Regional STOPS Models

A presentation to the NCMUG on November 9th, 2021

Speaker

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Director

Agenda

What is STOPS?

What are Regional STOPS models?

    Regional <u>Base</u> STOPS models

    Regional <u>Planning</u> STOPS models

Examples of Regional STOPS models

Thoughts on Regional STOPS models in NC

STOPS Resources

What is STOPS?

What is STOPS?

- Simplified Trips on Project Software
- Estimates ridership impacts from:
  - Changes in the transit system
  - Changes in population & employment
  - Changes in auto travel times
- Developed by the Federal Transit Administration (FTA)
  - Provides agencies option when submitting Capital Investment Grant applications
  - Combines national fixed-guideway experience with local ridership data
- Released in 2013; FTA provides maintenance & continues to release updates
- National Transit Institute provides STOPS training

How Does STOPS Work?

National Parameters + **Local Implementation**

National Parameters

- Based on database of rider survey/data from 20 cities
- Default settings for understanding fixed-guideway & transit trips by:
  - Trip purpose, auto-ownership & access mode
  - Transit access/egress time, frequencies
  - Fixed-guideway elements compared to local bus
- Default settings for predicting ridership on new fixed-guideway projects

Local Implementation

- Transit On-Board Survey
- Transit boarding data by stop & route
- PNR vehicle counts
- GTFS transit network

- Transfer penalty
- Fixed-Guideway settings
- Adjustment factors for system-wide & station-group boardings

How Does STOPS Work?

Inputs

Person Trips
- Census/ACS work trip data
- Local transit rider survey
- Population & employment by TAZ

Transit System
- Detailed transit schedule of regional services (GTFS)
- Transit stop locations
- Transit boardings by stop
- PNR vehicle counts
- Project characteristics

Auto System
- TAZ-to-TAZ auto travel times & distances, peak period
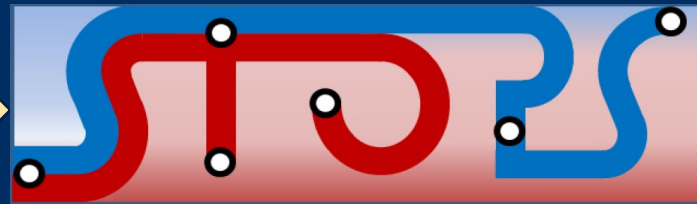
Outputs

CIG-related
- Trips on project
- Auto VMT changes
- New transit trips

Other
- Ridership & transit trips:
  - By route / line
  - By stop
  - By station to station
  - By access mode
  - By trip purpose
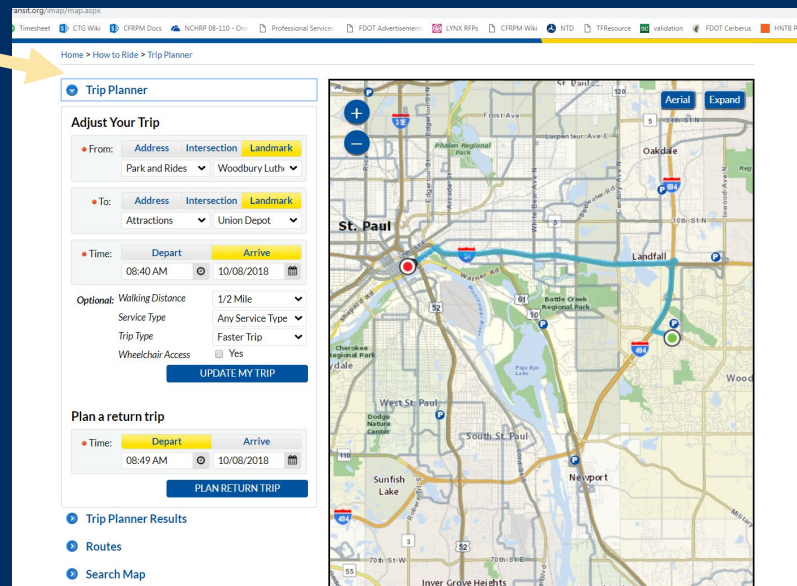
What information does STOPS produce?

