Distributed Driving Simulation Using A Modular Modeling Methodology

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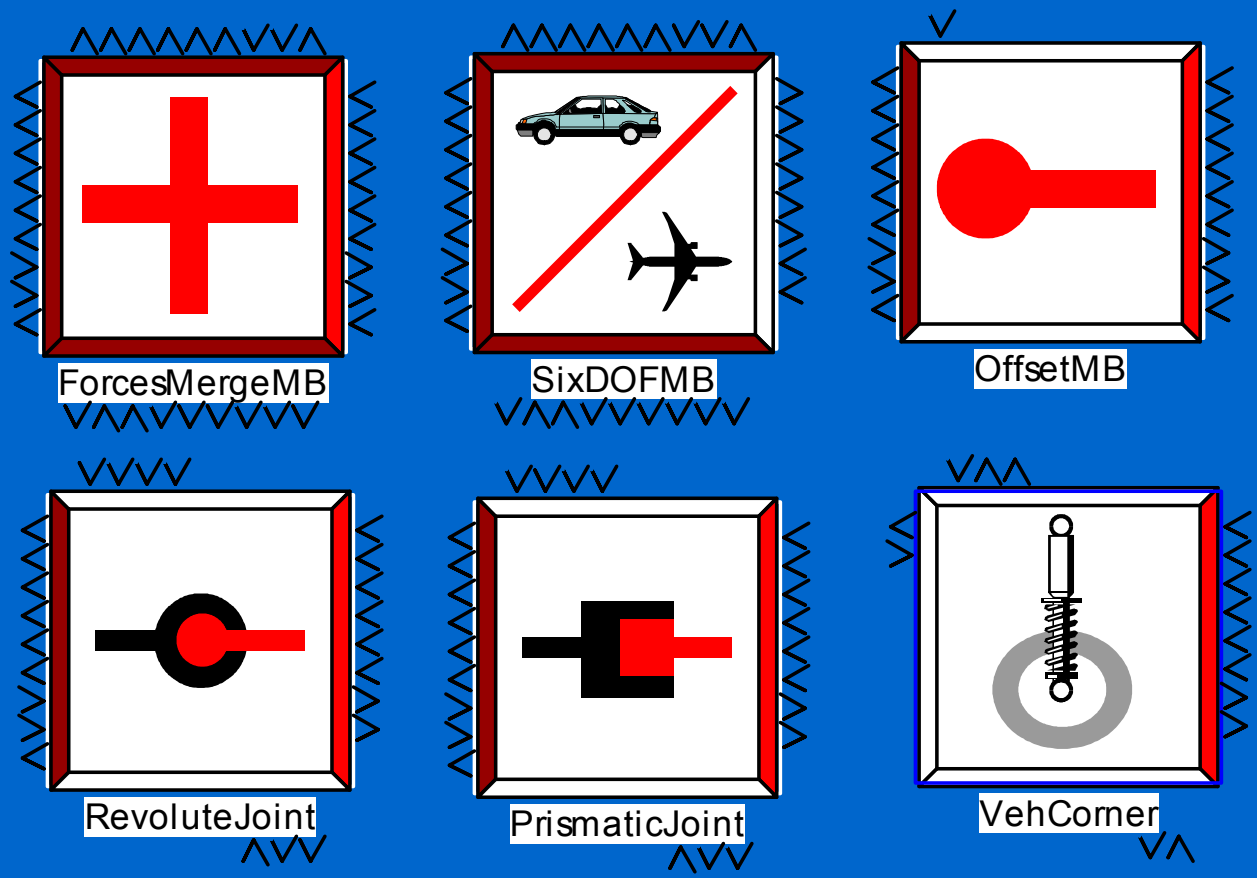
Goal of Work

