Reimplementation of the planomat strategy module for matsimJ

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Scoring function

Total score of a plan:

$$U_{total} = \sum_{i=1}^{n} U_{perf,i} + \sum_{i=1}^{n} U_{late,i} + \sum_{i=1}^{n} U_{travel,i}$$

where

- n - number of activities
- $U_{perf,i}$ - utility of performing activity i
- $U_{late,i}$ - utility of arriving late at activity i
- $U_{travel,i}$ - utility of travelling to activity i

for details see Charypar and Nagel (2005)

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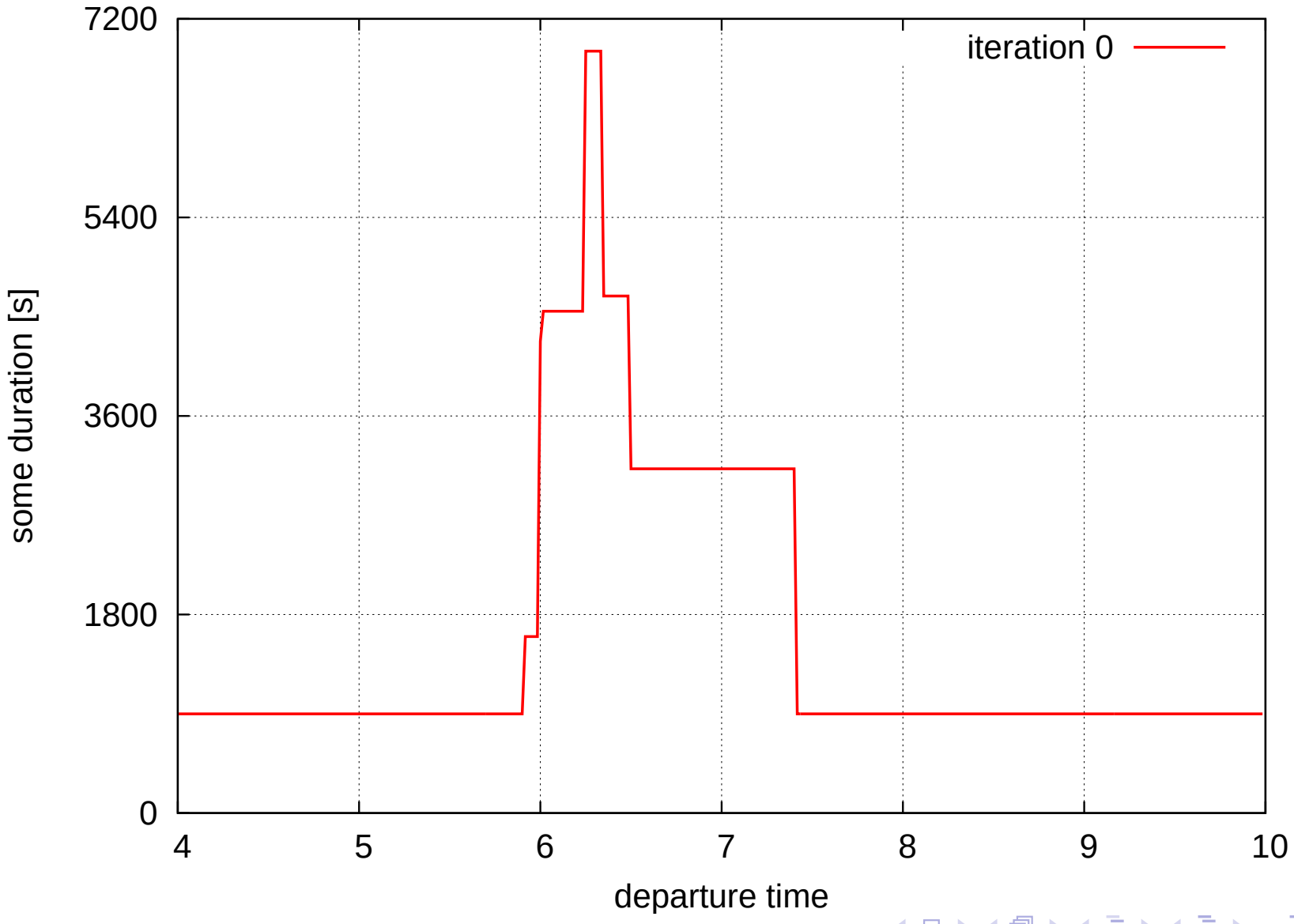
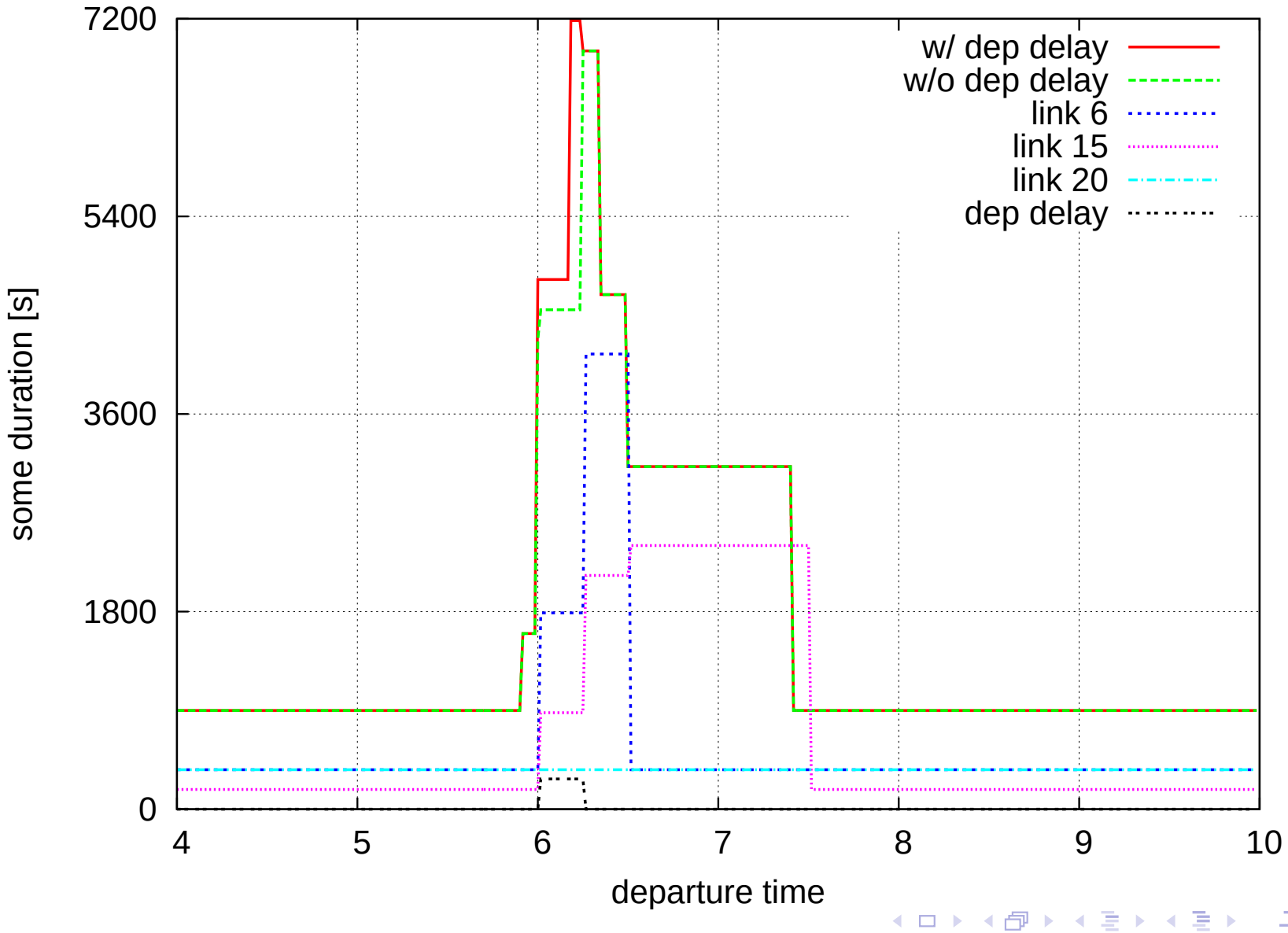
Goal:

Optimize an agent's score with respect to departure times and activity durations.

