Björn Schünemann

VSIMRTI

VEHICLE-2-X SIMULATION RUNTIME INFRASTRUCTURE
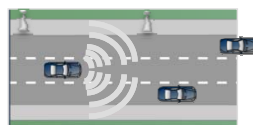
SUMO WORKSHOP, 11./12.11.2010, BERLIN

Aspects for the simulation of V2X scenarios

Movements of the vehicles
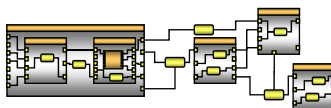
Wireless communication

V2X applications

Further aspects

Performance decrease

Requirements for a V2X Simulation Architecture

- One overall simulator not sufficient for most V2X scenarios
  - **Coupling of different simulation tools necessary**

- Different V2X scenarios and applications vary in their requirements for the simulation tools
  - **Flexibility to exchange simulators**
 - **Easy integration of further simulators**

## V2X Simulation Runtime Infrastructure (VSimRTI)

Simulation runtime infrastructure (RTI) with common interfaces for simulator coupling based on IEEE Standard for Modeling and Simulation High Level Architecture (HLA)

Central management by the simulation runtime infrastructure to handle simulators' synchronization, interaction, and lifecycle management
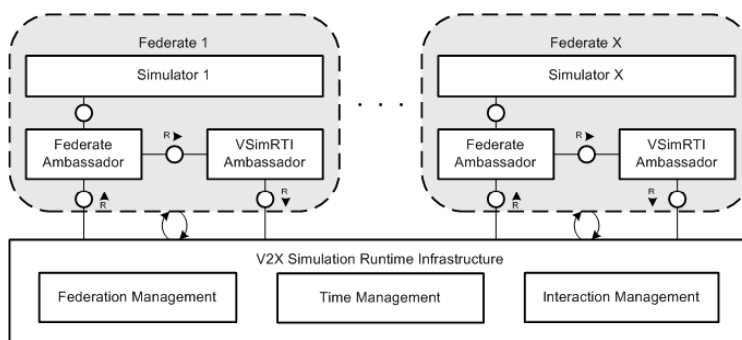
- **Advantages**
- Coupling of several best-in class simulators
- Flexibility to select most appropriate simulator at run-time
- Re-use of existing applications
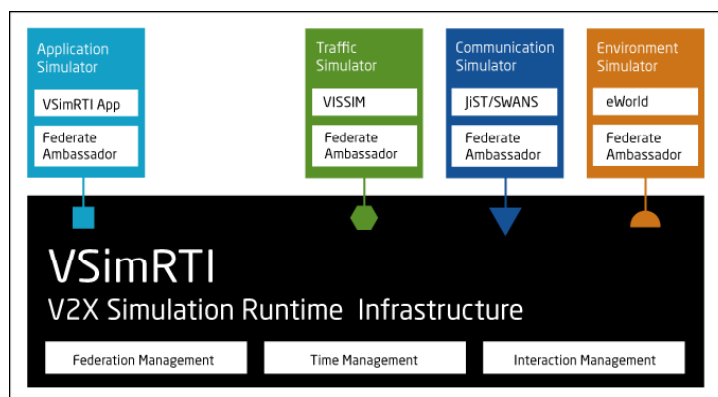
VSimRTI Architecture
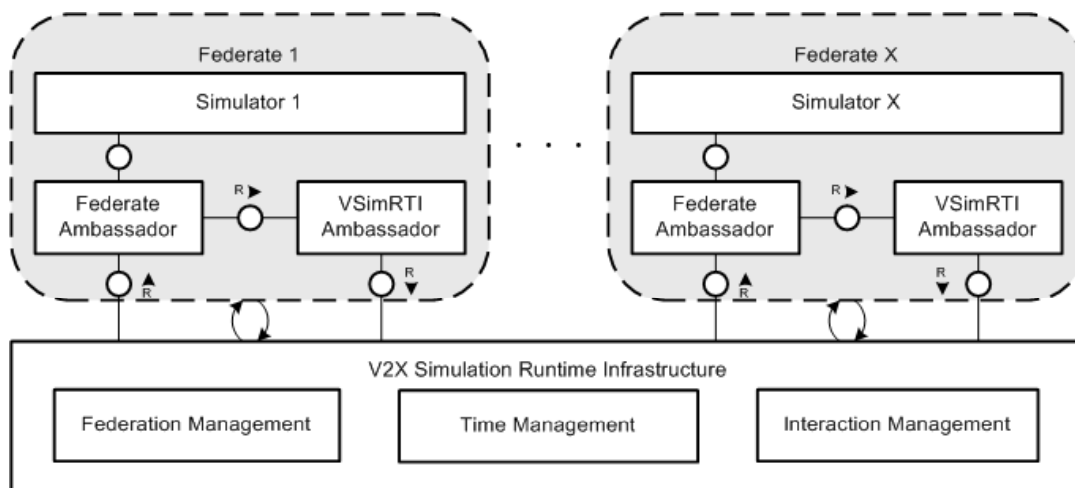
Integrated Simulators

