Introduction of PTRM Tour-Based Freight Model
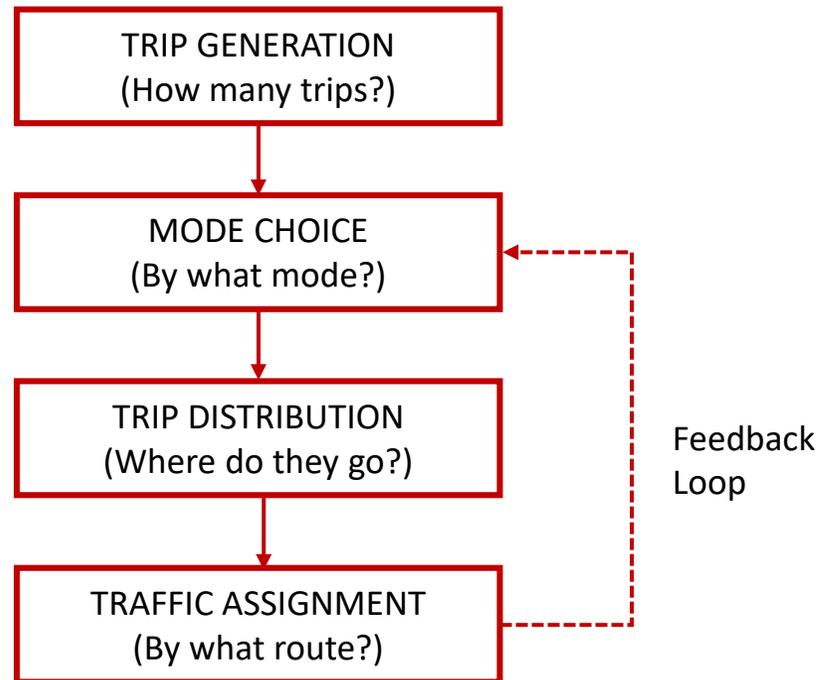
Presented by John Kim

Overview

❑ Overview of PTRM (Piedmont Triad Regional Model)

❑ Tour-Based Freight Model
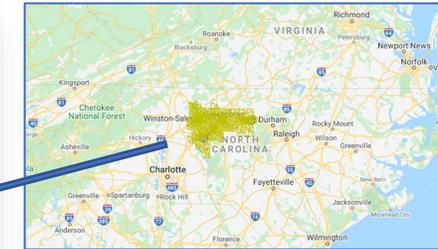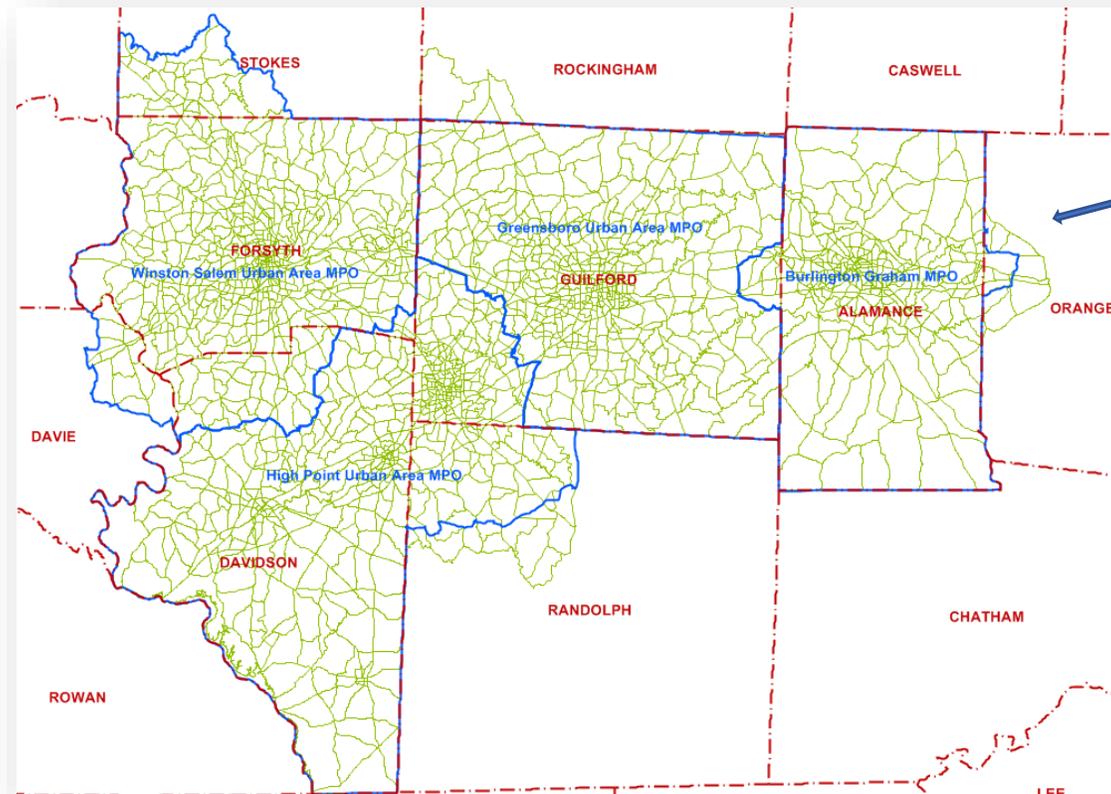
Four Step Model

```
┌─────────────────────────┐
│     TRIP GENERATION     │
│    (How many trips?)    │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│       MODE CHOICE       │◄┄┄┄┄┄┄┄┄┐
│    (By what mode?)      │         ┊
└─────────────────────────┘         ┊
             │                      ┊
             ▼                      ┊      Feedback
┌─────────────────────────┐         ┊      Loop
│    TRIP DISTRIBUTION     │         ┊
│   (Where do they go?)    │         ┊
└─────────────────────────┘         ┊
             │                      ┊
             ▼                      ┊
┌─────────────────────────┐         ┊
│    TRAFFIC ASSIGNMENT    │┄┄┄┄┄┄┄┄┄┘
│    (By what route?)      │
└─────────────────────────┘
```

