

Eclipse SUMO – Simulation of Urban Mobility

Dr. Robert Hilbrich

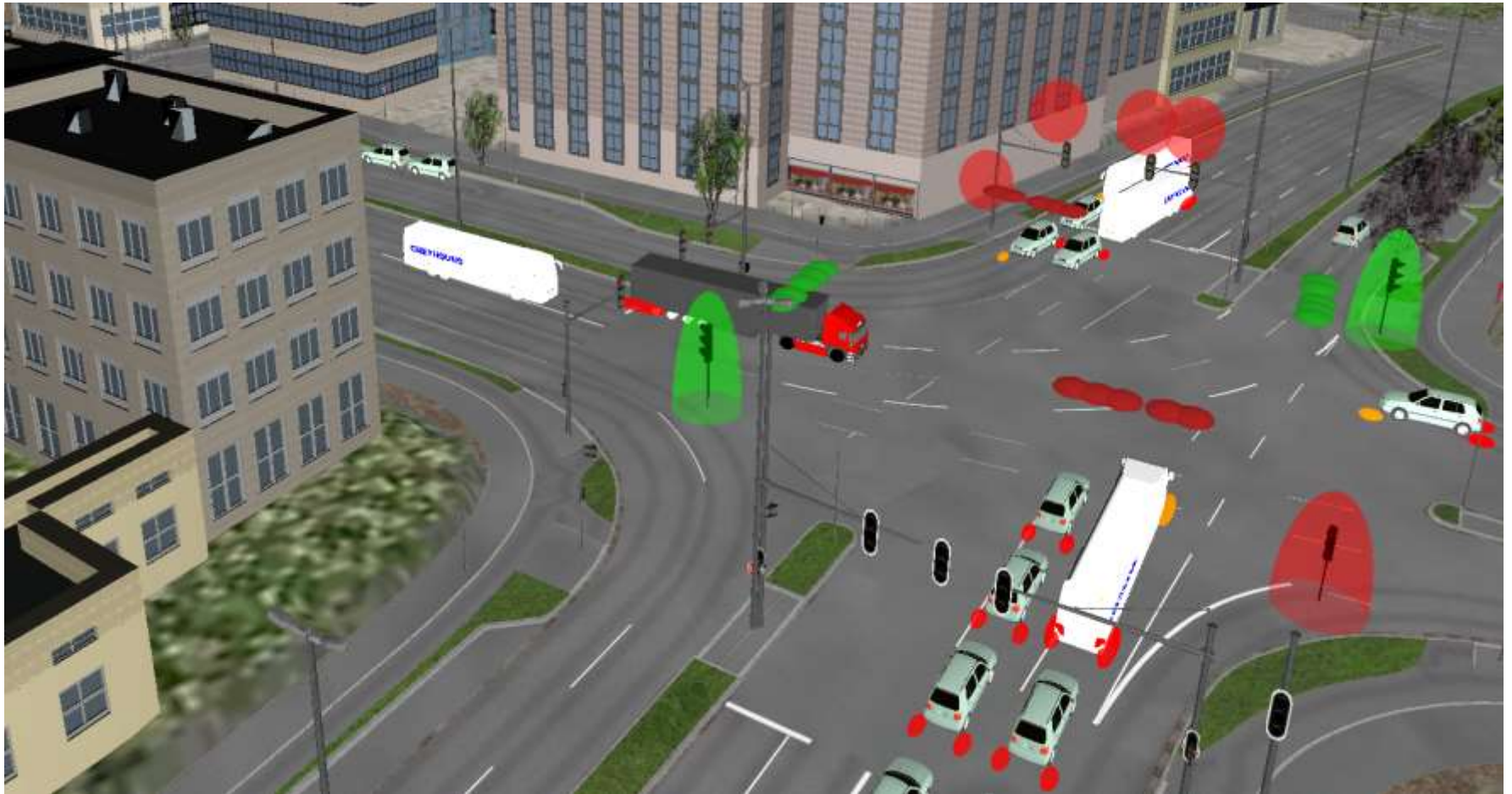
Knowledge for Tomorrow





**Research in
Real World Mobility**

Simulation of Urban Mobility (SUMO) - A Real World Traffic Simulator



3D version



SUMO – What is it?

