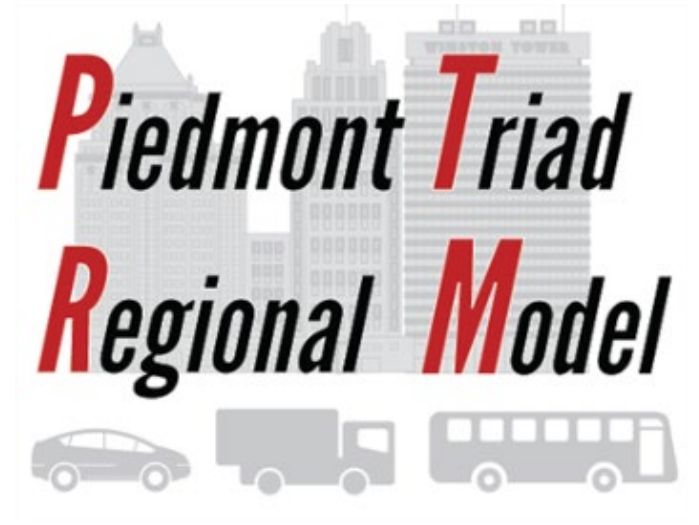


Introduction of PTRM Tour-Based Freight Model

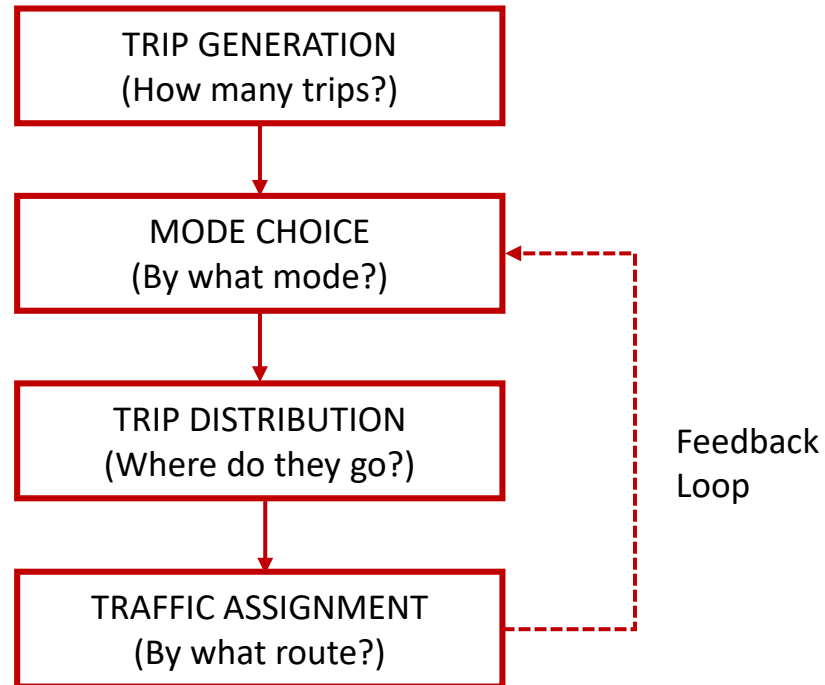
Presented by John Kim



Overview

- ☐ Overview of PTRM (Piedmont Triad Regional Model)
- ☐ Tour-Based Freight Model

