NVTA

NORTHERN VIRGINIA TRANSPORTATION AUTHORITY

NVTA Assignment Interoperability

A GMNS exchange workflow across regional assignment

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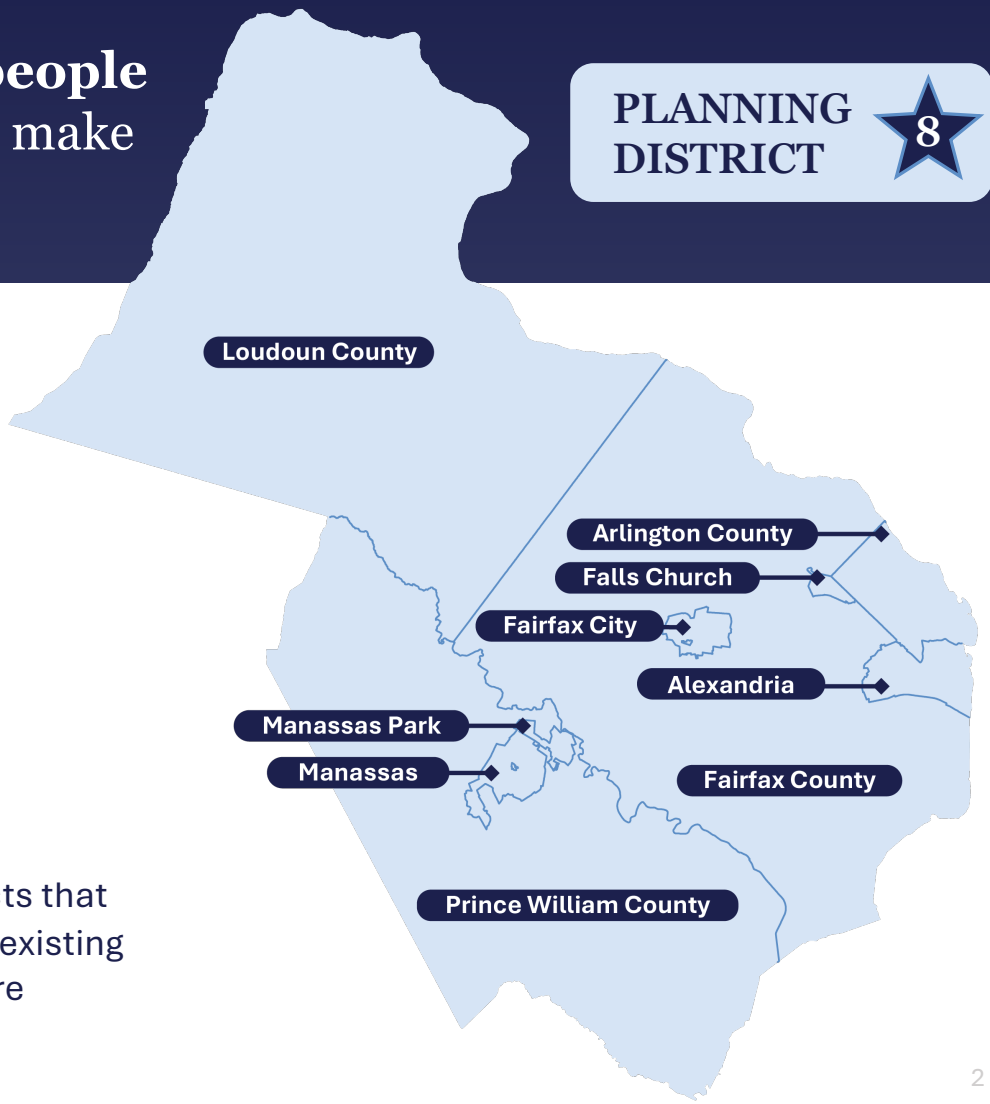
NVTA and our partners are **connecting people** by delivering **multimodal projects** that make travel **safer** and more **efficient**.



Planning for and investing in road, rail, bus, bicycle/pedestrian, and intersection/interchange projects

Partnering with jurisdictions and agencies to deliver regionally significant projects

