Semantic Model Assembly Framework for the Generation of Travel Demand

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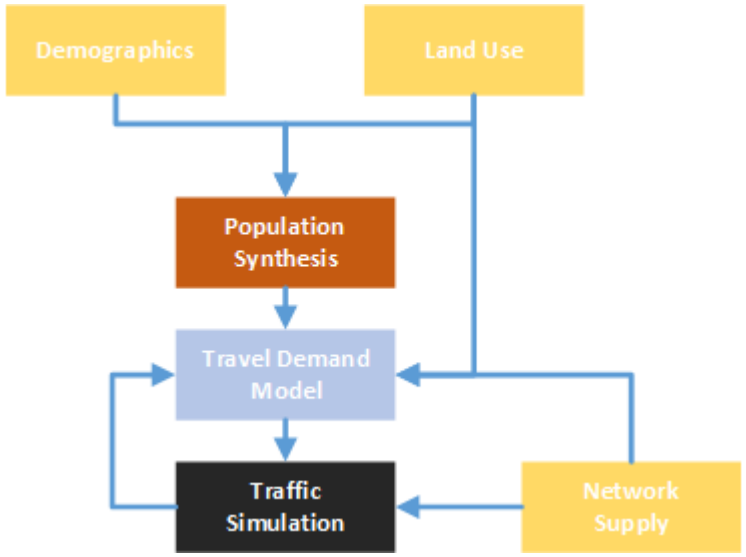
Activity-Based Travel Demand Model

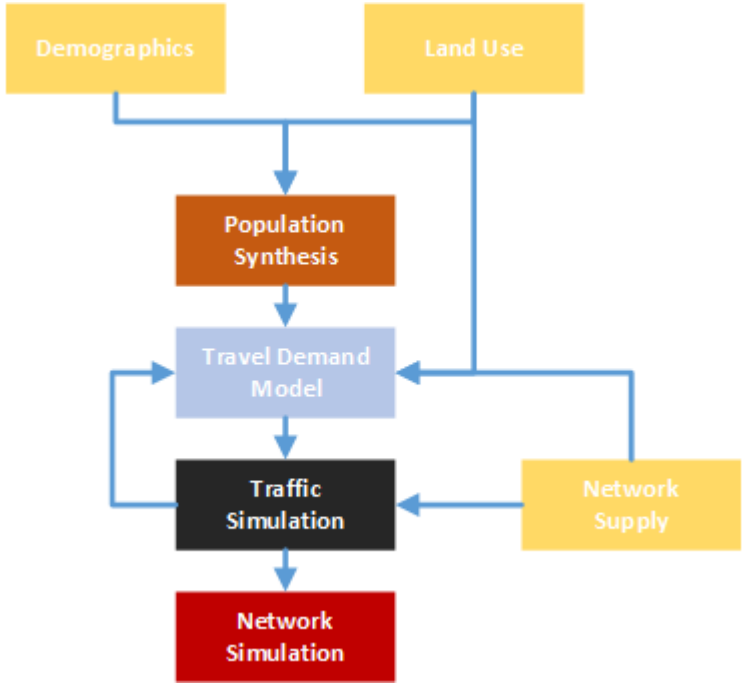


Adapted from:
Activity-Based Travel Demand Models - A Primer
J Castiglione, M Bradley, J Gliebe, 2014

Benefits:

- Model individuals for microsimulation
- Develop behavioural realism
- Integrity between components
- Greater spatial and temporal resolutions
- Support modelling in alternative domains (e.g. pollution, health)

