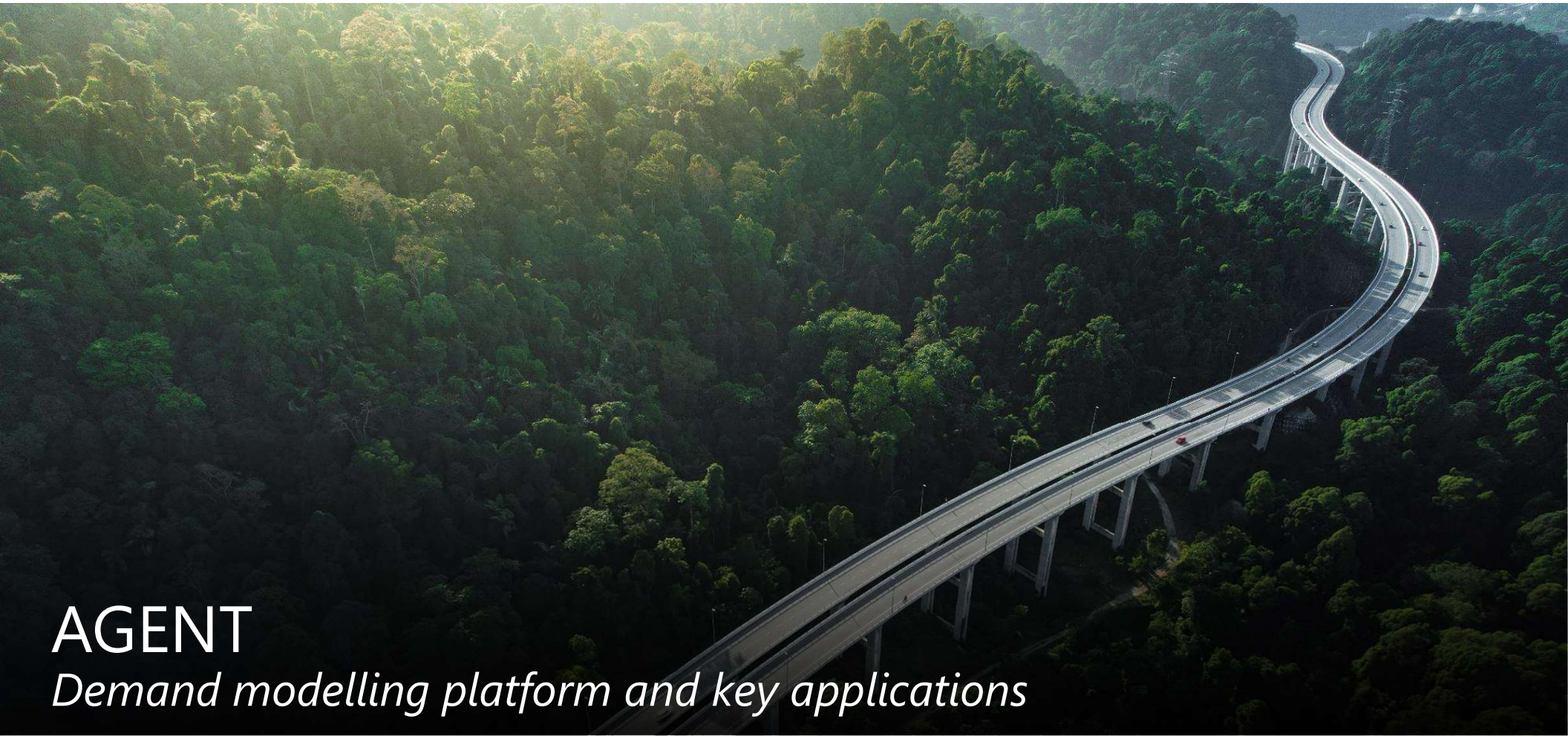


AGENT

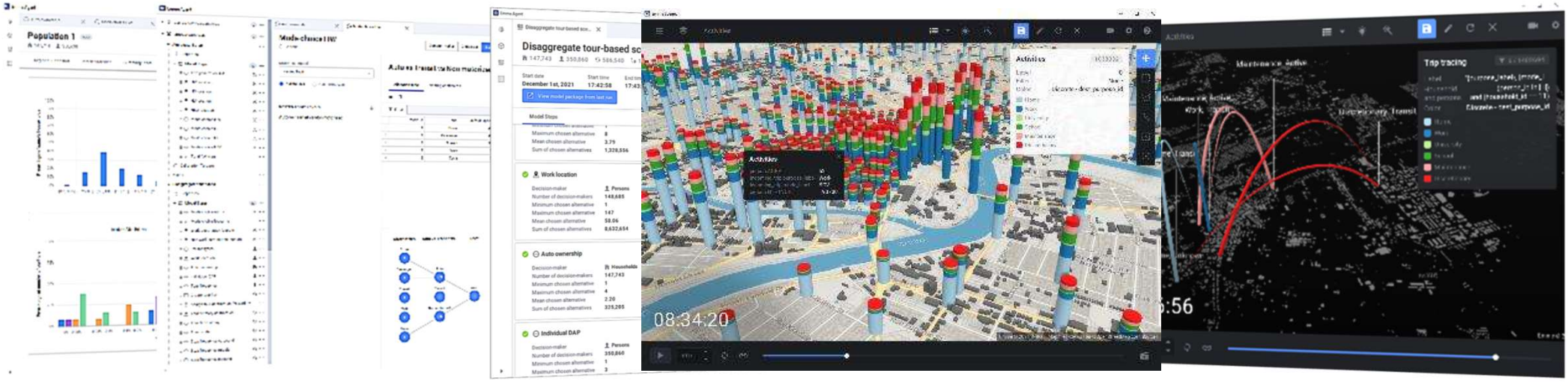
Demand modelling platform and key applications