PTRM Model Overview
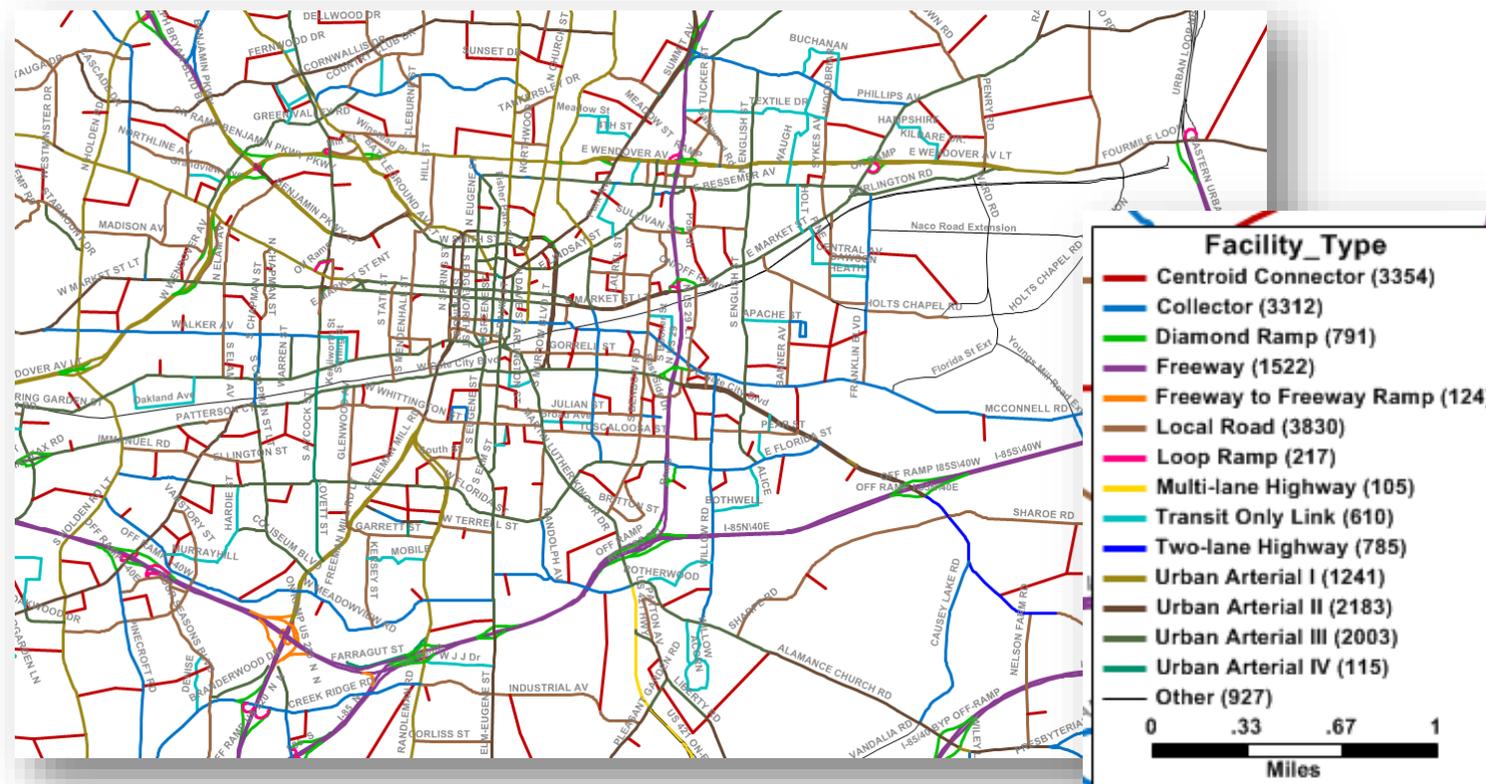
Area Coverage

☐ 4 Whole Counties &
   5 Partial Counties

☐ 4 MPOs

☐ 1,932 Zones (TAZs)

☐ 2,352 Sq Mi

Network Coverage – Highway Network

- ❑ 21,428 links (Freeway, arterials, two-lane highway, collector, local road)

- ❑ 2017 BASE & Future Scenario networks

- ❑ Various attributes

Facility_Type

▬	Centroid Connector (3354)
▬	Collector (3312)
▬	Diamond Ramp (791)
▬	Freeway (1522)
▬	Freeway to Freeway Ramp (124)
▬	Local Road (3830)
▬	Loop Ramp (217)
▬	Multi-lane Highway (105)
▬	Transit Only Link (610)
▬	Two-lane Highway (785)
▬	Urban Arterial I (1241)
▬	Urban Arterial II (2183)
▬	Urban Arterial III (2003)
▬	Urban Arterial IV (115)
▬	Other (927)

