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Gen3 Model Development Project

Travel Forecasting Subcommittee Meeting

March 26, 2021

IN PARTNERSHIP WITH

BASELINE MOBILITY

Metropolitan Washington Council of Governments

Discussion Topics

- Gen3 Model Status
- External Transit Demand Analysis

Gen3 Model Status

Phase 1 Development (Task Order 3) Status

- Population Synthesis (95%)
  - Final setup, GitHub repository
  - Finalizing PopulationSim documentation
- Data Development (60%)
  - MARC, VRE, and Metrorail on-board survey processing
  - Reweighting of RTS/MTS dataset
  - RTS/MTS processing in ActivitySim format
- ActivitySim Deployment (40%)
  - Input preparation – skims and synthetic population
  - Configuration of ActivitySim settings and utility expressions

Phase 1: Next Steps

- PopulationSim
  - Finalize documentation (1 week)
- Data Development
  - Finalize external-internal (IE/EI) and internal-internal (II) visitor transit trip tables (2 weeks)
  - Transit assignment and crowding testing (4 weeks)
  - Assist COG staff with RTS/MTS reweighting (2 weeks)
  - Develop mode choice targets for calibration and validation (2-3 weeks)
- ActivitySim Deployment
  - Update skims (1 week)
  - QA/QC initial implementation (2 weeks)
  - ABM Visualizer (2-3 weeks)

External Transit Demand Analysis

Background

- Purpose:
  - Represent externally generated transit demand in Gen3 Model
- Method
  - Generate base-year IE/EI and visitor II OD trip tables from transit on-board surveys (MARC, VRE, Metrorail)
- Data processing steps
  - Geocoding
  - IE/EI and visitor trip identification
  - Reweighting to match 2018 ridership
  - Generate IE/EI and visitor trip tables

Transit Onboard Surveys (TOBS)

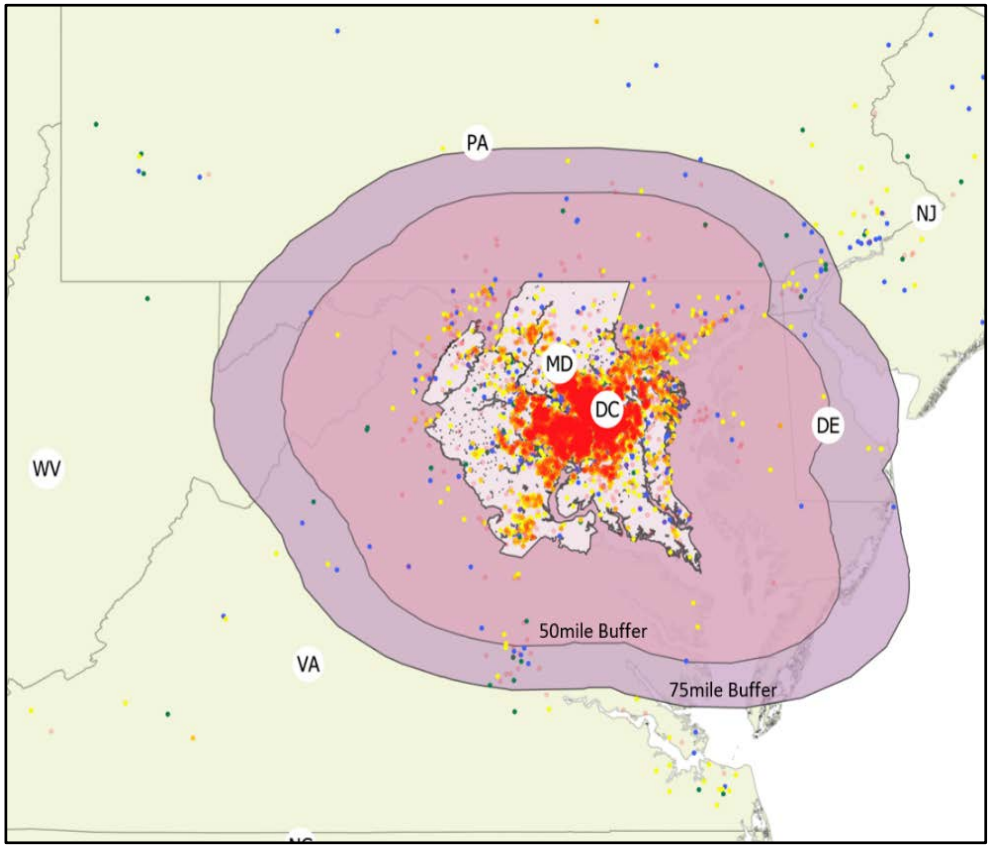
- VRE
  - 2019 passenger survey, weekday, AM, Northbound trains
  - 6,229 trip records
  - Location data: home and trip destination addresses
- MARC
  - 2016 MTA survey, all periods and days
  - 3,345 trip records
  - Location data: home, origin, and destination addresses
- Metrorail
  - 2016 WMATA survey
  - 62,329 weekday trip records
  - Location data: home

Reweighting to 2018 Ridership

- Why reweight?
  - TOBS are from different years
  - Some records were discarded due to missing information
- Reweighted to average weekday ridership in October 2018
- Reweighting was performed by boarding station for each line and operator
  - For MARC, stations with only few trips were grouped

IE/EI and Visitor Trip Identification

- **Using origin/destination**
  - Either origin or destination is outside the model boundary
- **Non-resident & non-visitor trips**
  - Resident: home within the model boundary
  - Visitor: non-resident visiting temporarily from outside of the 75-mile buffer of the modeled area
  - Non-resident and non-visitor: outside model boundary but within a distance buffer (75-mile)



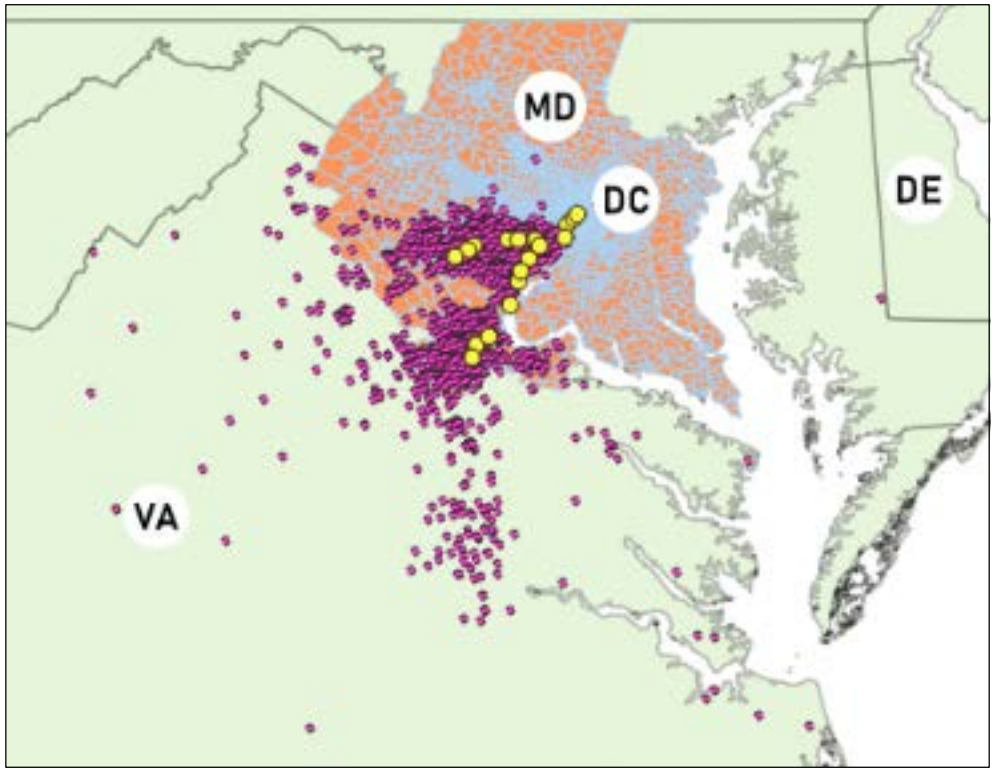
Metrorail home locations

VRE Results

VRE System Map

Stations are within the modeled area, but non-resident riders can access stations, especially end-of-line stations, by driving or taking a bus

