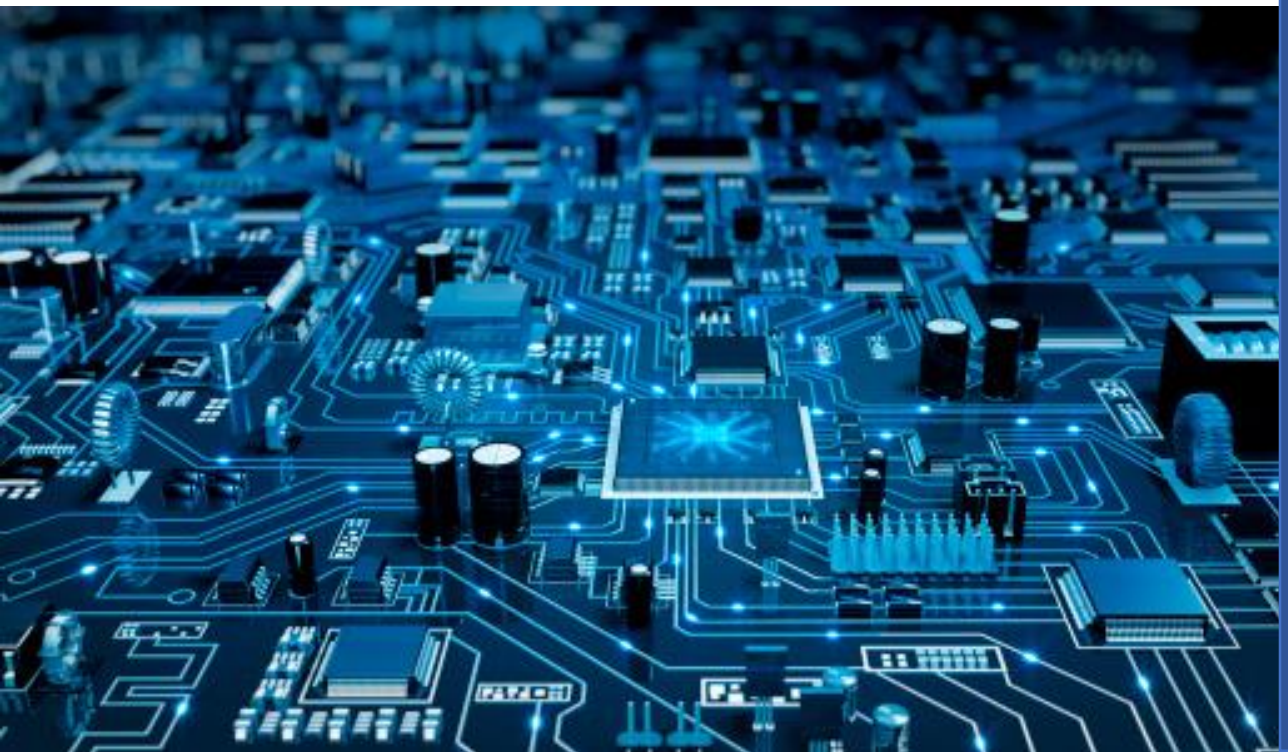
INTERFACE MICROSYSTEMS

MIL In Test-driven Development For Achieving Agile ECU Development

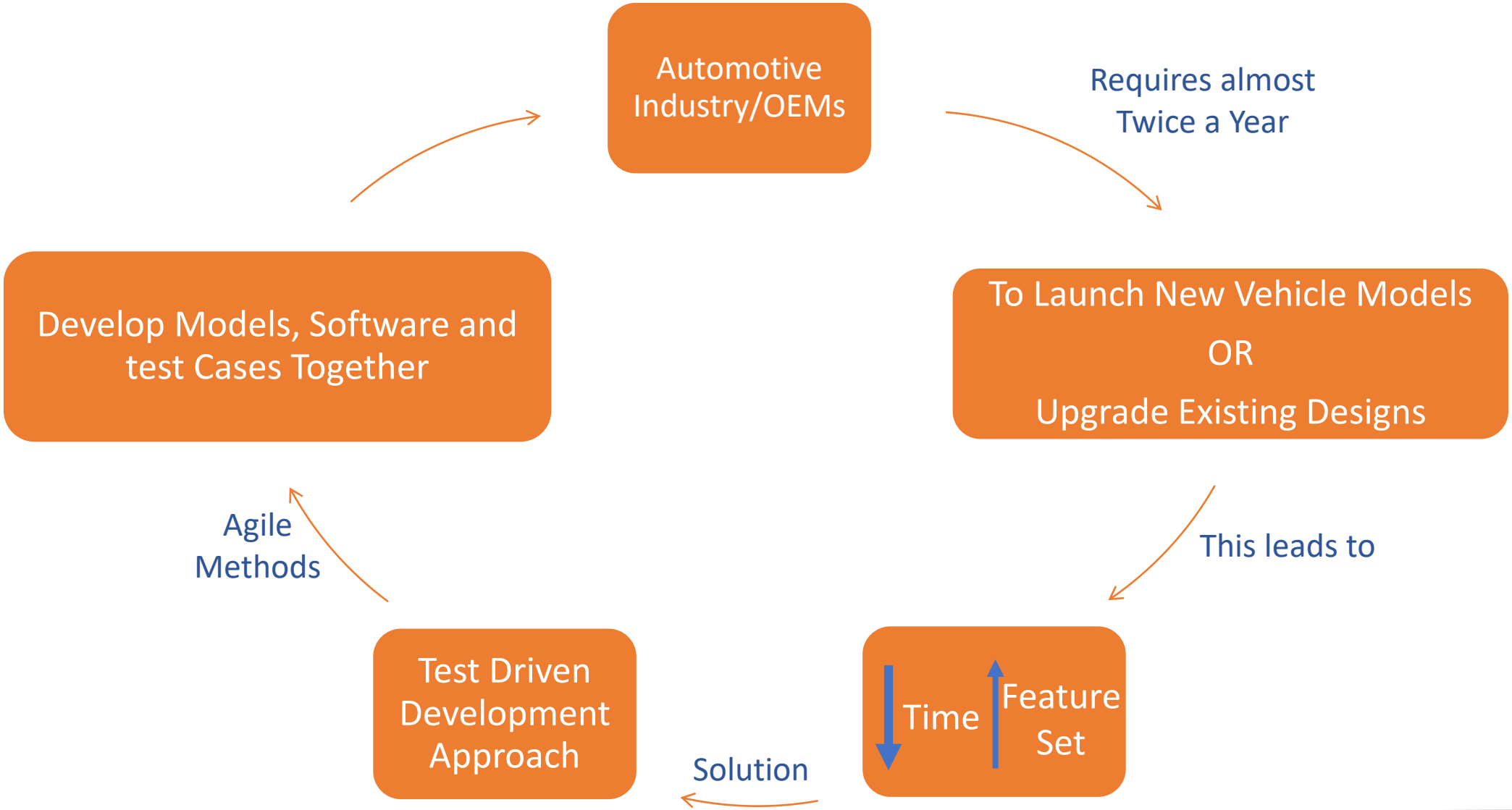


Nukul Sehgal
Team Lead – Software Engineering