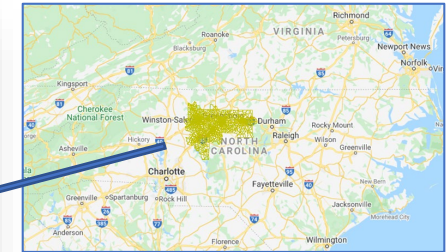
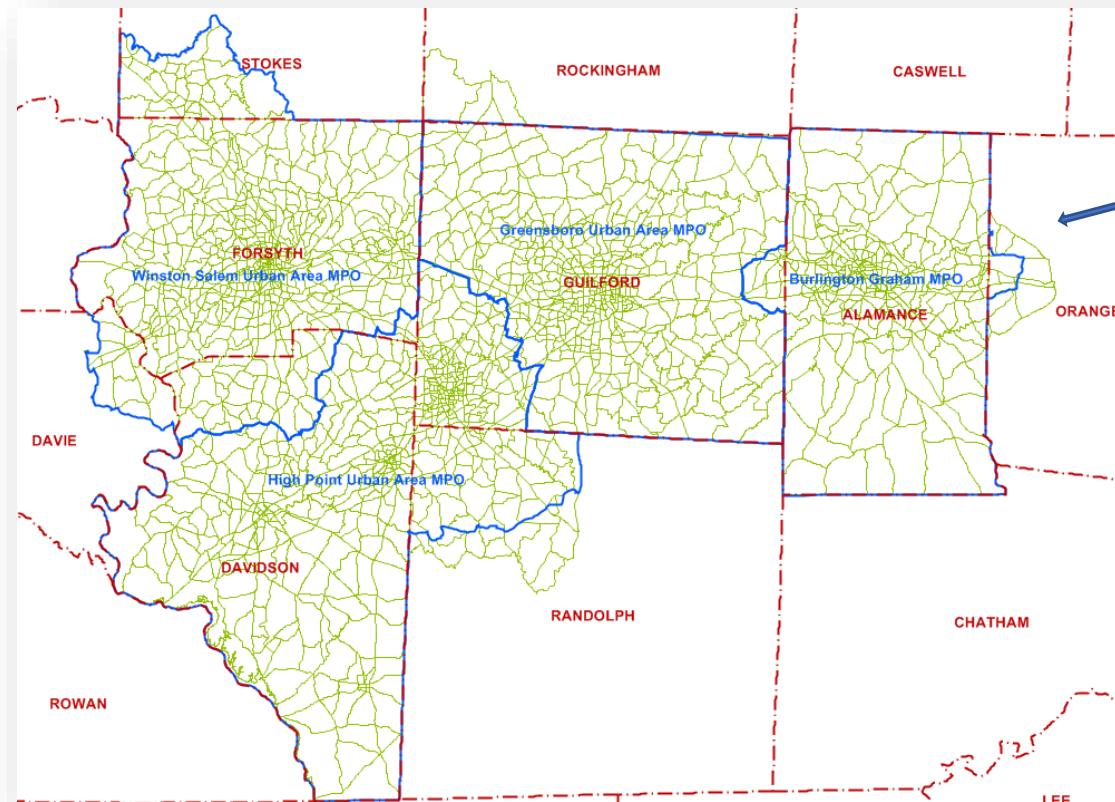
Four Step Model



