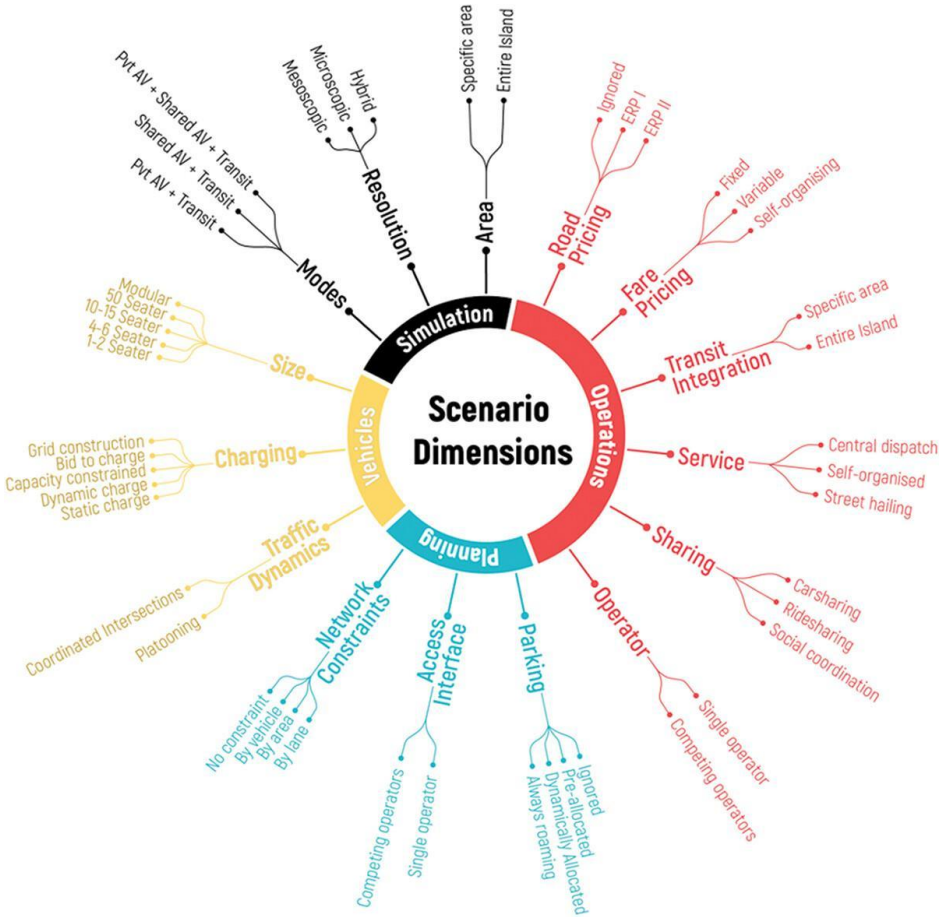
에이전트행동모델링 요구기술분석서

(진행률50%, 메인시나리오 단계)