0   .33   .67   1

Miles

Network Coverage – Transit Routes

- ❏ Local bus routes (GTA, HiTran, Link, WSTA)
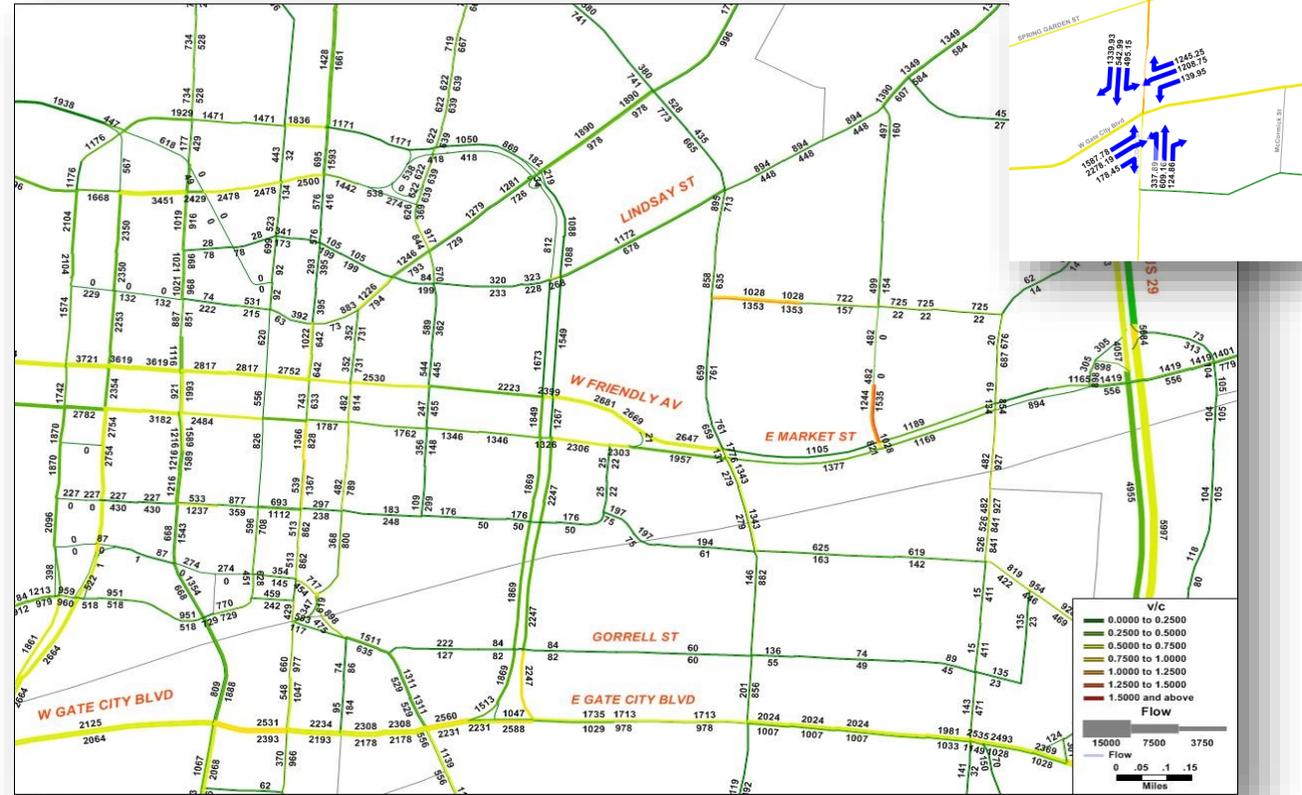
- ❏ PART Express Routes
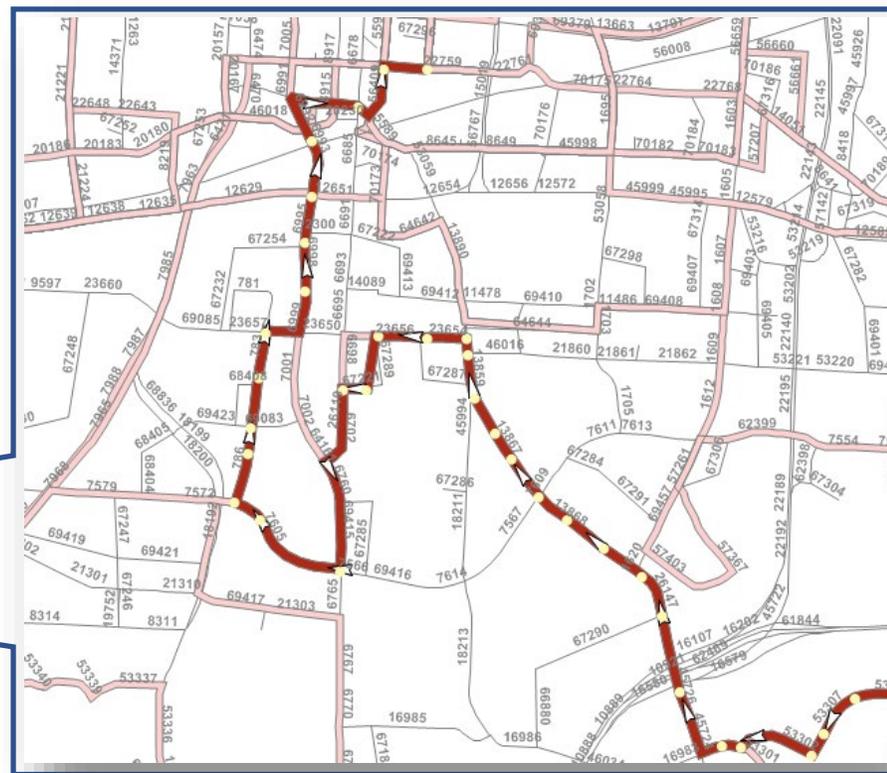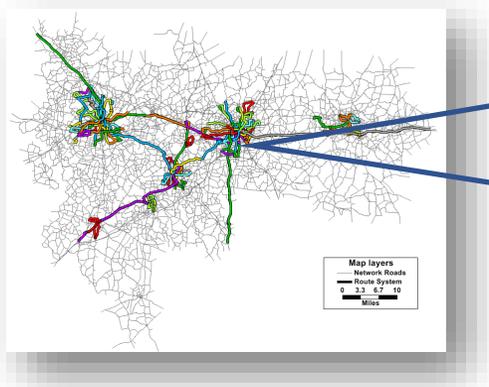
Socio-Economic Data

