Commonwealth of Virginia

Center for Innovative Technology

Virginia Information Technology Agency
- Virginia Geographic Information Network

Virginia Tech Center for Geospatial Information Technology

NATIONAL BROADBAND MAPPING PROJECT

SPRING 2011 SUBMISSION - VIRGINIA

A summary of processing steps necessary to move broadband provider submission into the NTIA SBDD data model.

Summary of Virginia Submission

The Virginia Center for Innovative Technology (CIT) was designated by the Governor as the primary point of contact for all Commonwealth of Virginia participation in the National Broadband Mapping Project. The CIT assembled a team consisting of the Virginia Information Technology Agency's (VITA) Virginia Geographic Information Network (VGIN) and the Virginia Tech Center for Geospatial Information Technology (CGIT) to review, process, normalize and submit the information outlined in the Notice of Funds Availability (NOFA) establishing the National Broadband Map.

The spring 2011 submission is the third submission of data to the National Telecommunications and Information Administration (NTIA). The submission includes data from 44 Broadband Service Providers (BSP) delivered in various formats ranging from GIS shape files to text files detailing broadband availability. Of the 44 broadband providers included, 24 submitted updated service information for this submission. To provide a complete snapshot of broadband availability in Virginia, the fall 2010 submission data was carried forward for the remaining 20 broadband providers.

A summary of the spring 2011 submission data includes:

Census Blocks provided with availability information	190115
Street Segments provided with availability information	100501
Addresses provided with availability information	85481
Wireless Broadband providers providing availability polygons	14
Middle Mile Points provided	490

A review of the 24 broadband providers providing updates in the VA Broadband mapping effort for the spring 2011 indicates:

- 10 broadband providers provided only addresses
- 19 broadband providers provided both census blocks and road segment ranges
- 4 broadband providers provided only wireless information
- 5 broadband providers provided only census blocks
- 2 non-wireless broadband providers provided GIS data

All broadband providers participating provided speed information for census block, road centerline segment, or addresses.

VGIN Base Map Data

VGIN maintains a series of statewide feature classes that were used to support the National Broadband Mapping Project.

Address Points - VGIN maintains a statewide address point feature class that is updated quarterly using locality address submissions. This statewide address point database is used to generate a Point Address Geocoding Service.

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 Linear Geocoding Service.

Navteq – VGIN maintains a subscription to the Navteq road centerline database in addition to the statewide road centerline database. This subscription provides a third geocoding service available to the broadband mapping project.

2000 Census Blocks – VGIN maintains a statewide inventory of 2000 Census geometry that is available to the broadband mapping project for location and presentation of broadband data.

Broadband provider Data Location Processing

All broadband provider processing was accomplished using VGIN statewide mapping initiatives as a basis. Broadband providers reported data in one of four formats: Polygon service areas; Census Blocks Served; Addresses Served; and Road Segments Served. Each of these reporting formats was handled differently.

Wireless Service Area Polygon Reporting – 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.

Census Block Reporting – Broadband providers reporting broadband availability on a census block basis submitted it in list form a majority of the time. These lists came in the form of spreadsheets and text files. These lists were normalized into spreadsheets and the attributes joined to the VGIN 2000 Census Block feature class. The resulting broadband provider specific staging database was validated for attributes and added to the NTIA SBDD data model.

Point Address Reporting - Broadband providers reporting broadband availability in a service address basis submitted it in list form in a majority of cases. These lists were submitted in the form of spreadsheets or text files. Once converted to spreadsheets, the address lists were geocoded using VGINs three tiered geocoding process. Addresses are first geocoded against the statewide address database. Any service addresses that are not matched on the first pass are rerun using the statewide road centerline geocoder. At this point, a majority of the addresses able to be located have been placed. Any remaining service addresses are geocoded against the Navteq database as a final attempt to generate a location.

Road Segment Address Reporting – Broadband providers reporting broadband availability using a road segment basis submitted it in a list form in a majority of cases. These lists were normalized into a series of spreadsheets for that were either used in joining to census features or geocoded using the VGIN road centerline database. Any broadband provider submitted road segment data that remained not located was rerun using the Navteq database to generate a final location.

Broadband Provider Staging Databases

To support the processing of broadband provider information separately, a broadband provider specific geodatabase was created. This geodatabase was an empty shell of the NTIA SBDD Database to maintain all topological and attribute constraints and validations. Each broadband provider's data was processed completely independent of all other broadband providers, allowing broadband providers to move through the process at different rates. This also allowed the correction of any data problems specific to broadband providers without affecting the entire submission database. Once the broadband provider data was processed to a point that it fully conformed to the NTIA SBDD data model, it was included in the Virginia submission for quality control and subsequent delivery.

Batch Calculation & Additional Processing

For data reported as service addresses, several fields were required that could be calculated in batch. The FULLFIPSID was calculated to the address points by spatially joining points to the census blocks. Latitude and Longitude were calculated in ArcCatalog using the calculate geometry function.

About half of the broadband providers who participated in the spring 2011 NTIA submittal provided Middle mile data. Resultantly, the processing and aggregation of a middle mile data set was done outside of standard broadband provider data processing.

Address Points, Road Centerlines, Census blocks, and Wireless Service polygons were processed as broadband provider data was received although middle mile information was a post processing step. To create middle mile event data, the broadband providers that provided the information to CIT and VGIN generally included latitude and longitude of the facility and these values were used in ArcGIS with the add XY function. After points were brought into ArcGIS, data was exported into a separate feature class and values were calculated based on information the broadband provider provided.