Gaurav Vyas

Product Manager, Bentley Systems

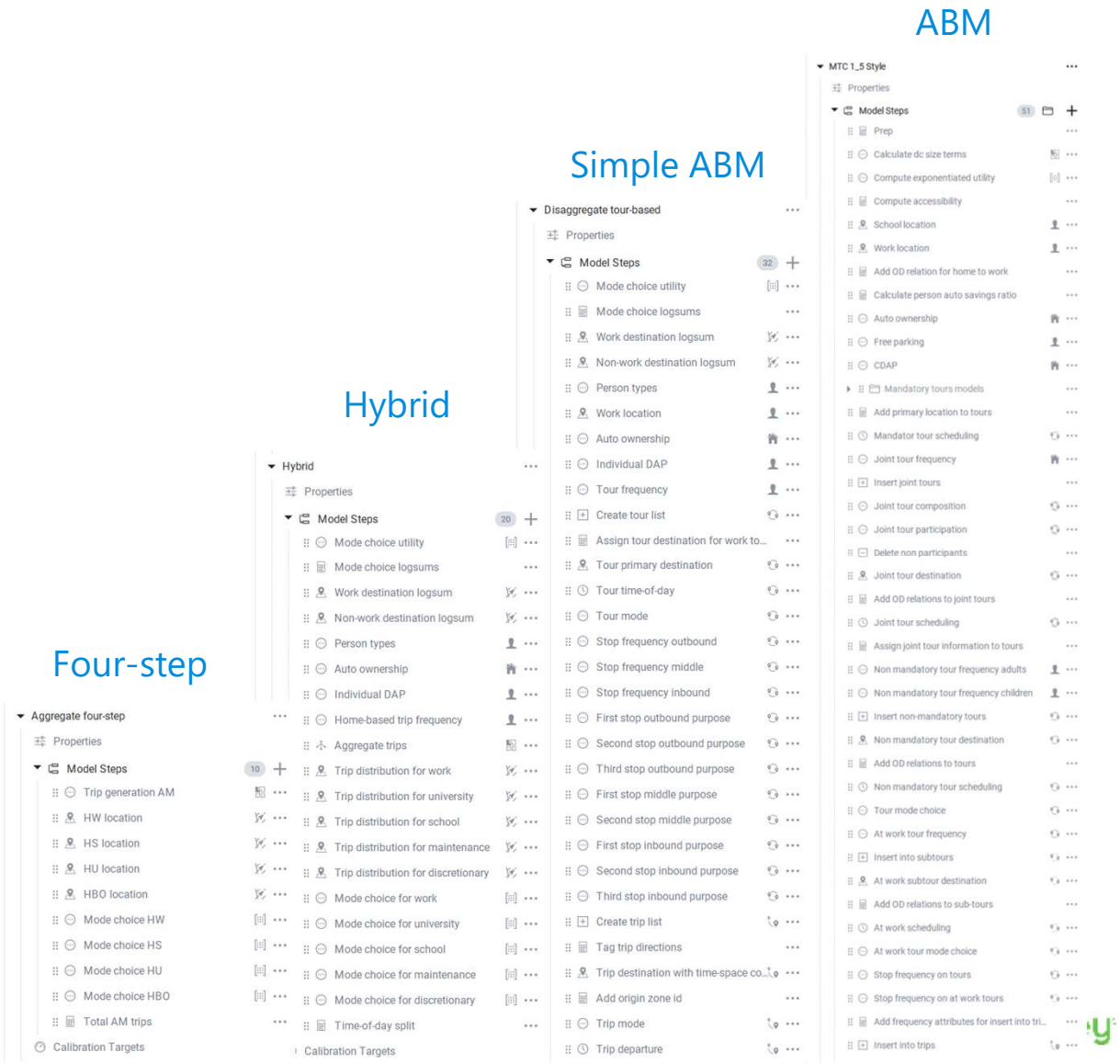
Bentley®

AGENT is a platform to assemble, calibrate and apply travel demand models



Bentley

- Assemble virtually any travel demand model structure from 4-step to ABM
- Enjoy transparent access to a full travel demand model UI
- Maintain different model structures or versions in parallel
- Upgrade and advance models over time with new features



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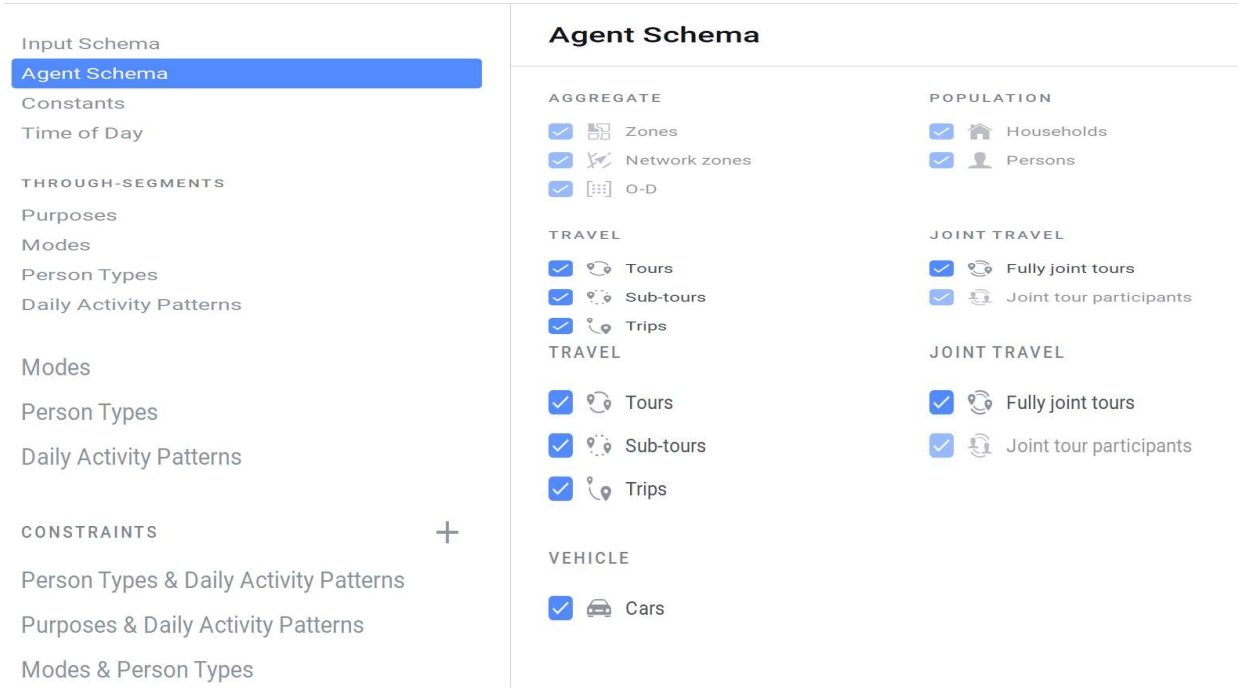

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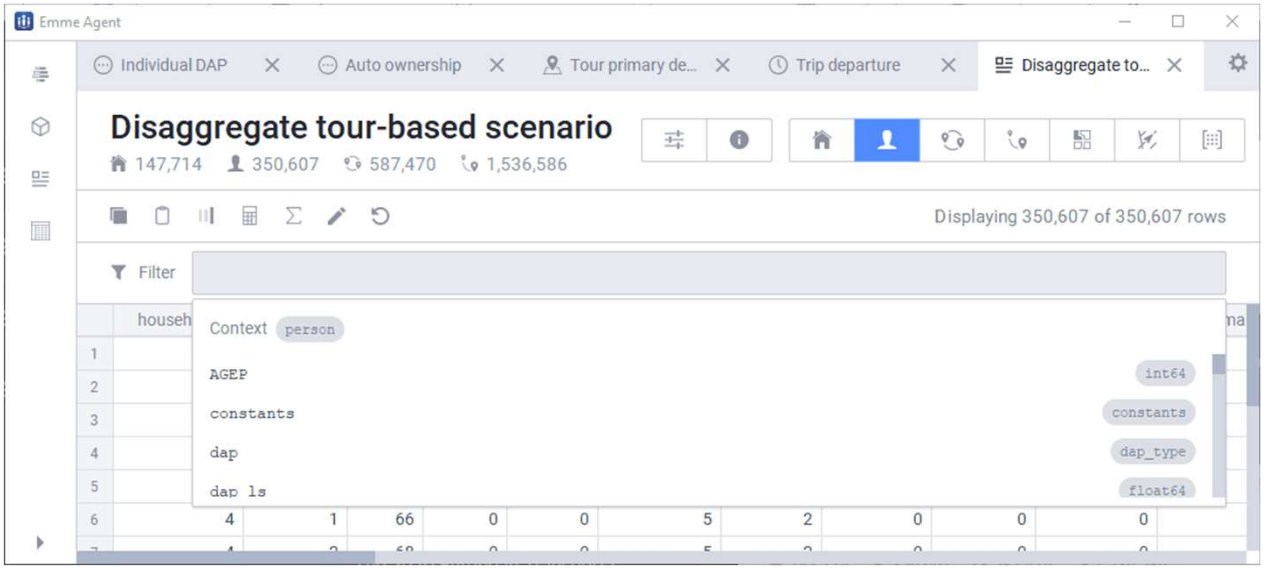