- ❑ Population, Household

- ❑ Employment by type

- ❑ K-12 students, University Students

- ❑ Avg Income, # HH Autos, …
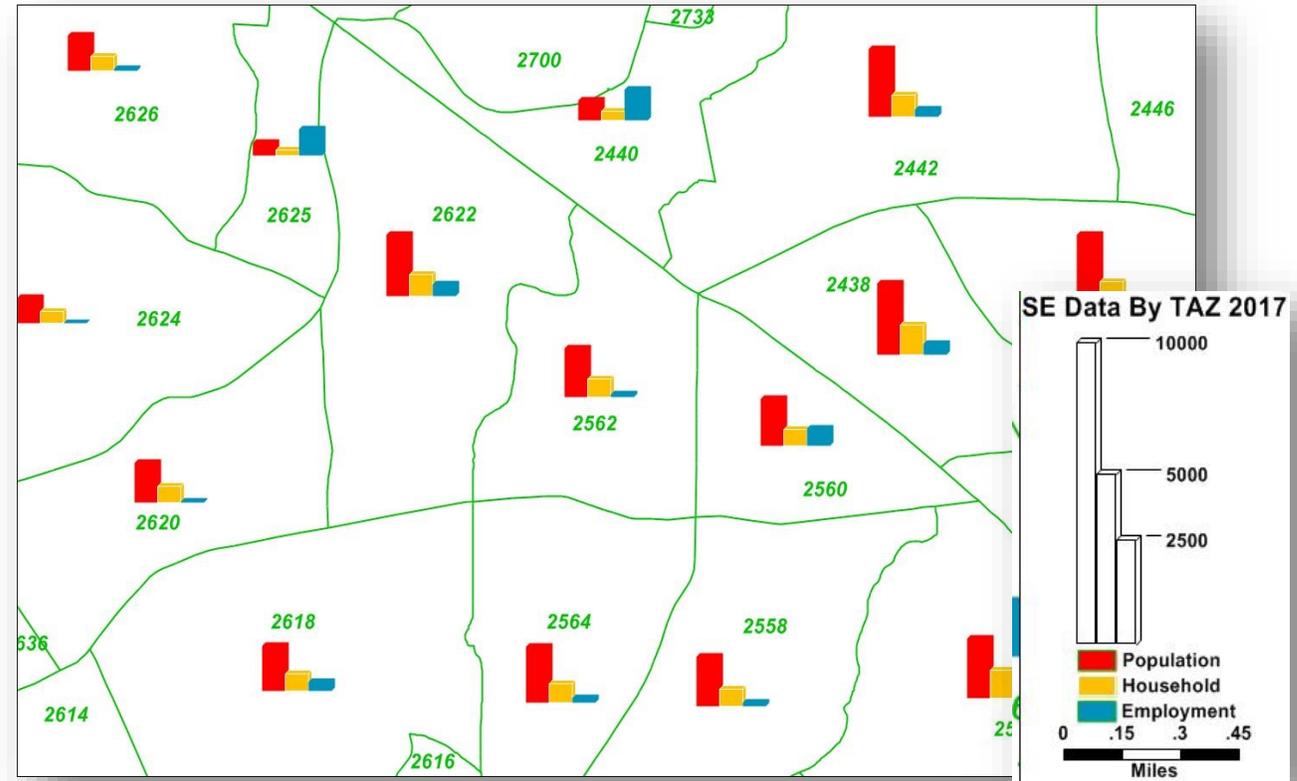
Forecast Traffic Flow & TransCAD v8.0

