Colorado Broadband Data & Development Program
October 2017 Data Delivery Report

The State of Colorado's first broadband mapping project began when the General Assembly passed SB08-215 and SB09-162, which directed the Office of Information Technology (OIT), working in consultation with the Governor's Innovation Council, to identify broadband service areas within the State and to produce a geographically-based statewide inventory of broadband availability. The resulting data and maps were intended to provide the starting point for developing a strategy for broadband service deployment to the state's underserved areas and to begin the discussion of how to increase broadband adoption and usage in those areas that are currently served. The project also included the development of an interactive web service allowing the public to toggle on and off broadband technology and speed layers, document inaccuracies in the data, display demographic information, and view the providers in their area by address search.

Purpose of this Report

This report provides details about the various techniques used by OIT to collect, validate, process, and publish data submitted by broadband service providers. The resulting broadband coverage areas are made available to the general public through the Broadband Mapping Application.

Status of Data Collection

The broadband mapping and development efforts began with a third party contractor through a data collection contract signed on March 22, 2010. After the October 2014 data submission, the State Broadband Initiative grant ended and the program was picked up by the State of Colorado. OIT continues to make efforts to improve broadband data collection and its broadband database. For the past 12 cycles, OIT's efforts to track down broadband providers have yielded positive results.

Currently 146 providers have been identified: 15 do not meet broadband requirements, 55 reported no changes to their data, 48 submitted data updates, 5 are non-responsive and have not provided data. The effort to identify all broadband providers in Colorado is ongoing as OIT continues to strive to improve its database through bi-annual outreach to providers. The ongoing research efforts of the Team have yielded a more nuanced view of the service provider community and an enhanced view of the service provider landscape.

The following table categorizes all possible broadband service providers in Colorado known to the Team:

Service Providers	October 2017
Potential Identified Providers	**146**
Data Sets Delivered	97
Has Never Submitted Data	5
Not a Broadband Provider	15
Will Not Provide Data	12
Out of Business	17

The following table describes service providers included in the current data delivery:

Service Provider Updates	October 2017
New Providers	0
Updated Data	42
Responded "No Data Change"	55
Removed Coverage; Non-responsive	0
Removed coverage Provider request	0
Data Sets in Public Database	**97**

OIT maintains a database of statewide Community Anchor Institutions (CAIs) with regards to activity, location, and broadband speed. OIT has expanded the number of CAIs submitting speed test information between October 2013 and present by reaching out to known CAI's to update provider information and perform speed tests. Providers have also been encouraged to reach out to CAIs within their broadband coverage area. The following table shows the number of CAIs that have been identified in the state:

Community Anchor Institutions	April 2017
	Count
Cat. 1 - School K -12	2395
Cat. 2 - Library	266
Cat. 3 - Medical/Healthcare	1008
Cat. 4 - Public Safety	1799
Cat. 5 - University/College	87
Cat. 6 - Other Government	1031
Cat. 7 - Other non-Government	352
TOTALS	**6938**

The CBDDP chooses to report multiple CAIs at the same address as distinct entities (i.e. a county sheriff's office and a 911 call center at the same address are reported as two distinct entities)

Validation and Verification Processes for the October 2017 Data Set

Techniques:
1. Automated Validation
2. Analysis of Change
3. Visual Review
4. Website Validation
5. Feedback Loop
6. CAI Speed Test Analysis
7. Crowd Sourcing
8. Automated Confidence Score

1. Automated Validation

OIT has been developing and improving automated validation scripts since its first data delivery processed in house in April 2011. OIT runs the scripts it has developed on the final dataset post processing in every delivery cycle. The data delivery includes documentation demonstrating that the data has passed the CBMP standards set in place and met all necessary requirements.

OIT's automated scripts:

- Verifies that feature classes are properly named
- Verifies all columns are properly named and defined
- Verifies all table value domains are adhered to
- Captures the required information to accurately complete the records count and provider table tabs for the data package
- Cross references and creates statistical tables of technology type and valid speed combinations for both service provider and CAI data
- Compares FCC assigned Frequency Reference Numbers (FRNs) to provider names to ensure consistency across the data set
- Ensures consistency in provider names
- Identifies possible duplicates among CAIs
- Creates a statistical table for all features classes, including: records details, service provider information, and attribution frequencies
- Ensures the data model, business rules, and schema are in compliance

2. Analysis of Changes

The major changes between the April 2017 and the October 2017 delivery:

- Streamline data submission process and reduce time required for service providers to prepare and submit data
- Foster positive relationships with providers by making less phone calls and making appointments for calls and data exchanges
- Changes and increase in detail of data submission requirements for broadband providers
- Reviewing the data status of all providers to identify gaps in data quality and reaching out to providers between deliveries in an effort to strengthen relationships and coordination efforts.