- DLR's open source microscopic transportation system simulation software
- Under development since 2001, with the explicit goal to simulate even large cities / areas in more than real-time
- SUMO comes with a full-fledged suite of helper programs that do setting up, running, and controlling such a simulation



2D version



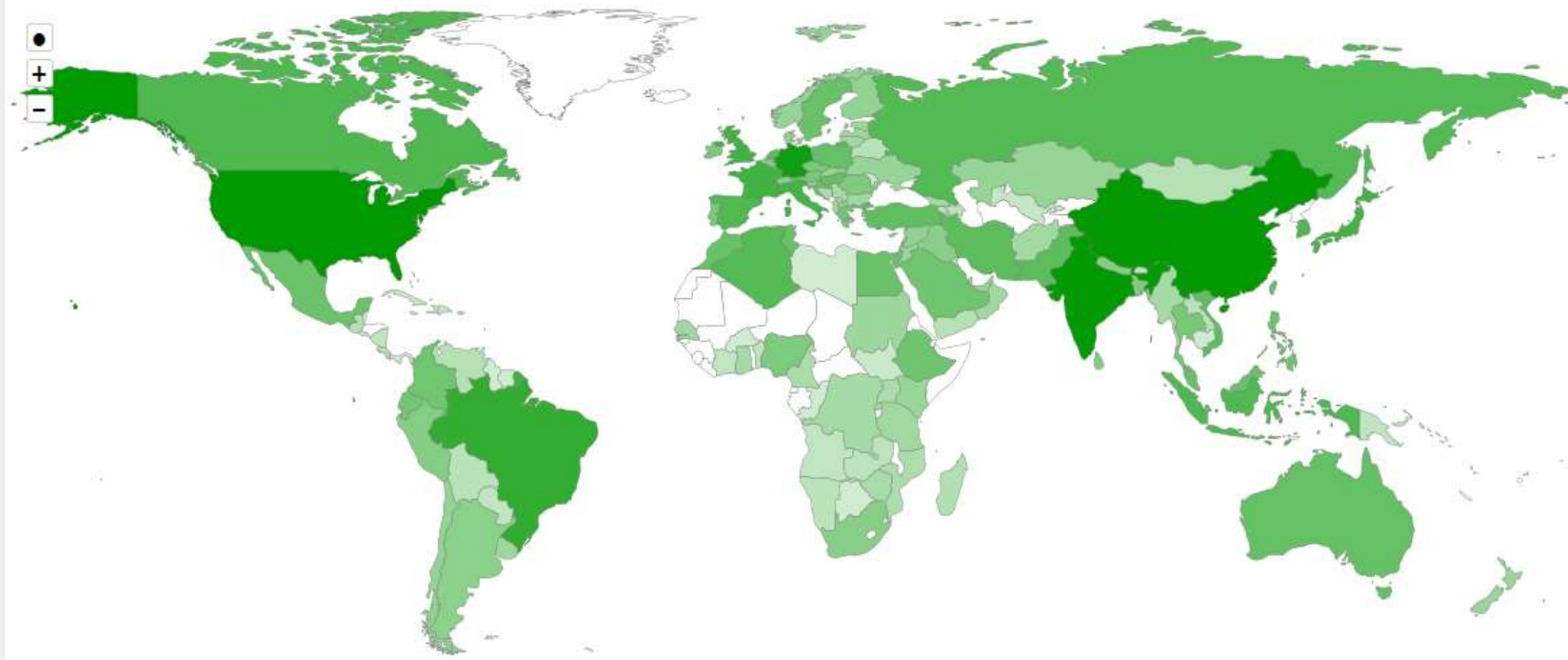
Open Source since the beginning

- Used world-wide, especially in the scientific community
- 15k hits on Google Scholar for 'sumo traffic'
- Downloads last year: > 45 000