Tour-Based Freight Model

Needs of Tour-based Freight Model

- The information of freight movement
- Limitations in modeling the complexities of freight traffic
- Transportation systems emissions
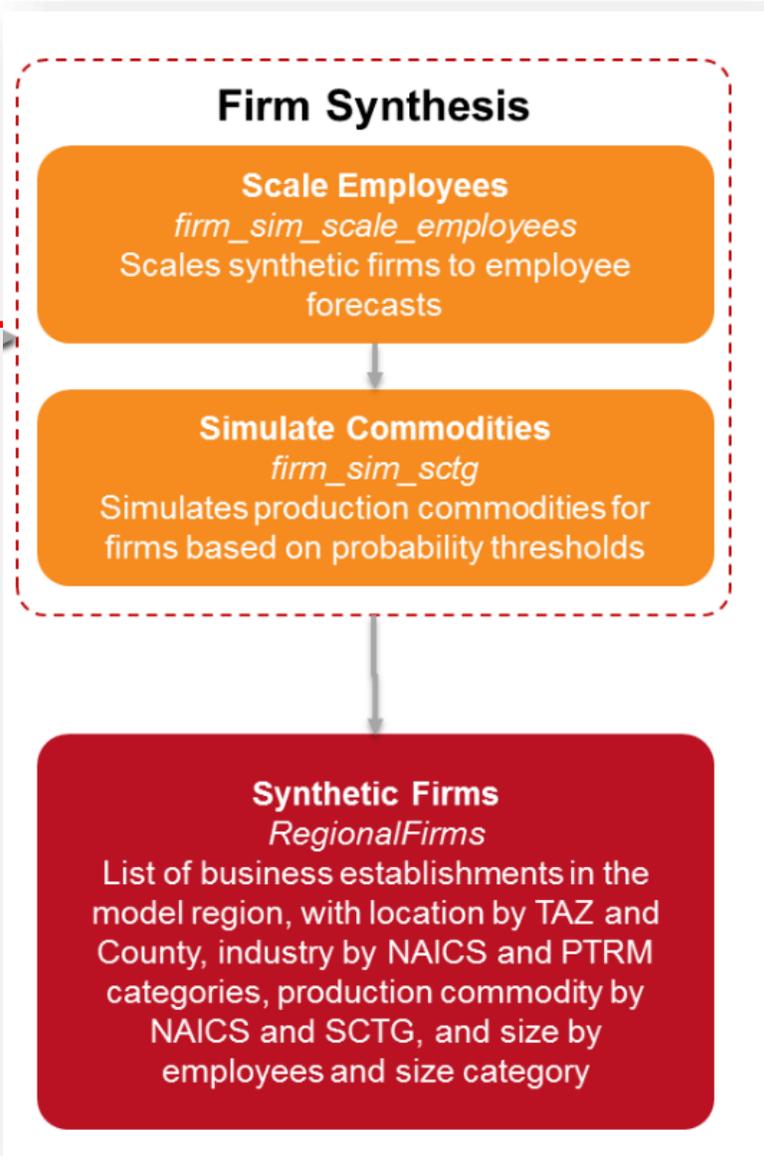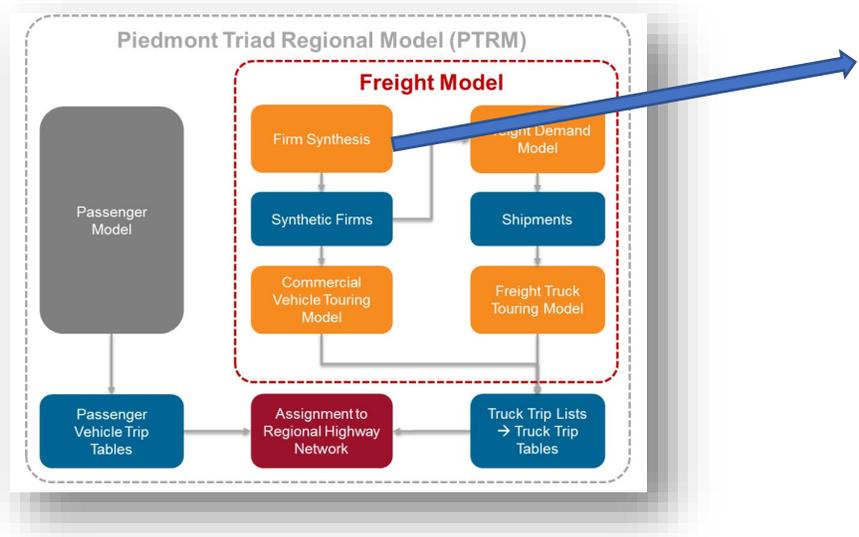- Analysis of the impacts of development

How the model addresses the Needs

- Behavioral Improvements
- Market Segmentation Scope
- Geographic Scope

Model System - Freight Model within PTRM
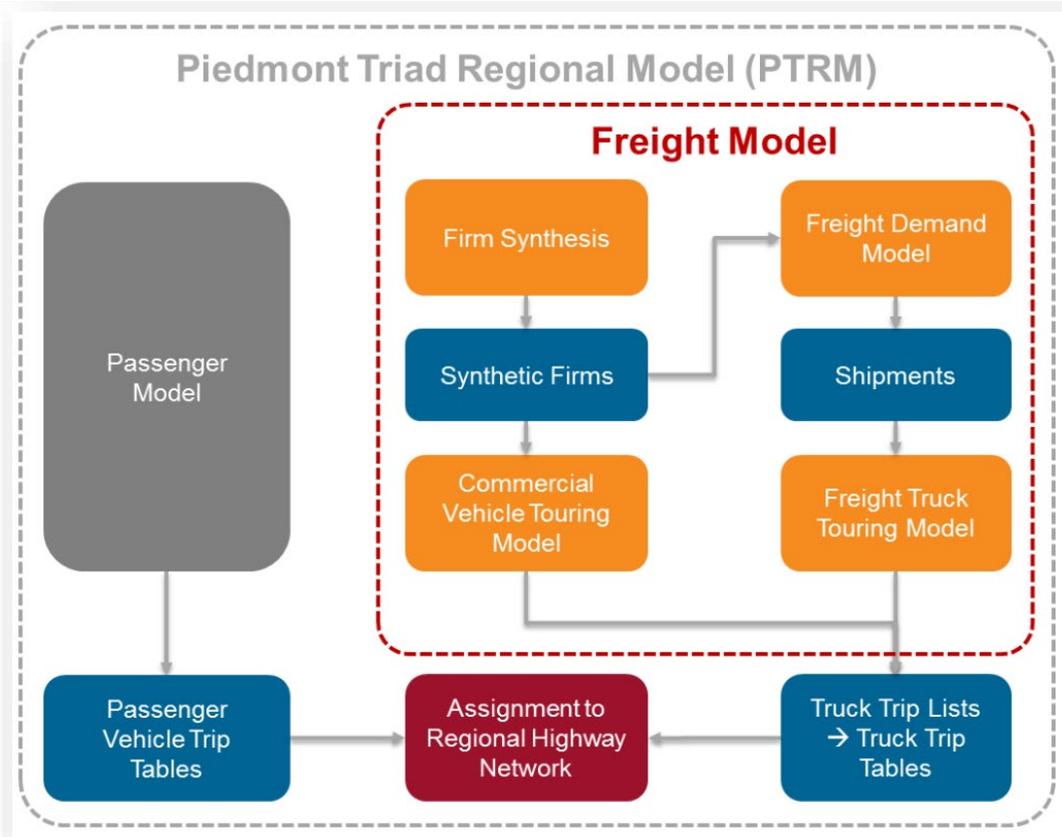
Firm Synthesis Model