Srishti Sharma
Software Engineer

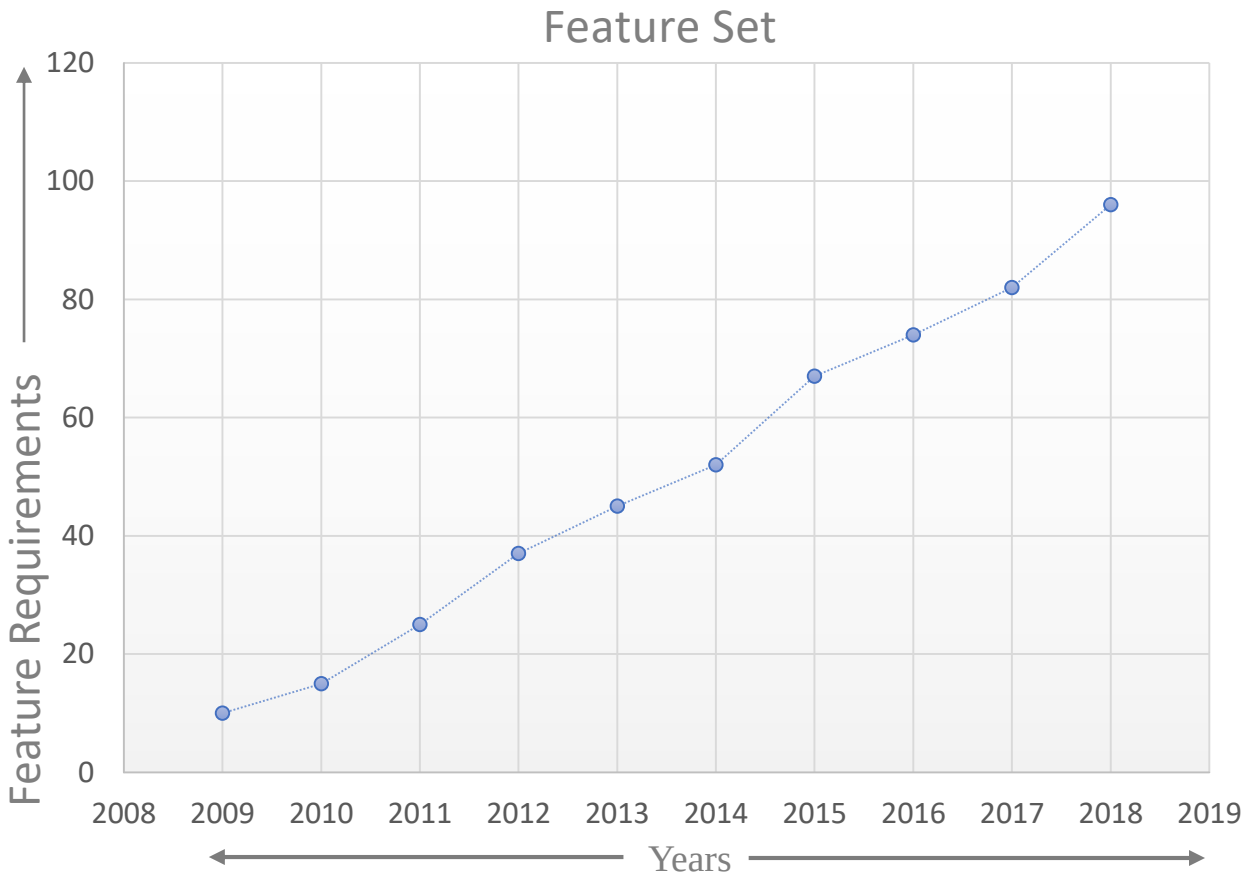
Headquarter
341-342, Udyog Vihar Phase II
Gurgaon-122016, Haryana
Phone: +91-124 - 4736950
Fax: +91-124-4736960
Website: www.interfaceauto.com