Download Statistics

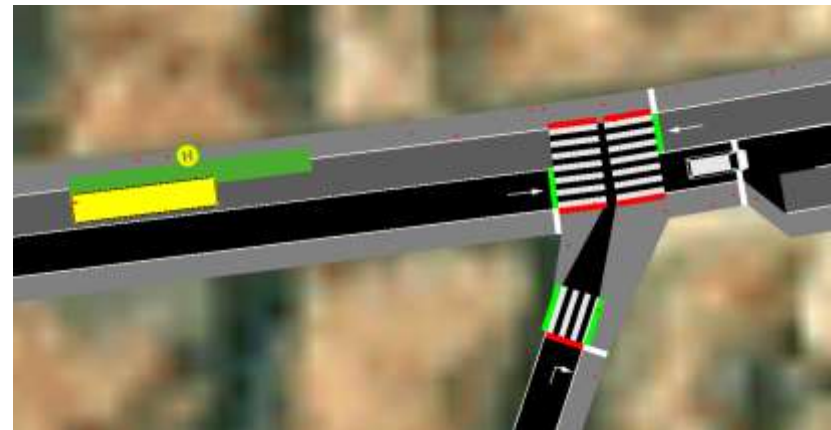
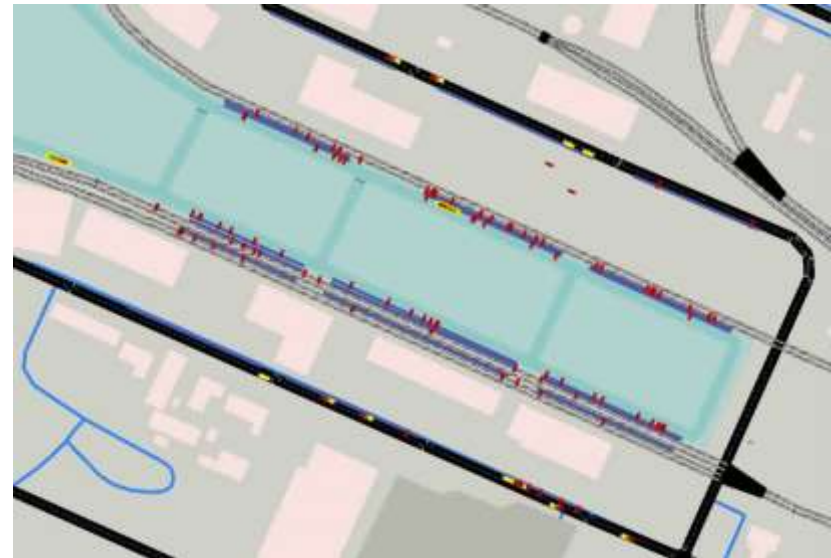
[All Files \(Change File\)](#)

