24.11.22 VVM Final Event

SAKURA
Safety Assurance KUdos for Reliable Autonomous Vehicles

The Japanese Safety Assurance Approach

JARI

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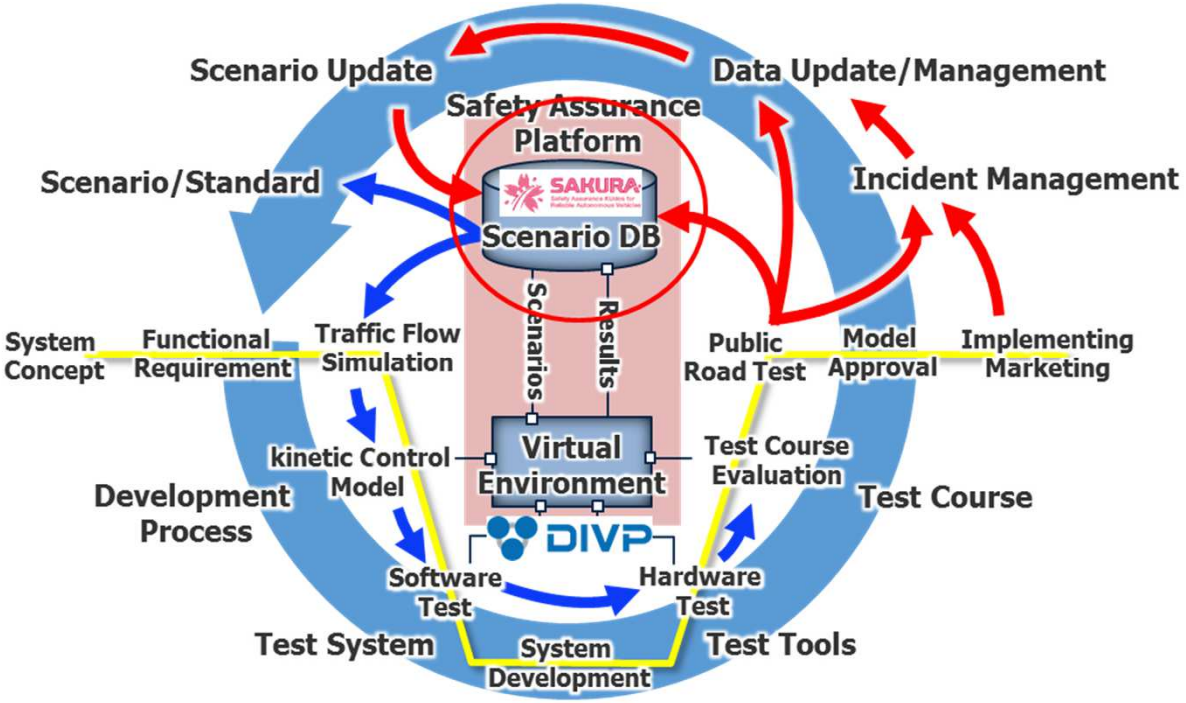
Overview of SAKURA project

Projects aim

- Harmonize data collection, develop research methodologies
- Coordinate standardization activities through joint efforts with JAMA and academia
- Establish a continuous safety evaluation eco-system for safer AD development

Facts about the projects

- **Funded by METI**
  - 1.26 Bio JPY(FY22)
  - 1.59 Bio JPY(FY23, incl. DIVP)
- **Duration**
  - 2018-2020(Phase1)
  - 2021-2025(Phase2)



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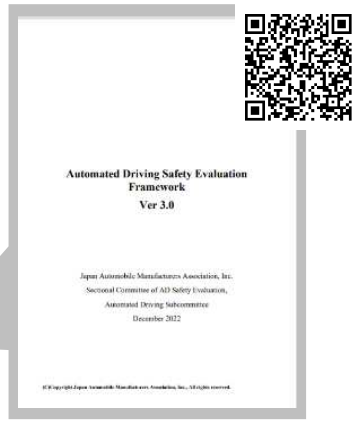
Structure of Japanese safety assurance activity

