Commonwealth of Virginia
State Broadband Data Development

Virginia Center for Innovative Technology

Virginia Information Technologies Agency
Virginia Geographic Information Network

Virginia Tech
Center for Geospatial Information Technology

NTIA STATE BROADBAND DATA DEVELOPMENT
ROUND 8 – October 2013 SUBMISSION

Summary of Virginia Submission

The Virginia Center for Innovative Technology (CIT) was designated by the Governor of Virginia as the primary point of contact for all Commonwealth of Virginia participation in the National Broadband Mapping Project. CIT works in conjunction with the Virginia Information Technologies Agency's (VITA) Virginia Geographic Information Network (VGIN) to review, process, normalize and submit the information outlined in the National Telecommunications and Information Administration's (NTIA) Notice of Funding Availability (NOFA) establishing a Virginia iteration of the National Broadband Map.

The fall 2013 submission to the NTIA includes data from 68 broadband service providers with unique federal identifications delivered in various formats ranging from GIS shape files to text files detailing broadband availability. This includes providers who did not submit data changes for the October 1, 2013 deadline.

The methodology for processing data was changed for the October 1, 2013 deadline in order to achieve more accurate data and to ensure that all data delivered in a particular format was processed in an identical fashion. Below are details explaining how each data type was processed for inclusion in the NTIA submission dataset. Further information about the effect of these changes is outlined in the VA_Changes_and_Corrections_2013_10_01 document. At the end of this document are two tables: one listing carriers alphabetized by DBA name and one listing carriers organized by the data type of their delivery.

A summary of the fall 2013 submission is below:

Census Blocks less than 2 square miles	415,260
Road Segments outside of census blocks less than 2 square miles	73,009
Wireless polygon coverage area(s)	46
Middle Mile points	464
Community Anchor Institution points	6,218

All participating broadband providers sent in their transmission technology type and advertised speed information for wireless polygons, census block, or road centerline segments.

As of the fall 2012 NTIA SBDD submission, Virginia has elected to no longer submit addresses as point data. All address data has been geocoded to the VA road centerline locater and road segments were then selected by location and loaded to the NTIA data model. This processing procedure created a redistribution of the total record counts by feature class.

Base Map Data

VGIN maintains statewide imagery, road centerline, and address point feature classes. VGIN also maintains a series of statewide base map data sets, or partnerships with commercial entities which allow the granularity of data necessary to support the National Broadband Mapping Project. The following Virginia and Federal data sets are used in SBDD data processing.

Road Centerlines (RCL)
VGIN maintains a statewide road centerline feature class that is updated quarterly using locality centerline submissions. This road centerline database contains address range information when it is provided by the locality. The RCL database is used to generate a geocoding service which is an interpolated point along a centerline that is fed into the Virginia statewide composite geocoding web service. *The RCL database is constantly updated and therefore the number of road segments is constantly increasing. This may impact the number of road segments for providers.*

TIGER 2010 Census Blocks
2010 Census geometry that is available to the broadband mapping project for location and presentation of broadband data.

Census Block Methodology

Census block data is the most standard and straightforward type of data submission. It is still necessary to maintain a strict methodology for processing so that data modeling and outputs maintain high quality. That methodology is as follows:

Census blocks (CBs) are delivered to the National Telecommunications and Information Administration (NTIA) if they are less than 2 Square Miles in size. Otherwise, data is delivered via Road Centerlines (RCL)**.** RCL methodology is captured below.

For census blocks that are delivered along with the **Census Block ID (CBID)**, a *join* to the selection feature class containing CBs that are less than 2 square miles is performed. The best practice is to then use the field calculator to populate the attribute fields in the selection feature class.

For census block data that is delivered as a **single address or range of address points** in tabular data, the points are first geocoded. Then a *spatial join* should be performed using the ArcGIS script with the following parameters:

> **One_to_Many:** This step will prevent aggregated attributes in the created feature class.
> **Keep all Target Features:** Checked. The purpose of this *join* is to attach the Census Block ID to the geocoded point feature. The next step will capture the maximum and typical

speeds from those points.
Within: All points within a Census Block should have the joined Census Block ID field.

Using the new feature class containing the Census Block ID, the point feature class should be dissolved based on the Census Block ID, with the Maximum Advertised Upload and Download speeds captured using the statistics options: MAX, and the Typical Upload and Download speeds captured using: MEAN. This may require a conversion from "string" to "integer" before the *dissolve*. These values will be used to populate the speed data for the submission.

