

# MATLAB EXPO

## 2021

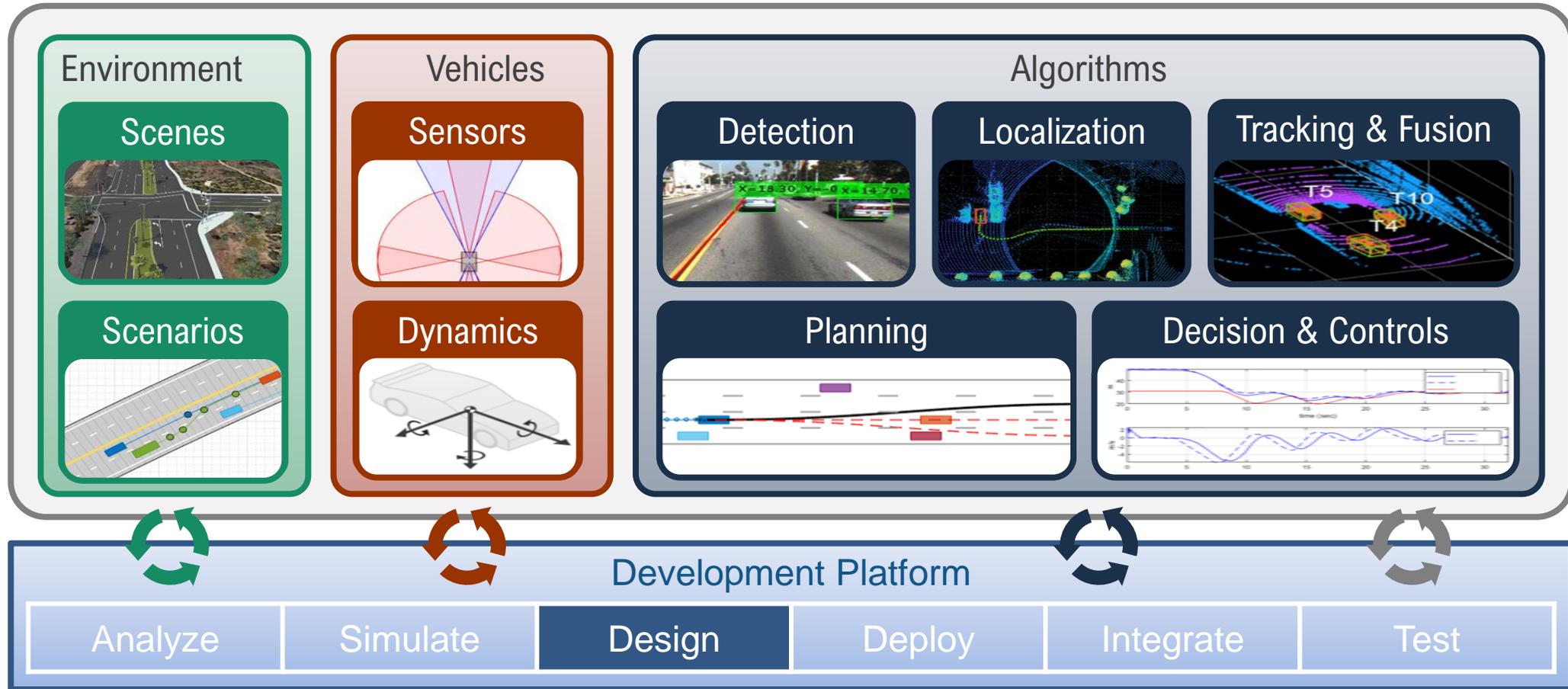
### Design and Evaluating Sensor Fusion Algorithms for Automated Driving

*Shusen Zhang*



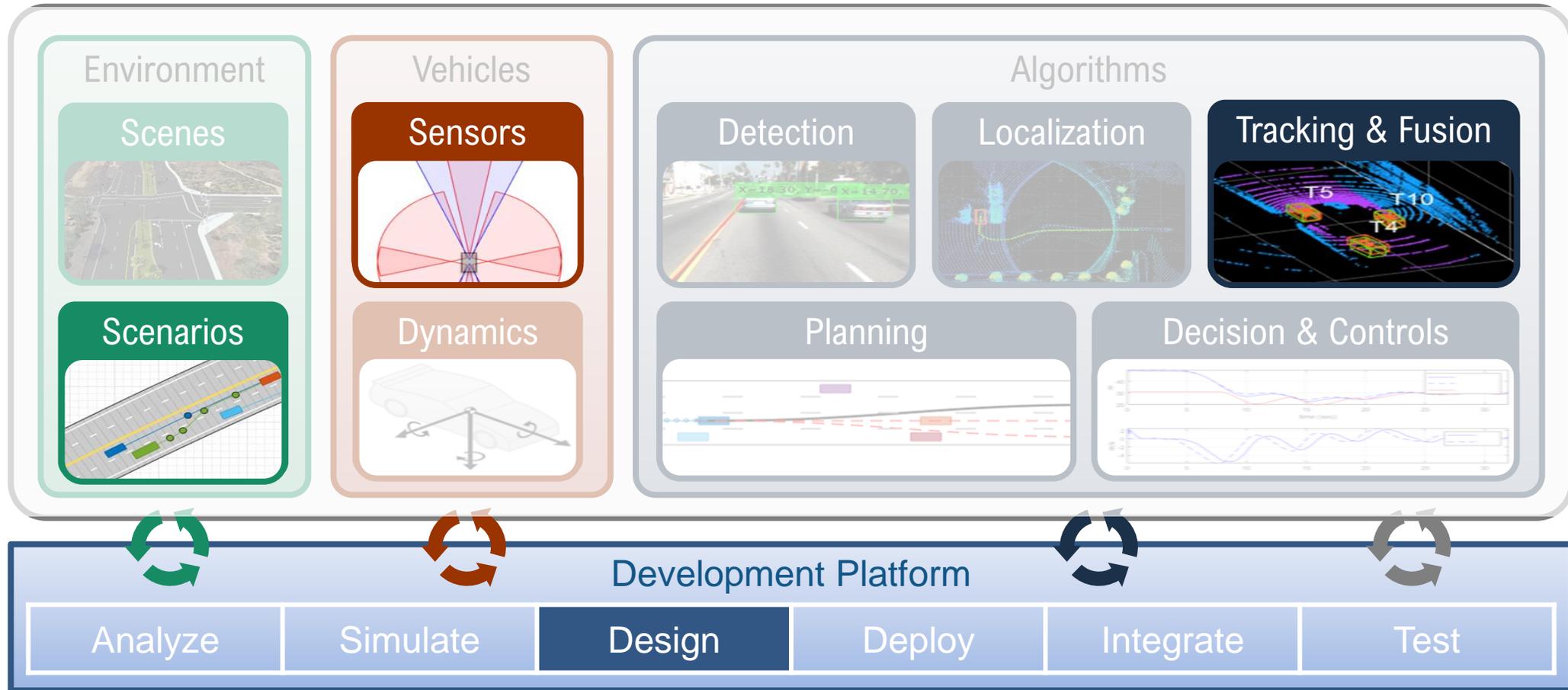
# Develop Automated Driving Applications