Date Range: 2018-02-11 to 2019-02-10

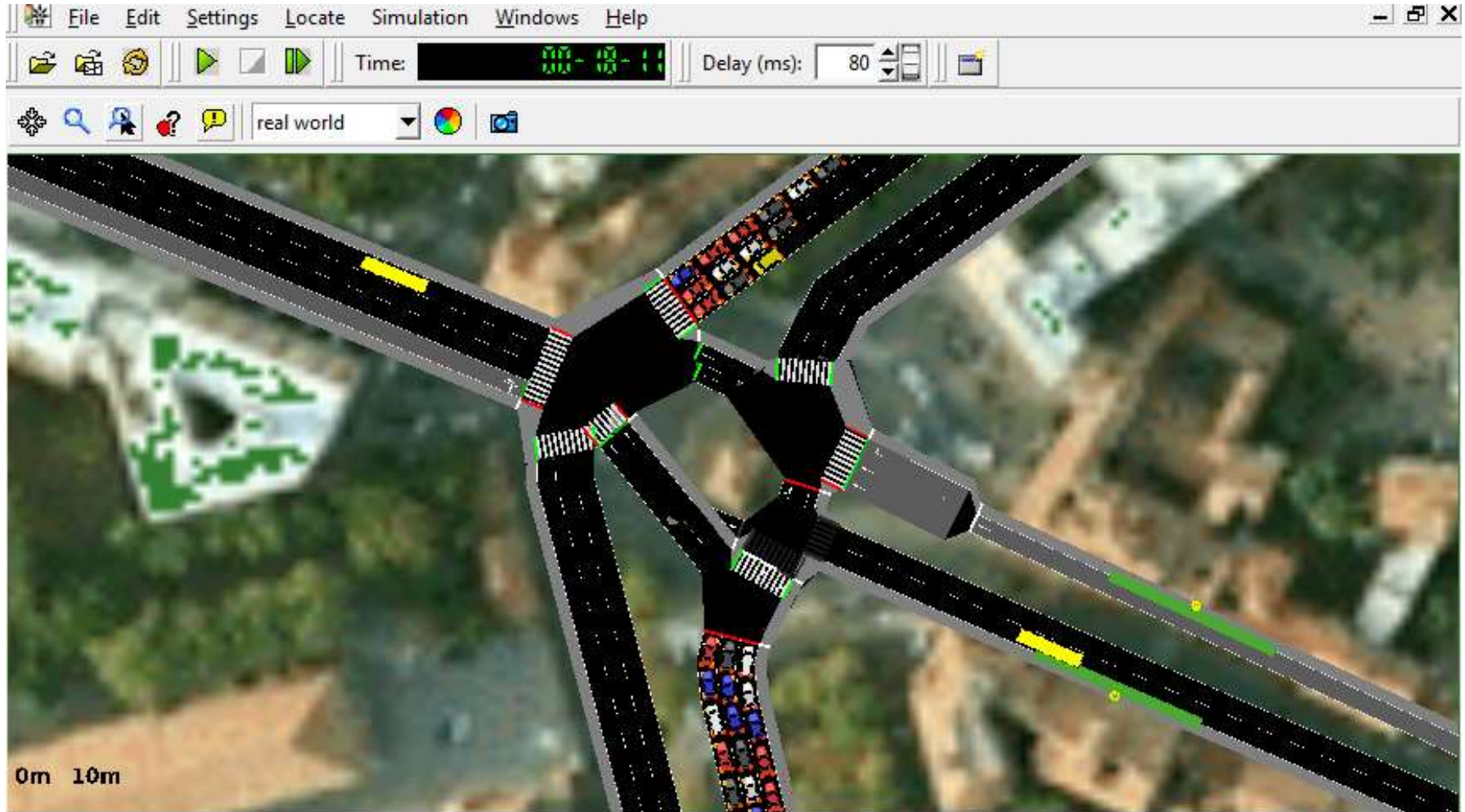


SUMO – what can be run?

- (Almost) any moving object in a city can be simulated with SUMO
 - Cars,
 - Busses,
 - Passengers,
 - Bicycles,
 - Pedestrians,
 - Ships,
 - Goods traffic,
 - ...

