Colorado Broadband Data & Development Program
October 1, 2010 Data Delivery Report

Summary

The Colorado Broadband Data and Development Program continued the data collection effort begun with signing a data collection contract on March 22, 2010. Effort since the May data delivery has focused on increasing the data reported for anchor institutions as well as promoting the use of speed tests. Data has been collected from almost all service providers of significant size, but effort will continue to capture data from those not yet reporting. The Colorado data set has achieved a critical mass enabling CBDDP to spend more time in the next six month cycle verifying service provider information and analyzing the data.

Data Collected

See the attached Data Delivery Report for more details on the data.

Service Providers	May 21, 2010	October1, 2010
Identified	102	158
Not a BB Provider	15	38
Have Chosen Not to Participate So Far	5	17
Working Universe of SP's	82	103
Data Sets Delivered to NTIA	39	59
Broadband Provider Status Not Yet Known	43	44

Community Anchor Institutions	May 21, 2010		October 1, 2010		
	Identified	Collected	Identified	Collected	Includes Speed Test
Cat. 1 - School K through 12	2097	328	2097	1927	665
Cat. 2 – Library	248	234	246	234	0
Cat. 3 – Medical/Healthcare	609	204	694	275	80
Cat. 4 – Public Safety	1875	356	1813	548	264
Cat. 5 – University/College	103	4	102	23	21
Cat. 6 – Other Government	407	149	407	156	6
Cat 7 – Other Non-Government					
Total	5339	1275	5359	3163	1036

Disposition of Issues Identified in May 21, 2010 Report

1. **Spatial representation of broadband service**. The convex hull process utilized by our contractor in the May 21 data delivery process has been replaced. Where the service provider has given us address specific information, a 150 foot buffer is drawn around each point. Any census block touched by the buffered area is selected. For census blocks greater than two square miles, any road segment touched by the buffer is selected. For Colorado's largest service provider, Qwest, this resulted in a 15.7% reduction in census blocks selected and a 57.6% reduction in road segments. CBDDP met in person with Qwest and described the process. Upon review of their data, Qwest agreed the 150 foot buffer process is reasonable and creates an accurate representation of their service area.
2. **Generalization of service attributes**. In the May 21 delivery, the maximum advertised speed for the service overview area was also reported for the maximum speed at the census blocks and road segments in that service area. The process has been corrected, and the maximum speed occurring in each census block and the road segment is reported.
3. **Road types included in road segment data**. The convex hull process used in the May 21 delivery caused a significant overstatement in road segments identified with broadband service. The buffering process described in Number 1 above corrects this problem and eliminates the need to deselect any road types such as jeep roads or trails from the TIGER road files.
4. **Length of rural road segments included**. In the May 21 delivery, many very long road segments were identified as having broadband even though service provider address points appeared in a very small portion of the road. Although it is an indirect result, the 150 foot buffer process described in Number 1 corrected this problem to a large degree.
5. **Geographic representation of the weighted average speed**. In May, we expressed concern with the BB_Service_OverviewCMA file which used the cellular market service area to generalize service across the state. The NTIA has clarified this requirement, and the Overview in this delivery is based on counties served.
6. **Weighted average speed calculation**. This number appears only in the Overview. We have reviewed the source of this data, and found there are three categories. In some instances the provider gave us the average weighted speed, in other instances we have calculated it based on provided subscriber and speed information, and finally, no information was provided and the advertized maximum down speed is used.
7. **Wireless coverage**. See Validation and Verification Process described below.
8. **Middle mile interconnection points** . See Validation and Verification Process described below.
9. **Community Anchor Institutions**. See Validation and Verification Process described below.

Validation and Verification Process for the October 1 Data Set

1. **Automated validation**. CBDD has expanded the automated scripts used to perform validation tests. These tests include technology type and valid speed combinations, FRN to provider name comparisons, consistency in provider names, analysis of nulls, and a duplicate check.

- There are four providers with '9999' for FRNs. Two are operating in unlicensed spectrum. Two claim they just don't have an FRN and we could not find one in the FCC look-up application.
- There are duplicate addresses in the CAI files, however these represent different entities co-located at the same building, and CBDDP chooses to report them separately.
- The percentage of null values for typical speeds is greatly reduced due to a change in Qwest data reporting. During an in-person meeting, Qwest stated their advertised speeds are the typical speeds and there is no potential for degraded service during peak periods of use or distance from central office. Based on this information from the service provider, CBDDP is using Qwest advertised as typical speed.
- CBDDP has added 'extent testing' to the automated tests. This checks 100% of the middle mile and CAI points to ensure they are all within the state boundaries. Three outliers were found and eliminated from the data base.