PTRM Model Overview

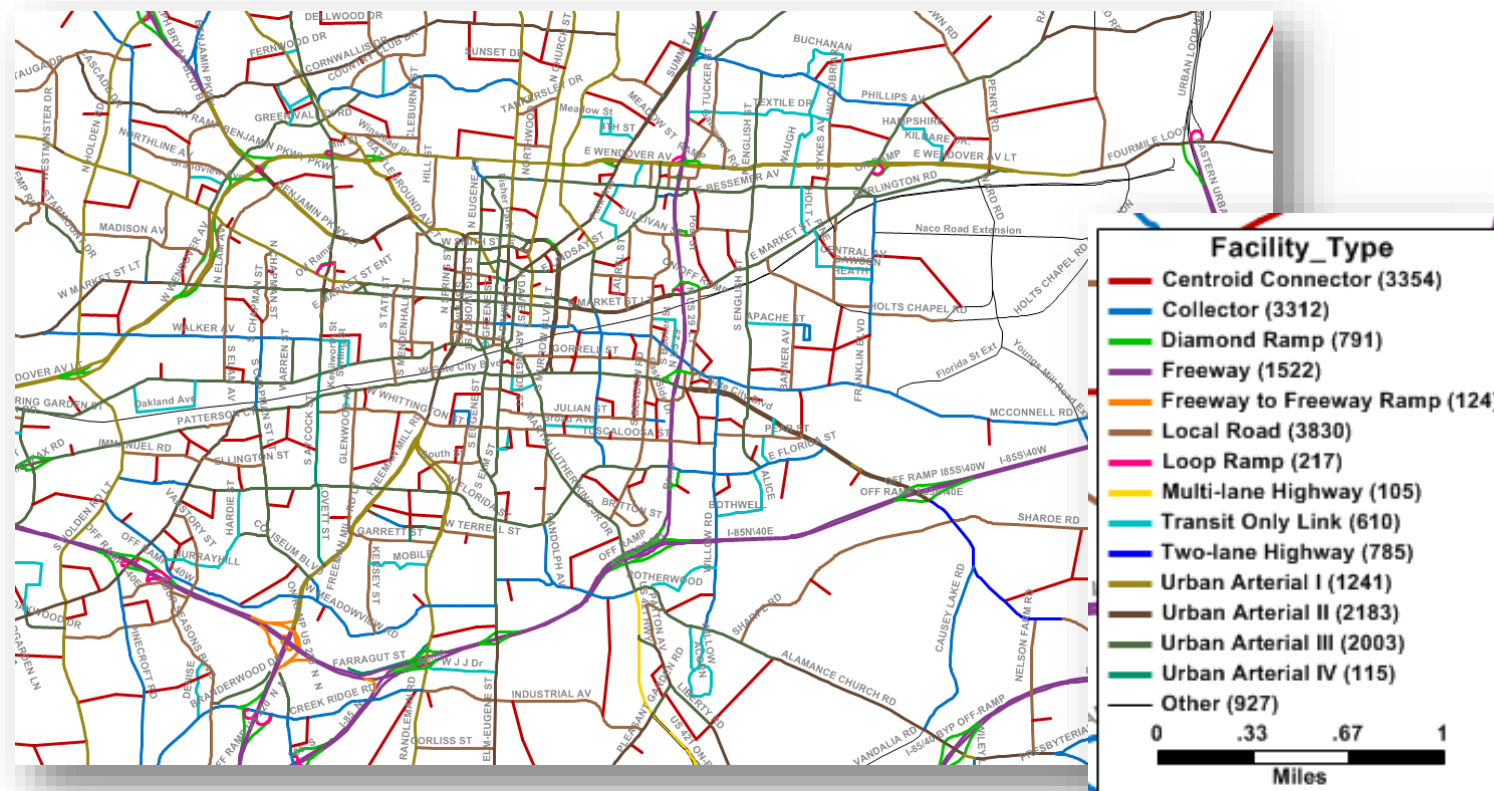
Area Coverage

- ❑ 4 Whole Counties & 5 Partial Counties
- ❑ 4 MPOs
- ❑ 1,932 Zones (TAZs)
- ❑ 2,352 Sq Mi



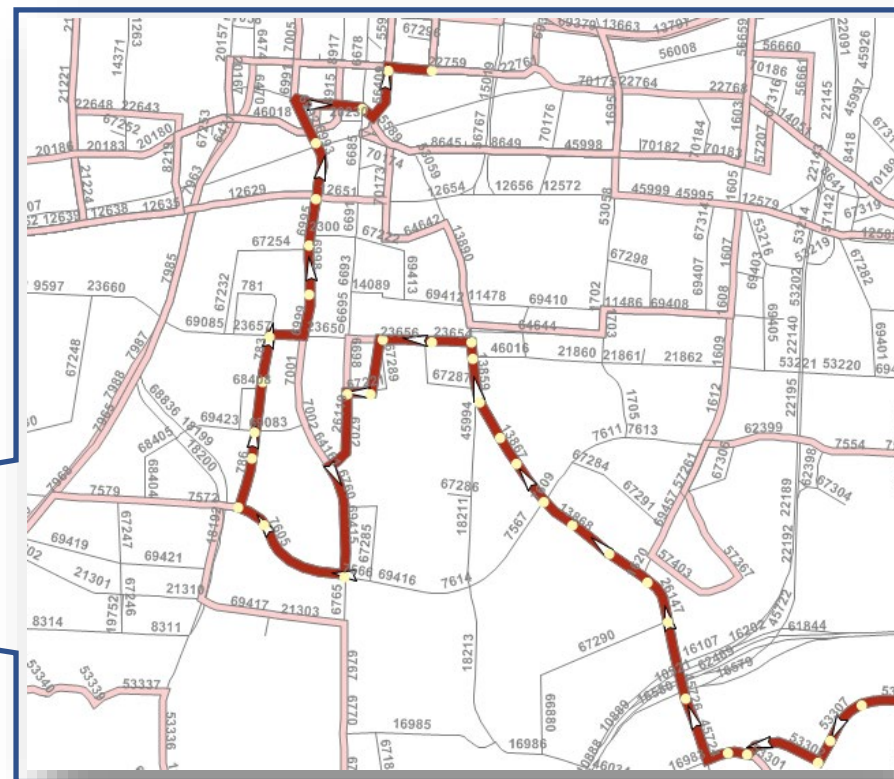
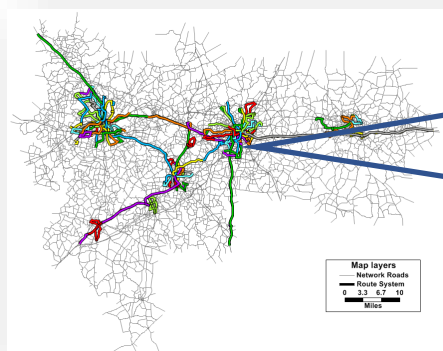
Network Coverage – Highway Network