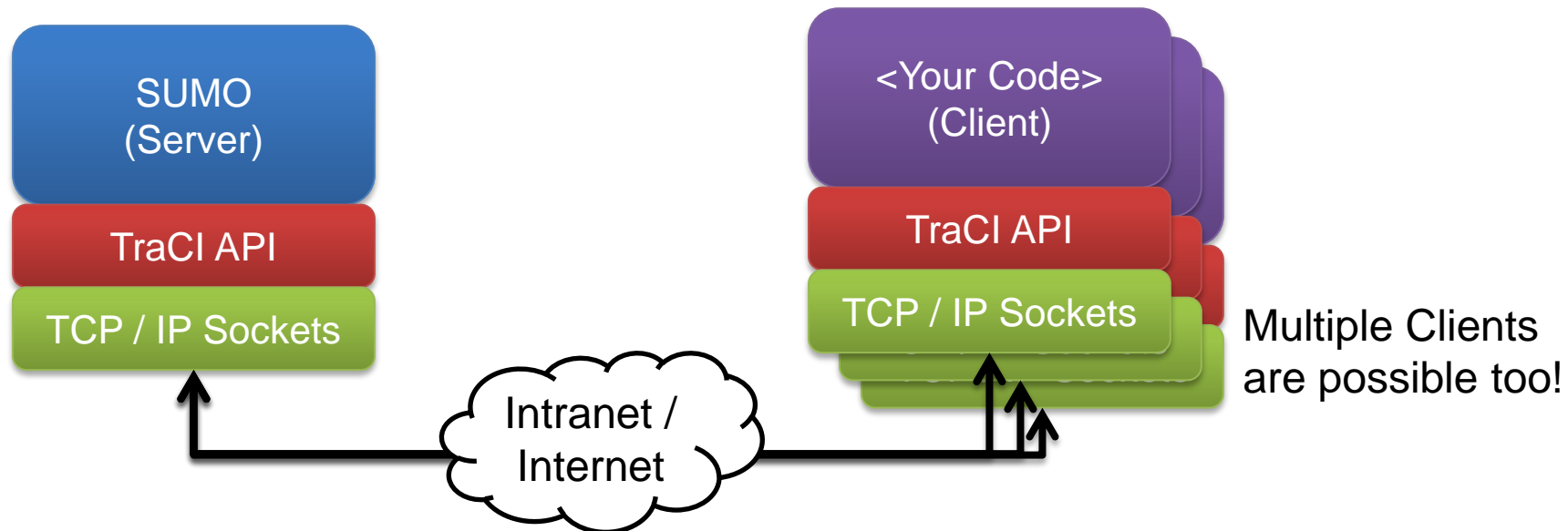


City of Bologna

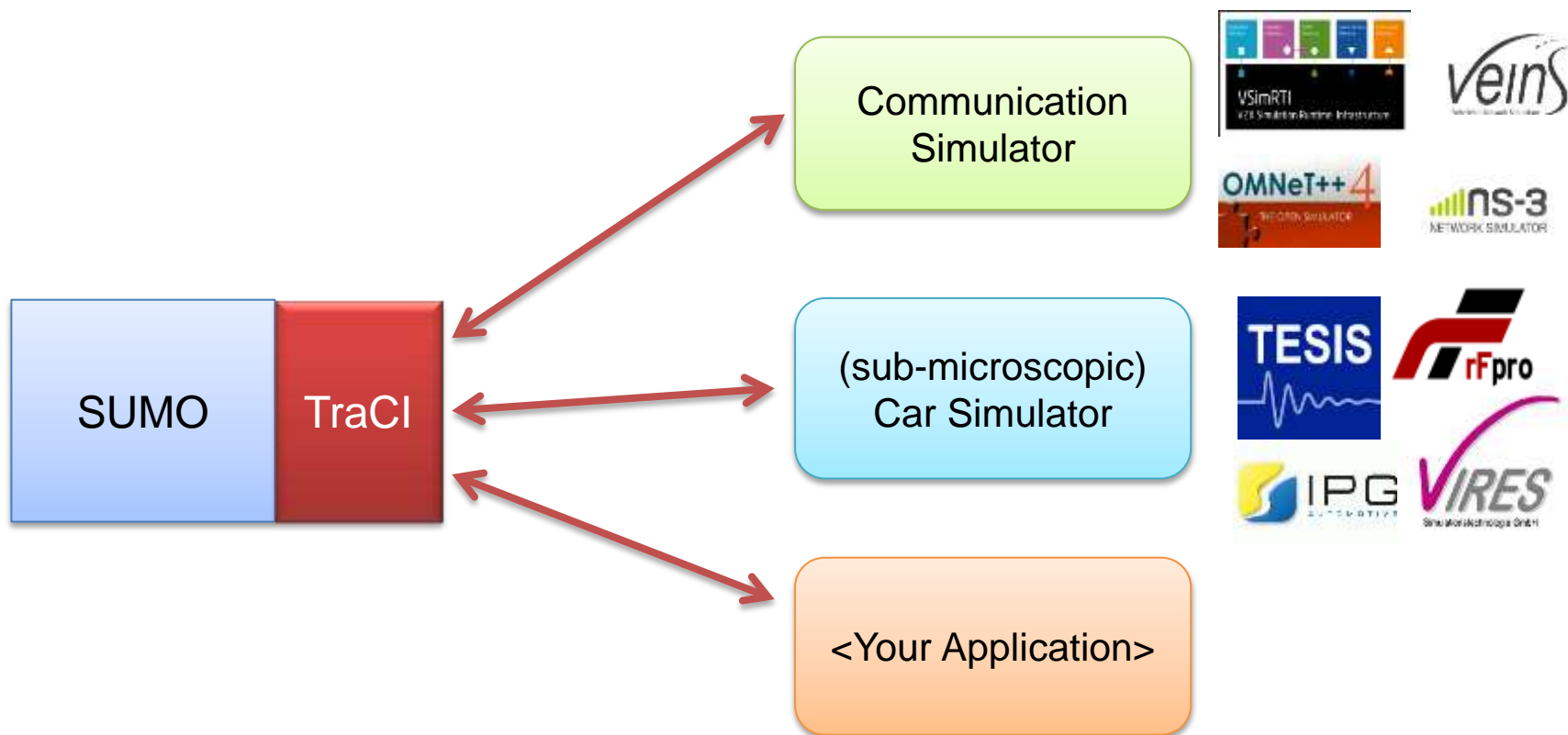


Dynamically Control Your SUMO Simulation: TraCI – Traffic Control Interface

- Retrieve information from a simulation on run-time
- Change the behavior of objects within the simulation on run-time
- TraCI = TCP/IP socket communication + standardized message format
- Clients can be implemented in C++, Java, Python, and Matlab



Interfacing SUMO with other Simulators – “Co-Simulation”



Driving Simulation



AI + SUMO = FLOW

Flow: Deep Reinforcement Learning for Control in SUMO

18 pages • Published: June 25, 2018

Nishant Kheterpal, Kanaad Parvate, Cathy Wu, Aboudy Kreidieh, Eugene Vinitsky and Alexandre Bayen