Outputs – Firm Synthesis

Table 5: List of Business Establishments Output by the Firm Synthesis Model

Bu... <int>	FAFZo... <int>	FIPS <int>	... <int>	NAI... <int>	NAICS6io <fctr>	Industry10 <fctr>	Industry7 <fctr>
1	372	37081	1	541850	541800	Other Services	SER
2	372	37081	1	238160	233411	Construction	IND
3	372	37081	1	238160	233411	Construction	IND
4	372	37081	1	443112	4A0000	Retail	RET
5	372	37081	1	541213	541200	Other Services	SER
6	372	37081	1	812111	812100	Other Services	SER
7	372	37081	1	441310	441000	Retail	HWY
8	372	37081	1	722110	722110	Hotel & Real Estate	HWY
9	372	37081	1	541213	541200	Other Services	SER
10	372	37081	1	445120	445000	Retail	HWY

1-10 of 100 rows | 1-8 of 12 columns   Previous **1** 2 3 4 5 6 ... 10 Next

Field	Description
BusID	Unique business identifier (created in the model)
FAFZone	FAF Zone that the business is located in
FIPS	FIPS code for the county that the business is located in
TAZ	PTRM TAZ that the business is located in
NAICS6	6 digit NAICS industrial code for the business
NAICS6io	6 digit BEA NAICS code for the business
Industry10	Employment category for the Ohio GES
Industry7	PTRM employment category
Industry5	Summarized Ohio employment categories
Employees	Number of employees
esizecat	Employment size category
SCTG	Production commodity (SCTG categories)

Firm Synthesis Model
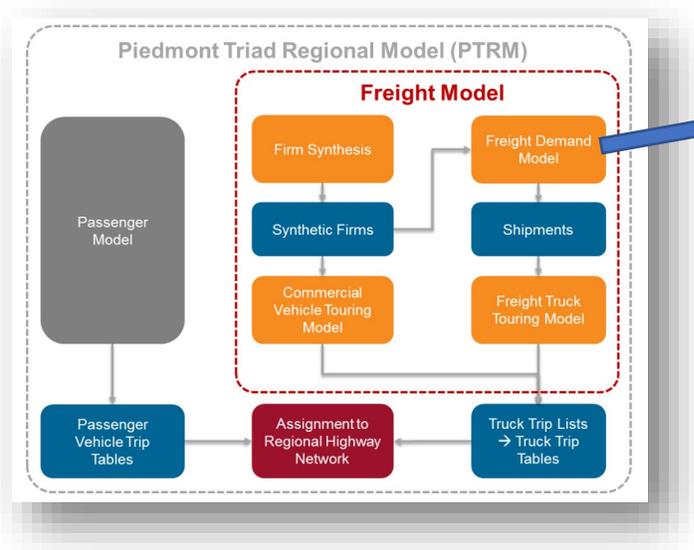
Outputs – Freight Demand Model

Table 10: List of Annual Shipments Output by the Freight Demand Model

BusID.Seller <int>	BusID.Buyer <int>	TAZ.Port <int>	S... <int>	Movement.Ty... <fctr>	Mo... <fctr>	ShipmentWeight <dbl>
15893	28049	NA	1	II	Truck	4.988590e+01
34609	32971	NA	1	II	Truck	4.832983e+01
32398	1644	NA	1	II	Truck	9.968027e+01
14353	1520	NA	1	II	Truck	8.054971e+01
1660	41638	NA	1	II	Truck	9.397466e+01
32398	6132	NA	1	II	Truck	9.930786e+01
44690	42782	NA	1	II	Truck	3.926798e+02
15893	27930	NA	1	II	Truck	4.988590e+02
15893	19940	NA	1	II	Truck	4.998468e+02
32398	33760	NA	1	II	Truck	7.249474e+03

1-10 of 100 rows | 1-7 of 11 columns   Previous **1** 2 3 4 5 6 ... 10 Next

Field	Description
BusID.Seller	Unique business identifier (created in the model) for the seller
BusID.Buyer	Unique business identifier (created in the model) for the buyer
TAZ.Port	PTRM for the port of entry to the region (either an intermodal facility or an external station)
SCTG	COmmodity of the shipment (SCTG categoty)
Movement.Type	Movement type for the shipment (e.g., external to internal)
Mode	Mode of the shipment (truck, rail, or air)
ShipmentWeight	Shipment weight in pounds
ShipmentSize	Shipment size category
NumShipments	Number of shipments annually
Channel	Distribution channel
DistID	Distribution facility identifier