Broadband Provider Specific Processing

The following Broadband Providers submitted CIT data for the Spring 2011 NTIA submission. It is assumed that the participating Broadband providers provided entire

coverage data as opposed to updates only unless otherwise noted. Included are the methods used in updating the Virginia Broadband map data:

AT&T
Provider Name: AT&T Mobility, LLC
DBA Name: AT&T Mobility, LLC
FRN: 0004979233

AT&T provided CIT and VGIN Geospatial data in the form of a coverage area shape file. Inside the shape file was only one field which represented the U.S. State of the coverage area so in order to apply the NTIA specific information, additional documentation included by AT&T was used to update the attributes. The GIS shape file was loaded into a staging Geodatabase feature class and fields were edited where pertinent. This data was then loaded into the reporting database.

Century Link
Provider Name: AT&T Mobility, LLC
DBA Name: AT&T Mobility, LLC
FRN: 0004979233

Century Link provided CIT and VGIN Geospatial data in the form of road centerlines and census blocks. Middle mile and subscriber weighted speed were also included. A new personal Geodatabase was created to represent the staging of this broadband provider for the spring 2011 release. Inside of the staging database a road centerline feature class and census block polygon feature class were imported from the NTIA packaging data model. In order to provide the Road Centerline data in Virginia's geometry (VBMP RCL Quarter 1, 2011), the road lines provided by Century Link were used in a select by location analysis. The Virginia Road Centerlines were selected if the Century Link provided lines were within 5 meters and then exported to a new feature class. All values inside the Century Link roads were then spatially joined to the selected VA RCL and attributes were conflated and loaded to staging model feature class. This iteration of the roads was loaded into the reporting database.

Century Link also provided geospatial data in the form of census blocks less than two square miles. These values were joined to the 2000 TIGER data by FULLFIPSID and output to new features in order to make sure the census geography provided to NTIA was sufficient. Since the data associated to the blocks were named similarly to the NITA model data, they were loaded into a staging census block feature class then into the SBDD data model.

Charter
Provider Name: Charter Communications Inc.
DBA Name: Charter Communications Inc.
FRN: 0017179383

Charter provided CIT and VGIN Geospatial data in the form of road centerlines and census blocks. A new personal Geodatabase was created to represent the staging of this broadband provider for the spring 2011 release. Inside of the staging database a road centerline feature class and census block polygon feature class were imported from the NTIA packaging data model. In order to provide the Road Centerline data in Virginia's geometry (VBMP RCL Quarter 1, 2011), the centerline data provided by Charter were used in a select by location analysis. The Virginia RCL was selected if the Charter GIS lines were within 5 meters and then exported to a new feature class. All values inside the Charter roads were then spatially joined to the selected VA RCL and attributes were conflated and loaded to a staging model feature class. This iteration of the roads was loaded into the reporting database.

Charter also provided geospatial data in the form of census blocks less than two square miles. These values were joined to the 2000 TIGER data by FULLFIPSID and output to new features in order to make sure the census geography provided to NTIA was sufficient. Since the data associated to the blocks were named similarly to the NITA model data, they were loaded into a staging census block feature class then into the SBDD data model.

Sprint
Provider Name: Sprint Nextel Corporation
DBA Name: Sprint
FRN: 0003774593

Sprint provided CIT and VGIN Geospatial data in the form of a coverage area shape file. Middle mile and subscriber weighted speed were also included. Inside the shape file were two records but the shape file structure had all of the fields needed to load into the NTIA model therefore no additional information was needed. The GIS shape file was loaded into the staging Geodatabase feature class and FRN information was scrubbed to match the NTIA number reporting format. This data was then loaded into the reporting database.

Verizon Wireless
Provider Name: Verizon Wireless
DBA Name: Verizon Wireless
FRN: 0003290673

Verizon Wireless provided CIT and VGIN Geospatial data in the form of two coverage area shape files; one representing EVDO statewide and another showing LTE in the Northern Virginia Region. The EVDO was gridded into 883 individual polygons with the same speed so the data was exported into a staging feature class and was merged into a single polygon. The LTE data showed a 4G core and 4G borders. These were the same transmission technology and speed according to Verizon so the two "4G" polygons were

exported to a staging feature class and merged together. These two newly created merged polygon feature classes with different spectrums were loaded into the staging Geodatabase feature class and FRN information was scrubbed to match the NTIA number reporting format. This data was then loaded into the reporting database.

Time Warner Cable
Provider Name: Time Warner Cable
DBA Name: Time Warner Cable
FRN: 0013430244

Time Warner Cable provided CIT and VGIN Geospatial data in the form of road centerlines and census blocks. They also provided a text file for blended average speeds and based on the values it was assumed this was their pricing spreadsheet. A new personal Geodatabase was created to represent the staging of this broadband provider. Inside of the staging database a road centerline feature class and census block polygon feature class were imported from the NTIA packaging data model. In order to provide the Road Centerline data in Virginia's geometry (VBMP RCL Quarter 1, 2011), the centerline data provided by Time Warner were used in a select by location analysis. The Virginia RCL was selected if the Time Warner GIS lines were within 5 meters and then exported to a new feature class in the staging database. Features did not need to be spatially joined since Time Warner did not provide Typical Up/Down data and their Max Advertised values were all the same for each segment. Values were manually calculated in the staging feature class of selected roads. This iteration of the roads was loaded into the reporting database.