- ❑ 21,428 links (Freeway, arterials, two-lane highway, collector, local road)
- ❑ 2017 BASE & Future Scenario networks
- ❑ Various attributes



Network Coverage – Transit Routes

- ☐ Local bus routes (GTA, HiTran, Link, WSTA)
- ☐ PART Express Routes

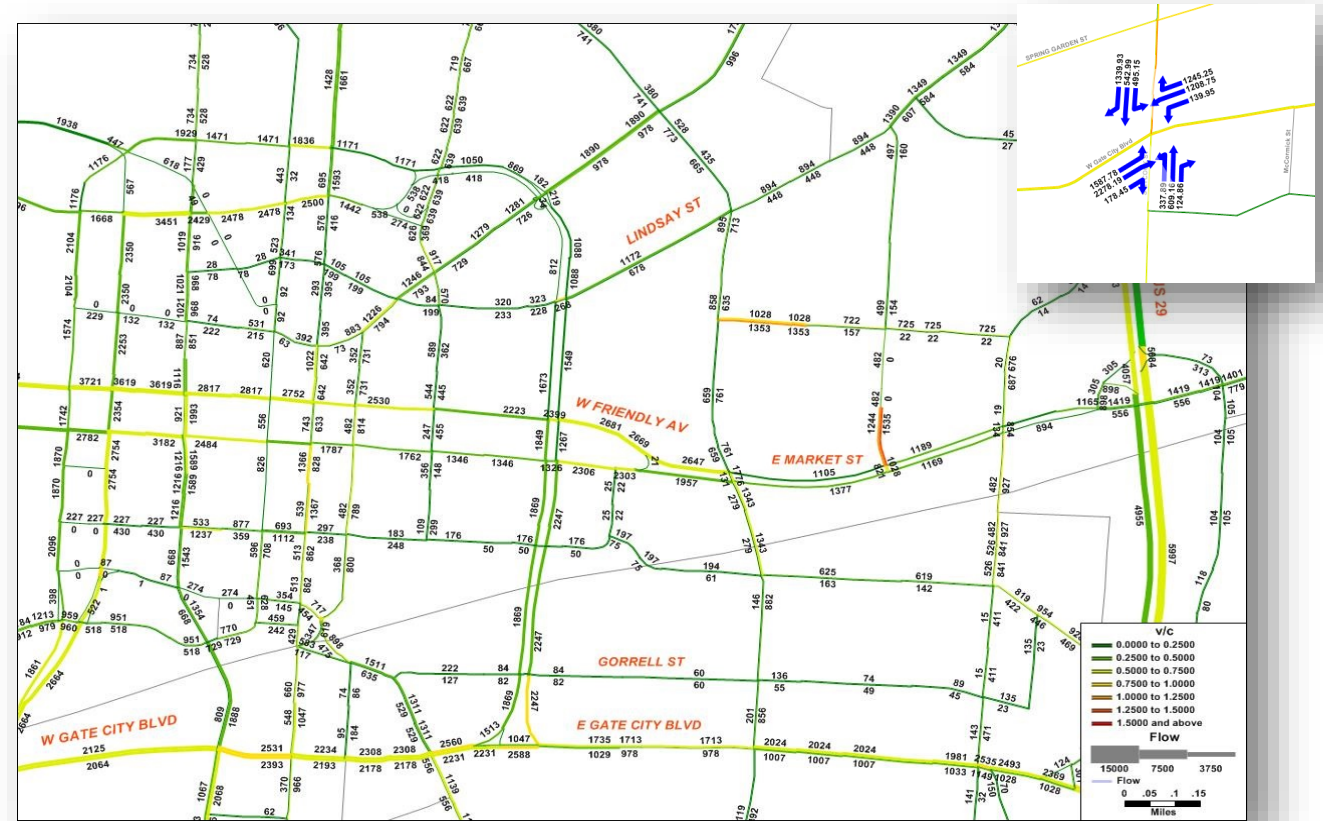
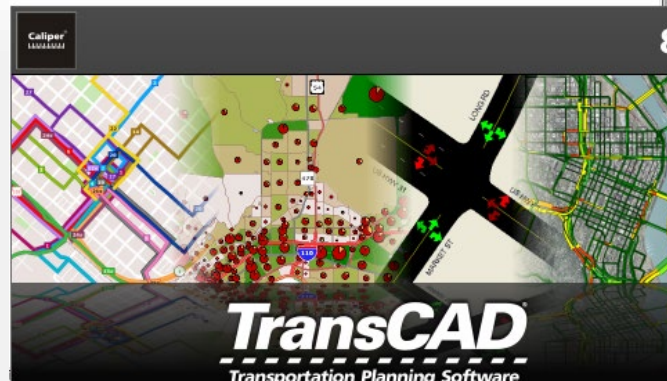


