

Applied Research using Open Experiment Platform

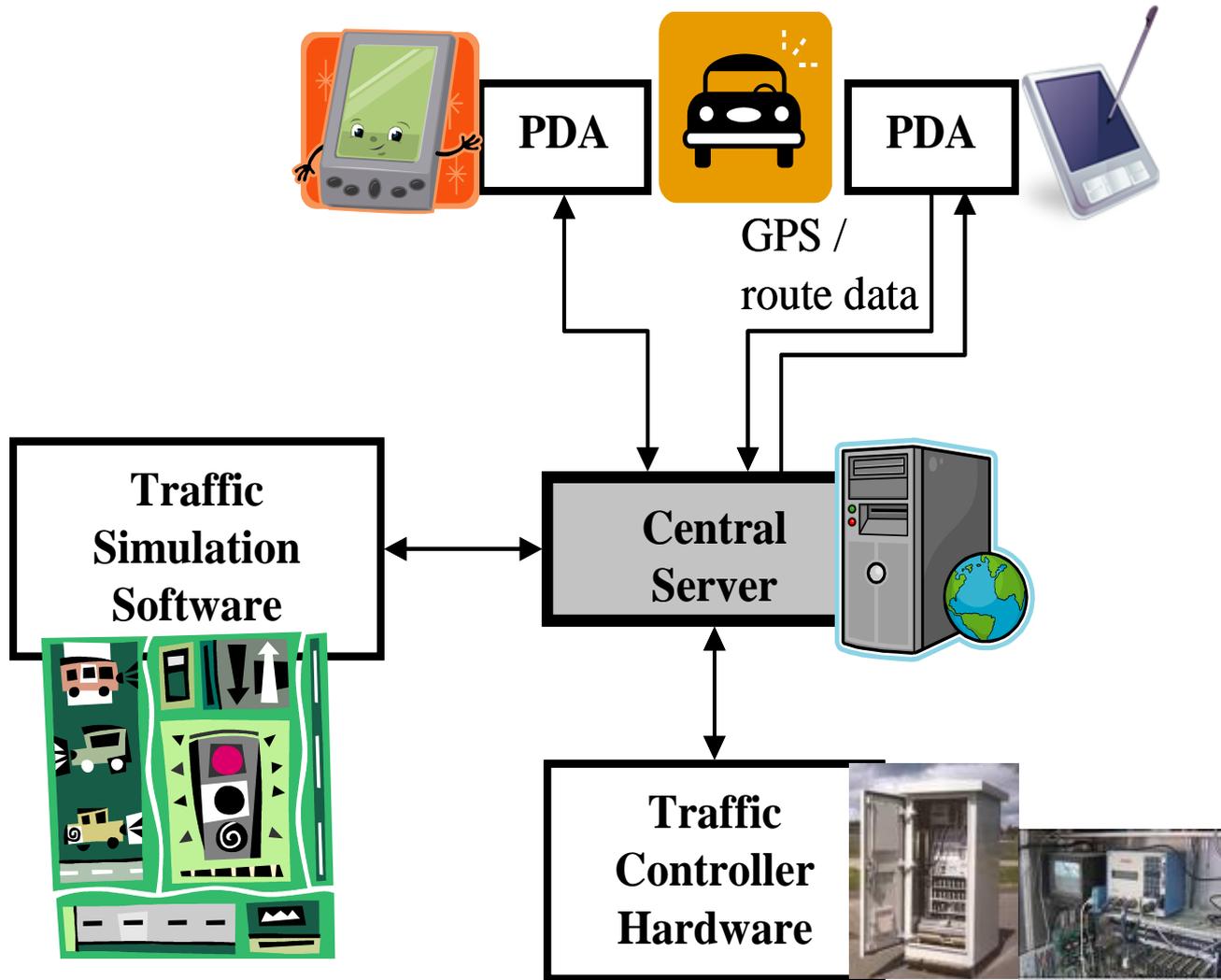
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University of Virginia