The coverage in this delivery reflects the increase or decrease in service from these changes. The total number of features delivered for each data type declined very slightly this cycle. This is due in large part to having refined the process of displaying overrepresented coverage's from provider data by removing areas where there is no infrastructure (see Data Processing section for more information on this process).

The following table summarizes the comparison of data delivered this cycle by data type:

	PLSS QQ		Wireless Service		Middle Mile	
	April 2017	October 2017	April 2017	October 2017	April 2017	October 2017
New Providers	-	-	-	-	-	-
Received new data	31	30	21	17	31	21
No Changes	26	31	23	35	33	39
% of the total number of features changed	-1.06%		-1.77%		-1.04%	

3. Visual Review

OIT routinely reviews the coverage areas of new service providers and those with updates or changes to coverage in preparation for each delivery. After the October 2014 data delivery, in an effort to prevent providers from exaggerating coverage, PLSS quarter-quarter sections and address point data are used in conjunction with imagery to verify and reduce areas of claimed coverage over undeveloped land. PLSS quarter-quarter sections with no address points and no evident development based on imagery were selected and removed from each provider's coverage. We also verified tower points falling atop other surface features, for instance, water silos, grain elevators, dwelling structures, or tall buildings. Additionally, tower specification information was requested from all wireless providers, if information was currently unknown.

Numerous wireless providers submit PDF's of polygon coverage or claimed coverage extended uniformly a certain radius from the tower. In order to prevent further exaggeration of wireless coverage, beam radius, azimuth, tower height, and frequency were requested for each tower to be used in a wireless coverage model. Starting with the April 2015 delivery, address level data is requested of all providers in order for OIT to better verify and represent accurate provider coverage. For landline providers, submitted location data is used to identify which PLSS quarter-quarter sections are included in their respective coverage. With wireless providers, address data and imagery are used to verify that the claimed coverage areas are spread over developed land. A confidence rating was implemented in order to indicate both the quality of the data received from providers, and how accurate the coverage is believed to be. For each provider, the confidence rating is based on the quality of data submitted by provider, as well as the resulting accuracy of the coverage. A more accurate coverage model was created for all the providers in compliance with our requests, therefore a higher confidence rating was given those providers individual datasets.

4. **Website Validation**

   After the October 2014 data delivery, OIT also extended validation efforts to provider website analysis. For all providers having a website, the Team visited each site to validate the provider's maximum advertised download and upload speeds in megabytes per second (Mbps), as well as the price associated with each speed. Previous data deliveries outlined by the NTIA included a speed tier format; however, this method is no longer preferred. Additionally, OIT documented inconsistencies between the data deliveries and the advertised speeds for internal processing.

5. **Feedback Loop**

   As a routine part of the processing work flow, all service providers were given the opportunity to review the final geospatial representation of their data in the form of KML files viewable in Google Earth. The Team asked for follow-up conversations to create a dialogue with providers on improving OIT's depiction of their coverage area.

6. **Crowd Sourcing**

   Colorado broadband speed tests are collected in four ways: a public speed test application, a provider-only speed test application, a CAI speed test, and the Colorado Broadband Mapping Application. The public speed test is located in the mapping application (http://maps.co.gov/publicspeed/) and an image of the speed test is shown below. A direct link speed test application also exists that can be placed on any website, which will help increase availability of the speed test and collect more results than the CBDDP mapping application alone.

Using the application, the general population can conduct speed tests from their home or office. The speed test is provided by an Ookla application and results are given for download and upload speeds in Mbps. In addition to test results being collected, the user's location, provider name, technology type, and monthly cost are also requested with the test results. The purpose is to collect reports of service from citizens and Community Anchor Institutions in order to compare against provider data. The speed tests are processed quarterly and included in validation for individual providers.

The provider-only speed test application allows providers to submit speed tests during service calls or installations, at which time they are able to test the bandwidth unrestricted by the particular service level subscribed to by the customer. OIT is continuing efforts to collect speed tests using the aforementioned methods, which are used to compare against provider data.