참고

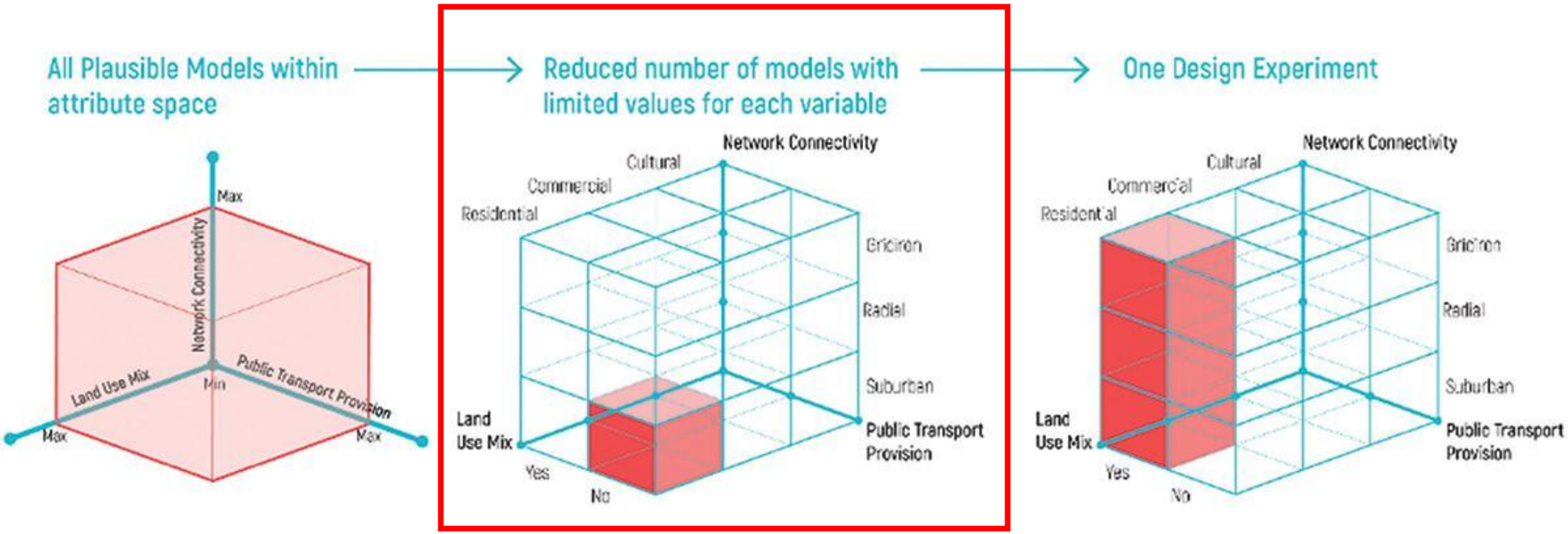
- Deep Activity Model: A Generative Approach for Human Mobility Pattern Synthesis (arxiv.org)
- Full article: Iterative urban design and transport simulation using Sketch MATSim (tandfonline.com)
- v784.pdf (ethz.ch)
- matsimItsumo-2009-03-02.pdf (tu-berlin.de)
- Tackling the Traveling Salesman Problem with Graph Neural Networks | by Michael Atkin | Stanford CS224W GraphML Tutorials | Medium