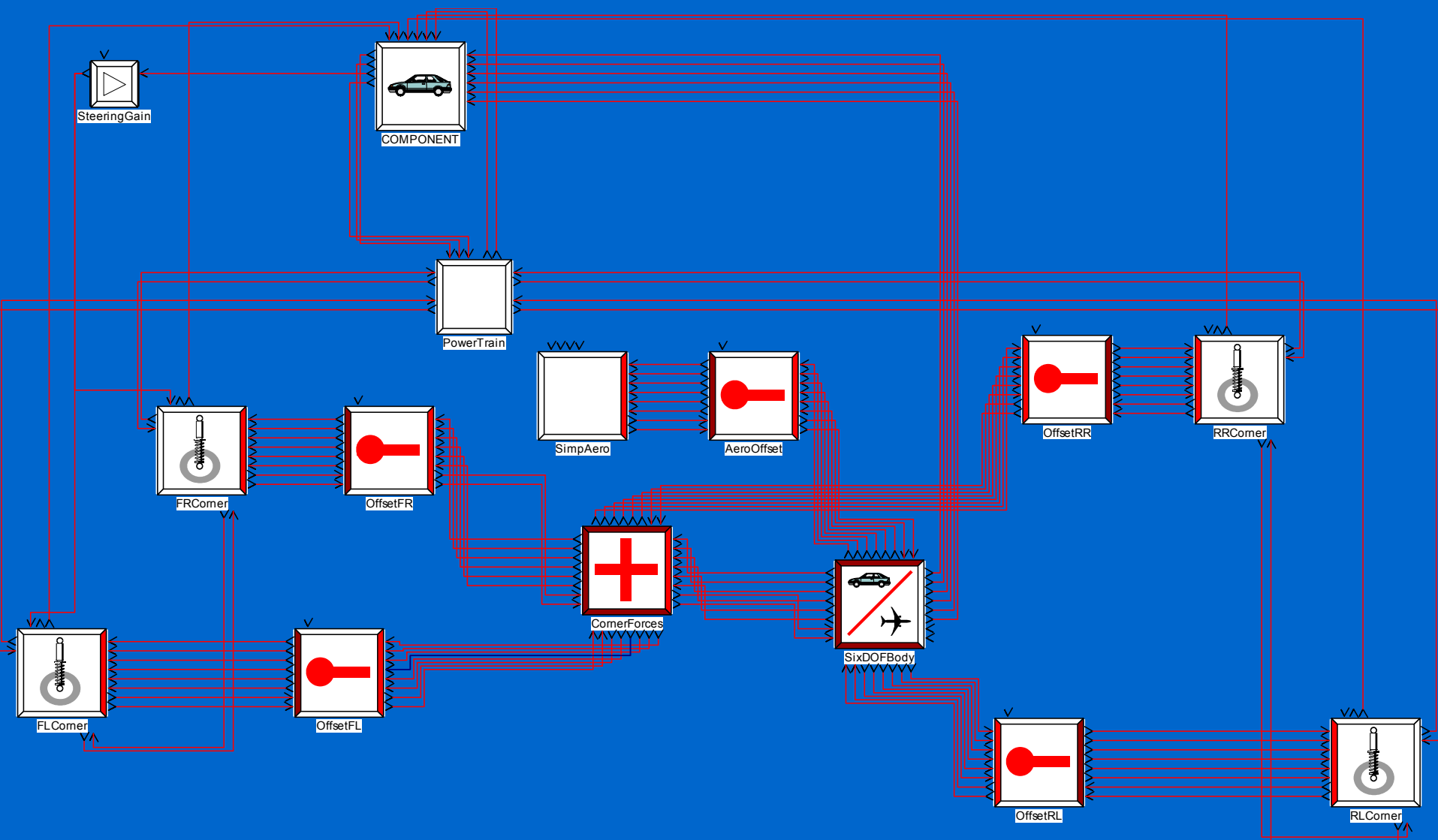
- Develop Modular Modeling Methodology That Allows For Easily Reconfigurable Simulator Subsystems
- Applied to Complete Distributed Driving Simulator to Maximize Reconfiguration Speed and Model Flexibility