7. Automated Confidence Score

Starting in April of 2017, OIT began implementing a new confidence metric to measure the quality of the broadband data received and processed. This metric is compiled via automated script, and is entirely dependent on the data provided by the Internet Service Provider. The criterion for the confidence scoring is outlined in the Confidence Script Documentation that accompanies the user information available for the script. The script is run as part of the processing phase and confidence scores are logged in both the Team's broadband provider database and its GIS databases. This data will be used in several ways, in that it will be published to the public facing broadband map and it will be used to track the quality of data submission. Below is a graphic illustration of the confidence score distribution based on data submitted by providers for the current Broadband Data Delivery. Data confidence scores are on a 100 point scale, with 100 being the best possible score and 0 being the lowest possible score.

During this data delivery cycle the confidence calculation and scoring system is still considered a work-in-progress, meaning the precision of the scoring equation is still being refined. In light of this, confidence scores may be adjusted in future data cycles because of updates to the formula based on feedback and identified improvements. The presently displayed confidence scores are based on the current formula, which is believed to be the best demonstration of The Team's belief in the precision and accuracy of broadband data coverage.

Landline Data Confidence Score Frequency

■ October '17 Providers
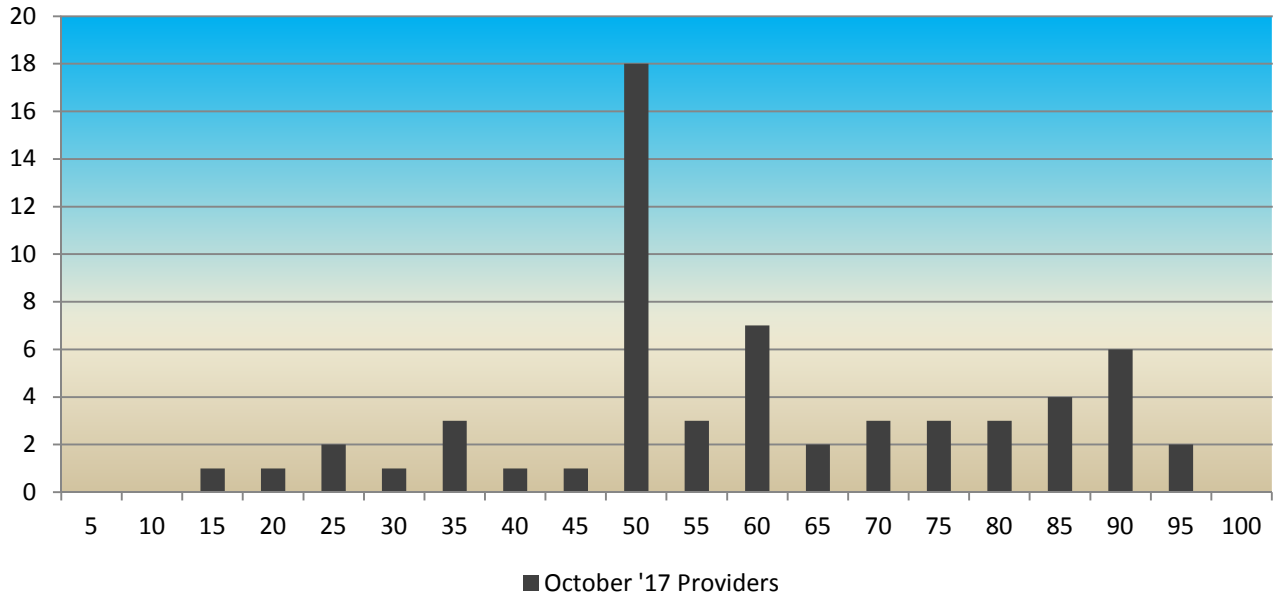
Number of landline broadband providers with confidence scores falling within score ranges of 5