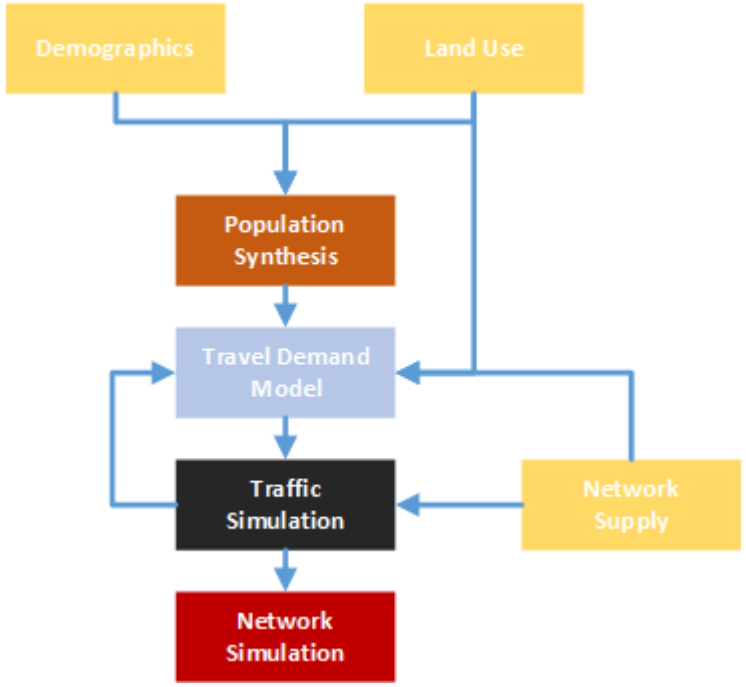
Activity-Based Travel Demand Model



Components:

- Population Synthesis: conversion of aggregate data (e.g. census) into disaggregate individuals.
- Travel Demand Model: generation of journeys for individuals based upon activities.
- Traffic Simulation: modelling of interactions from journeys in transport network.

Activity-Based Travel Demand Model



Issues:

- Numerous design and feature choices.
- Some designed for specific geographic areas.
- Preparation and re-formatting of input data can be time intensive.
- Platform and tool dependency.
- Perception of greater data requirements than traditional aggregate models.
- Human behaviour modelling still utilitarian.

All models are wrong but some are useful
George E. P. Box, 1978

Travel Demand Model Purpose

Travel Demand models seek to express:

Person A wants to travel from Location X to Location Y by Car at 14:00 on Tuesday.

Activity-Based Travel Demand models seek to express:

Person A wants to go shopping so needs to travel from Location X to Location Y by Car at 14:00 on Tuesday.

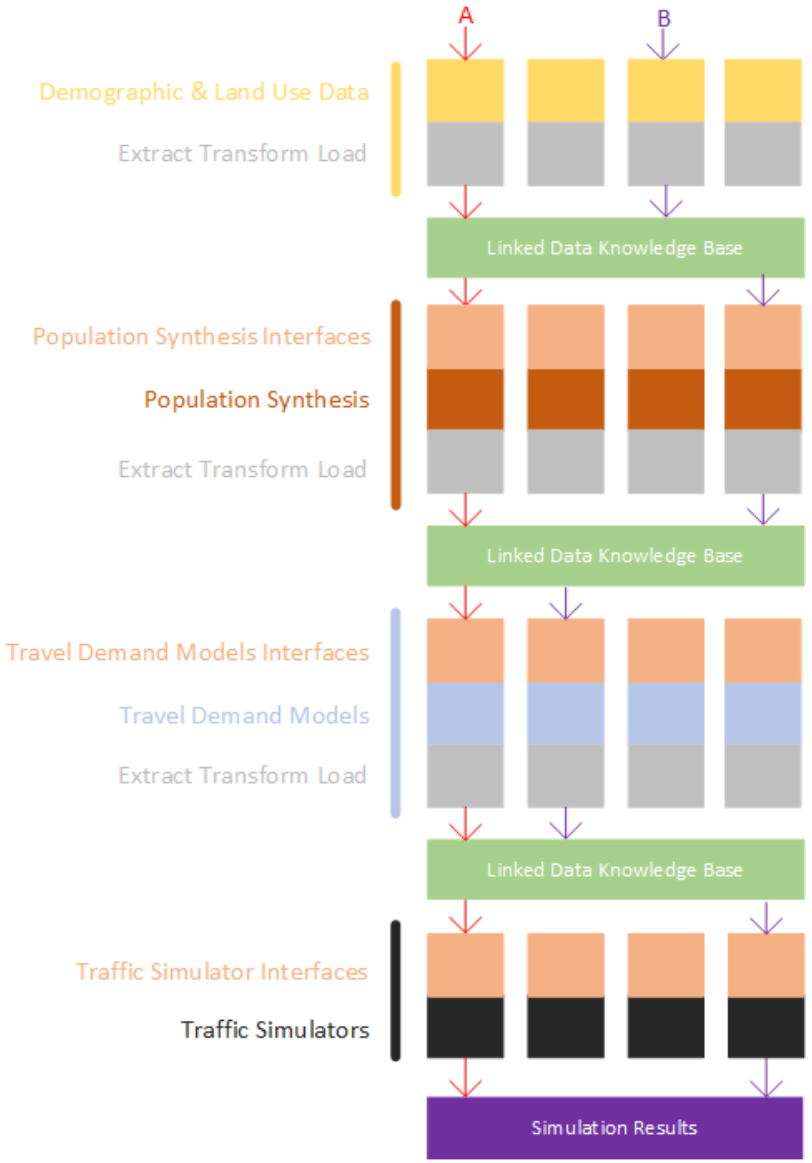
Choices:

- Origin & Destination Location (spatial)
- Modality
- Timeframe (temporal)
- Route

Complexity:

- Multi-modality
- Varying choice importance
- Resource availability
- Interpersonal co-operation (e.g. parent/child)
- Information availability of individuals
- Experience & Learning

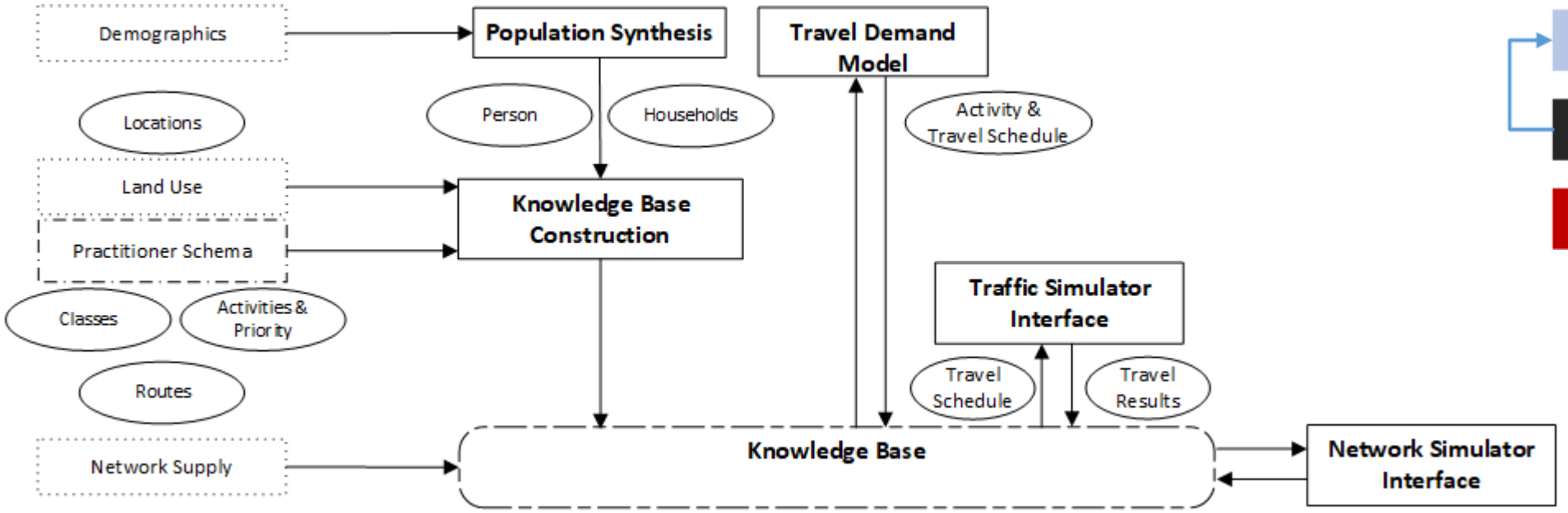
Interchangeable Modules

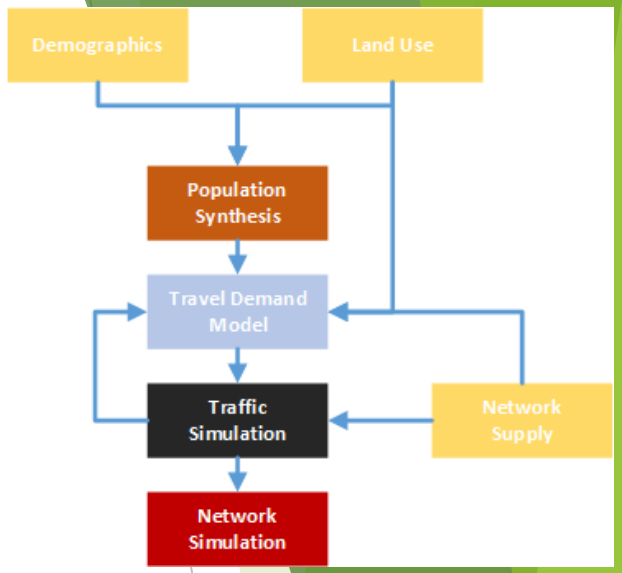


Modular Approach:

- interchange implementations.
- decompose problems.
- data focus to reuse common concepts.
- wrap existing implementations.

