Preferred citation style

Axhausen, K.W. (2006) MATSIM-T: A micro-simulation system of activity demand, TRB Travel Demand Forecasting Conference, Austin, May 2006.

MATSIM-T: A micro-simulation system of activity demand

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May 2006

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Development team

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How do we explain behaviour at the microscopic level ?

Elements:

- Generalised costs of the route-mode-location alternative
- Budgets and long term commitments
- Taste (Values, attitudes, life style) by socio demographics

- Personal world (i.e. Mental map)
- Social network membership (minimum: household)

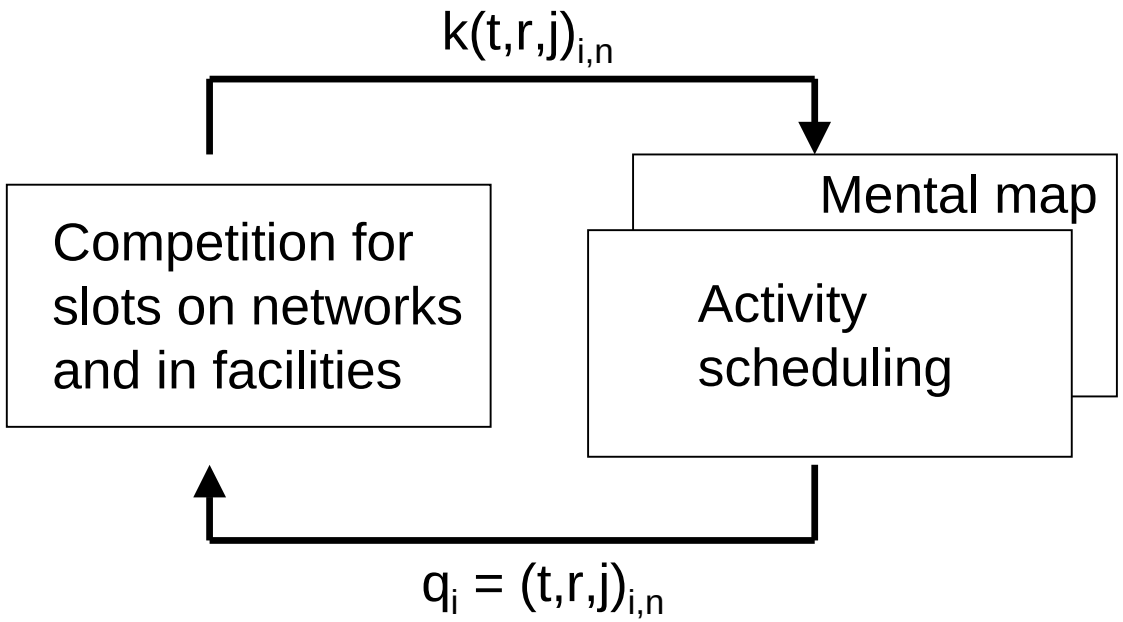
Generalised cost of a route-mode-destination alternative

Elements:

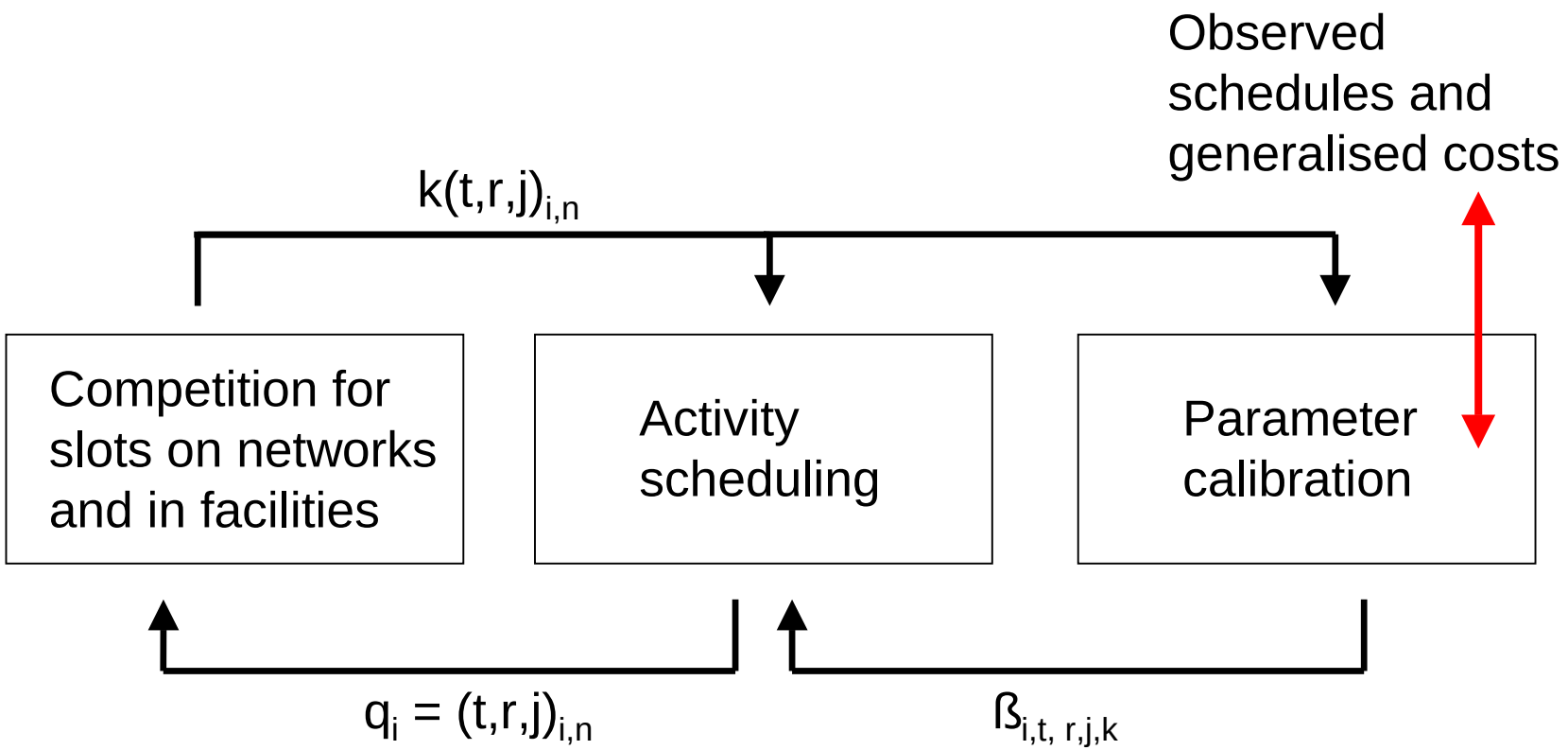
- (Comfort and risk adjusted) time spent traveling, inc. schedule delay (relative to intended arrival time)
- (Decision time-frame relevant) monetary expenditure