CPS Workshop 2011
March 17, Troy, MI

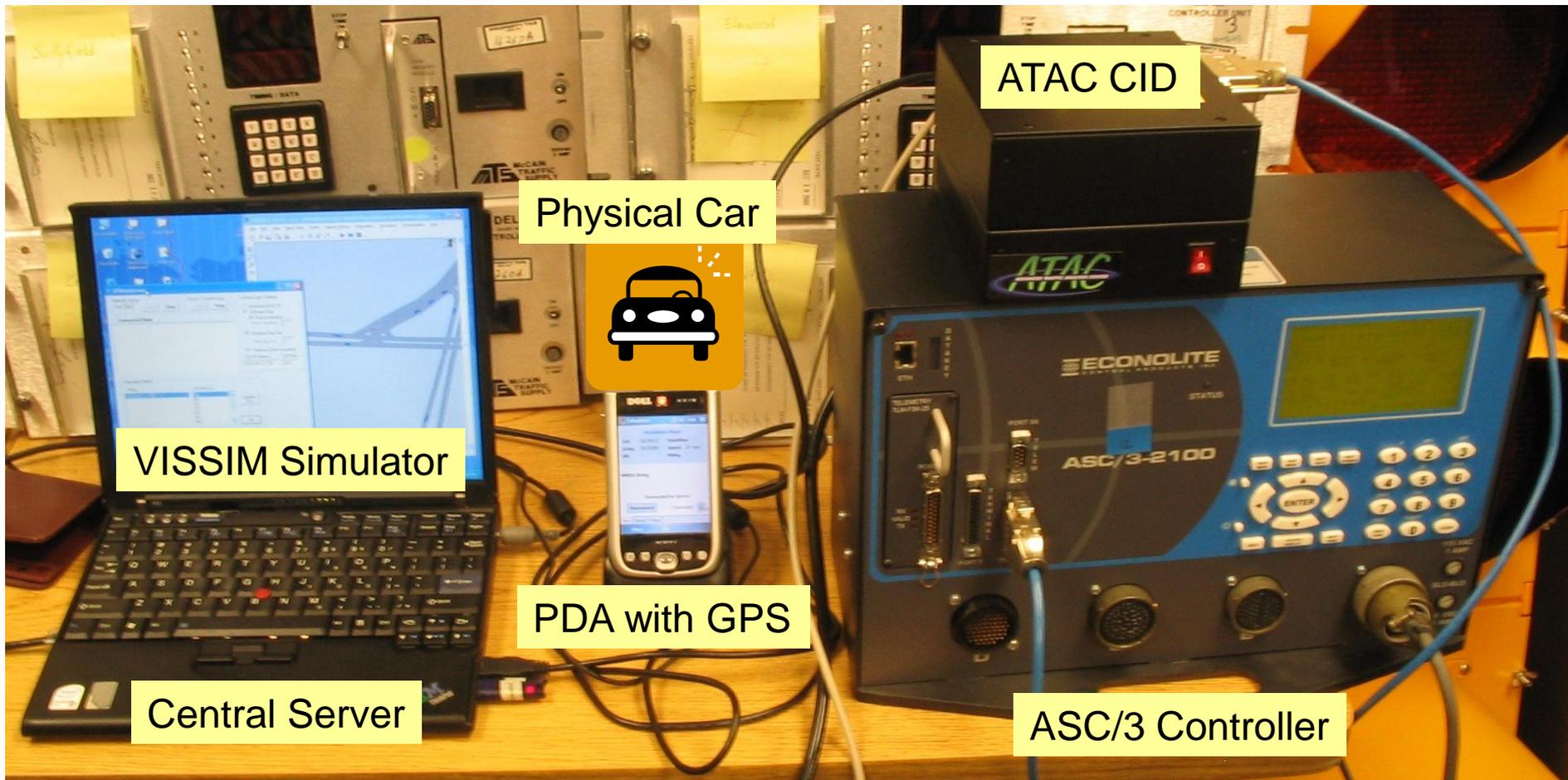
Applied Research at CTS UVA

- Center for Transportation Studies at the University of Virginia...
 - Hardware/Software in the Loop Simulation
 - Integrated Traffic and Wireless Communications Simulations Testbed

HILS/SILS Framework



HILS-based System Layout



Video Demo!

The screenshot displays the VISSIM 4.10-14 software interface. The main window shows a road network simulation with a grey background and road lines. A red line indicates a specific road segment, and green vertical lines mark specific points on the road. The interface includes a menu bar (File, Edit, View, Base Data, Traffic, Signal Control, Evaluation, Simulation, Presentation, Test) and a toolbar with various icons for file operations and simulation control.