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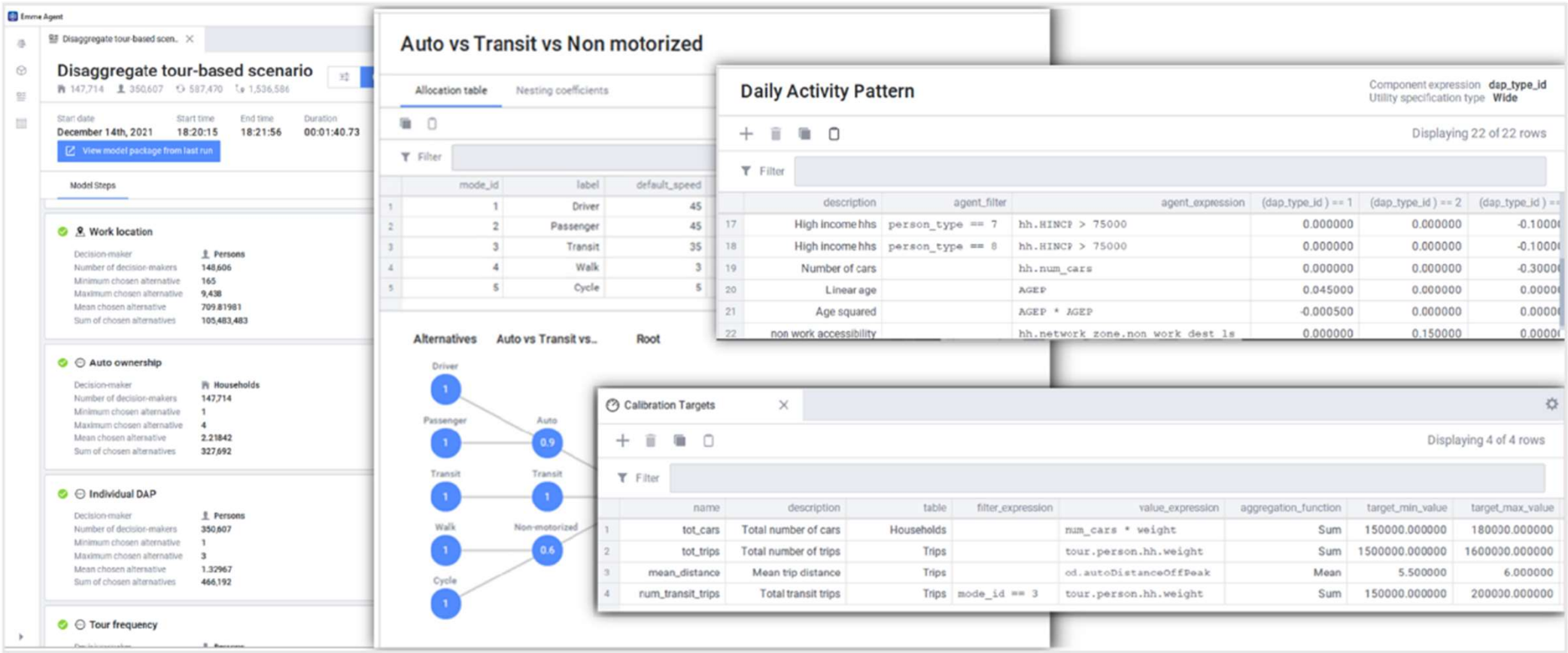

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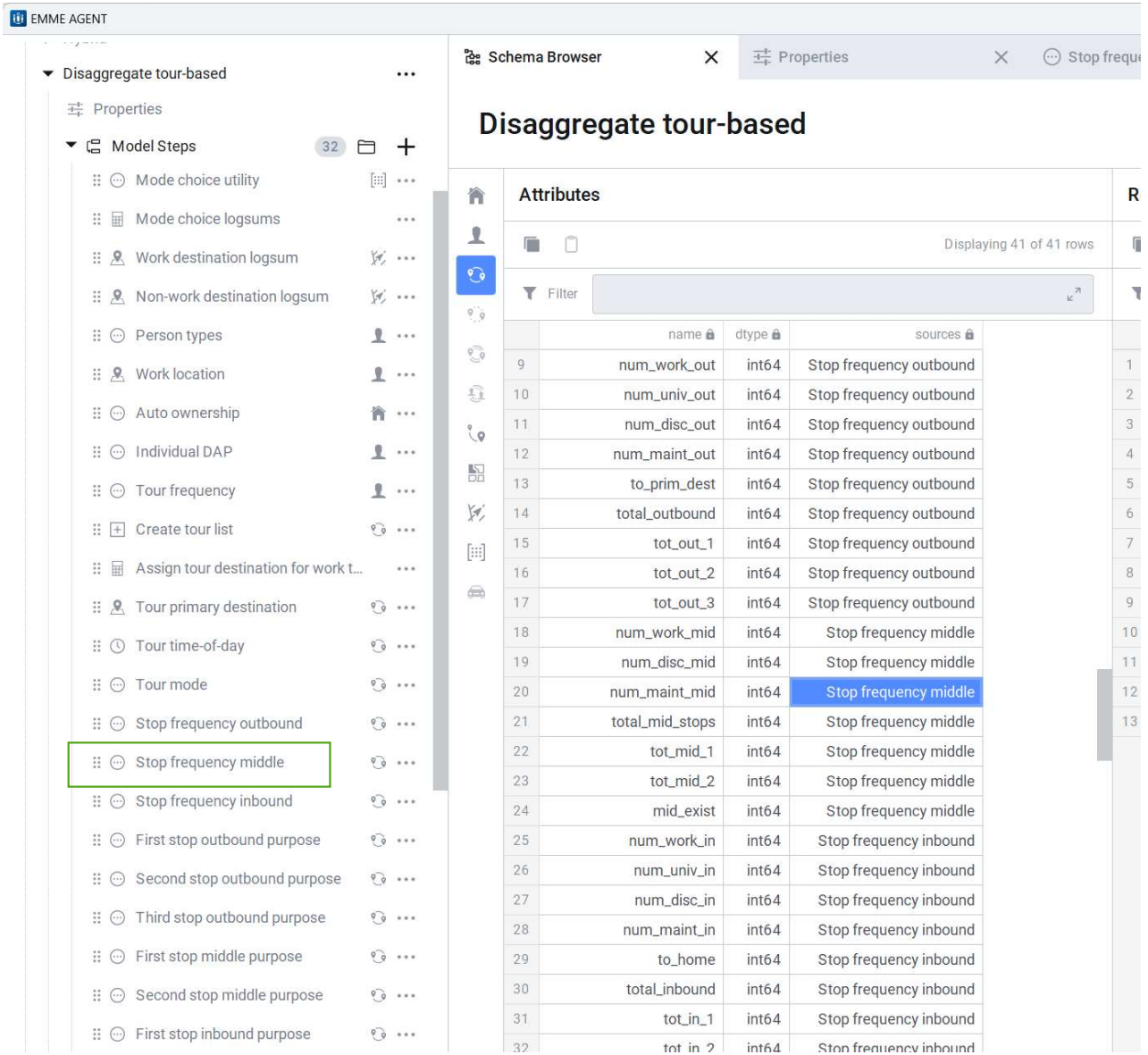
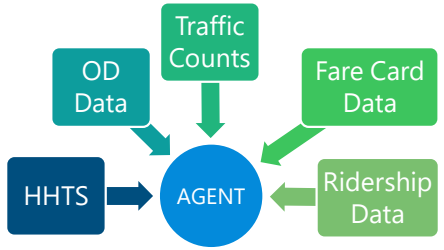
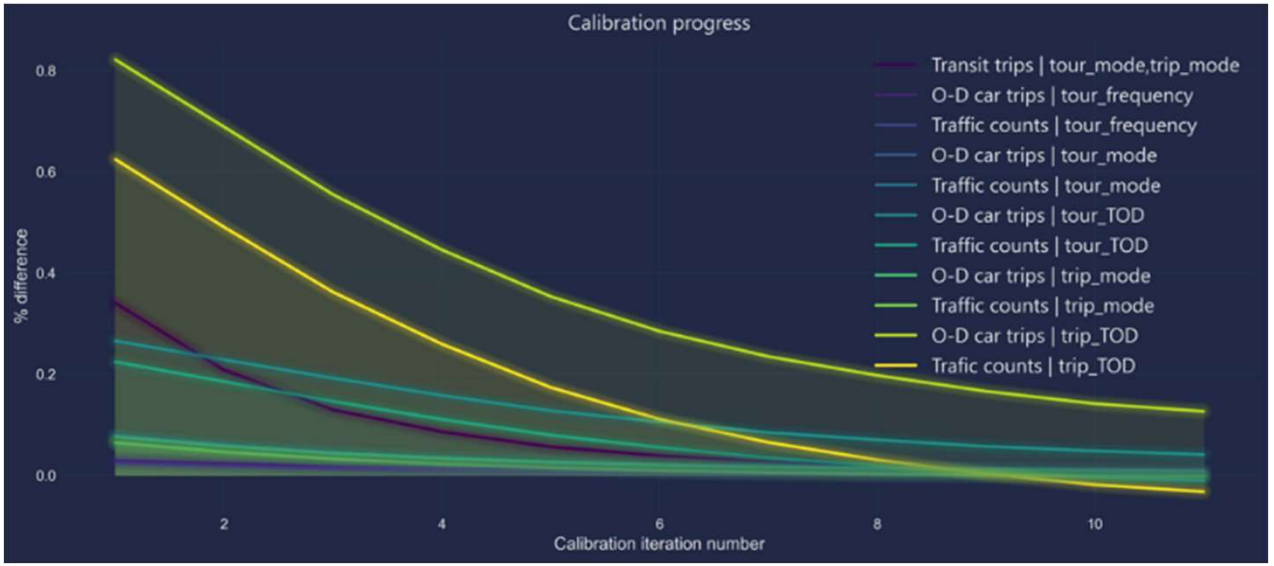