Time Warner also provided geospatial data in the form of census blocks less than two square miles. These values were joined to the 2000 TIGER data by FULLFIPSID and output to new features in order to make sure the census geography provided to NTIA was sufficient. Since the data associated to the blocks were named similarly to the NITA model data, they were loaded into a staging census block feature class then into the SBDD data model.

Verizon Wireline
Provider Name: Verizon Virginia, Inc.
DBA Name: Verizon Virginia, Inc.
FRN: 0002073203

Verizon Wireline provided CIT and VGIN text files for census blocks, road segments, pricing, and speed availability by region. A new personal Geodatabase was created to represent the staging of this broadband provider. The text files were imported to excel files and then imported into ArcGIS to in order to keep a single working environment. The regional speed data was used in the creation of a boundary layer based on the census locality boundaries in Virginia and merged based on speeds across Virginia provided in the text data.

The road segment data that Verizon Wireline provided did have a TLID which represented the unique ID of Tiger Road Centerlines so the values were joined to Tiger data and output to a new feature class. In order to provide the Road Centerline data in Virginia's geometry (VBMP RCL Quarter 1, 2011), the joined & converted road centerline data provided by Verizon Wireline was used in a select by location analysis. The Virginia RCL was selected if the extracted Verizon Wireline GIS lines were within 5 meters and then were exported to a new feature class in the staging database. Features were spatially joined to the Verizon generated Tiger lines in order to apply Transmission Technology. Verizon did not supply CIT & VGIN with Typical Downstream/Upstream values but did provide maximum advertised values in the speed text file which was converted to GIS polygons. Select by locations were performed and road centerlines were calculated based on their location to the created boundary data. This iteration of the roads was loaded into the reporting database.

Verizon Wireline also provided census blocks less than two square miles. The spreadsheet they used supplied the full FIPS id to use in a join. The original table had values which showed that this broadband provider is using newer census block geography than the requested NTIA data so the table was joined to the 2000 TIGER data by FULLFIPSID and all join match values were kept, all values not matched were left out based on ArcGIS join commands. The joined block features were output to new a new feature class based on the associated TIGER 2000 data in order to make sure the census geography provided to NTIA was sufficient. The census table provided by Verizon Wireless did not have Max Advertised speeds so the created boundary layer for speed was used in selecting areas which matched the advertised speed to the staging block feature class. After this data was checked in a staging census block feature class, it was then loaded into the SBDD data model.

Cox
Provider Name: CoxCom Inc.
DBA Name: Cox Communications
FRN: 0001524461

Cox provided CIT and VGIN text file updates of advertised speed and subscriber weighted speed. Addresses & road segments from the fall 2010 submittal were reused in conjunction with the updates. A new personal Geodatabase was created to represent the staging of this broadband provider. The text files were imported to excel files and then imported into ArcGIS to in order to keep a single working environment. The regional speed data was used in the creation of a boundary layer based on cellular market area boundaries since speeds were reported by Cox in this format. In the staging geodatabase, feature classes from the NTIA model were imported for Address Points, Road Centerlines, and Census Blocks.

The address level data spreadsheets from the fall 2010 were imported into the staging geodatabase and were geocoded based on the most recent VA address point geocoding service and were output to a new data set. All unmatched or tied geocoded results were then exported to an additional table and re-geocoded based on the VA Road Centerline geocoding service. The geocoded RCL point data was spatially joined to the first quarter of 2011 VA Road Centerline data in order to place features in a linear feature class. Both address point and road centerline data were loaded to their staging feature class and then loaded to the SBDD data model.

Cox also provided data from fall 2010 in the form of text files for census blocks less than two square miles which were processed for the fall 2010 submission. Since the data associated to the blocks were named similarly to the NITA model data, they were loaded into a staging census block feature class and checked against current FRN information as well as the newly created speed feature class. After these were checked for updates, they were then loaded into the SBDD data model.

Level 3
Provider Name: Level 3 Communications, LLC
DBA Name: Level 3 Communications, LLC
FRN: 0003723822

Level 3 Communications provided CIT and VGIN text files of customer addresses. A new personal Geodatabase was created to represent the staging of this broadband provider. The text files were imported to excel files and then imported into ArcGIS to in order to keep a single working environment. The addresses were geocoded based on the most recent VA address point geocoding service and were output to a new data set. All unmatched or tied geocoded results were then exported to an additional table and re-geocoded based on the VA Road Centerline geocoding service. The geocoded RCL points were spatially joined to the first quarter of 2011 VA Road Centerline data in order to place the point features in a linear feature class. Both address point and road centerline data were loaded to their staging feature class and then loaded to the SBDD data model.

Covad
Provider Name: DIECA Communications, Inc.
DBA Name: Covad Communications Company
FRN: 0003753753

Covad provided CIT and VGIN text files for census blocks, road segments, and speed availability by region. A new personal Geodatabase was created to represent the staging of this broadband provider. The text files were imported to excel files and then imported into ArcGIS to in order to keep a single working environment. The regional speed data was used in the creation of a boundary layer based on the census locality

boundaries in Virginia and merged based on speeds across Virginia provided in the text data.