Wireless Data Confidence Score Frequency

■ October '17 Providers
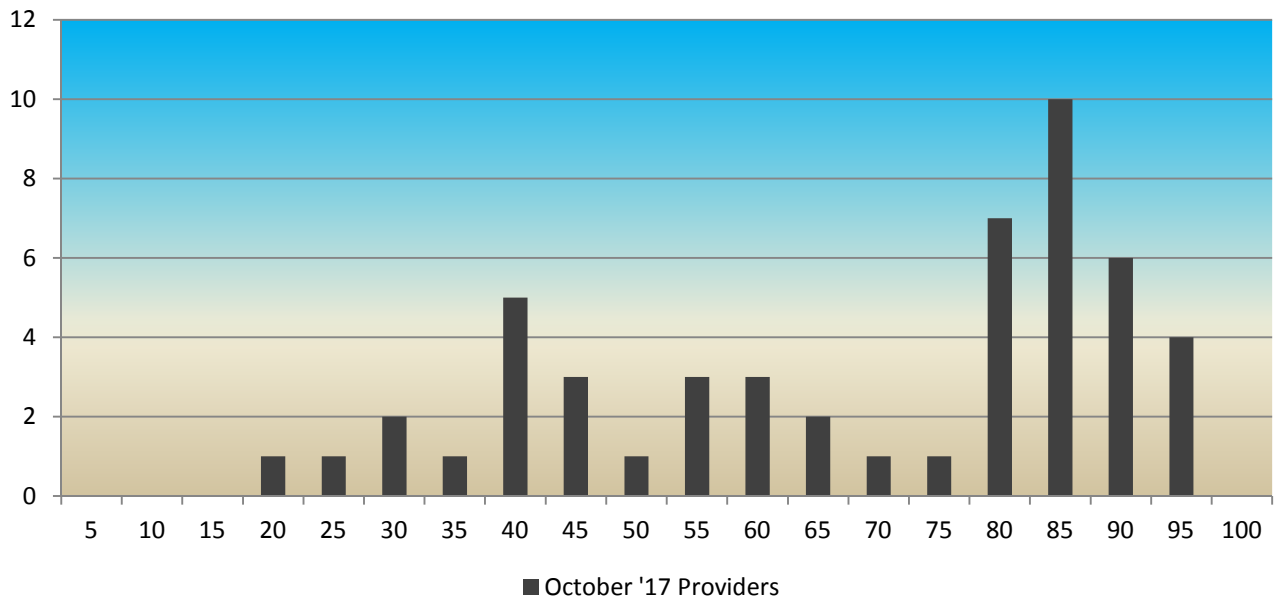
Number of wireless broadband providers with confidence scores falling within score ranges of 5

The confidence script separates weight groups into three categories: attributes, data type, and data age. Each of these categories holds a percent weight towards the final confidence score. Additionally, multiple criteria exist within each group which each carry their own weights contributing to the group total. The final confidence score for each provider is based on the following equation -

[**Attributes Total** x 0.25] + [**Data Age Total** x 0.25] + [**Data Type Total** x 0.50] = Final Confidence Score

The individual group totals are based out of a maximum of 100, and each criterion specific to those groups carries a designated weight towards the overall total. OIT places a heavier weight on data type over data age and attributes given that the data type of the provider submission has a major impact on the spatial quality and accuracy of the resulting processed coverage area. Our priority to produce the most spatially accurate representation of broadband coverage in the State of Colorado thus results in this aspect playing a major role on the final data confidence score of each service provider.

Summary of Process

During the first two years of the program, OIT contracted a third party business (Critigen) to perform data processing. Starting with the April 1, 2011 delivery, OIT hired staff and brought this process in-house. OIT continued with in-house staff through the remainder of the State Broadband Initiative to January 15, 2014. In-sourcing has improved data quality and increased the number of providers reporting in comparison to previous deliveries.

The completion of the State Broadband Initiative posed many challenges in 2015 to continue mapping state broadband coverage. The State of Colorado has and will continue to map broadband coverage. The NTIA previously designated that all landline broadband coverage be represented in the form of census blocks from the US Census Bureau. OIT has decided to move away from this unit of representation for broadband purposes based on numerous conversations with providers, surveys, and general complaints about how the data is being represented. Therefore, OIT will use the Public Land Survey System at the Quarter-Quarter section level to map landline coverage areas. The new geographic unit has increased the level of detail to which we are able to represent coverage areas. Imagery and address location data is used in conjunction with this geographic unit to ensure accuracy and reduce overrepresentation. A more detailed description of the data processing methods is provided in the Process Guide, which is included with the data submission (CO_Process_Guide_2017_10_01.pdf).

The Team has implemented the following process, which may vary from other state programs:

Data Collection

1. The data gathering process begins by identifying and contacting potential broadband providers. Participation in the program is voluntary, but many providers choose to support our effort.
2. OIT reaches out to providers who have not previously submitted data, in order to create a more comprehensive state dataset.
3. OIT also contacts each currently participating provider to allow them to report data changes or confirm the existing data is still accurate.
4. OIT works closely with providers to help find the best and most accurate method to submit data. We encourage a uniform data submission across all providers, but accept data in various formats dependent on the provider's software limitations. Additional details are located in the Data Submission Guidance page within the State's Broadband Portal.