- Leverage automated calibration procedures
- Improve model calibration and validation results
- Minimize risks and costs associated with costly trial-and-error approaches to calibration
- Helps keep travel demand models up-to-date across mobility changes
- Incorporate all mobility data sources including big data





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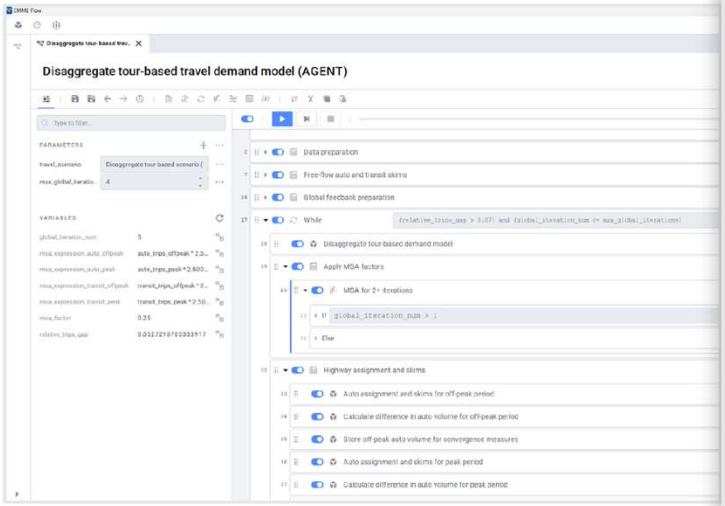
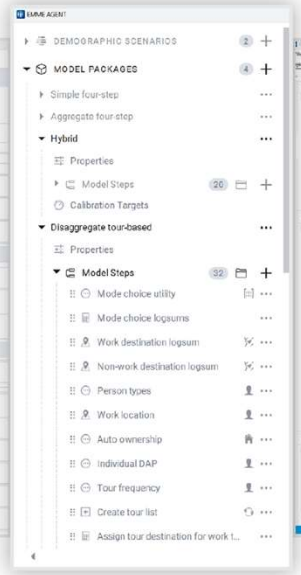
AGENT works with CUBE and EMME

EMME®

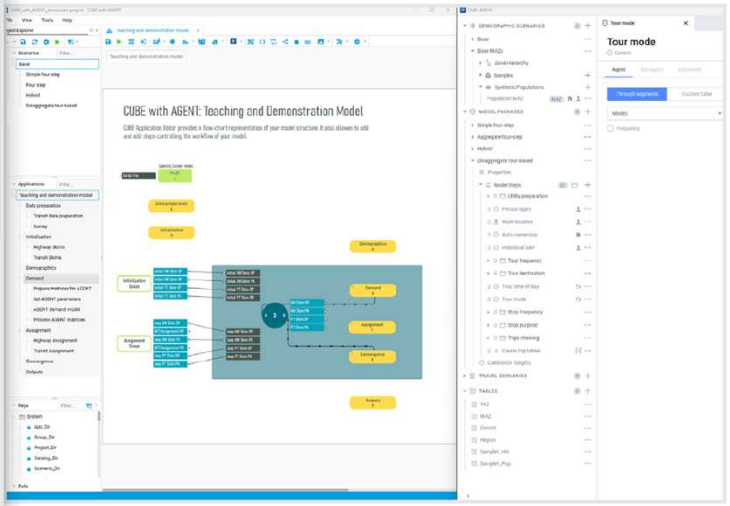


Leverage EMME features like Modeler, APIs, Notebooks, Scenes, and Flow with AGENT.

AGENT®



CUBE™



Leverage CUBE features like Application Manager, Scenario Manager, and Voyager with AGENT.

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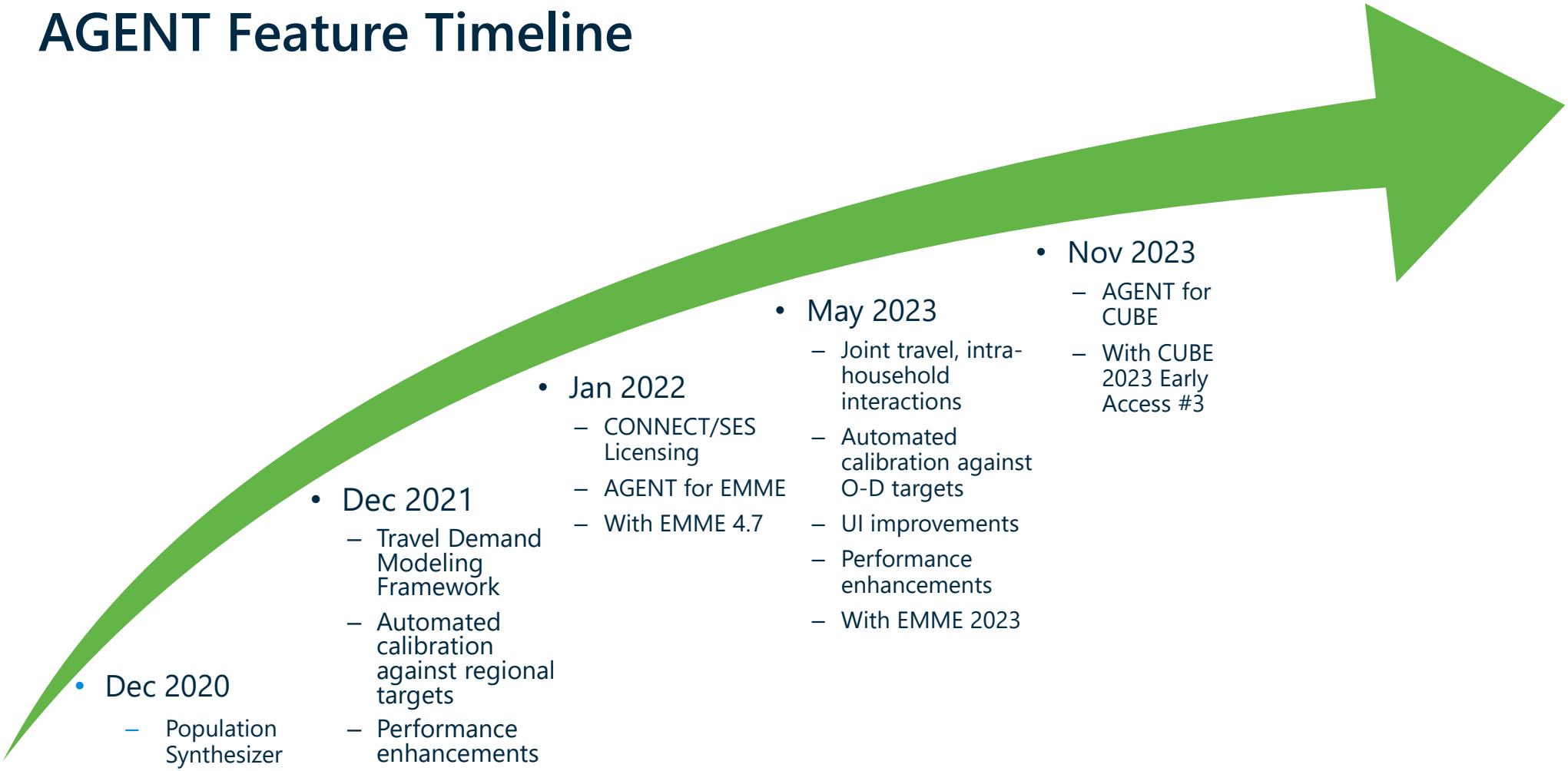
AGENT Feature Timeline