VRE Home Locations

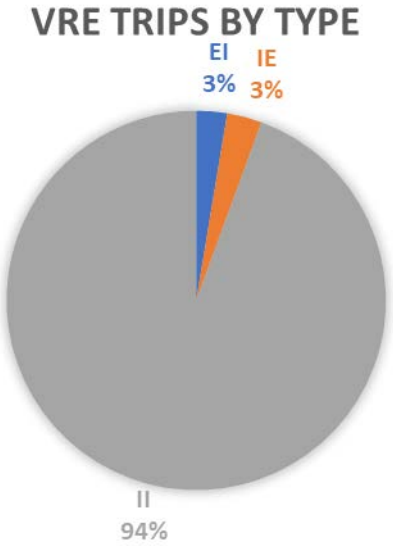


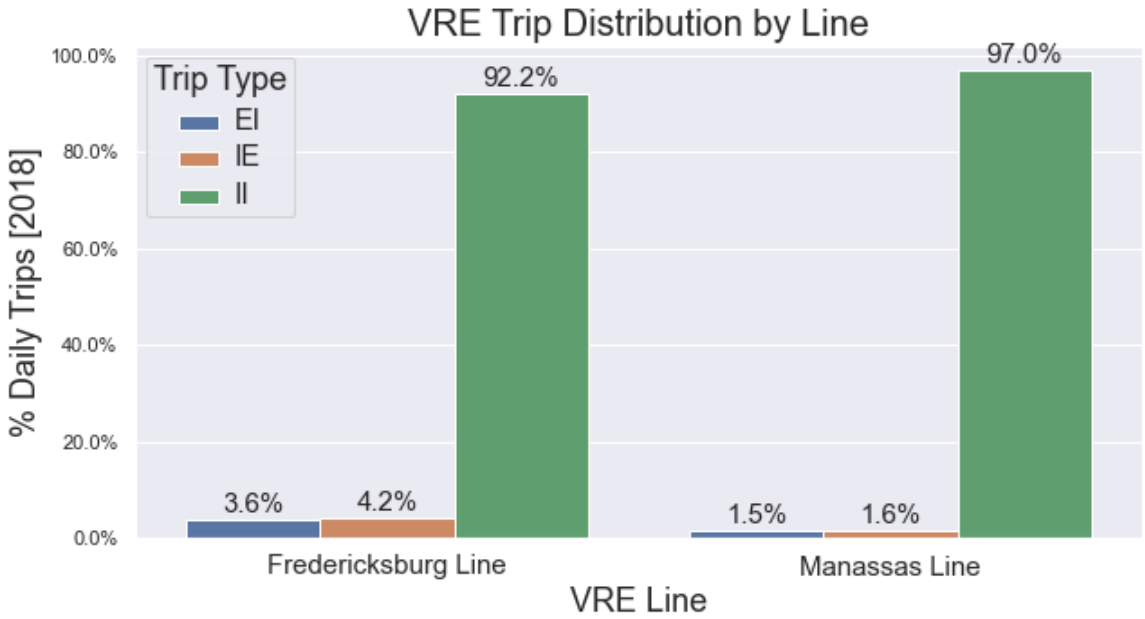
- ~6% of the home locations outside the model boundary
- All trips with home locations outside the model boundary are coded as EI
- IE trip in the PM are generated as transpose of EI trips in the AM

Dots are plotted on top of each other
Yellow Dots: VRE stops
Magenta Dots: Home locations
Orange: MWCOG modeled area

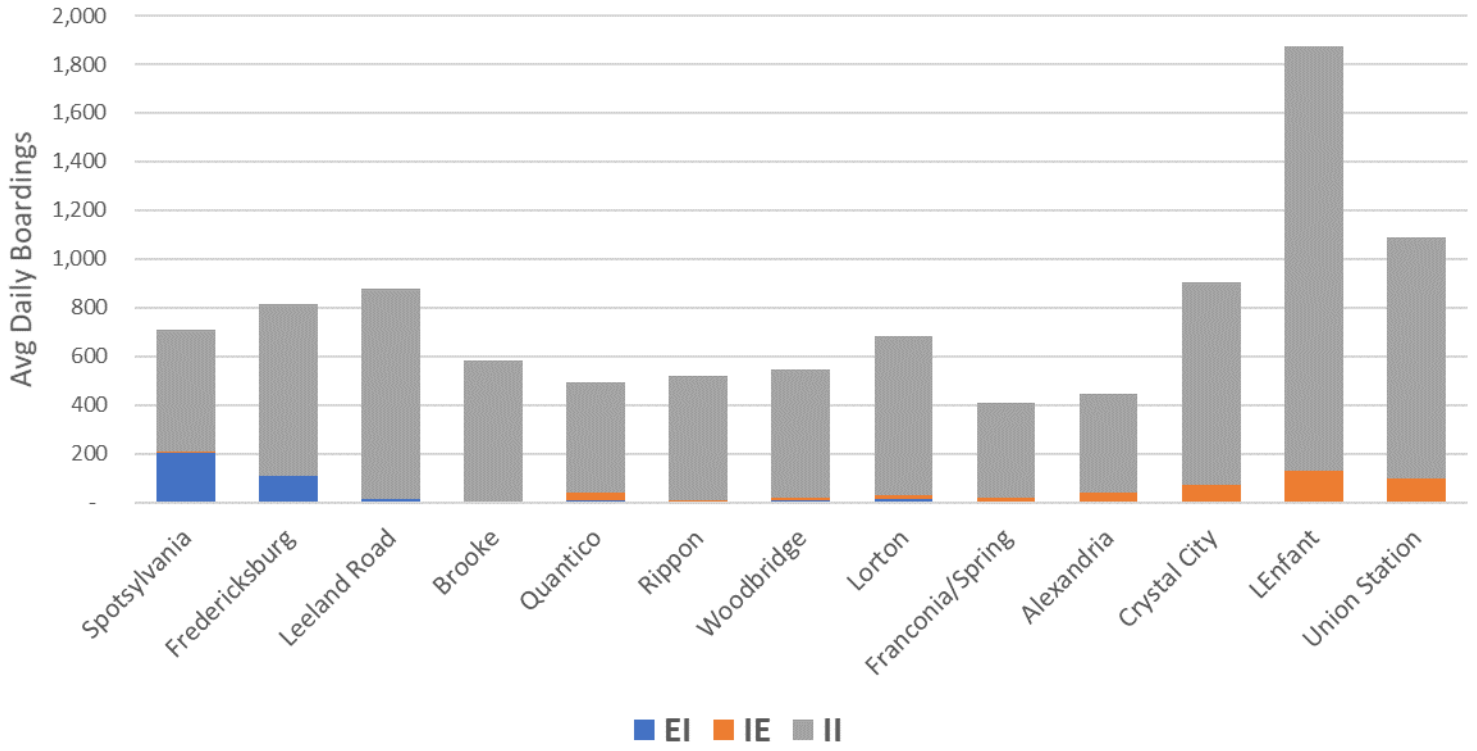
VRE Trip Distribution

- 6% of 18.5K trips start or end outside the model boundary
- EI/IE visitor trips included as IE/EI. Very few visitor II trips
- Manassas line has fewer IE/EI riders compared to Fredericksburg line