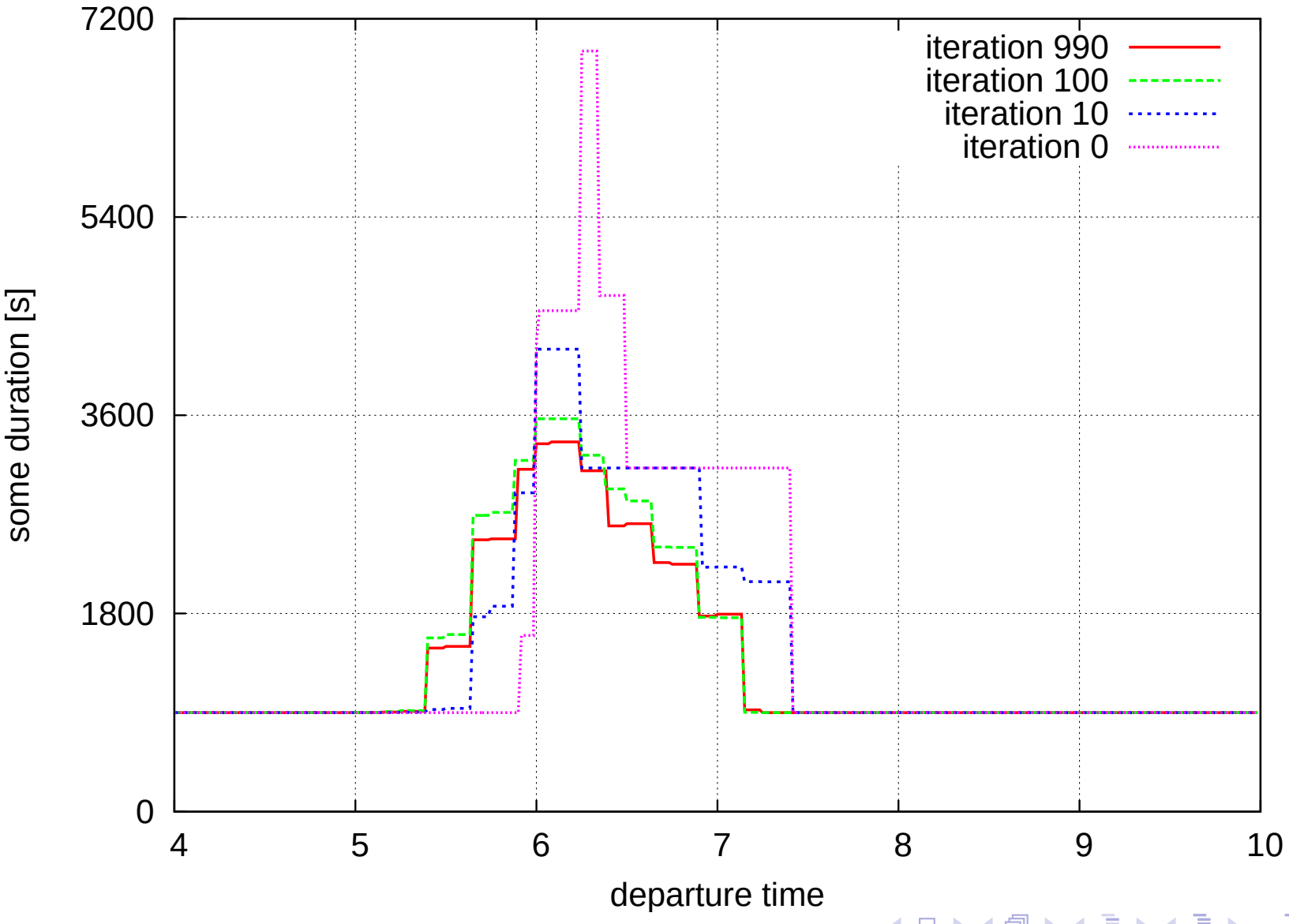
Feedback of travel costs



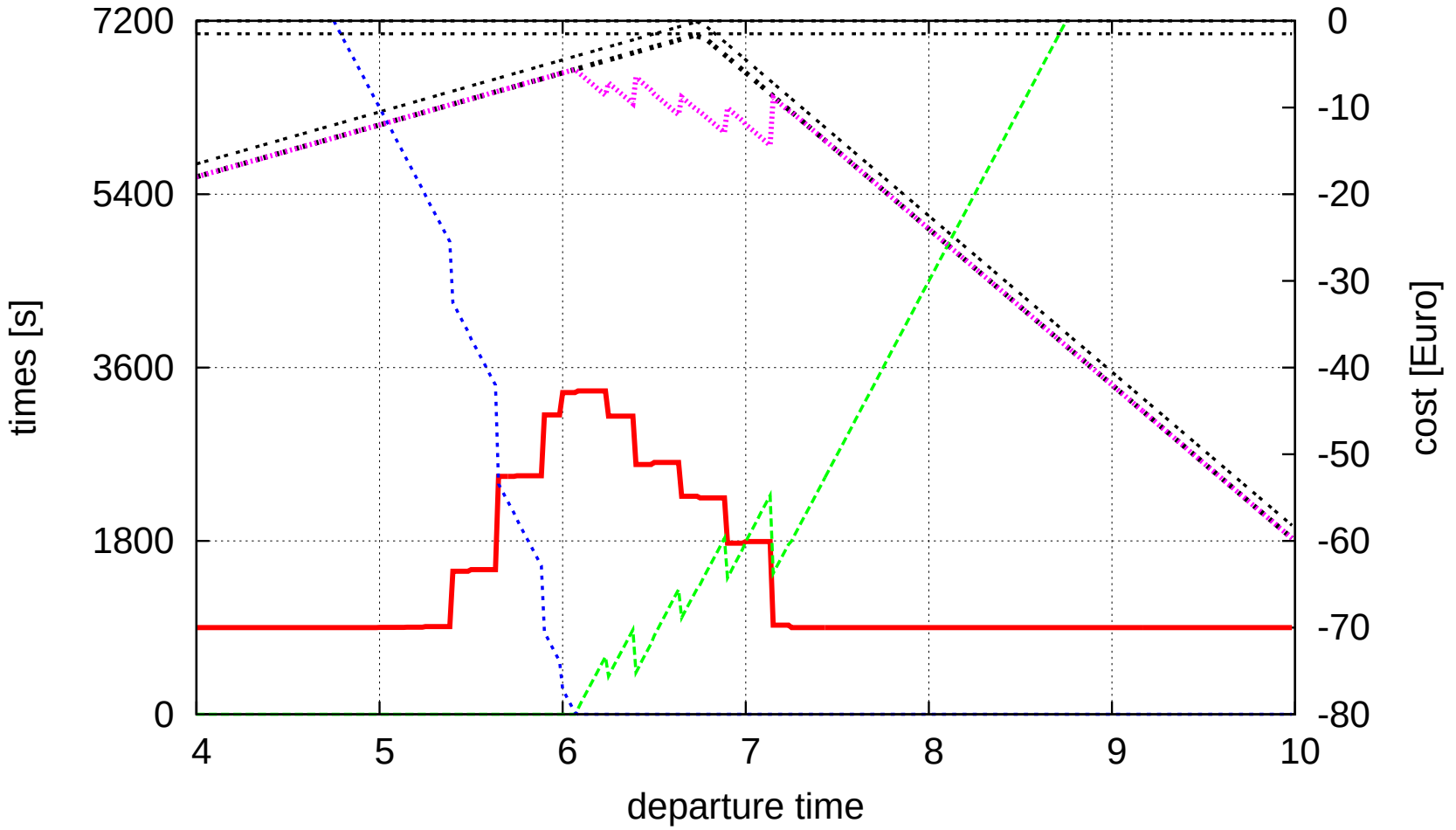
Feedback of travel costs



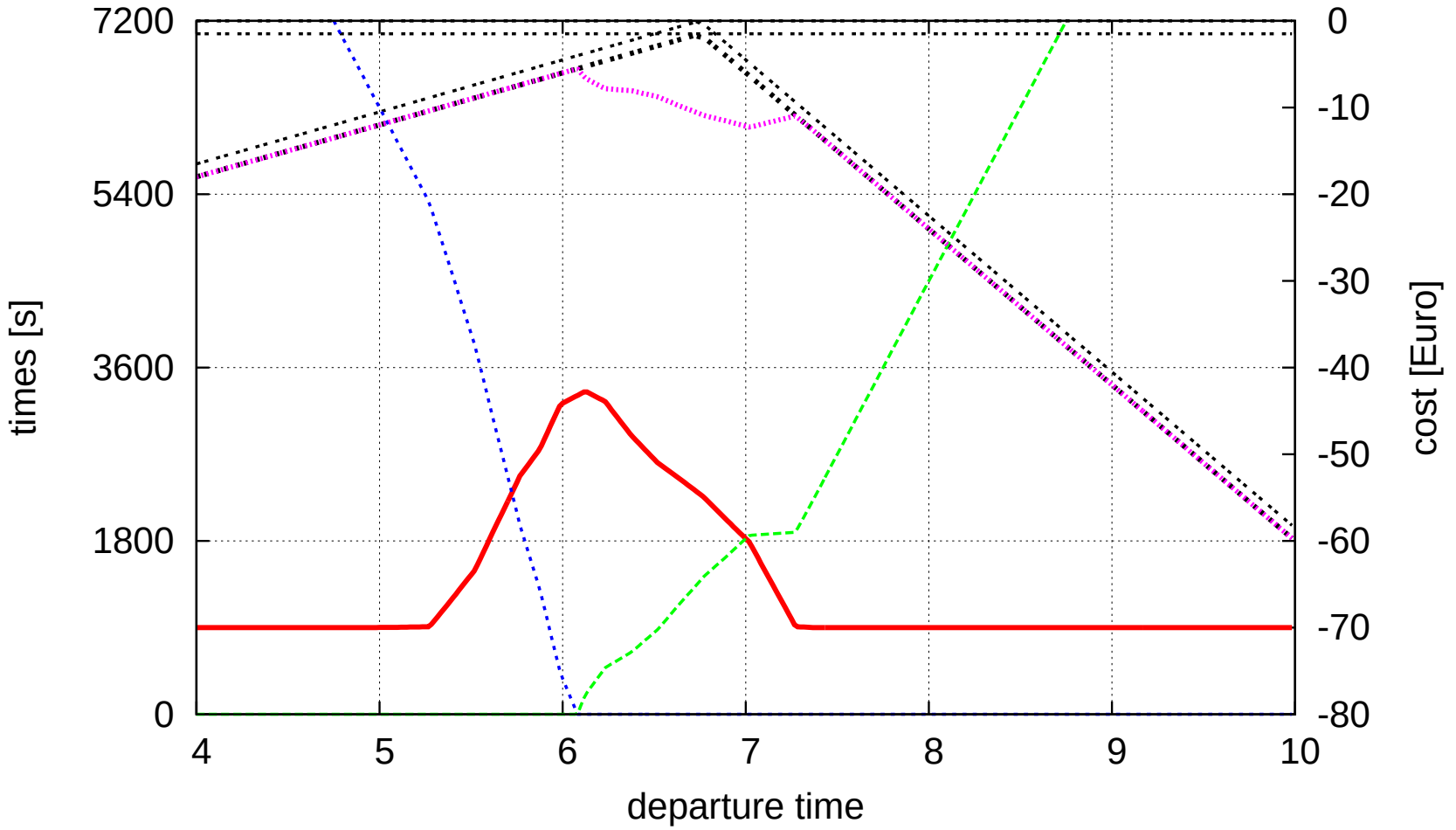
Feedback of travel costs



Cost structure of bottleneck



Interpolation of link travel times



GA configuration

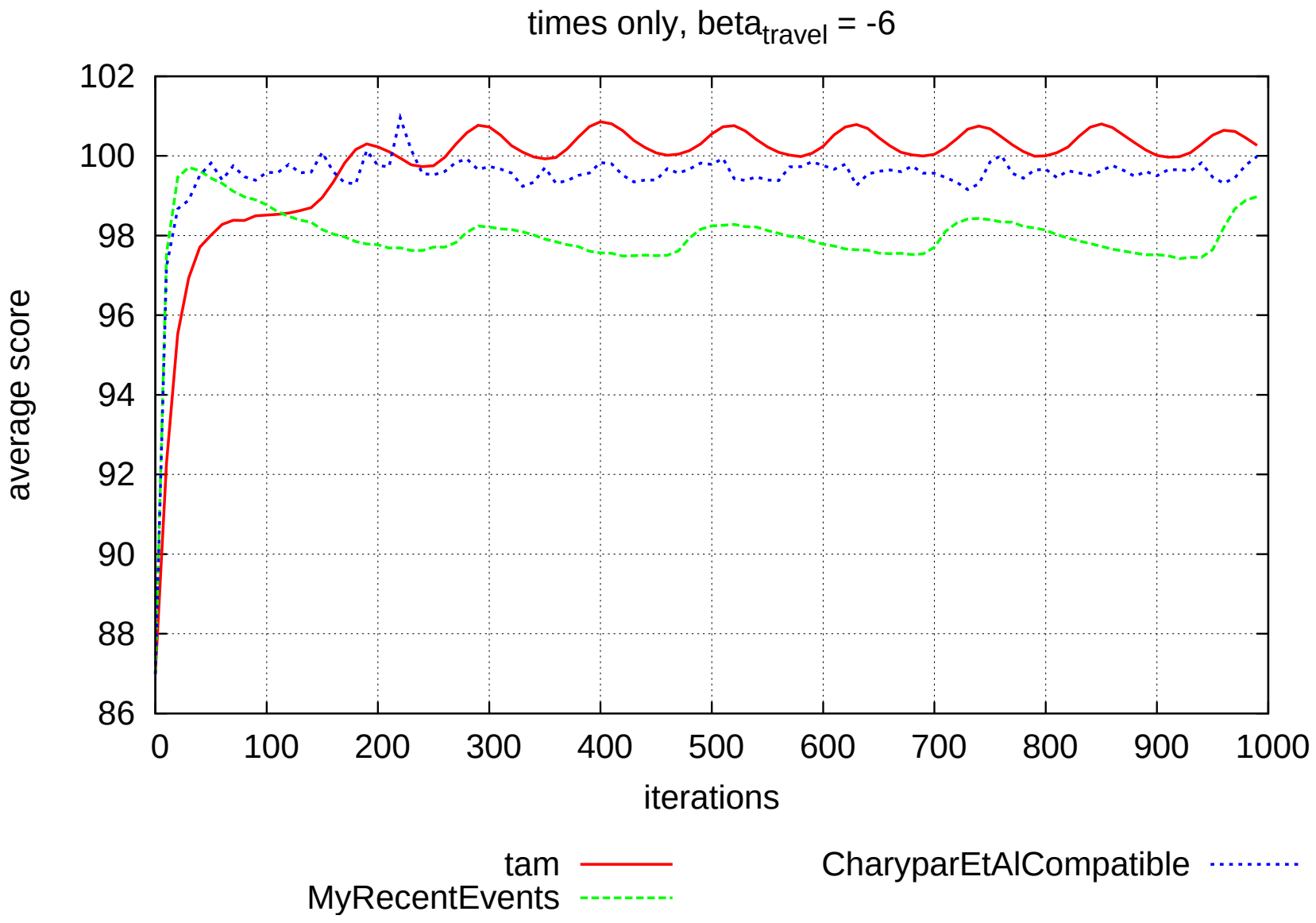
JGAP - `http://jgap.sourceforge.net`

- **Encoding** n_{act} doubles
- **Crossover** Simple Crossover
- **Mutation** Random Mutation
- **Mutation probability** $\frac{1}{n_{act}}$
- **Selection** best 95%
- **Population size** constant 10
- **Fitness function** MATSim-T scoring function
- **Stop criterion** 1000 generations max. / score of best individual does not improve by x points after 100 generations (yields 300-500 generations)

