

# GEN2/VER. 2.4.6 TRAVEL MODEL

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## Status Update

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# Background

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- The Gen2/Ver. 2.4 Model, a trip-based travel forecasting model, is TPB's latest production-use model
- Bentley/Citilabs has been promoting Cube CONNECT Edition (v 6.5) and plans to release its successor (v 6.5.1) soon
- TPB's next generation, activity-based Gen3 Travel Model is currently under development
- Staff plans to maintain the Gen2 Model while developing the Gen3 Model
- The Gen2/Ver. 2.4.6 Model is the latest developmental trip-based model, which has implemented six updates relative to Gen2/Ver. 2.4
- Visualize 2050 is scheduled to be approved by the TPB in June 2025



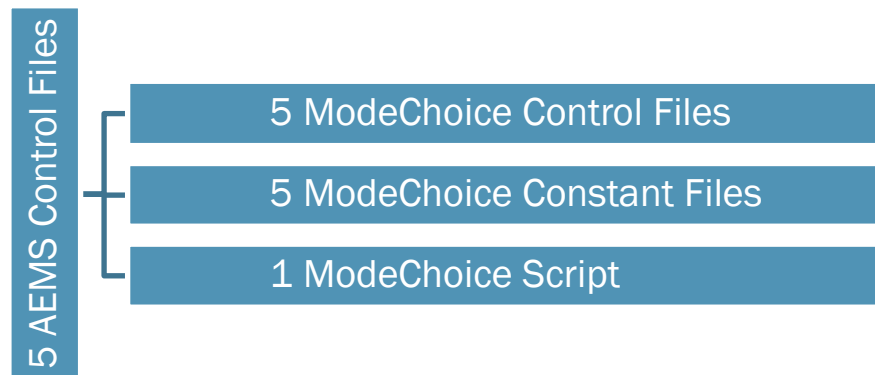
# Overview of the Ver. 2.4.6 Model

- Six updates to the model:
  1. Migrated mode choice application software from AEMS to TRANSIMS ModeChoice
  2. Migrated transit walkshed process from ArcPy to GeoPandas
  3. Added an automatic shutdown feature
  4. Cleaned up the transit skimming/assignment report files
  5. Updated the bus speed degradation process so that it calculates new degradation factors using the original factors for both current CPI year and modeled year
  6. Added a model check to ensure that no row/record in the transit line files (“mode files”) exceeds 144 columns
- The updates in the Ver. 2.4.6 Model improve model stability, slightly reduce model runtime, and have little impact on model outputs



# Update 1: Migrated Mode Choice Process from AEMS to ModeChoice

- Issues associated with AEMS program: unstable, outdated, lacking technical support
- Advantages of TRANSIMS ModeChoice program: well maintained and better supported, open-source, more efficient in computation, built-in calibration capabilities, etc.
- Model steps and input and output files are the same
- ModeChoice setup is different from the AEMS setup



# Update 1: Findings

- Mode choice process migration has little impact on model outputs

Regional Metric	% Change (year-2020) (ModeChoice vs AEMS)
Transit Person Trips	0.04%
Auto Person Trips	0.00%
Daily VMT	0.02%
Transit Ridership	0.06%

- Improvements:
  - Model stability: >10 successful test runs on on-premises and cloud servers
  - Compatibility with newer Cube versions, such as Cube 6.5
  - Runtime performance: slightly faster for a full model run
  - Better technical support



# Update 2: Migrated Transit Walkshed Process from ArcPy to GeoPandas

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- Issues associated with the ArcPy Transit Walkshed Process: unstable, incompatible with newer Cube versions
- Advantages of Python's GeoPandas: open-source, less prone to issues caused by ArcGIS Engine Runtime or ArcGIS Desktop, independent from future Cube releases
- Model steps and input and output files are the same
- Model setup requires
  - Mambaforge (an open-source collection of software tools that automates the process of installing, upgrading, configuring, and removing computer programs for a computer in a consistent manner, also known as a “package manager”) and
  - A software environment containing GeoPandas if the transit walkshed process is enabled



# Update 2: Findings

- The migration has little impact on model outputs

Regional Metric	% Change (year-2020) (GeoPandas vs ArcPy)
Transit Person Trips	0.06%
Auto Person Trips	0.00%
Daily VMT	0.01%
Transit Ridership	0.04%

- Improvements:
  - Model stability: 20 process runs on the on-premises and AWS cloud servers
  - Compatibility with newer Cube versions, such as Cube 6.5
  - Runtime performance: 20 minutes faster (75% reduction)



# Other Updates

Update	Description	Output change
Update 3	Added an automatic shutdown feature (useful for running on-demand servers in the cloud)	No
Update 4	Cleaned up the transit skimming/assignment report files	No
Update 5	Updated the bus speed degradation process so that it calculates new degradation factors using the original factors for both current CPI year and modeled year	Marginal
Update 6	Added a model check to ensure that no row/record in the transit line files (“mode files”) exceeds 144 columns	No





# Testing of the Ver. 2.4.6 Model

- Staff conducted multiple tests on on-premises and cloud servers (Cube 6.4.1/Cube 6.5 on Windows Server 2012 and Windows Server 2019)
- Random errors occasionally occurred when running the model with Cube 6.5 on AWS on-demand servers; COG and Bentley staff are investigating
- The six updates resulted in minimal differences in regional travel metrics

Regional Metric	% Change (year-2020) (Ver. 2.4.6 vs Ver. 2.4)
Daily VMT	-0.02%
Daily VHT	-0.05%
Daily VHD	-0.02%
Metrorail	-0.08%
MARC	-0.10%
VRE	-0.12%
All Bus	0.79%
<b>Total Transit</b>	<b>0.29%</b>



# Status and Plan for Upcoming Release

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- Staff is updating the Ver. 2.4.6 Model user's guide
- Staff plans to release the Ver. 2.4.6 Model as the production-use model this summer. At that time, the updated model will be the recommended production-use travel model.
- The Ver. 2.4.6 Model, or its successor, will be used in the upcoming air quality conformity analysis for Visualize 2050
- If Visualize 2050 is approved by the TPB (scheduled in June 2025), Ver. 2.4.6 Model or its successor will become the adopted, production-use regional travel model



# Main Takeaways

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- Six updates are included in the Ver. 2.4.6 Model
- The Ver. 2.4.6 Model runs moderately faster than the Ver. 2.4 Model
- Changes in the model outputs are minor
- Cube 6.5 is compatible with the Ver. 2.4.6 Model
- Staff is planning to release the Ver. 2.4.6 Model as the next production-use model in the summer



# Acknowledgements

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