

What we know, What we guess, and What we need to find out



Broadband Data Collection

The Missing Manual

O'RELY?

Broadband Commons

Introducing Broadband Data

Introduction

If you’ve found this book, you’ve probably wondered at some point: “who has internet, and how good is it?”

Answering that question is no small feat. For one, there is no definitive report of who’s online and how well their internet works. Where social scientists have a decennial census to probe at and glean new information from, broadband analysts rely on a manifold data landscape to figure out what internet access looks like for a population of users. That can mean a painstaking journey of tracking down raw data, triangulating service from heterogeneous sources, controlling for bias, working through data-hygiene quirks, and more.

This book is intended to be the “missing manual” to broadband data users — how to find the data you need, how to wield it to answer your research questions, common gotchas to look out for, and how to share your work back with the community.

About Broadband Commons

[Broadband Commons](#) is an open collective formed to make broadband data more accessible to the digital equity community. Our output is free and available to all. Anyone is invited to join — [click here](#) to become a Commoner 🙌

Authors

Shaddi Hasan

Shaddi Hasan is an assistant professor of computer science at Virginia Tech.

Robert Martin

Robert is a public technologist and owner of Works Public, a broadband data consultancy. He’s worked with governments from the local to federal level on mapping, software development, and data engineering. Robert is based out of Chicago.

Sascha Meinrath

Sascha Meinrath is the Palmer Chair in Telecommunications at Penn State University, and director of X-Lab. Sascha is a co-founder of MeasurementLab.net and BroadbandMapping.com, and has been at the forefront of national broadband mapping initiatives.

Nick Pappin

Former IT person. Credentialed map nerd. Passionate about rural Broadband.

Nick Pappin has worked on almost every aspect of IT from small business desktop support to large scale systems and services supporting an R1 University. Now he works with communities to put together broadband and digital equity plans that will help them know how best to deploy the BEAD funds becoming available to them.

Christine Parker (she/her)

Christine Parker is the Senior GIS Analyst at the Institute for Local Self-Reliance. In her role on the Community Broadband Networks team, Christine is responsible for all map and data-driven projects which include in-depth reports, statistics or maps for articles, and dashboards. Christine also contributes to the team's outreach efforts as the resident mapping expert, and provides guidance on the FCC's National Broadband Map challenge process. Christine holds a Ph.D. in Natural Resources and Environmental Science from the University of Illinois at Champaign-Urbana where she spent a lot of years studying ticks, migrating birds, and wild turkey behavior.

Alexis Schrubbe

Alexis Schrubbe is the Director of the Internet Equity Institute at the University of Chicago. Before joining UChicago, she was responsible for undertaking large scale broadband data collection efforts for the Michigan Moonshot, a program aimed to enhance community-owned broadband in Michigan. Alexis received her PhD from the Technology and Information Policy Institute at the University of Texas where her research straddled broadband access and public policy across multiple geographies in the US and beyond.

Michael Wasser

Acronyms

- ABI:
- BDC: Broadband Data Collection
- BEAD: Broadband Equity, Access and Deployment
- BSL: Broadband Serviceable Location
- CAI: Community Anchor Institution
- CQA: CostQuest Associates
- FCC: Federal Communications Commission
- ISP: Internet service provider
- MDU: Multi-dwelling unit
- NBM: National Broadband Map
- NTIA: National Telecommunications and Information Administration
- RUS: Rural Utilities Service

Part I: FCC Broadband Data

A question you might have asked getting started with broadband data is — where's the authoritative data? Is there a source of truth that will tell me: "who has internet, and how good is it?"

The answer is: it's complicated. The entity charged with knowing what connectivity looks like nationally is the Federal Communications Commission, or FCC, but their report card is a bit mixed when it comes to recording the reality of who's online, and who isn't. In the following sections, we'll cover:

- What efforts the FCC has made to measure internet in America, and how well they performed
- What the current process looks like and key things to know about it
- What kinds of insights you can expect to get from FCC data, and where you may want to augment your research with other sources

How Did We Get Here?

While this part of the book focuses on the current iteration of broadband mapping happening at the FCC, it's preceded by a number of earlier broadband mapping efforts.