- Four Capital Investment Grant metrics...
  - Project Trips
    - Total (all trip purposes: HBW + HBO + NHB)
    - Project trips from transit-dependent households
  - Incremental transit trips (No Build vs. Build)
  - Change in auto passenger-miles traveled (No Build vs. Build, user converts to VMT)
- ...And other information for analysis
  - Over 1,000 reports and district-to-district trip tables
  - Passenger loads by route by stop by direction

STOPS Use Cases

- Capital Investment Grant (CIG) studies and applications
  - Pre-project development phase through final Grant Agreement
  - Before/After studies

- "Second check" on ridership forecasts using other models or methods

- Corridor transit planning studies and analyses (non-CIG)
  - Equity and accessibility analyses

What are Regional STOPS models?

What are Regional STOPS Models?

- My definition...

A STOPS model developed for application in <u>multiple </u>corridors or <u>an entire region</u>

- In contrast, "traditional" STOPS models include an entire region, but their calibration & application is focused on a specific corridor

Purposes for Regional STOPS Models

- A platform for multiple corridor STOPS models ("base")
  - Shares consistent information across multiple corridor study teams
  - Improves consistency across ridership estimates in multiple corridors
  - Examples: Minneapolis/St. Paul, Atlanta, the Miami/Ft. Lauderdale/West Palm Beach region, Atlanta, New Orleans, and Columbus Ohio
- The region's mode choice model for regional and Long-Range Transportation Planning analyses ("planning")
  - Serves as or replaces existing mode choice/transit model
  - Can improve consistency between needs for transit agency & other agencies
  - Examples: Corpus Christi Texas and the Greater Orlando/Central Florida region

Why Consider Regional STOPS Models?

- Essentially, STOPS' flexibility and standardization

Why Consider Regional STOPS Models? (2)

- "Ridership estimates are very different between the regional model and STOPS, so uncomfortable conversations arise when decision-makers base a decision on the regional model results and later surprised by STOPS results"
- The existing transit model doesn't get the attention it deserves
  - 'Good' calibration and validation requires thorough review of including speeds, travel patterns, mode choice coefficients and constants
  - This validation level is beyond typical "highway" validation efforts, so transit model validation can become a simple comparison of total transit trips
- An MPO transit model usually isn't ready for major transit-specific projects
  - Significant work is typically needed to ready local models
  - This work is sometimes lost by the next model update
- Likely need a STOPS model for CIG transit work anyway
- Transit models add to the regional model's running time, regardless if users need transit-related output
  - Can be an extra hour of running time or more

Why Consider Regional STOPS Models? (3)

- "We have different consultant teams working on various corridors, and we don't know if they are being consistent"
  - Ease coordination among forecasting efforts being done by multiple consultants and agencies^
  - Distribute more reliable input data for new projects^
- Minimizes STOPS model development efforts for multiple corridors
- Maintaining transit models can be a lot of work
  - Maintaining the networks can be challenging
  - Transit networks require specialized knowledge due to its path-building characteristics
  - Knowledge to calibrate/validate transit models to meet FTA guidance
- Good base for MPO staff to use STOPS more broadly^

^Regional STOPS Model Development Scope of Work – Metropolitan Council (Twin Cities, MN) – 2020.

Why Consider Regional STOPS Models? (4)

- Using STOPS meets known regulatory requirements for regional transit modeling
  - There is no federal or state requirement for embedded mode choice model
  - Roadway travel times are integrated into model
  - Sensitive to changes in transit options
  - Supports equity and accessibility analyses
- Developing a STOPS model is a relatively light lift
  - You probably have a STOPS model already built in your area
  - If you don't, it only takes 2-3 months to develop one
  - No additional software cost
  - Training is free for public agencies
- Maintaining a STOPS model is doable
  - Transit agencies generally handle network maintenance via GTFS
  - Runs faster than some regional models (e.g., <3 hours vs. 6+ hours)
  - Only needs to run when needed

Favorable Reactions …

"Has streamlined processes and reduced uncertainties"

"Implications on the efficiency (time and cost saving) of project development is very significant"