Common Foundation of ADS safety assurance

- **Methodology: converge complicated real traffic into finite number of scenarios**
  - Scenario based approach
  - Defining reasonably foreseeable and preventable boundary
  - Output as JAMA Framework and standards (ISO34502, UN R157)



- **Application: traceable evidences and practical testing tool**
  - SAKURA database
  - Integration with virtual platform (DIVP)

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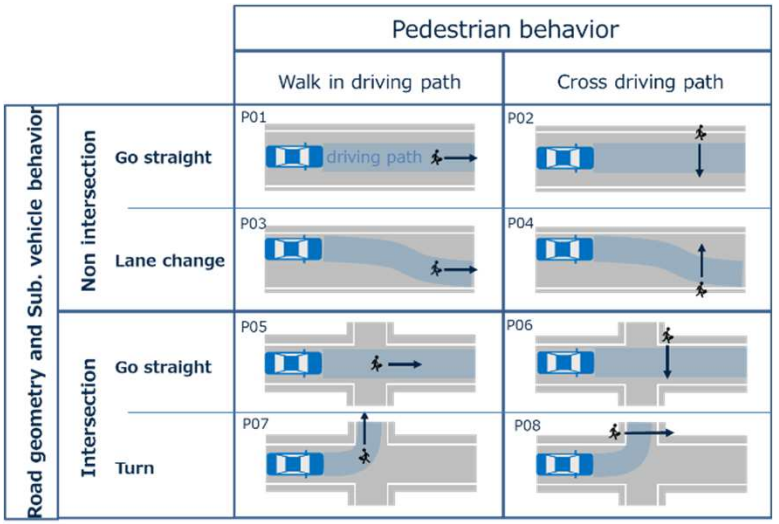
Current status of FS development

- **Car to Car Scenario**
  - **Consideration of turning maneuver, oncoming vehicle and intersection**
  - **Converged into 58 Functional Scenarios**
- **Car to Pedestrian Scenario**
  - **Pedestrian behavior are simply described**
  - **First draft provides 8 FS**

Highway
24 Scenarios

Urban 58 Scenarios



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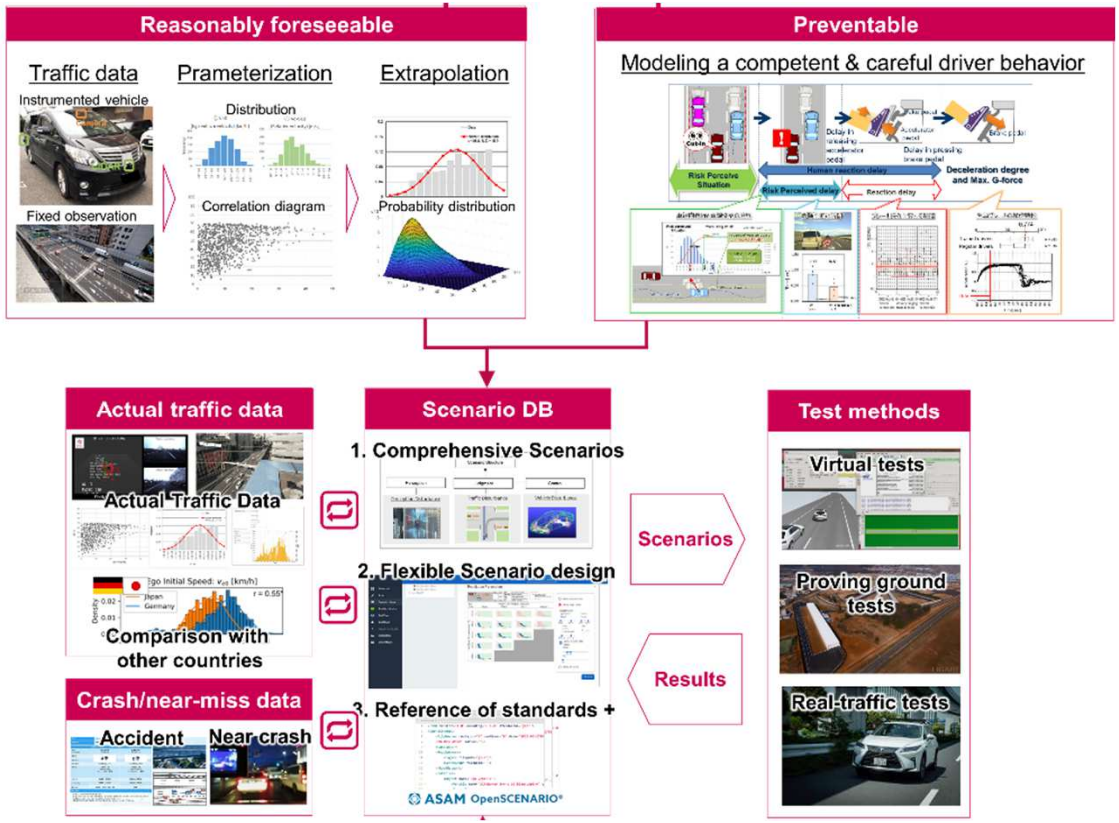
SAKURA database in the context of SA toolchain