with MATLAB, Simulink, and RoadRunner

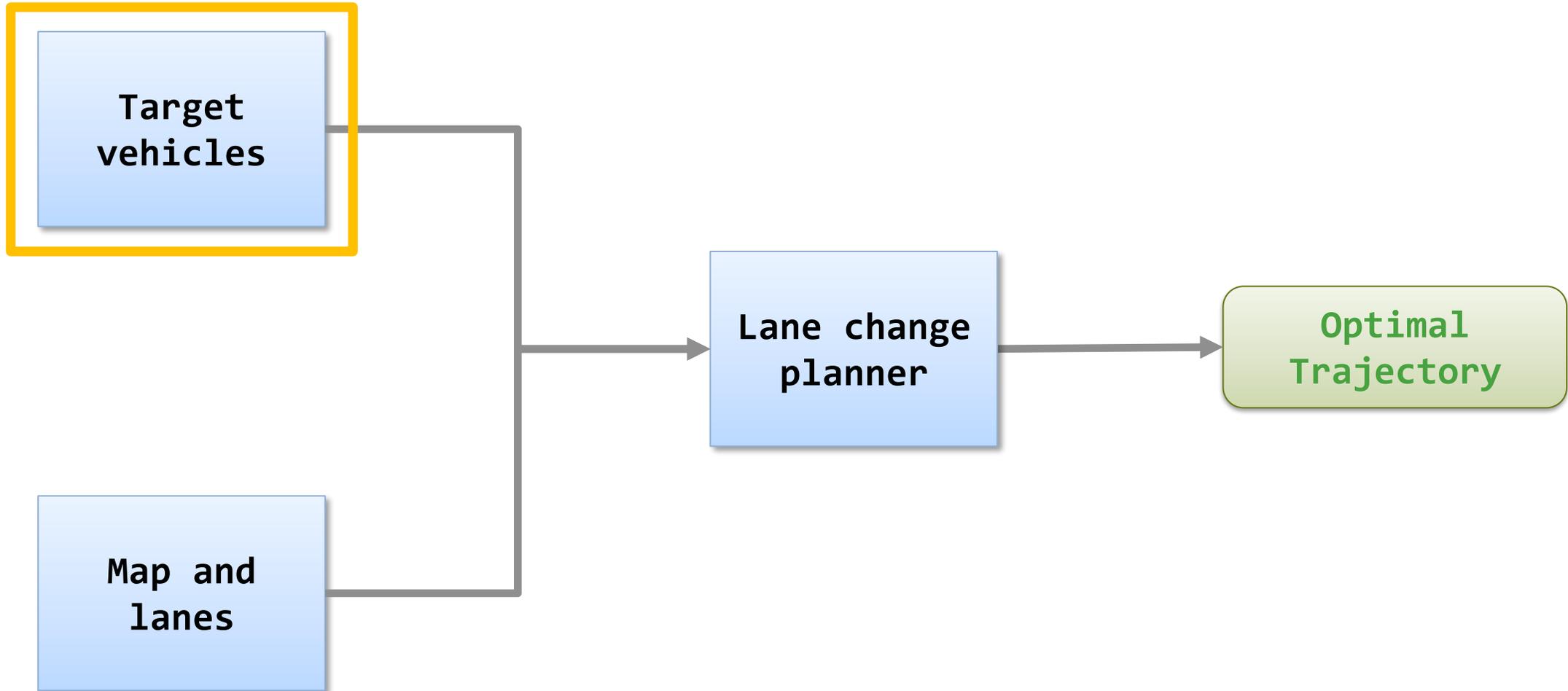


# Develop Automated Driving Applications

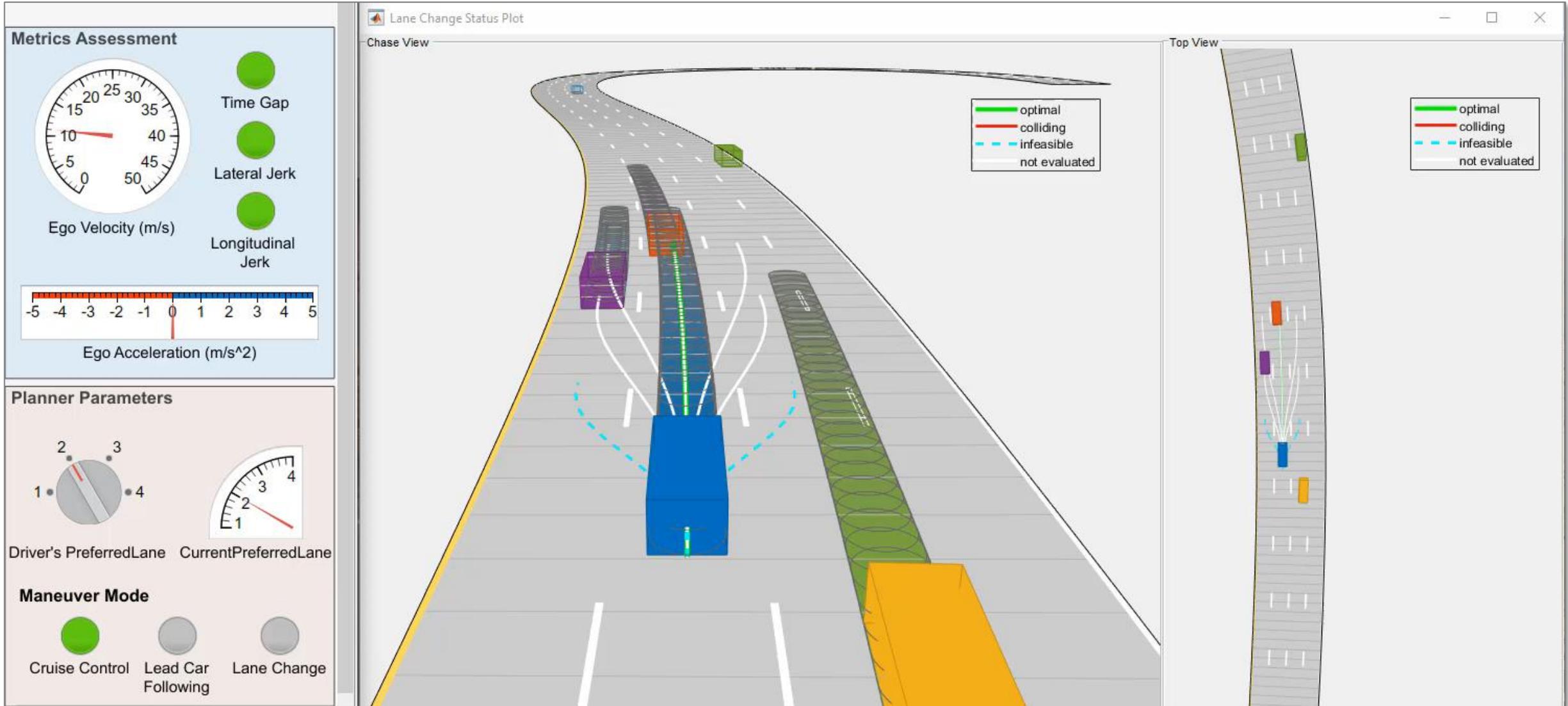
with MATLAB, Simulink, and RoadRunner



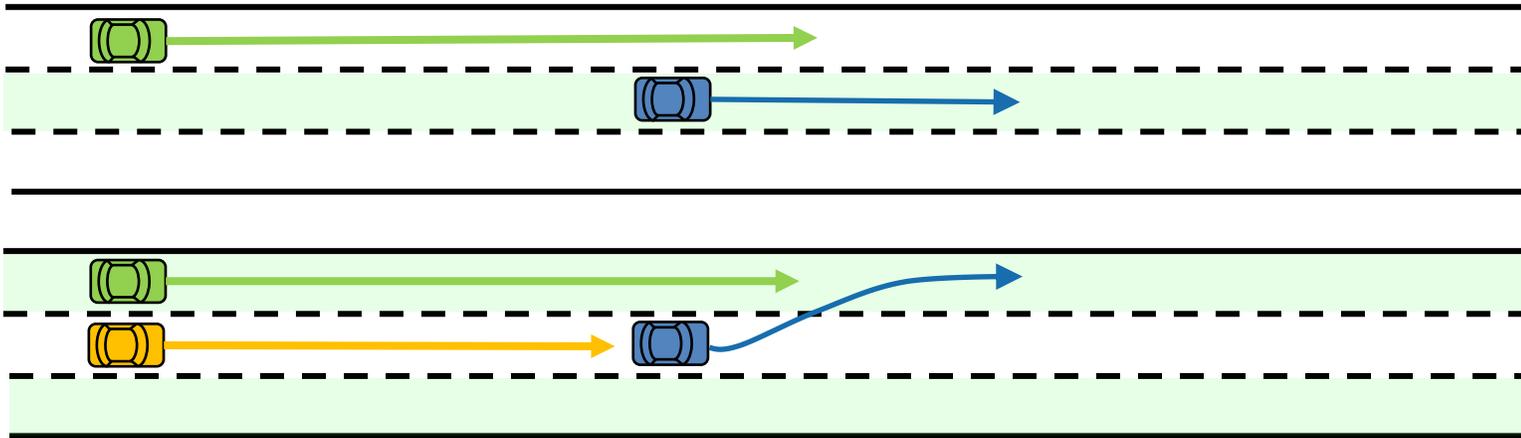
# Schematic of highway lane change functionalities



# Highway Lane Change example



## Potential fault due to position error



 ego

 True target

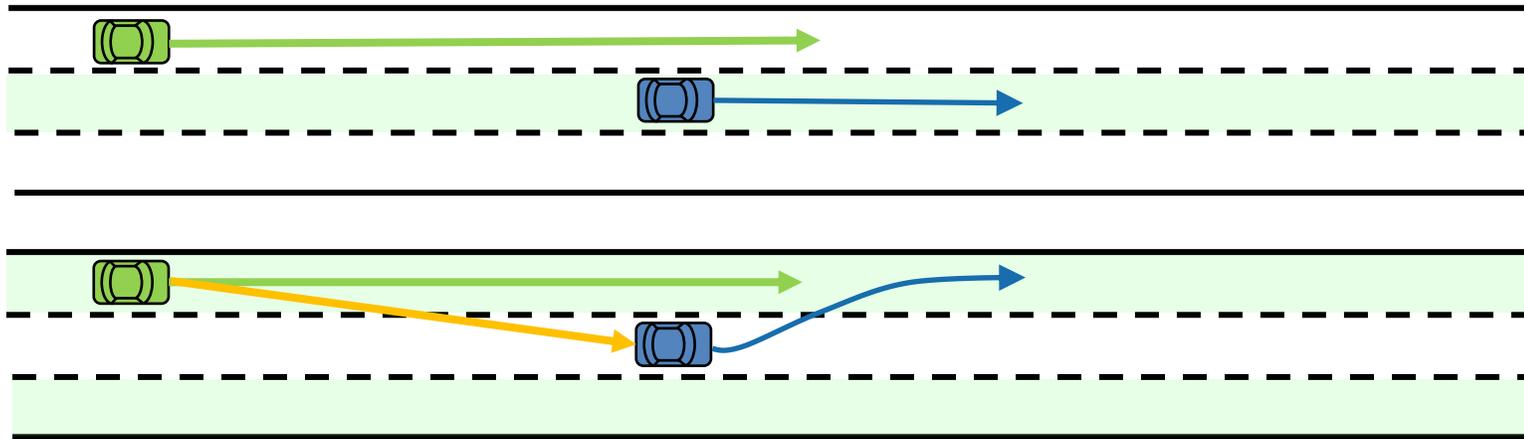
 Estimated target

Target position error

Incorrect lane  
assignment

Incorrect decision

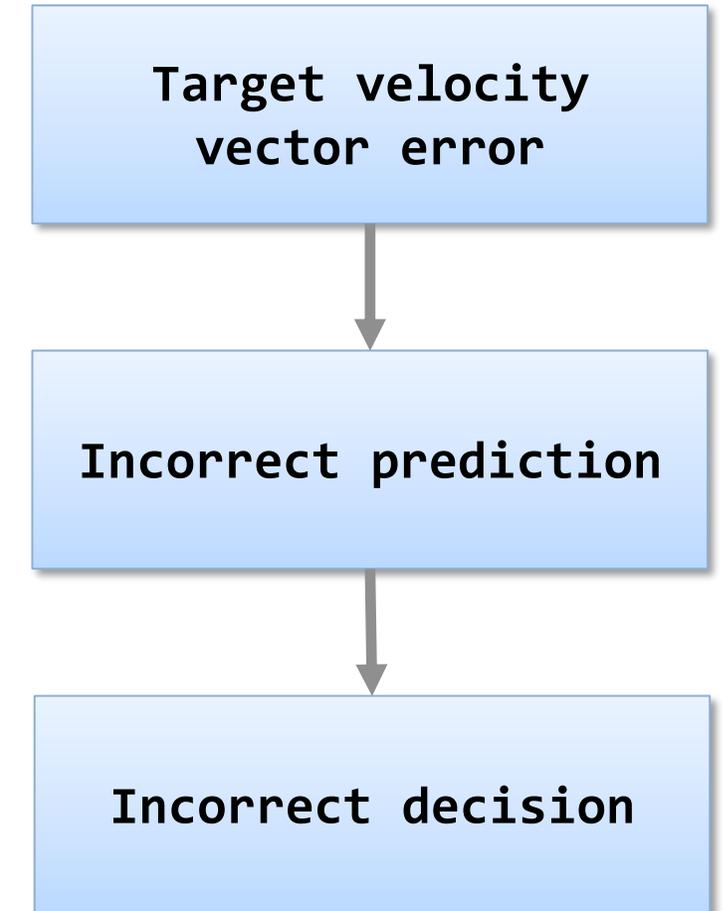
## Potential fault due to velocity vector error



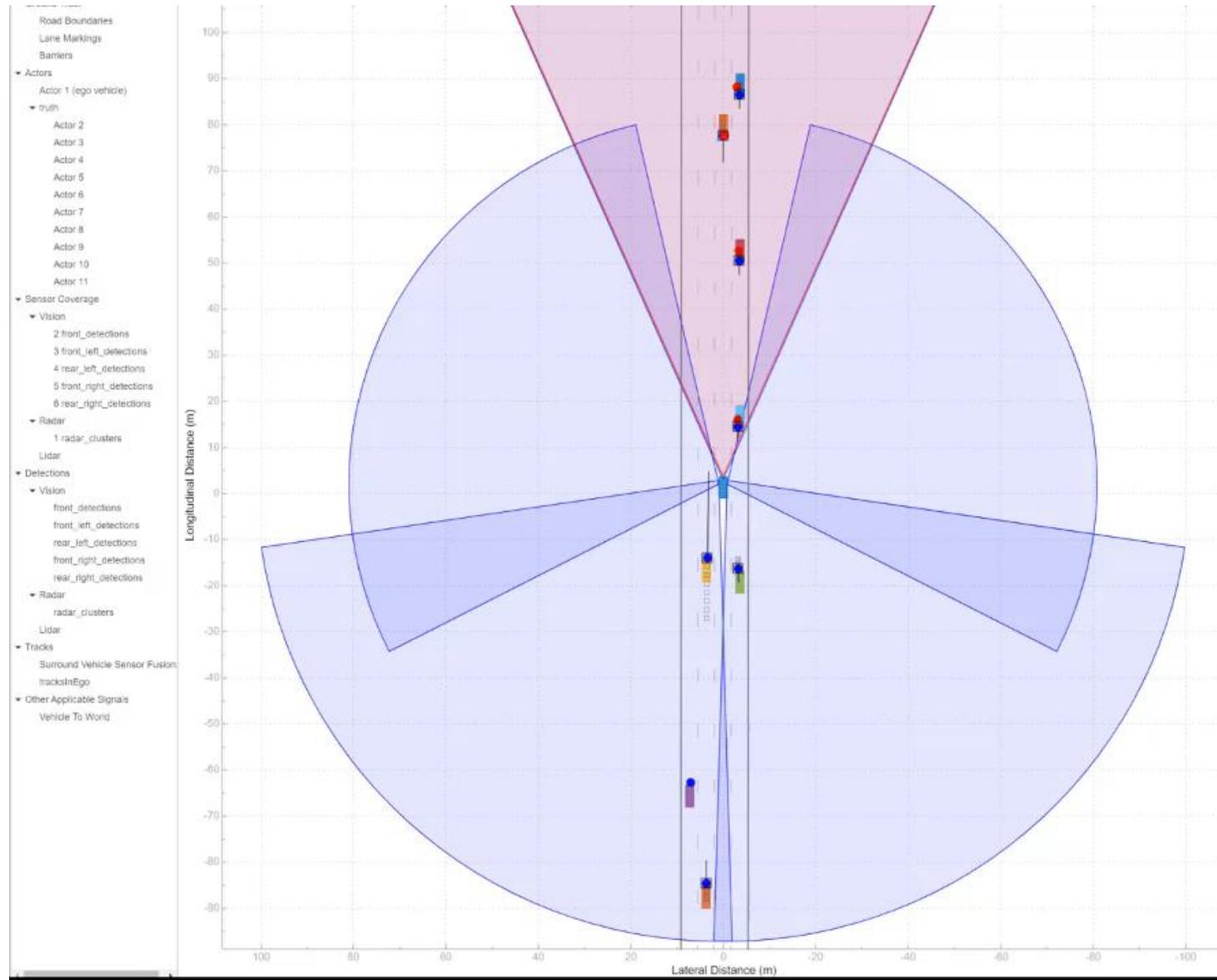
 ego

 True target

 Estimated target

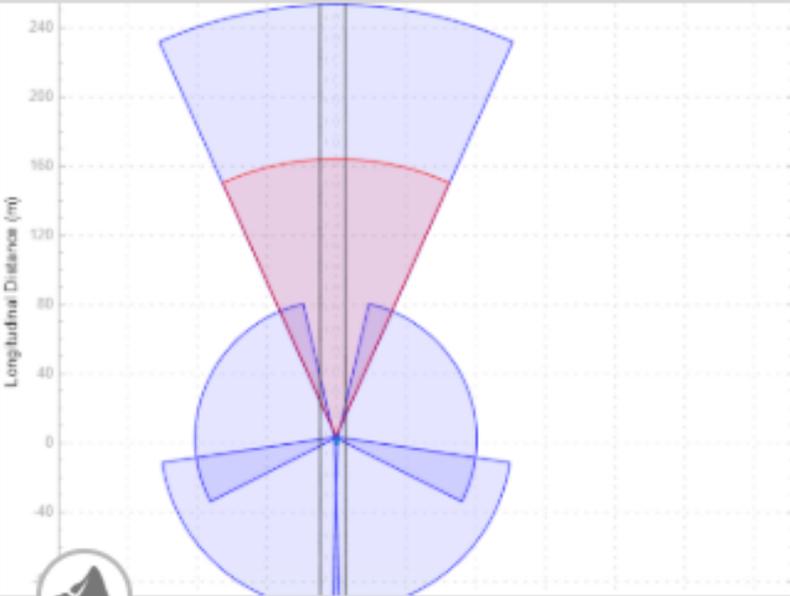


# Simulated tracker failures



## Demo Overview

- Key Takeaways
  - Design, test and evaluate for sensor fusion and tracking are supported by MathWorks tools.