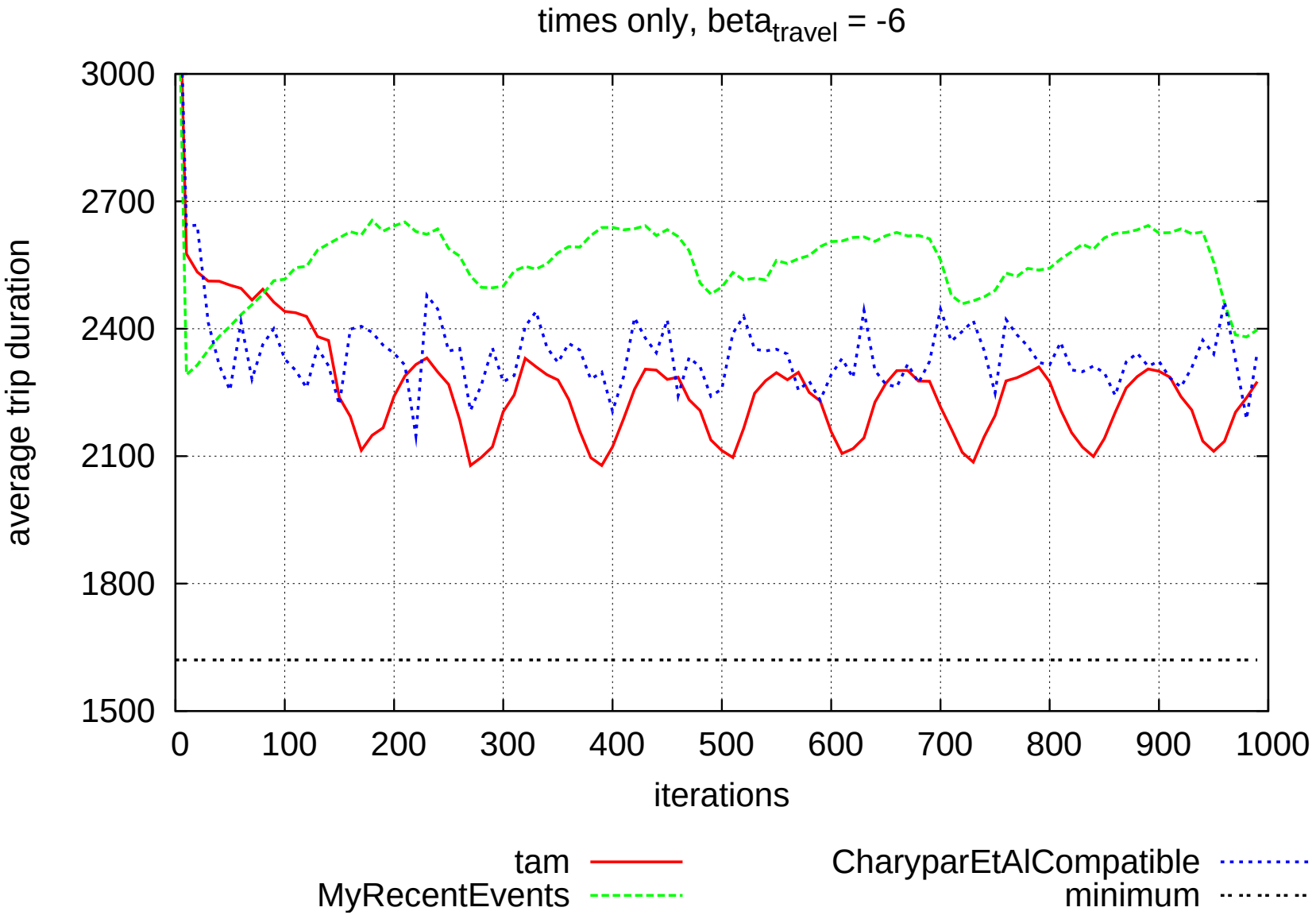
equil-test

- **agent database** equil-net, 2'000 agents, home–work–home, $T_{open,work}$=$T_{latest,work}$=7:00 (Raney, 2005)
- **agent database** n_{plans} =3 (instead of 6), p_{rnd} =0.1, p_{route} = p_{time} =0.1, rest probabilistic selection
- **traffic flow simulation** event-driven, queue-based agent traffic simulation (Charypar (2007)), in opposite to Cetin (2005)):
  - includes origin activity link
  - excludes destination activity link
- compare
  - time allocation mutator *tam*
  - planomat with constant travel time expectation (**wrong!**, compare Meister (2006)) *MyRecentEvents*
  - planomat with time-of-day dependent travel time expectation *CharyparEtAlCompatible*