Socio-Economic Data

- ☐ Population, Household
- ☐ Employment by type
- ☐ K-12 students, University Students
- ☐ Avg Income, # HH Autos, ...



Forecast Traffic Flow & TransCAD v8.0



Tour-Based Freight Model

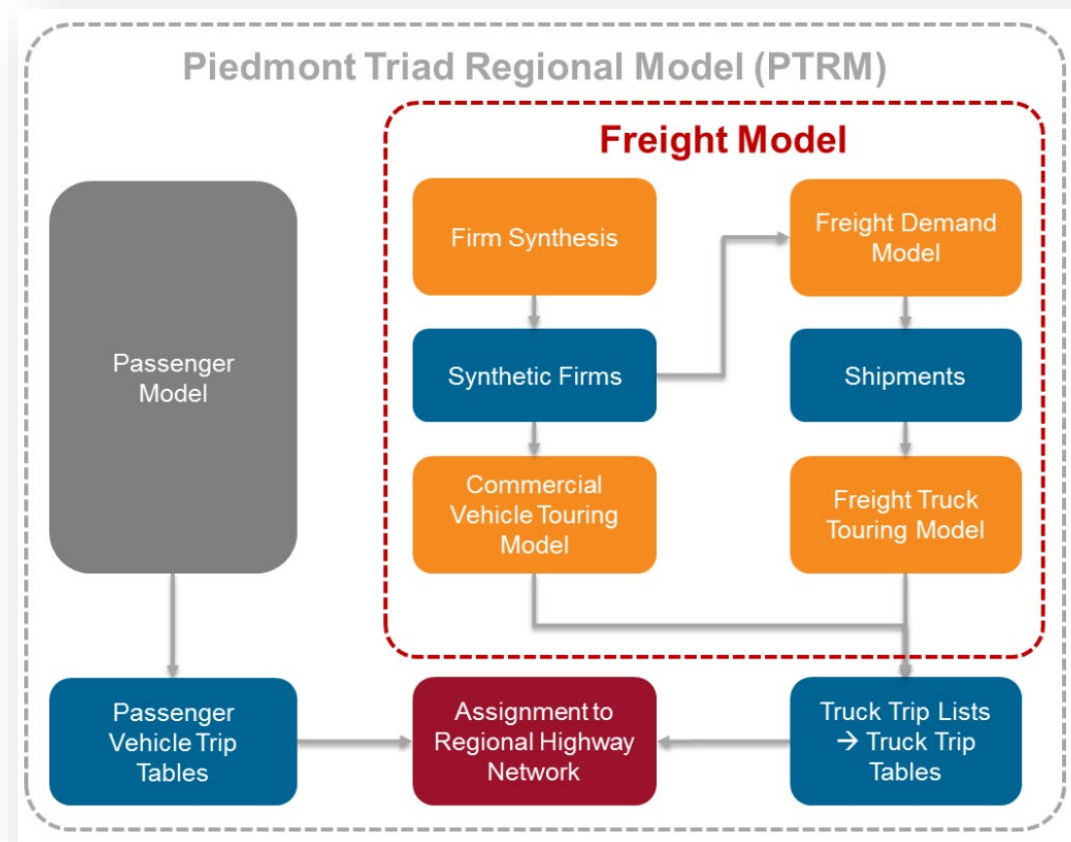
Needs of Tour-based Freight Model

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

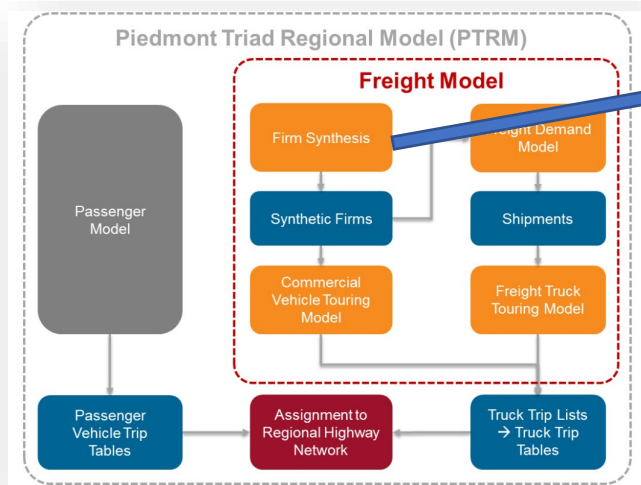
How the model addresses the Needs

- Behavioral Improvements
- Market Segmentation Scope
- Geographic Scope

Model System - Freight Model within PTRM



Firm Synthesis Model



Firm Synthesis

Scale Employees

firm_sim_scale_employees
Scales synthetic firms to employee forecasts

Simulate Commodities

firm_sim_sctg
Simulates production commodities for firms based on probability thresholds

Synthetic Firms

RegionalFirms