- (Comfort and risk adjusted) time spent at the location by type
- Activity expenditure
- Social content

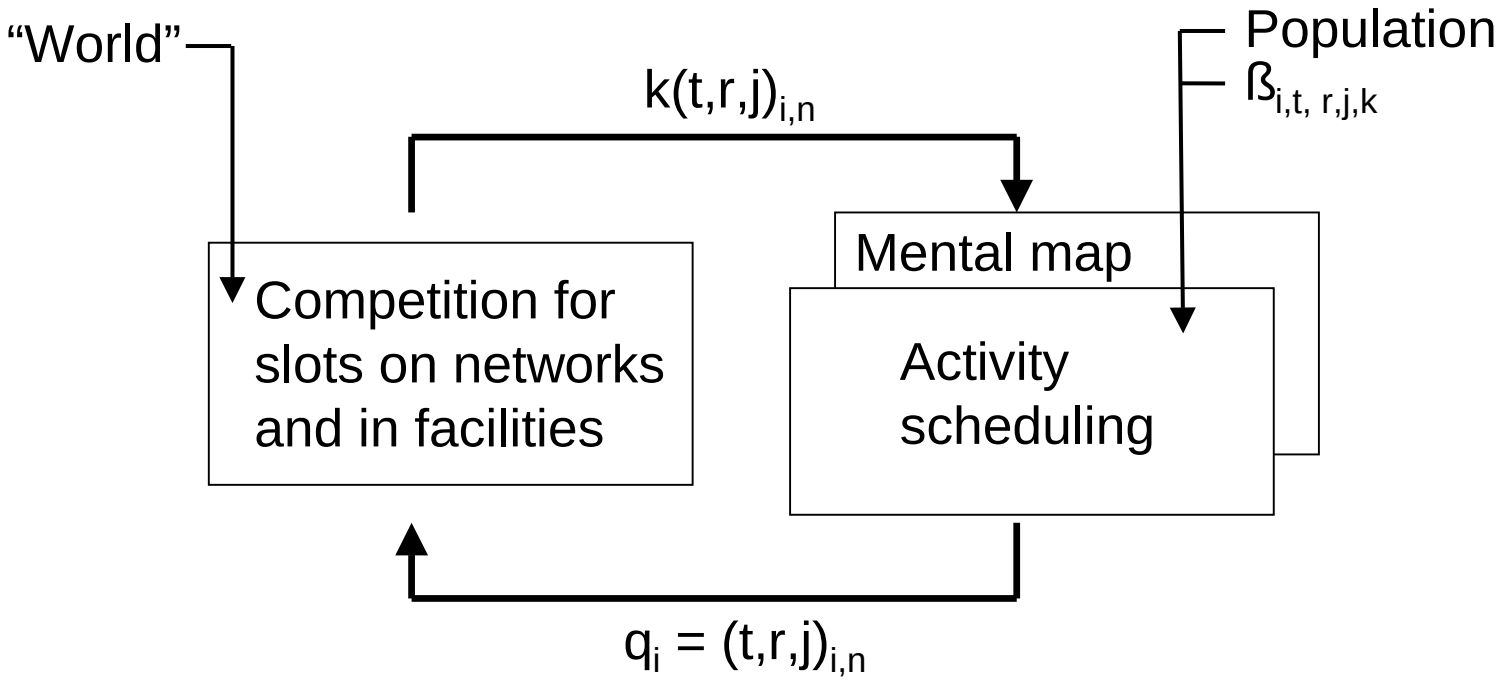
Overall learning approach



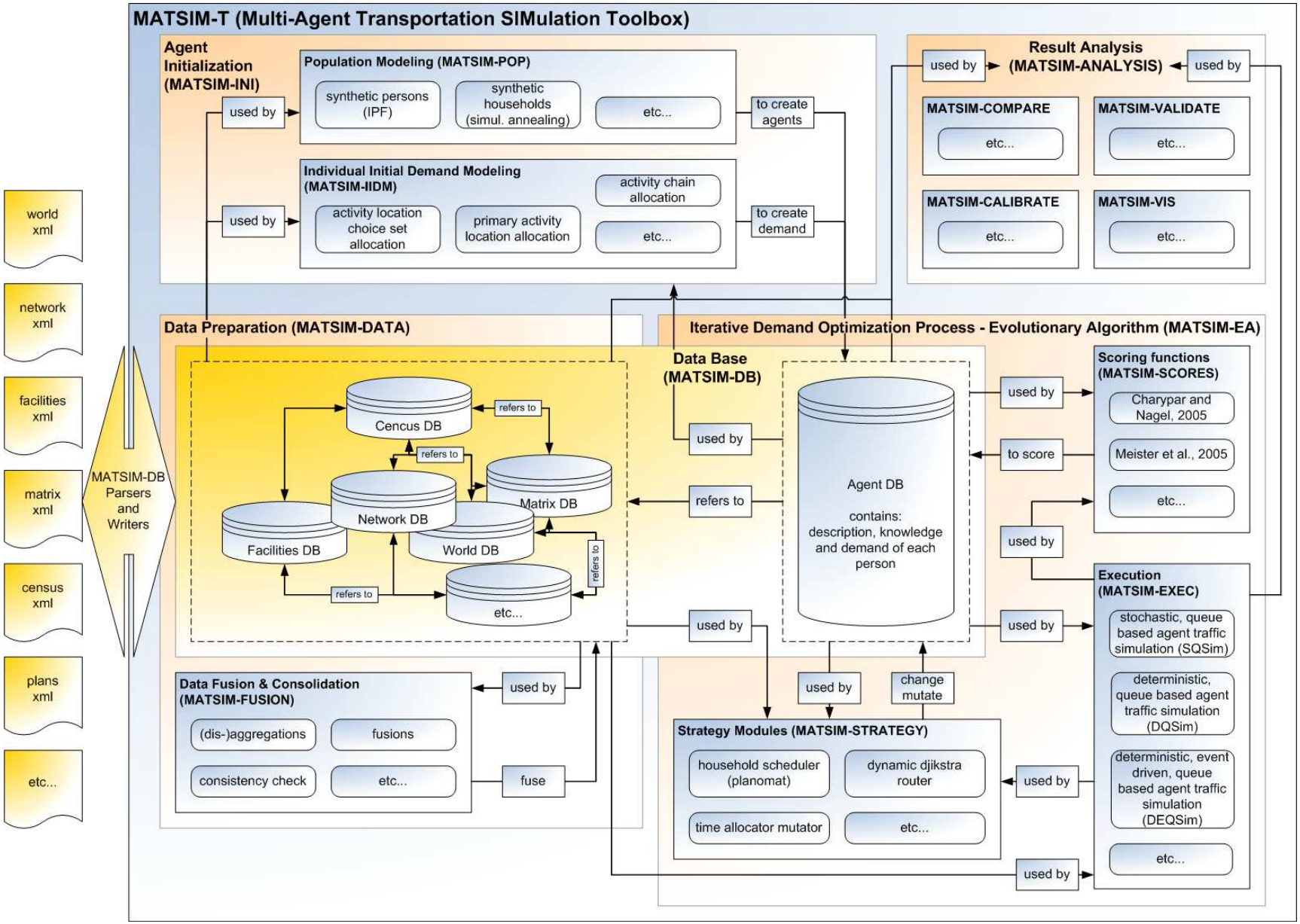
Side remark


Observed schedules and generalised costs
$k(t,r,j)_{i,n}$
Competition for slots on networks and in facilities
Activity scheduling
Parameter calibration
$q_i = (t,r,j)_{i,n}$
$ß_{i,t,\ r,j,k}$