Form 477 (data collected, data details, data submission, problems)

- Starting in the year 2000, the FCC has collected data about advertised broadband availability for Internet Service Providers (ISPs) via the Form 477.
- Data collected included the census blocks in which they claim to be able to provide service, the technology used, and the maximum advertised download/upload speeds (i.e., not measures of performance).
- Data was submitted by ISPs twice annually (March & Sep?) and those data were later released in June and December, respectively.
- The latest FCC 477 dataset as of December 2021 is represented in terms of 2020 Census Blocks.
- This dataset was particularly problematic because if a provider claimed to be able to serve at least one location within a census block, the entire block was considered served.
 - Impacts on measures of realistic landscape of broadband availability
 - Impacts on measures of broadband competition
 - More info detailed here (dated, but still relevant):
<https://communitynets.org/reports/profiles-monopoly-big-cable-and-telecom>
- Another issue with this dataset is that in addition to over- representing where an ISP can provide service, the measures of speed represent the highest speed tier the ISP *may* offer in that area, and not what a customer may actually be able to receive. For instance, a customer could end up calling the provider or visiting their website only to find out that

the ISP offers plan(s) with lower speeds than what was reported for the census block that their address falls within.

- Criticism
 - [salty tweets and congressional hearings etc here]

Broadband DATA Act

TODO talk about this as the catalyst of BDC

A New Day Dawns

Clearly, the status quo of Form 477 was not working, with all of the data-quality and usability issues that were flagged by industry, communities, and government insiders alike. What came next was a concerted effort to rethink how the FCC collects broadband data, ____

What new processes, products, and concepts were introduced with this large-scale pivot in how mapping is performed at the FCC? In the following sections we'll introduce you to the current state of mapping affairs at the agency.

Broadband Data Collection Program

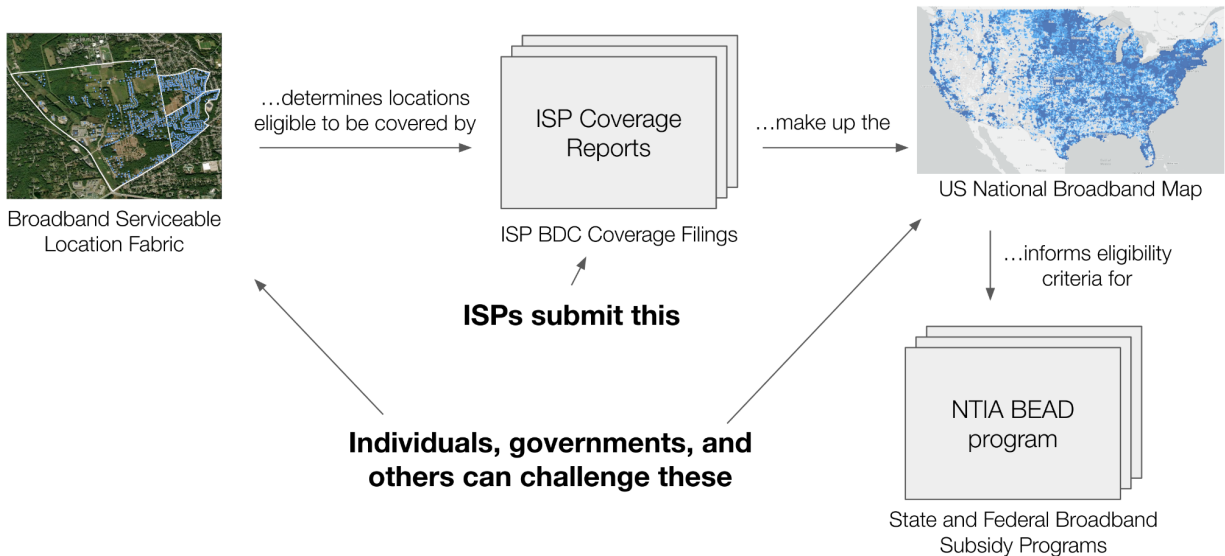
What is it?

The Broadband Data Collection program (or “BDC” for short) is a new process implemented by the FCC in ____ 2021 to solicit broadband availability from ISPs, as well as challenges to that claimed availability. It represents a part of the agency's broader efforts to overhaul broadband availability data, both in terms of how finely it's measured and how it's made accessible to the public.

How does it work?