"Allowed stakeholders to make quick assessment of feasibility of projects"

"Helped in 'pre-work' to iron out project issues before a major study"

Regional <u>Base</u> STOPS Model
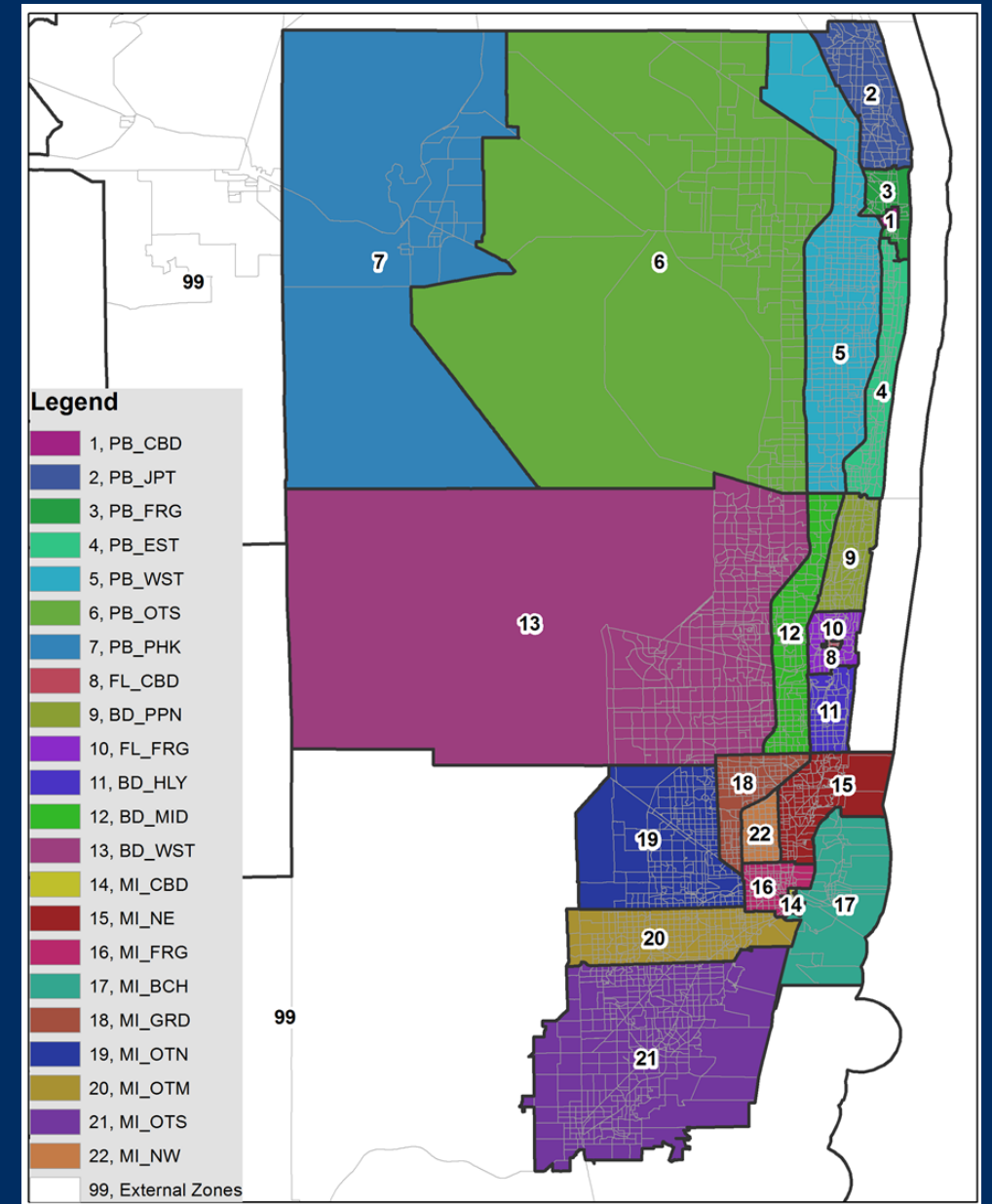
A platform for multiple corridor STOPS models