5. Beginning with the April 2015 cycle, data requirements have changed. New data requirement information is emailed to providers with OIT's initial outreach package.
6. Numerous providers have expressed concern due to the requirement of subscriber level data and location for all provider types. OIT enforces a strict confidentiality policy and offers Non-Disclosure Agreements in order to maintain subscriber anonymity and offer assurance to providers.

Data Processing

OIT processes three types of data: wireless, middle mile, and landline. All data is processed in accordance with the Broadband Geoprocessing Guide, which includes loading processed data into the Team's Confidence Template, QC Tools, and Staging tool in order to standardize datasets.

Wireless

- Wireless data submitted as a service coverage area is re-processed for accuracy.
- Wireless data submitted as tower locations are processed using signal propagation software to create a coverage plot.
- Statewide and provider submitted address data is used to verify coverage plots and their proximity to developed areas.
- Confidence values are assigned to each wireless coverage based on age and quality of data submitted by provider and assessment of accuracy
- Representing typical and subscription speeds continues to be an issue, as less than one third of the providers report typical and subscription speed information.
- OIT requests pricing information from providers and the amount of providers who included this information in their data submissions has increased compared to past broadband cycles.

Middle Mile
- Middle mile locations are reported by providers in either address or latitude longitude format and are processed following processing guide lines.
- Validation methods are used to check the data accuracy, as described in "Validation and Verification" section of this document.
- Middle mile locations are used in conjunction with propagation software to model fixed wireless coverage area representative of each provider.
- Submission of middle mile data or lack thereof affects the data confidence score of each provider in both landline and wireless datasets.
- The middle mile dataset tracks ownership, output capacity, and type of each middle mile unit.

Landline
- Previously, landline data was divided into three separate categories: census blocks less than two square miles, census blocks greater than two square miles represented as road segments, and service address points. Currently, these categories are all processed in PLSS quarter quarter section format.
- Submitted subscriber data was used to generate PLSS coverage in the case of providers which submitted required level data.

- To ensure provider coverage is not over represented and only covers developed areas, statewide address data is used to filter and verify which PLSS quarter-quarter sections have developed land (buildings, homes, establishments etc.). Address data is not available for several counties so a manual check of aerial imagery is applied.
- Confidence scores are assigned to each provider's PLSS coverage using an automated script based on the age, quality and completeness of data submitted.
- Representing typical and subscription speeds continues to be an issue, as less than one third of the providers report typical and subscription speed information.
- OIT requests pricing information from providers and the amount of providers who included this information in their data submissions has increased compared to past broadband cycles.

Pricing Data

OIT requests monthly pricing rates for each speed configuration from providers along with broadband data. We have seen mixed results in this effort; some providers offer complete pricing information while others contribute information for only some of their speed groups. For each provider, OIT stores and updates pricing information and uses scripts to automate populating pricing in PLSS and wireless features based on provider, transmission technology, and speeds. In instances where the provider does not have price information for a specific speed but does for other speeds, price per Mbps is calculated based on the average of the price per Mbps values of the other speeds offered. For example -
A landline provider offers four different speed groups, however they submit pricing information for the speeds below, while not submitting pricing information on their 70 Mbps maximum advertised download speed –

20 Mbps Down - $39.95 per month
60 Mbps Down - $59.95 per month
100 Mbps Down - $79.95 per month

39.95/20 = $1.99
59.95/60 = $0.99
79.95/100 = $0.79

Average Price per Mbps Download Speed = (1.99 + 0.99 + 0.79) / 3
Average Price per Mbps Download Speed = $1.25

In this example the features with a download speed of 70 would have a price per Mbps of download speed of $1.25 while the other three speeds would retain their respective price values.

Additionally OIT calculates and tracks price averages at the quarter quarter level in order to better represent the cost of broadband based on spatial location rather than individual provider. Landline providers are already in quarter quarter format while wireless features are spatial joined to the PLSS quarter quarter section grid in order to facilitate this process. Prices are averaged based on the number of unique providers offering service in a given quarter quarter section as shown in the diagram below.