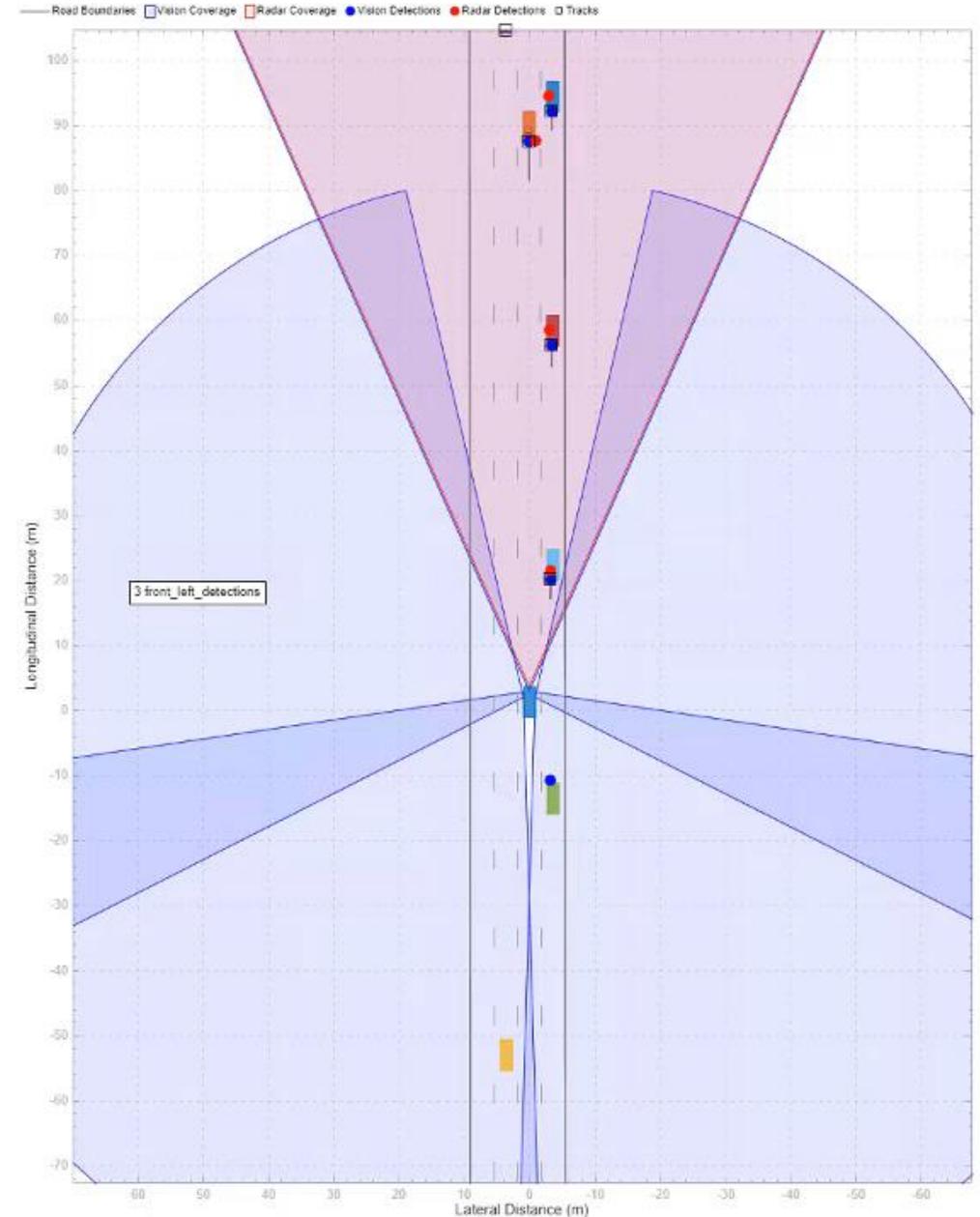
**Surround Vehicle Sensor Fusion**

Implement a synthetic data simulation to detect vehicles using multiple vision and radar sensors, and generate fused tracks for

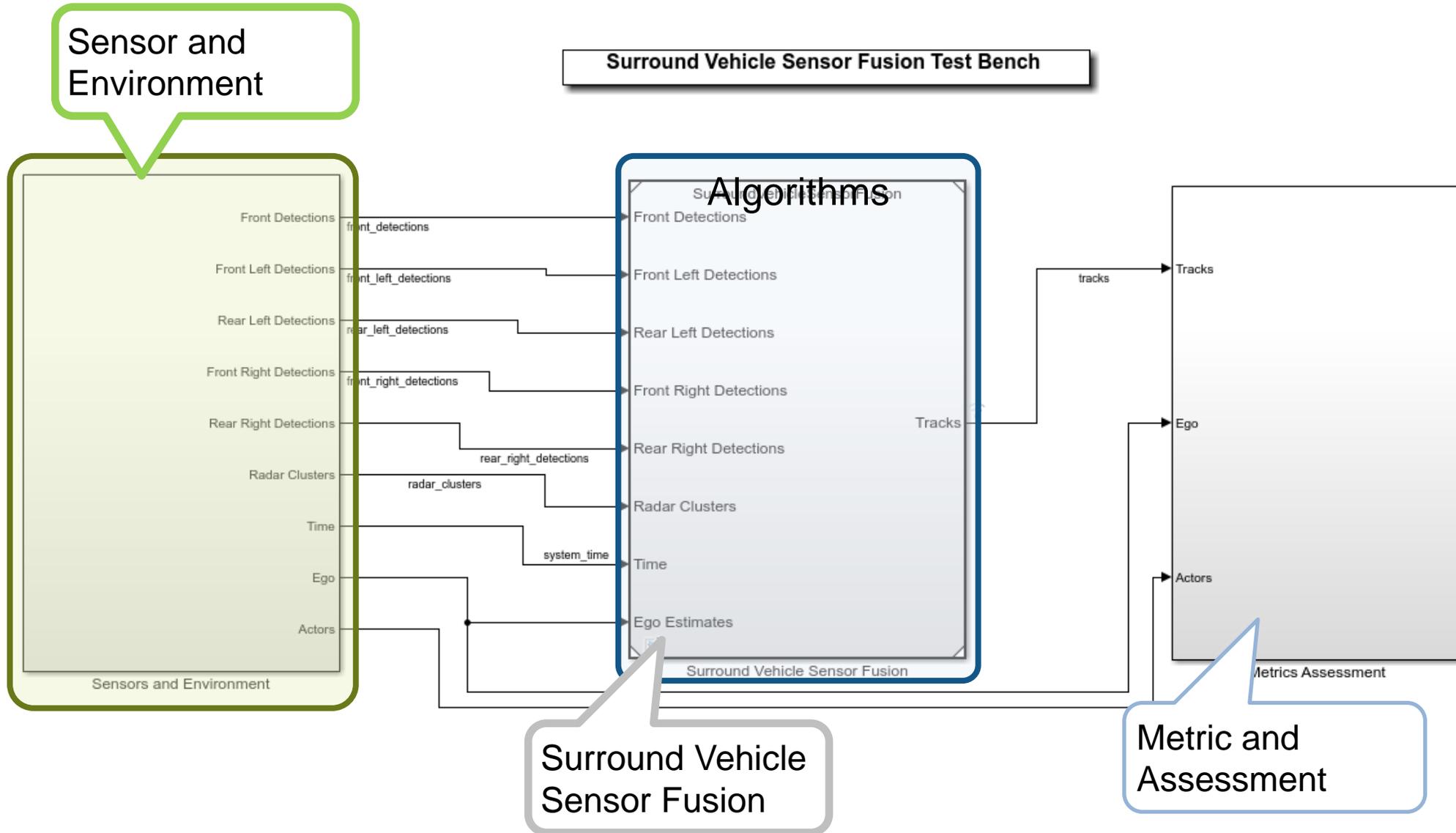
**R2021a** [Open Script](#)