Regional **Base** STOPS Models

- A STOPS Model used as a platform for multiple corridor STOPS models

- Developed similarly to a standard STOPS model, but calibrated & validated for the entire region, rather focusing on a single corridor

Southeast Florida Regional STOPS Model

- Developed in 2016

- Covers 3 counties in Southeast Florida representing over 500k daily transit boardings

- Used as a basis for multiple transit corridor studies in the region

Legend

- 1, PB_CBD
- 2, PB_JPT
- 3, PB_FRG
- 4, PB_EST
- 5, PB_WST
- 6, PB_OTS
- 7, PB_PHK
- 8, FL_CBD
- 9, BD_PPN
- 10, FL_FRG
- 11, BD_HLY
- 12, BD_MID
- 13, BD_WST
- 14, MI_CBD
- 15, MI_NE
- 16, MI_FRG
- 17, MI_BCH
- 18, MI_GRD
- 19, MI_OTN
- 20, MI_OTM
- 21, MI_OTS
- 22, MI_NW
- 99, External Zones

Minneapolis-St. Paul Twin Cities Regional STOPS Model

- Developed in 2020
- Relies on the regional on-board survey conducted in 2016
- Geographic coverage aligns with the coverage of MPO's regional activity-based travel demand model
- Tested against existing projects and studies in the region
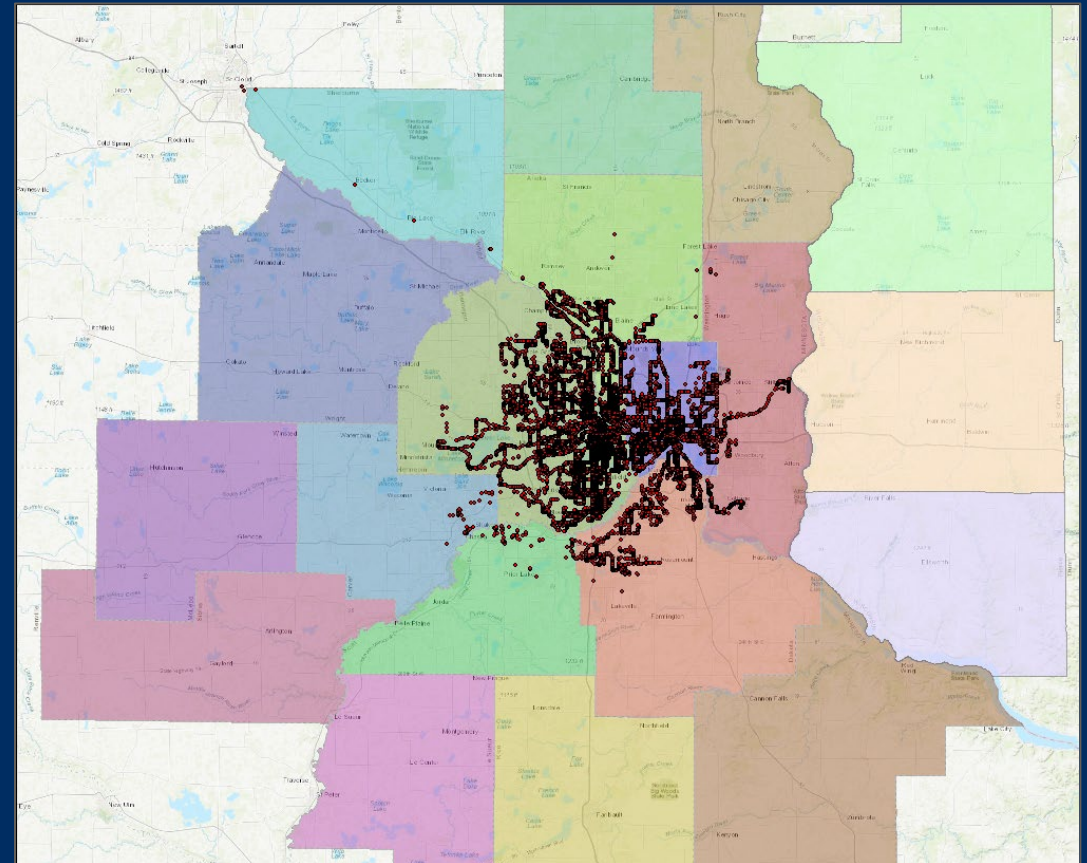
Atlanta Regional Council (ARC) Regional STOPS Model