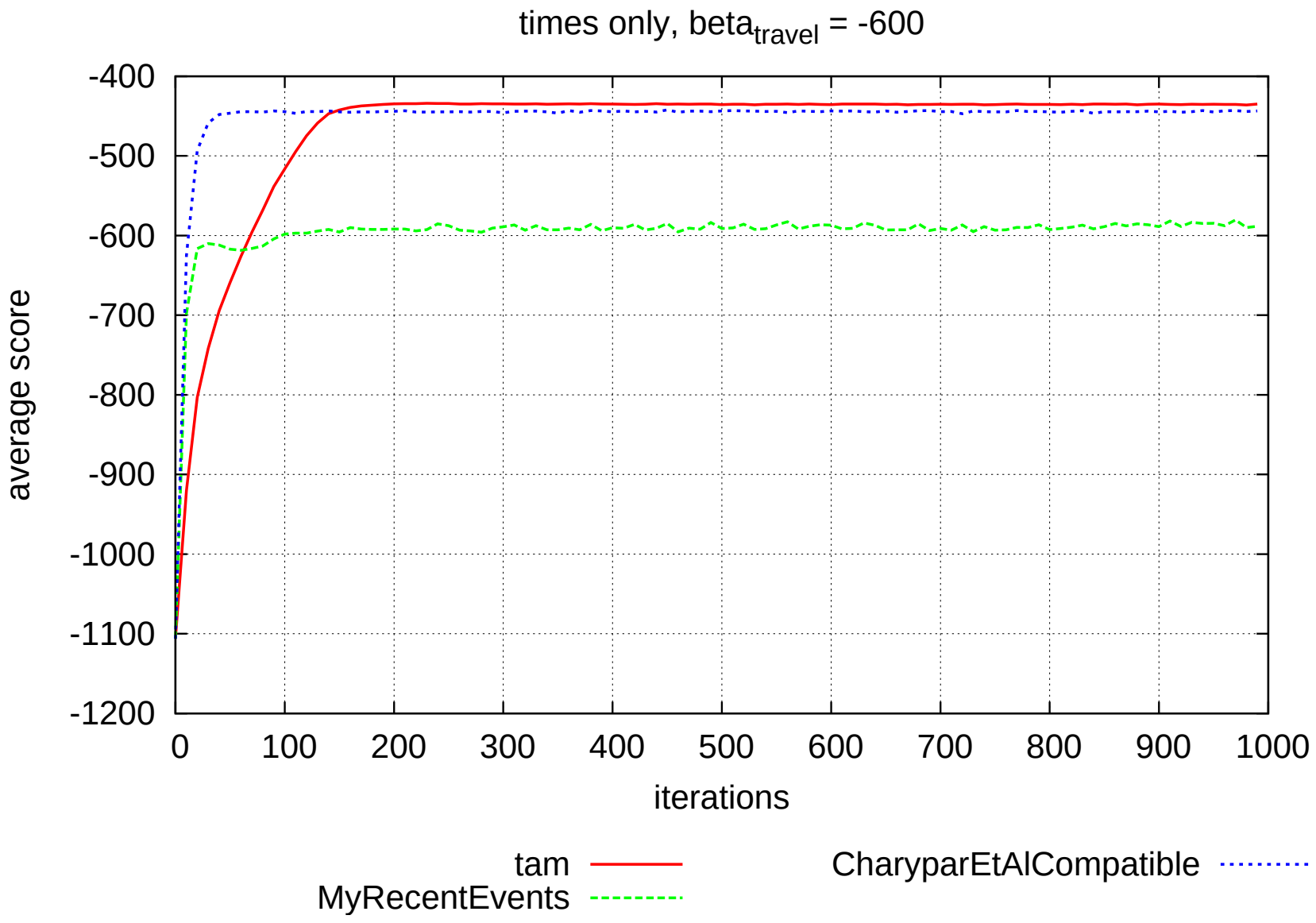
Relaxation


times only, beta$_{travel}$ = -6
average score
102
100
98
96
94
92
90
88
86
0
100
200
300
400
500
600
700
800
900
1000
iterations
tam
MyRecentEvents
CharyparEtAlCompatible

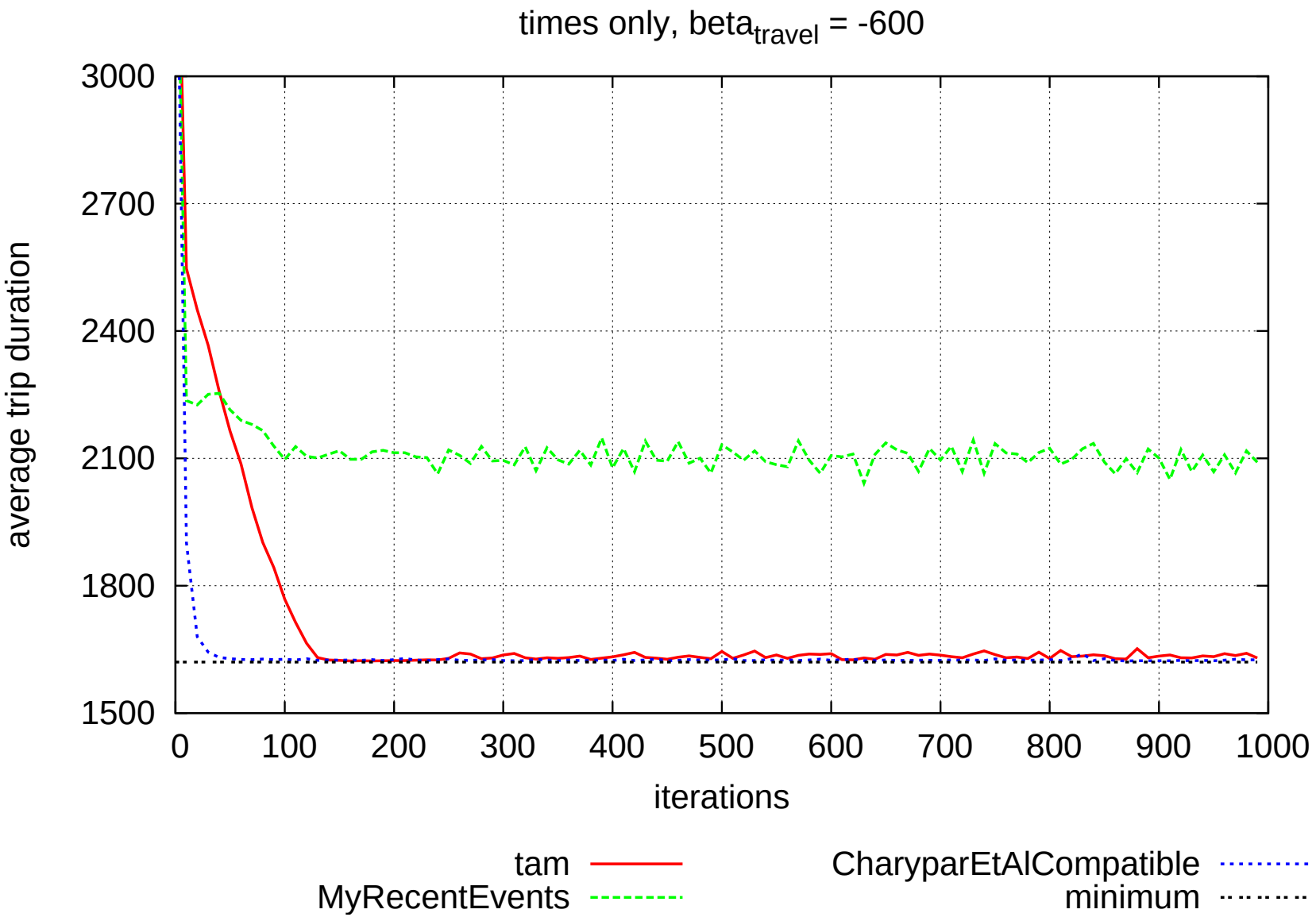
Relaxation


times only, beta_travel = -6
average trip duration
3000
2700
2400
2100
1800
1500
0
100
200
300
400
500
600
700
800
900
1000
iterations
tam
MyRecentEvents
CharyparEtAlCompatible
minimum

Relaxation


times only, beta$_{travel}$ = -600
average score
-400
-500
-600
-700
-800
-900
-1000
-1100
-1200
0
100
200
300
400
500
600
700
800
900
1000
iterations
tam
MyRecentEvents
CharyparEtAlCompatible