In the foreground, the **GPSDataServer** window is open, showing the following settings:

- Network Server:** Port 9002, Start, Stop buttons.
- Vissim / Control Logic:** Start, Stop buttons.
- Control Logic Settings:**
 - Hardware (ASC/3)
 - Software Only
 - Run in real-time
 - Yellow Duration: 2.4
 - Dynamic Gap Out
 - Max Gap Out: 4.0
 - Dilemma Zone Correction
 - CID IP Address: 192.168.1.101
 - CID Port: 2822
- Connected Clients:** Empty list.
- Simulated Clients:**

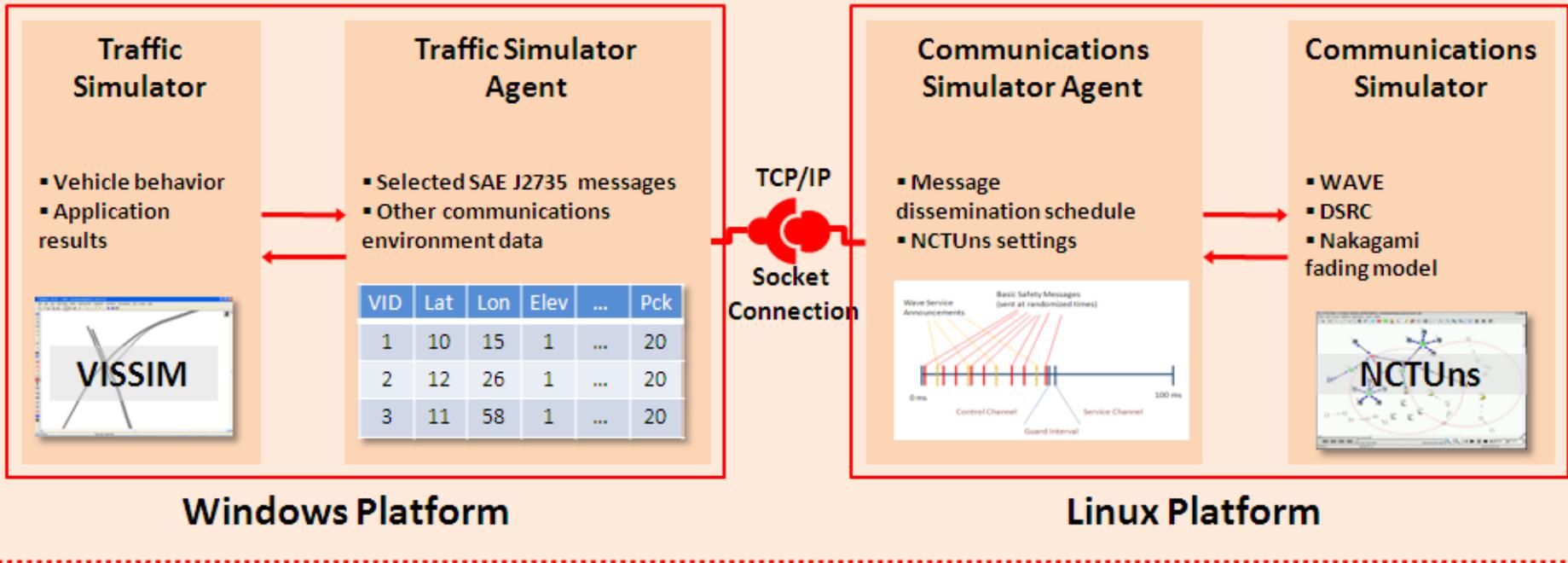
PDAs	VISSIM Car
169.254.2.1:1378 -1	4
	3
	2
	1

Update List, Set buttons.

The status bar at the bottom shows the following values: 210.4-362.1, 28.9, 0, 6, 1.0.

Integrating Traffic & Wireless Simulators (for Connected Vehicles)

IntelliDrive Simulation Environment



Research Resources

- Vehicle Hardware in the Loop
- Sensor simulation
- Distributed simulation architecture