Covad provided text files for census blocks less than two square miles. The data provided used supplied the full FIPS id to use in a join so the table was joined to the 2000 TIGER data by FULLFIPSID and all joined values were kept. The joined block features were output to new a new feature class based on the associated TIGER 2000 GIS data in order to make sure the census geography provided to NTIA met their requirements. The census table provided by Covad did not have Max Advertised speeds so the created boundary layer for speed was used in selecting areas which matched the advertised speed to the staging block feature class. After this data was checked in a staging census block feature class, it was then loaded into the SBDD data model.

The road segment data that Covad provided did have TLID to join to the tiger lines so the data was joined to Tiger GIS line data and output to a new feature class. In order to provide the Road Centerline data in Virginia's geometry (VBMP RCL Quarter 1, 2011), the joined & converted road centerline provided by Covad were used in a select by location analysis. The Virginia RCL was selected if the Covad GIS lines were within 5 meters and then exported to a new feature class in the staging database. Features were spatially joined to Covad lines in order to attach Transmission of Technology and Typical speeds. Select by locations were performed and Max Advertised values for road centerlines were calculated based on their location to the created boundary data. This iteration of the roads was loaded into the reporting database.

Shentel
Provider Name: Shentel Cable Company
DBA Name: Shentel
FRN: 0018024075

Shentel provided CIT and VGIN a single excel file which included census blocks and road segments inside the same spreadsheet as well as a tab in this spreadsheet which showed advertised speed by region. A new personal Geodatabase was created to represent the staging of this broadband provider. Many of the roads Shentel included in the spreadsheet had TLID so these were exported into their own spreadsheet as well as their own Geodatabase table. Another spreadsheet was created where only census block data was present in the initial spreadsheet and this was imported into ArcGIS as its own table. Finally, all other roads that did not have a block associated to it were exported as their own spreadsheet and geodatabase table. The regional speed data available in the Shentel spreadsheet was used in the creation of a boundary layer based on the census locality boundaries in Virginia and merged based on speeds across Virginia provided in the text data.

The road segments that Shentel provided which had TLID were joined to the tiger lines and output to a new feature class. In order to provide the Road Centerline data in

Virginia's geometry (VBMP RCL Quarter 1, 2011), the joined & converted road centerline provided by Shentel were used in a select by location analysis. The Virginia RCL were selected if the Shentel TLID GIS lines were within 5 meters and then exported to a new feature class in the staging database. The speed polygon data was used in calculating maximum advertised values. Output Virginia line features were spatially joined to Shentel lines in order to attach Transmission of Technology and Typical speeds. This iteration of the roads was loaded into the reporting database.

Road address ranges that were inside the original spreadsheet from Shentel that did not have TLID did have census block ID and street name. The census block ID and Street name fields were concatenated to create a string to use in joining. The census block values for these roads were joined to the census block GIS data and were output to a feature class in order to create a maximum potential area of interest boundary of segments. The entire VA Road Centerline data from Quarter 1 of 2011 were clipped to these polygons. The clipped RCL values then were spatially joined to the blocks in order to get full FIPS block ID attached to the road centerline. Once these values were added to the clipped RCL data, the census block ID that was newly added to the roads were concatenated with the Street name. This concatenation in the clipped RCL data was joined with the original concatenation of the table. All GIS features that matched were kept and output to a separate feature class using the NTIA model structure. The speed polygon data which was created originally was used in calculating maximum advertised values for these segments and once the values were calculated, this iteration of the roads was loaded into the reporting database.

Shentel data which only had census blocks less than 2 square miles contained the full FIPS id and was used in joining to the 2000 TIGER data by FULLFIPSID. All joined values were kept. The joined block features were output to new a new feature class based on the associated TIGER 2000 GIS data in order to make sure the census geography provided to NTIA met their requirements. After this data was checked in a staging census block feature class, it was then loaded into the SBDD data model.

NTELOS Wireline
Provider Name: Various
DBA Name: Various
FRN: Various

NTELOS provided CIT and VGIN text file updates addresses and census blocks, along with speed information by region. A new personal Geodatabase was created to represent the staging of this broadband provider. The text files for census blocks and speed were imported to excel files and then imported into ArcGIS in order to keep a single working environment. Since the addresses were updates only, data from the spring/fall submission by NTELOS were merged in a separate excel file to create an "all address" spreadsheet. This was imported to ArcGIS as a geodatabase table. The regional speed data was used in the creation of a boundary layer based on locality boundaries since

speeds were reported by NTELOS in this format. In the staging geodatabase, feature classes from the NTIA model were imported for Address Points, Road Centerlines, and Census Blocks.

The combined address data was imported into the staging geodatabase for NTELOS wireline as a table and the values were geocoded based on the most recent VA address point geocoding service and were output to a new data set. All unmatched or tied geocoded results were then exported to an additional table and re-geocoded based on the VA Road Centerline geocoding service. The Road geocoding point data was spatially joined to the first quarter of 2011 VA Road Centerline data in order to place the resultant point features in a linear feature class. Both address point and road centerline data were loaded to their staging feature class and then loaded to the SBDD data model.

NTELOS data for census blocks less than 2 square miles contained the full FIPS id and were used in joining to the 2000 TIGER data by FULLFIPSID. All joined values were kept. The joined block features were output to new a new feature class based on the associated TIGER 2000 GIS data in order to make sure the census geography provided to NTIA met their requirements. After this data was checked in a staging census block feature class, it was then loaded into the SBDD data model.