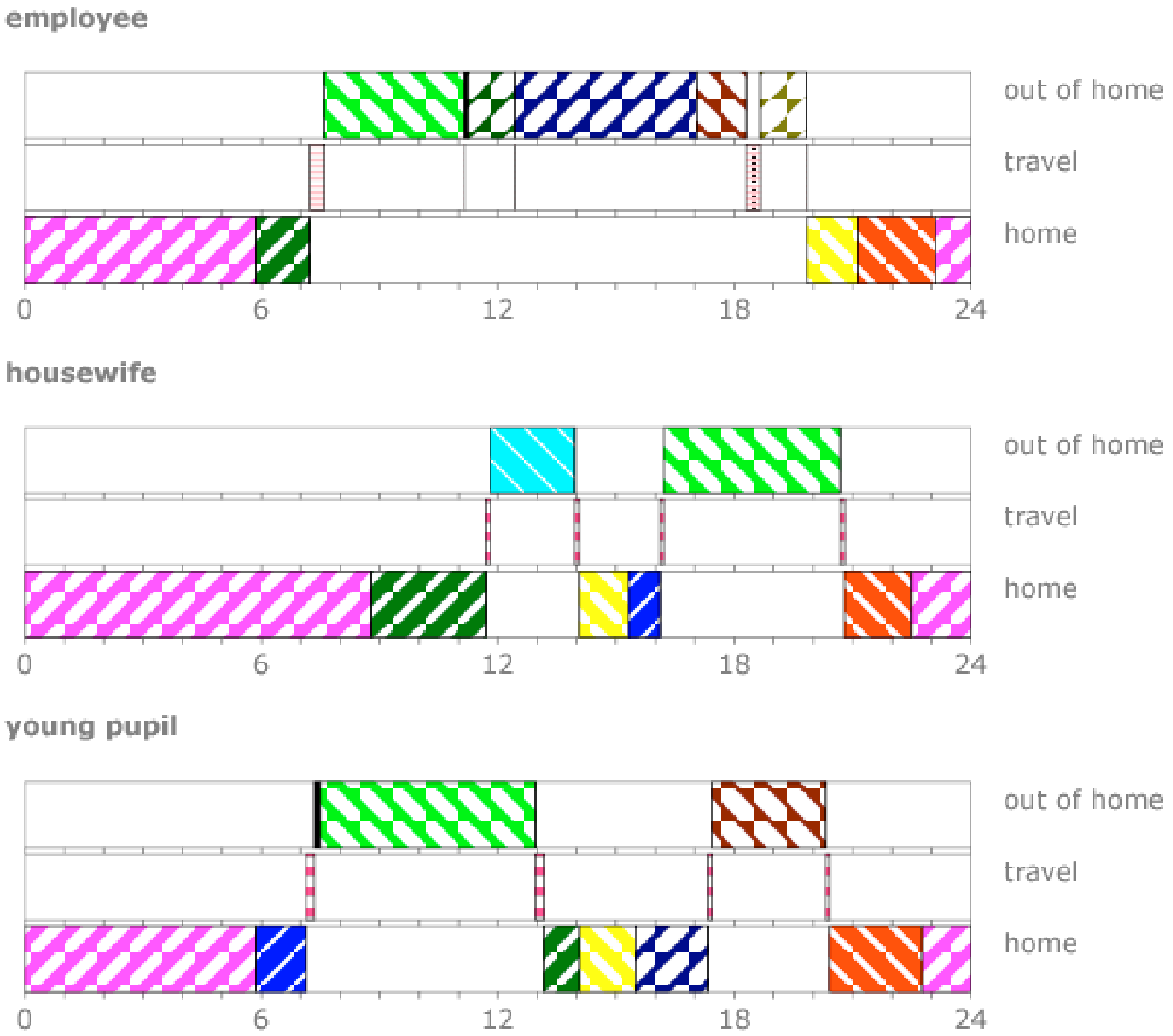
Overall approach: Getting started



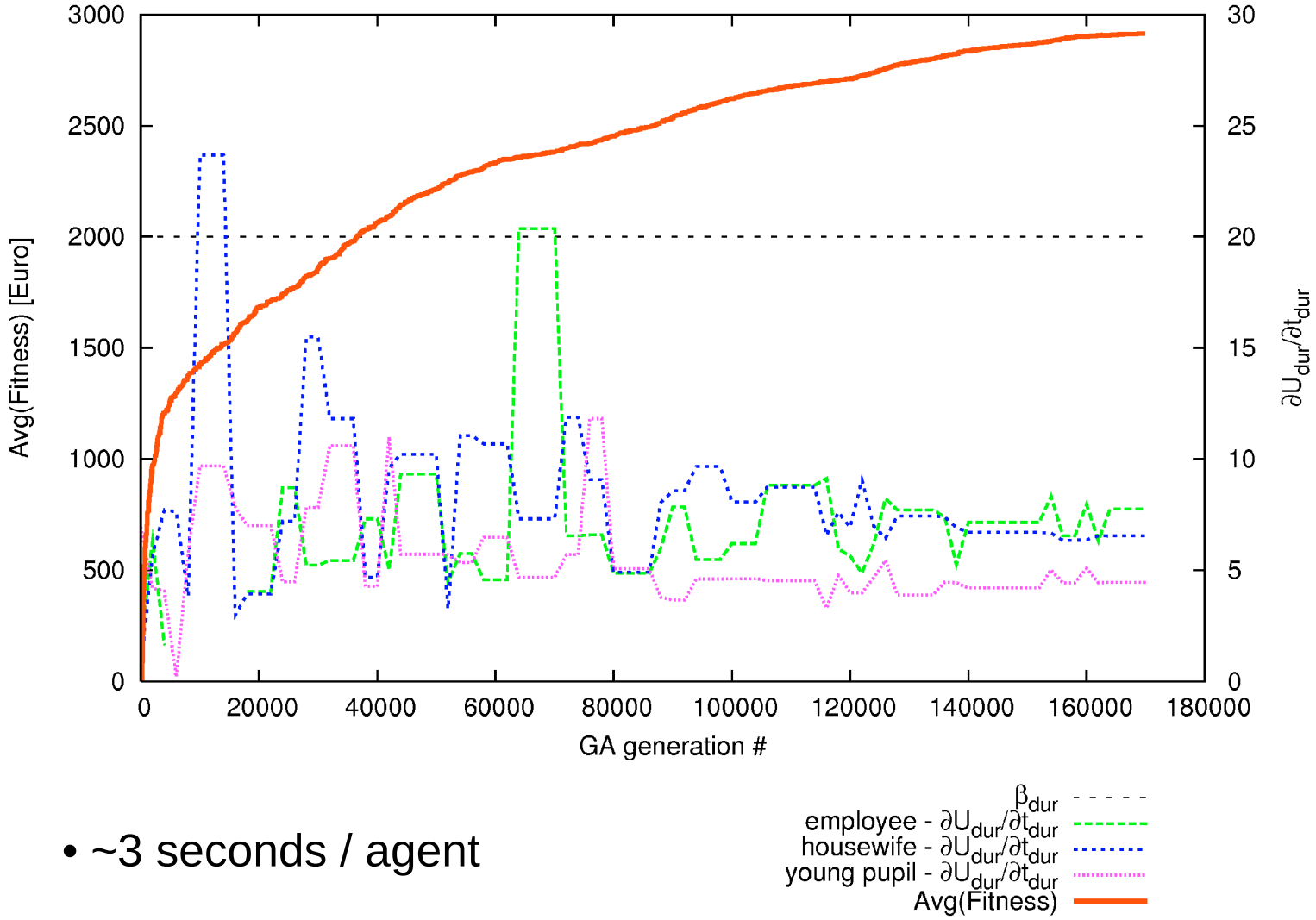
MATSIM-T


MATSIM-T (Multi-Agent Transportation SIMulation Toolbox)
Agent Initialization (MATSIM-INI)
used by
Population Modeling (MATSIM-POP)
synthetic persons (IPF)
synthetic households (simul. annealing)
etc...
to create agents
Individual Initial Demand Modeling (MATSIM-IIDM)
activity chain allocation
activity location choice set allocation
primary activity location allocation
etc...
to create demand
Result Analysis (MATSIM-ANALYSIS)
MATSIM-COMPARE
etc...
MATSIM-VALIDATE
etc...
MATSIM-CALIBRATE
etc...
MATSIM-VIS
etc...
world xml
network xml
facilities xml
matrix xml
census xml
plans xml
etc...
MATSIM-DB Parsers and Writers
Data Preparation (MATSIM-DATA)
Census DB
refers to
Network DB
Matrix DB
Facilities DB
World DB
etc...
Data Base (MATSIM-DB)
Iterative Demand Optimization Process - Evolutionary Algorithm (MATSIM-EA)
Agent DB
contains: description, knowledge and demand of each person
Scoring functions (MATSIM-SCORES)
Charypar and Nagel, 2005
Meister et al., 2005
etc...
to score
Execution (MATSIM-EXEC)
stochastic, queue based agent traffic simulation (SQSim)
deterministic, queue based agent traffic simulation (DQSim)
deterministic, event driven, queue based agent traffic simulation (DEQSim)
etc...
Data Fusion & Consolidation (MATSIM-FUSION)
(dis-)aggregations
fusions
consistency check
etc...
fuse
Strategy Modules (MATSIM-STRATEGY)
household scheduler (planomat)
dynamic djikstra router
time allocator mutator
etc...
change mutate

planomat: The task



planomat: GA-based scheduler



- ~3 seconds / agent

Test bed: Kanton Zürich

All relevant networks and facilities:

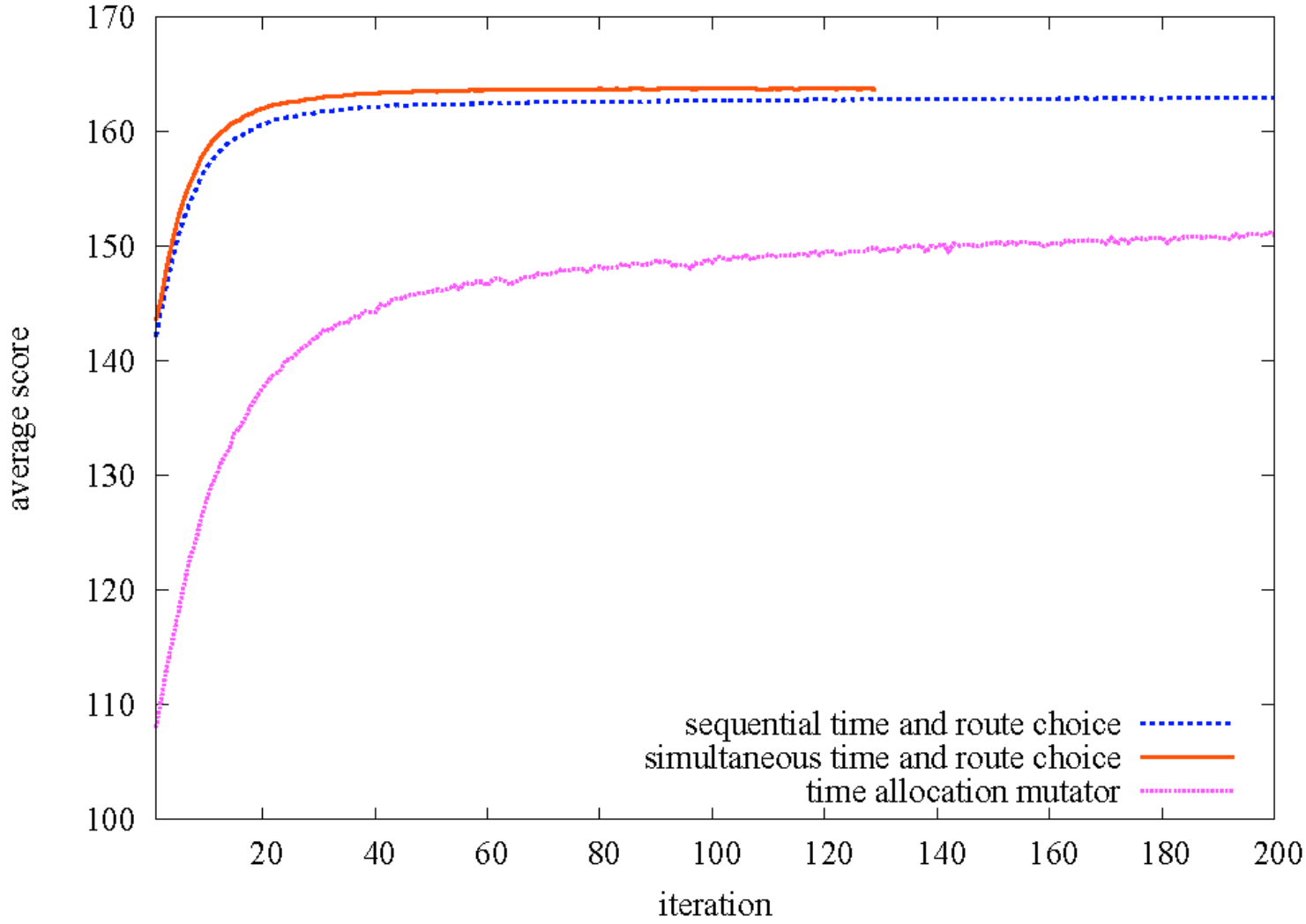
- NavTeq network
- Time-tabled public transport
- Estimate of facilities for each hectare

Agent population by hectare (7 dimensions) (1.2 mio)