2. **Analysis of Changes**. CBDP compared the May 21 and October 1 service areas for each provider and ensured the cause of significant changes was understood.

3. **Fringe Testing**. Fringe area testing was completed on both terrestrial coverage areas and wireless polygons. The premise of this testing is that if processing errors occur in representing a service provider's raw data, it is most likely to happen in the fringe rather than the core of a coverage area. A sample of 1136 fringe census blocks for 17 new or modified terrestrial providers, and 626 fringe census blocks underlying the edge of wireless polygons for 15 new providers, were tested. No errors were found indicating speeds and technology from service provider data was correctly ingested and census blocks and wireless polygons accurately represented. See tables at the end of this document for more details.

4. **Feedback loop**. All service providers have been given the opportunity to review the geospatial representation of their data. Approximately six providers have provided feedback. In addition, in person meetings and phone conversations were held with the two largest terrestrial providers in the state, Qwest and CenturyTel.

CBDDP has created an exception table that will record unusual areas or pockets were coverage may or may not exist. The table will be persistent through provider updates, so these exceptions will not have to be rediscovered with each update.

5. **Visual review**. In reviewing maps, CBDDP identified the coverage areas of two rural providers that appeared to show every road covered in the greater than two square mile census blocks. After phone conversations, the providers convinced CBDDP they have laid fiber on all of the roads in their service areas.

It was also noted that gigabit speeds were showing up for census blocks in Denver. Upon investigation, we obtained permission from Level 3 to provide address specific information for commercial buildings connected to the fiber loop. This is the only address specific information our NDA's allow us to provide to the NTIA.

Visual review also identified a small provider, City of Glenwood Springs, with service in surprisingly distant and non-contiguous census blocks. Follow-up phone conversations with the provider indicate this is correct.

6. **CAI Testing**. CBDDP is very pleased with progress that has been made in promoting speed tests among reporting CAI, particularly for K through 12 schools. Per the table on the first page of this report, 33%, or 1036 of 3163, of the data collected for CAI's is from speed tests. Acceptable technology type and speed tier validation has been done, and where available, multiple data sources where compared. Duplicates were validated. CBDDP chooses to report multiple anchors at the same address as distinct entities. For example, a county sheriff's office and a 911 call center at the same address are two entries.

7. **Middle Mile Testing**. Of the 16 new providers reporting data since the May 21 delivery, 48 points, 100%, were compared to the provider raw data. No errors were found. CBDDP is reporting wireless towers in the Middle-Mile where they are being used as backhaul. When service providers have submitted central office locations, they are included in the middle mile. Qwest and Century did not provide such information, and have requested CBDDP not include publicly available central office locations in their data. See tables at the end of this document for more details.

8. **Central Office Analysis**. CBDDP has begun to work with the data to analyze service areas outside of an 18,000 foot buffer around central offices. This will be a learning experience, and to date has not produced results due to variability of equipment in the central offices and boosters that can extend the 18,000 foot rule of thumb for DSLAMs. However, we do note that one provider, Columbine, submitted their information based on a list of central offices and specified the distance range of 18,000.

9. **Speed Test Analysis**. CBDDP recently obtained speed test data sets from the Communications Workers of America. This included 4,199 speed tests completed during 2010. It appears these test were all taken from fixed positions rather than mobile devices. We have made the following observations about this data.

- Of the 4199 speed tests, 559, or 13% of the tests, identified service in census blocks not identified by service providers. This could indicate the method of determining the latitudes and longitude employed by Ookla through their partner MaxMind (http://www.maxmind.com/app/locate_demo) has accuracy problems in rural areas. It could also indicate our current data set is under-reporting service in these 559 census blocks. CBDDP will continue to explore this issue, perhaps by focusing on anchor institution or local technology teams in these areas.
- Of the 4199 speed tests, 1898, or 45%, recorded slower download speed tiers than the typical speed reported by the provider.
- Of the 4199 speed tests, 1343, or 32%, recorded download speeds two or more speed tiers slower than the typical speed reported by the provider.

10**. Demographic Analysis**. CBDDP has spent a great deal of effort establishing a baseline for demographic analysis. The current analysis is based upon allocating 2009 population by county to each census block based on the percentage of 2000 census block population in the county. Additional work will include comparing the results of this method with results from interpolating 2009 census block group population data provided in the ESRI Business Analyst module to individual census blocks. CBDDP has begun a demographic analysis based on the first population allocation method described above. The analysis assumes that if broadband service is available anywhere in the census block, it is available for everyone.