Traffic: VISSIM, SUMO
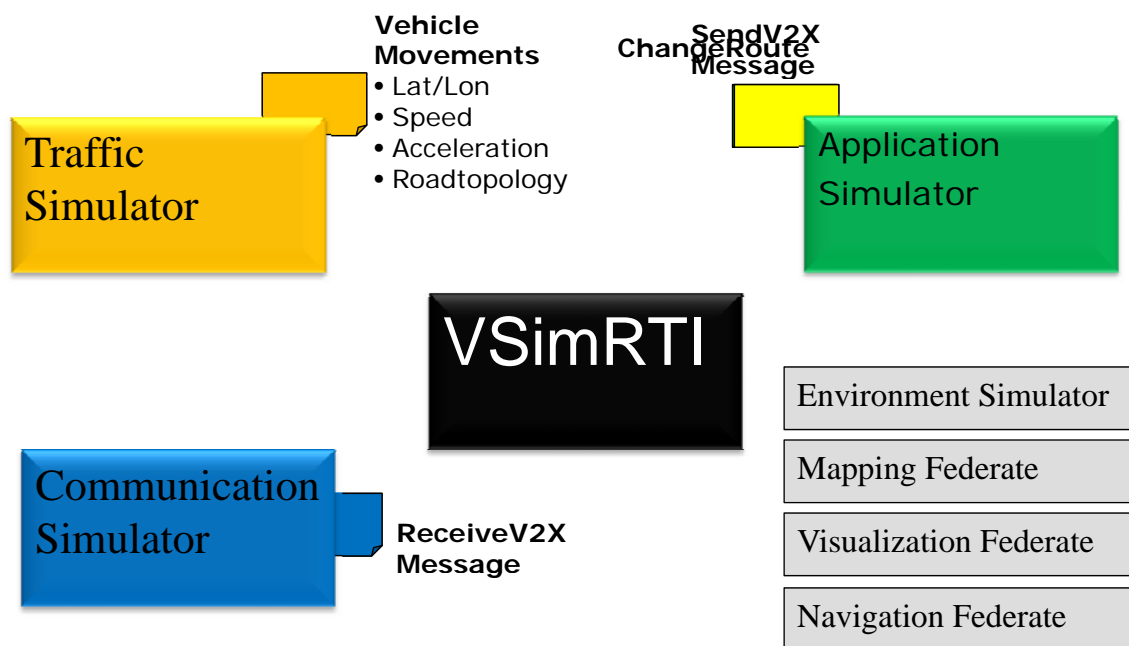
Communication: JiST/SWANS, OMNeT++, OPNET