- Developed in 2021
- Relies on the regional on-board survey conducted in 2019
- Covers all 21 counties of ARC's Activity Based Model (ABM)

- Model runtime is 3-5 hours; will run on a laptop
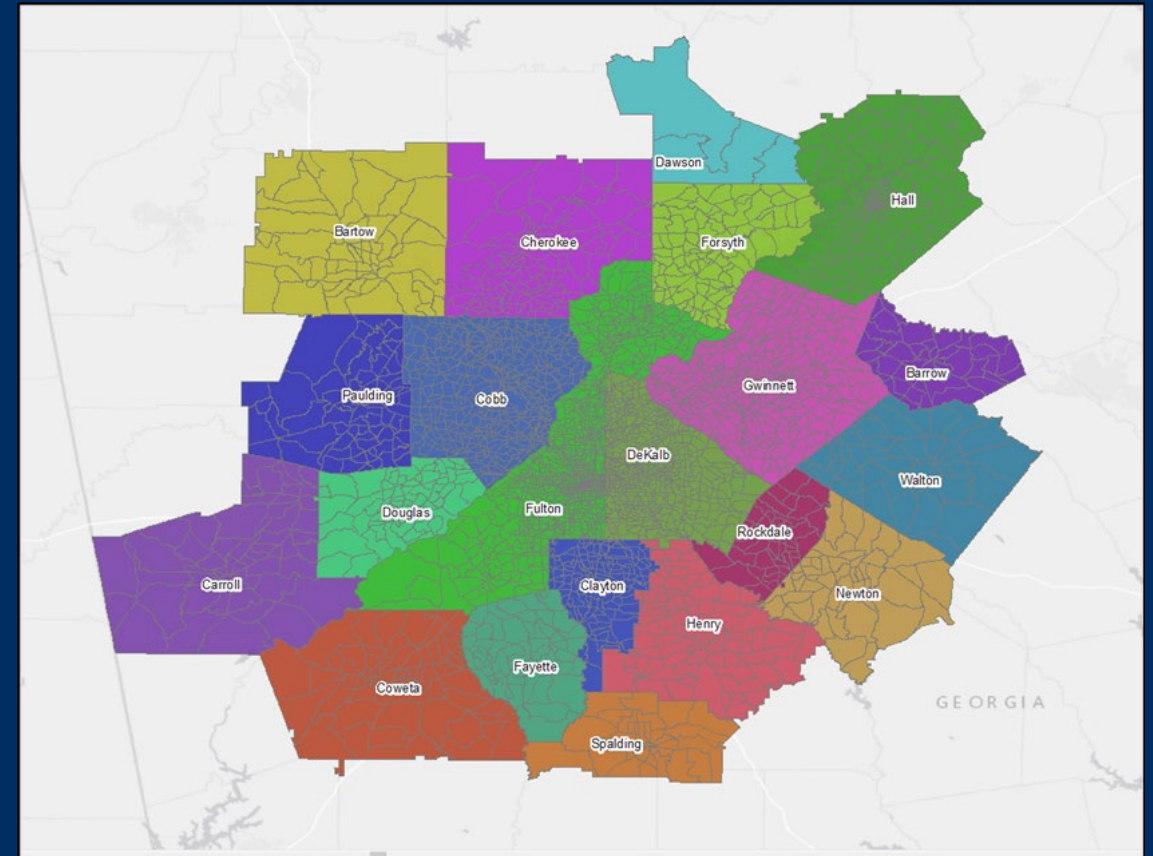
Regional <u>Planning</u> STOPS Model

The region's mode choice model for regional and LRTP analysis

Regional **Planning** STOPS Models

- A STOPS Model that serves as the region's mode choice model for regional and Long-Range Transportation Planning analyses

- Developed similarly to a standard STOPS model, but calibrated & validated for the entire region, rather focusing on a single corridor