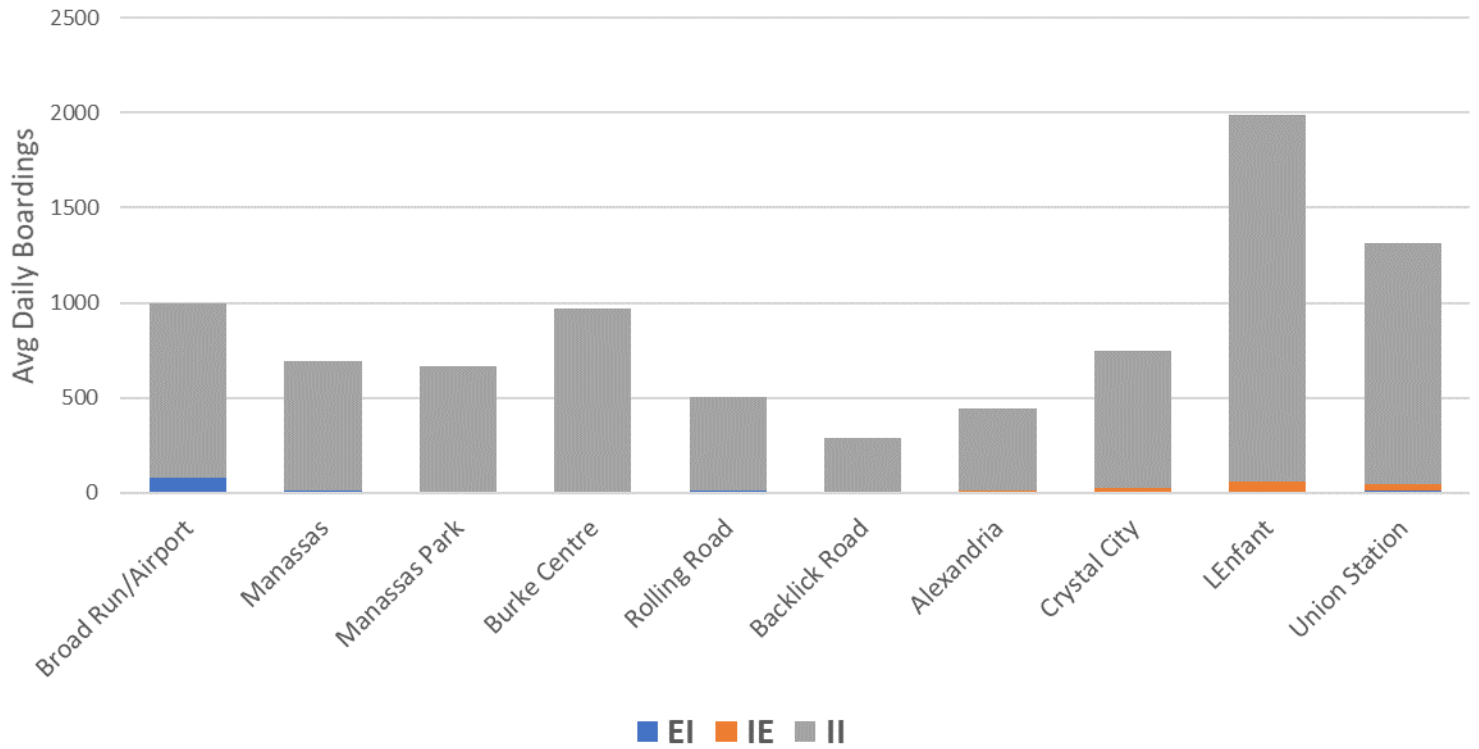


VRE Trips by Boarding Station
Fredericksburg Line



- Most external trips board at end-of-line stops
- Most external riders travel to core CBD zones

VRE Trips by Boarding Station
Manassas Line



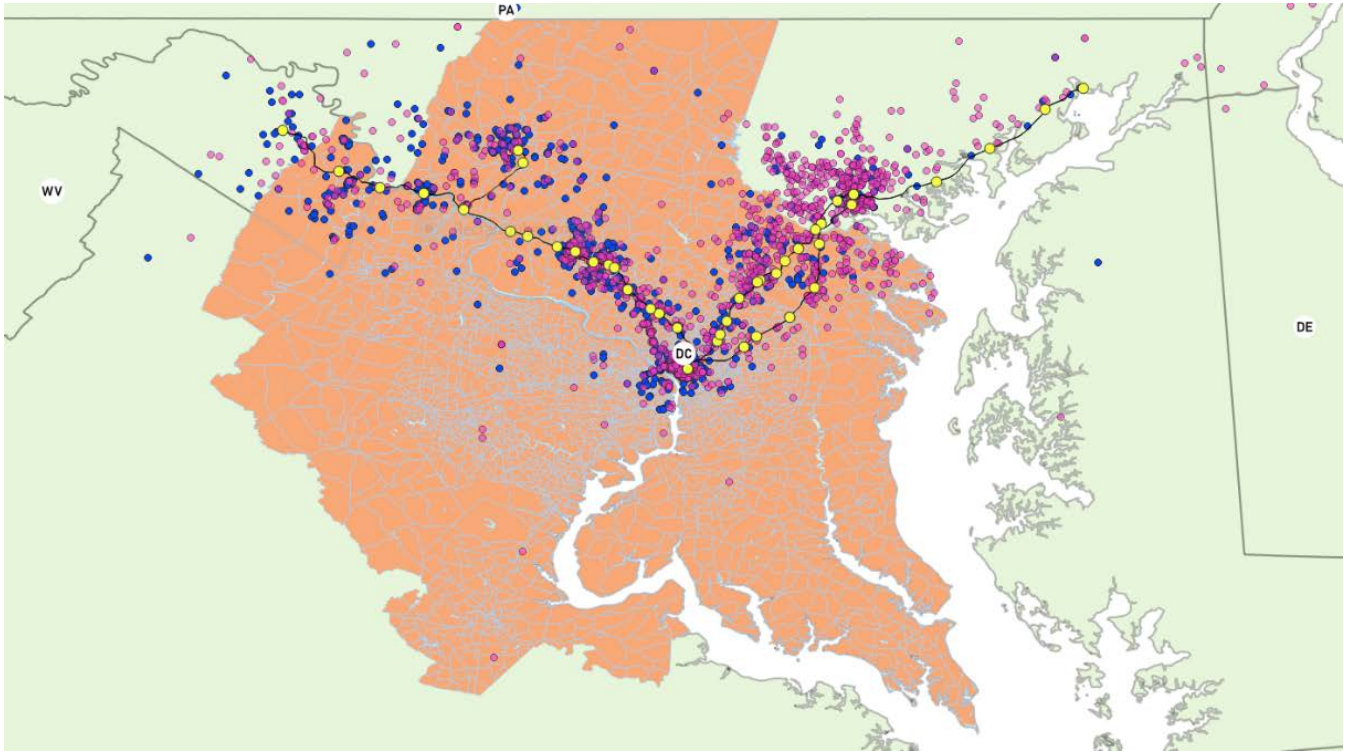
- 45% of total trips and 25% of total IE/EI trips on VRE system are made on Manassas line
- Most external trips board at end-of-line stops and most external riders travel to CBD core

MARC Results

MARC System Map

- Some stations are outside the model boundary
- Non-residents can board at a station outside the model boundary or drive or take a bus to an internal station

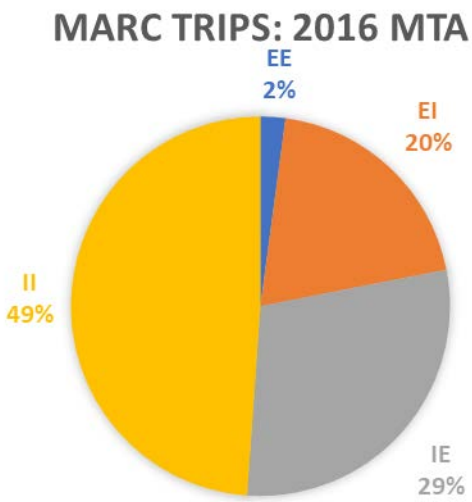
MARC Origins and Destinations

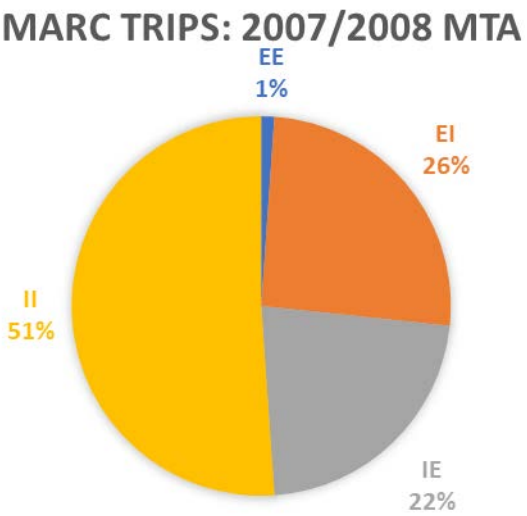


Yellow Dots: MARC stations
Blue Dots: Origins
Magenta Dots: Destinations
Orange: MWCOG modeled area

- All trips with either origin or destination outside the model boundary are coded as IE/EI
- Very few visitor trips could be identified in MARC TOBS