- **Quantify foreseeable and preventable**
  - **Measurement of traffic data**
    - Validate functional scenarios
    - Estimate parameter distribution
  - **Modelling C&C driver behavior**
    - Preventable boundary
- **Integrate with testing methods**
  - **Provide relevant exposure**
  - **Near crash/Accident scenarios**
  - **Output concrete scenarios**



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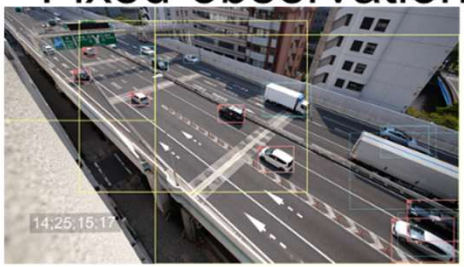
Quantitative definition of reasonable foreseeable

- **Derive relevant exposure parameter range from real traffic data**

Traffic data

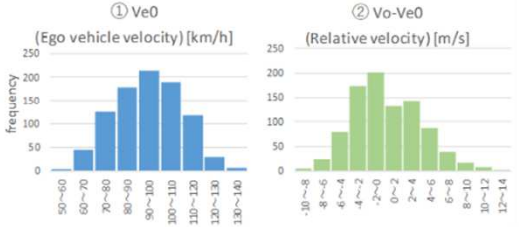
Instrumented vehicle

Fixed observation

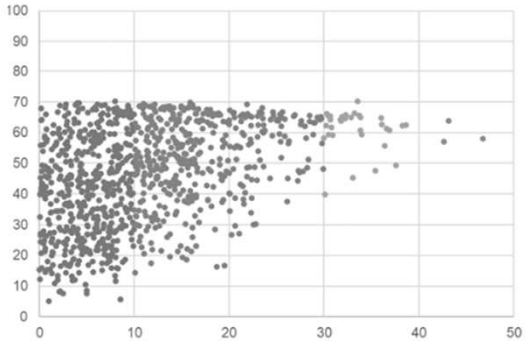


Parameterization

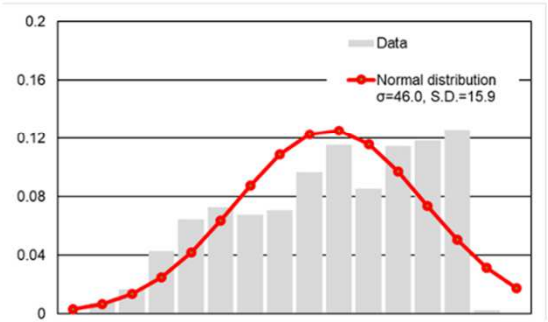
Distribution



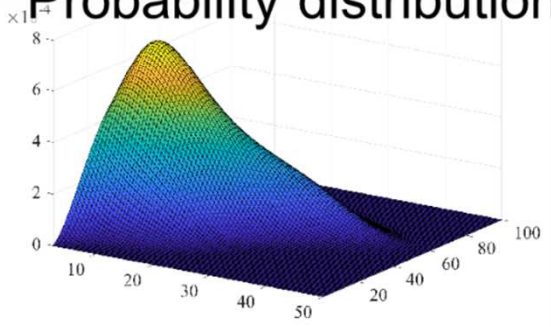
Correlation diagram



Extrapolation



Probability distribution



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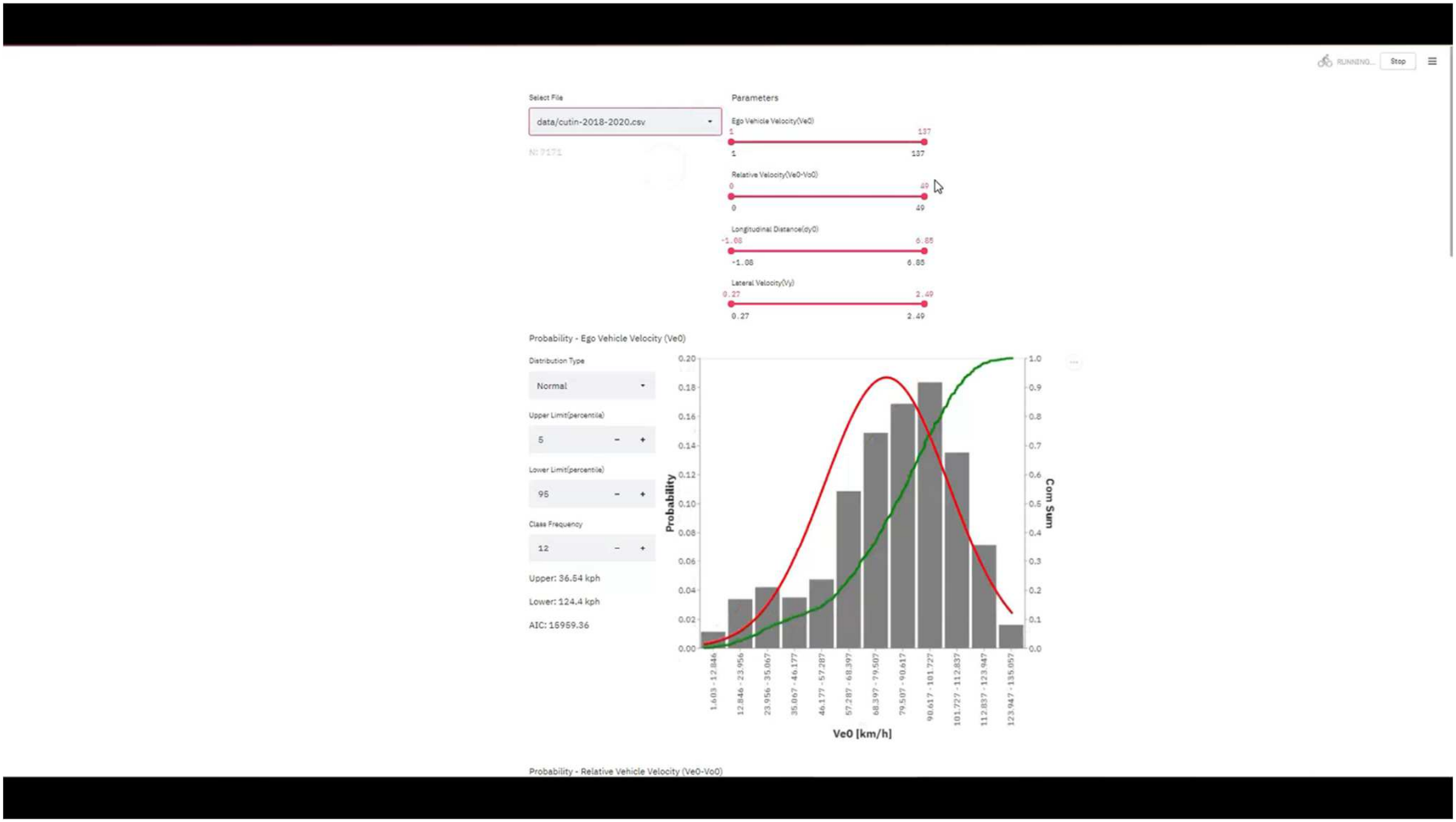
Demo of traffic flow database