For census block data that is delivered as **road centerlines**, a *spatial join* should be performed with the following parameters:

One_to_Many: This step will prevent aggregated attributes in the created feature class.
Keep All Target Features: Checked. The purpose of this *join* is to attach the Census Block ID to the RCL feature. The next step will capture the maximum and typical speeds from those points.
Within: All road centerlines that have segments within a Census Block should have the joined Census Block ID field.

Using the new feature class containing the Census Block ID, the RCL feature class should be dissolved based on the Census Block ID, with the Maximum Advertised Upload and Download speeds captured using the statistics options: MAX, and the Typical Upload and Download speeds captured using: MEAN. This may require a conversion from "string" to "integer" before the *dissolve*. These values will be used to populate the speed data for the submission.

For Census Block data delivered as **polygon of coverage area**, *select by location* all Census Blocks that are within the polygon. This will select all polygons that are partially covered by the area, while maintaining those with a section outside.

Road Centerlines Methodology

Road centerline data is delivered in various formats. In order to capture the most accurate selection of roads from the Virginia Broadband Mapping Program road centerline (VBMPRCL) feature class, it is necessary to have a strict methodology for selection, based upon the type of data delivery. That methodology and reasoning is as follows:

For road data that is delivered as a **single address or range of addresses** in tabular format, the points will be geocoded using the latest VGIN road centerline locator file, with the side offset set to zero feet. By eliminating side offset, the geocoded points will be placed directly upon the corresponding road. The geocoding result will be *spatially joined* using the built in ArcGIS script, with the following parameters:

One_to_Many: This step will prevent aggregated attributes in the created feature class.
Keep all Target Features: Unchecked. The *join* should eliminate any target features that don't meet the *join* standard from the data set.

Closest (5 meters): This step will yield one match for each feature, and eliminate multiple matches that fall within the search distance. 5 meters is selected because the geocoded points are placed directly on the road to be matched, and too large of a selection distance would result in false matches.

For road data that is delivered along **with Tiger line ID numbers**, the data will be joined to the Tiger line data that is maintained on the VGIN servers, and a *spatial join* to the VBMPRCL selection feature class will be performed using the following parameters with the ArcGIS script:

One_to_Many: This step will prevent aggregated attributes in the created feature class.
Keep all Target Features: Unchecked. The *join* should eliminate any target features that don't meet the *join* standard from the data set.
Closest (10 meters): This step will yield one match for each feature, and eliminate multiple matches that fall within the search distance. 10 meters is selected because the Tiger lines and VBMPRCL lines should be digitized close in proximity.

For road data that is delivered as **a shapefile without Tiger line ID or VBMP RCL ID**, a *spatial join* to the VBMP data set will be performed with the following settings.

One_to_Many: This step will prevent aggregated attributes in the created feature class.
Keep all Target Features: Unchecked. The *join* should eliminate any target features that don't meet the *join* standard from the data set.
Closest (10 meters): This step will yield one match for each feature, and eliminate multiple matches that fall within the search distance. 10 meters is selected because the Tiger lines and VBMPRCL lines should be digitized close in proximity.

For address data that is delivered as **discrete addresses in tabular or point format**, the points will be geocoded using the latest VGIN address point locator file. These points will then be *spatially joined* to the closest road centerline within 50 meters, using the following settings for the ArcGIS script:

One_to_Many: This step will prevent aggregated attributes in the created feature class.
Keep all Target Features: Unchecked. The *join* should eliminate any target features that don't meet the *join* standard from the data set.
Closest (50 meters): This step will yield one match for each feature, and eliminate multiple matches that fall within the search distance. 50 meters is selected to capture streets that are a normal distance from the road while excluding as many false matches as possible.

For **polygons showing coverage area**, use *select by location* to capture all VBMP RCLs that are within the polygon area. This will select only roads that are covered by the polygon, while not excluding road segments that partially extend outside the polygon.

Wireless Data

Service Area Polygons were reported by Wireless Broadband providers and required little processing to be included in the NTIA SBDD data model. Typical inclusion processes included attribute validation and use of the ESRI Simple Data Loader or Copy and Paste. A small number

of providers needed assistance in compiling their data and were referred to the staff at CGIT. The provider supplied the antenna data needed for a propagation model. When the polygons from the model were completed and approved by the provider they were then sent to VGIN for including in the NTIA submittal. Specific information about the modeling method is available by calling VGIN.