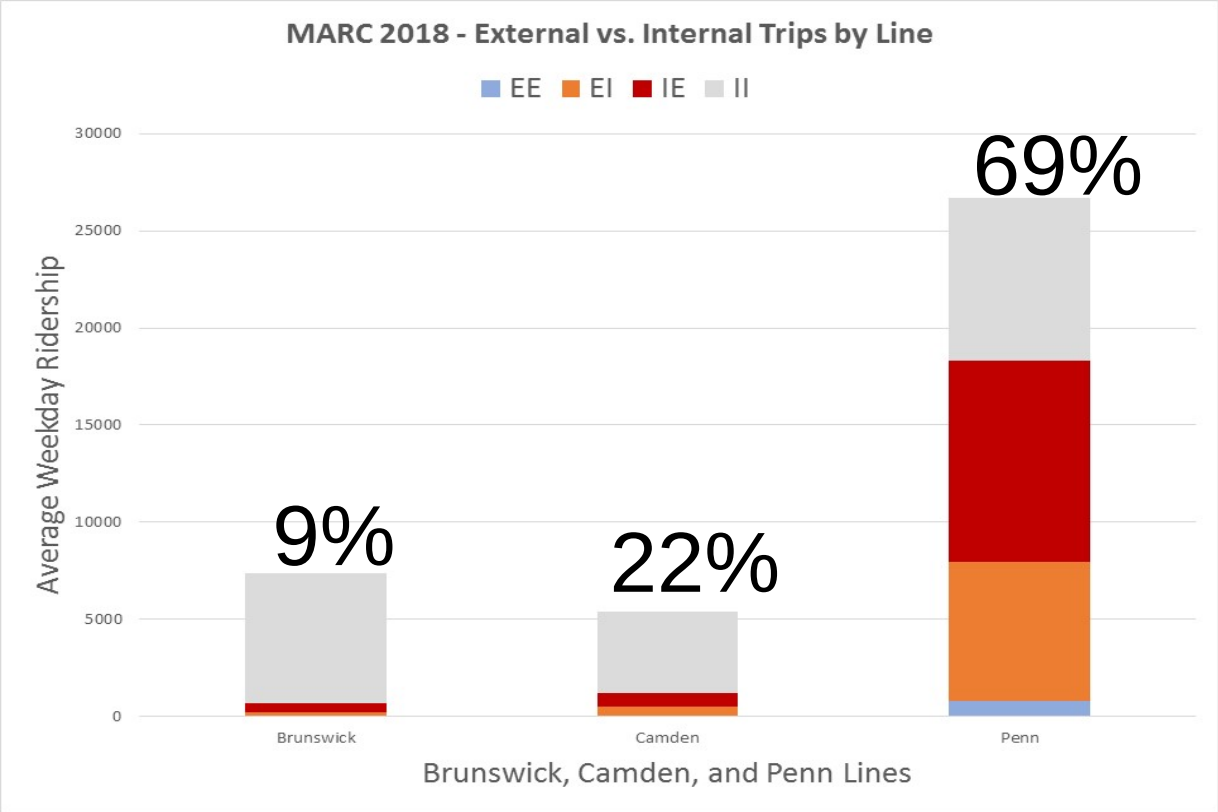
MARC Trip Distribution





- MARC trip distribution compares reasonably with 2007/2008 MTA survey
- IE vs EI split is more imbalanced in 2016

MARC Trips by Line

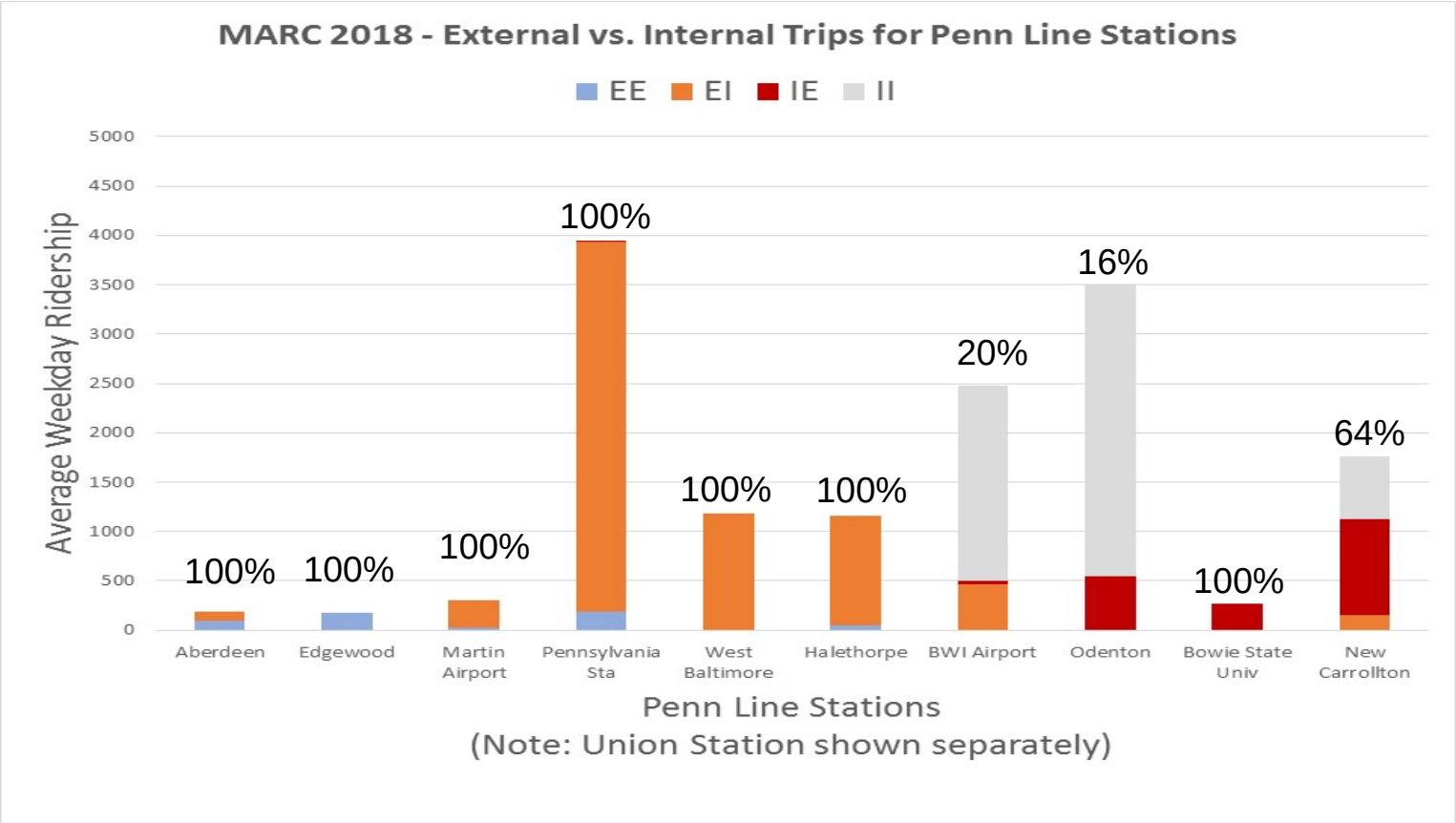


Percentage represents share of IE/EI/EE trips for each line

- 69% of trips on Penn line start or end outside the model boundary
- Penn line also accounts for 67% of total MARC ridership

MARC Trips by Boarding Station
Penn Line

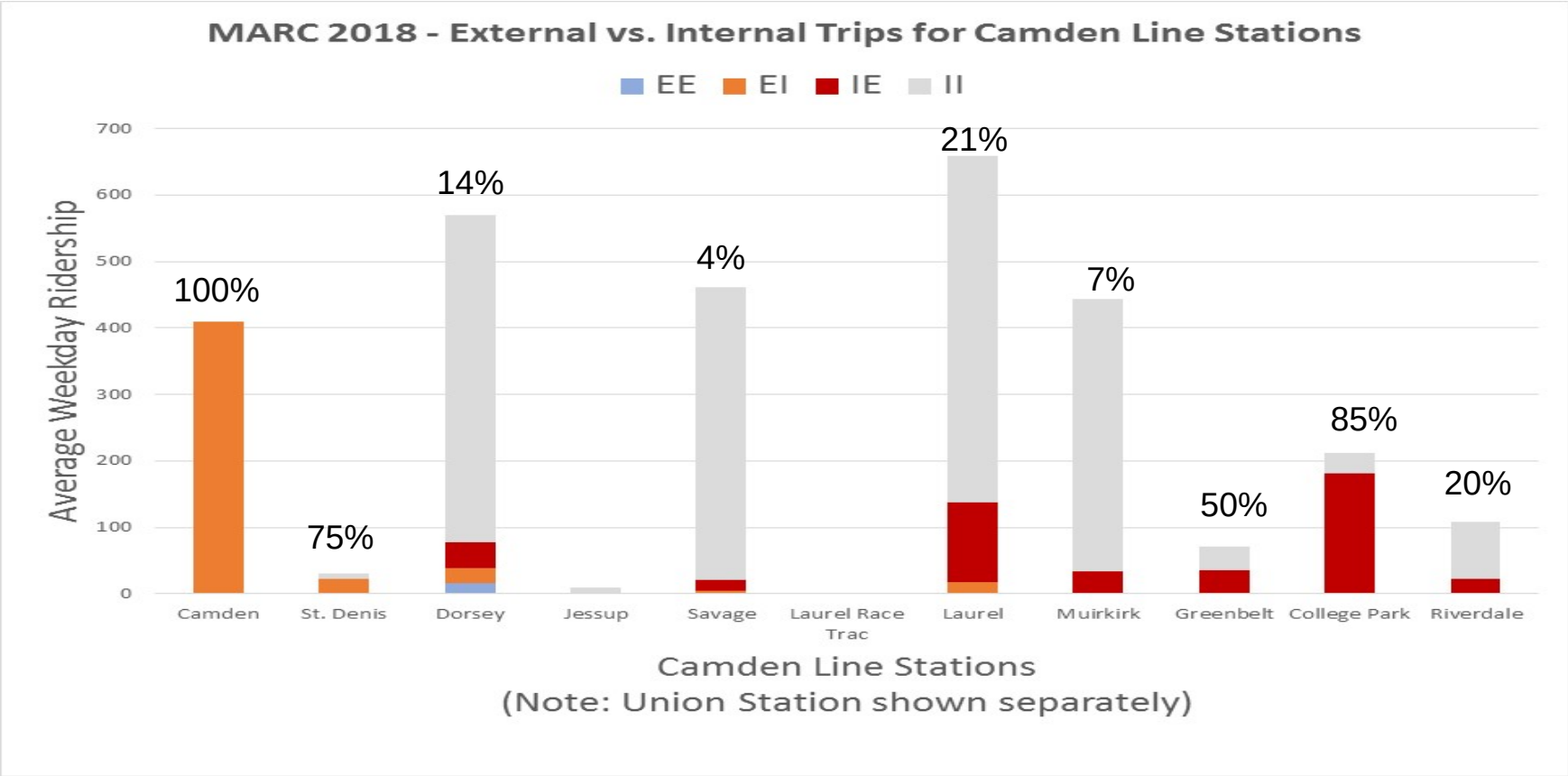
Percentage represents share of IE/EI/EE trips for each line