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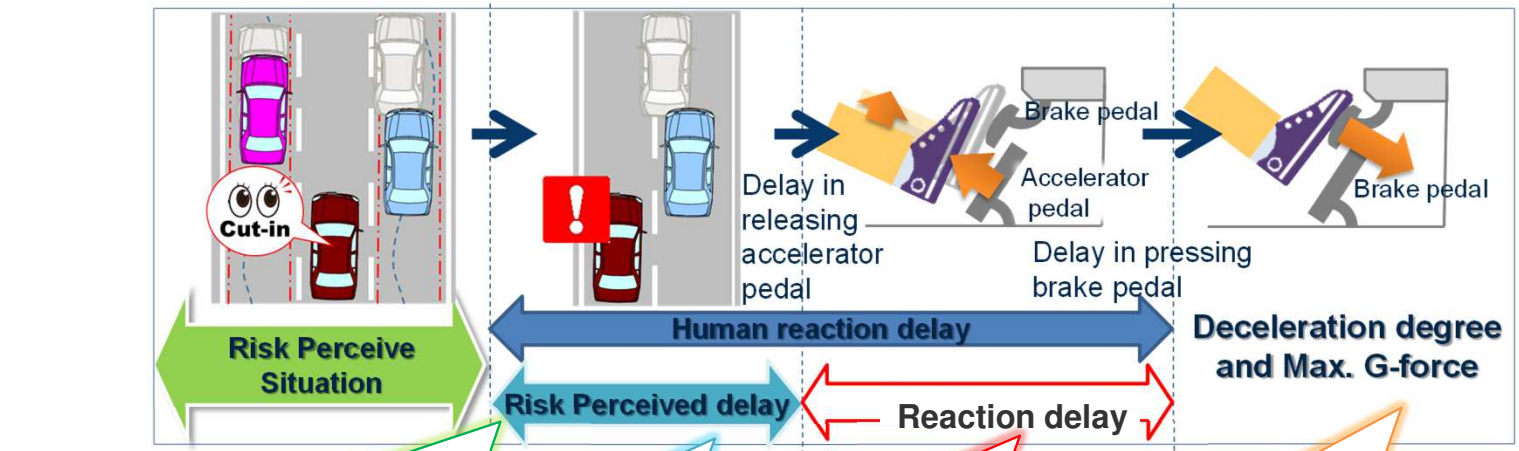
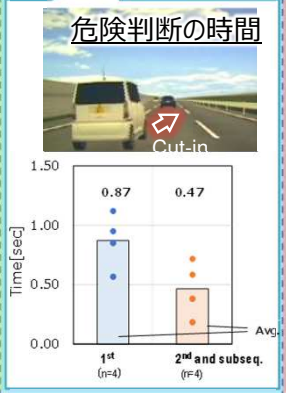
Determination of preventable boundary