- Dec 2020
  - Population Synthesizer
  - With EMME 4.5
- Dec 2021
  - Travel Demand Modeling Framework
  - Automated calibration against regional targets
  - Performance enhancements
  - With EMME 4.6
- Jan 2022
  - CONNECT/SES Licensing
  - AGENT for EMME
  - With EMME 4.7
- May 2023
  - Joint travel, intra-household interactions
  - Automated calibration against O-D targets
  - UI improvements
  - Performance enhancements
  - With EMME 2023
- Nov 2023
  - AGENT for CUBE
  - With CUBE 2023 Early Access #3

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AGENT Users

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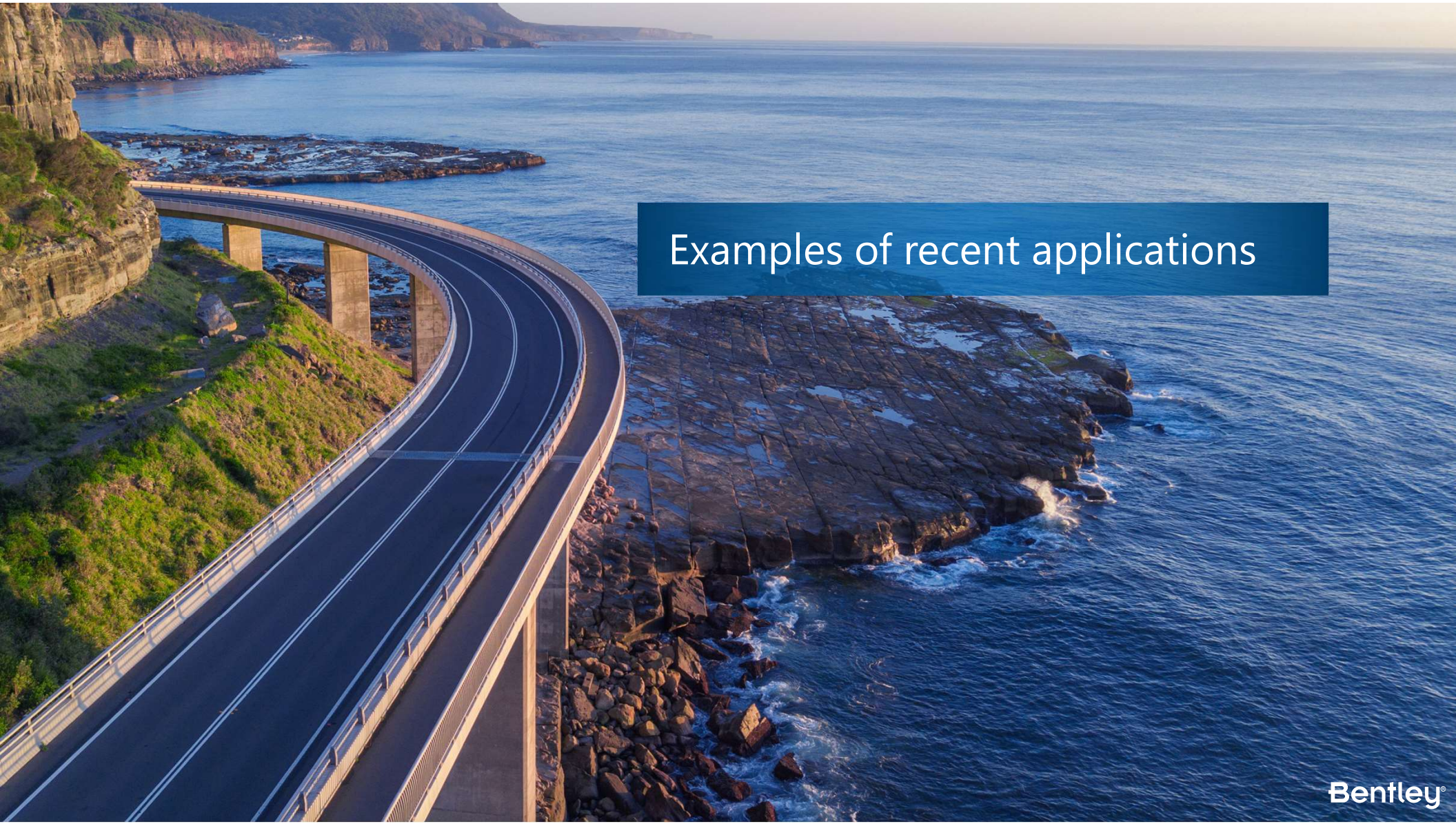
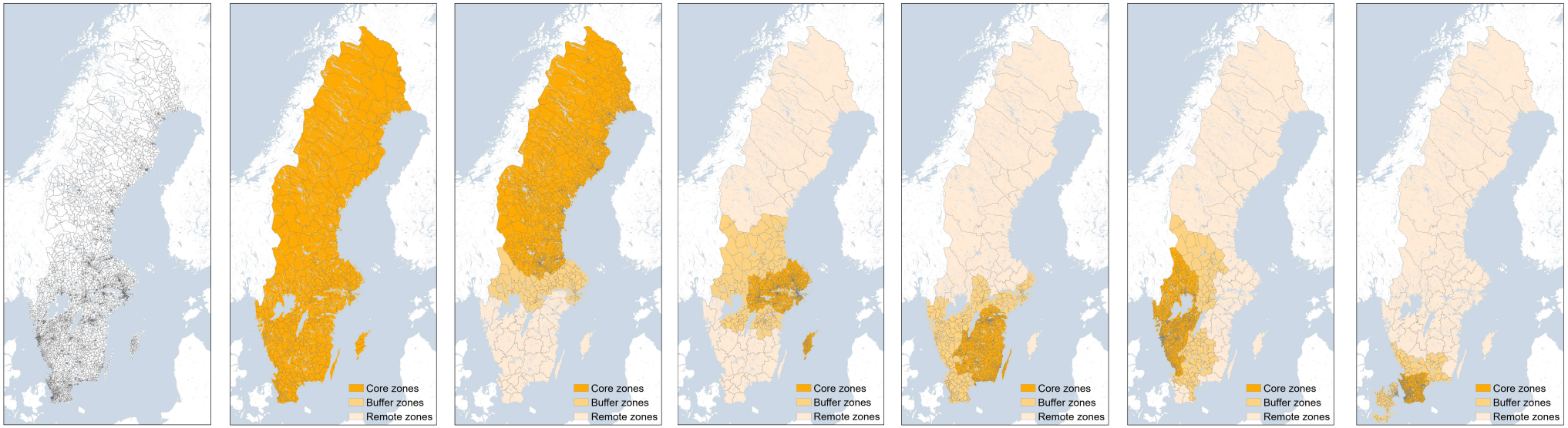