Application: VSimRTI_App

Environment: eWorld

Evaluation and visualization: VSimRTI tools

Emissions: PHEM

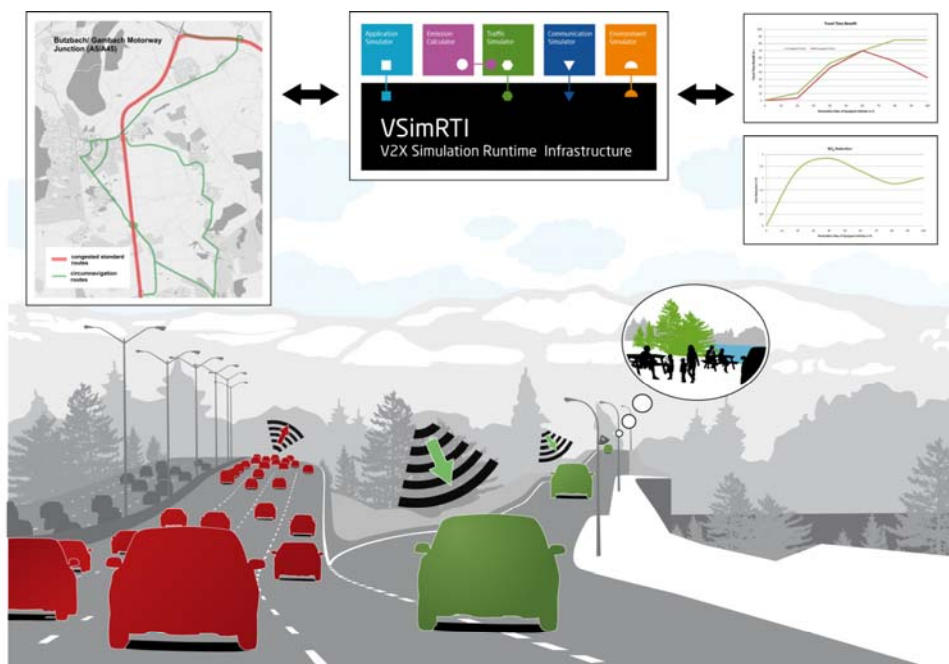## Simulation Message Flow

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VSimRTI Users

Automotive companies and research institutes

– Opel, VW

– TNO, DENSO, Cirquent

– University of Karlsruhe / Karlsruher Institut für Technologie

– Fraunhofer SIT, Uni Darmstadt, TU Muenchen
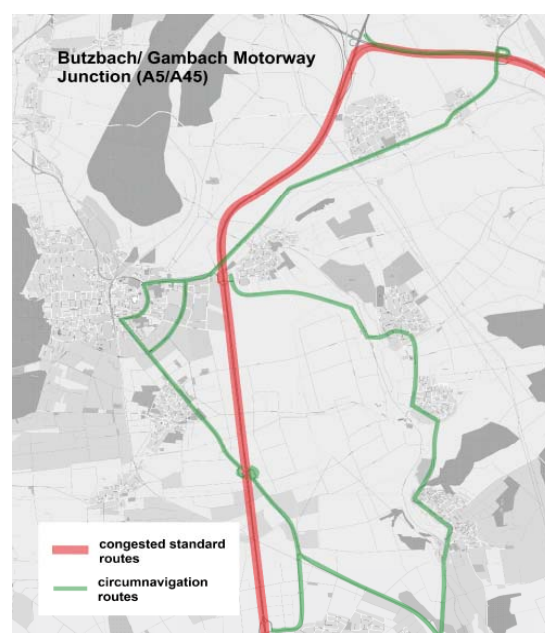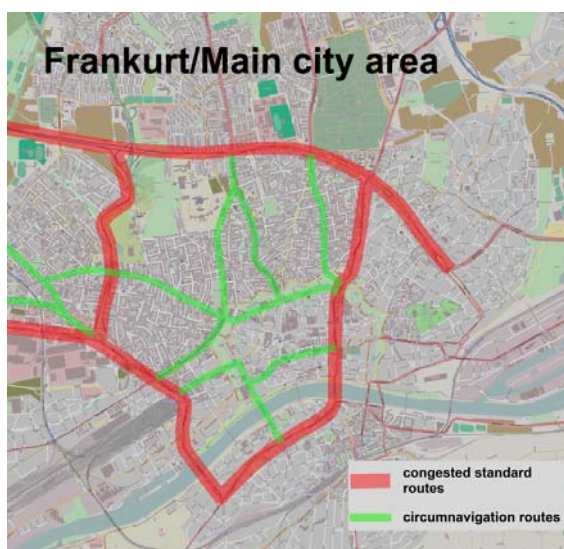
– HTW Saarland, DFKI, University of Surrey

Projects

– PRE-DRIVE C2X

  ■ Analysis of emissions and travel time benefits for different use cases

  ■ Regulatory and Contextual Speed Limit, Traffic Information and Recommended Itenary, Green Light Optimal Speed Advisory