T-Mobile
Provider Name: T-Mobile USA, Inc.
DBA Name: T-Mobile
FRN: 0006945950

T-Mobile provided CIT and VGIN Geospatial data in the form of two coverage area shape files as well as text files which described the data. Inside the shape files was not enough information to decipher the NTIA specific information so the text data was used to populate the data. The GIS shape file was loaded into a staging Geodatabase feature class and fields were edited where pertinent. This data was then loaded into the reporting database.

Cricket
Provider Name: Leap Wireless International, Inc.
DBA Name: Cricket Communications, Inc.
FRN: 0002963528

Cricket provided CIT and VGIN Geospatial data in the form of a coverage area shape file. Inside the shape file was one record and the shape file structure had all of the fields needed to load into the NTIA model therefore no additional information was needed. The GIS shape file was loaded into the staging Geodatabase feature class and FRN information was scrubbed to match the NTIA number reporting format. This data was then loaded into the reporting database.

MGW Networks
Provider Name: MGW Networks, LLC
DBA Name: MGW Networks, LLC
FRN: 0019225366

MGW Networks provided CIT and VGIN an excel file of customer addresses. A new personal Geodatabase was created to represent the staging of this broadband provider and the excel information was imported as a new Geodatabase table in order to keep a single working environment in ArcGIS. The address data was geocoded based on the most recent VA address point geocoding service and were output to a new data set. All unmatched or tied geocoded results were then exported to an additional geodatabase table and re-geocoded based on the VA Road Centerline geocoding service. The Road geocoding point data was spatially joined to the first quarter of 2011 VA Road Centerline data in order to place point features to their related linear feature class. Data was then joined and imported to a road centerline feature class which matched the NTIA model. Data was massaged and then loaded to the SBDD data model.

Northern Neck WIFI
Provider Name: Northern Neck Wireless Internet Services, LLC
DBA Name: Northern Neck Wireless Internet Services, LLC
FRN: 0017338054

Northern Neck WIFI provided CIT and VGIN an excel file of customer addresses. A new personal Geodatabase was created to represent the staging of this broadband provider and the excel information was imported as a new Geodatabase table in order to keep a single working environment in ArcGIS. The address data was geocoded based on the most recent VA address point geocoding service and were output to a new data set. All unmatched or tied geocoded results were then exported to an additional geodatabase table and re-geocoded based on the VA Road Centerline geocoding service. The Road geocoding point data was spatially joined to the first quarter of 2011 VA Road Centerline data in order to place features in a linear feature class. Data was then joined and imported to a road centerline feature class which matched the NTIA model. Data was massaged and then loaded to the SBDD data model. One challenge faced with Northern Neck WIFI was the fact that it is a wireless broadband provider and the only way to accurately report the data provided to VGIN was to placed it into Addresses Point as well as Road Centerline features. Although there is spectrum information for this broadband provider, the current features did not allow it to be used at this point in time. **CIT/VGIN will work with broadband provider in future submissions to provide data in conformance with NTIA model.**

TDS Telecom
Provider Name: Various
DBA Name: TDS Telecom
FRN: Various

TDS Telecom provided CIT and VGIN text files of customer addresses as well as middle mile and pricing information. A new personal Geodatabase was created to represent the staging of this broadband provider and the text files were imported to excel and then imported as a new Geodatabase table in order to keep a single working environment in ArcGIS. The address data was then geocoded based on the most recent VA address point geocoding service and was output to a new data set. All unmatched or tied geocoded results were then exported to an additional geodatabase table and re-geocoded based on the VA Road Centerline geocoding service. The Road geocoding point data was spatially joined to the first quarter of 2011 VA Road Centerline data in order to place features in a linear feature class. Data was then joined and imported to a road centerline feature class which matched the NTIA model. Data was massaged and then loaded to the SBDD data model.

Comcast
Provider Name: Comcast Cable Communications, LLC
DBA Name: Comcast
FRN: 0004441663

Comcast provided CIT and VGIN update text files for census blocks and addresses as well as speed based on region so for them to be usable in a GIS environment, they were converted to excel files. A new personal Geodatabase was created to represent the staging of this broadband provider. Comcast did not provide entire data sets so delta staging feature classes were created in the process. All features were loaded into individual geodatabase tables and based on joins; exceptions were created in order to show all available coverage using census blocks and address ranges. The regional speed data available in the Comcast text file spreadsheet was used in the creation of a boundary layer based on the census locality boundaries in Virginia and merged based on speeds across Virginia provided in the text data.

The census block data less than 2 square miles which represented coverage areas by Comcast did contain the full FIPS id of each census block. This information was used in joining to the 2000 TIGER data by FULLFIPSID. All joined values were kept and the joined block features were output to a new feature class based on the associated TIGER 2000 GIS data in order to make sure the census geography provided to NTIA met the requirements. This data was imported into a staging feature class and to calculate Max Advertised Values, the speed regional polygon data was used in creating select by locations. After this data was populated in the staging census block feature class, it was then loaded into the SBDD data model.