Middle Mile

The majority of providers do not send middle mile data. When it is received it is converted into a geodatabase table in the broadband provider's staging geodatabase. An add XY function was performed in ArcMap and XY events were exported as a new feature class. Inside the provider's staging geodatabase, the NTIA SBDD data model feature class named BB_ConnectionPoint_MiddleMile was imported and renamed NTIA_middle_mile. Data was either loaded to this feature class and all appropriate fields were calculated based on the XY event in order to load data spatially or if only a handful of points were provided the data was manually edited in an edit session.

Community Anchor Institutions

The purpose of the CAI layer is to identify the location of community anchor institutions and the availability of broadband at that location. The facilities defined by NTIA as a CAI for this purpose are K-12 school, library, medical/healthcare facility, public safety institution, post-secondary institution, or community support facilities.

Resources and data were obtained from several Government agencies and organizations: National Telecommunications and Information Administration (NTIA), Center for Innovative Technology (CIT), Virginia Tech Center for Geospatial Information Technology (CGIT), Virginia Information Technologies Agency (VITA), Virginia Department of Emergency Management (VDEM), Virginia Economic Development Partnership (VEDP), Virginia Department of Health (VDH), Library of Virginia (LVA), the National Center for Education Statistics (NCES) and the Virginia Council for Private Education (VCPE).

Public school K-12 data was processed by VDEM by collecting and geocoding the data from the Virginia Department of Education, which was then submitted to VGIN. VDEM has agreed to update the data yearly before Labor Day. Post-secondary institution data was obtained from the VEDP (http://gis.vedp.org/data_resources.aspx). The layer called 'College and Universities" dataset was downloaded and extracted. The most recent update of the dataset occurred on 12/12/2012. As well as the VDEM, VEDP has agreed to update the data yearly before Labor Day. Medical/Healthcare data was carried over from the October 1 submittal to the NTIA with slight alterations made to individual attributes and the expansion of our dataset to include facilities other than Hospitals. In the future, data will be submitted to VGIN by VDH. VDH will make regular, yearly, updates to the dataset in November. Updates to the library data is the responsibility of VGIN. The Library of Virginia houses a comprehensive list of public libraries in Virginia which will be used by VGIN to make updates. Updates will occur biannually in preparation for the NTIA submittal. Public safety data has been obtained in a variety of ways.

Law enforcement data, including police and sheriff stations/precincts, was submitted to VGIN by VDEM. Initially, the data had no broadband attribution. CIT has gathered broadband data for various public safety entities through localized efforts. At this time, fire, police and U.S. Military installations are included in the public safety category.

CAI Processing & Submittal

Between the fall of 2012 and spring of 2013 submissions, VGIN Staff standardized a process for updates to the Virginia statewide CAI data set. Data must be obtained from the primary business owner then quality assurance is performed to normalize the data. Speed data is aggregated by VGIN through provider submission, Virginia Tech speed testing, and VGIN estimation.

A broadband speed hierarchy was established to identify a maximum broadband speed for each CAI. Provider data is assumed most accurate, CGIT speed data is secondary, and VGIN speeds are assigned only if no other speed data is available. Using a geo-processing model, VGIN speeds are created by extracting speed data from census blocks that contain the CAI point. In the case of two speeds available within the particular census block, the maximum available speed is chosen.

Virginia's CAI data has additional attribution beyond the NTIA data model due to the source of the VA data set. VGIN and CGIT both house CAI data although the record counts for tables are not identical due to the individual attribute purposes. The master VGIN geospatial feature class is used in submission to the SBDD project while changes from CGIT are generally conflated.

Carry-Over or Legacy Data

Many carriers did not provide new data or reported their data as unchanged from previous submissions. This data was double checked for accuracy and then transferred into the final geodatabase. If the data was found to be inaccurate, it was reprocessed using the original submission data from the carrier, and was listed under that original data type in the Provider Link Table.

Other

Some data was delivered in a format that is outside our standard data types, for example a PDF showing coverage area or a paper map with roads and Census Blocks highlighted. These submittals were processed on a case by case basis with every effort to translate them into a data type covered by our methodology so their processing could follow the same protocols.

Wireline Link Table

The following table is an index of providers with links to methodology for each data type. Each provider is listed alphabetically, and data type for Census Blocks and Roads is listed. A table showing wireless provider follows, with the header linking to the wireless methodology section.

