

Hybrid and Distributed Traffic Simulation with Open Traffic Models

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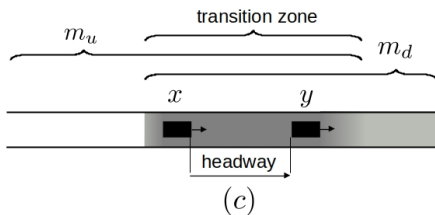
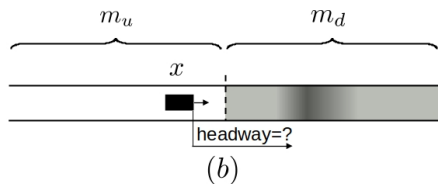
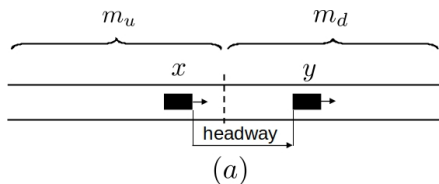


Workshop on Traffic Simulation and CAV Modeling

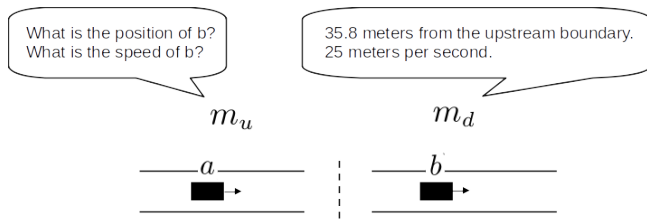
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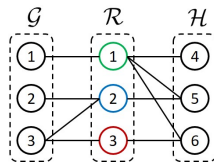
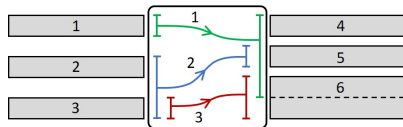
Traditional hybrid traffic simulation



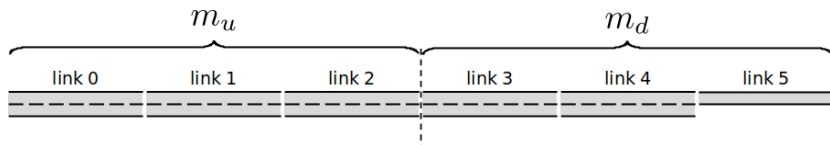
Overview of Open Traffic Models



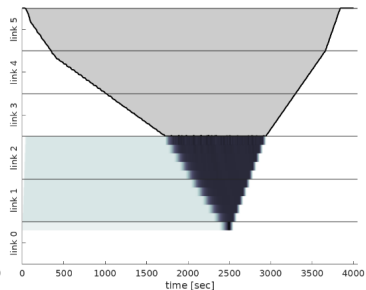
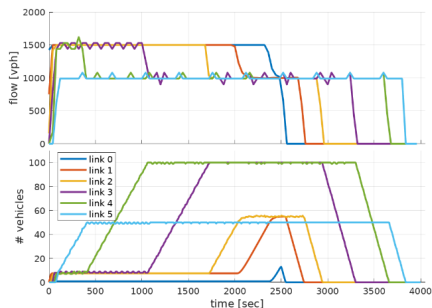
- The most important question is: **Can you accept this vehicle packet?**
- This must be resolved on a generic intersection: “node model”.



Simple verification

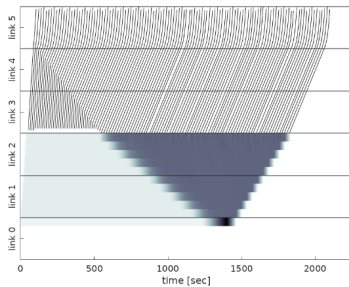
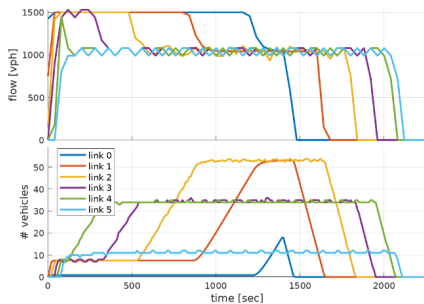