Vehicle Dynamics

- Vehicle Dynamics Model Is Broken Down Into Several Reusable Modules

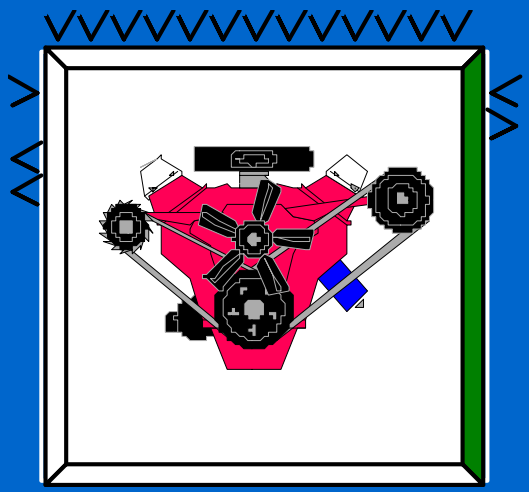


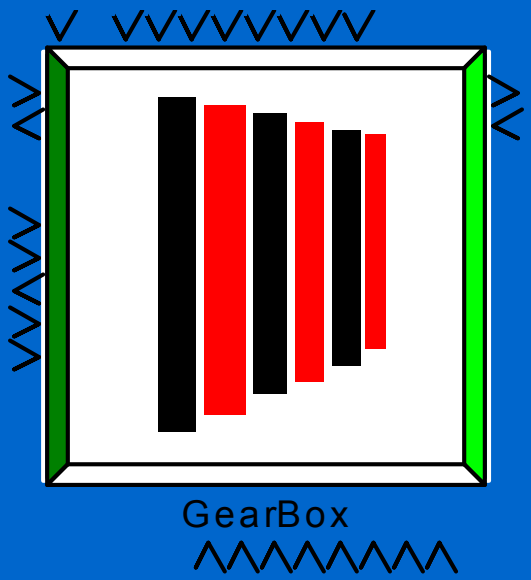
Complete Vehicle Dynamics

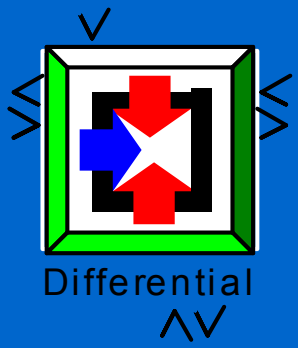


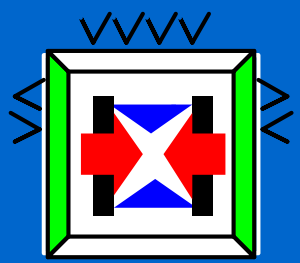
Powertrain

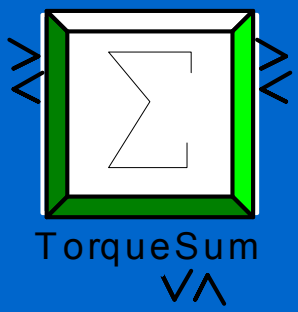
- Vehicle Subsystems Can Also Be Broken Down Into Reusable Modules
- Lowest Level Components Are C Code