- Penn Station contributes the most to IE/EI ridership on Penn line
- Airport trips are assumed to start/end at the airport

MARC Trips by Boarding Station
Camden Line

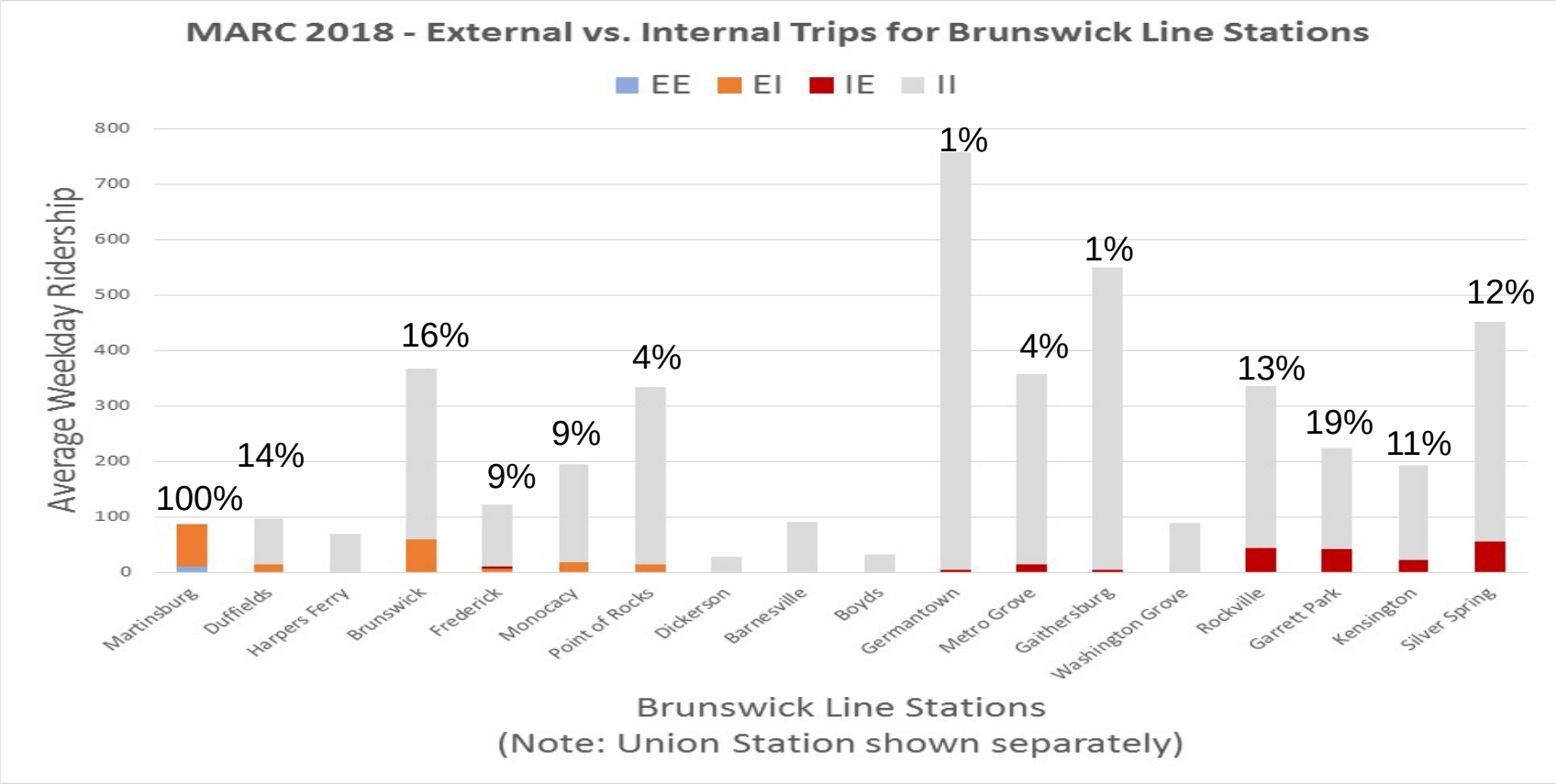
Percentage represents share of IE/EI/EE trips for each line



- Camden line accounts for 14% of ridership on MARC system
- Most IE/EI trips on Camden line originate from Camden Station

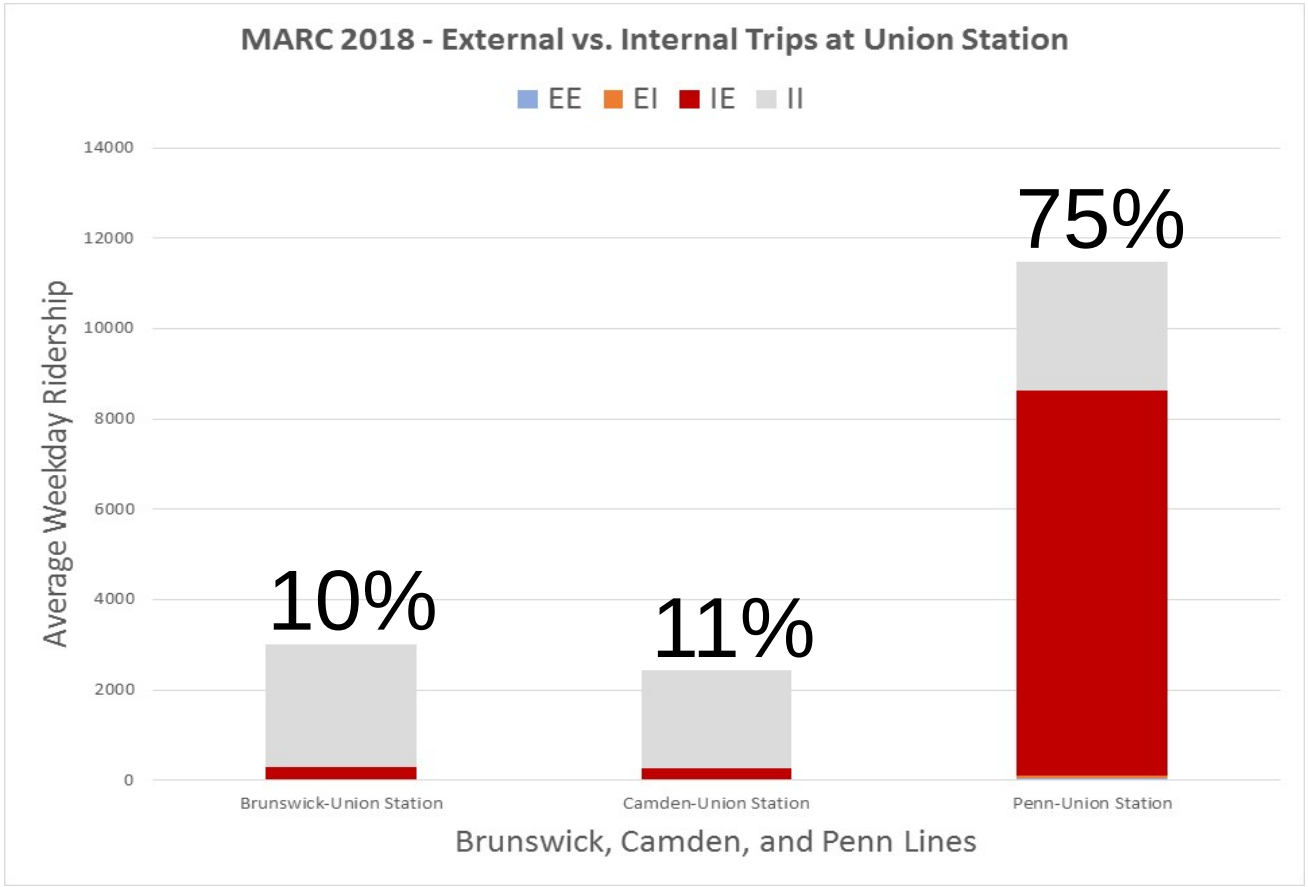
MARC Trips by Boarding Station
Brunswick Line