Scenario dimensions

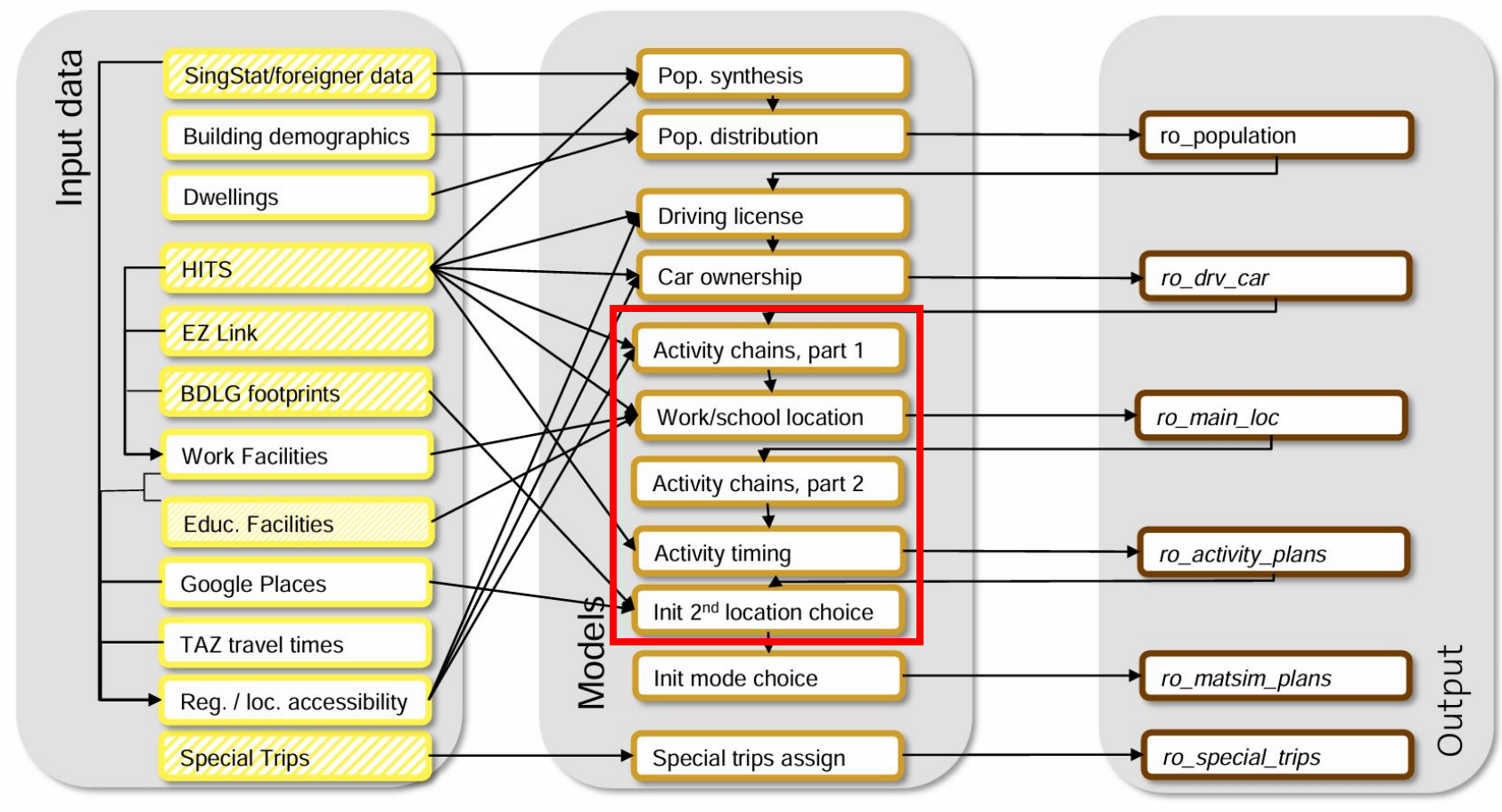


+ 예외 상황 시나리오

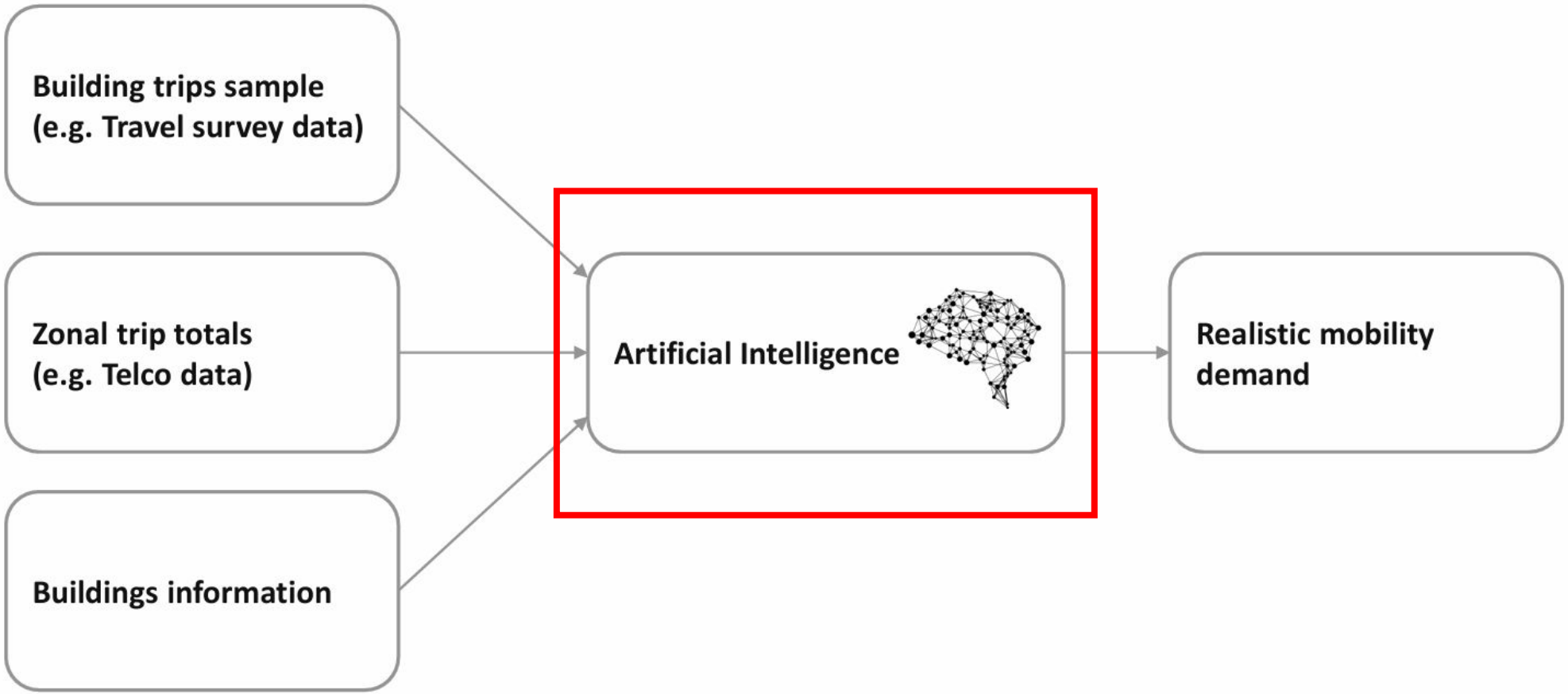
Design Experiment



Demand generation process



Demand generation



Activity Times Generator

- This module is called to change the timing of an agent's plan. At this point, a very simple approach is used which just applies a random "mutation" to the duration attributes of the agent's activities. Although this approach is not very sophisticated, it is sufficient in order to obtain useful results. This is consistent with our overall assumption that, to a cer tain extent, simple modules can be used in conjunction with a large number of learning iterations.