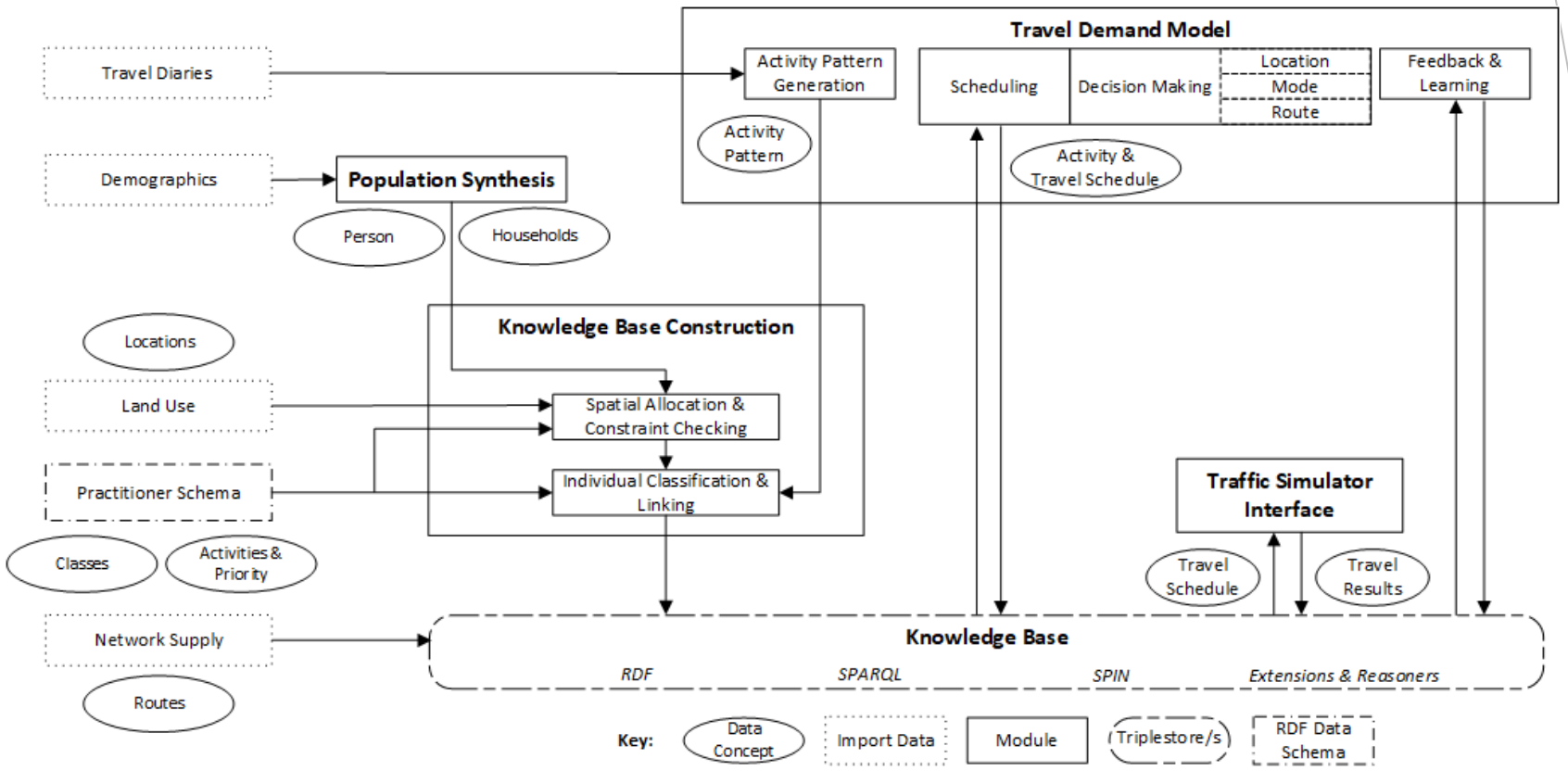
Semantic Framework





- Knowledge Modelling: define common concepts for inter-relationships, re-use and inferencing.
- Semantic Web:
  - gather data from local or remote sources.
  - SPARQL queries to retrieve, store and process data.
  - published ontologies and vocabularies for re-use and sharing.
  - schema separate to data so that alternative structures and inferences can be applied upon the same data.
  - RDF data format allows incorporation and expansion of new data: e.g. vehicles, infrastructure, communications
  - Semantic Web standards provide platform independence, interoperability and tool variety.

Semantic Framework Prototype



Conclusion

- Knowledge Base: re-use of data
- Modular: change techniques and data sources
- Configuration: schema and queries