Road address ranges that were provided by Comcast did not have TLID in them and therefore could not be used to create selections without some additional data manipulation. Inside the original spreadsheet from Comcast, roads did have census block ID and street name. The census block ID and Street name fields were

concatenated to create a string to use in joining. The census block values for these roads were joined to the census block GIS data and were output to a feature class in order to create a maximum potential area of interest boundary for road segments. The entire VA Road Centerline data from Quarter 1 of 2011 were clipped to these block polygons. The clipped RCL values then were spatially joined to the blocks in order to get full FIPS block ID attached to the clipped road centerline based on area of interest for these select blocks. Once the block values were added to the clipped RCL data, the census block ID that was added to the roads were concatenated with the street name. This concatenation in the clipped RCL data was joined with the original concatenation of the table. All GIS features that matched were kept and output to a separate feature class using the NTIA model structure. The speed polygon data which was created originally was used in calculating maximum advertised values for these segments and once the values were calculated, this iteration of the roads was loaded into the reporting database.

MBC
Provider Name: Mid-Atlantic Broadband Cooperative
DBA Name: MBC
FRN: 0019765304

MBC provided CIT and VGIN GIS shape files of points where their addresses served were available as well as several other GIS shape file which did not pertain to the NTIA mapping initiative. A new personal Geodatabase was created to represent the staging of this broadband provider and the address data was exported to a Geodatabase table in order to keep a single working environment in ArcGIS. The address data was then geocoded based on the most recent VA address point geocoding service and was output to a new data set. All unmatched or tied geocoded results were then exported to an additional geodatabase table and re-geocoded based on the VA Road Centerline geocoding service. The Road geocoding point data was spatially joined to the first quarter of 2011 VA Road Centerline data in order to place the point features in a linear feature class. Data was then joined and imported to a road centerline feature class which matched the NTIA model. Data was massaged and then loaded to the SBDD data model.

Participating Broadband Providers who did not submit updates

The following broadband providers are participating in the SBDD program but did not indicate having updates for the spring 2011 submission. The fall 2010 submission data for the broadband providers was included in the spring 201 reporting database.

Broadband Provider	FCC Registration Number
Bugg's Island Telecommunications	0002031698
Burke's Garden Telephone Company, Inc.	0004942819

Citizens Telephone Cooperative	0004381422
Citizens Cablevision Inc.	0009485343
Highland Telephone Cooperative	0004318846
MetroCast	0018547471
Nelson Cable	0000900287
New Hope Telephone Cooperative	0002071579
NextLink	0014286934
NTELOS Wireless	Various
BVU OptiNet	0006823991
Peoples Fairpoint	0002071116
RoadStar Internet	0013445358
Scott County Telephone Cooperative	0002069862
The Wired Road	0020153854
VMMicro	0018713800
XO	0006275945

Additional Broadband Provider data sets used in reporting data

Community Anchor Institution information

Virginia Tech held speed tests in order to get download and upload speeds for Community Anchor institutions. NTIA requested that the data model not be changed so unfortunately speed data was not reported since VT had the typical upload and download speeds populated. The requested attributes were advertised upload and download speeds; the broadband providers who provided service to the Anchor institutions in Virginia were unreported in many categories therefore advertised speeds were unavailable to report.

Middle Mile

If middle mile data was provided by the participating broadband provider, this was converted into a Geodatabase table in the providing broadband provider's staging Geodatabase. All appropriate fields were added in order to load data spatially. This information was exported to an access database and then exported to comma delimited text for the non spatial middle mile reporting feature class.

Pricing

If nominal weighted subscriber speed was available from a broadband provider, the data was placed into an Access database which followed the format of requested text output information from NTIA. It was then output to a requested tab delimited text file for the release.

Speed based on CMA/MSA/RSA

If speed was available by cellular market area or MSA/RSA and provided to CIT and VGIN, this information was placed into an Access database which followed the format of

requested text output information from NTIA. It was then output to a requested tab delimited text file for the release. This category of reporting was least provided by broadband providers.

Validation and Quality Control

The data included in the NTIA SBDD data model was quality controlled using the topology included in the model as well as the python script provided by NTIA. The topology was validated using ESRI ArcGIS Topology validation tools and any errors were fixed using standard ESRI processing techniques.

The attribution included in the Virginia submission was validated using the NTIA provided Python Script SBDD_CheckSubmission.py. The script was run repeatedly against the data sets until all attribute errors were identified and corrected. The script was altered by VGIN to limit each run to only one feature class to speed processing. Once each feature class was run successfully, the entire script was enabled and run in its entirety against the Virginia submission. This final check ran without identifying any errors.

The output of the final run is shown below:

NOTES - RJO
TRANS_TECH test failure in Address and Road_Segment is valid because of Wirless Vendor that submited Point and line data rather than polygon coverage areas.
FAILED tests in CAI points are valid because of no Transmission Technology identified.

```
* ---------------------------------------------------------------------------
* Data Submission Reciept
* CheckSBDDSubmission.py
* Created on: 3/23/2011
* Created by: VA
* State Broadband Data Development Program
* NTIA / FCC
* ---------------------------------------------------------------------------

*****************************************************************************
*****                                                 *****
*****                                                 *****
*****              Submission Reciept File            *****
*****          Check below for any FAILED Statements          *****
*****                                                 *****
*****                                                 *****
*****************************************************************************

*Check Layer: LastMile
    Geometry PASSED:  Layer has 0 records.
    Field Check:    passed    LastMile_PROVNAME values are good
    Field Check:    passed    LastMile_DBANAME values are good
    Field Check:    passed    LastMile_FRN values are good
    Field Check:    passed    LastMile_OWNERSHIP values are good
    Field Check:    passed    LastMile_BHCAPACITY values are good
    Field Check:    passed    LastMile_BHTYPE values are good
    Field Check:    passed    LastMile_LATITUDE values are good
    Field Check:    passed    LastMile_LONGITUDE values are good
    Field Check:    passed    LastMile_ELEVFEET values are good
    Field Check:    passed    LastMile_STATEABBR values are good
    Field Check:    passed    LastMile_FULLFIPSID values are good
```