# Demo Overview

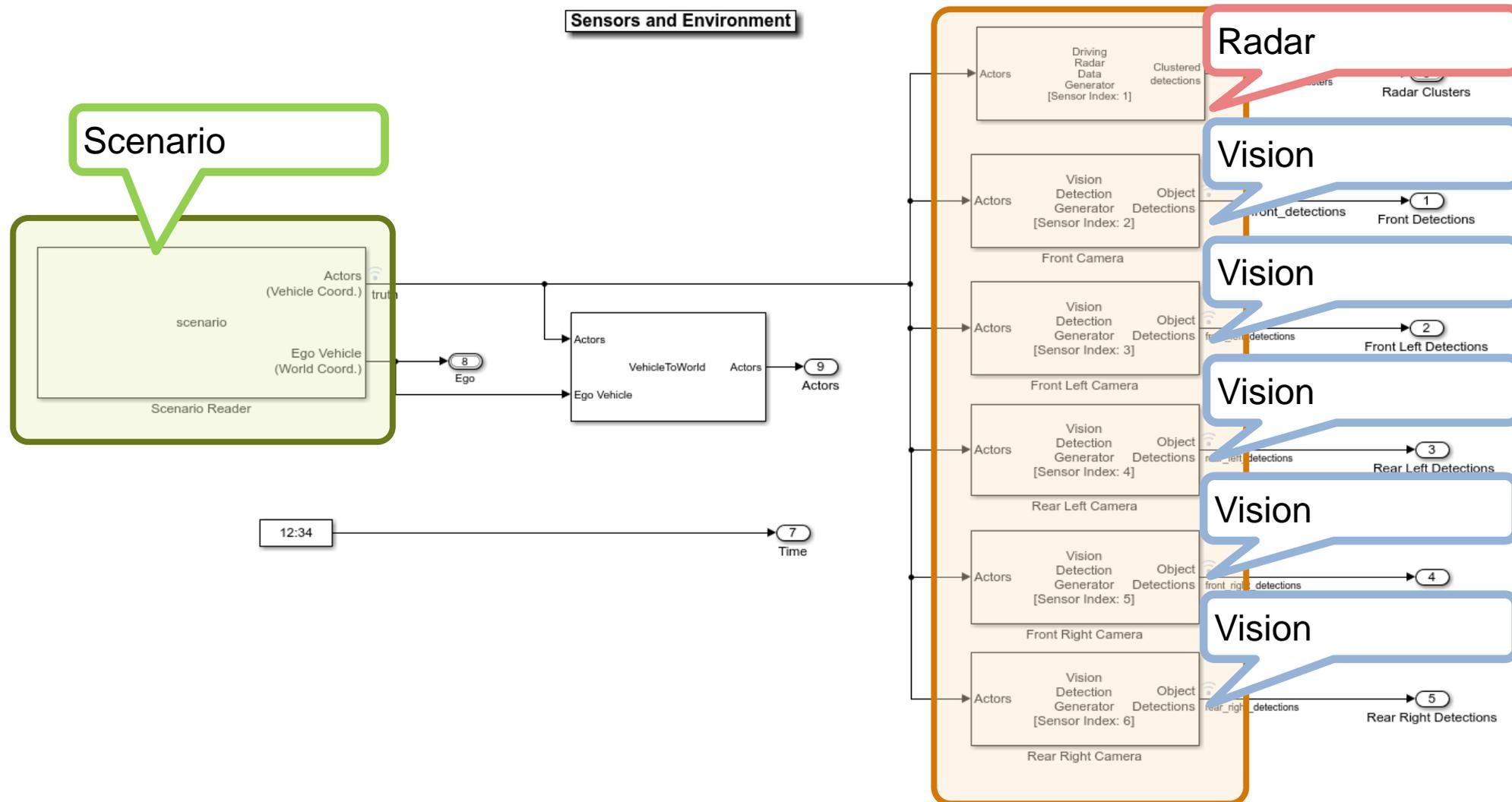
- Key Takeaways
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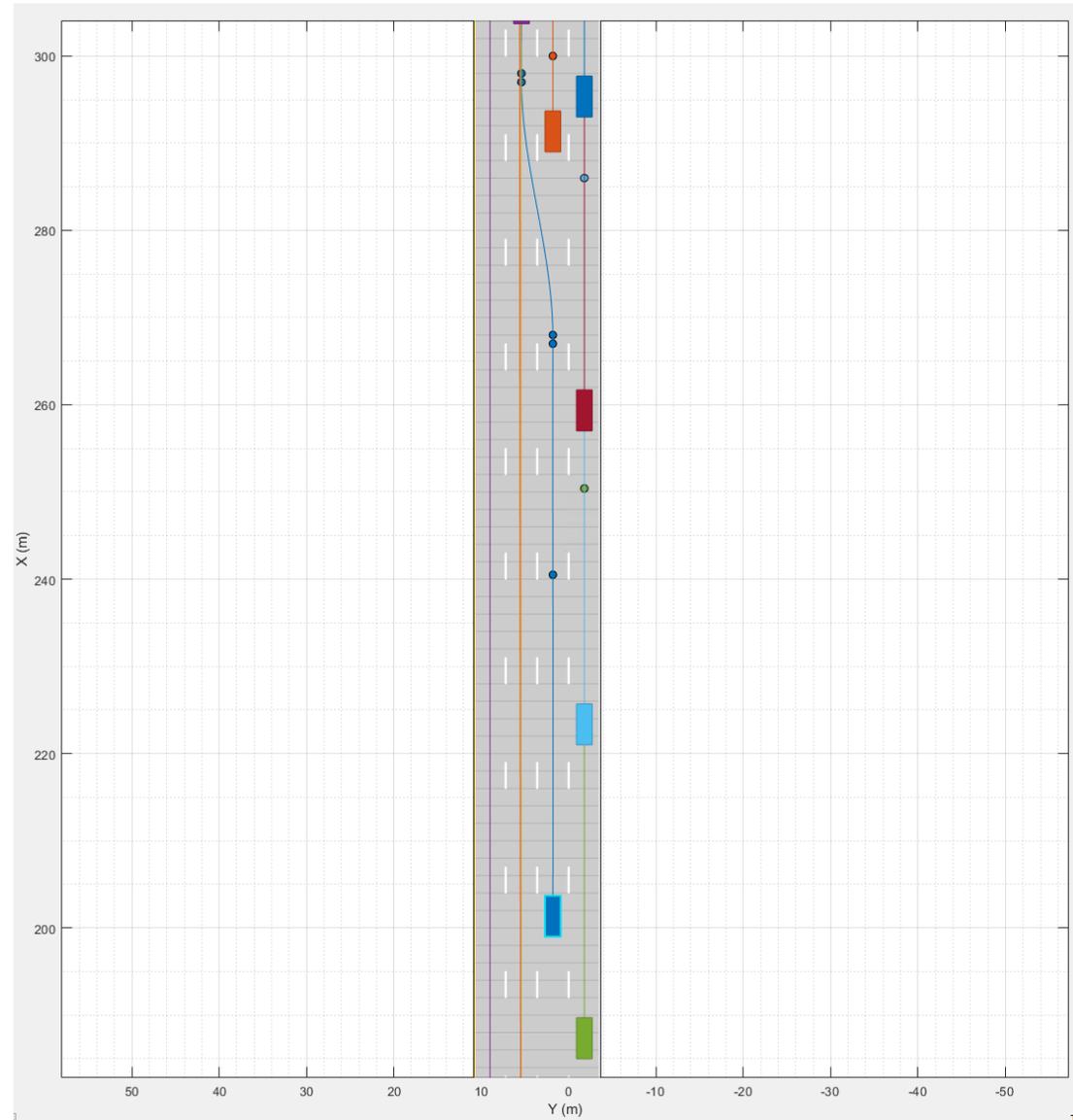
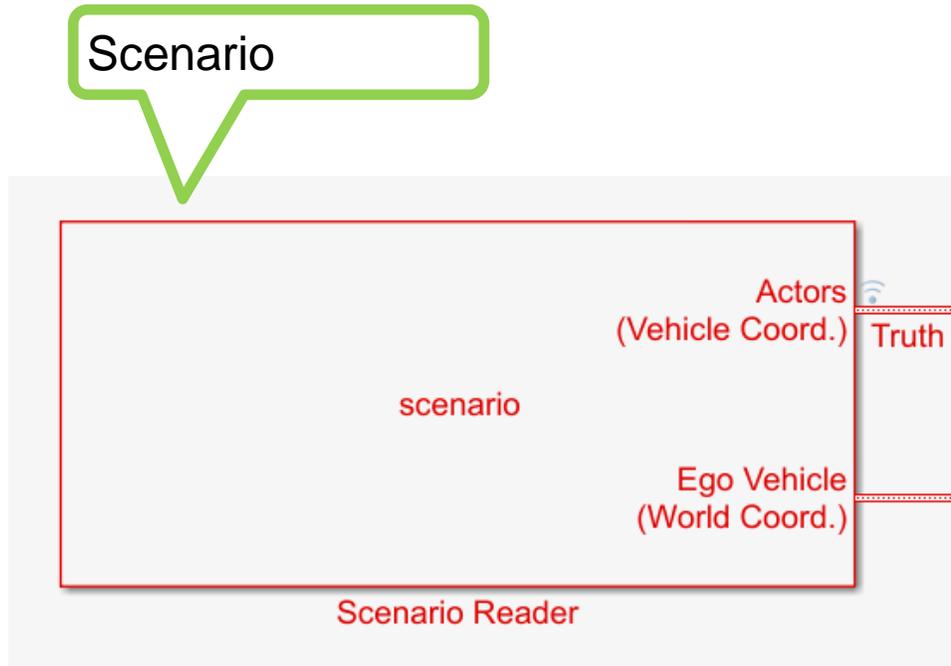
# Surround vehicle sensor fusion testbench



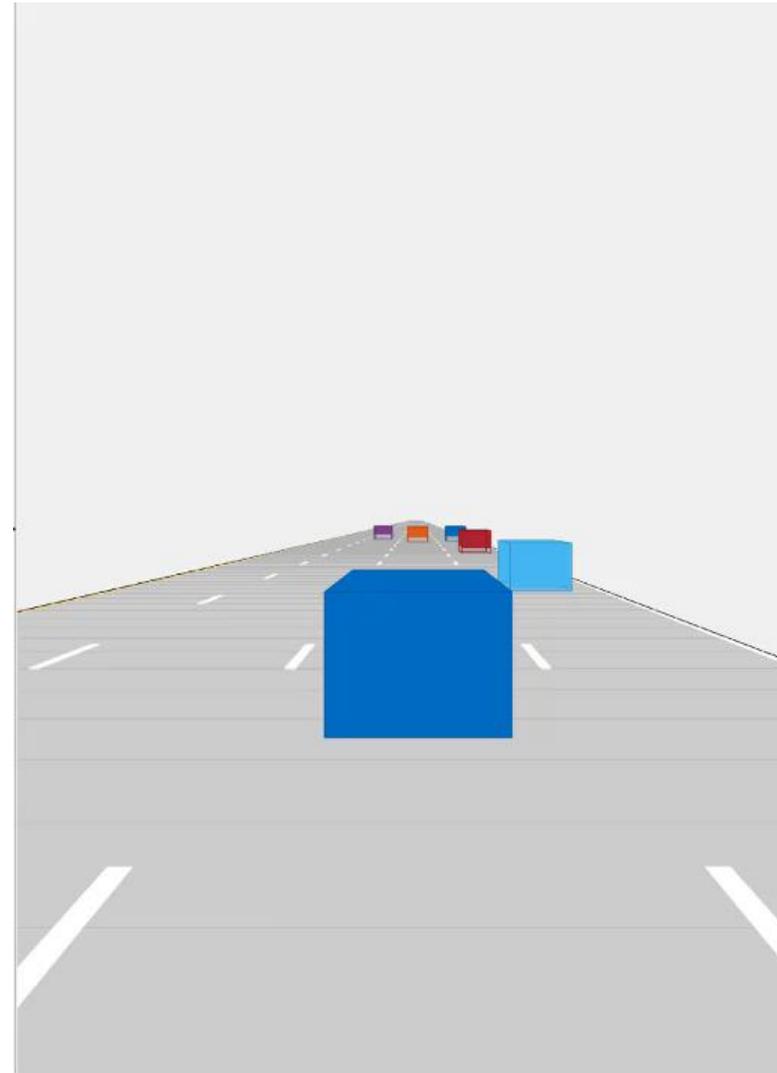
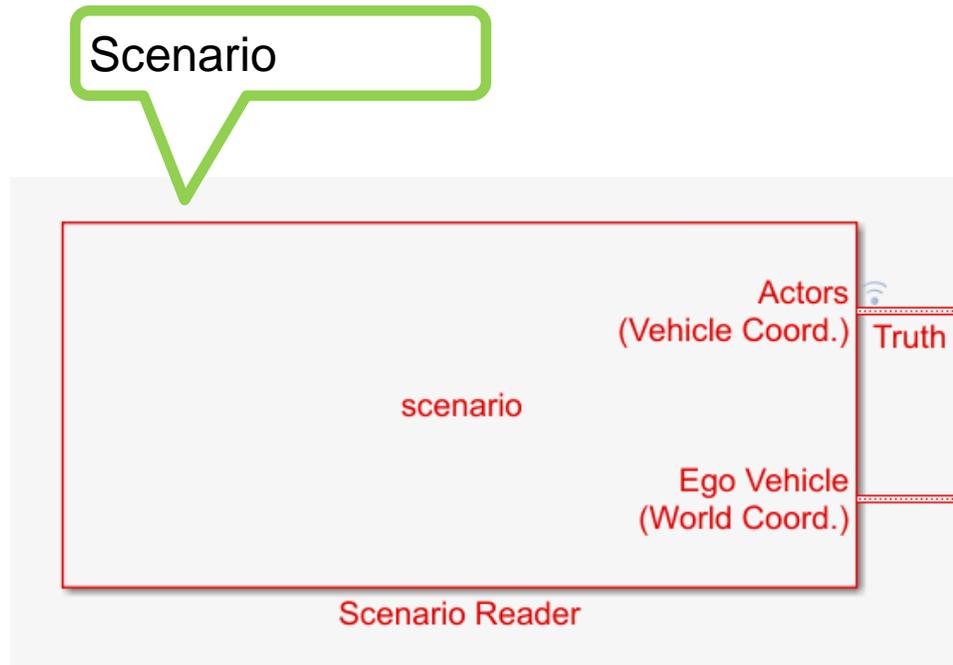
# Sensor and Environment