For terrestrial service only, the analysis determined:

- 371,028, people in Colorado, 7% of population, have no access to terrestrial broadband; and
- 570,835 people in Colorado, 11% of population, do not have access to terrestrial broadband at speeds greater than 3 Mbps Down/1Mbps Up.

Work will continue to complete this analysis for terrestrial wireless and mobile wireless coverage. However, since minimal independent verification of the provider data has been completed at this point, the results are not considered reliable.

Planned Data Verification and Analysis

CBDDP now has a substantial enough data set to move into more extensive verification. This will include consumer surveys, more pro-active promotion of speed testing, and drive testing. CBDDP is working to establish a data sharing arrangement with Colorado Department of Public Safety. In addition, CBDDP will move forward with the development of a public facing map which should further engage the public in verification of service provider data.

Summary Results from Fringe Area Testing for Oct. 1, 2010

For a description of these tests, see the earlier section of this report titled 'Validation and Verification Process for the October 1 Data, Number 3 Fringe Testing."

Landlines:

Provider	No. of Blocks Tested	Percent Valid
Baja Broadband Holding	14	100
Big Sandy Telecom, Inc.	3	100
City of Glenwood Springs	19	100
Columbine Telecom Co	7	100
Eastern Slope Rural	28	100
Farmers Telephone Co	5	100
Internet Colorado, LLC	10	100
James Cable LLC	5	100
New Edge Holding Company	30	100
Nunn Telephone Company	5	100
Qwest Corporation	945	100
Rye Telephone Company	5	100
S & T Telephone Co	3	100
Sunflower Telephone	4	100
tw telecom inc.	30	100
Wiggins Telephone Assoc.	10	100
XO Communications, LLC	13	100
Total	1136	100

Fringe Analysis

1) 17 providers: 10 New, 7 Old-Change
2) Error rate: 0 %
3) Validity rate: 100%
4) Total sample size: 1136 represents 4% of the total CB Fringe Area designations
5) QA Summary:
    a. Provider Name v FRN: only one per provider
    b. Provider Name v DBAName: no nulls
    c. UP speed > DN speed: none

6)

Wireless:

Provider	No. of Blocks Tested	Percent Blocks Valid	Percent Spatially Valid
Beulahland Communications	25	100	100
Brainstorm Internet	30	100	100
BySky, Inc.	14	100	100
Colorado Mobile Inet, LLC	60	100	100
HighSpeed4U	13	100	100
IHateToWait.com, LLC	15	100	100
Irish & Reynolds, Inc	9	100	100
Jade Communications, LLC	30	100	100
Nedernet, Inc.	16	100	100
OurayNet	18	100	100
Phillips County Telephone	8	100	100
San Isabel Telecom, Inc.	5	100	100
SECOM	55	100	100
T-Mobile USA, Inc.	225	100	100
Town of Timnath	3	100	100
Total	526	100	

Fringe Analysis

1) 15 providers: 15 New
2) Error rate: 0% on census blocks and spatially
3) Validity rate: 100% on census blocks and spatially
4) Total sample size: 526 represents 5% of the total wireless CB Fringe Areas
5) QA Summary:
    a. Provider Name v FRN: only one per provider
    b. Provider Name v DBAName: no nulls
    c. UP speed > DN speed: none

Summary Results from Middle Mile Testing for Oct. 1, 2010

For a description of these tests, see the earlier section of this report titled 'Validation and Verification Process for the October 1 Data, Number 7 Middle Mile Testing."

Middle Mile:

Provider	No. Tested	Percent Valid
Big Sandy Telecom, Inc.	3	100
Bijou Telephone Co-op	3	100
Columbine Telecom Co	1	100
Eastern Slope Rural	12	100
Farmers Telephone Co	2	100
HighSpeed4U	1	100
IHateToWait.com, LLC	4	100
James Cable LLC	1	100
Nunn Telephone Company	1	100
OurayNet	1	100
Rico Telephone Company	1	100
S & T Telephone Co	11	100
T-Mobile USA, Inc.	3	100
Verizon Wireless	3	100
Wiggins Telephone Assoc.	1	100
Total	48	100

Analysis

1) 16 providers: 16 New
2) Error rate: 0%
3) Validity rate: 100%