– simTD

  ■ Technical analysis and validation with field test results
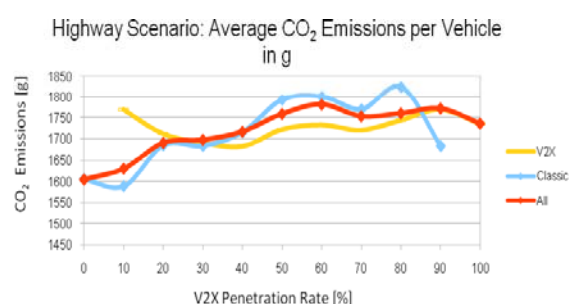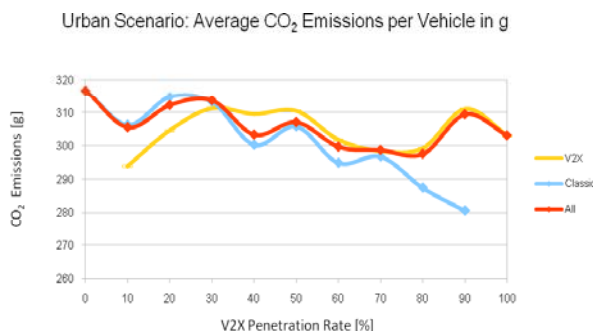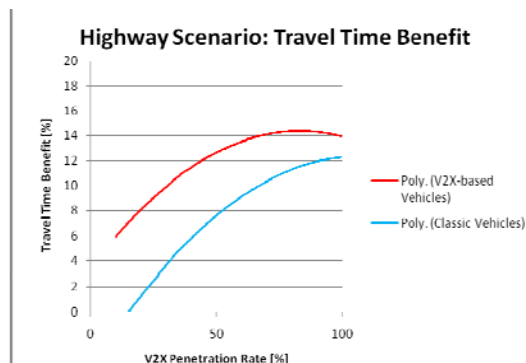
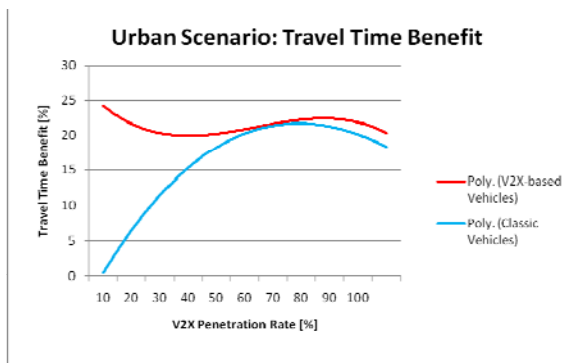# V2X-based Navigation
System to Optimize Travel Routes

Urban Scenario: Travel Time Benefit

Highway Scenario: Travel Time Benefit

Urban Scenario: Average CO_2 Emissions per Vehicle in g

Highway Scenario: Average CO_2 Emissions per Vehicle in g

V2X-based Hazardous Location Warning
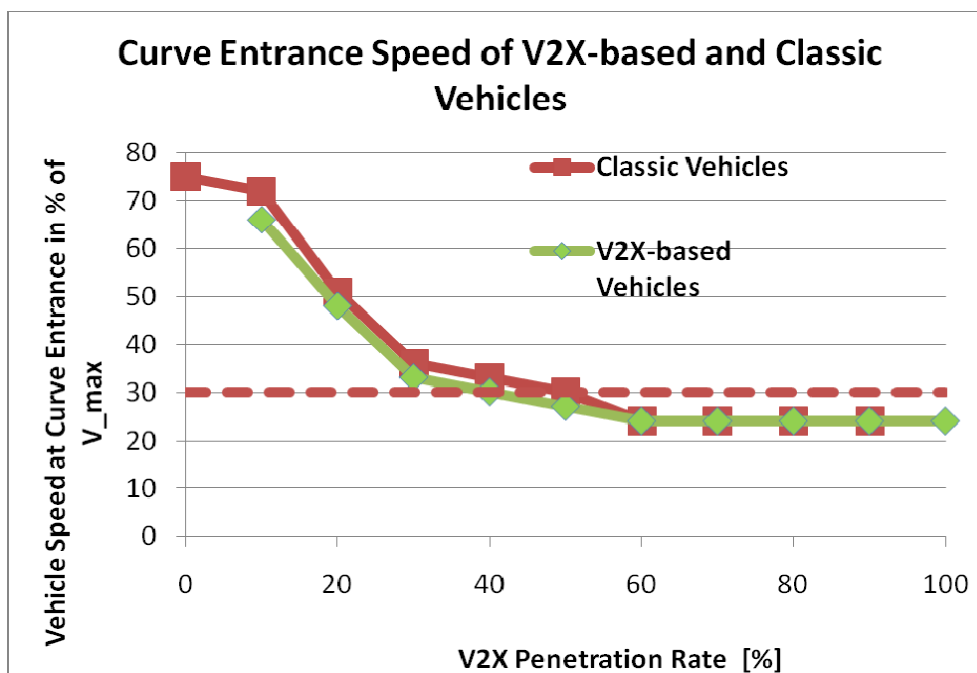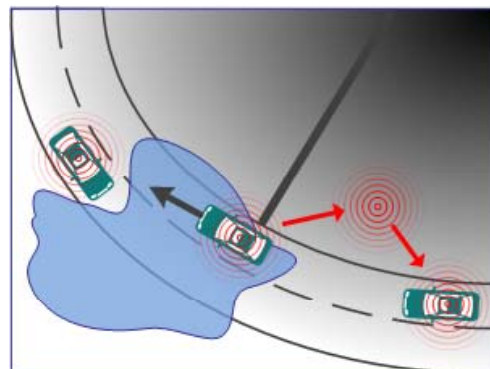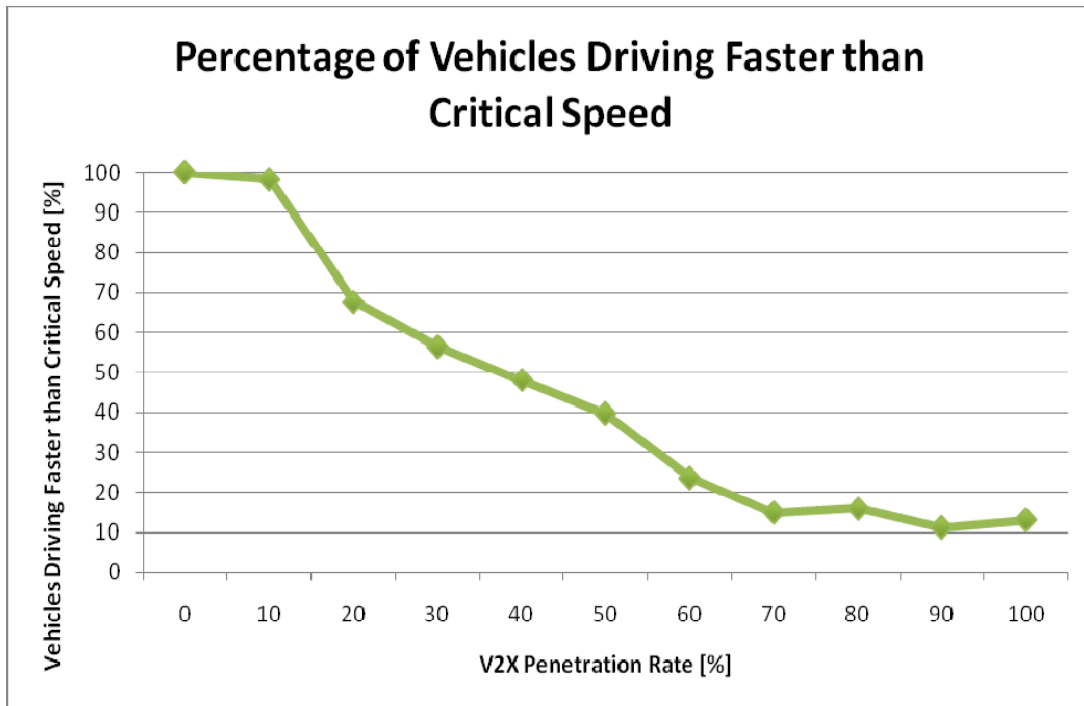
Application - Hazardous Location Warning