Prioritizing projects that alleviate strain on existing infrastructure

NVTA's TransAction

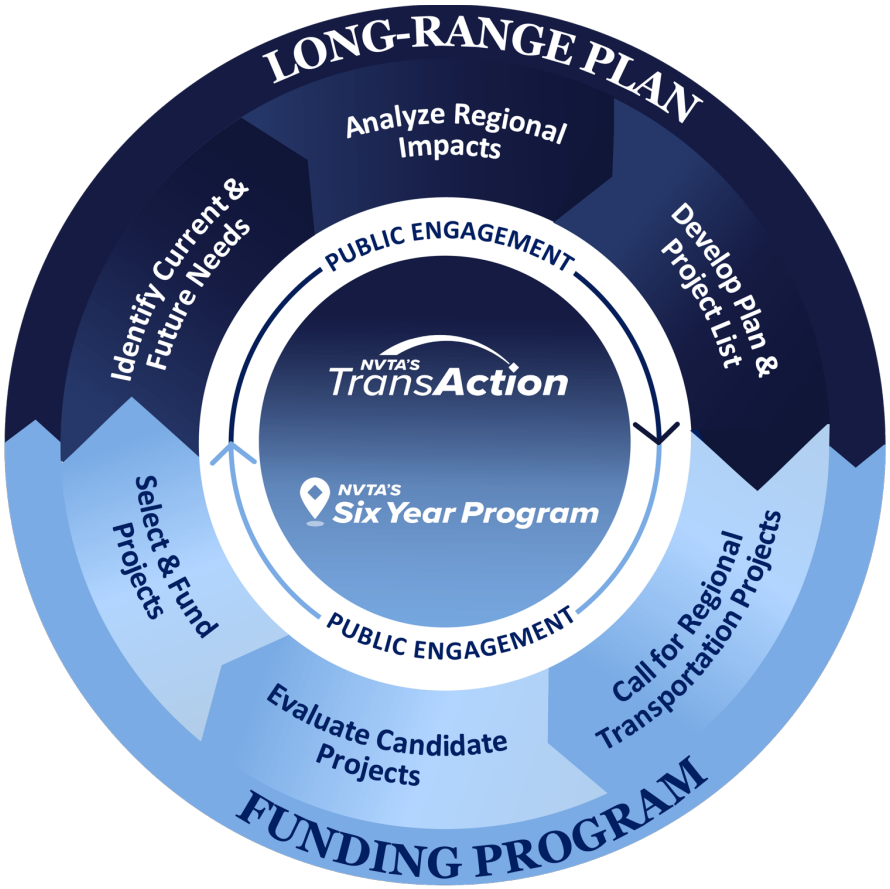
NVTA's Six Year Program

Long-Range Plan

- Updated Every Five Years
- Fiscally and Geographically Unconstrained
- Identifies Current and Future Transportation Needs & Priorities
- Analyzes Regional Impacts
- Develops a Plan and Project List

Funding Program

- Updated Every Two Years
- Allocates NVTA's Regional Revenues to Regional, Multimodal, Congestion Reducing Transportation Projects
- Most Recent SYP Adopted in July 2026



Primary Responsibilities

Project Selection Process

Multiple Components

1. Eligibility
   - TransAction ID; project descriptions will be verified
   - Project location
   - Governing Body resolution(s)
2. Quantitative Analyses
   - Congestion Reduction Relative to Cost (CRRC) – initial ranking uses this measure
   - TransAction Project Ratings, formerly HB 599 (2012)
   - Long Term Benefit (LTB)
3. Qualitative Considerations
   - Past performance
   - Previous NVTA allocation
   - Funding gaps
   - External funding (committed sources only)
   - Alignment with Core Values
   - Geographic/modal balance
4. Public Comment

Congestion Reduction Relative to Cost (CRRC)

VA Code requires NVTA to give priority to projects that achieve the greatest congestion reduction relative to cost (CRRC).

- Derive person hours of delay (PHD) reduced from individual project model runs for years 2030 and 2045 by comparing no-build and build networks.
- PHD reduction values for 2030 and 2045 are extrapolated from the year of expected project completion to 2045, and summed for each year.
- The cumulative PHD reduction is divided by total project cost.

TransAction Rating and Performance Measures

NVTA evaluates potential transportation projects based on how well they:

- Improve mobility and reduce congestion
- Increase access to jobs and destinations
- Enhance safety for all users
- Support environmental sustainability
- Strengthen system resiliency

Performance Measure	Weight
A1. Total Person-Hours of Delay in autos	10%
A2. Total Person-Hours of Delay on Transit	10%
B1. Duration of Severe Congestion	10%
B2. Transit person-miles in dedicated/priority ROW	10%
C1. Access to jobs by car, transit, and bike	10%
C2. Access to jobs by car, transit, and bike for EEA populations	10%
D1. Quality of access to transit and the walk/bike network	15%
E1. Potential for safety and security improvements	10%
F1. Vehicle Emissions	10%
G1. Transportation System Redundancy	5%

21 Projects Adopted for FYP2026-2031 SYP

Application ID	Project Title	Total Project Cost	Requested NVTA Funds	TransAction Project Rating Rank (incl. HB 599)	CRRC Rank	Recommended Funds	Phases for which Funds Recommended
ARL-031	Next Generation Bus Rider Info	$ 2,500,000	$ 2,500,000	6	1	$ 2,500,000	CN, Asset
ARL-035	Performance Parking Initiative Phases 2 and 3	$ 4,587,747	$ 4,587,747	12	2	$ 4,587,747	CN, Asset