- May or may not be integrated with regional travel model

How to Integrate Regional Model with STOPS?
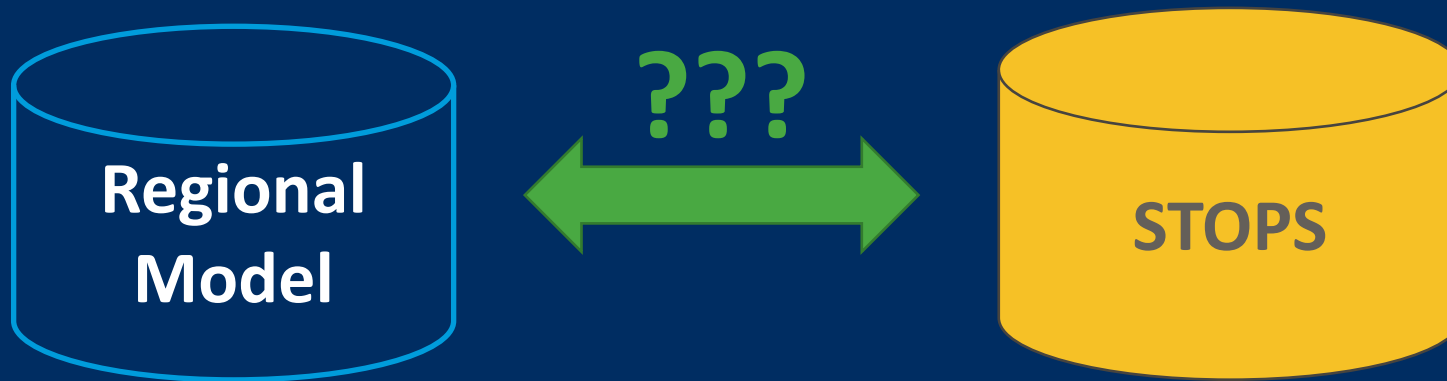
Integration Options
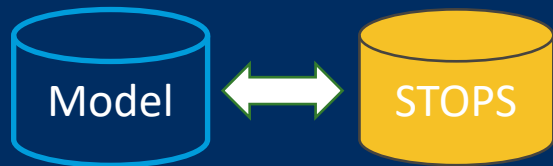
	Interaction with Regional Model	Mode Choice Model	Network, Path-building & Assignment	Benefits
Model STOPS	None	STOPS	STOPS	Can address transit needs as needed; STOPS ready for transit corridor projects
Model ⟷ STOPS	Transit trips deducted from person trips before highway assignment	STOPS	STOPS	Above benefits + Regional model sensitive to changes in transit; Transit model sensitive to changes in auto speeds
Model ⇄ STOPS	Transit paths/skims included in mode choice model	Regional Model	STOPS	Above benefits + Uses real-world transit schedules