Examples of recent applications
Bentley

National model: Sweden

- One model for 5 regions
  - Differential sampling weight to represent “halo” and external zones for each region
- Total population: 10M
  - Effective population after differential sampling: 3-5M

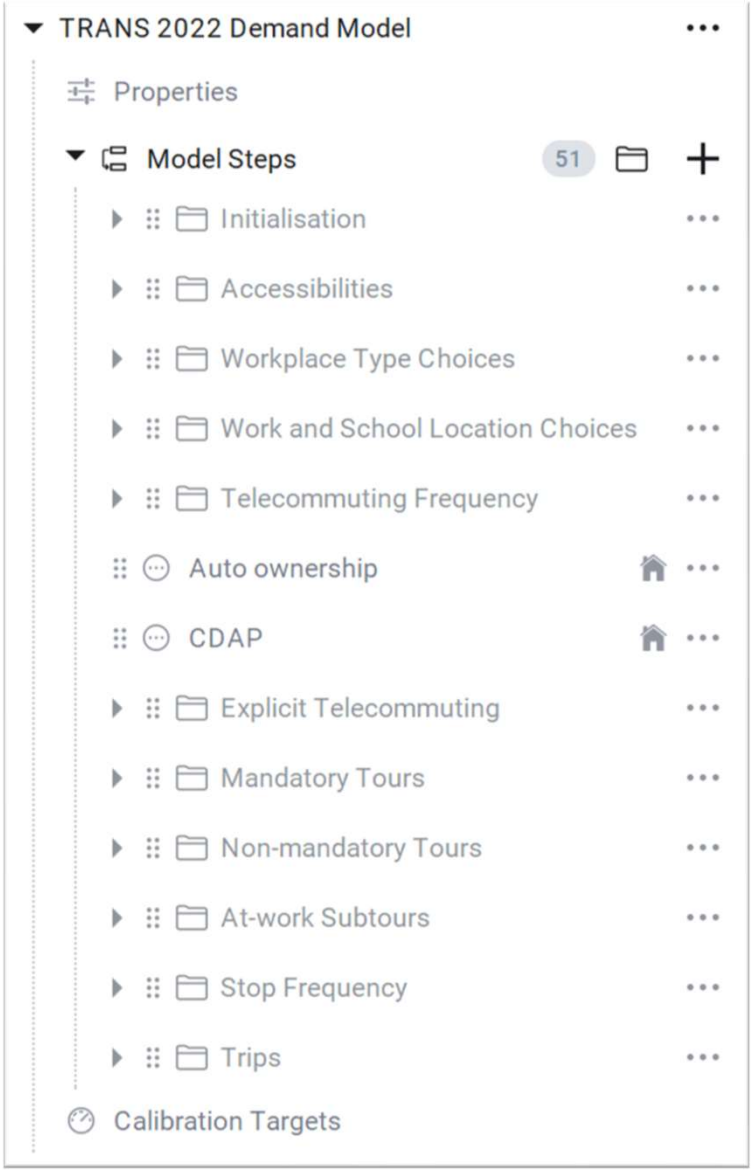
10,997 zones | 682 zones | 2,103 zones | 3,110 zones | 1,952 zones | 2,982 zones | 2,253 zones



TRANS Model: Ottawa

- Development of new regional model in AGENT
- Population: 1.4M
- Calibration data sources:
  - Household travel survey
  - Traffic counts
  - Transit counts

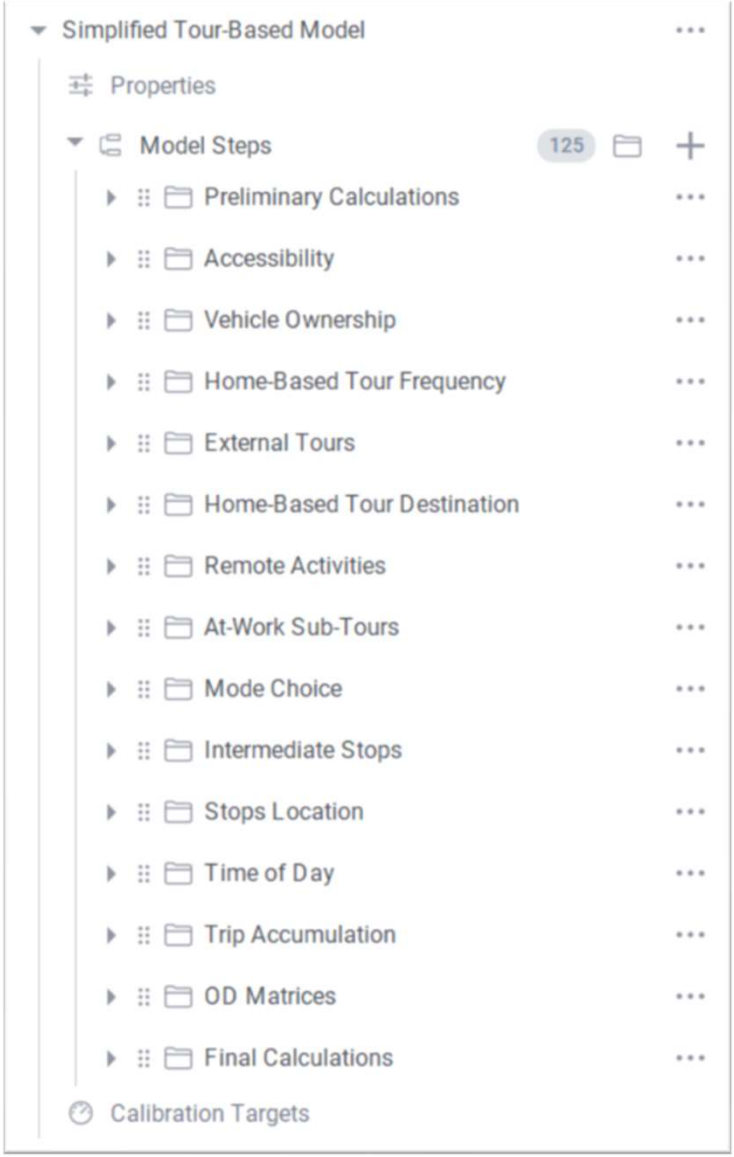
- Runtime for 1 iteration of demand model
  - ~12 mins on Intel® 2.4GHz, 16 cores, 32 GB RAM



Simplified Tour-Based Model (STBM): Perth

- Re-platform demand model to AGENT and auto-calibrate
- Population: 2M
- Calibration data sources:
  - Household travel survey
  - Census
  - Traffic counts
  - Transit counts

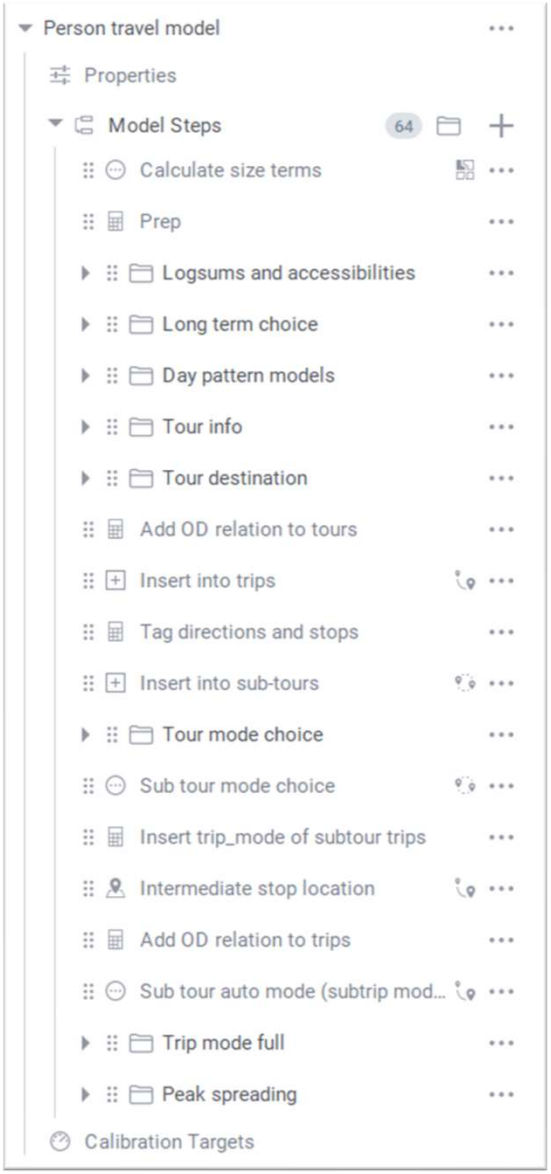
- Runtime for 1 iteration of demand model
  - ~15 mins on Intel® 2.4GHz, 16 cores, 32 GB RAM