PWC-046	Van Buren Road North Extension: Route 234 to Cardinal Drive [1]	$ 191,005,800	$ 179,005,800	7	3	$ 179,005,800	ROW, CN
PWC-048	Route 15 Railroad Overpass and Improvements Project	$ 80,000,000	$ 65,000,000	18	4	$ 65,000,000	PE, ROW, CN
LDN-040	Route 50 North Collector Road - Tall Cedars Parkway to Route 28 [2]	$ 400,716,000	$ 200,000,000	2	5	$ 200,000,000	ROW, CN
ARL-036	Custis Trail Widening and Modernization	$ 29,900,000	$ 2,400,000	23	6	$ 2,400,000	PE
FFX-141	Richmond Highway Bus Rapid Transit - Phases I & II [1]	$ 987,290,200	$ 463,000,000	1	7	$ 116,300,000	CN
PWC-050	Dale City Transit Priority Project	$ 50,080,000	$ 6,000,000	5	8	$ 6,000,000	PE
ARL-029	South Glebe Road and West Glebe Road Intersection Improvements	$ 10,000,000	$ 10,000,000	20	9	$ 10,000,000	PE, ROW, CN
ARL-033	South Glebe Road and 7th Street South Intersection Improvements	$ 10,000,000	$ 3,000,000	22	10	$ 3,000,000	PE, ROW
PWC-047	Old Bridge/Gordon Boulevard Intersection Improvements	$ 94,456,481	$ 56,000,000	14	11		
ALX-040	Duke Street Transitway Phase 2: Van Dorn Street and Duke Street Interchange Improvements [1]	$ 102,555,000	$ 15,000,000	3	12	$ 15,000,000	ROW, CN
PWC-049	Route 234 Trail at Innovation Park	$ 45,000,000	$ 45,000,000	25	13	$ 45,000,000	PE, ROW, CN
ARL-032	Arlington Boulevard Trail: North Side from North Granada Street to North Jackson Street	$ 15,000,000	$ 15,000,000	27	14	$ 15,000,000	PE, ROW, CN
ARL-034	North Glebe Road at Quincy Street / Henderson Road Intersection Improvements	$ 15,000,000	$ 5,000,000	10	15	$ 5,000,000	PE, ROW
ARL-028	North Glebe Rd at I-66 WB Off-Ramp Intersection Improvements	$ 17,500,000	$ 10,000,000	19	16	$ 10,000,000	PE, ROW
CFC-013	Annandale Road Multimodal Improvements	$ 30,000,000	$ 30,000,000	11	17	$ 30,000,000	PE, ROW, CN
ARL-037	Eads Street Multimodal Improvements: 15th Street South to 23rd Street South	$ 18,300,000	$ 2,000,000	4	18	$ 2,000,000	PE
ARL-026	South George Mason Drive Multimodal Improvements: Columbia Pike to South Dinwiddie St	$ 36,000,000	$ 36,000,000	13	19	$ 28,747,299	PE, ROW, Part CN
CFC-012	Haycock Road Shared Use Path	$ 15,087,696	$ 15,000,000	26	20		
ARL-024	Arlington Memorial Trail: Memorial Avenue to Columbia Pike	$ 29,338,000	$ 5,000,000	24	21		
MAN-004	Manassas VRE Line Rail-with-Trail: Downtown Manassas to Bull Run Trail (Phase 1) [2]	$ 30,534,594	$ 30,265,994	15	22	$ 30,265,994	PE, ROW, CN
ARL-027	South George Mason Drive and South Four Mile Run Drive Intersection Safety Improvements	$ 64,375,000	$ 8,500,000	17	23		
LDN-041	Colonial Highway Pedestrian Safety Improvements Project	$ 8,488,000	$ 8,488,000	21	24	$ 1,586,166	PE
HND-016	South Elden Street Corridor Improvements [3]	$ 31,572,514	$ 4,400,000	9	25	$ 4,400,000	CN
ALX-039	Eisenhower Avenue and South Van Dorn Street Corridor Improvements	$ 21,856,219	$ 21,856,219	8	26		
ARL-030	Court House Metro Station Access Improvements	$ 67,127,000	$ 11,655,000	16	27		
		$ 2,408,270,251	**$ 1,254,658,760**			**$ 775,793,006**	
					Available PayGo	**$ 775,793,006**	