Percentage represents share of IE/EI/EE trips for each line



- Brunswick line accounts for 19% of ridership on MARC system and only 3.5% of the IE/EI ridership on the MARC system

MARC Trips Boarding at Union Station

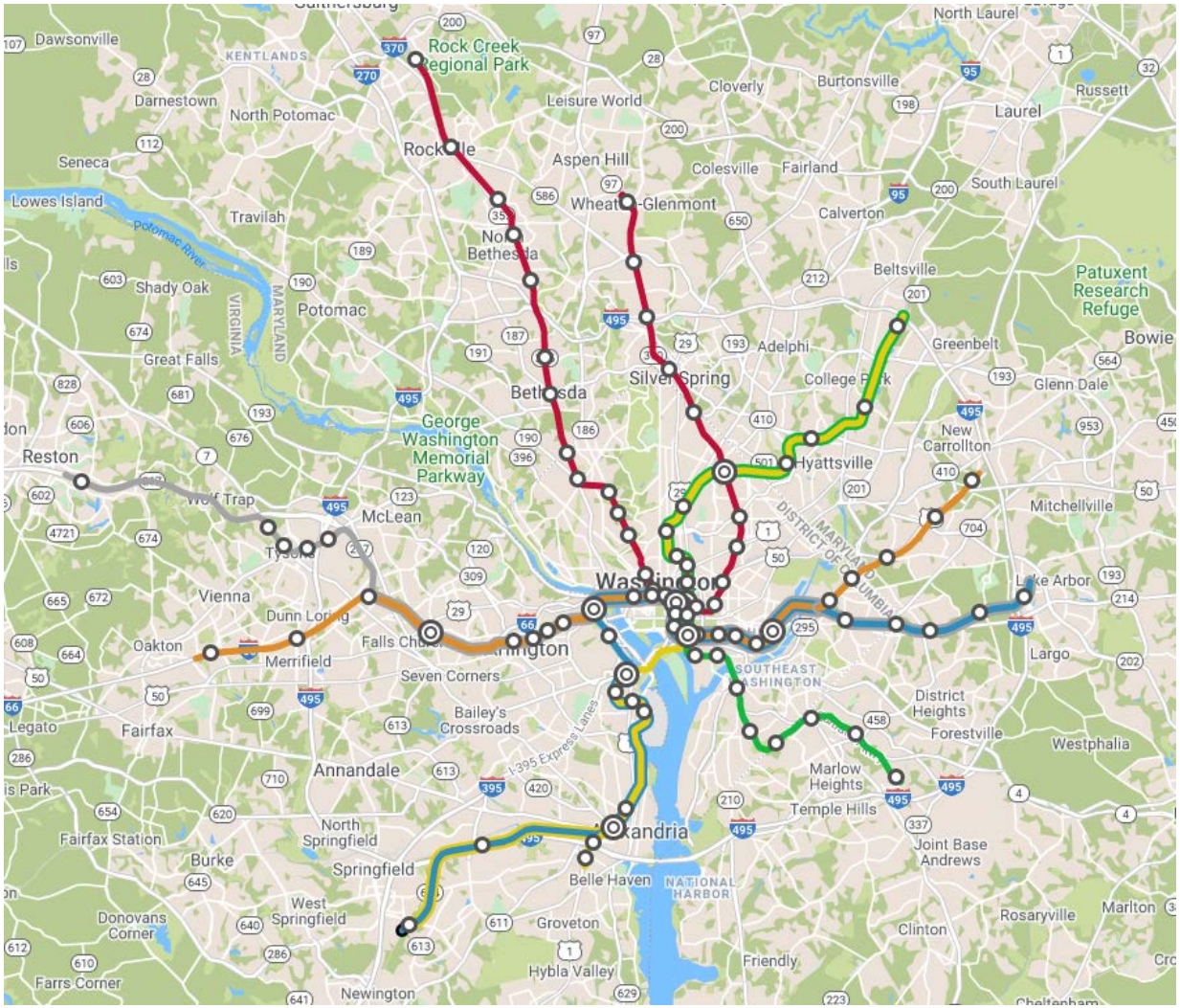


Percentage represents share of IE/EI/EE trips for each line

- 43% of all boardings on Penn line originate at Union Station and 75% of these have destinations outside the model boundary

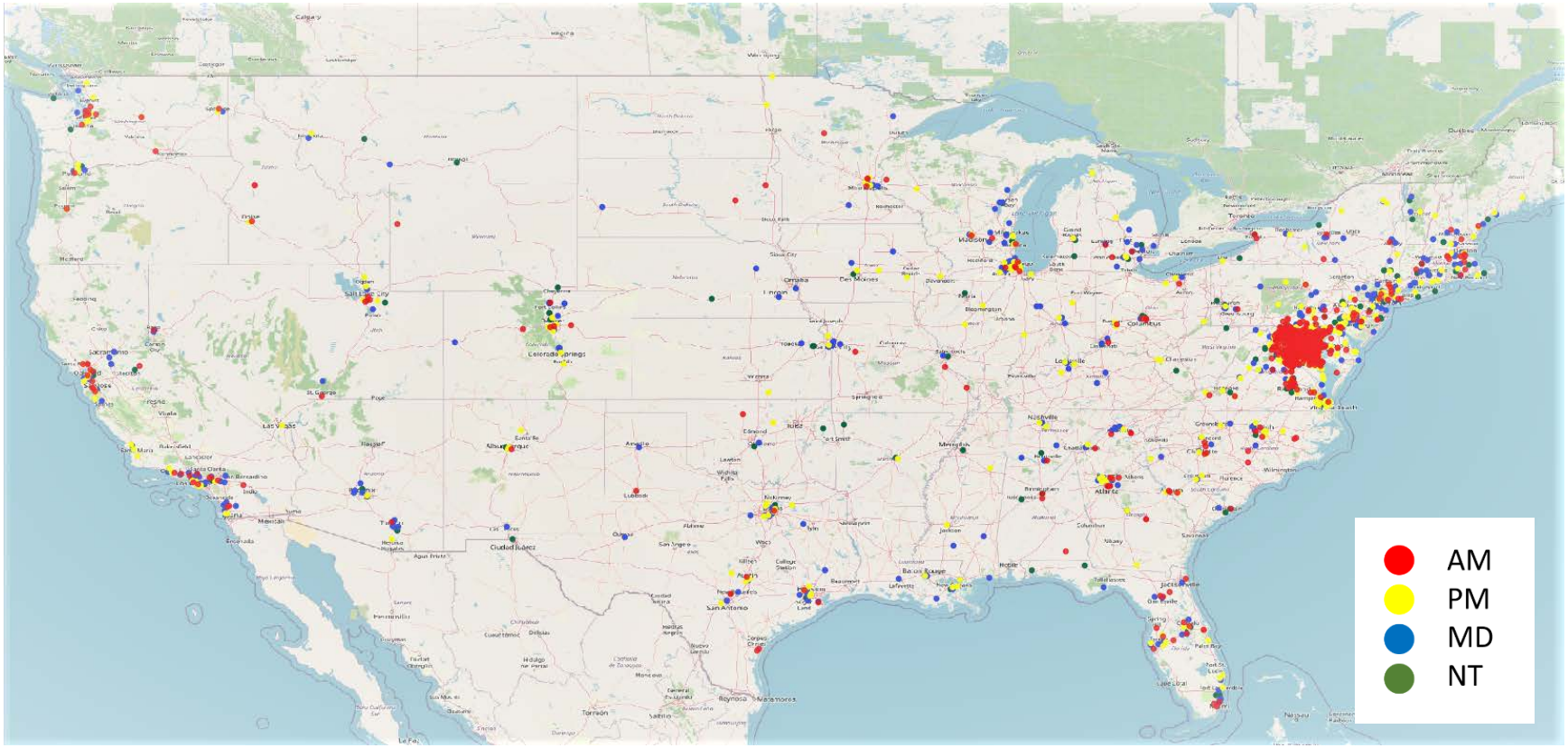
Metrorail Results

Metrorail System Map



All stations are within the model boundary, but non-resident riders can access stations, especially end-of-line stations, by driving or taking a bus