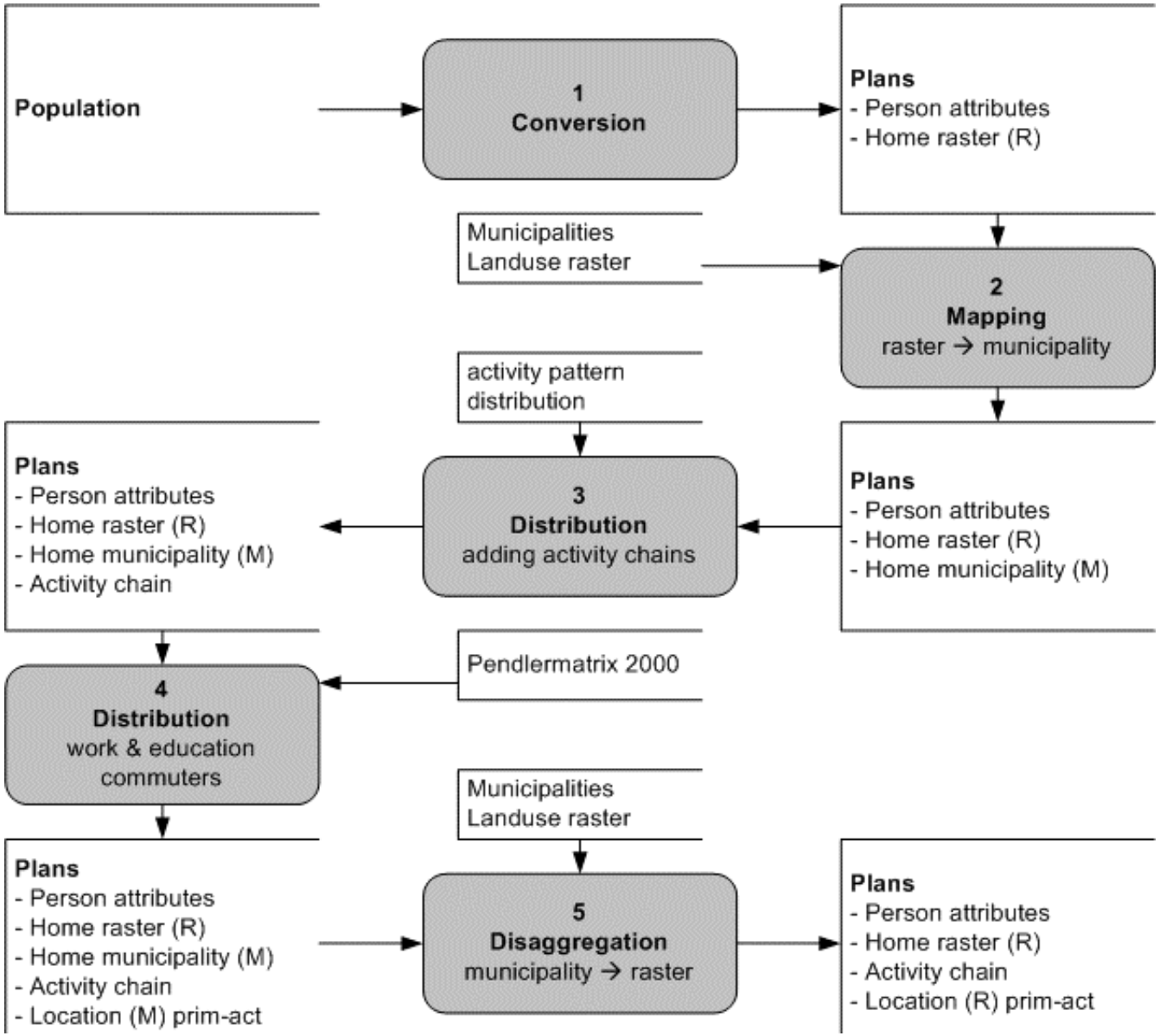
Travel demand

Detailed measurements

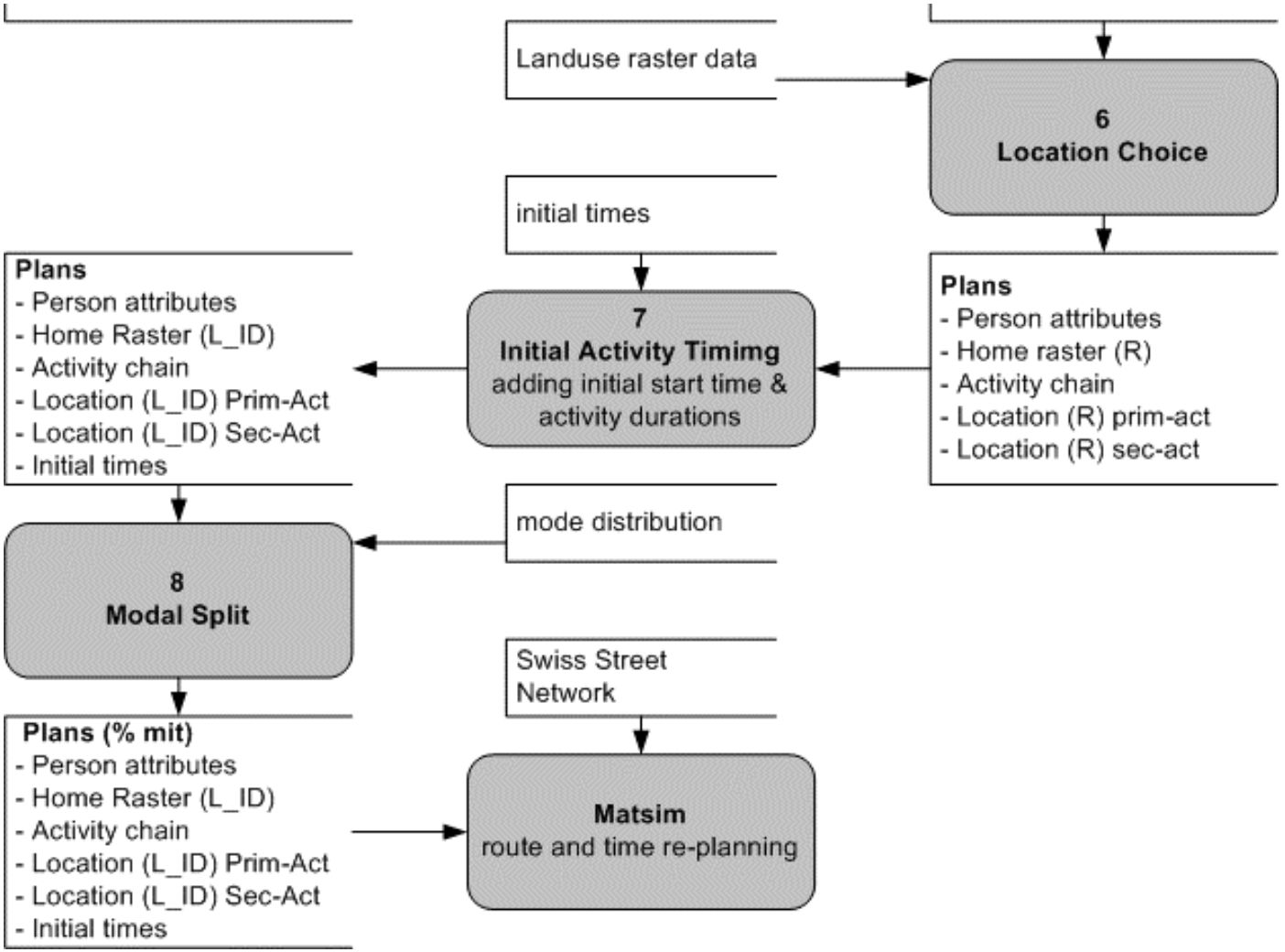
Speeding up the process (1% sample)