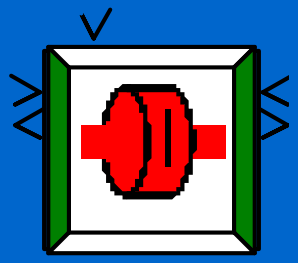




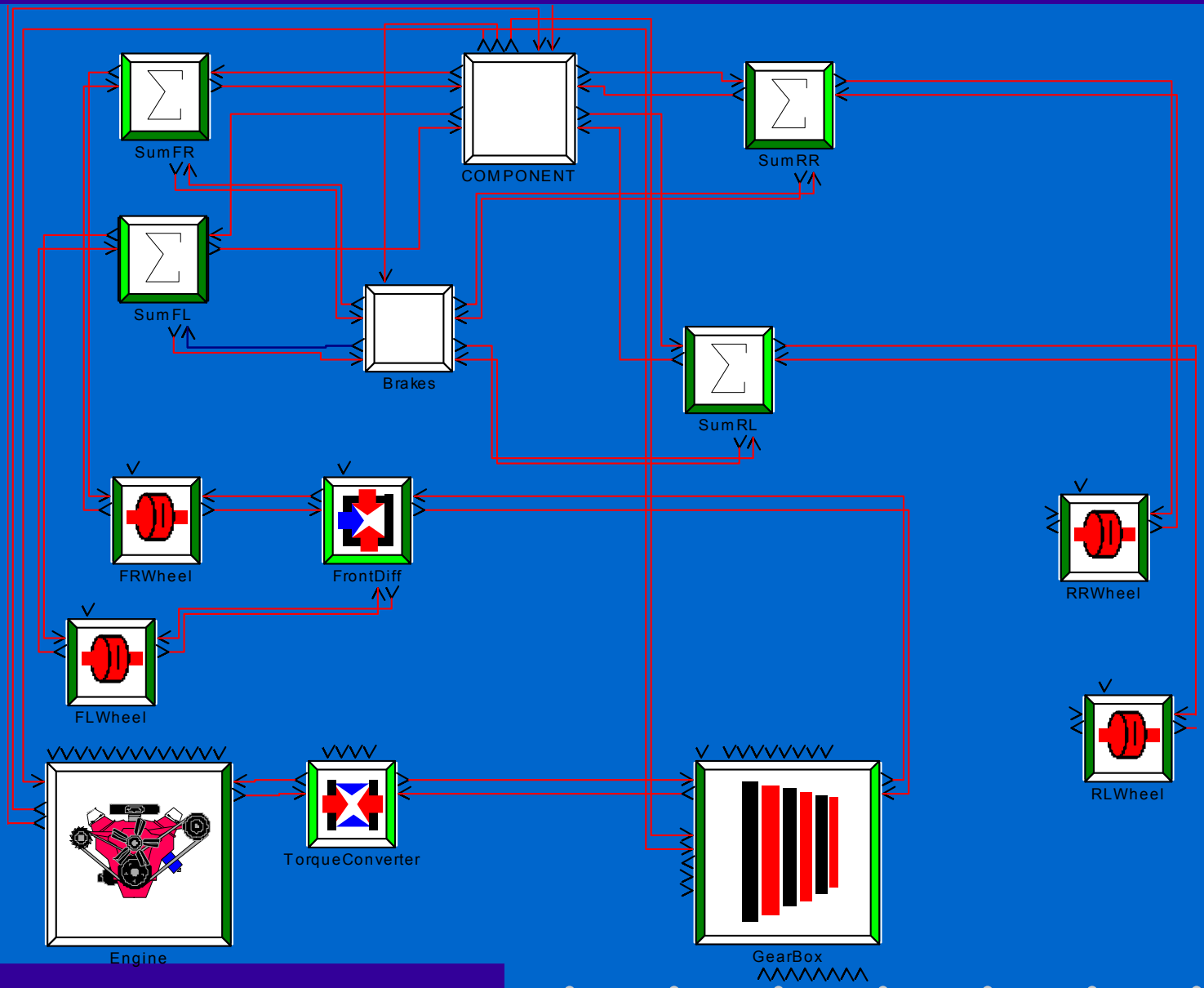






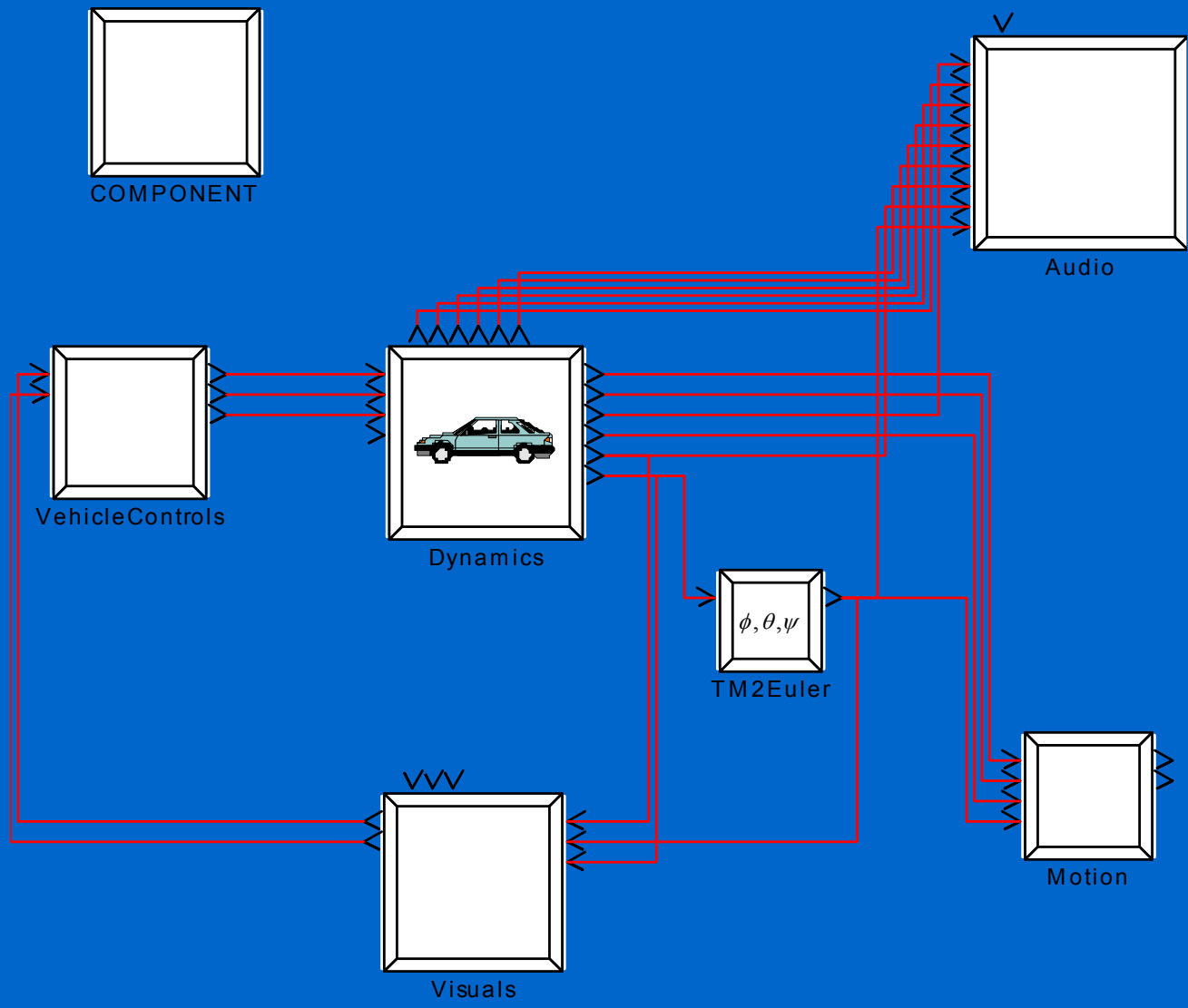


Powertrain


SumFR
COMPONENT
SumRR
SumFL
Brakes
SumRL
FRWheel
FrontDiff
RRWheel
FLWheel
RLWheel
TorqueConverter
Engine
GearBox