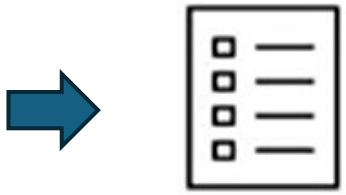
(Co-Evolutionary)

Initial Trip Plan

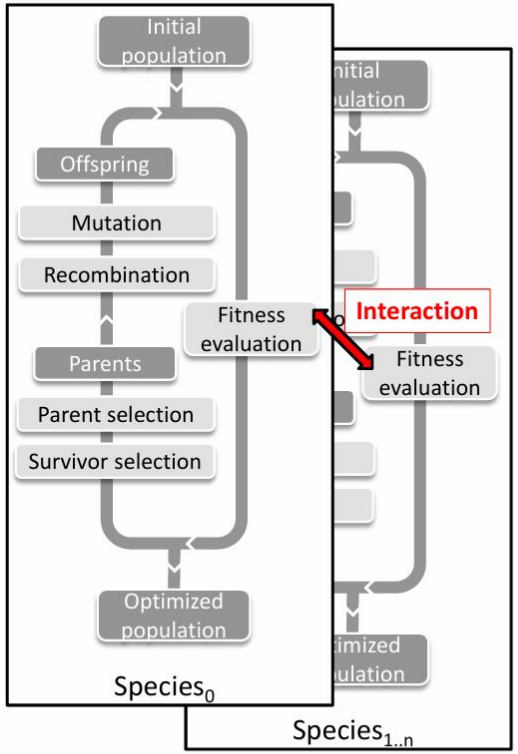
자식생성 및 돌연변이

생존

유형선별기



Initial Trip Plan



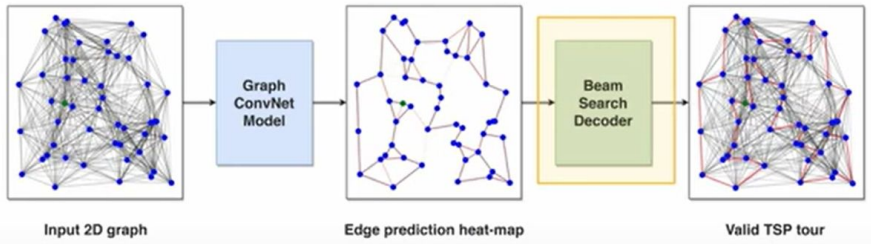
Router

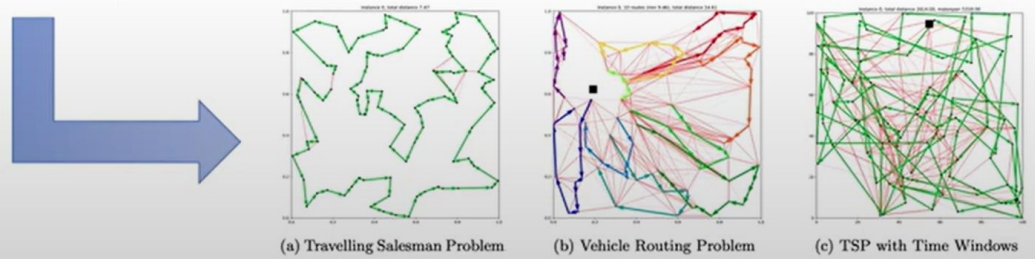
- The router is implemented as a time dependent Dijkstra algorithm. It calculates link travel times from the output of the traffic flow simulation. The link travel times are encoded in 15 minute time bins, so they can be used as the weights of the links in the network graph.