Corpus Christi Regional STOPS Model

- Developed for 2016 & 2045 years

- Covers both counties in regional model

- Needed transit model for multimodal analysis, but did not have resources for traditional transit model and transit data collection
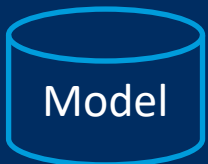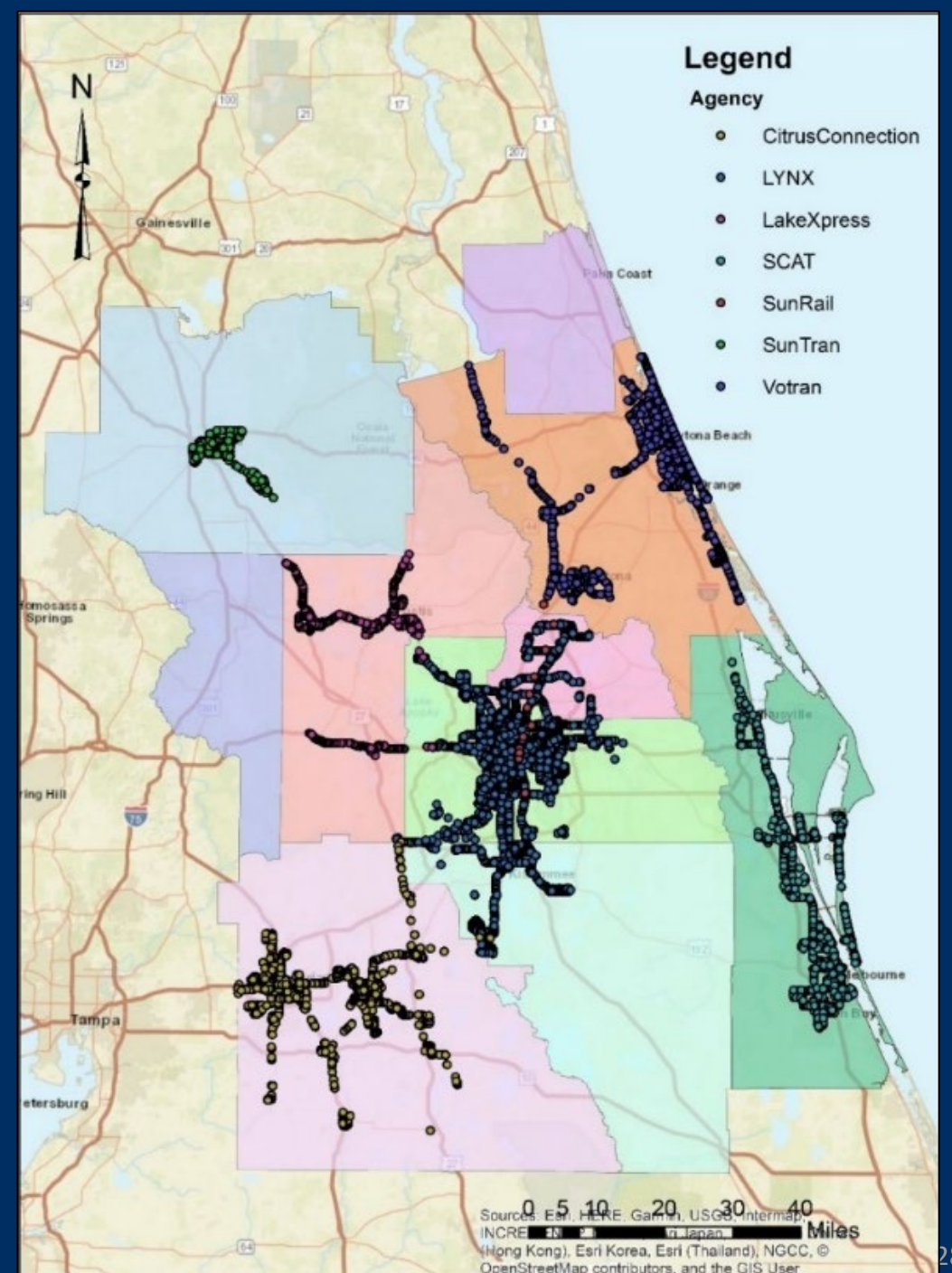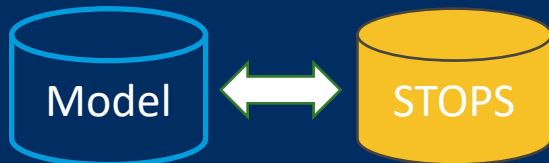

Model

STOPS

Central Florida Regional STOPS Model

- Developed in 2019

- Scenarios for 2015, 2020, 2025, 2030, 2035, 2040, 2045

- Covers all 10 counties in regional model

- Needed multimodal analysis, but regional model primarily used for traffic & technical analysis → need to minimize model running time

Model ↔ STOPS

Legend

Agency
- CitrusConnection
- LYNX
- LakeXpress
- SCAT
- SunRail
- SunTran
- Votran

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User

Central Florida Regional STOPS Model (2)

Transit trips are deducted from person trips prior to highway assignment

Transit zone-to-zone skims converted to binary format used by airport passenger sub-model