TNO's Vehicle Hardware In the Loop

MATLAB
The Language of Technical Computing



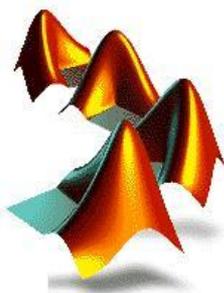
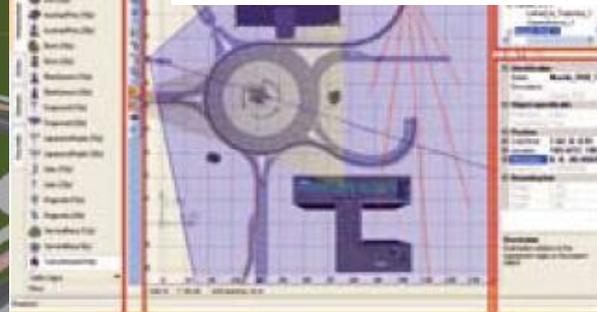
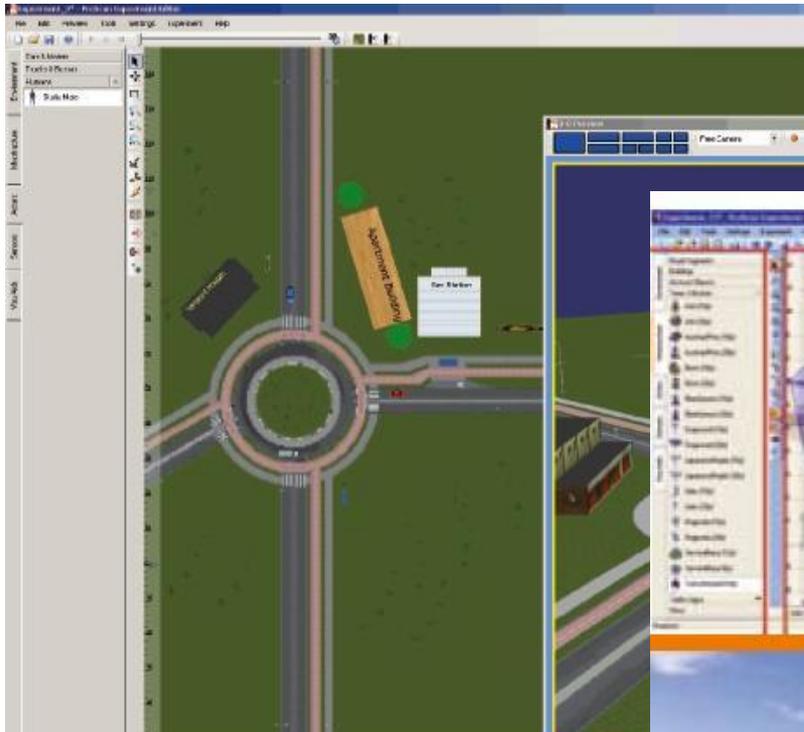
Simulates 2 milli-second interval,
or 20 milli-second without modeling tires

Very detail level – bridges traffic simulation
and actual road testing



TNO's PreScan

Simulation environment realizing
advanced sensing technologies
Integration with driving simulator and
human driver model