**Check Layer: MiddleMile*
Geometry PASSED: Layer has 490 records.
Field Check: passed MiddleMile_PROVNAME values are good
Field Check: passed MiddleMile_DBANAME values are good
Field Check: passed MiddleMile_FRN values are good
Field Check: passed MiddleMile_OWNERSHIP values are good
Field Check: passed MiddleMile_BHCAPACITY values are good
Field Check: passed MiddleMile_BHTYPE values are good
Field Check: passed MiddleMile_LATITUDE values are good
Field Check: passed MiddleMile_LONGITUDE values are good
Field Check: passed MiddleMile_ELEVFEET values are good
Field Check: passed MiddleMile_STATEABBR values are good
Field Check: passed MiddleMile_FULLFIPSID values are good

**Check Layer: Address*
Geometry PASSED: Layer has 85481 records.
Field Check: passed Address_PROVNAME values are good
Field Check: passed Address_DBANAME values are good
Field Check: passed Address_FRN values are good
Field Check: passed Address_ADDRESS values are good
Field Check: passed Address_BLDGNBR values are good
Field Check: passed Address_STREETNAME values are good
Field Check: passed Address_CITY values are good
Field Check: passed Address_STATECODE values are good
Field Check: passed Address_ZIP5 values are good
Field Check: passed Address_LATITUDE values are good
Field Check: passed Address_LONGITUDE values are good
Field Check: passed Address_ENDUSERCAT values are good
Field Check: FAILED Address_TRANSTECH has UNEXPECTED VALUES
Field Check: passed Address_MAXADDOWN values are good
Field Check: passed Address_MAXADUP values are good
Field Check: passed Address_SpeedNotBB values are good
Field Check: passed Address_OneSpeedAndNotTheOther values are good
Field Check: passed Address_TYPICDOWN values are good
Field Check: passed Address_TYPICUP values are good
Field Check: passed Address_SpeedCheck values are good

**Check Layer: CAInstitutions*
Geometry PASSED: Layer has 1684 records.
Field Check: passed CAInstitutions_ANCHORNAME values are good
Field Check: passed CAInstitutions_ADDRESS values are good
Field Check: passed CAInstitutions_BLDGNBR values are good
Field Check: passed CAInstitutions_STREETNAME values are good
Field Check: passed CAInstitutions_CITY values are good
Field Check: passed CAInstitutions_STATECODE values are good
Field Check: passed CAInstitutions_ZIP5 values are good
Field Check: passed CAInstitutions_CAICAT values are good
Field Check: passed CAInstitutions_BBSERVICE values are good
Field Check: passed CAInstitutions_DBANAME values are good
Field Check: FAILED CAInstitutions_TRANSTECH has UNEXPECTED VALUES
Field Check: passed CAInstitutions_MAXADDOWN values are good
Field Check: passed CAInstitutions_MAXADUP values are good
Field Check: FAILED CAInstitutions_SpeedNotBB has UNEXPECTED VALUES
Field Check: passed CAInstitutions_OneSpeedAndNotTheOther values are good
Field Check: passed CAInstitutions_FULLFIPSID values are good

**Check Layer: CensusBlock*
Geometry PASSED: Layer has 190115 records.
Field Check: passed CensusBlock_PROVNAME values are good
Field Check: passed CensusBlock_DBANAME values are good
Field Check: passed CensusBlock_PROVIDER_TYPE values are good
Field Check: passed CensusBlock_FRN values are good
Field Check: passed CensusBlock_STATEFIPS values are good
Field Check: passed CensusBlock_COUNTYFIPS values are good
Field Check: passed CensusBlock_TRACT values are good
Field Check: passed CensusBlock_BLOCKID values are good
Field Check: passed CensusBlock_FULLFIPSID values are good
Field Check: passed CensusBlock_TRANSTECH values are good
Field Check: passed CensusBlock_MAXADDOWN values are good

Field Check: passed CensusBlock_MAXADUP values are good
Field Check: passed CensusBlock_SpeedNotBB values are good
Field Check: passed CensusBlock_OneSpeedAndNotTheOther values are good
Field Check: passed CensusBlock_TYPICDOWN values are good
Field Check: passed CensusBlock_TYPICUP values are good
Field Check: passed CensusBlock_SpeedCheck values are good
Speed Tier Record Check PASSED

**Check Layer: Overview*
Geometry PASSED: Layer has 0 records.
Field Check: passed Overview_PROVNAME values are good
Field Check: passed Overview_DBANAME values are good
Field Check: passed Overview_FRN values are good
Field Check: passed Overview_GEOUNITTYPE values are good
Field Check: passed Overview_STATECOUNTYFIPS values are good
Field Check: passed Overview_TRANSTECH values are good
Field Check: passed Overview_MAXADDOWN values are good
Field Check: passed Overview_MAXADUP values are good
Field Check: passed Overview_SpeedNotBB values are good
Field Check: passed Overview_OneSpeedAndNotTheOther values are good
Field Check: passed Overview_STATEABBR values are good
Field Check: passed Overview_SpeedCheck values are good