Providers by DBA Name

DBA_NAME	Data Type for Census Blocks	Data Type for Roads
BGTCo	Deleted*	Deleted*
BIT Communications	Carry Over	Carry Over
Blue Ridge Internetworks	Customer Address numbers	Customer Address numbers
CenturyLink	Census Block ID	Road Centerline Shapefile
Charter Communications, Inc.	Census Block ID	Road Centerline Shapefile
Citizens	Census Block ID	Road Centerline Shapefile
Citizens	Census Block ID	Road Centerline Shapefile
Cogent	Customer Address numbers	Customer Address numbers
Comcast	Census Block ID	Customer Address numbers
Cox Communications	Census Block ID	Road Centerline Shapefile
ESVBA	Carry Over	Carry Over
FairPoint Communications	Carry Over	Carry Over
Highland Telephone Cooperative	Other	Other
Level 3 Communications, LLC	Customer Address numbers	Customer Address numbers
Lumos Networks, Inc.	Carry Over	Carry Over
Lumos Telephone of Botetourt, Inc.	Carry Over	Carry Over
MBC	Other	Other
Mediacom Southeast, LLC	Carry Over	Carry Over
MegaPath Corporation	Census Block ID	Customer Address numbers
MetroCast Communications	Polygon	Polygon
MGW Networks, LLC	Census Block ID	Road Centerline Shapefile
Nelson Cable, Inc.	Carry Over	Carry Over
Nelson County	Other	Other
New Hope Telephone Cooperative	Carry Over	Carry Over
Nextlink Wireless, Inc.	Carry Over	Carry Over
Optinet	Carry Over	Carry Over
PCBA	Other	Other
RCN Telecom Services, LLC	Census Block ID	No Data Delivered
Roadstar Internet, Inc.	Carry Over	Carry Over
Scott County Telephone Cooperative	Carry Over	Carry Over
Shentel	Census Block ID	Carry Over
Sidera	Customer Address numbers	Customer Address numbers
Skyline Telephone Membership Corporation	Census Block ID	Road Centerline Shapefile

Stewart Computer Services	Other	Other
Suddenlink Communications	Census Block ID	Customer Address numbers
Sunset Digital Communications, Inc.	Carry Over	Carry Over
TDS Telecom	Customer Address numbers	Customer Address numbers
Time Warner Cable	Census Block ID	Road Centerline Shapefile
Verizon Virginia, Inc.	Census Block ID	Tiger Line ID
XO Communications Services, Inc.	Carry Over	Carry Over
Zayo Group LLC	Customer Address numbers	Customer Address numbers

***Data removed because speed no longer qualifies as Broadband according to NTIA standards**

Polygon of Wireless Coverage

Provider Name	Delivery Type	Data Type
AT&T Mobility, LLC	Modified	SHP of wireless coverage
B2X Online Inc	Modified	SHP of wireless coverage
Clearwire Corporation	Modified	SHP of wireless coverage
Leap Wireless International, Inc	Modified	SHP of wireless coverage
Central Virginia Technology Group LLC	Modified	SHP of wireless coverage
Eastern Shore Communications	New	SHP of wireless coverage
Rural Broadband Network Services LLC	Modified	SHP of wireless coverage
Hughes Network Systems, LLC	Modified	SHP of wireless coverage
Virginia Mountain Micro	Unchanged	SHP of wireless coverage
Northern Neck Wireless Internet Services, LLC	Unchanged	SHP of wireless coverage
NTELOS Inc	Modified	SHP of wireless coverage
Richmond 20 MHz LLC	Modified	SHP of wireless coverage
Virginia PCS Alliance, LLC	Modified	SHP of wireless coverage
West Virginia PCS Alliance, LLC	Modified	SHP of wireless coverage
Skycasters	Unchanged	SHP of wireless coverage
Sprint Nextel Corporation	Modified	SHP of wireless coverage
Starband Communications, Inc	Unchanged	SHP of wireless coverage
The Wired Road	Unchanged	SHP of wireless coverage
T-Mobile USA, Inc.	Modified	SHP of wireless coverage
U.S. Cellular	Unchanged	SHP of wireless coverage
Cellco Partnership and its Affiliated Entities	Modified	SHP of wireless coverage
ViaSat	Unchanged	SHP of wireless coverage