[1] *Continuation project (previously received NVTA regional revenue funds)*

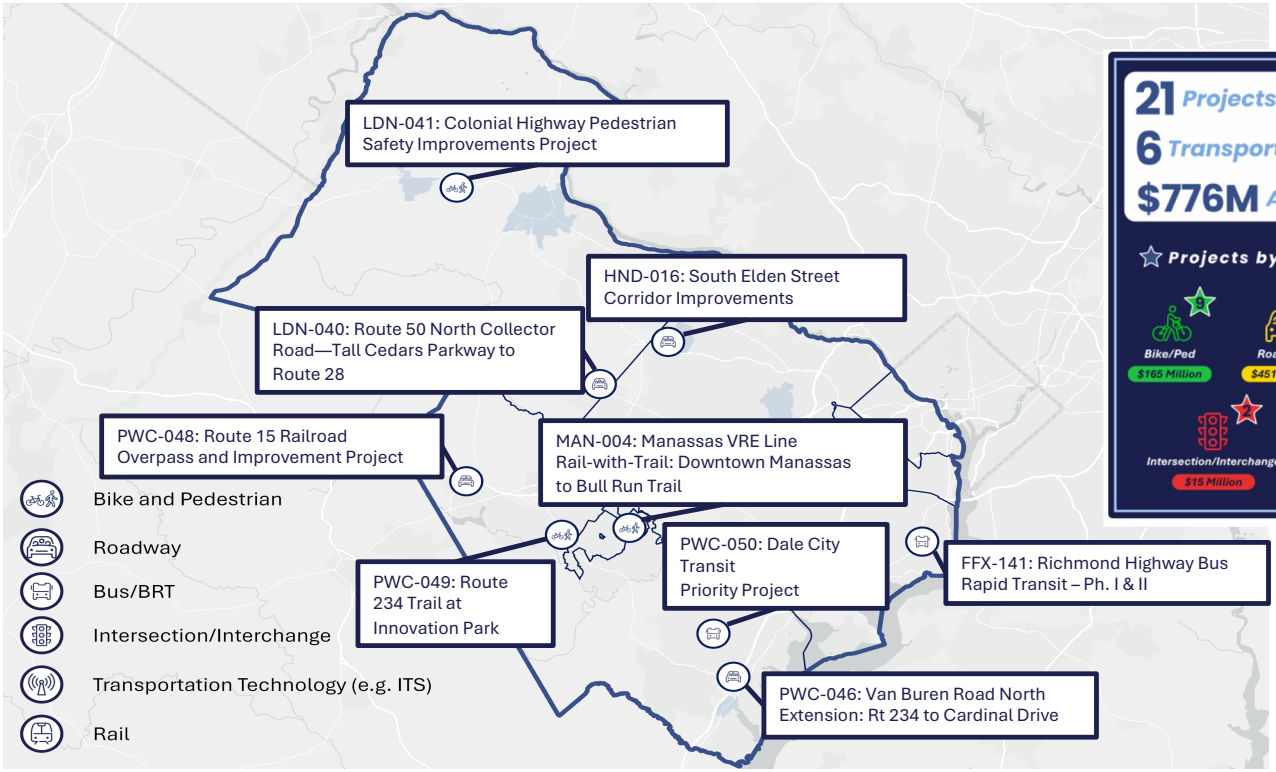
[2] *Multi-jurisdictional project*

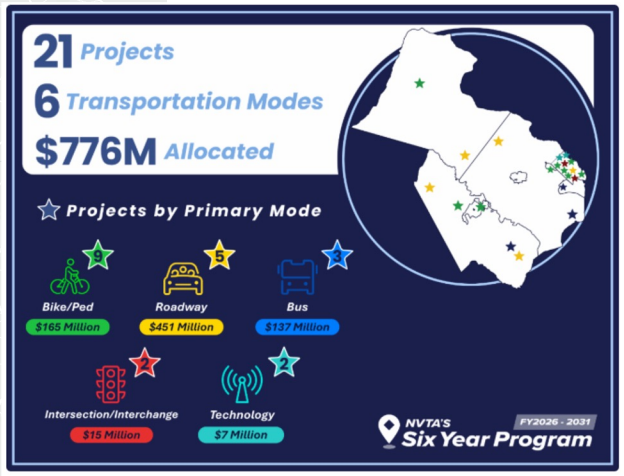
[3] *Town of Herndon reduced the request to $4,400,000 from the original request of $15,572,514*

XX Partial Funding

PE: Design/Preliminary Engineering ROW: Right of Way CN: Construction Asset: Asset Acquisition

Location and Mode of Adopted Projects





Bike/Pedestrian:
9 projects ($165M)

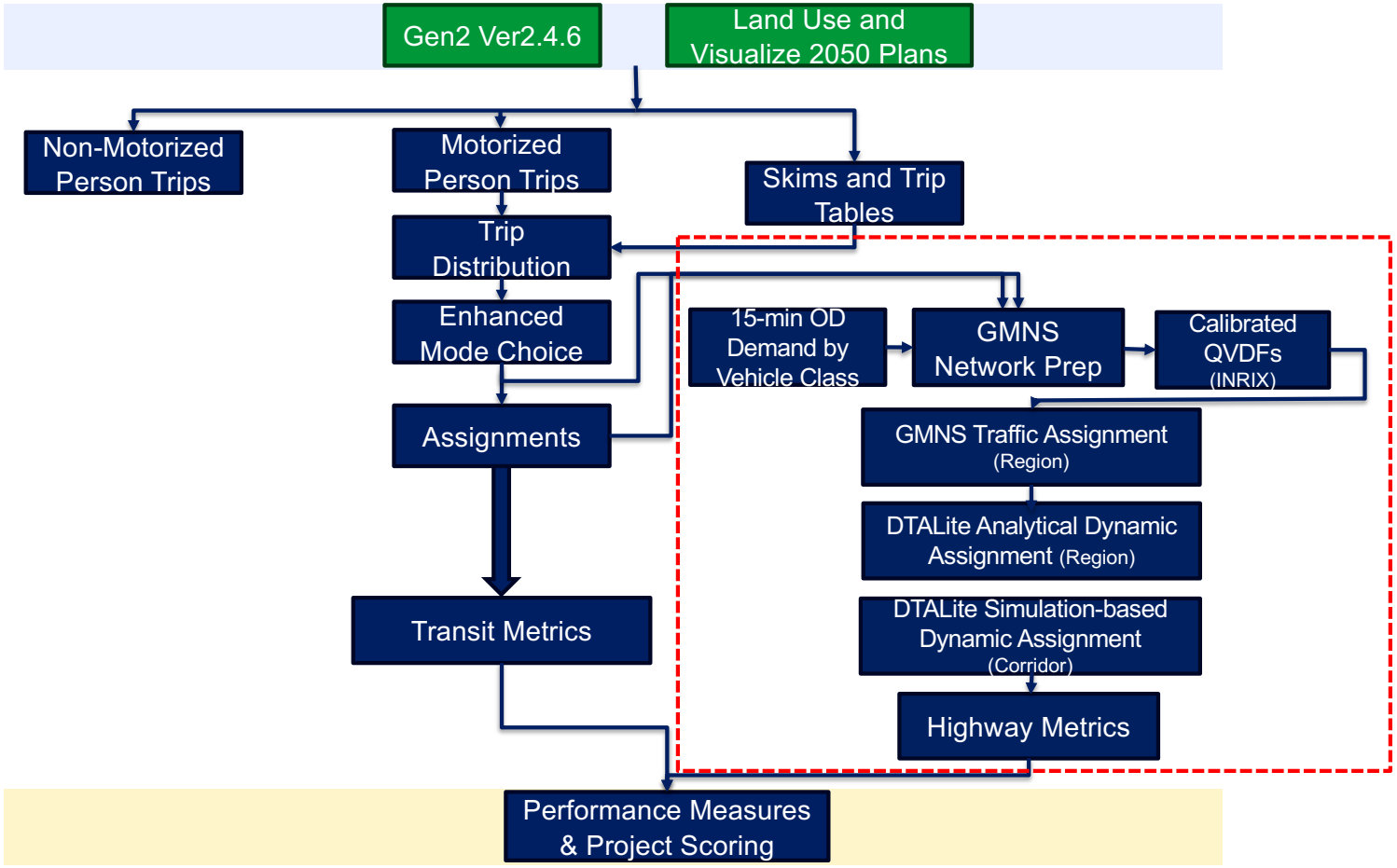
Roadway:
5 projects ($451M)

Bus:
3 projects ($137M)