TODO

How the BDC Process Fits Together



Fixed Availability Data

Not Public

- Location data - lat/long/address/MDU
- ISP methodologies
- Subscriber data

Public Facing

- ISP Details
- Location Details
- Broadband Details
- Public Data Downloads
 - Instructions for using API if we create an alternative house for BDC
 - Gitcard to code for automating download and creating in-house database for working with NBM data

Broadband Serviceable Location Fabric

- What is it?
 - A Very Expensive Map of U.S. Homes and Businesses™
 - A map of buildings that should, in theory, be able to subscribe to consumer-grade high-speed internet

- In response to the problems with the Form 477 problems Congress passed the Broadband Deployment Accuracy Technology Availability Act (or Broadband DATA, for short).
- The FCC was charged with creating a national location database of broadband serviceable locations (BSLs), now known as the Broadband Serviceable Location Fabric (or “the Fabric” for short)
- In addition to creation of the Fabric, the BEAD Act also requires providers to report service availability at the individual BSL (TODO: References below) level.
- What it is not?
 - The fabric does not contain information about internet service, such as which ISPs serve a location, what speeds they offer, etc. It is simply a map with latitude-longitude coordinates for locations where a home or business should be able to get broadband.
 - The fabric specifically excludes any location that is not a residence or business. The rule of thumb is: would this location normally subscribe to mass-market internet?
 - This is missing data that is not end-user servicing. Examples would be:
 - Middle mile fiber lines
 - Backhaul fiber lines
 - Internet Exchange Points
 - Data Centers - may be on the map but not mass market
 - Broadband availability data
 - Service offerings, only **max advertised**
 - It is also not the web app found here: [Home | FCC National Broadband Map](#)
 - This was created by Emprata. ([FCC Broadband Data Collection contract for Data Architecture and Design Services awarded to Emprata – Emprata](#)) (TODO: Further reference needed)
- How was it created?
 - Ostensibly, parcel data + ...
 - YouTube video queued to the right timecode
[<https://youtu.be/vb7vIORyH54?t=620>]
 -
- How to get it? (Licensing - Do you need one, how to get it, and what it means)
 - Do you need one? - Shaddi has a great article about this, [You Probably Don't Need the BSL Fabric | by Shaddi Hasan | SPIN@VT | May, 2023 | Medium](#)
 - How to get it? - [FCC Broadband Serviceable Location Fabric - CostQuest](#)
 - Fabric data dictionary - [[link](#)]
 - Active, BSL File [[CQA-FCC Data Dictionary-Client V2 Active - BSL.xlsx \(cqafabric.s3.amazonaws.com\)](#)]
 - This describes the data about BSL's that is not public ([Note below](#))
 - Active, No BSL File [[CQA-FCC Data Dictionary-Client V2 Active - NonBSL.xlsx \(cqafabric.s3.amazonaws.com\)](#)]

- This is the same data as the Active BSL File but about locations that are flagged as not BSL's (Schools, Libraries, etc)
- Secondary File [[CQA-FCC Data Dictionary-Client V2 Secondary.xlsx \(cqafabric.s3.amazonaws.com\)](https://cqafabric.s3.amazonaws.com/CQA-FCC%20Data%20Dictionary-Client%20V2%20Secondary.xlsx)]
 - This is a secondary address file. It is unclear if these are addresses that have been submitted as corrections and will be secondary forever or will eventually be listed as the primary address in the Active BSL data.
- Summarizing Fabric Challenge Data
 - Challenge outcome data [[link](#)]
 - Some data is not geocoded in the file above. There is a tool built by the Broadband Commons team and available here. [[bdc-data-tools/challenge-lookup at main · broadband-commons/bdc-data-tools \(github.com\)](https://github.com/broadband-commons/bdc-data-tools)]
- Gitcard to code for analyzing challenge data in the format that Fabric-holders receive it.

National Broadband Map

What it is. The National Broadband Map is the FCC's dataset capturing where broadband service is available on a *per-location* basis.

- What it could be...

Development

- Policy summary that led to this
- Drama that ensued and the players involved (e.g., CQA, FCC)

Where does the data come from?

Everything about the service availability reported in the National Broadband Map starts with data self-reported by ISPs.

ISPs are required to submit data every six months outlining the *list of locations* at which they provide service, the *highest speed service plan* they offer at each location, as well as other metadata about their service offerings (such as the type of technology used to serve that location). In addition, ISPs submit information about the number of subscribers they have in each census block they serve, similar to what was previously submitted via the Form 477 process. The subscriber data seems to be used as a quality check on the service availability data, which is the main focus of the BDC process.