OIT_ID 11579

Provider 1
PPMBDown = $1.50
PPMBUp = $3.50

Provider 2
PPMBDown = $2.25
PPMBUp = $5.75

Provider 3
PPMBDown = $9.10
PPMBUp = $12.45

OIT_11579
PPMBDown = $4.28
PPMBUp = $7.23
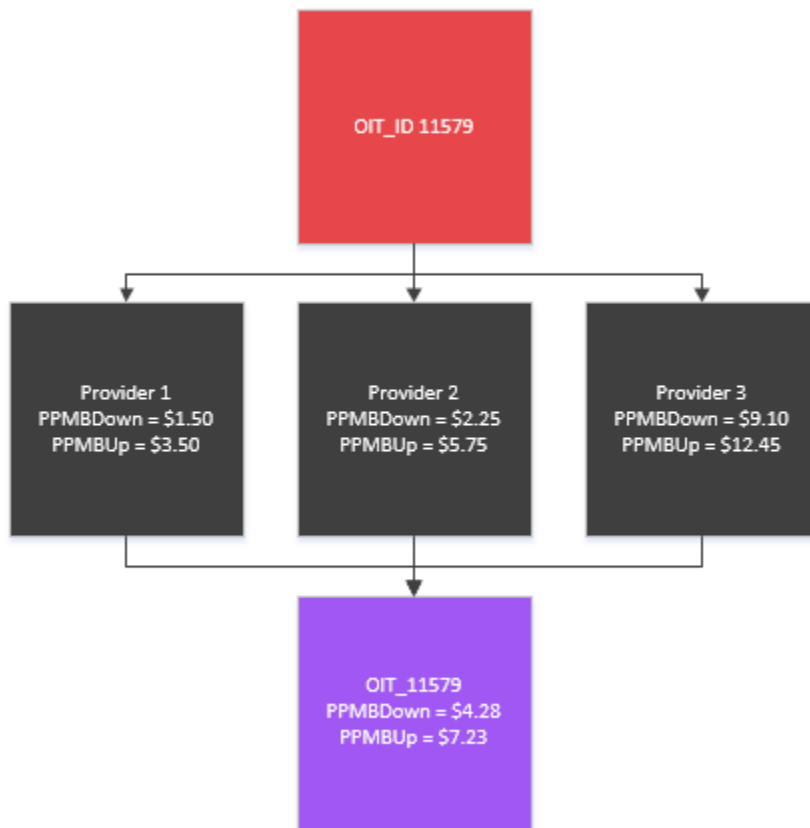
Colorado	

Data Summary	

File Summary	
File Type	Number of Records
Total Records in All Files	178260
PLSS Quarter Quarter Sections	168897
Wireless	113
Community Anchor Institutions	6938
Middle Mile	2312
Metadata Provided for Geospatial Data	Yes

File Type	Number of Records
Total Records in All Files	97
Provider Information	

Colorado

PLSS Quarter Quarters

Data Type	Code	Data Element	Count	%	Data Type	Code	Data Element	Count	%
Records Details		Total Records	1588034		**Typical Download Speed**	3	>= 768 kbps. < 1.5 mbps.	1	0.0000059%
		PLSS with Broadband	168897			4	>= 1.5 mbps. < 3 mbps.	0	0.00%
						5	>= 3 mbps. < 6 mbps.	493	0.29%
		(with & without broadband)				6	>= 6 mbps. < 10 mbps.	0	0.00%
		Total Census Blocks in the State (with & without broadband)	201062			7	>= 10 mbps. < 25 mbps.	761	0.45%
						8	>= 25 mbps. < 50 mbps.	0	0.00%
Services Provider Details		Number of Distinct Providers	60			9	> 50 mbps, < 100 mbps.	10	0.000059%
		Number of Distinct "Doing Business As"	59			10	> 100 mbps, < 1 gbps.	320	0.19%
		Number of Distinct FRN	59			11	> 1 gbps.	0	0.00%
							ZZ "null"	167312	99.06%
Technology	10	Asymmetric xDSL	90294	53.46%					
	11	ADSL2/ADSL2+	4192	2.48%					
	12	VDSL	1788	1.06%					
	20	Symmetric xDSL	1693	1.002%	**Max. Advertised Upload Speed**	1	< 200 kbps	156	0.00092%
						2	>200 kbps, < 768 kbps.	8361	4.95%
	30	Other Copper Wireline	13392	7.93%		3	>= 768 kbps. < 1.5 mbps.	35636	21.099%
	40	Cable Modem-DOCSIS 3.0	41220	24.41%		4	> 1.5 mbps, < 3 mbps.	23985	14.2%
	41	Cable Modem-Other	603	0.36%		5	> 3 mbps, < 6 mbps.	14116	8.36%
	50	Optical Carrier/Fiber	15715	9.304%		6	> 6 mbps, < 10 mbps.	93	0.00055%
	60	Satellite	0	0.00%		7	> 10 mbps, < 25 mbps.	32715	19.37%
	70	Terrestrial Fixed Wireless-Unlicensed	0	0.00%		8	> 25 mbps, < 50 mbps.	40025	23.7%
	71	Terrestrial Fixed Wireless-Licensed	0	0.00%		9	> 50 mbps, < 100 mbps.	2916	1.7%
	80	Terrestrial Mobile Wireless	0	0.00%		10	> 100 mbps, < 1 gbps.	3417	2.02%
	90	Electrical Power Line	0	0.00%		11	> 1 gbps.	7477	4.43%
	0	Other	0	0.00%					
Max. Advertised Download Speed	2	> 200 kbps, < 768 kbps	549	0.33%	**Typical Upload Speed**	2	>200 kbps, < 768 kbps.	1	0.0000059%
	3	> 768 kbps, < 1.5 mbps.	671	0.397%		3	> 768 kbps, < 1.5 mbps.	403	0.24%
	4	> 1.5 mbps, < 3 mbps.	19830	11.74%		4	> 1.5 mbps, < 3 mbps.	701	0.42%
	5	> 3 mbps, < 6 mbps.	10279	6.1%		5	> 3 mbps, < 6 mbps.	134	0.00079%
	6	> 6 mbps, < 10 mbps.	5498	3.26%		6	> 6 mbps, < 10 mbps.	0	0.00%
	7	> 10 mbps, < 25 mbps.	32266	19.1%		7	> 10 mbps, < 25 mbps.	16	0.000095%
	8	> 25 mbps, < 50 mbps.	10101	5.98%		8	> 25 mbps, < 50 mbps.	0	0.00%
	9	> 50 mbps, < 100 mbps.	10460	6.19%		9	> 50 mbps, < 100 mbps.	10	0.000059%
	10	> 100 mbps, < 1 gbps.	69497	41.15%		10	> 100 mbps, < 1 gbps.	320	0.19%
	11	> 1 gbps.	9746	5.77%		11	> 1 gbps.	0	0.00%
							ZZ "null"	167312	99.06%
Provider Type	1	Provider	168055	99.5%					
	2	Reseller	842	0.5%					
End User Name	1	Residential	18916	11.2%					
	2	Business	16680	9.88%					
	3	Government	0	0.00%					
	5	Residential/Business Identical	133301	78.92%					