◆ Derive preventable boundary base on C&C human driver model

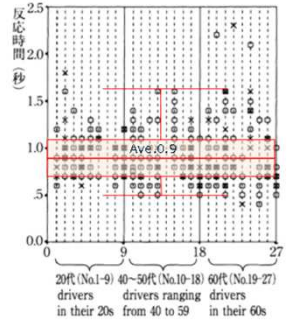


車線内走行と車線変更の境界

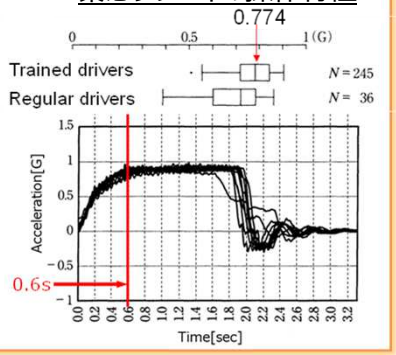
危険判断の時間



ブレーキ操作に要する時間



緊急ブレーキの操作特性



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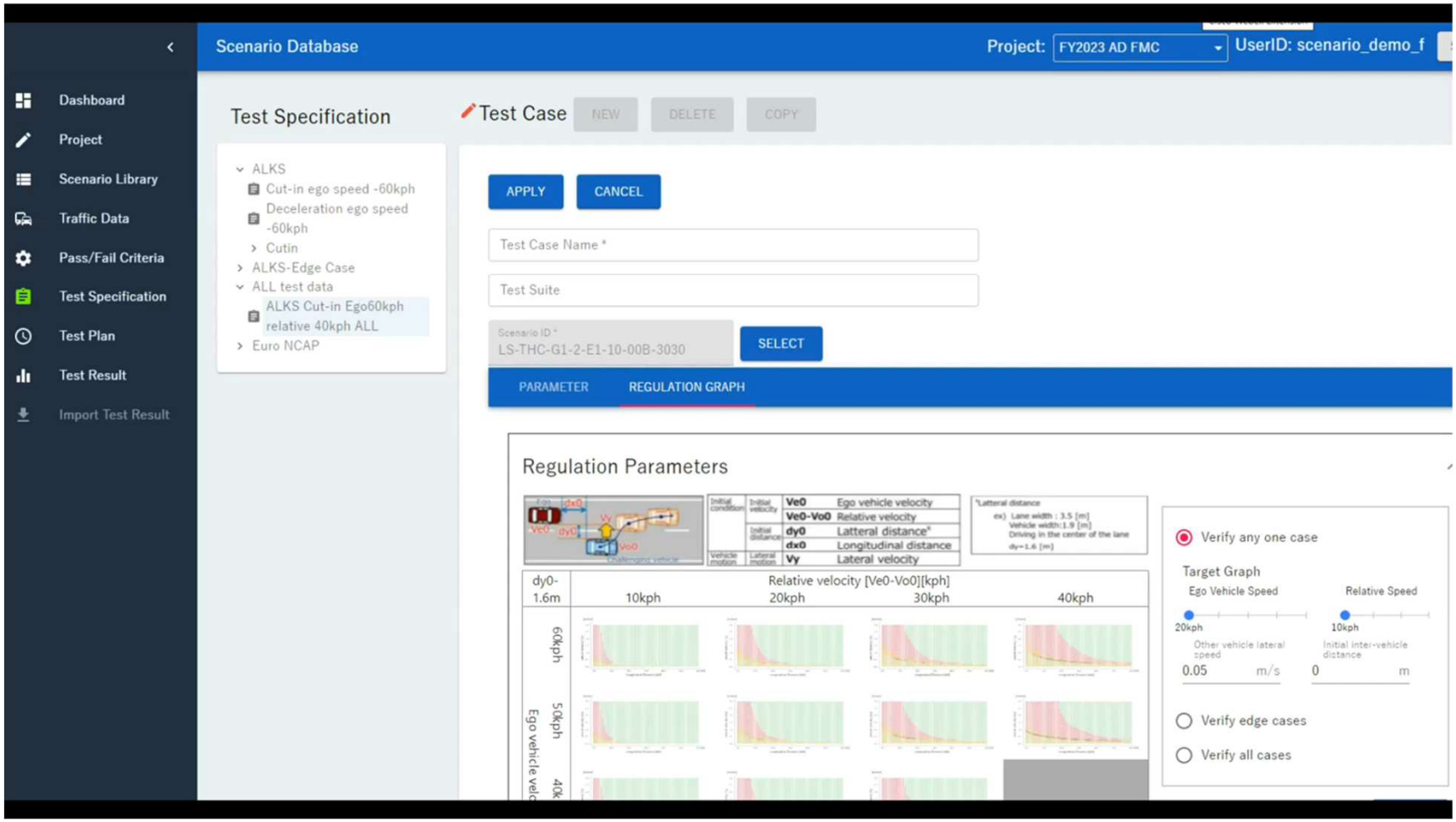
Demo of scenario database