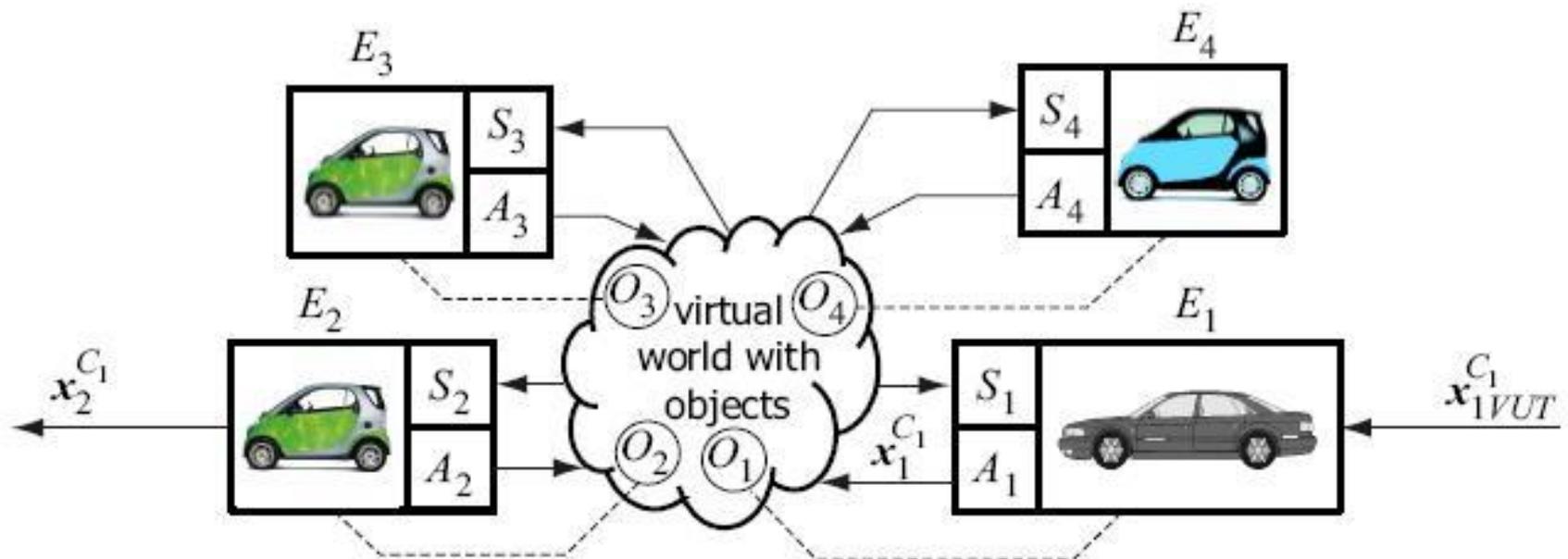
The MATLAB/SIMULINK



Multi-Agent Real-time Simulator

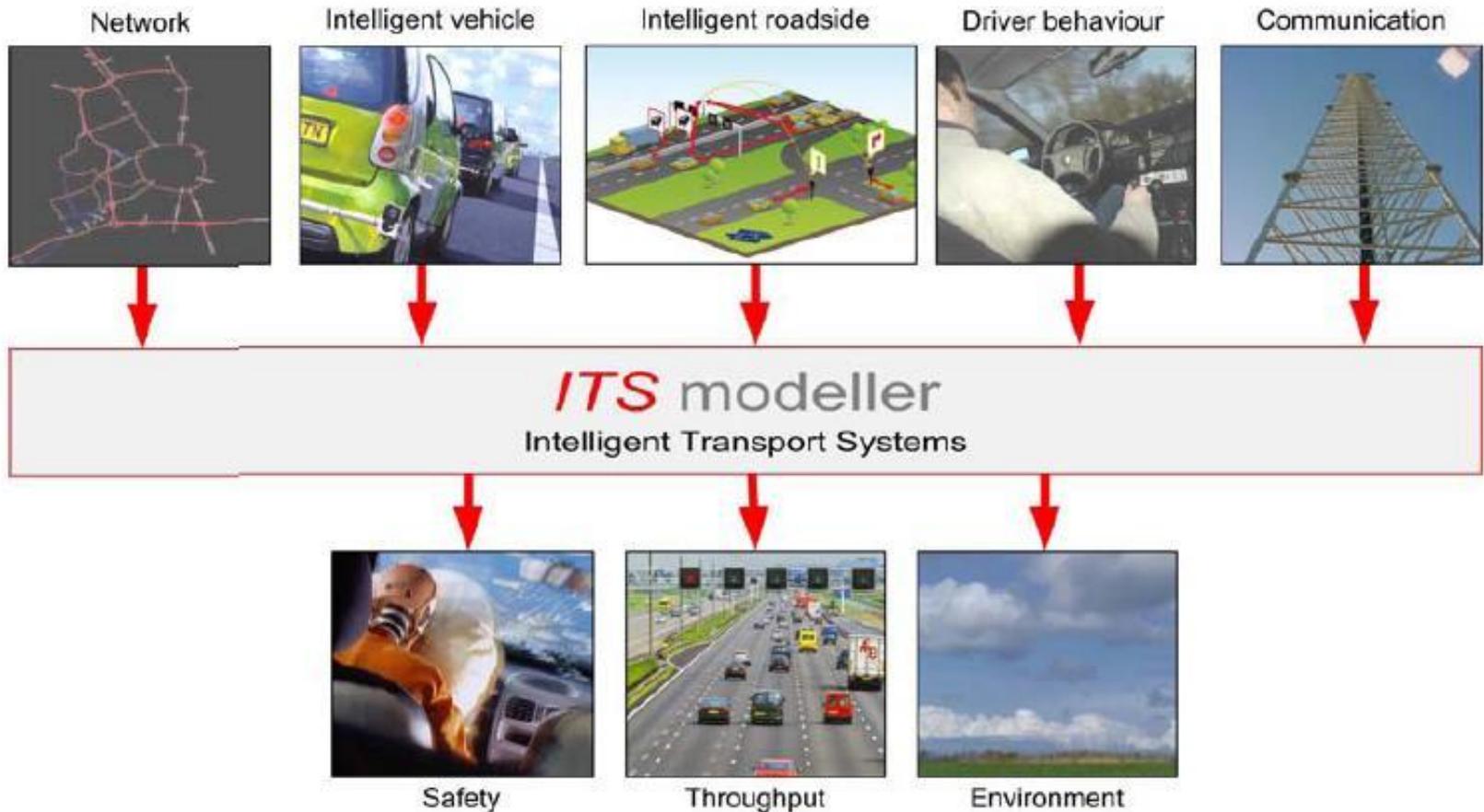
A continuous discrete event and multi-agent based distributed simulation environment

Amazing flexibility in integrating any agents including vehicles, drivers, sensors, communications, etc.