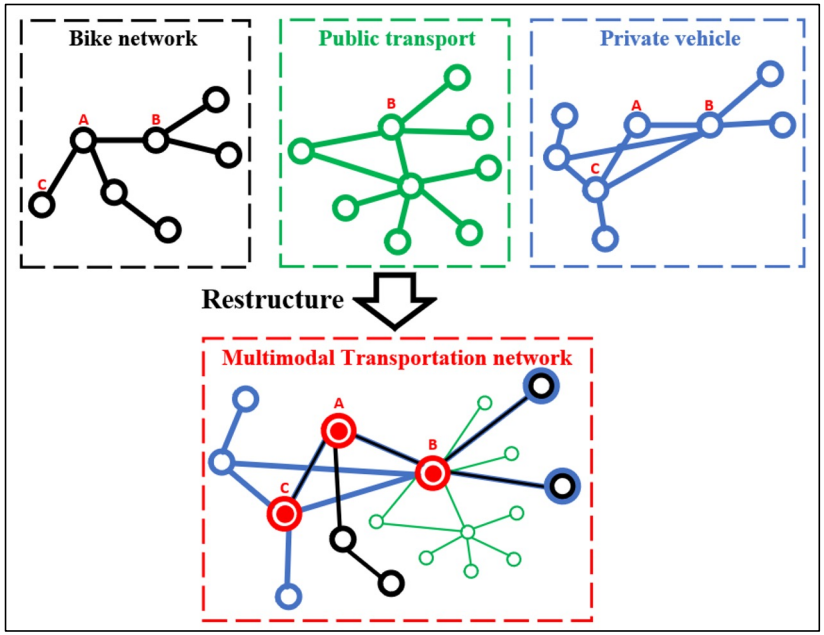
Intersection/ Interchange:
2 projects ($15M)

Technology:
2 projects ($7M)

NVTA Travel Demand Model Framework



Challenges in Building Model Specifications



Multimodal network representation

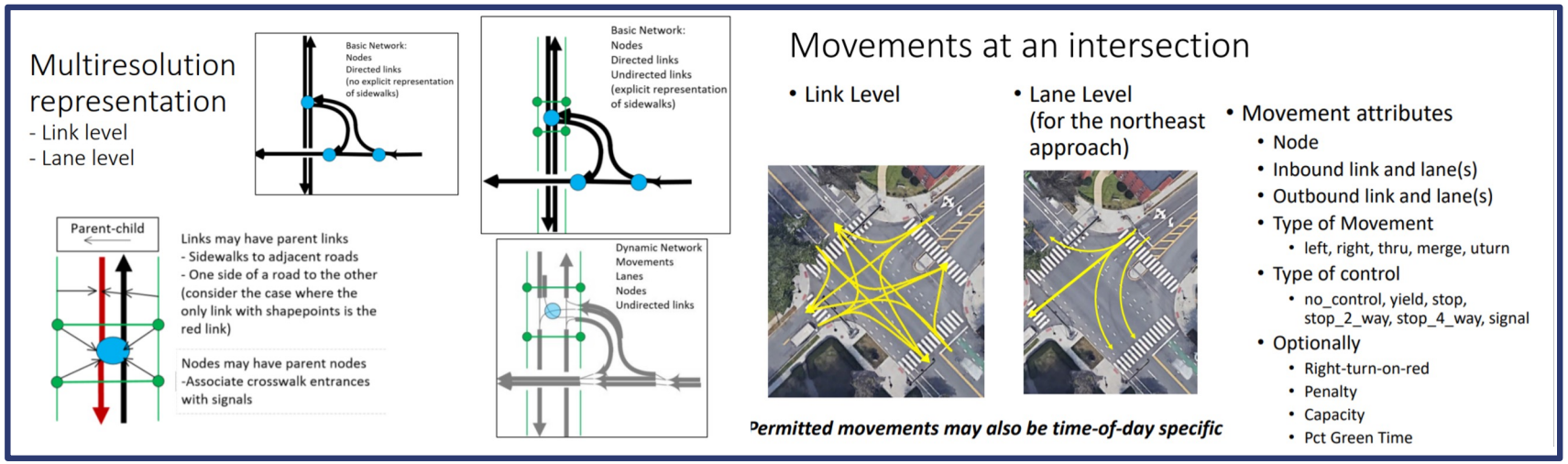
- A wide range of ways to code multimodal network with real-world requirements
- Non-trivial data structure even for essential information
- Network manipulation is not being standardized
- Different data format options
- Limited recent activities in network model standardization
- Needs for cross-mode standards to ensure complete trip interoperability

Network Representation

The objective of the GMNS is to provide **a common human and machine-readable format** for sharing routable road network files.

The project is overseen by a project management group, with MPO, city, industry, academic and US DOT participation.

github.com/zephyr-data-specs/GMNS



Source: Volpe Center GMNS team
Scott.Smith@dot.gov
Ian.Berg@dot.gov

Network Data Structure and Required Fields

The General Modeling Network Specification (GMNS) is designed to be used in multi-modal static and dynamic transportation planning and operations models.

Basic Data Elements

- node
- link
- geometry
- zone

node.csv

name	node_id	osm_node	osm_highw	zone_id	ctrl_type	node_type	activity_typ	is_boundar	x_coord	y_coord	main_node	poi_id	notes
	0	41459438			0				-111.928	33.4245			
	1	41520512			0				-111.944	33.42547			
	2	41520515			0				-111.944	33.42432			
	3	41520518			0				-111.944	33.42318			
	4	41520521	traffic_signals		1				-111.944	33.42189			
	5	41520523			0				-111.944	33.42064			
	6	41520525			0				-111.944	33.42035			
	7	41520528			0				-111.944	33.4194			
	8	41520531			0				-111.944	33.41892			
	9	41520533			0				-111.944	33.41778			