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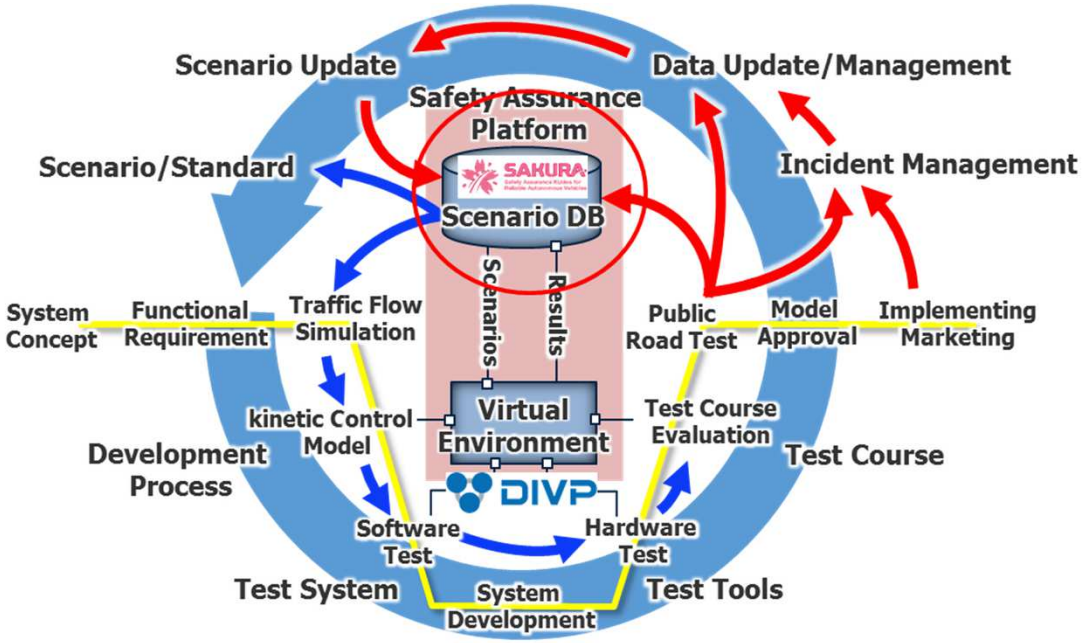
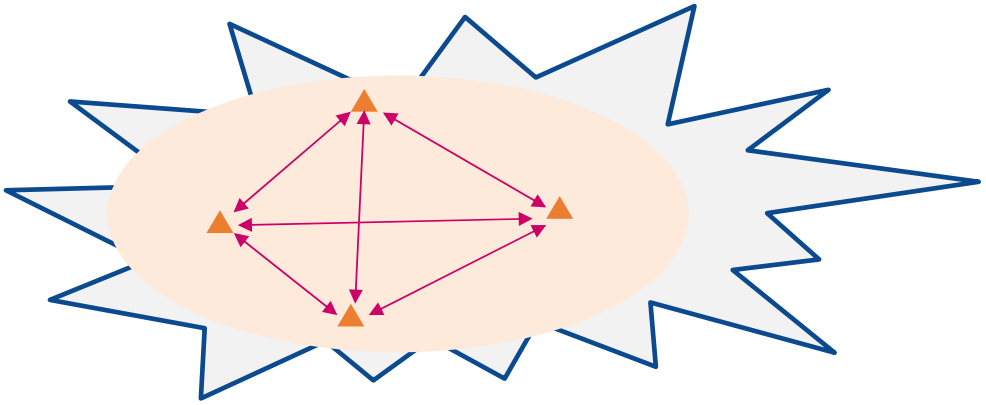
Summary

- SAKURA project is developing traffic interaction scenario
- Implementing scenarios as SAKURA database
- It will maximize the value of concrete test cases (simulations)





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