GNN

Improved Graph Search Algorithms

- One-shot, **non-autoregressive decoding**[1] + more powerful/flexible **graph search algorithms**, e.g. Dynamic Programming[2], MCTS[3].





(a) Travelling Salesman Problem (b) Vehicle Routing Problem (c) TSP with Time Windows

[1] Joshi et al., An Efficient Graph Convolutional Network for the TSP, arXiv 2019
[2] Kool et al., Deep Policy Dynamic Programming for Vehicle Routing Problems, arXiv 2021
[3] Fu et al., Generalize a Small Pre-trained Model to Arbitrarily Large TSP Instances, AAAI 2021

Parcels and buildings

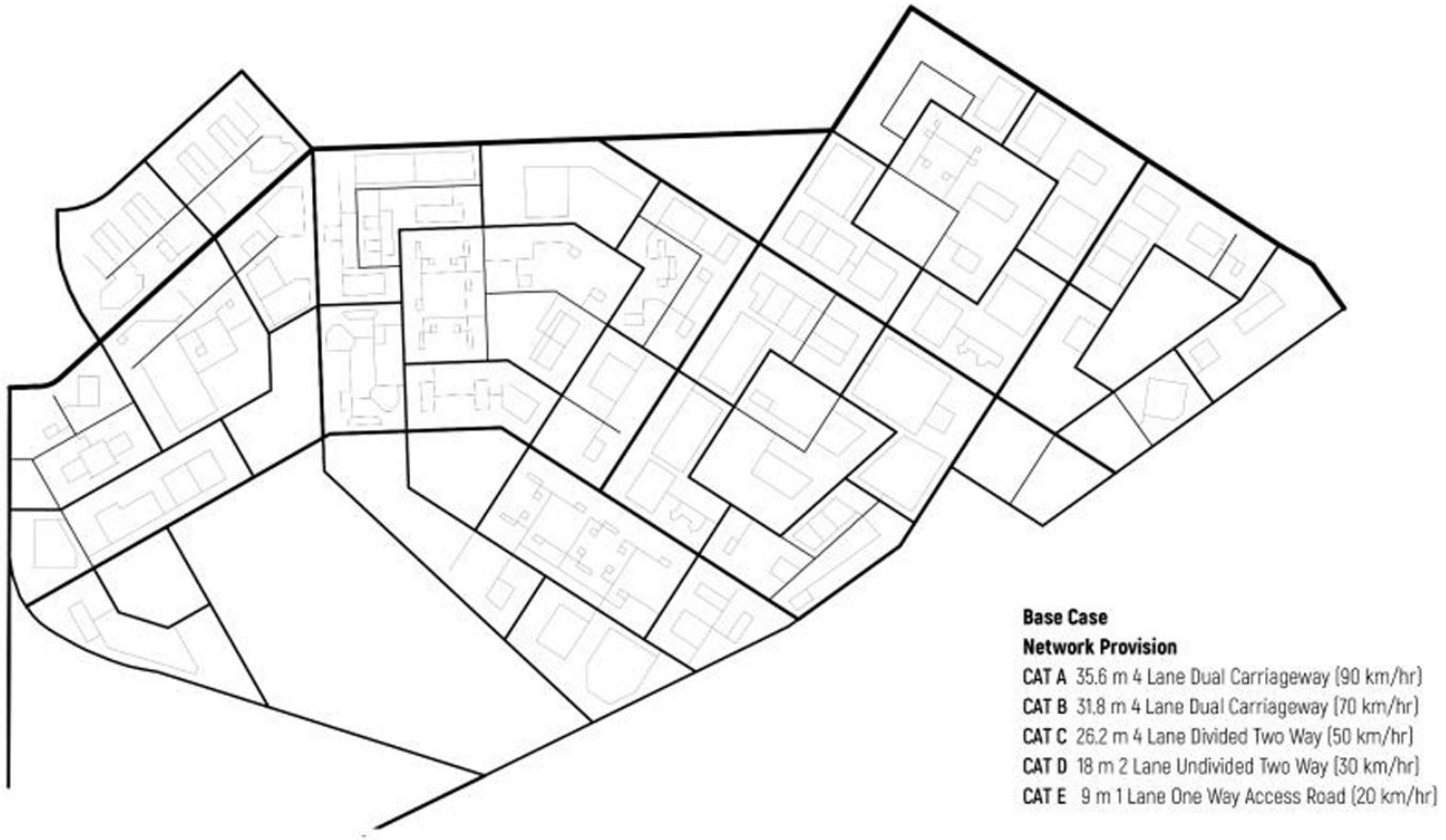
Land use distribution

Base Case

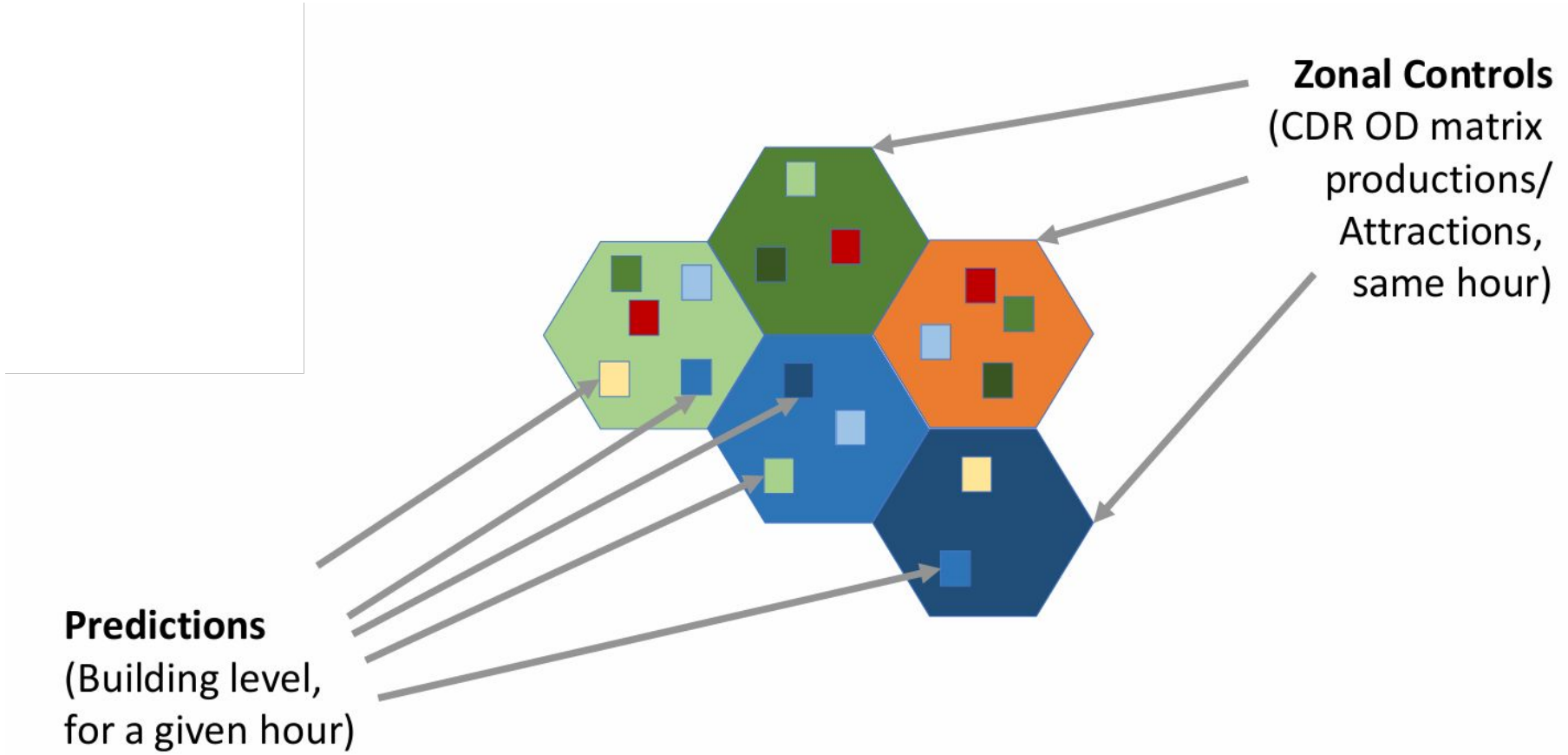
Demand Generation

HDB Residential Units	30 165
Condominium Units	5 280
Total Residential Units	35 445
Commercial (sqm)	251 346
Office (sqm)	1 119 939
Education (sqm)	520 323
Other/Civic (sqm)	173 8874