List of business establishments in the model region, with location by TAZ and County, industry by NAICS and PTRM categories, production commodity by NAICS and SCTG, and size by employees and size category

Outputs – Firm Synthesis

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

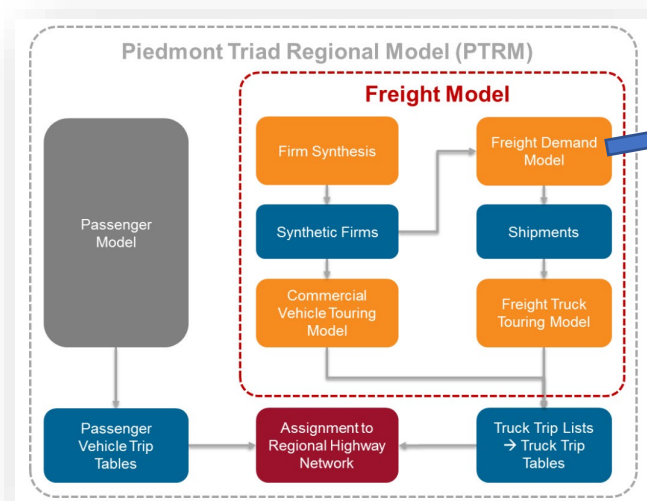
Bu...	FAFZo...	FIPS	...	NAI...	NAICS6io	Industry10	Industry7
<int>	<int>	<int>	<int>	<int>	<fctr>	<fctr>	<fctr>
1	372	37081	1	541850	541800	Other Services	SER
2	372	37081	1	238160	233411	Construction	IND
3	372	37081	1	238160	233411	Construction	IND
4	372	37081	1	443112	4A0000	Retail	RET
5	372	37081	1	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



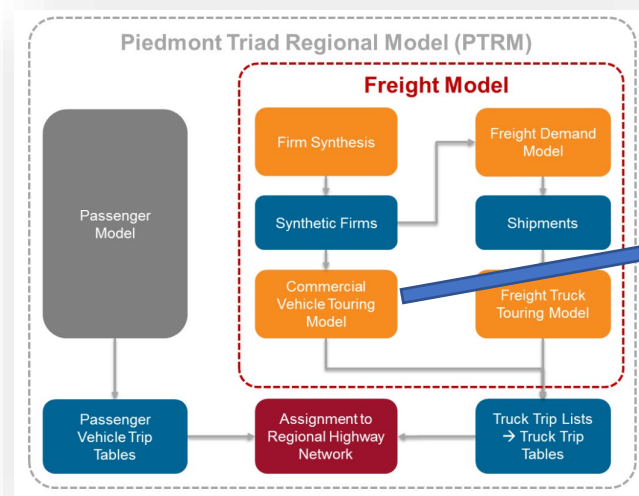
Outputs – Freight Demand Model

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 category)
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