Metrorail Home Locations



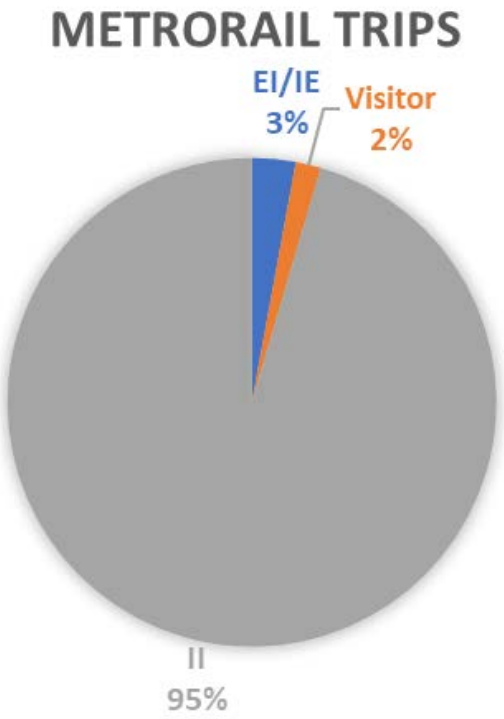
- While majority respondents are residents, the Metrorail survey includes visitors from all over US.

Metrorail trip segments

- Metrorail trips were segmented based on resident and visitor status

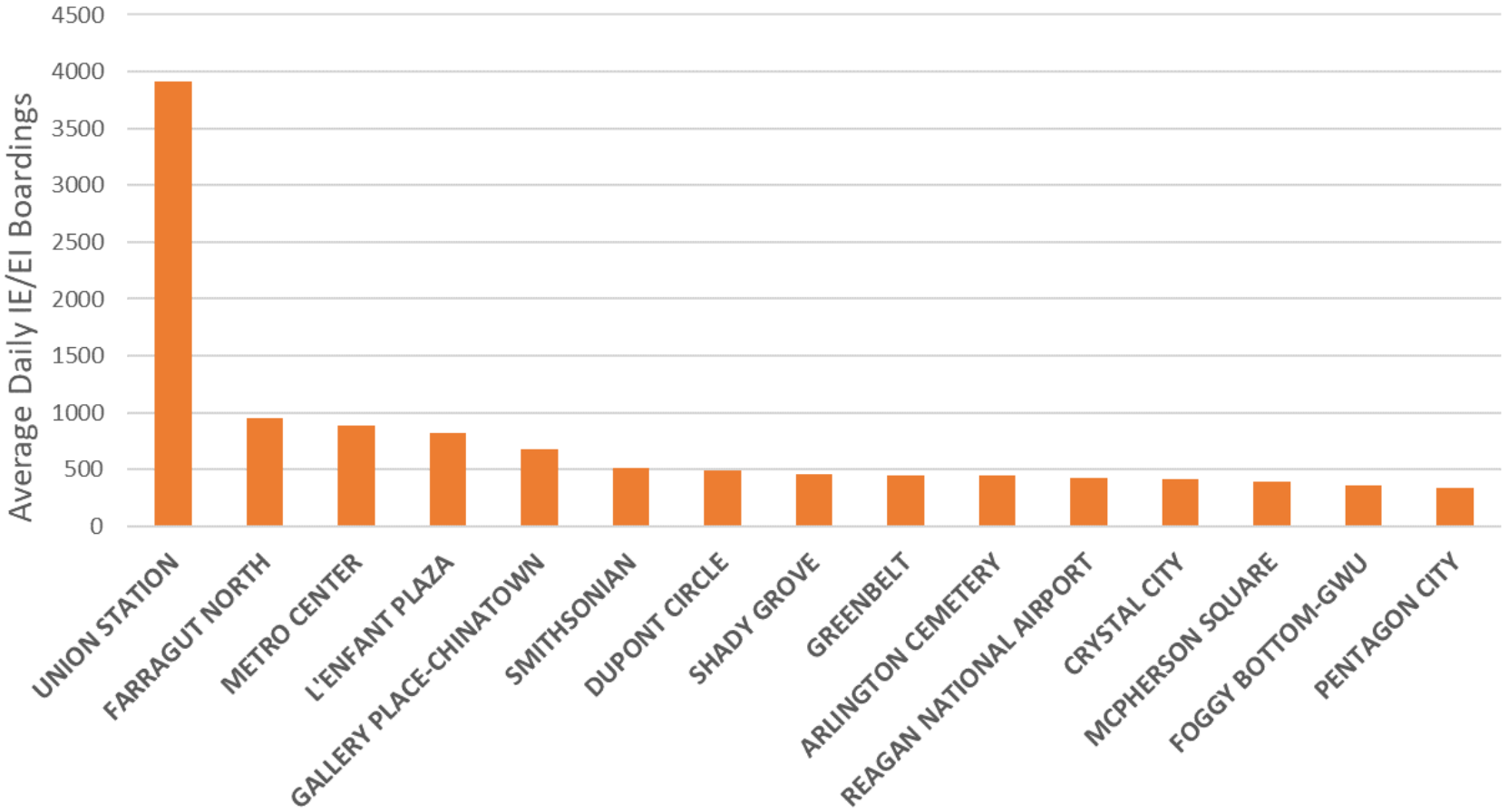
Segment	Criteria	Trip Type
Residents	Home within model boundary	II
Visitors	Home outside 75-mile	II
Non-resident & Non-visitors	Home outside model boundary but within 75-mile buffer	IE/EI
Non-resident VRE/MARC transfers	Home outside model boundary but within 75-mile buffer and transferring from VRE/MARC	IE/EI
Non-resident Amtrak transfers	Home outside 75-mile buffer and transferring from VRE/MARC	IE/EI

Metrorail Trips



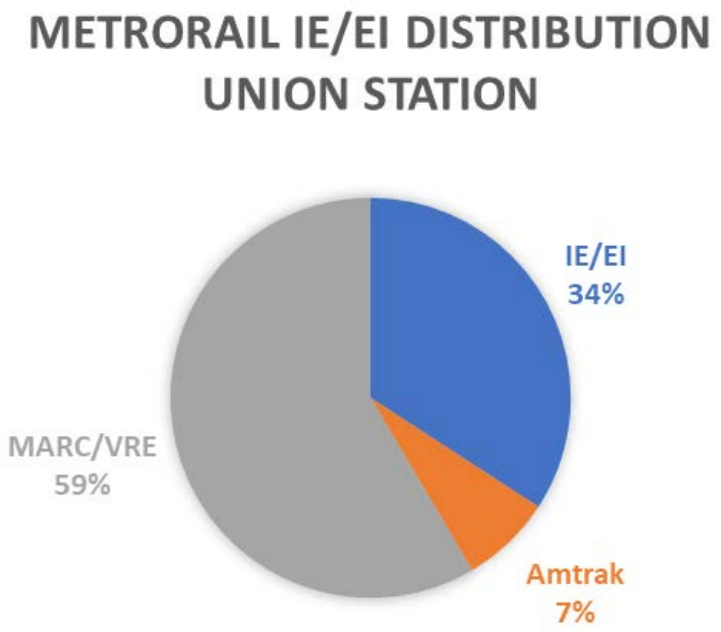
- 95% of ~650K trips are internal-internal
- 2% of all trips are internal-internal trips made by visitors
- 3% IE/EI trips include transfers from MARC, VRE and Amtrak
- Visitor trips are mainly internal-internal
  - To/from airport
  - Internal trips