Commercial Vehicle Touring Model
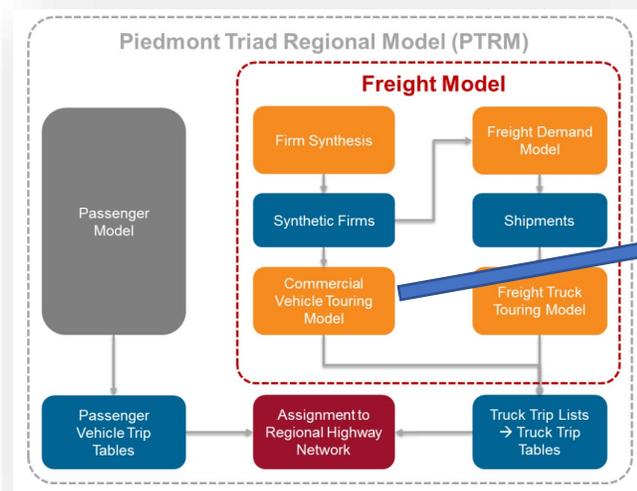
Outputs – CVTM

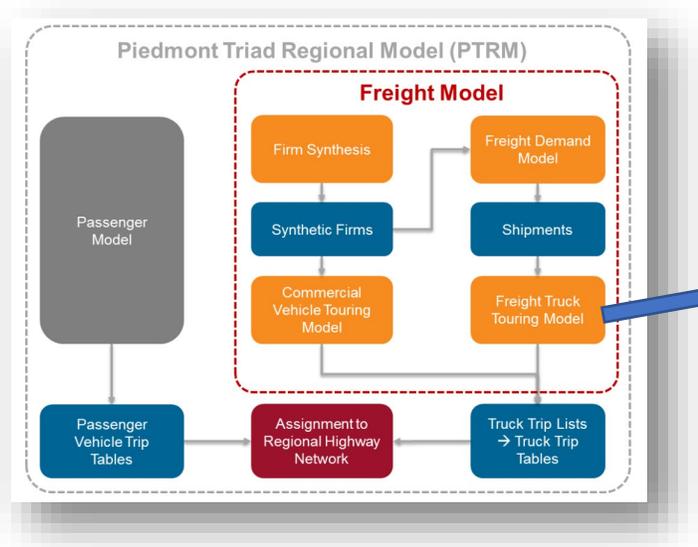Table 20: List of Commercial Vehicle Tours and Trips Output by the CVTM

Bu... <int>	Vehicle <ord>	Tou... <int>	TripID <int>	Schedul... <int>	O... <int>	D... <int>	Activity <fctr>	MAMDe... <S3: mam>	MAMA... m
3	Light	26627	1	1	1	622	Service	785.16	78
3	Light	26627	2	1	622	713	Service	878.00	89
3	Light	26627	3	1	713	575	Service	927.42	94
3	Light	26627	4	1	575	1	Return	1099.29	110
6	Light	45838	1	1	1	590	Service	646.94	65
6	Light	45838	2	1	590	603	Service	653.00	65
6	Light	45838	3	1	603	1	Return	735.57	73
12	Light	3620	1	1	1	530	Meeting	479.83	48
12	Light	3620	2	1	530	3092	Service	543.00	56
12	Light	3620	3	1	3092	3128	Service	638.48	64

1-10 of 100 rows | 1-10 of 13 columns   Previous **1** 2 3 4 5 6 ... 10 Next
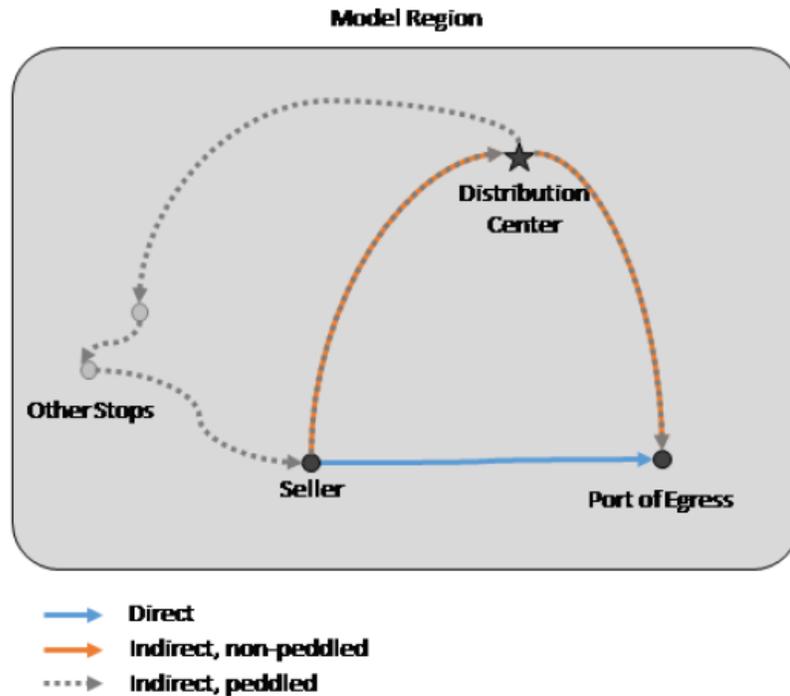
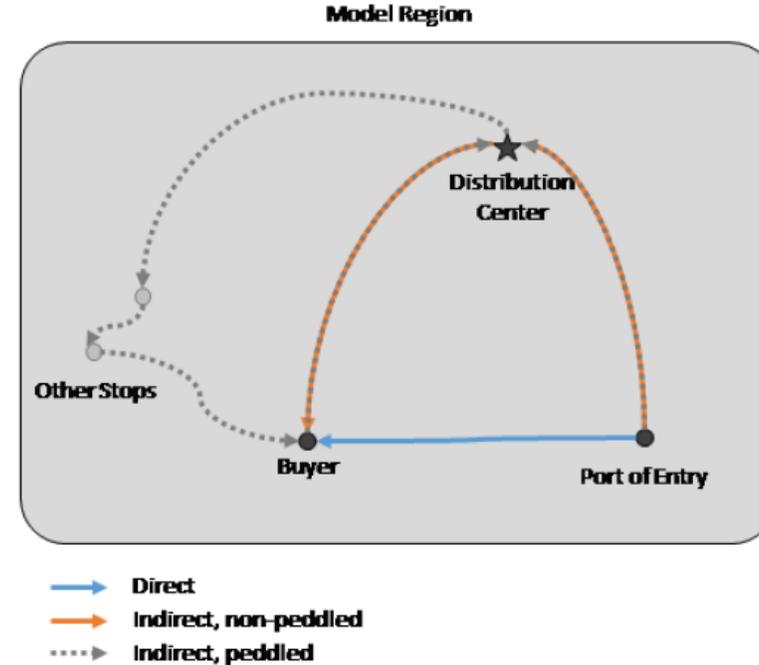| Field	Description
BusID	Unique business identifier (created in the model)
Vehicle	Vehicle type (light, medium, heavy)
TourID	Tour identification number
TripID	Trip identifier (order within the tour)
Scheduled	Flag to denote that the stop at the end of the trip was scheduled (vs. an intermediate stop)
OTAZ	Origin PTRM TAZ
DTAZ	Destination PTRM TAZ
Activity	Activity at the stop location at the end of the trip
MAMDepart	Departure time of the trip (minutes after midnight)
MAMArrive	Arrival time of the trip (minutes after midnight)
TravelTime	Travel time of the trip (minutes)
Distance	Distance of the trip (miles)
StopDuration	Stop duration for the activity at the end of the trip