Wireless

Data Type	Code	Data Element	Count	%	Data Type	Code	Data Element	Count	%
Record		Total Records	113			2	>200 kbps, < 768 kbps.	0	0.00%
						3	> 768 kbps, < 1.5 mbps.	0	0.00%
Services Provider Details		Number of Distinct Providers	52			4	> 1.5 mbps, < 3 mbps.	0	0.00%
		Number of Distinct "Doing Business As"	52		Typical Download Speed	5	> 3 mbps, < 6 mbps.	4	3.54%
		Number of Distinct FRN	51			6	> 6 mbps, < 10 mbps.	2	1.54%
						7	> 10 mbps, < 25 mbps.	3	2.65%
Technology	10	Asymmetric xDSL	0	0.00%		8	> 25 mbps, < 50 mbps.	3	2.65%
	20	Symmetric xDSL	0	0.00%		9	> 50 mbps, < 100 mbps.	2	1.77%
	30	Other Copper Wireline	0	0.00%		10	> 100 mbps, < 1 gbps.	0	0.00%
	40	Cable Modem-DOCSIS 3.0	0	0.00%		11	> 1 gbps.	0	0.00%
	41	Cable Modem-Other	0	0.00%			ZZ "null"	99	87.61%
	50	Optical Carrier/Fiber	0	0.00%		2	>200 kbps, < 768 kbps.	4	3.54%
	60	Satellite	6	5.31%		3	> 768 kbps, < 1.5 mbps.	11	9.73%
	70	Terrestrial Fixed Wireless-Unlicensed	97	85.84%		4	> 1.5 mbps, < 3 mbps.	9	7.96%
	71	Terrestrial Fixed Wireless-Licensed	3	2.65%	Max. Advertised Upload Speed	5	> 3 mbps, < 6 mbps.	26	23.01%
	80	Terrestrial Mobile Wireless	7	6.19%		6	> 6 mbps, < 10 mbps.	9	7.96%
	90	Electrical Power Line	0	0.00%		7	> 10 mbps, < 25 mbps.	22	19.47%
	0	Other	0	0.00%		8	> 25 mbps, < 50 mbps.	18	15.93%
						9	> 50 mbps, < 100 mbps.	4	3.54%
Max. Advertised Download Speed	3	> 768 kbps, < 1.5 mbps.	4	3.54%		10	> 100 mbps, < 1 gbps.	7	6.19%
	4	> 1.5 mbps, < 3 mbps.	0	0.00%		11	> 1 gbps.	3	2.65%
	5	> 3 mbps, < 6 mbps.	18	15.93%		2	>200 kbps, < 768 kbps.	1	0.88%
	6	> 6 mbps, < 10 mbps.	8	7.08%		3	> 768 kbps, < 1.5 mbps.	2	1.77%
	7	> 10 mbps, < 25 mbps.	38	33.63%		4	> 1.5 mbps, < 3 mbps.	1	0.88%
	8	> 25 mbps, < 50 mbps.	18	15.93%	Typical Upload Speed	5	> 3 mbps, < 6 mbps.	2	1.77%
	9	> 50 mbps, < 100 mbps.	15	13.27%		6	> 6 mbps, < 10 mbps.	5	4.42%
	10	> 100 mbps, < 1 gbps.	9	7.96%		7	> 10 mbps, < 25 mbps.	1	0.88%
	11	> 1 gbps.	3	2.65%		8	> 25 mbps, < 50 mbps.	2	1.77%
						9	> 50 mbps, < 100 mbps.	0	0.00%
Spectrum	1	800 Mhz Spectrum Used	1	0.88%		10	> 100 mbps, < 1 gbps.	0	0.00%
	2	700 Mhz Spectrum Used	0	0.00%			ZZ "null"	99	87.61%
	3	1900 Mhz Spectrum Used	4	3.54%					
	4	1700 Mhz Spectrum Used	1	0.88%					
	5	2500 Mhz Spectrum Used	3	2.65%					
	6	Unlicensed Spectrum Used	96	84.96%					
	7	Specialist Mobile Radio Service	2	1.77%					
	8	Wireless Communication Service	0	0.00%					
	9	Satellite	6	5.31%					