link.csv

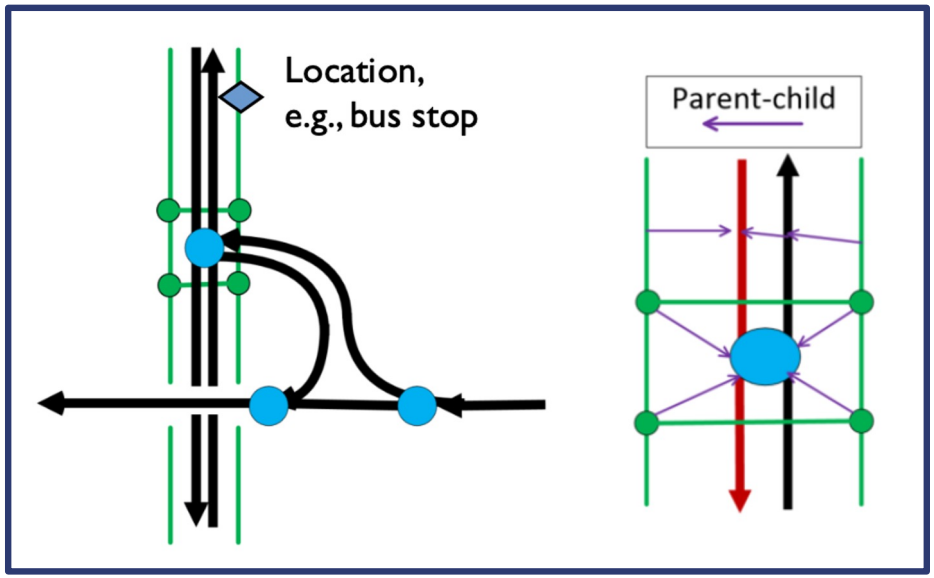
name	link_id	osm_way_i	from_node	to_node_ic	dir_flag	length	lanes	free_speed	capacity	link_type_n	link_type	geometry	allowed_us	from_biwa
South Farn	0	5590095	13	14	1	81.57798	1	25		residential	6	LINESTRIN	auto	1
South Farn	1	5590095	14	13	1	81.57798	1	25		residential	6	LINESTRIN	auto	1
South Farn	2	5590095	14	15	1	80.16146	1	25		residential	6	LINESTRIN	auto	1
South Farn	3	5590095	15	14	1	80.16146	1	25		residential	6	LINESTRIN	auto	1
South Farn	4	5590095	15	16	1	240.2824	1	25		residential	6	LINESTRIN	auto	1
South Farn	5	5590095	16	15	1	240.2824	1	25		residential	6	LINESTRIN	auto	1
South Farn	6	5590095	16	17	1	84.15426	1	25		residential	6	LINESTRIN	auto	1
South Farn	7	5590095	17	16	1	84.15426	1	25		residential	6	LINESTRIN	auto	1
South Farn	8	5590095	17	18	1	83.10715	1	25		residential	6	LINESTRIN	auto	1
South Farn	9	5590095	18	17	1	83.10715	1	25		residential	6	LINESTRIN	auto	1

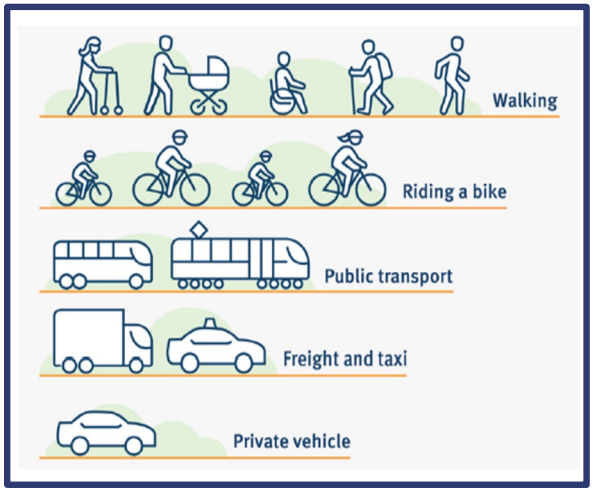
Network Representation

Multimodal Accommodation in GMNS

The **allowed uses** field indicates what may flow on a **link** or **lane** (e.g., walk, bike, bus, truck, auto, hov2, hov3+), as well as non-travel uses (shoulder, parking)

Location—a point that is associated with a specific location along a link, using a linear reference





Network Representation

Segments and Lanes:

Segment— portion of a link defined by linear references

Lane— Lanes are numbered left to right with 1 as the left-most through lane. Left turn lane is –1

Turn pockets are defined via segments.

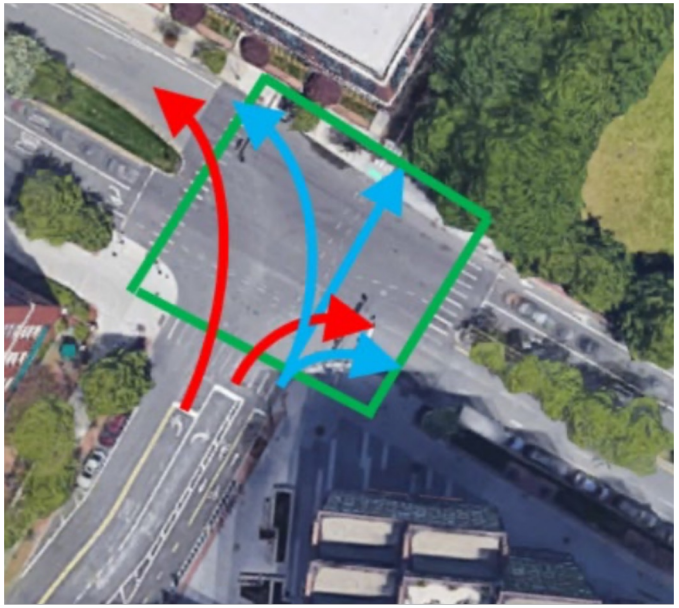
Network Representation

Movement:

Movements define connections and traffic control types (none, yield, stop, signal) between inbound and outbound links or lanes at an intersection