Relaxation


times only, beta_travel = -600
average trip duration
3000
2700
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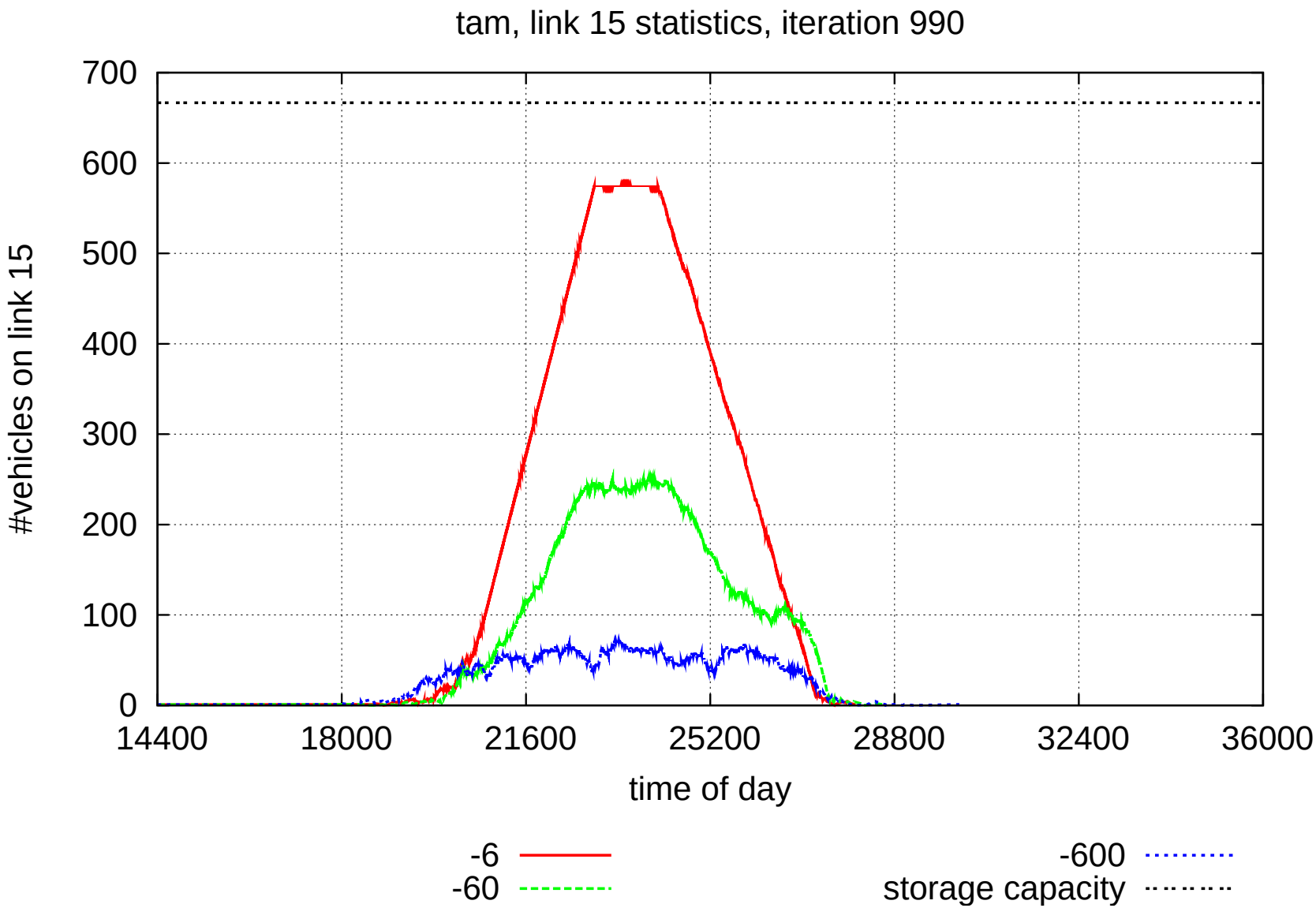
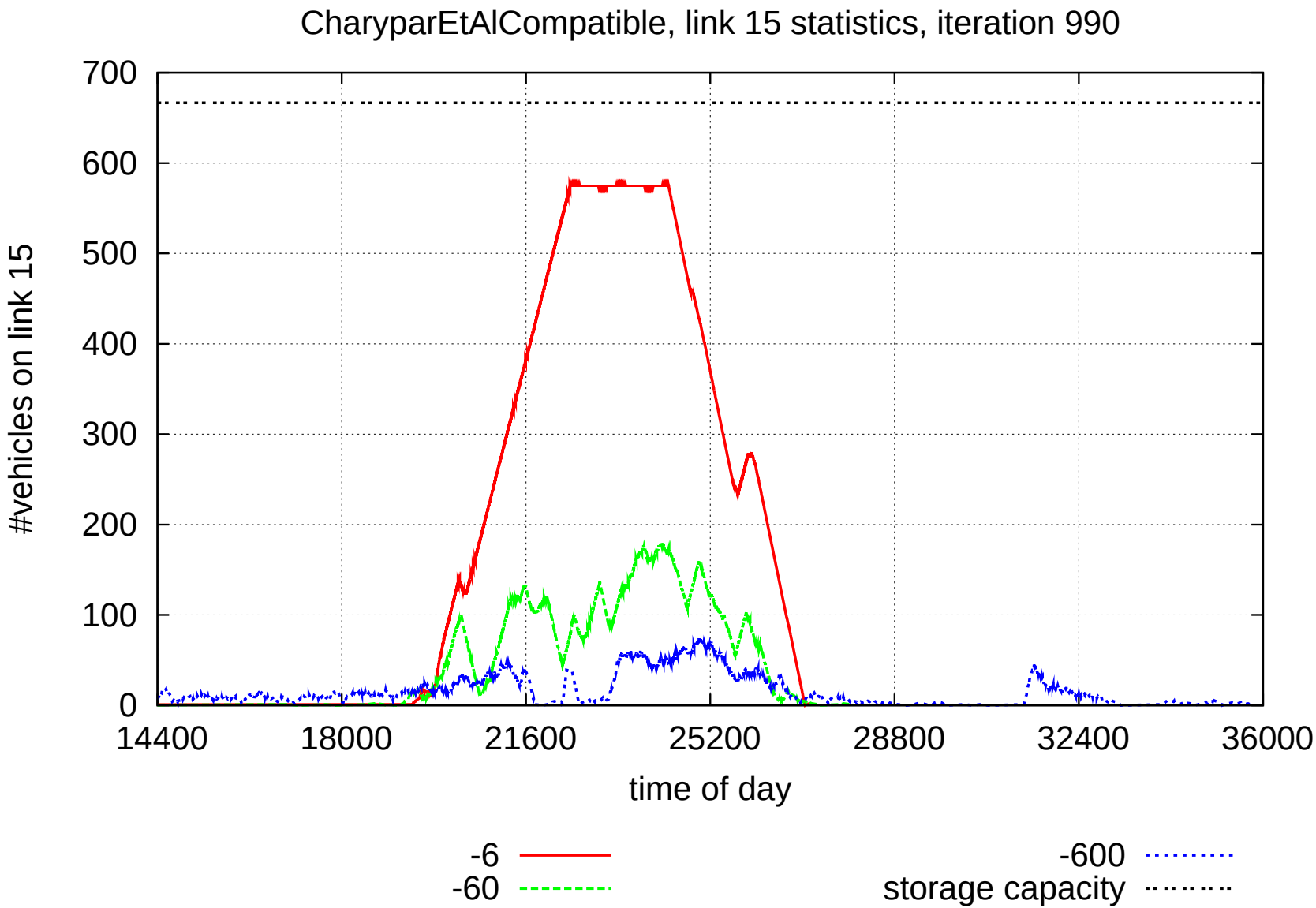
minimum

