TWC</td>
<td>No</td>
</tr>
<tr>
<td>Verizon</td>
<td>No</td>
</tr>
<tr>
<td>CenturyLink</td>
<td>150 GB per month to 250 GB per month</td>
</tr>
<tr>
<td>Cox</td>
<td>30GB-400GB per month</td>
</tr>
<tr>
<td>Cablevision</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ISP</th>
<th>Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charter</td>
<td>100GB – 500 GB per month</td>
</tr>
<tr>
<td>Frontier</td>
<td>No</td>
</tr>
<tr>
<td>Windstream</td>
<td>No</td>
</tr>
<tr>
<td>SuddenLink</td>
<td>150GB to 350 GB per month</td>
</tr>
<tr>
<td>MediaCom</td>
<td>150 GB to 999 GB per month</td>
</tr>
<tr>
<td>Cable One</td>
<td>1GB, 50 GB and 100 GB per month</td>
</tr>
<tr>
<td>FairPoint</td>
<td>No</td>
</tr>
<tr>
<td>Cincinnati Bell</td>
<td>No</td>
</tr>
</tbody>
</table>

Caution: Do not take at face value. Many missing details about exceptions and overages were removed for sake of brevity. See original article for all detail. See [http://gigaom.com/2012/10/01/data-caps-chart/](http://gigaom.com/2012/10/01/data-caps-chart/), accessed October, 2012.
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OIAC sub-committee on economic impact
Questions about user knowledge & understanding

• From consumer standpoint, caps are generally more appealing when predictable and their properties are knowable. Motivates question: What do users know and understand?
  – Reason to be concerned: Many household surveys find rather poor knowledge of speed/usage of own broadband & applications.
    • E.g., Pew surveys.
  – Related reason: Changing norms for software usage, and more innovation.
    • Users have limited ability to understand bit/rate of an application.
  – Related concern: Ability to measure own data use in real time?
    • Some user tools are beginning to emerge. How widely used?
    • Can users measure own usage by application? If so, how to encourage use?
    • User experience in wireless suggests some users can adjust over time.
  – Related concern: User notion of fairness. Typical user pays same as heavy user.
    • Moving target: Will caps be updated to account for changing user behavior & changing costs?

• Tentative conclusion: important consumer-education component to topic.
  – Open questions: transitory or permanent concern?
  – Whose responsibility?
Questions about role caps play in managing capacity, part I.

• If measurement & transparency issues were satisfactorily addressed, could a monthly cap – at high end of downloading (e.g., less 1%) – reduce data use?
  – Speculation: It can, by incentivizing those near cap to behave differently.
    • Household can build more efficient usage into their own network.
  – Who is that? Those who download *much* more than typical user.

• Users can control some investments & operations. Examples.
  – Uncompressed HD cameras streaming to the Internet 7x24, when on-demand will do
  – P2P servers, especially bit-torrent – all day long – when partial operations will do.
  – Running servers out of the house on household contract, when business offering better matches needs & usage.

• Tentative conclusion: Do caps help manage capacity? Yes/No/Maybe?
  – Over long run? Yes, if users respond w/less overall data use, then carrier makes less costly operations & investment.
    • Question: How much do long run costs vary with use?
    • Question: Usage has historically grown year after year. Has carrier provisions made any difference to that growth so far? No evidence – to accept or refute – propositions about how caps shape usage.
Questions about role caps play in managing capacity, part II.

• A role in managing use at peak times?
  – Motive? Reduce congestion & improve user experience?
    • Congestion management generally not a stated rationale behind use of tiers, metering, or caps, so this question is more speculative.
    • Generalization difficult: Variety of “local” management & investment issues related to density/architecture. E.g., cable architecture w/shared lines or infrastructure.

• Does monthly cap help with managing peak & off-peak traffic?
  – No, b/c cap provides no direct incentive to heavy users to reduce traffic at peak time.
    • E.g., Monthly cap will count traffic from middle of the night against a cap.
  – Perhaps, if cap leads heavy users to reduce activity, perhaps something.

• Tentative conclusion: Whether monthly caps play role in managing peak traffic depends on how it curtails overall traffic at peak.
  – Depends on how heaviest users behave during peak times.
    • Again, no particular data speaks to this question one way or another.
Questions about user control over data that contribute to exceeding caps.

- Concern: If primary purpose of a data cap is to incentivize user to make effort to economize data, then caps have potential to “punish” user for aspects over which they lack control.
  - E.g., data-intensive video commercials in web software.
  - E.g., Automated nightly/weekly updates of software.
  - Operate inefficient software, over which user has little control.
    - Which generate good behavior out of software writers? Rather indirect.
    - Begs questions about whether there are more direct ways?

- But why care? With typical high cap, few users at risk to hit cap for these reasons.

- Tentative conclusion: In principle, these concerns could matter. Yet, with typical high cap, these issues seem largely irrelevant, as few users affected by cap.
  - Open question: Are these concerns salient for policy today?
  - If not, at what point do they become urgent?
  - If so, whose responsibility?
Questions about impact on edge providers and others?

- Can a cap from broadband provider shape other providers of services in broadband ecosystem, e.g., entrepreneurs or s/w designers?
  - Example: Caps in Canada caused Netflix to set a low quality bitrate limit (500kbps vs. 1500kbps) as the default for all users, to remove the cap fear from the public discussion. As a result, streaming of high-definition content on the ISPs that cap in Canada is essentially non-existent. Reduced user experience.
  - Example: Bettering of CODEX to higher resolution using fewer resources with more efficiency would occur regardless of the presence/absence of caps.

- Does cap reduce – rationally or irrationally – demand for data-intensive services & reduce entry of new data-intensive software firms?
  - Leading to decline in incentive to enter w/new services, reducing commercialization of innovation?
    - The open question: How much do entrepreneurs target data-intensive users, which data caps affect? Not many examples other than from Canada, as noted.
    - Related open question: Many things are technically feasible, but not all of them are commercially viable. How to draw a line?

- Tentative conclusion: These questions may become salient at some point for entrants who anticipate growth in data use among US households.
  - Open question: Are these concerns salient for policy today?
  - If not, at what point do they become urgent?
  - If so, whose responsibility?
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Summary

- These slides reviewed concerns with data caps in wireline non-specialized services.
  - A progress report on framing topic. Focused on providing definitions and identifying concerns/questions.
  - Concern is most salient for typical cap in US broadband wireline providers in settings with few or no substitutes at high end.

- What categories of questions emerge?
  - About user understanding, and the need for user education.
  - About how caps manage capacity in long and short run.
  - About user control over data that exceed cap, and whether these concerns are salient today.
  - About impact behavior of other providers of Internet services, and whether these concerns are salient today.
  - About who has responsibility for such concerns?

- Work in progress.
  - Additional terms to define, and questions to consider.
Thank you

• Thank you for your attention.