**Check Layer: RoadSegment*
Geometry PASSED: Layer has 100501 records.
Field Check: passed RoadSegment_PROVNAME values are good
Field Check: passed RoadSegment_DBANAME values are good
Field Check: passed RoadSegment_PROVIDER_TYPE values are good
Field Check: passed RoadSegment_FRN values are good
Field Check: passed RoadSegment_ADDMIN values are good
Field Check: passed RoadSegment_ADDMAX values are good
Field Check: passed RoadSegment_STREETNAME values are good
Field Check: passed RoadSegment_CITY values are good
Field Check: passed RoadSegment_STATE values are good
Field Check: passed RoadSegment_ZIP5 values are good
Field Check: FAILED RoadSegment_TRANSTECH has UNEXPECTED VALUES
Field Check: passed RoadSegment_MAXADDOWN values are good
Field Check: passed RoadSegment_MAXADUP values are good
Field Check: passed RoadSegment_SpeedNotBB values are good
Field Check: passed RoadSegment_OneSpeedAndNotTheOther values are good
Field Check: passed RoadSegment_TYPICDOWN values are good
Field Check: passed RoadSegment_TYPICUP values are good
Field Check: passed RoadSegment_SpeedCheck values are good

**Check Layer: Wireless*
Geometry PASSED: Layer has 14 records.
Field Check: passed Wireless_PROVNAME values are good
Field Check: passed Wireless_DBANAME values are good
Field Check: passed Wireless_FRN values are good
Field Check: passed Wireless_TRANSTECH values are good
Field Check: passed Wireless_MAXADDOWN values are good
Field Check: passed Wireless_MAXADUP values are good
Field Check: passed Wireless_SpeedNotBB values are good
Field Check: passed Wireless_OneSpeedAndNotTheOther values are good
Field Check: passed Wireless_TYPICDOWN values are good
Field Check: passed Wireless_TYPICUP values are good
Field Check: passed Wireless_STATEABBR values are good
Field Check: passed Wireless_SpeedCheck values are good

During processing VGIN identified two issues with the NTIA provided Python script. In order to complete the requirements of the submission, the script had to be altered slightly and those changes are detailed below.

1. The Last Mile and Middle Mile feature class defines the attribute ELEVFEET to identify the elevation of the Last/Middle Mile point provided by the broadband providers. If the SBDD data model, the default value is -9999. The Python script contained a query string

"***ELEVFEET Is Null OR ELEVFEET < 0***" which was causing every record using the -9999 default value to fail. VGIN changed the query string to read "***ELEVFEET Is Null OR (ELEVFEET < 0 and ELEVFEET <> -9999)"*** which allowed records using the default value to pass the validation check.

2. Two Wireless broadband providers reported service territory using Points and Lines rather than Polygon features. This cause the TTRANS_TYPE field to be populated with a value that did not pass the validation check for WIRELESS technology. VGIN and CIT will work with these broadband providers in future submissions to deliver their information in a format that is compatible with the SBDD data model.

Issues/Considerations

Cellular Market Area reporting

There were several cases where Cellular Market Area (CMA) coverage was used in reporting speed tiers. A CMA shapefile was located online and loaded into SDE for processing. The features used had CMA id number and CMA name and this information was spatial joined to blocks, streets, and addresses where pertinent.

Several major providers submitted a census blocks less than two square miles and road segment ranges although left the upload and download speeds out. The information for maximum advertised for up and download speed was provided in a separate spreadsheet and referenced speeds by cellular market area (CMA). A CMA shapefile was downloaded and used potential census block information and this contained reference information to other spreadsheets. The advertised download and upload speeds were provided by cellular market area. The road centerline information was then spatially joined to this updated table as well as the address points to get the speed information.

Data version issues & future processing

Several broadband providers reported blocks in 2008 geography so block FIPS id did not join from the provided block spreadsheet to the statewide block file. Since these changes reported no results when joining, the column where block was reported was formatted to allow only the exact amount of characters for the block FIPS id to be equal from the provider to the feature selected. This seemed to be the cause of why some blocks were reported in the less than two square mile feature class but their geometry was actually more than two from 2000.

Broadband providers who reported address level data only did not have any additions or subtractions done to their reported data. It was geocoded directly and results were loaded into the master data set wholesale so one thing that may be done or at least need to be looked at for the next submission is where these broadband providers report addresses that fall in blocks less than two square miles. There may be many cases where these broadband providers actually need a block placed in the report instead of centerlines and points. This may reduce the amount of total address points and road segments submitted as well as increase the individual coverage area for a broadband provider if we do leave out features that sit on top of these polygons.

With further analysis of road name and address range data provided by broadband providers, many roads had null values for address range high and low as well as the street name. This was

problematic when attempting to select by attributes since only data yielded results for segments where this information was populated.

Also, further analysis of the data may show which centerline source broadband providers are using. Geocoding data may be a step that is only needed for address data only in the future and not needed for ranges if the census data can be utilized for a geographic feature.