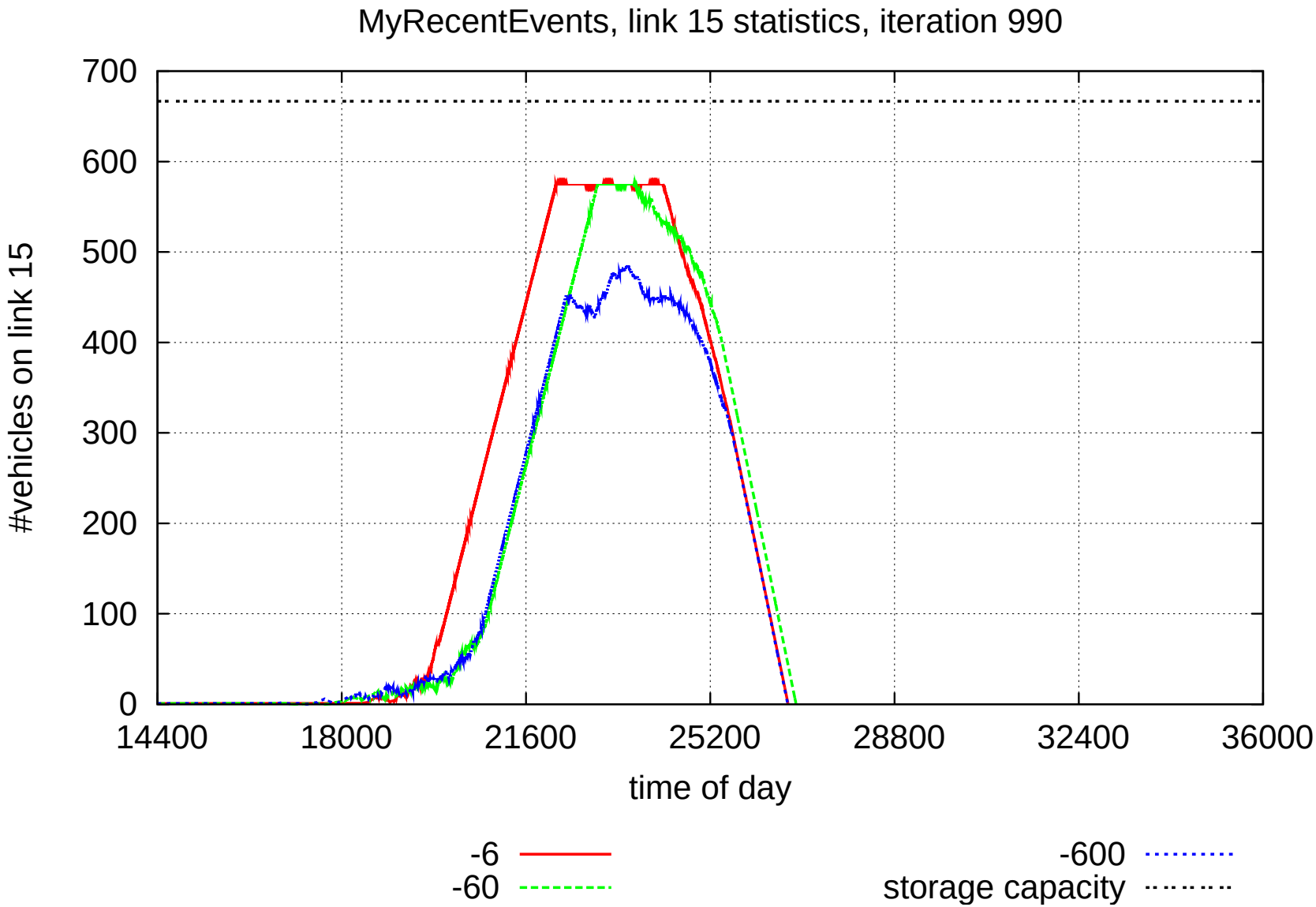
Traffic volumes



Traffic volumes



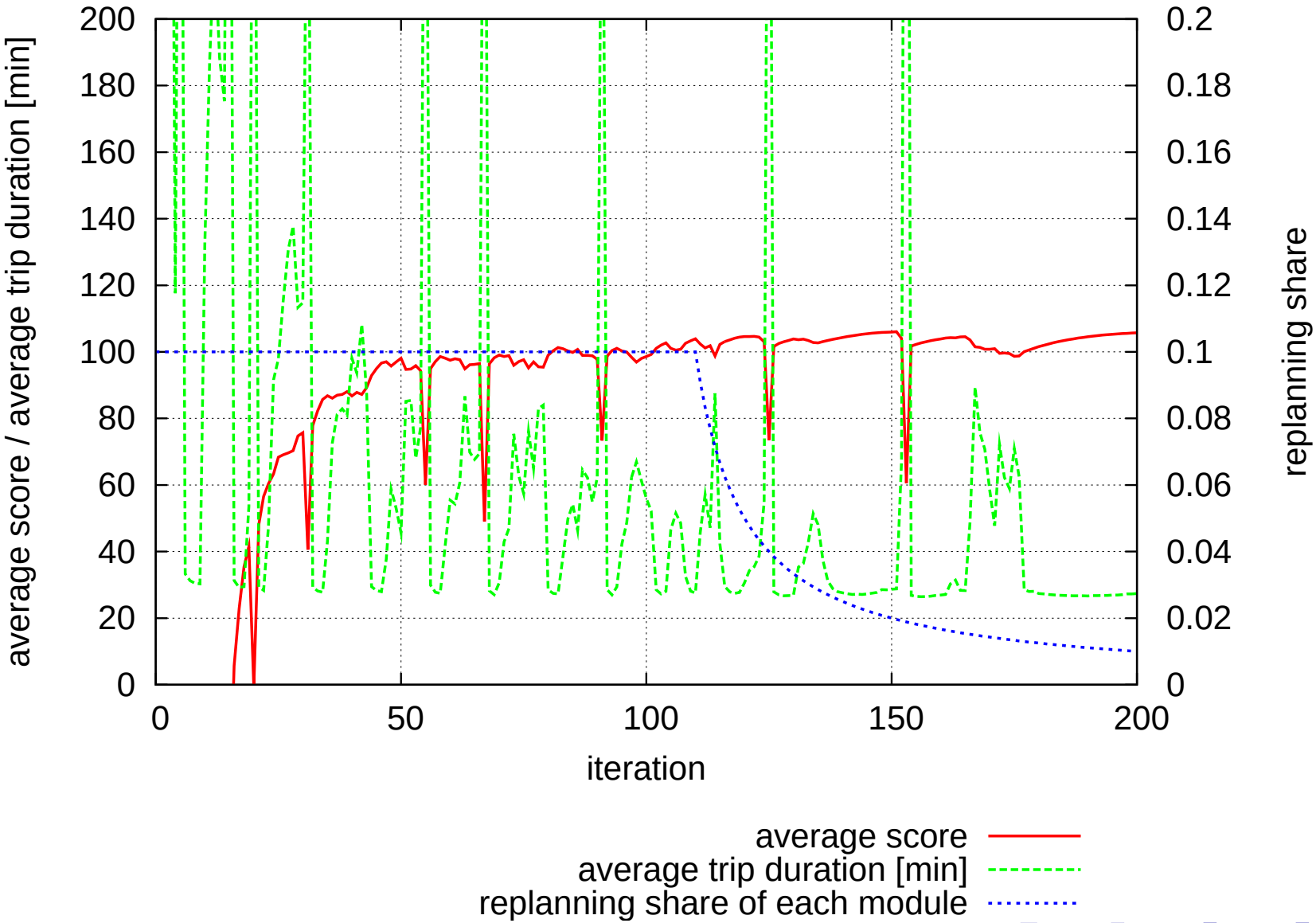
Traffic volumes



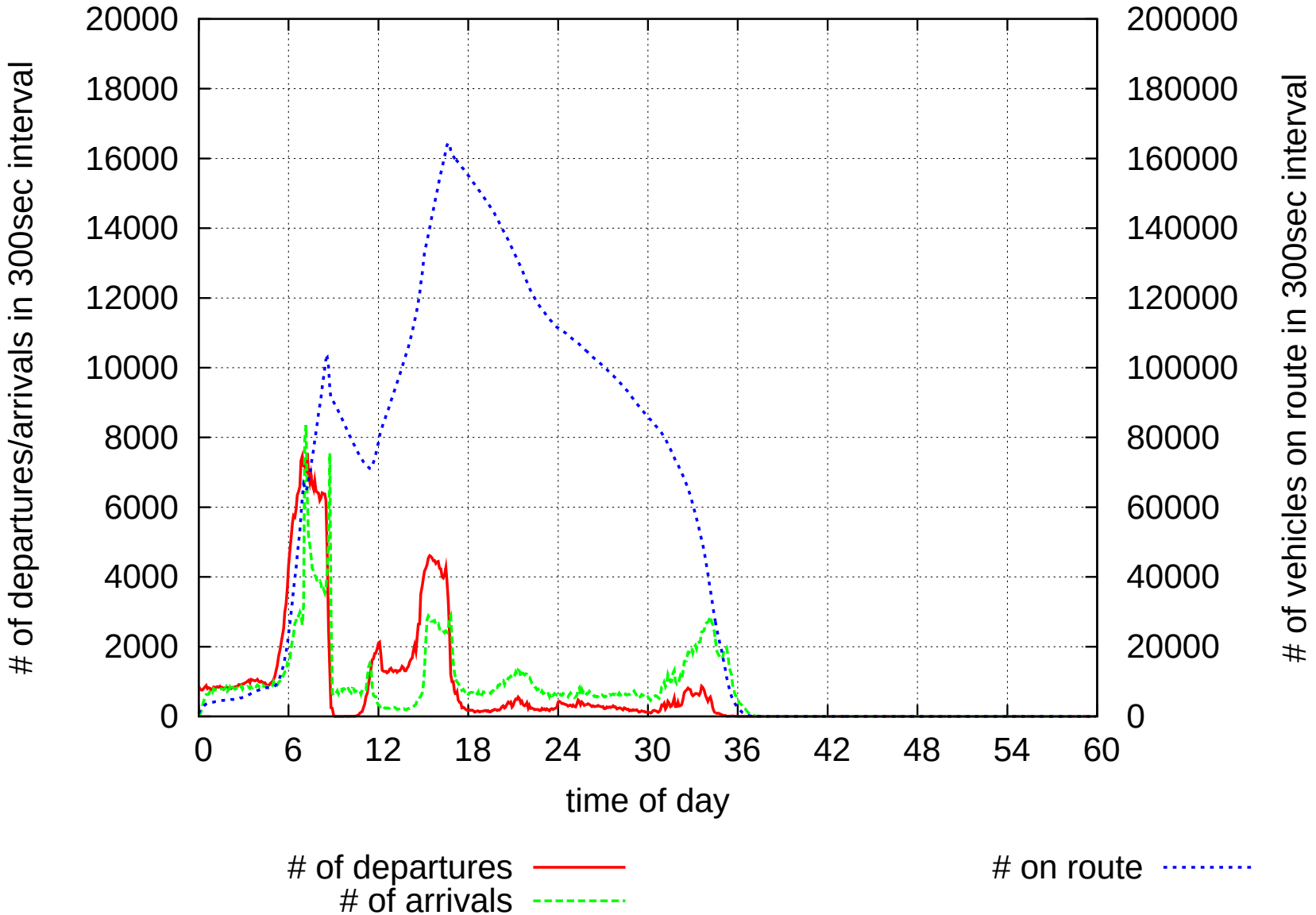
Diluted Zurich scenario

- **Synth population** 260'000 agents (30 km circle around Bellevue, Zurich)
- **Network model** `vsp-cvs/studies/schweiz/2network/ch.xml`, 10'564 nodes, 28'620 links
- **Activities** home–work–home
  - **home** t^* =16h
  - **work** t^* =8h, $T_{open,work}$=7:08, $T_{latest,work}$=8:52
- **agent database** n_{plans} =3 (instead of 6), p_{rnd} =0.1, $p_{route} = p_{time}$ =0.1 or diminishing, rest probabilistic selection