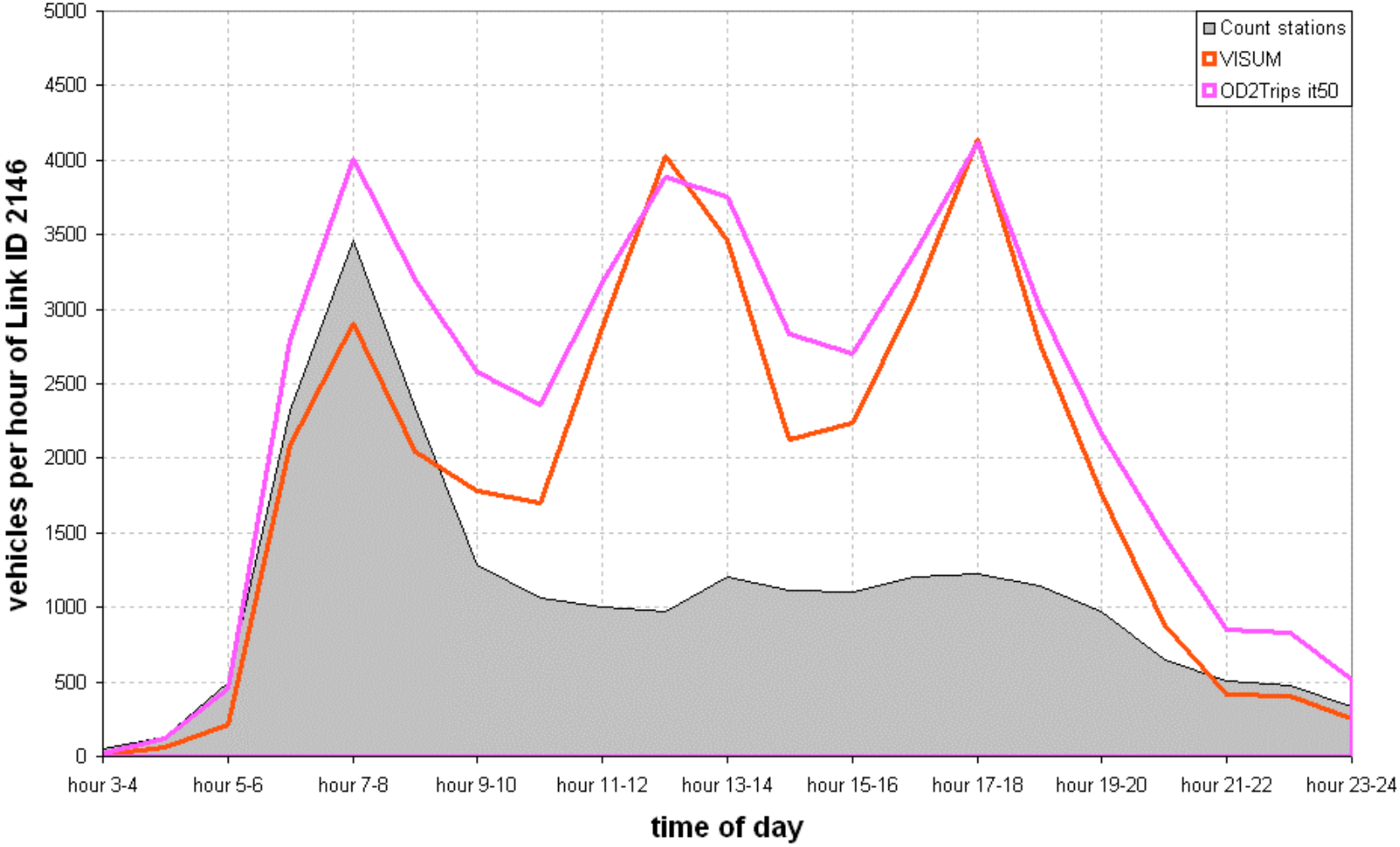
10% sample (Part 1)



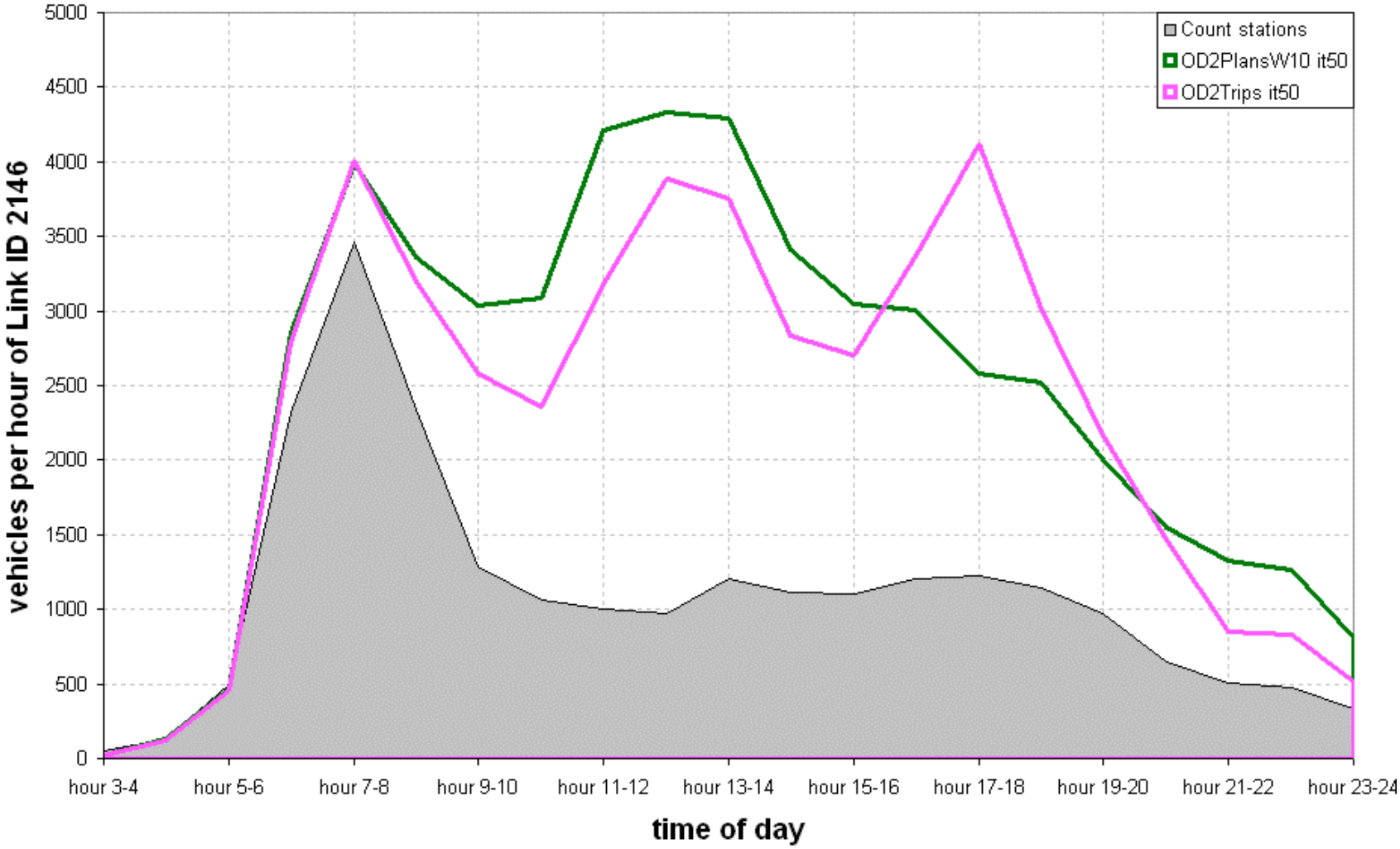
10% sample (Part 1)