Abstract

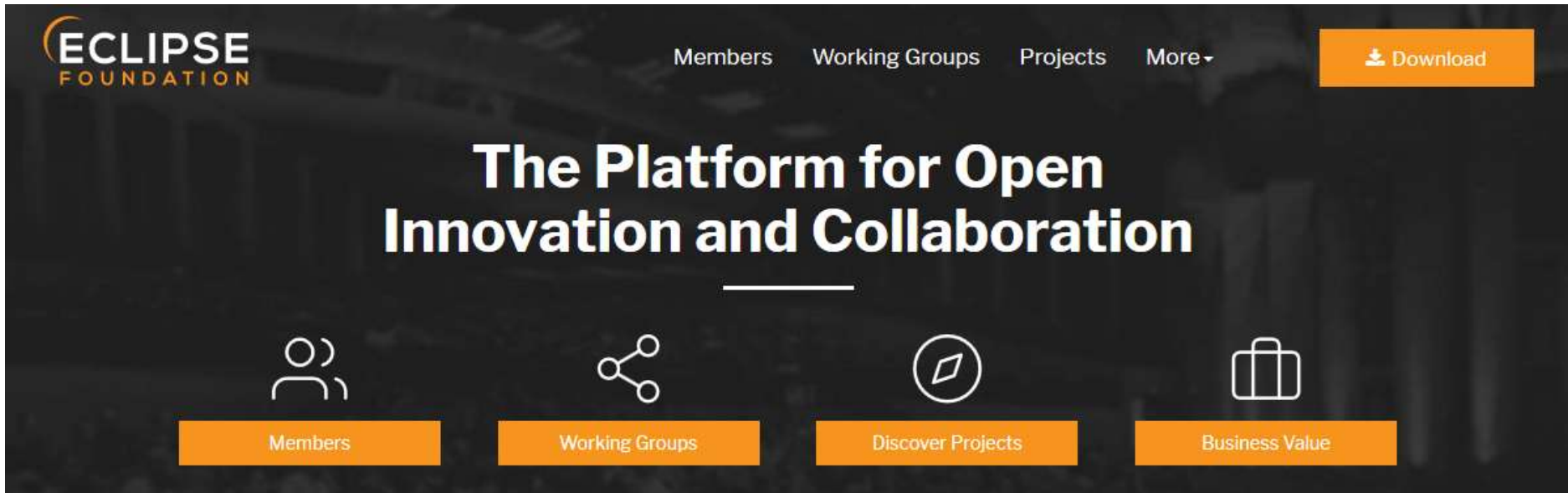
We detail the motivation and design decisions underpinning Flow, a computational framework integrating SUMO with the deep reinforcement learning libraries rllab and RLlib, allowing researchers to apply deep reinforcement learning (RL) methods to traffic scenarios, and permitting vehicle and infrastructure control in highly varied traffic environments. Users of Flow can rapidly design a wide variety of traffic scenarios in SUMO, enabling the development of controllers for autonomous vehicles and intelligent infrastructure across a broad range of settings.

Flow facilitates the use of policy optimization algorithms to train controllers that can optimize for highly customizable traffic metrics, such as traffic flow or system-wide average velocity. Training reinforcement learning agents using such methods requires a massive amount of data, thus simulator reliability and scalability were major challenges in the development of Flow. A contribution of this work is a variety of practical techniques for overcoming such challenges with SUMO, including parallelizing policy rollouts, smart exception and collision handling, and leveraging subscriptions to reduce computational overhead.