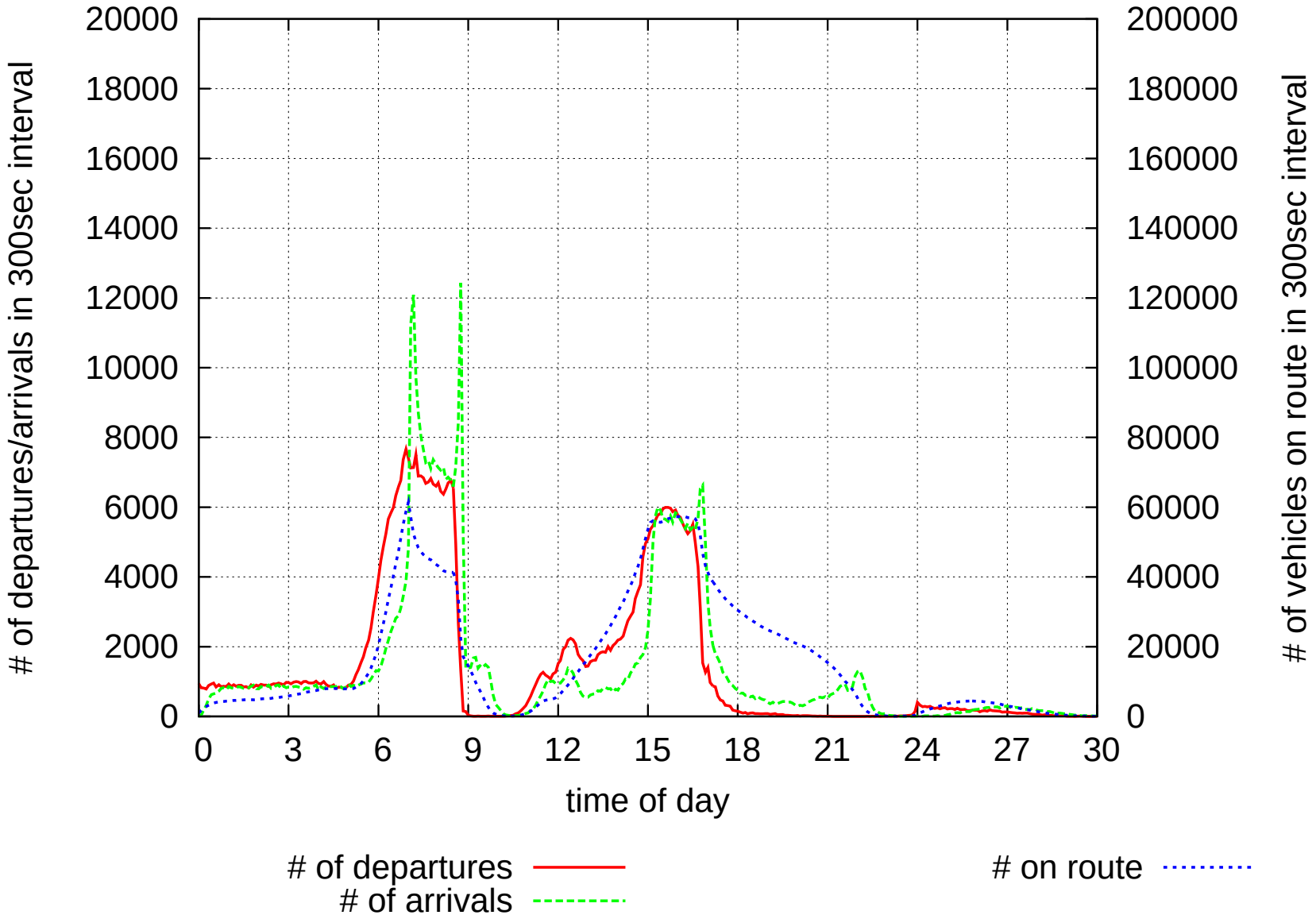
Iterations - planomat



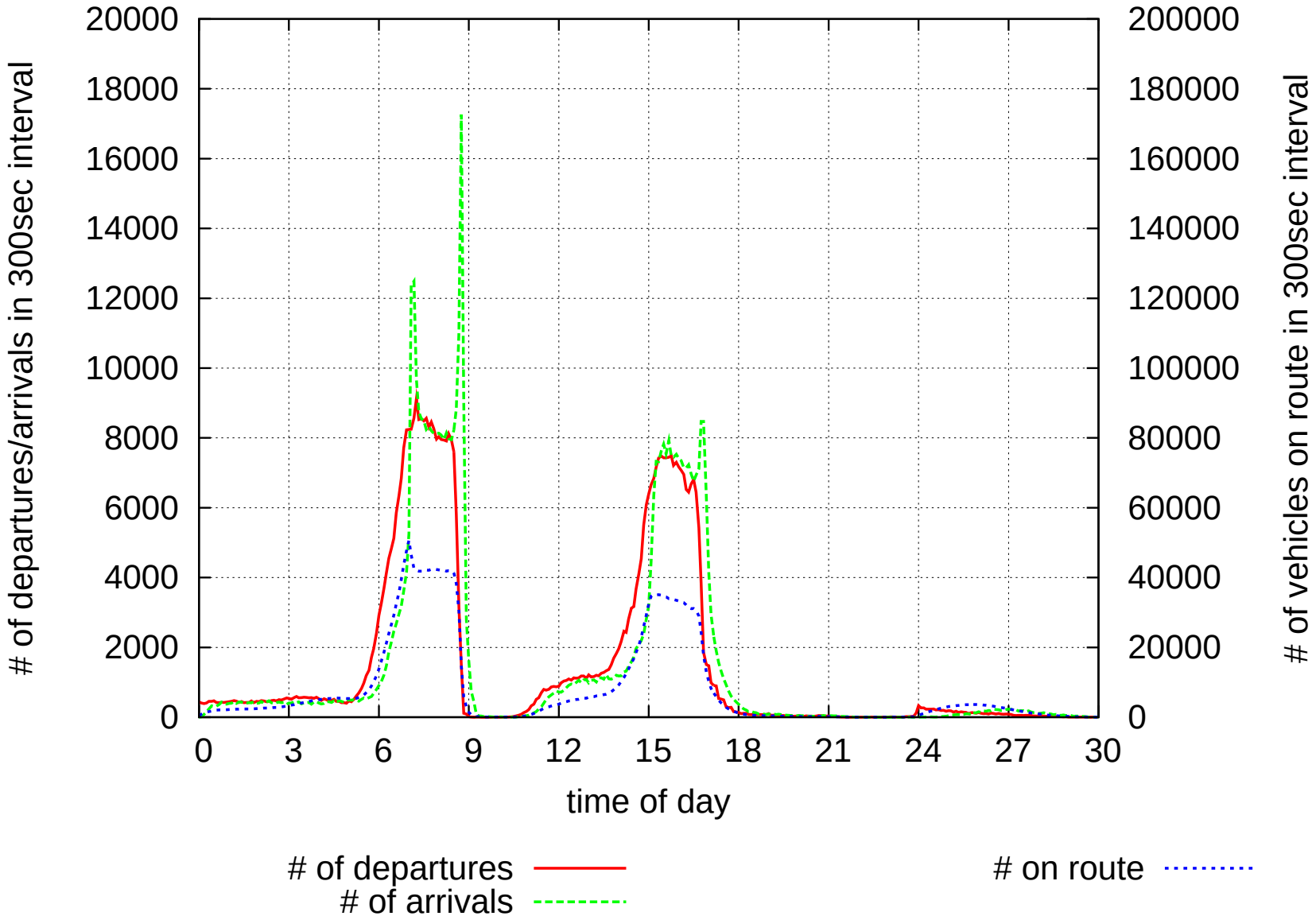
Departures - planomat - breakdown



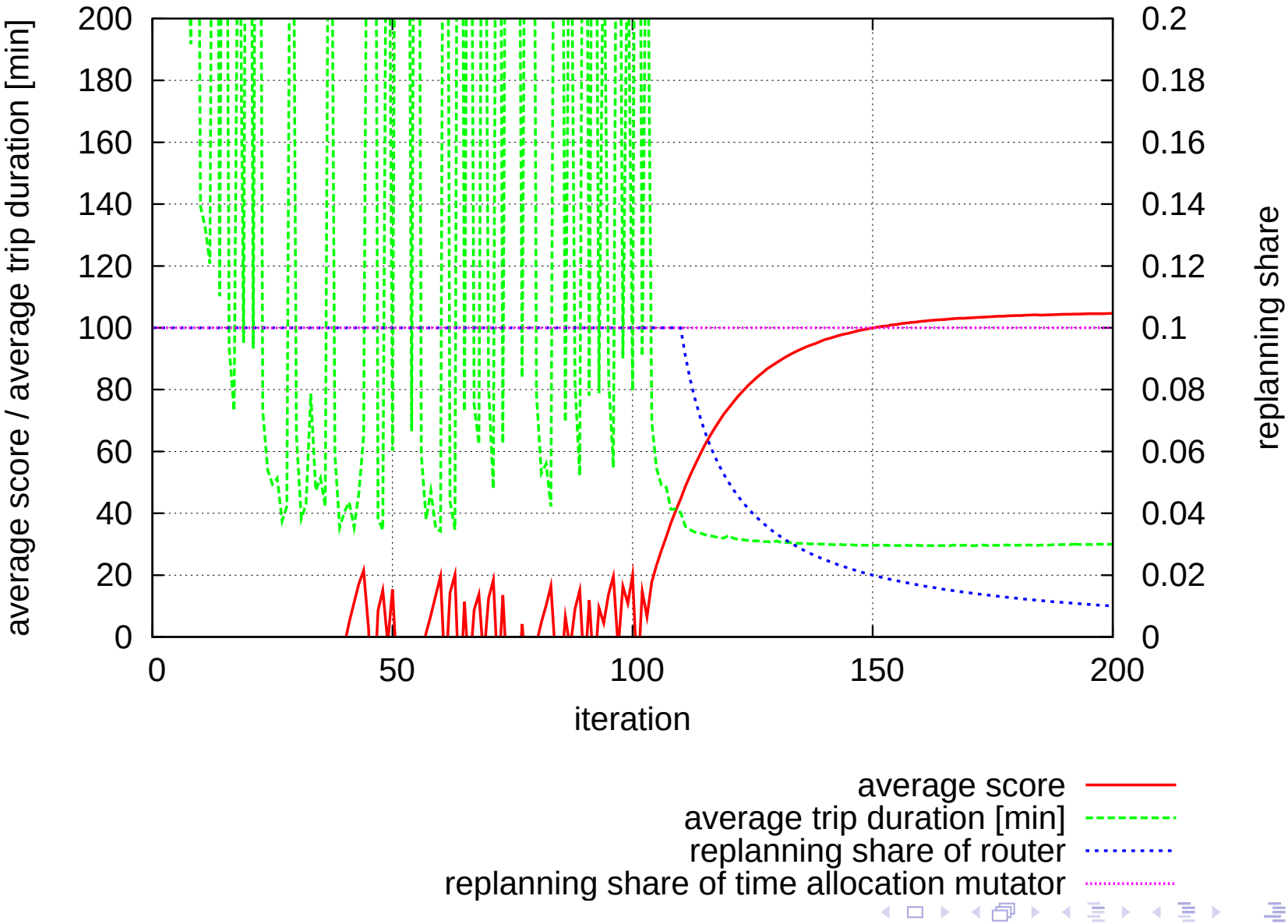
Departures - planomat - constant 10%



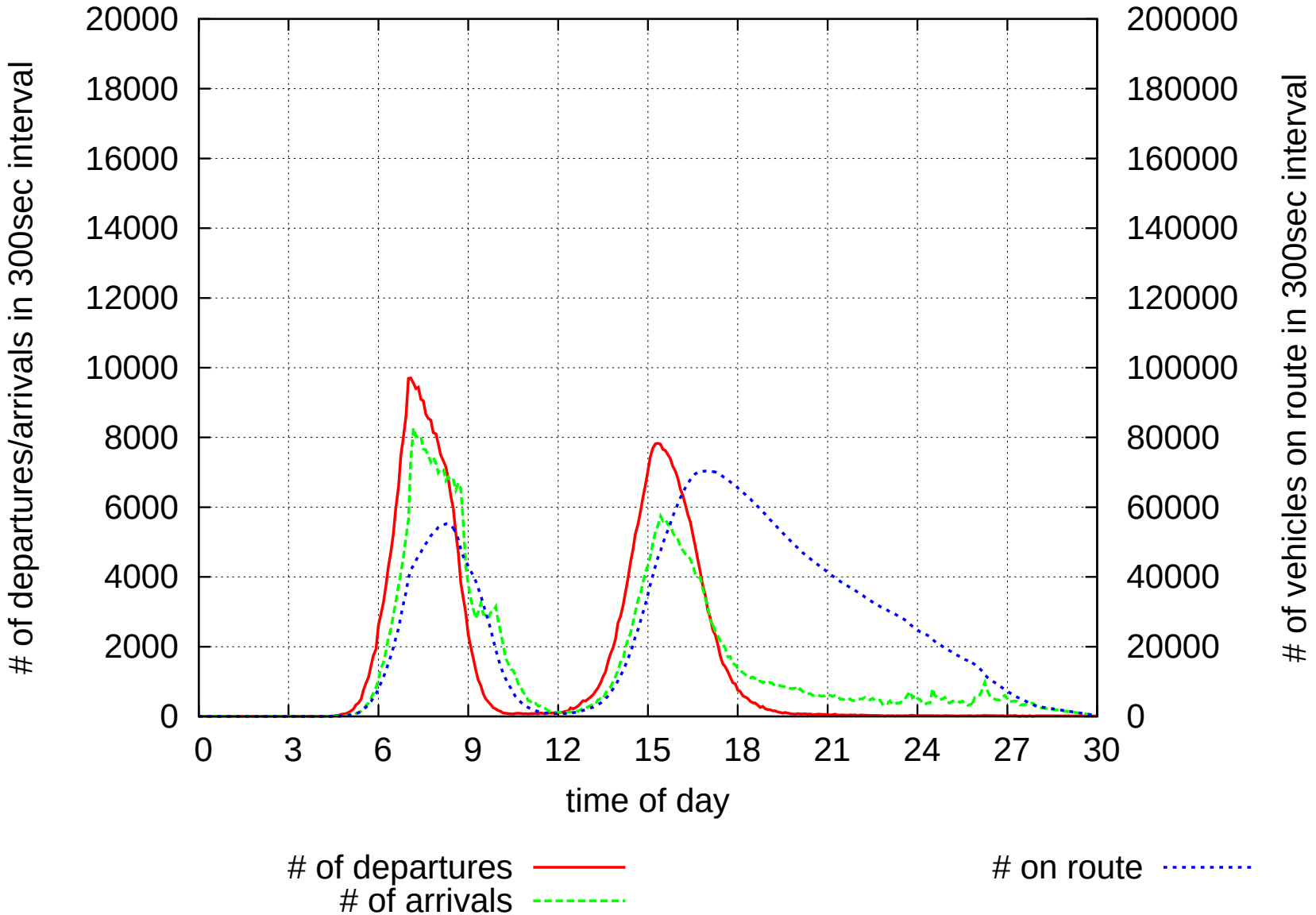
Departures - planomat - falling replanning share



Iterations - time alloc mutator



Departures - tam - constant 10%



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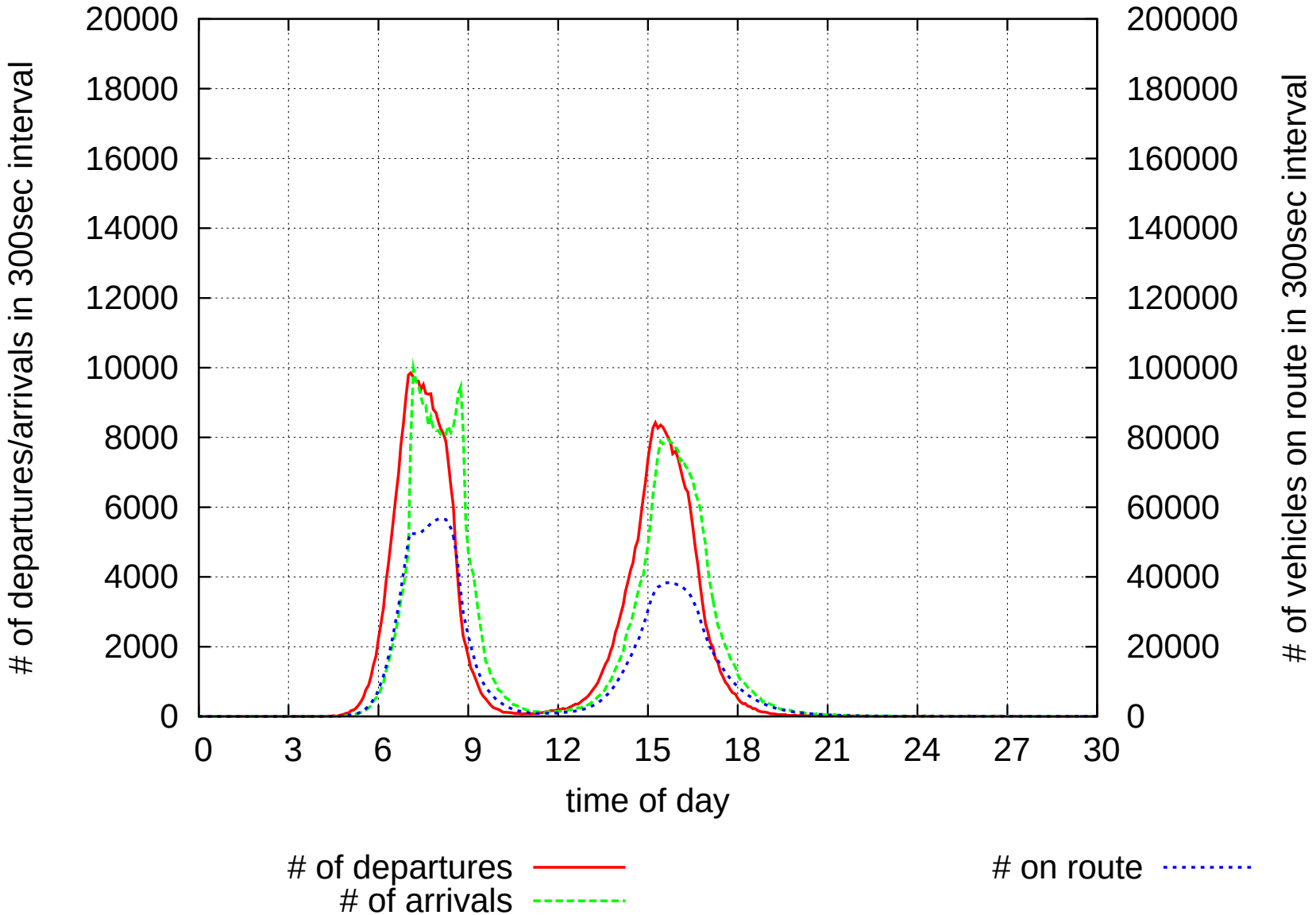

Outlook and discussion

- Diminishing replanning share mandatory !?!
- Don't look at score only, but also travel times.
- What kind of test cases for replanning modules are useful?
- Use Fabrice's BBOG as optimization suite, e.g. algo comparisons
- include mode choice

Cetin, N. (2005) Large-scale parallel graph-based simulations, Ph.D. Thesis.

Charypar, D., K. W. Axhausen and K. Nagel (2007) Event-driven queue-based traffic flow microsimulation, paper presented at *the 86th Annual Meeting of the Transportation Research Board*.

Charypar, D. and K. Nagel (2005) Generating complete all-day activity plans with genetic algorithms, *Transportation*, **32** (4) 369–397.

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*.

Raney, B. (2005) Learning framework for large-scale multi-agent simulations, Ph.D. Thesis.