There is no single methodology all ISPs use to submit this data. The general rule is that an ISP can claim a location as served if they could, if requested, provide service at the advertised speed

to a location within ten days of a request. There's room for interpretation here: two well-intentioned ISPs could make different reasonable assumptions in translating this guidance into a list of locations they serve, resulting in different reported service availability.

The service availability challenge process. When an ISP reports they provide service at a given speed to a location, there's no verification that the offered speeds in a location are actually correct (e.g., via network measurements). To account for this, the BDC process also allows for individuals, governments, ISPs, and others to *challenge* the service an ISP reports to a location.

- Bulk vs individual challenges
- Challenge adjudication process: challenger and ISP hash it out, if they can't agree, the FCC gets the final say. Each step can take 90 (?) days.

How often is this data updated?

The public availability data sets appear to be updated every other Thursday however the data is as of the previous day and notated as such. This appears to occur as filers update their availability against the fabric. Such as in the case of an ISP accidentally stating they have services available in a neighborhood when it is on their build out list. Additionally we have seen the data get updated after the minor update window. This has usually happened because the data exports were broken.

As a tool to assist users in ensuring they are talking about we propose and have adopted a date based semantic versioning style based off of date. For the major version we use the fabric date of the base map. The minor version is the availability release date. Finally, the bug version is used to connote any additional out of band updates. This may be related to an issue where a file didn't generate correctly or other data cleanliness issues.

In practice this would look like 20020630.20230426.2 for our current release. The fabric is from 2023-06-03, the availability is from 2023-04-26 and there was a problem with that release which led to the bugfix version being 2 due to an issue where fiber data from Utah was blank.

API

The National Broadband Map pulls in data on the fly from an undocumented REST API. This section documents it, in the name of science.

Note: while the National Broadband Map API is "public" in the sense that anyone can access it via an unauthenticated HTTP client on their machine (aka a web browser), we do not know what the FCC's official position is on accessing the following endpoints outside of surfing the National Broadband Map. As a general rule, if the data contains addresses or latitude-longitude coordinates, it's property of CostQuest, and scraping

their data doesn't appear to be condoned. Talk to a lawyer, be respectful, and use at your own discretion.

The base URL for the API is: `https://broadbandmap.fcc.gov/nbm/map/api`

- `GET /fabric/detail/{PROCESS ID}/{LOCATION ID}`
 - Returns details for a location
 -

Broadband Funding Data

Broadband Mapping Funding Already Spent

\$350 million re: 2010 mapping/original broadband map

\$45 million FCC Broadband Fabric

\$48 million NTIA Broadband Fabric Access?

??? RUS/ABI (2017-2021 era)

??? NTIA Measures of Broadband Need

??? super-secret "internal" map (apparently NTIA dev'ed it, but wouldn't share w/ other agencies)

Vs.

\$0 open alternative run by the scientific & research community

Analyzing FCC Data

Spatial Analyses

- Spatial analysis of BEAD-defined served/unserved using standardized geography (e.g., state, zipcode, county, etc...)

Version Changes

- Evaluate changes between map versions (major (6 month) and minor (2 week) updates)

Process issues

BSL Updates to the fabric (Unit changes, Address updates, etc.)

Part II: Additional Broadband Data

How to Not Use the Fabric

Author: Robert (and calling all collaborators)

Synopsis: You don't need the CostQuest fabric to do your work. Roll your own with open data!

M-Lab

Introduction

What can I use M-Lab data for?

Ookla

Netrics

Glossary

- **BSL Fabric:** A database of points that underlies the National Broadband Map. Each point roughly represents a building. This database is maintained by CostQuest Associates, under contract to the FCC.
- **FCC National Broadband Map:** This is the map that shows service availability, based on both the BSL Fabric as well as data provided via the BDC process.
- **Broadband Data Collection:** The FCC program that defines the processes by which data is collected to create the National Broadband Map. The BDC includes both the process by which data is collected from Internet service providers every six months, as well as the service availability challenge process, by which individuals, governments, ISPs, and other organizations can challenge the reported availability of broadband on the National Broadband Map.
- **Form 477:** The name of the form used for collecting service availability data from ISPs prior to the introduction of the BDC process. Sometimes used interchangeably with the dataset represented by the previous version of National Broadband Map, which used Form 477 as its data source.