Integrated Modeling

ITS modeller: A modelling environment for Intelligent Transport Systems, including co-operative systems



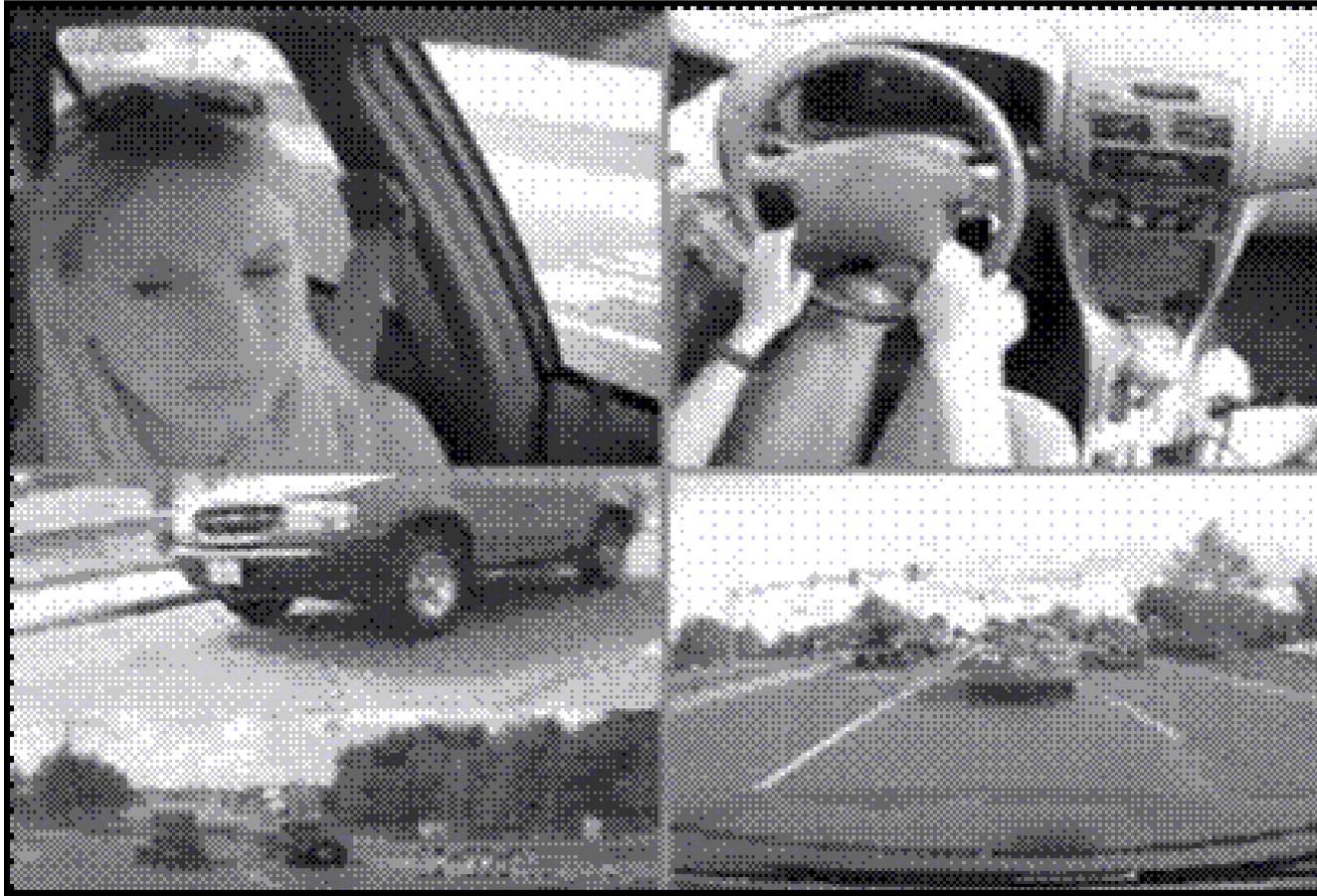
Driving Simulator & Instrumented Vehicle