Example: Pedestrian movements in green

General traffic (red) and bike (blue) movements are shown from the south

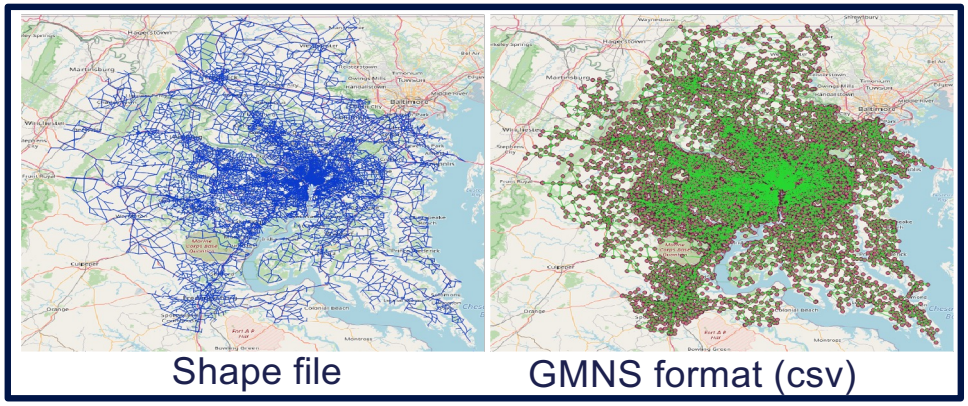


Network Representation

Cube to GMNS Conversion:

Step 1: Prepare shapefiles

Step 2: Extract GIS Information



External input file	GMNS input file	Output of DTALite
1a. Node shape file	2a. node.csv	5a. link_performance.csv
1b. Link shape file	2b. link.csv	5b. od_accessibility.csv 5c. route_assignment.csv
1c. Zone shape file (optional)	2c. zone.csv	5d. final_summary.csv
3. Demand file (csv, matrix)	4. setting.csv demand_file_list and departure time profile	6a. Agent file 6b. trajectory.csv from simulation

Transit Data Input and Output

Input

agency.txt

- **agency_id**
- agency_name

routes.txt

- **route_id**
- **agency_id**
- route_short_name
- route_long_name
- route_desc
- route_type

stops.txt

- **stop_id**
- stop_lat
- stop_lon

stop_times.txt

- **trip_id**
- arrival_time
- deaprture_time
- **stop_id**
- stop_sequence

trips.txt

- **route_id**
- service_id
- **trip_id**
- direction_id

Output

node.csv

- **node_id**
- **name**
- x_coord
- y_coord
- node_type
- **directed_route_id**
- **agency_name**

link.csv

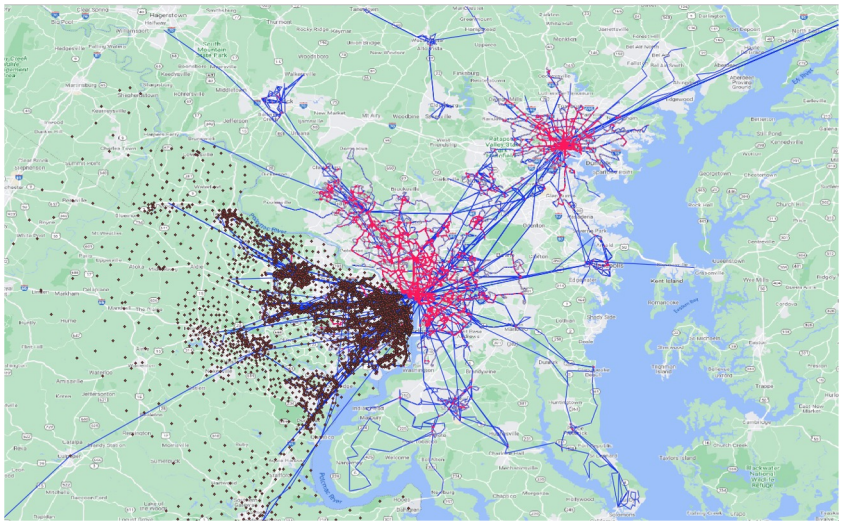
- link_id
- name
- from_node_id
- to_node_id
- **directed_route_id**
- link_type_name
- length
- agency_name
- **VDF_fftt**
- VDF_cap
- VDF_alpha
- VDF_beta
- **VDF_freq**

service.csv

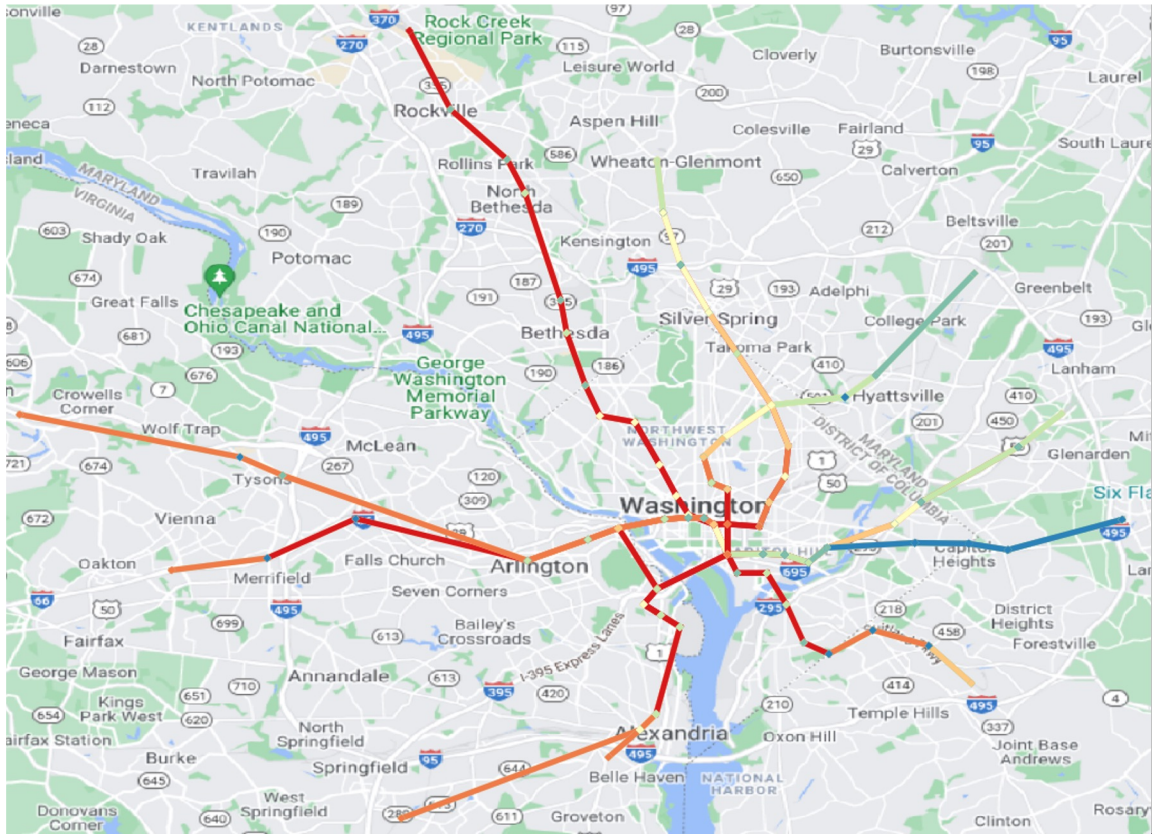
- route_id
- **directed_route_id**
- **agency_type**
- route_id_short_name
- o_zone_id
- d_zone_id
- agency_name
- arrival_time
- travel_time
- distance
- node_sequence
- time_sequence
- time_period
- frequency