macro-meso



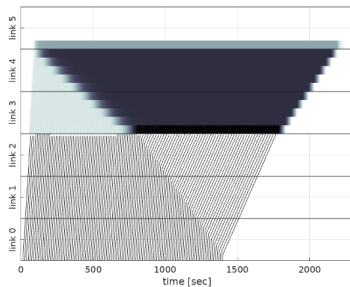
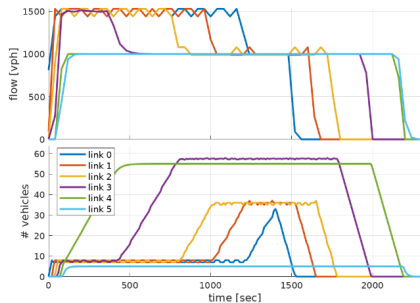
Simple verification

macro-micro

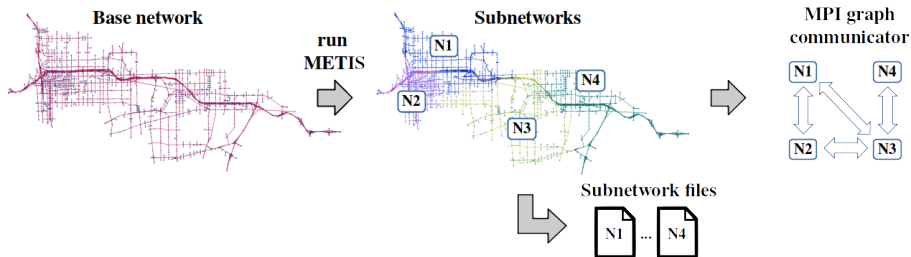


Simple verification

micro-macro

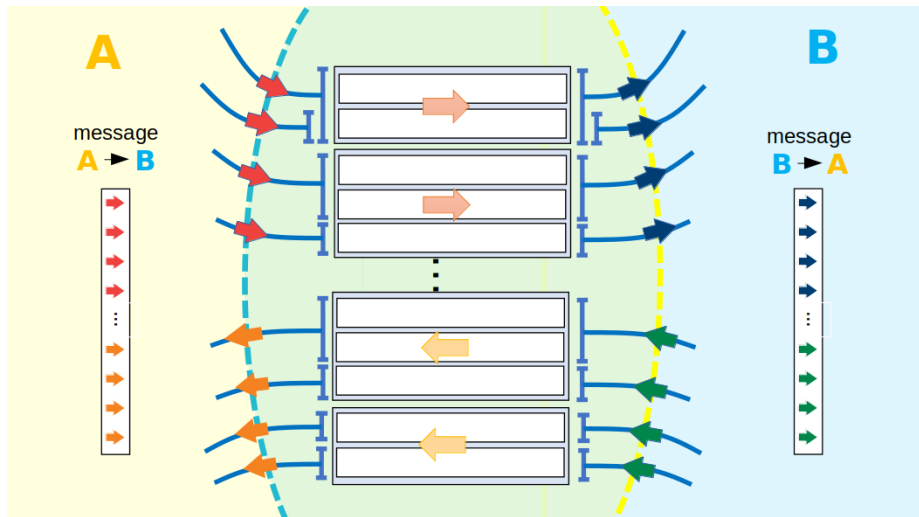


Network partitioning



- The base network is partitioned with METIS.
- Each subnetwork is a vertex in the MPI communications graph.
- Each subnetwork and its demands are written to an XML file and distributed to the compute nodes.

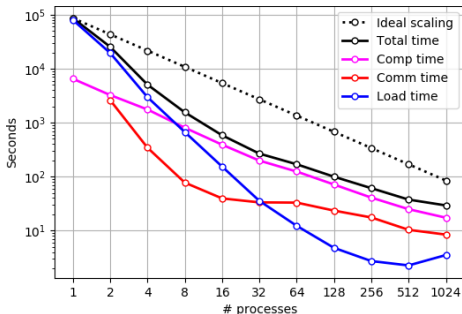
Process communication



Larege-scale experiment



- Cori @ NERSC: ranked 16th in the world by top500.org
- Network: 80K nodes, 268K links, 15K sources, demand 500 vhp per source.
- Simulated for 1000 time steps.



Thank you!

Code

- **OTM:** github.com/ggomes/otm-sim
- **OTM-MPI:** github.com/ggomes/otm-mpi

Publications

- Gabriel Gomes (2020) *A framework for hybrid simulation of transportation networks*, Journal of Simulation.
- Gabriel Gomes, Juliette Ugirumurera, Xiaoye Li. (2020) *Distributed simulation of macroscopic traffic models for large networks*. IEEE Intelligent Transportation Systems Conference.