Colorado

Middle Mile

Data Type	Code	Data Element	Count	%	Data Type	Code	Data Element	Count	%
Record Details		Total Records	2312			1	Fiber	937	40.53%
						2	Copper	4	0.17%
Services Provider Details		Number of Distinct Providers	60		**Facility Type**	3	Hybrid Fiber Coax (HFC)	1	0.0004%
		Number of Distinct "Doing Business As"	58			4	Wireless	1370	59.26%
		Number of Distinct FRN	58				N/A "null"	0	0.00%
Ownership	0	Owned	1579	68.29%	**Lat / Long**		# of Lat/Long in State	2312	100%
	1	Leased	733	31.7%			Total Lat/Long	2312	
Facility Capacity	1	Multiple T1's and less than 40 mbps.	937	40.53%			Number of Data Points	2312	
	2	Greater than 40 mbps and less than 150 mbps.	161	6.96%					
	3	Greater than 150 mbps and less than 600 mbps.	283	12.24%	**Elevation**		Lowest Elevation	0	
	4	Greater than 600 mbps and less than 2.4 gbps.	172	7.44%					
	5	Greater than 2.4 gbps and less than 10 gbps.	4	0.17%			Highest Elevation	300	
	6	Greater than 10 gbps	755	32.66%					

Colorado

Distinct Speed Tiers Provided

	Technology Codes	Allowable	
		Down	Up
10	Asymmetric xDSL	3 to 10	2 to 9
20	Symmetric xDSL	3 to 9	2 to 9
30	Other Copper Wireline	3 to 11	2 to 11
40	Cable Modem-DOCSIS 3.0	9 to 10	2 to 7
41	Cable Modem-Other	3 to 7	2 to 7
50	Optical Carrier/Fiber to End User	3 to 11	2 to 11
60	Satellite	3 to 7	2 to 5
70	Terrestrial Fixed Wireless-Unlicensed	3 to 7	2 to 7
71	Terrestrial Fixed Wireless-Licensed	3 to 7	2 to 7
80	Terrestrial Mobile Wireless	3 to 7	2 to 6
90	Electric Power Lines	3 to 5	2 to 5
0	All Other	3 to 11	2 to 11

	Speed Tier Codes
1	< 200 kbps.
2	>200 kbps, < 768 kbps.
3	> 768 kbps, < 1.5 mbps.
4	> 1.5 mbps, < 3 mbps.
5	> 3 mbps, < 6 mbps.
6	> 6 mbps, < 10 mbps.
7	> 10 mbps, < 25 mbps.
8	> 25 mbps, < 50 mbps.
9	> 50 mbps, < 100 mbps.
10	> 100 mbps, < 1 gbps.
11	> 1 gbps.