Agencies, TAZ and Transit Nodes in Northern Virginia

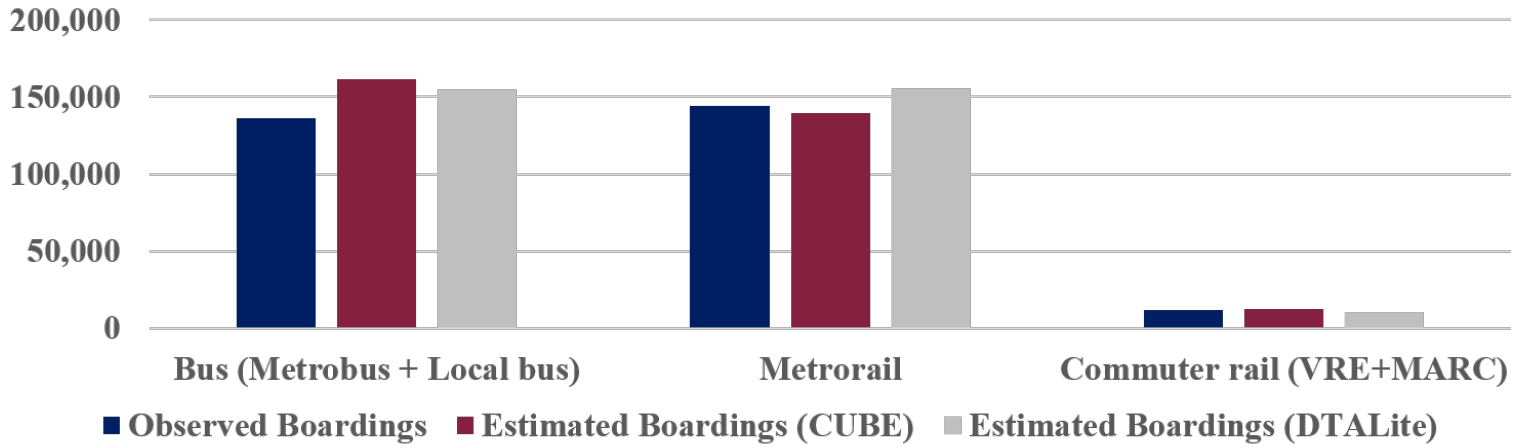
1. Washington Metropolitan Area Transit Authority (WMATA)
2. DC Circulator
3. DC Streetcar
4. Arlington Transit: ART,VA
5. Dash| Alexandria, VA
6. CUE Bus| Fairfax, VA
7. Fairfax Connector, VA
8. Potomac and Rappahannock Transportation Commision, VA
9. Loudoun County Transit, VA
10. Virginia Railway Express, VA
11. Amtrak
12. Transportation | Annapolis, MD
13. Transportation | Prince George's County,MD
14. Public Transportation | Calvert County, MD
15. Ride on | Montgomery, MD
16. TransIT | Frederick County, MD
17. Maryland Transit Administration
18. Carroll Transit System|Carroll County, MD
19. RTA of Central Maryland
20. VanGO | Charles County, MD



Transit Assignment Result (Metro, AM)



Transit Assignment and Observed Boarding



	Observed Boardings	Estimated Boardings (CUBE)	Estimated Boardings (DTALite)	Percentage Error(CUBE)	Percentage Error(DTALite)
Bus (Metrobus + Local bus)	136,507	161,693	155,090.56	18%	14%
Metrorail	144,521	139,801	155,432.49	3%	8%
Commuter rail (VRE+MARC)	11,823	12,277	10,187	4%	14%

Challenges Addressed

Aggregate travel demands (CUBE trip tables) and network data (CUBE regional network) conversion to open GMNS environment

Challenges large scale GMNS implementation analytical and simulation in Northern Virginia.

Critical system performance measures for project prioritization such as congestion duration

Opportunities for State DOTs and MPO Stakeholders

1. It takes a community for building tools that work with open standard such as GMNS, GTFS.

2. Use of different resolutions to supplement each other.
Improved dynamic traffic assignment via mesoscopic modeling

3. Integrated analytical and simulation process
Congestion bottleneck identification for priority corridors