Offline = does not need to be run if there are no changes to transit network

   Transit trips & skims automatically included with model

   If desired, users can update transit networks and run STOPS
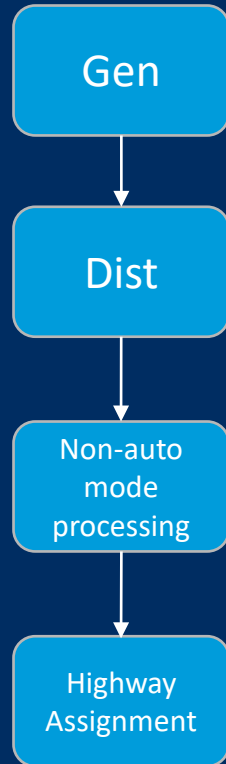
Benefits

Reduced model development effort

Reduced transit model maintenance effort

Reduced CFRPM run time by 3-4 hours

Improved confidence in transit results

Central Florida Regional STOPS Model (3)

• If user <u>does not</u> change transit network…

```
Gen
 ↓
Dist
 ↓
Non-auto mode processing
 ↓
Highway Assignment
```

• If user <u>does</u> change transit network…

```
Gen
 ↓
Dist ──→ [python]
            ↓
         [STOPS]
            ↓
Non-auto ←── [python]
mode processing
 ↓
Highway Assignment
```
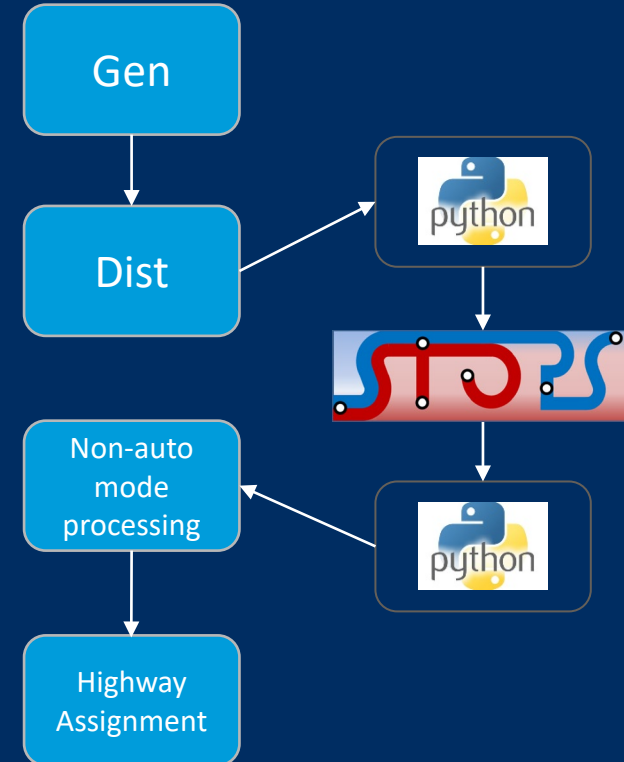
Thoughts on Regional STOPS models in North Carolina

STOPS in North Carolina

- Corridor STOPS models already developed in Charlotte & Raleigh, possibly other locations

- Consider Regional STOPS models...
  - For areas planning multiple new transit capital projects
  - For areas who primarily use the regional model for traffic forecasting, but need occasional transit modeling capabilities
  - For less urban areas who need ability to evaluate transit in their LRTPs

STOPS Resources

Resources

- FTA
  - STOPS software, example STOPS application, User guide
  - For most recent STOPS version, contact FTA STOPS help desk: Jeffrey.Roux@dot.gov

- National Transit Institute (NTI)
  - Ridership Forecasting with STOPS for Transit Project Planning: 3-day course
  - In-depth course

Resources (2)

FDOT: *2016 Guidebook for Florida STOPS Applications*

- https://www.fsutmsonline.net/images/uploads/Task_1_Guidebook_for_Florida_STOPS_Application.pdf

GUIDEBOOK FOR FLORIDA STOPS APPLICATIONS

NOVEMBER 2016

THE FLORIDA DEPARTMENT OF TRANSPORTATION
FREIGHT, LOGISTICS AND PASSENGER OPERATIONS
TALLAHASSEE, FL

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Questions?

Thank you!