# Scenario modeling

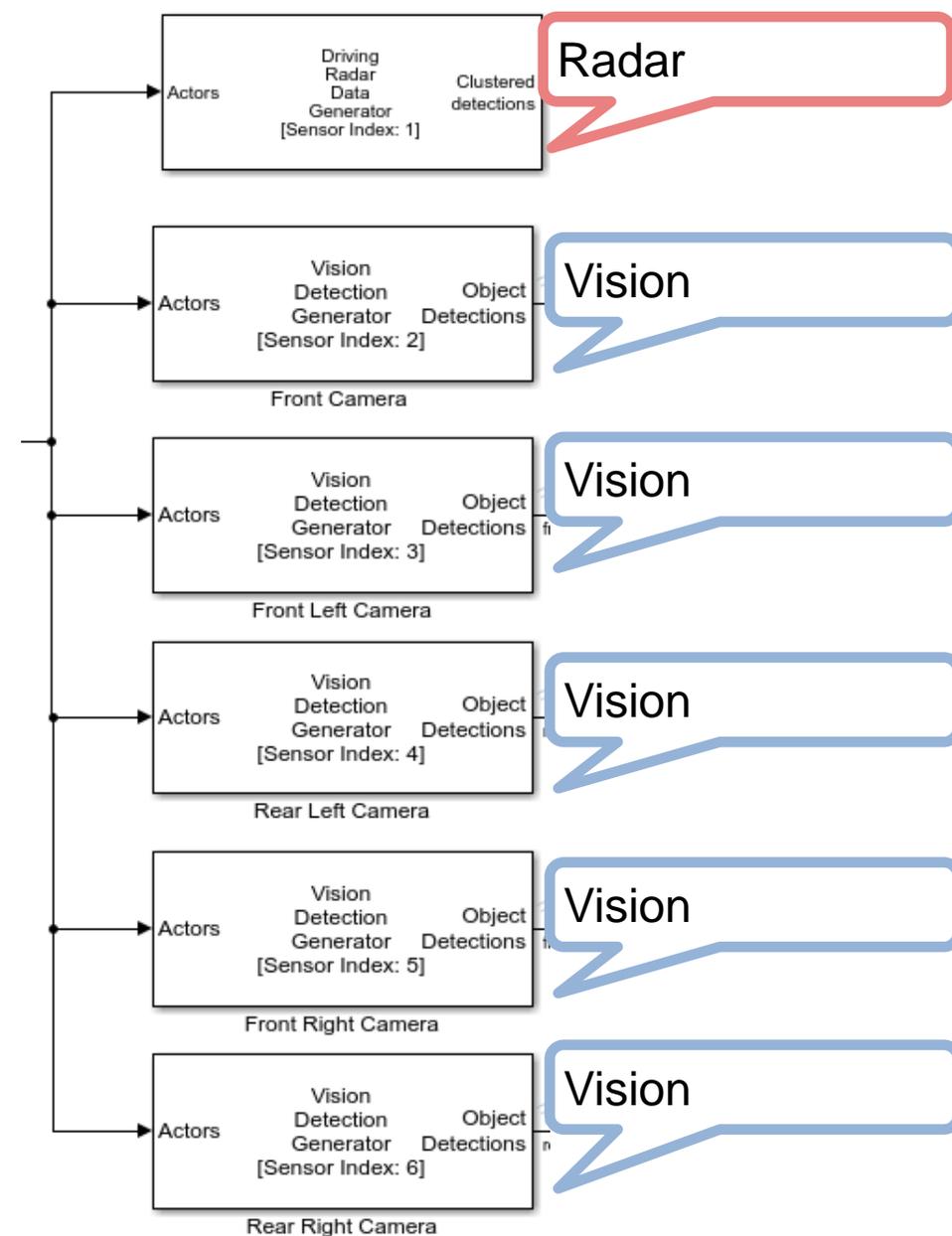
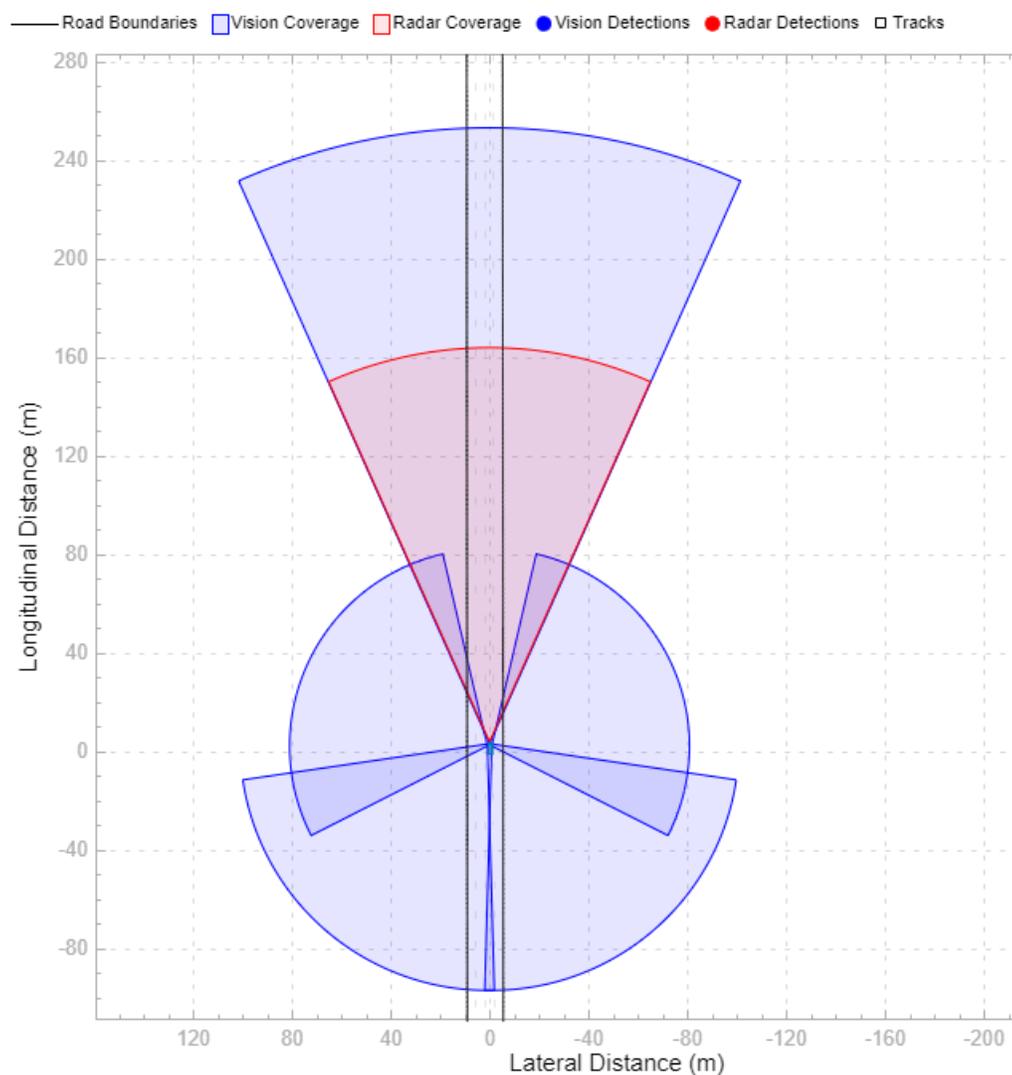


# Scenario modeling

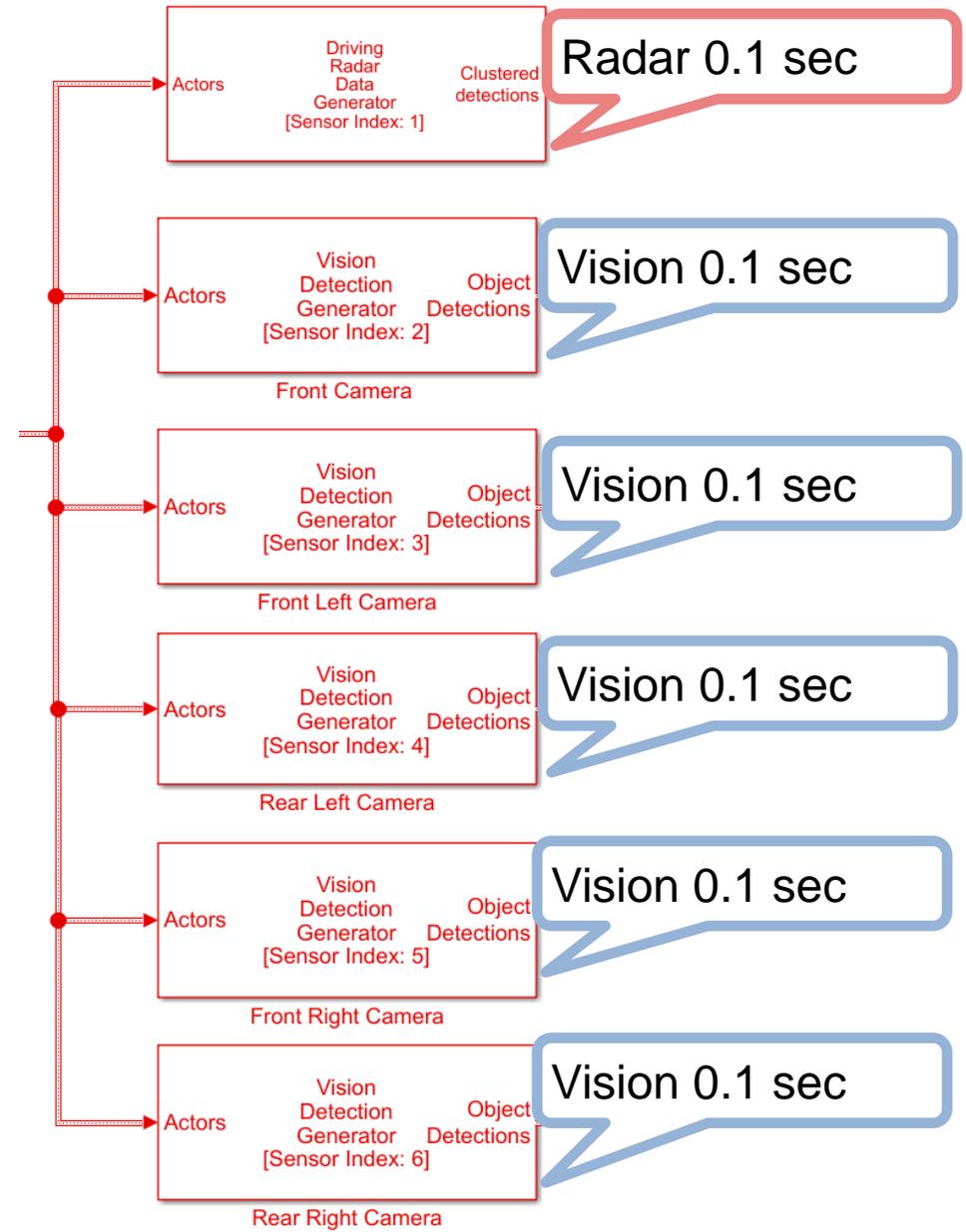
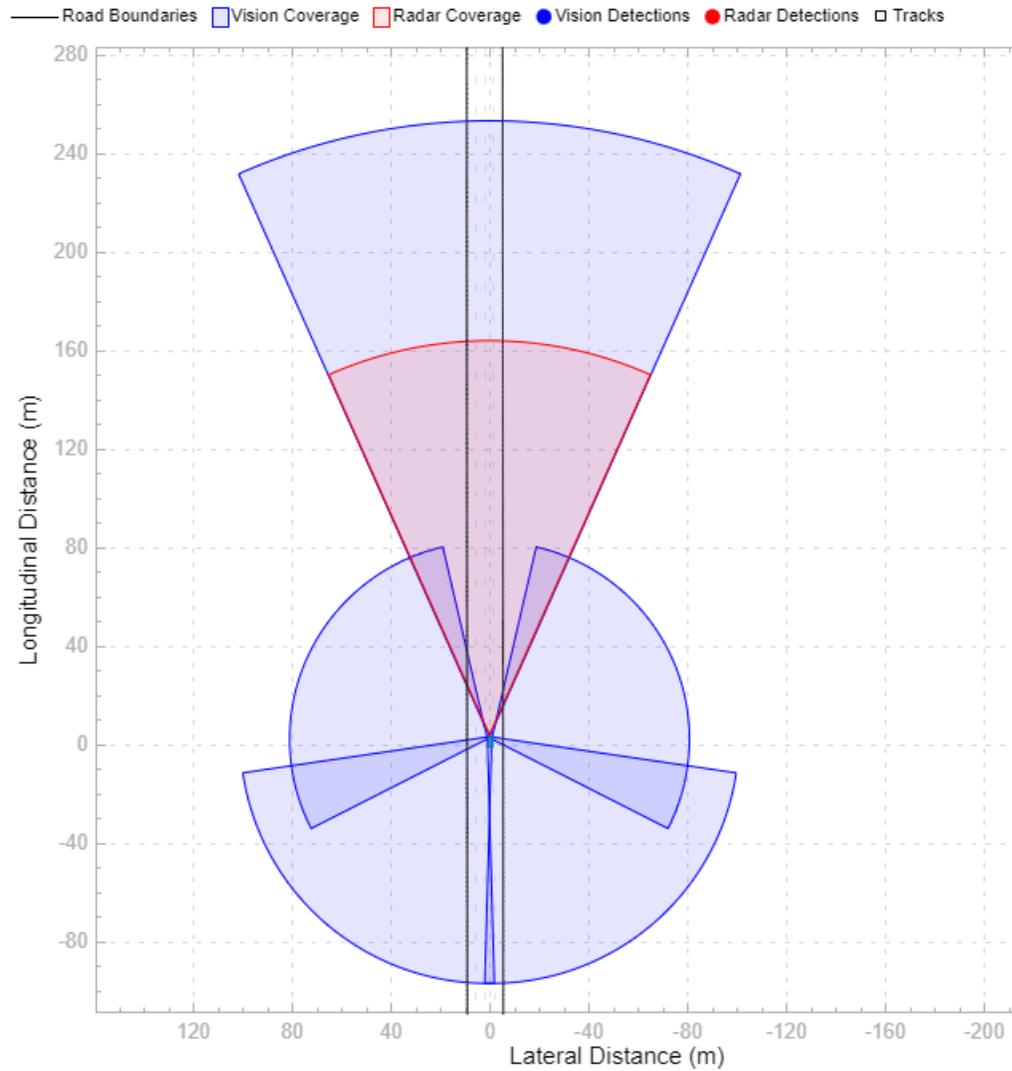