Commercial Vehicle Touring Model

Simulate Firm Activities
cv_sim_activities
 Develops demand for outbound and inbound shipments from commodity flow data

Simulate Scheduled Stops
cv_sim_scheduledstops
 Creates scheduled stops based on input firms and zones

Simulate Vehicle Choice
cv_sim_vehicle
 Choose vehicle type based on industry and distance

Simulate Stop Duration
cv_sim_stopduration
 Determine stop duration based on industry and vehicle

Simulate Tours and Routing
cv_sim_tours
 Create tours and stop order from stop information

Simulate Scheduled Trips
cv_sim_scheduledtrips
 Create trips from tours and stop order

Simulate Intermediate Stops
cv_sim_intermediatestops
 Predict intermediate stops and durations

Trips
cv_trips
 List of tour and trips planned with sequence of stops, complete schedule of arrivals and departures and travel times, and vehicles to be used for each tour.

Outputs – CVTM

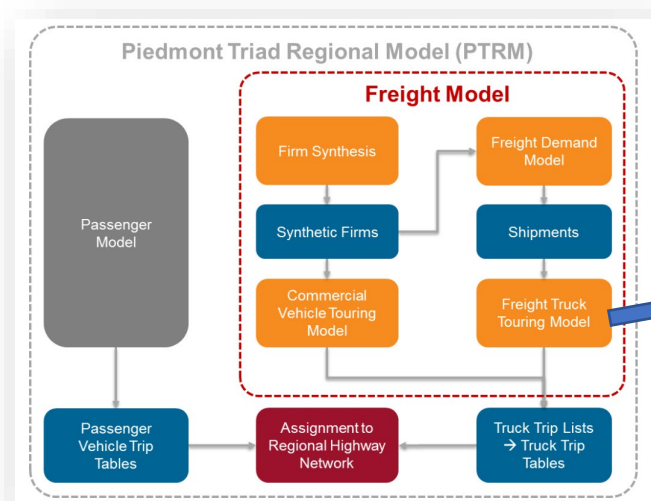
Table 20: List of Commercial Vehicle Tours and Trips Output by the CVTM

Bu...	Vehicle	Tou...	TripID	Schedul...	O...	D...	Activity	MAMDe...	MAMA
<int>	<ord>	<int>	<int>	<int>	<int>	<int>	<fctr>	<S3: mam>	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

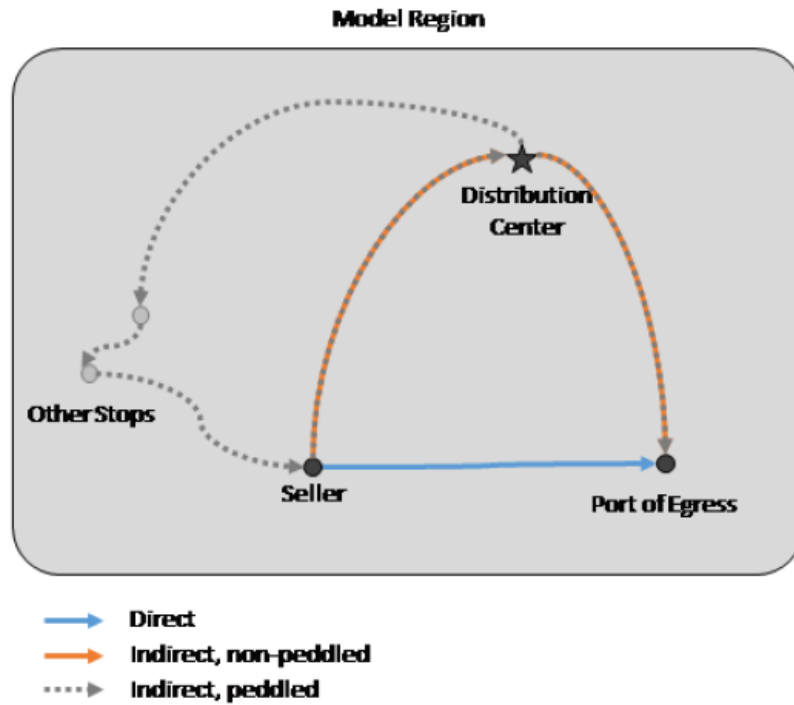
Field	Description
BusID	Unique business identifier (created in the model)
Vehicle	Vehicle type (light, medium, heavy)
TourID	Tour identification number
TripID	Trip identifier (order within the tour)
Scheduled	Flag to denote that the stop at the end of the trip was scheduled (vs. an intermediate stop)
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