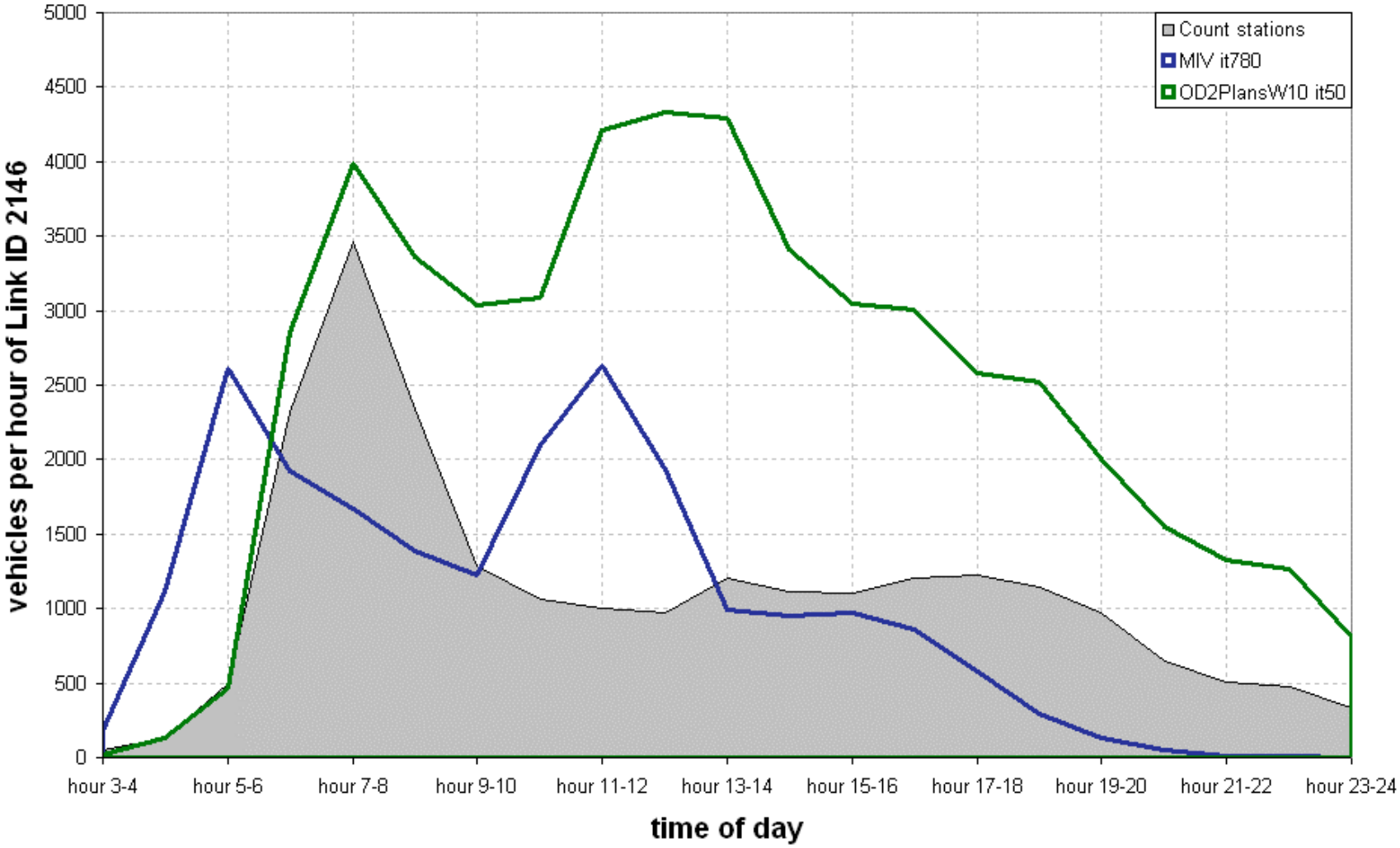
MATSIM-T simulates the OD matrix



MATSIM-T converges ODs into schedules



MATSIM-T starts with schedules



Next steps

- Transfer to www.sourceforge.net
- Adding co-developers

- Regaining full scheduler (planomat)
- Further improvement of the optimiser of the planomat
- Parameter estimates for the scheduler

- Visualisation and analysis tools

- Integration of tools to design systems (DRT, parking capacities, etc.)
- Integrating social networks

Sources

Software:

www.matsim.org

Papers:

www.ivt.ethz.ch/vpl/publications/reports/index_EN

Starting points

Balmer, M., K.W. Axhausen and K. Nagel (Forthcoming) A demand generation framework for large scale micro-simulations, *Transportation Research Record*.

Charypar, D. and K. Nagel (2006) Q-learning for flexible learning of daily activity plans, *Transportation Research Record*, **1935**, 163-169.

Meister,K., M. Balmer, K.W. Axhausen and K. Nagel (2006) planomat: a comprehensive scheduler for a large-scale multi-agent transportation simulation, paper presented at the 6th Swiss Transport Research Conference, Ascona, March 2006**.**

Meister, K., M. Frick and K.W. Axhausen (2005) A GA-based household scheduler, *Transportation*, **32** (5) 473 – 494.

Raney, B., N. Cetin, A. Völlmy, M. Vrtic, K. W. Axhausen and K. Nagel (2003) An agent-based microsimulation model of Swiss travel: First results, *Networks and Spatial Economics*, **3** (2003) 23-41.