*Automated Driving Toolbox™*

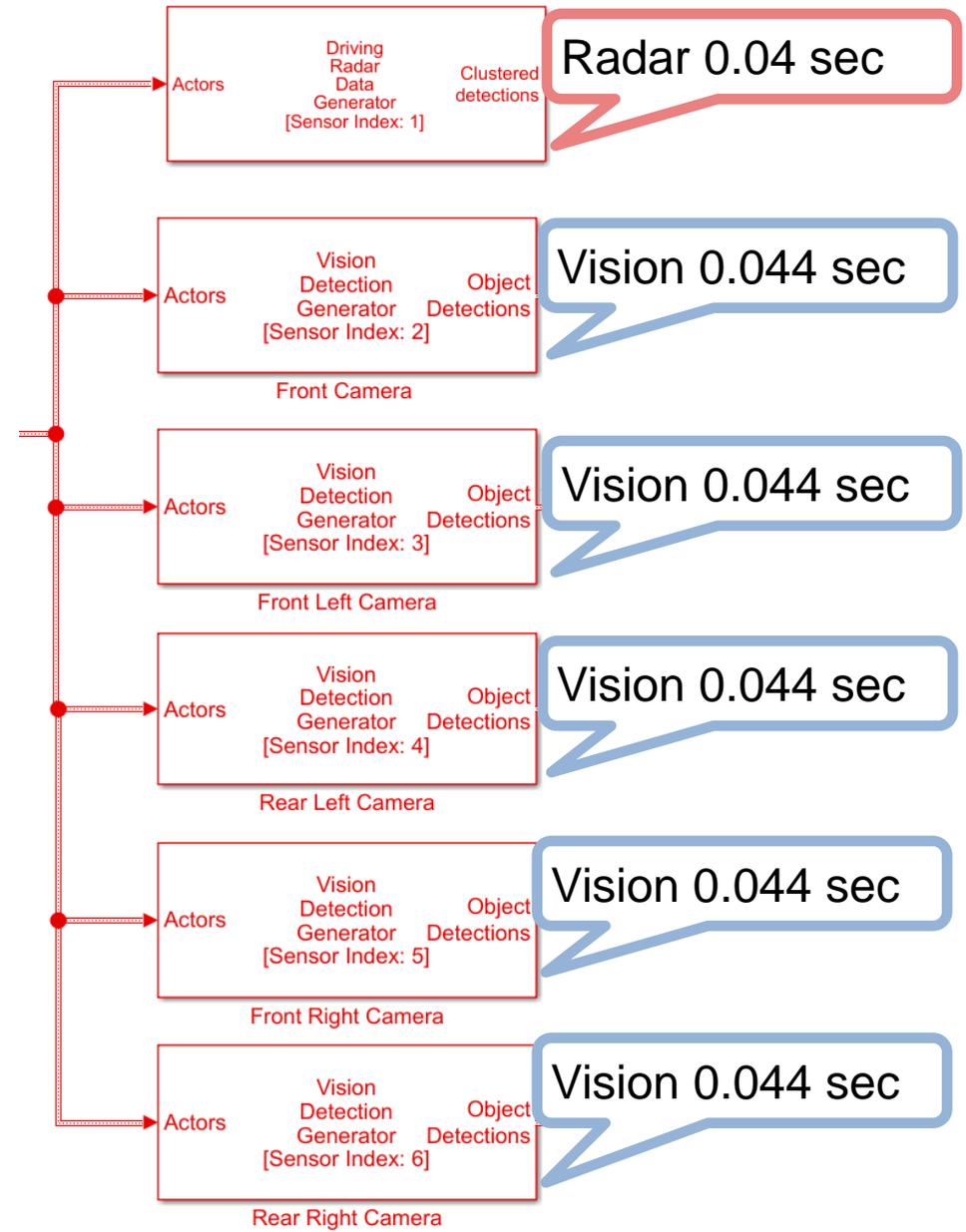
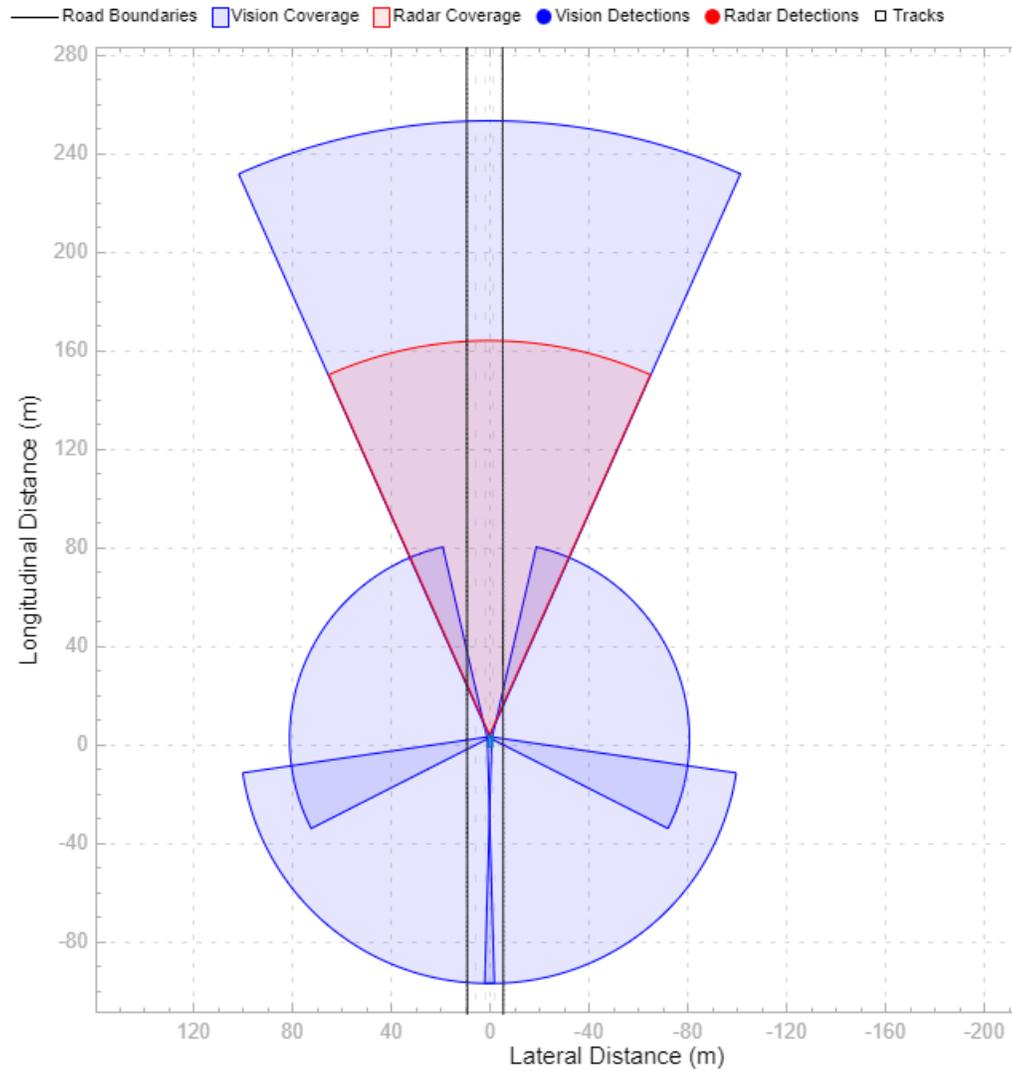
# Sensor configurations



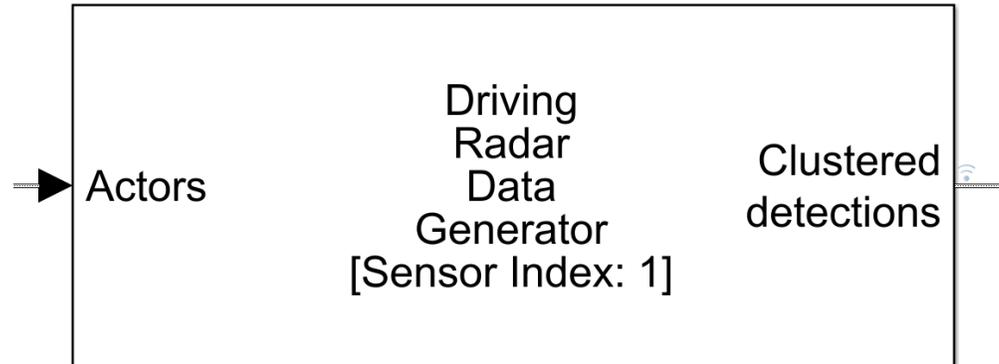
# Sensor sample times



# What if sensors are at different rate



# Radar data generation



Target reporting format:

- Clustered detections
- Clustered detections**
- Tracks
- Detections

Coordinate system:

Port Settings

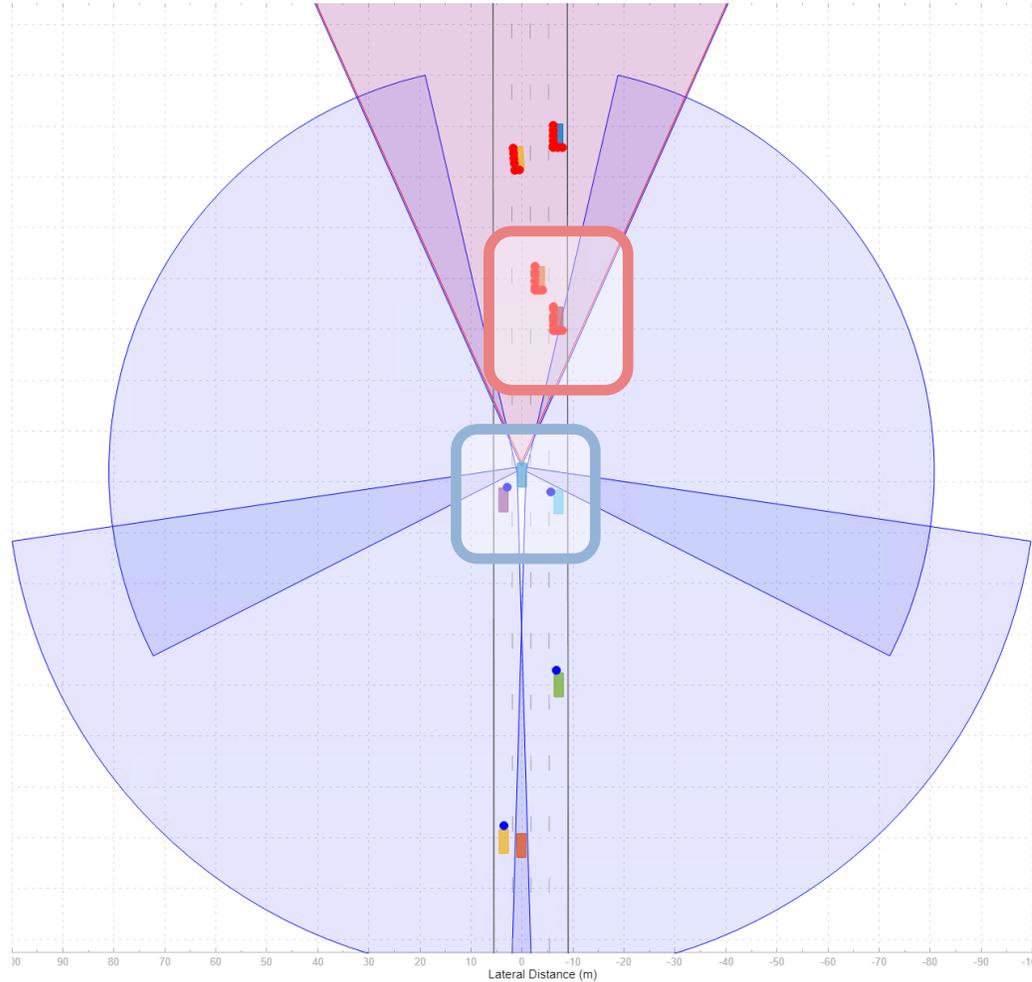
Coordinate system:

- Body
- Body**
- Sensor rectangular
- Sensor spherical

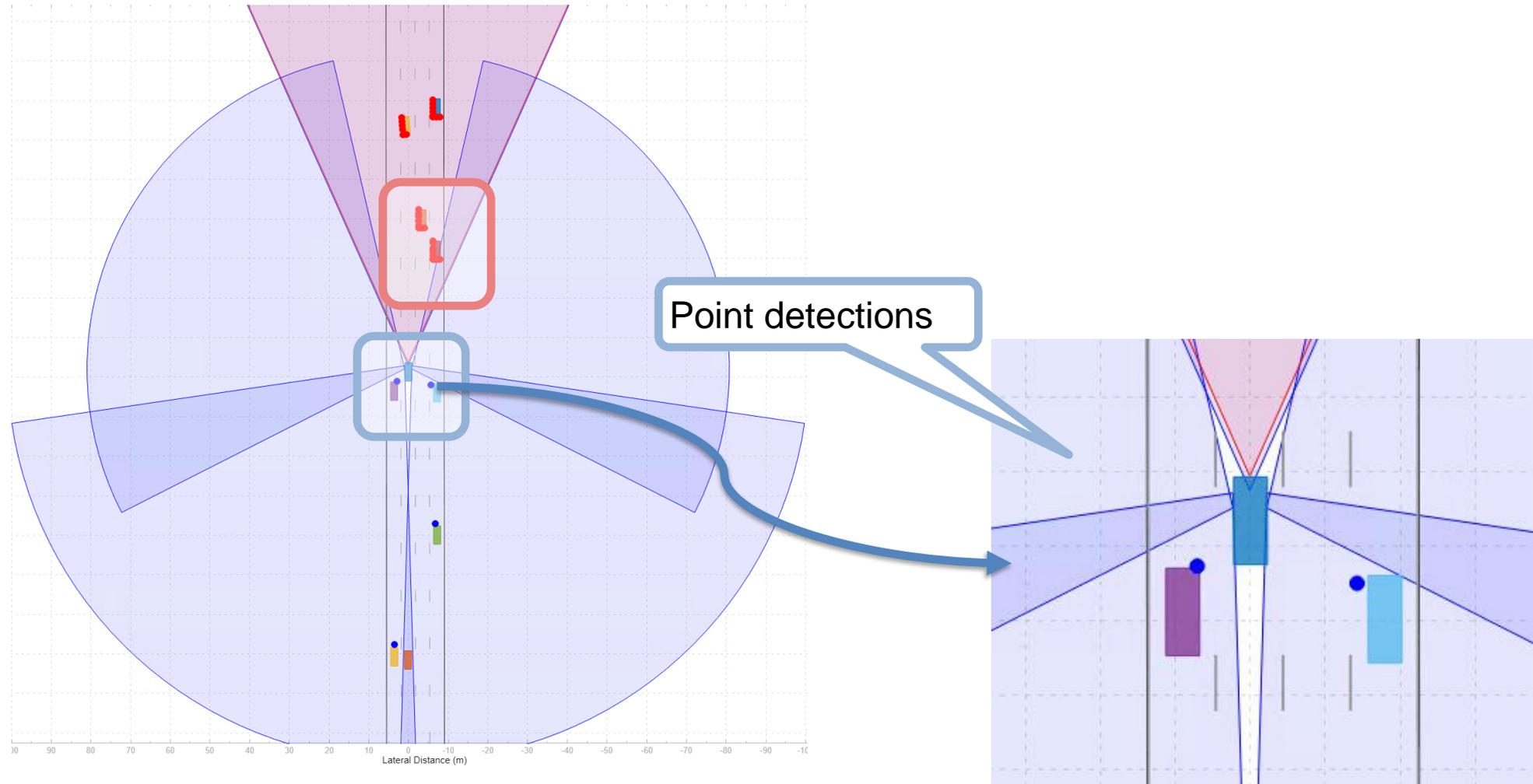
Port Settings

Source of output bus name:

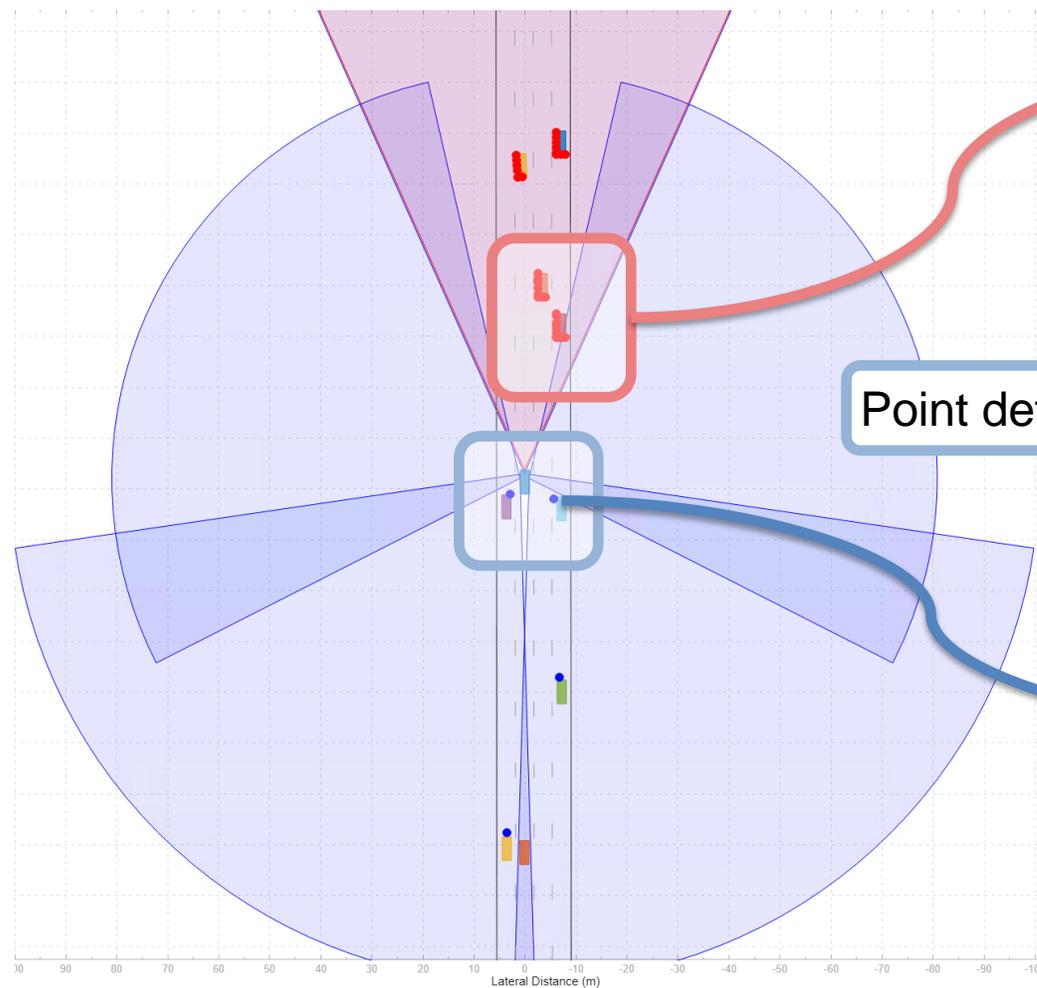
# Sensor settings



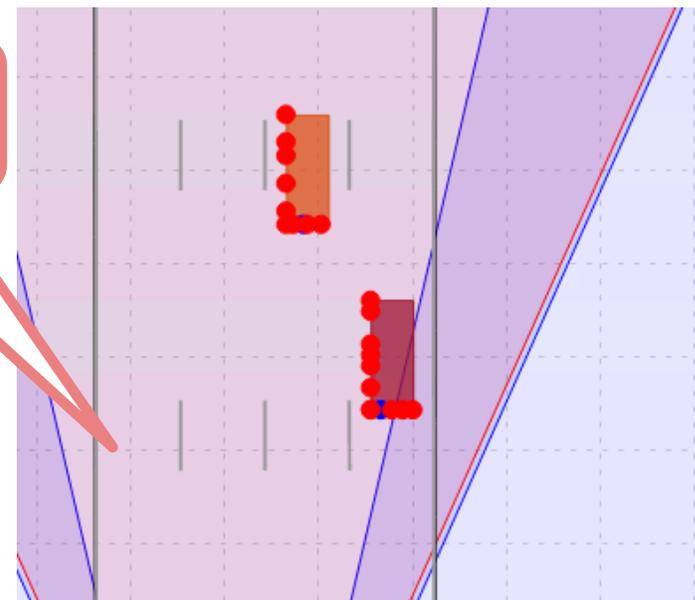
# Sensor settings



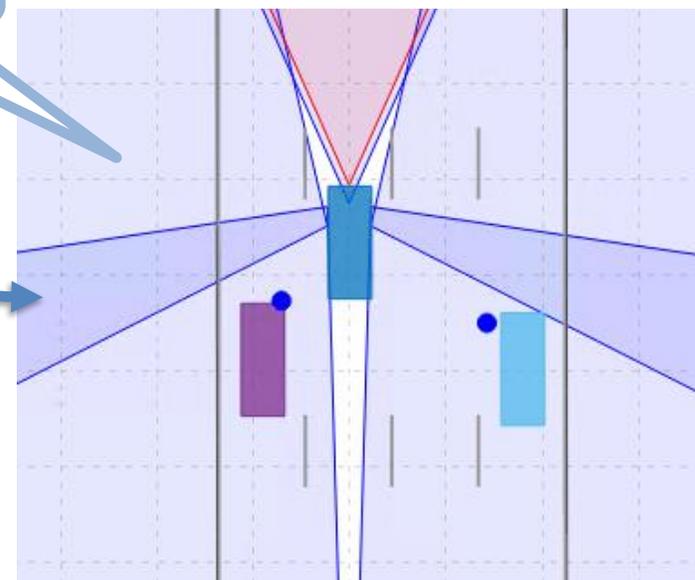
# Sensor settings



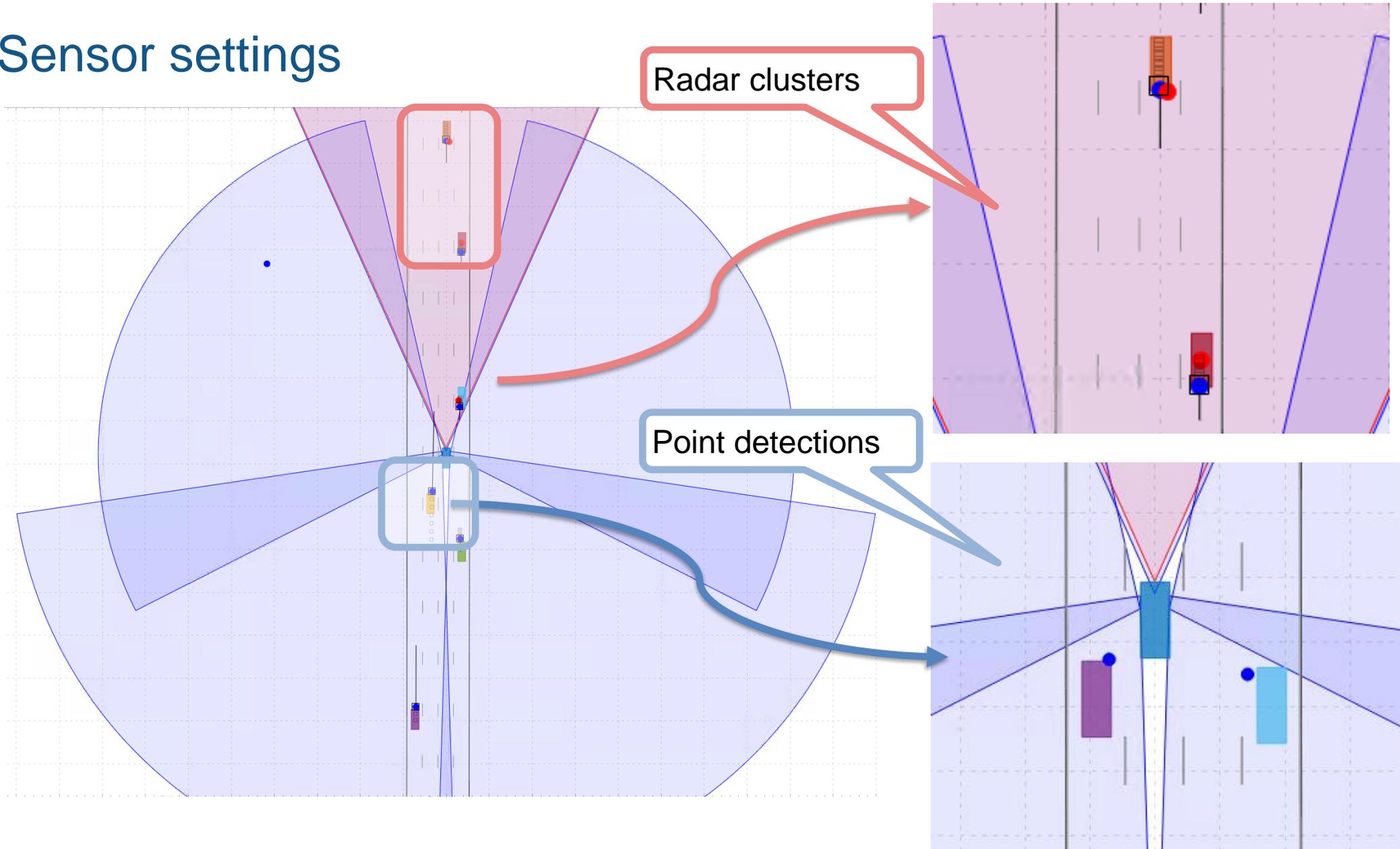
Contour  
detections



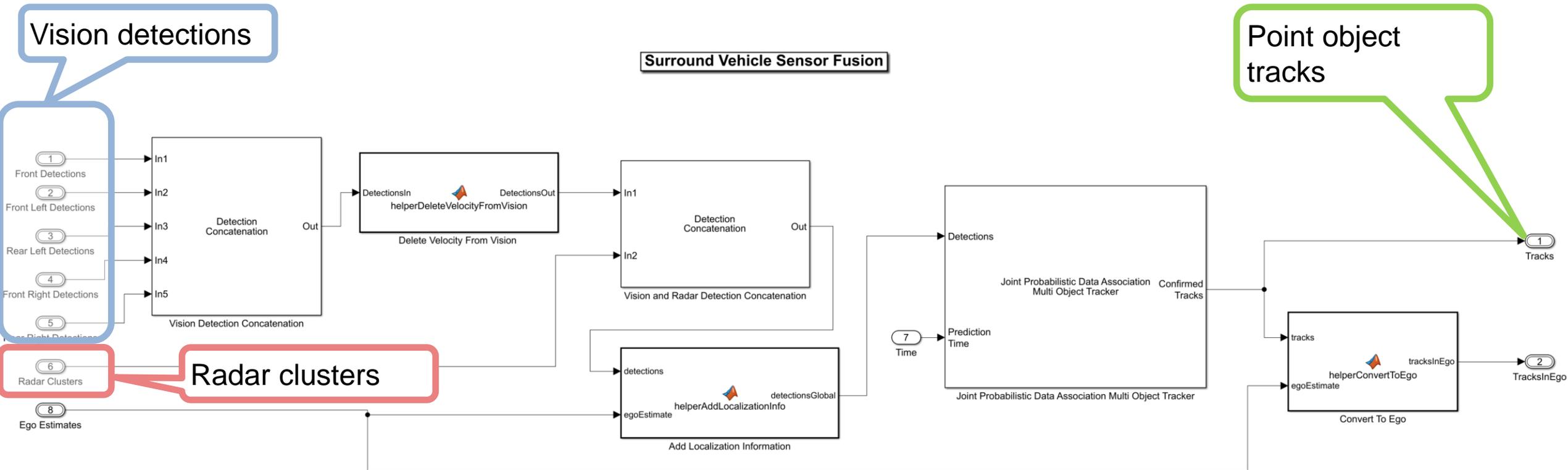
Point  
detections



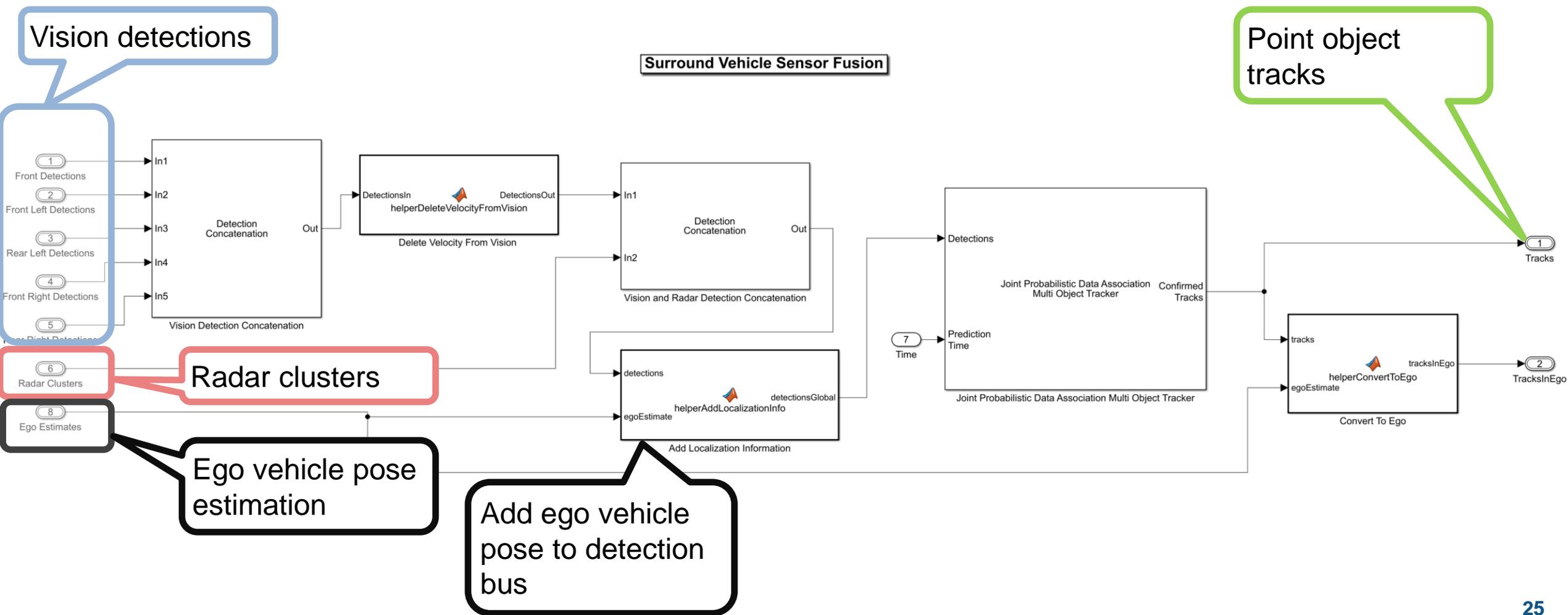
# Sensor settings



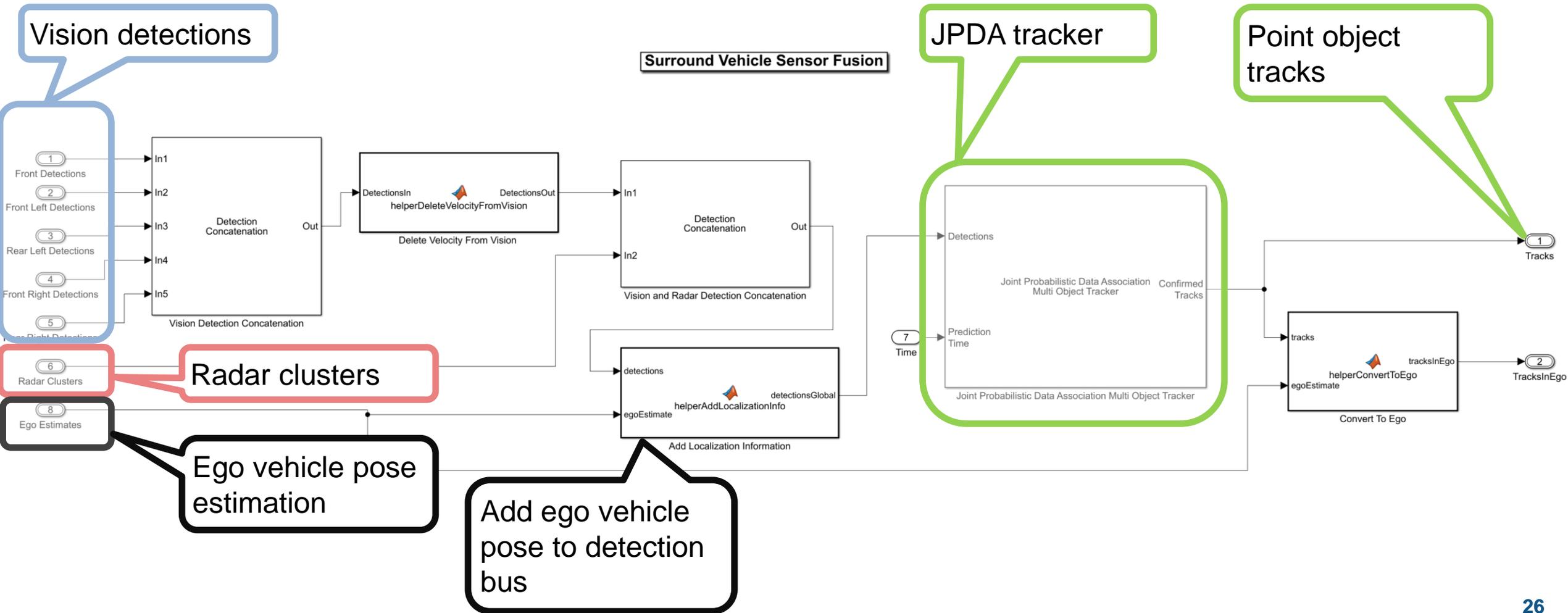
# Surround Vehicle Sensor Fusion Algorithms



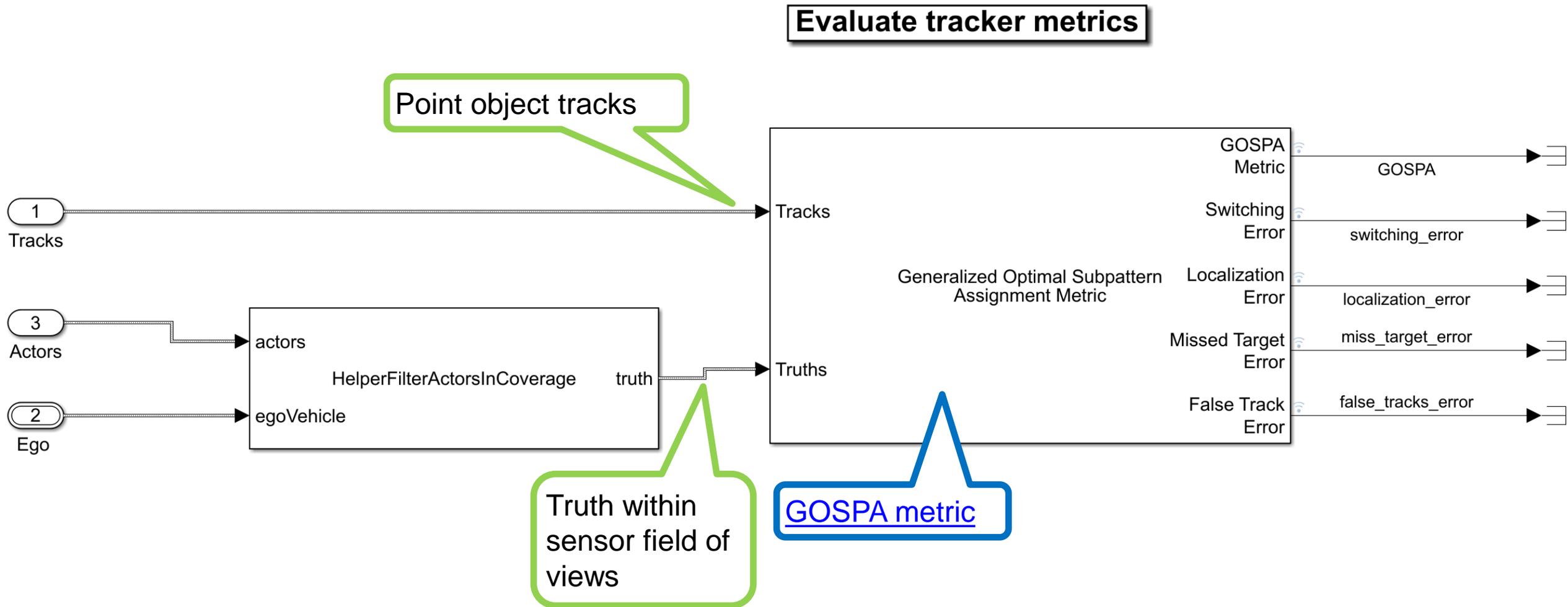
# Surround Vehicle Sensor Fusion Algorithms



# Surround Vehicle Sensor Fusion Algorithms



# Metrics and Assessment



# Key Takeaways

- MathWorks provides
  - Scenario and sensor models
  - Metrics for trackers
  - Building block for sensor fusion and tracking algorithms

# MATLAB EXPO

## 2021

Thank you