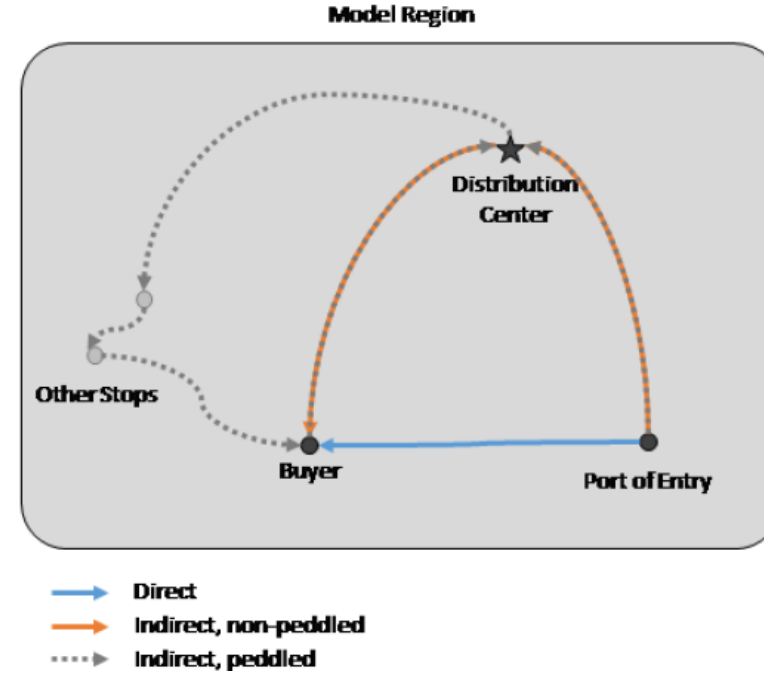


Peddling – FTTM

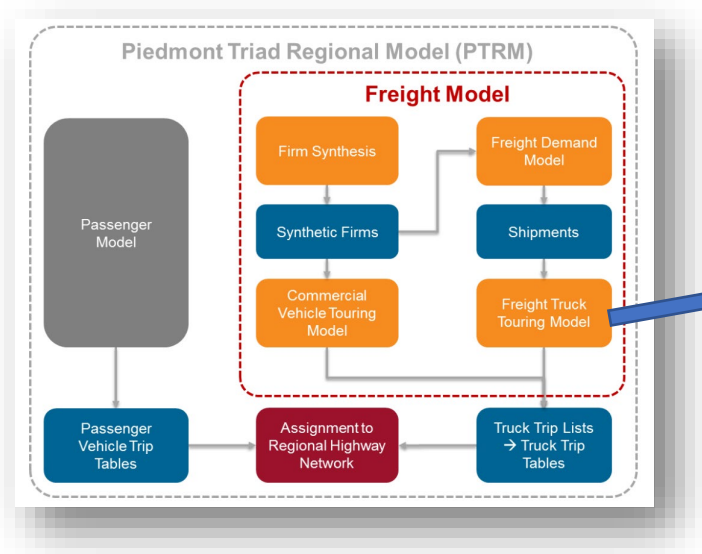
Internal-to-External Freight Movements



External-to-Internal Freight Movements



Freight Truck Touring Model



Outputs – FTTM

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

DistID	Peddl...	Tou...	TripID	TAZ.Anch...	Vehicle	Schedul...	NintStops	TAZ.Origin						
<int>	<int>	<int>	<int>	<int>	<fctr>	<int>	<int>	<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
Peddlled	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