Human factor research
– driving behaviors

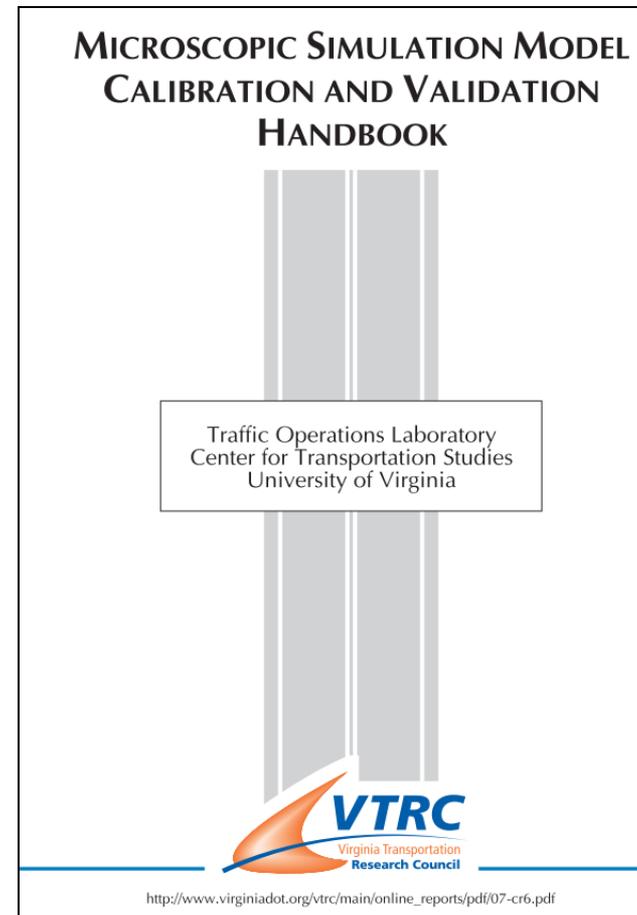
Applications of
integrated driver
assistance