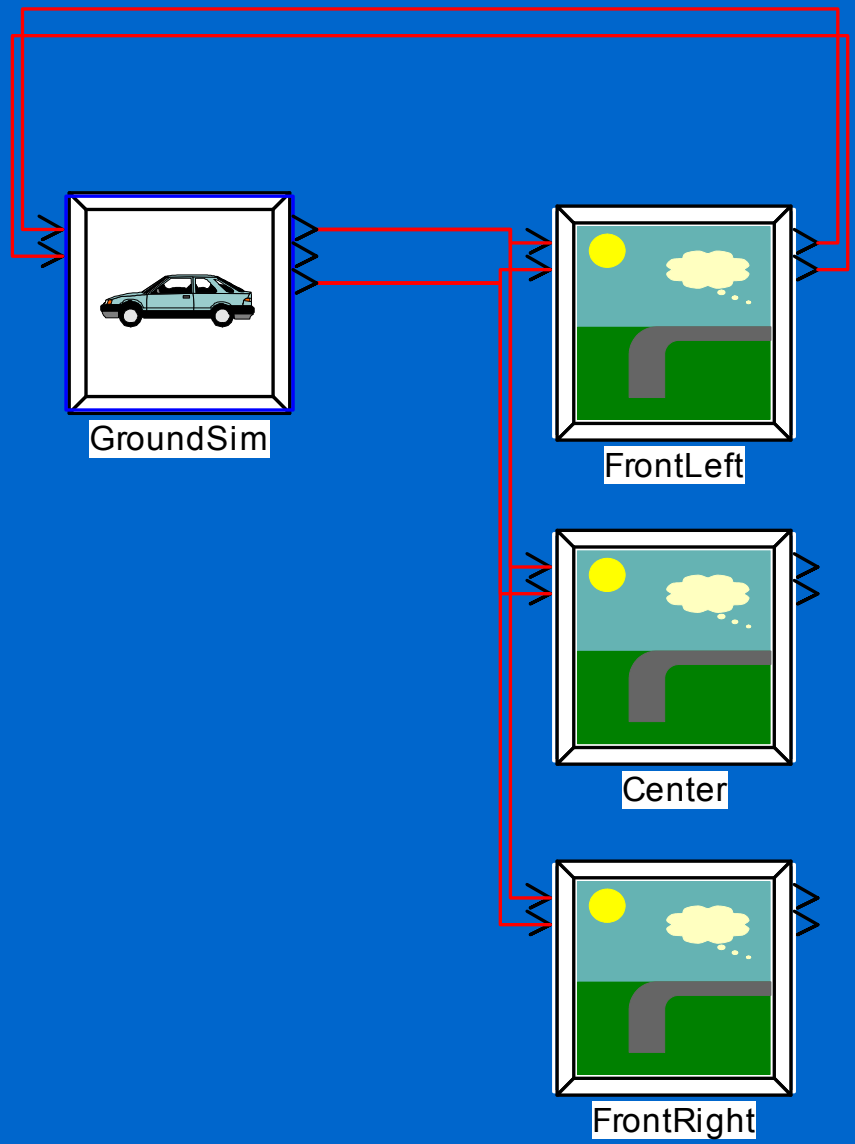
Driving Simulator

- The Driving Simulator Is Made Up Of Modules



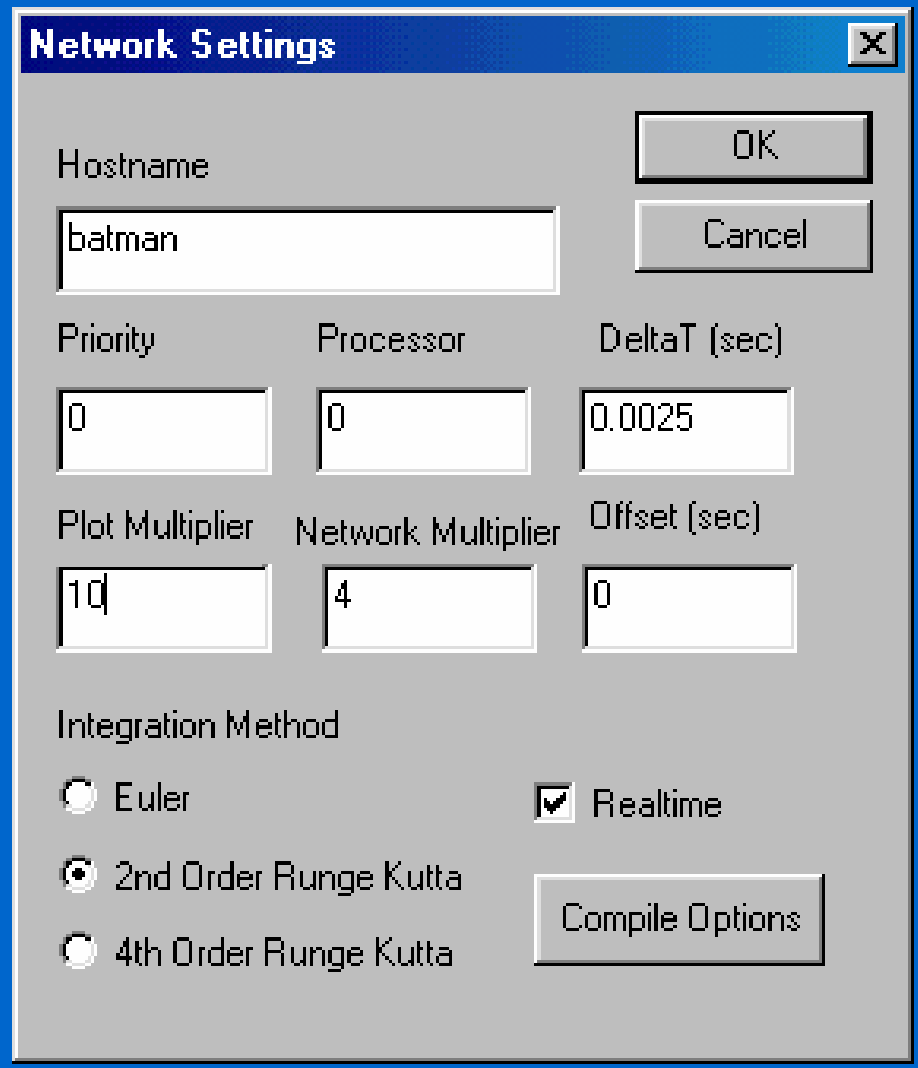
Distributed 3 Channel Simulator

- Modules At The Top Level Of Any Model Can Be Distributed



Network Properties

- Automatically Builds The Network Topology At Runtime
- Shared Memory, Reflective Memory, UDP/IP
- Distributed Compilation



Performance

- Driving Simulator Contains 52 states
- Using Runge Kutta Second Order Method
- MultibodyVehicle Dynamics at 400 Hz
- Audio and Visual Systems at 60 Hz
- Entire Simulation Ran Faster Than Realtime On a Pentium III 450 MHz Computer

Advantage Of GUI

- Structured Framework to Build C Code Components
- Causality
- Unified Integration Algorithm
- Built in Data Management and Plotting
- Greater Insight Into the Model
- Hierarchical Viewing
- Model and Component Reuse