Metrorail Stations with Most IE/EI Boardings



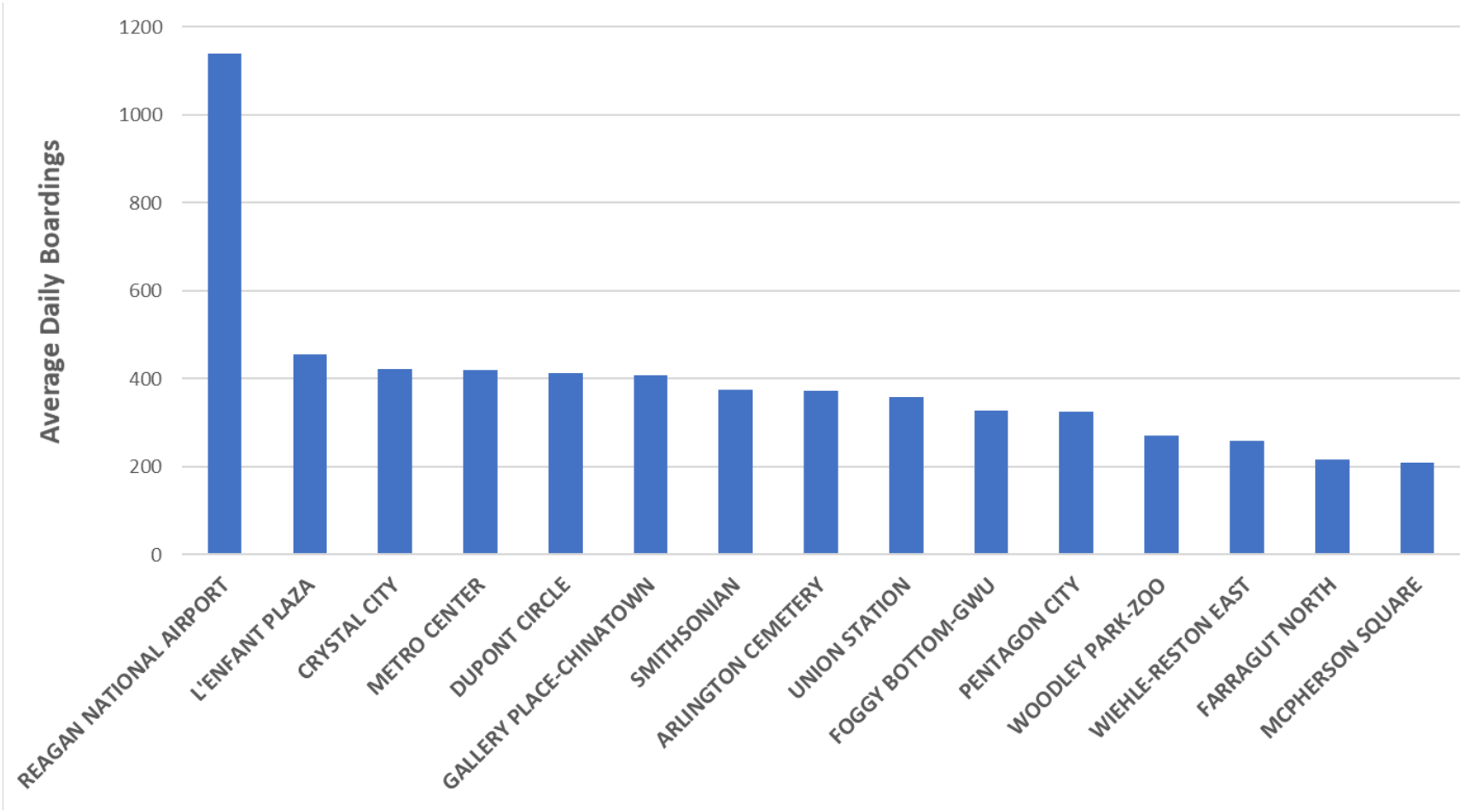
- Top 15 Metrorail stations with most IE/EI boardings.

Metrorail IE/EI Boardings at Union Station



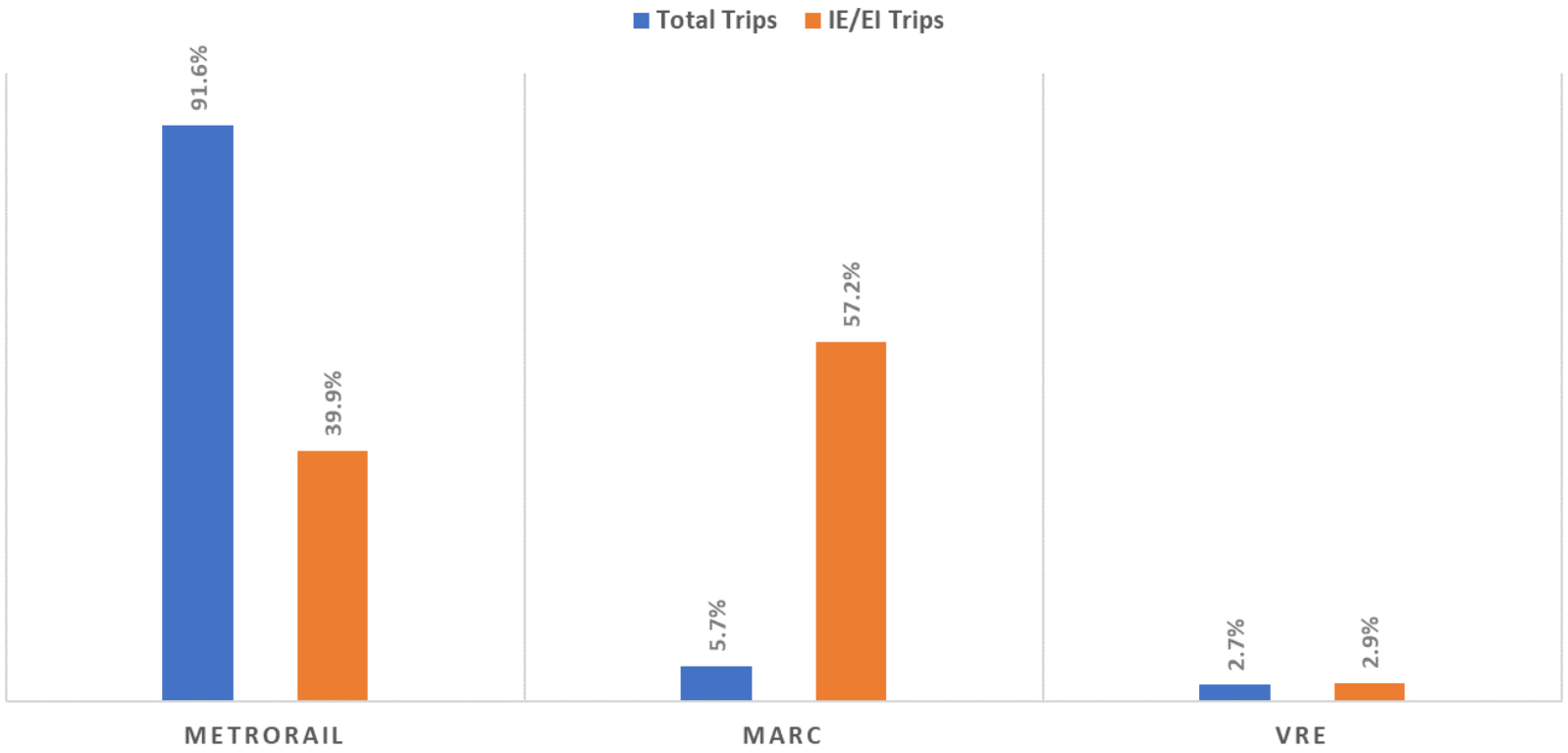
- 66% of the IE/EI boardings at Union Station are transfers from Amtrak, MARC, or VRE
- Transfers from MARC and VRE are not included in Metrorail trip tables to avoid double counting
- No separate Amtrak survey is available, so these are included

Metrorail Stations with Most Visitor Boardings



- The Reagan National Airport station has the most visitor boardings on a given day

All Markets Summary



- Metrorail IE/EI trips exclude trips with transfer to/from MARC/VRE to avoid double counting
- Only 5.7% of the trips across the three systems use MARC system but account for 57% of the IE/EI trips across three transit systems

Next Steps

- Generate transit IE/EI and visitor I-I trip tables
- Assign Metrorail trip tables to the network
  - Investigate and debug network issues
  - Tune assignment parameters
  - Test crowding and capacity restraint features
- Update transit networks for external-internal transit modeling
- Prepare mode choice targets for calibration

Contacts

Joel Freedman
Senior Director

Joel.Freedman@rsginc.com

Binny Paul
Advanced Forecasting Modeler

Binny.Mathewpaul@rsginc.com

www.rsginc.com