- Detects curve radius and weather related sensor data (e.g. about black ice).

- If black ice is detected in a curve, a DENM is sent containing:
  - Curve radius
  - Position data of the hazardous location

- V2X based vehicles use this received information to calculate a recommended speed

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Curve Entrance Speed of V2X-based and Classic Vehicles

Percentage of Vehicles Driving Faster than Critical Speed

Features of VSimRTI

High performance
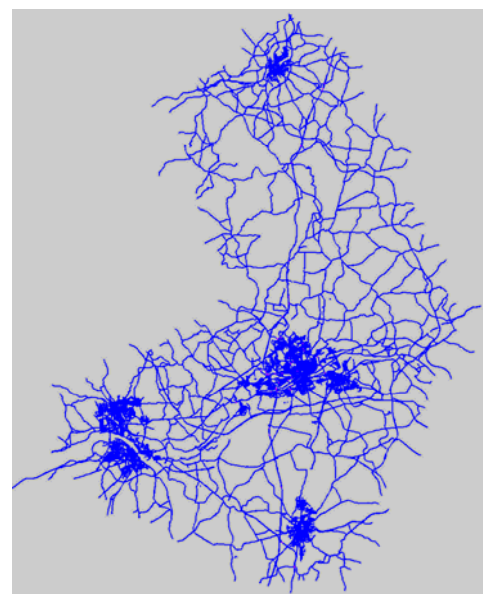Supports
    Traffic Lights
    Road Side Units
    CAM and DENM
Detailed road network data of city of Frankfurt and
    surroundings available
Great usability
    Enhanced user and developer documentation
    Various configuration options

Feature Requests for new SUMO Releases

- Dynamic route creation at runtime
- Dynamic vehicle type definition at runtime
- Simulation state saving and roll-back mechanisms in order to make optimistic simulations possible
- Possibility to simulate crashes

Contact

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