Person Travel Model (PTM): Edmonton

- Re-platform demand model to AGENT
- Data-driven day pattern model
- Population: 1.3M

- Runtime for 1 iteration of demand model
  - ~90 mins* on Intel® 2.8GHz, 32 cores, 128 GB RAM

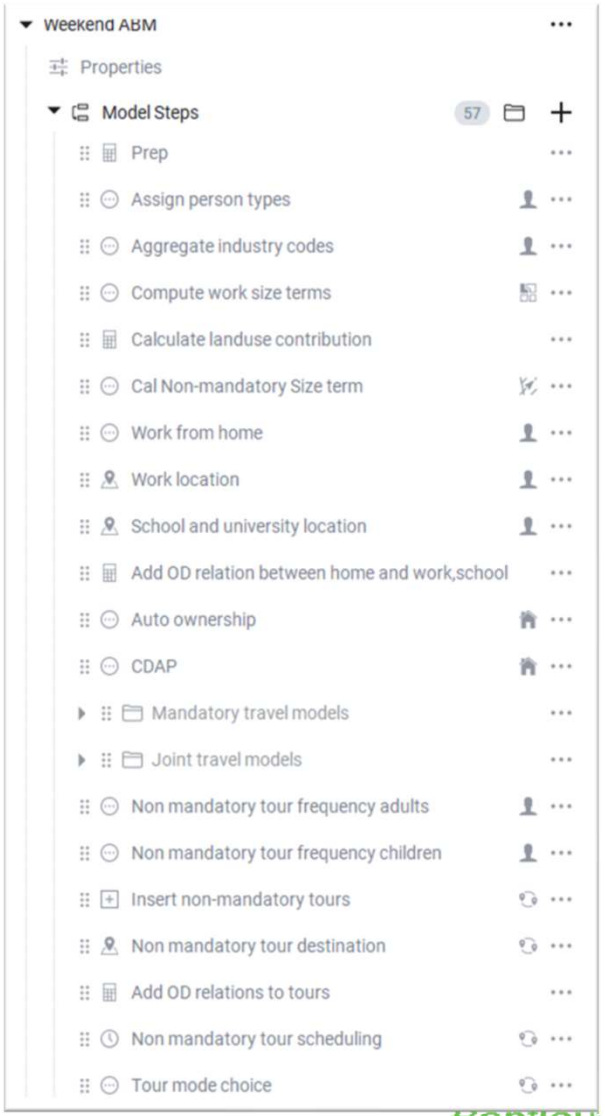


Weekend model: MAG

- ABM for new weekend travel demand model
- Population: 5M

- Transfer of weekday model to weekend:
  - No HTS for weekend travel behavior
  - Available data: AirSage data, traffic counts

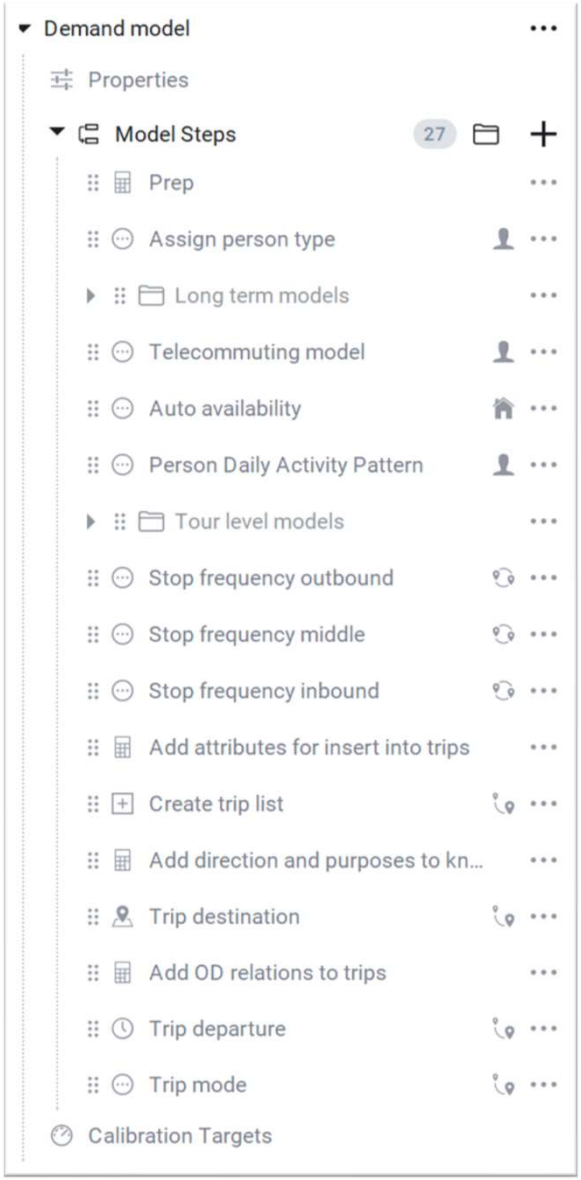
- Runtime for 1 iteration of demand model
  - ~80 mins* on Intel® 2.8GHz, 32 cores, 128 GB RAM



Tour-Based Model: Hong Kong

- Development of new tour-based model for Hong Kong
- Population: 6.8M
- Calibration data sources:
  - Household travel survey
  - Traffic counts
  - Transit counts

- Runtime for 1 iteration of demand model
  - ~40 mins on Intel® 2.4GHz, 16 cores, 32 GB RAM



Key benefits (1)

Shorter model configuration time

Examples:

Perth STBM → 4-5 weeks

TRANS Ottawa → 3-4 weeks

PTM Edmonton → 2-3 weeks

Easy to understand interface allowed collaboration

Everyone in the team could participate in model updates, QC and validation

Faster runtimes

Re-platformed models experienced substantial improvement in runtime:

- STBM Perth: 35 mins vs 15 mins in AGENT
- PTM Edmonton: 120 mins vs 90 mins in AGENT

Key benefits (2)

Automated calibration

Easier to transfer models from one region to another → Ex: Parts of MAG, ARC, GGHM, 3C for TRANS Ottawa

Accelerated model calibration → Ex: Calibration to HTS in less than a week for TRANS Ottawa

Leverage multiple data sources for model calibration → Ex: AirSage O-D data + traffic counts for MAG weekend Model