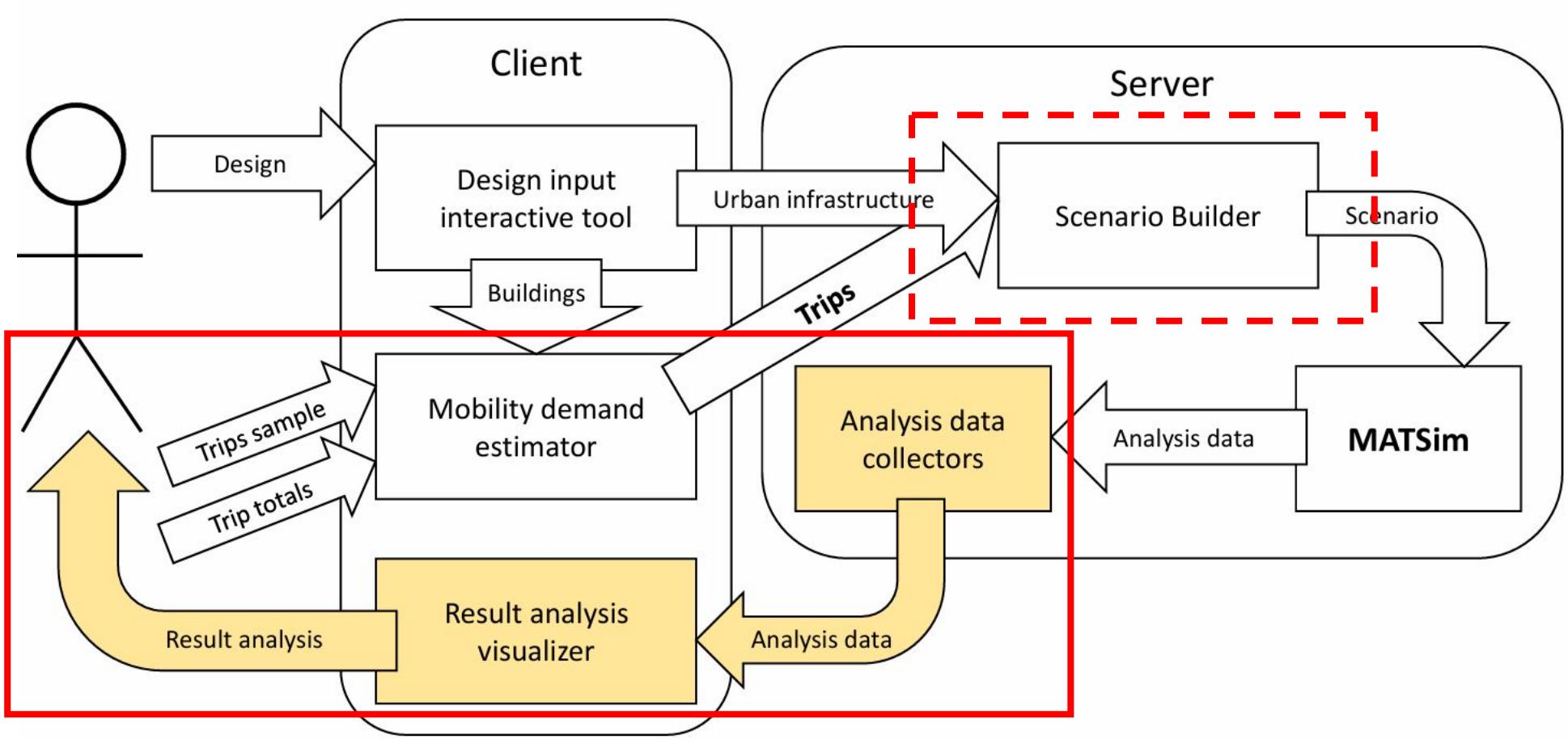
Network Design



Zonal trip totals



Information Flow



Evaluate scenarios