Freight Truck Touring Model

Peddling – FTTM

Internal-to-External Freight Movements

Model Region

Distribution Center

Other Stops

Seller → Port of Egress

Direct
Indirect, non-peddled
Indirect, peddled

External-to-Internal Freight Movements

Model Region

Distribution Center

Other Stops

Buyer ← Port of Entry

Direct
Indirect, non-peddled
Indirect, peddled

Freight Truck Touring Model
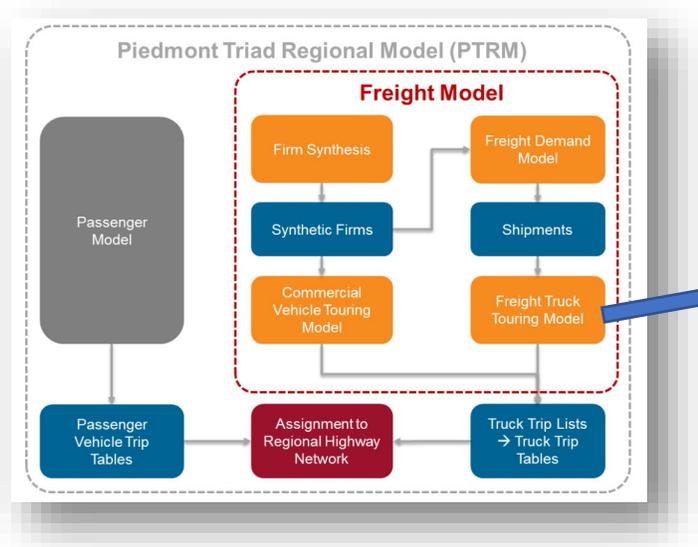
Outputs – FTTM

Table 23: List of Freight Truck Tours and Trips Output by the FTTM

DistID <int>	Peddl... <int>	Tou... <int>	TripID <int>	TAZ.Anch... <int>	Vehicle <fctr>	Schedul... <int>	NintStops <int>	TAZ.Origin <int>
10	1	1	1	4281	Heavy	1	0	4281
10	1	1	2	4281	Heavy	1	0	461
10	1	1	3	4281	Heavy	1	0	332
10	1	2	1	4281	Heavy	1	0	4281
10	1	2	2	4281	Heavy	1	0	4003
10	1	2	3	4281	Heavy	1	0	4003
10	1	2	4	4281	Heavy	1	0	4022
10	1	3	1	4281	Heavy	1	0	4281
NA	NA	3	2	4281	Heavy	0	1	4287
10	1	3	3	4281	Heavy	1	1	4056

1-10 of 100 rows | 1-9 of 20 columns   Previous **1** 2 3 4 5 6 ... 10 Next

Field	Description
DistID	Unique identifier for the distribution center facility where the tour starts
Peddled	Flag to identify whether the tour is a peddling tour, i.e., it begins at a distribution center and includes one or more stops
TourID	Tour identification number
TripID	Trip identifier (order within the tour)
TAZ.Anchor	Anchor PTRM TAZ where the tour starts and ends
Vehicle	Vehicle type (light, medium, heavy)
Scheduled	Flag to denote that the stop at the end of the trip was scheduled (vs. an intermediate stop)
NintStops	Number of intermediate stops during the tour
TAZ.Origin	Origin PTRM TAZ
TAZ.Destination	Destination PTRM TAZ
Activity	Activity at the stop location at the end of the trip
ShipmentWeight	Shipment weight delivered or picked up at the shop
StopDuration	Stop duration for the activity at the end of the trip
TravelTime	Travel time of the trip (minutes)
Distance	Distance of the trip (miles)
MAMArrive	Arrival time of the trip (minutes after midnight)
MAMDepart	Departure time of the trip (minutes after midnight)
Movement.Type	Movement type (e.g. internal to internal) for the trip
ExternalStation	PTRM TAZ code for eXternal station used by the trip
Direction	Direction group for the external station

Tour-based Freight Model: Dashboard