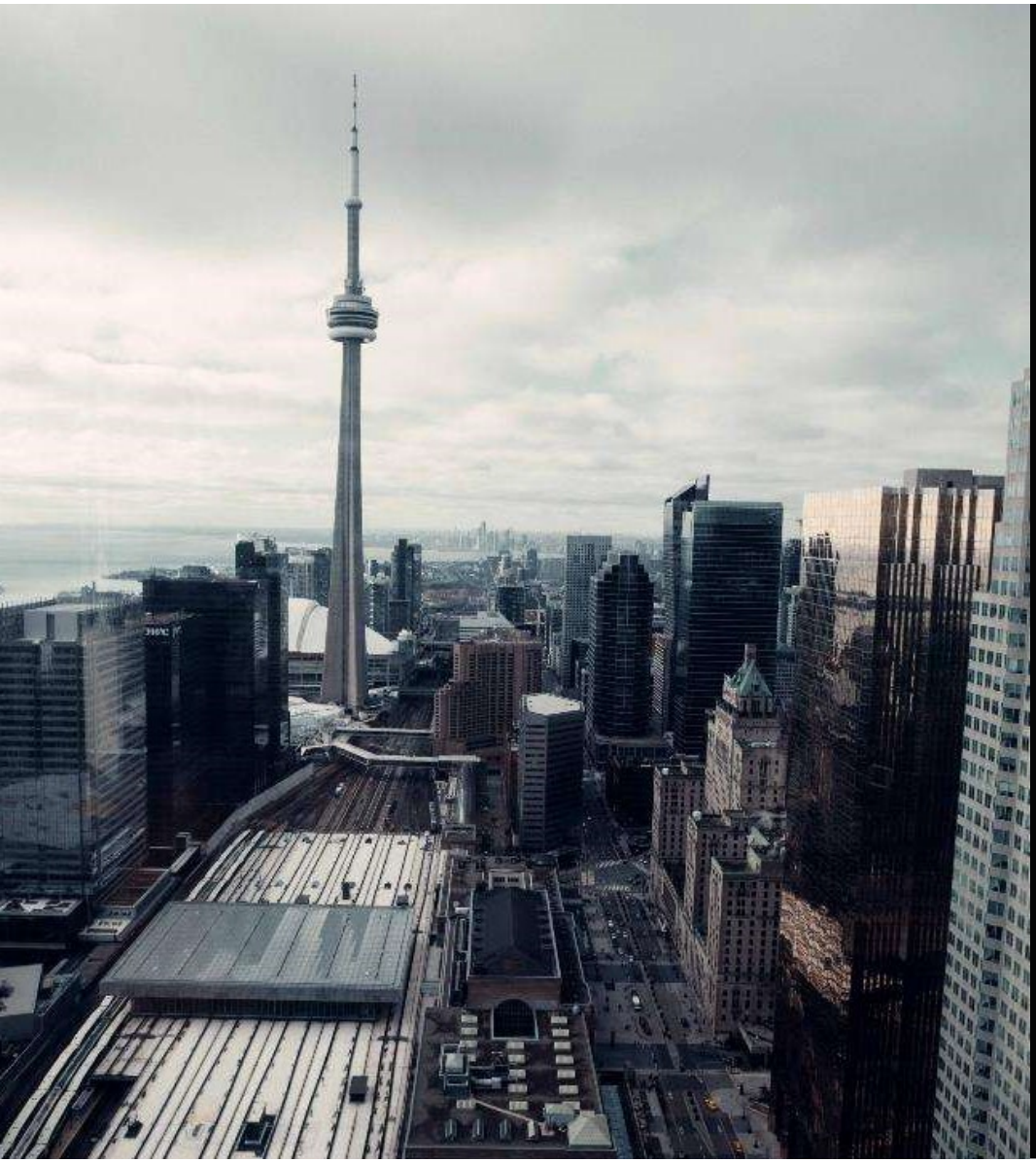
Demand model as a common denominator to understand multiple dataset

Managing stochasticity

Bentley

AGENT provided us with a transparent modelling environment where the complete definition of utility functions, data and model results can be studied without …specific programming skills. Our impression so far [of AGENT] is that we have a model with low cost of maintenance that can be further developed to address new questions.

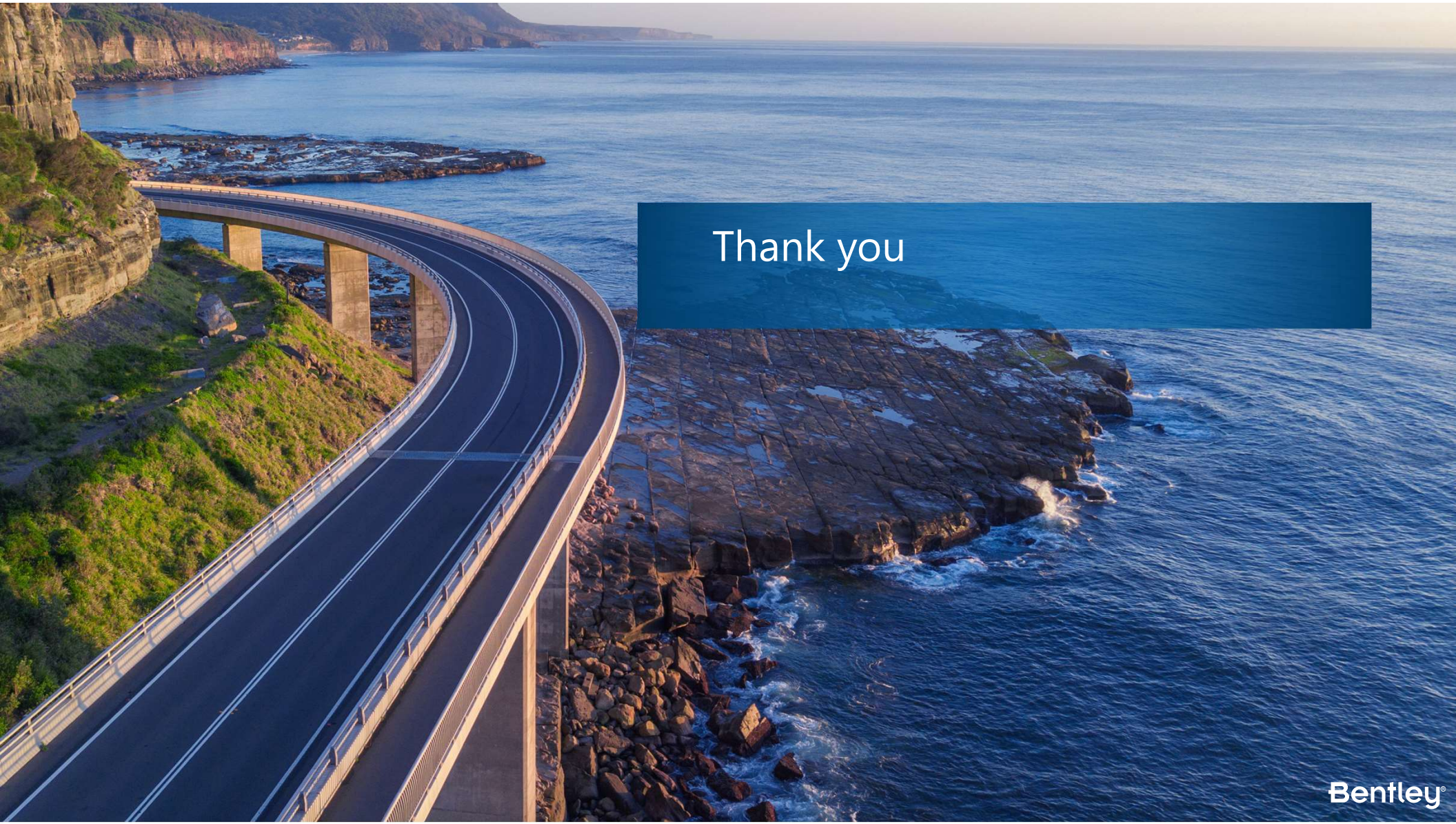
- Svante Berglund
Trafikverket, Sweden



[AGENT's] easy to use interface, calibration frameworks, multi level and comprehensive use of big data sources, and pre-built modelling paradigms has provided practitioners and users flexibility and access to cutting edge ideas that was previously out-of-reach without a significant investment in time and resources.

- Mausam Duggal
National Director, Transportation Planning and Science,
WSP Canada

CN Tower in the Middle of Toronto by Sam Kolder, edited


Thank you
Bentley