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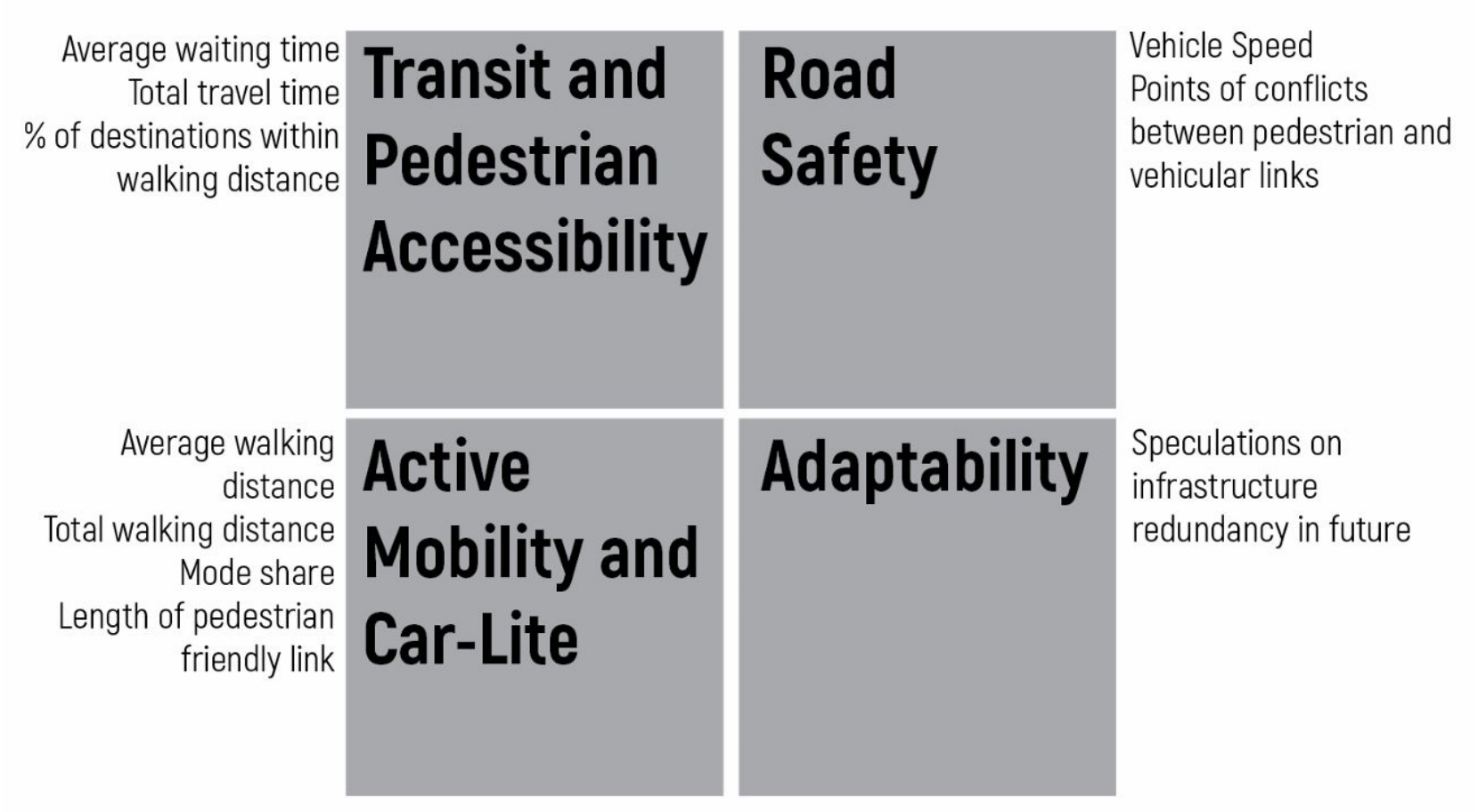

Compare scenarios