<https://easychair.org/publications/paper/FBQq>



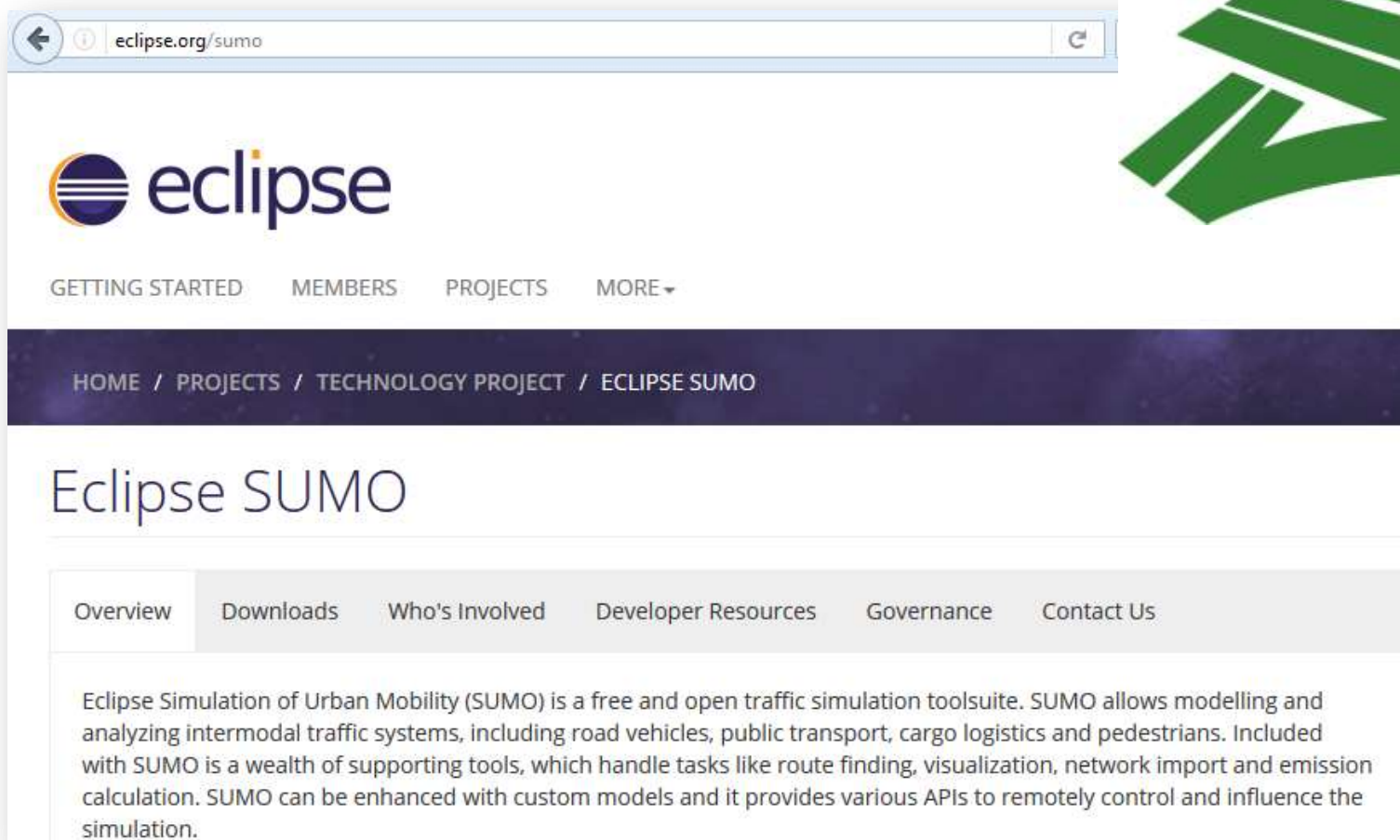
Eclipse Foundation



Provides IP services, infrastructure and governance models for business-friendly open source software.



Eclipse SUMO Project



The screenshot shows a web browser window with the address bar displaying `eclipse.org/sumo`. The Eclipse logo is visible in the top left, and a navigation menu includes `GETTING STARTED`, `MEMBERS`, `PROJECTS`, and `MORE`. A breadcrumb trail reads `HOME / PROJECTS / TECHNOLOGY PROJECT / ECLIPSE SUMO`. The main heading is `Eclipse SUMO`. Below it is a horizontal menu with `Overview`, `Downloads`, `Who's Involved`, `Developer Resources`, `Governance`, and `Contact Us`. The `Overview` section contains the following text:

Eclipse Simulation of Urban Mobility (SUMO) is a free and open traffic simulation toolsuite. SUMO allows modelling and analyzing intermodal traffic systems, including road vehicles, public transport, cargo logistics and pedestrians. Included with SUMO is a wealth of supporting tools, which handle tasks like route finding, visualization, network import and emission calculation. SUMO can be enhanced with custom models and it provides various APIs to remotely control and influence the simulation.



<http://eclipse.org/sumo>



Industry Consortium: openMobility



- SUMO User Conference 2019 (May 13-15) in Berlin (<https://sumo.dlr.de/2019>)
- openMobility Working Group Kick-Off (May 13) in Berlin
- More Information: <https://openmobility.eclipse.org>



Q & A

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 @EclipseSUMO