100-Car Naturalistic Driving Study



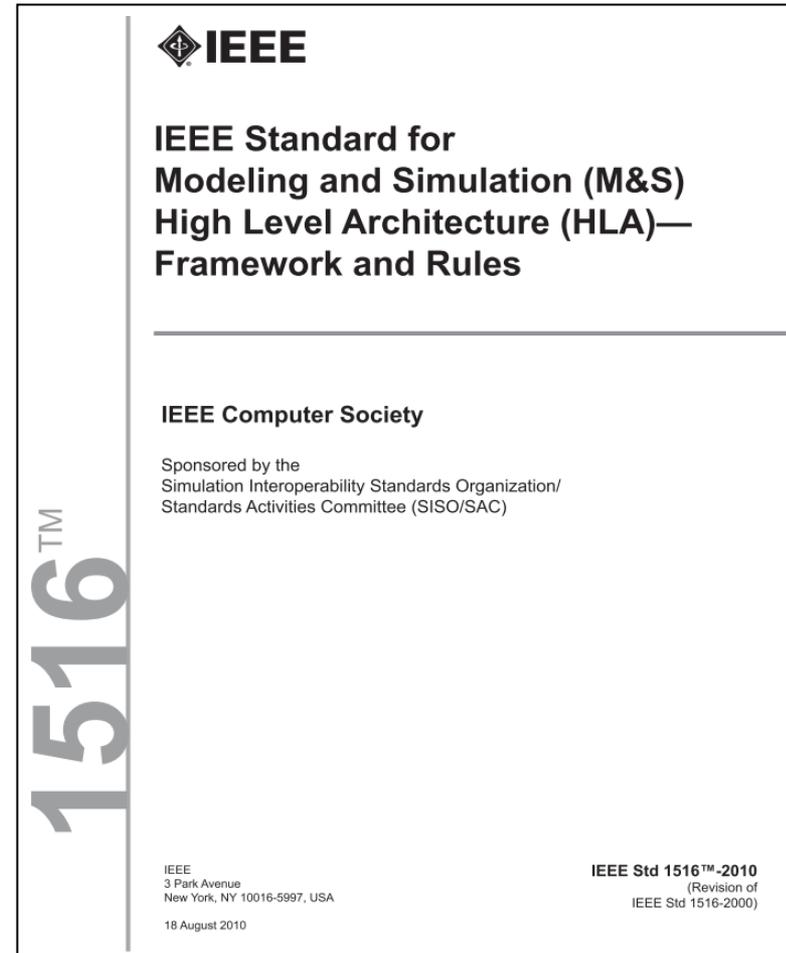
Some Challenges and Possible Solutions

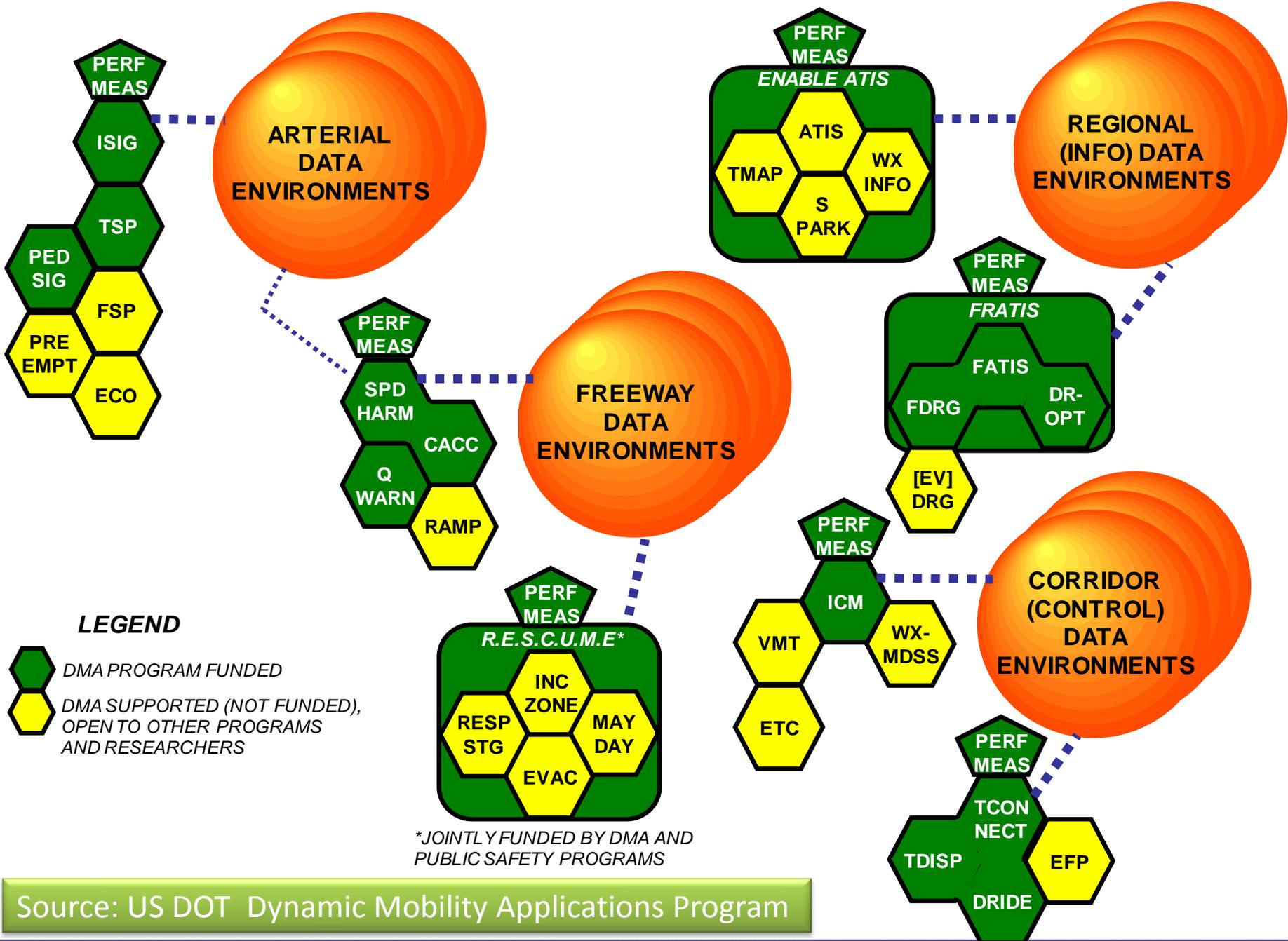
- Calibration and validation of simulation modeling tools or components



Some Challenges and Possible Solutions

- Interoperability among the customized codes developed by researchers





Source: US DOT Dynamic Mobility Applications Program