Problem Statement



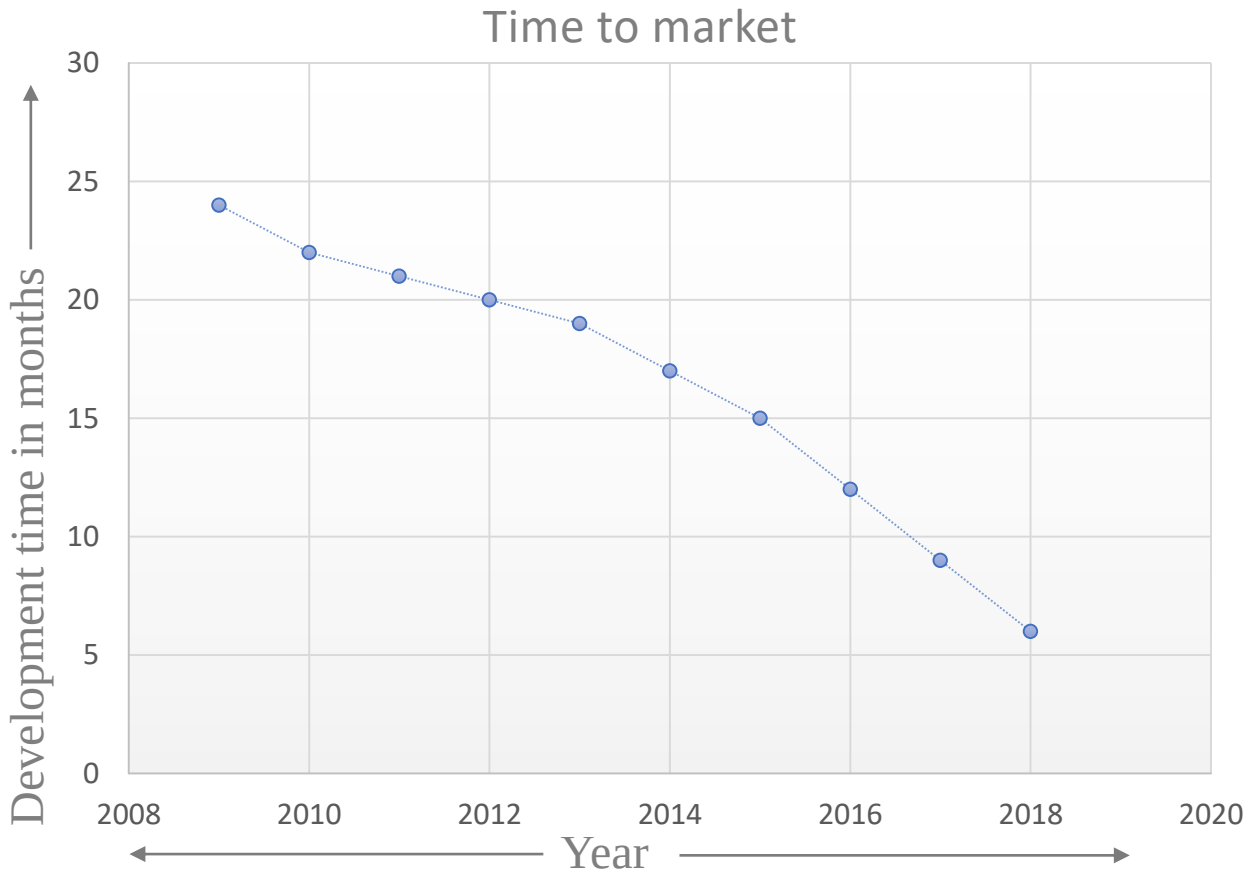
Problem Statement

Increased ECU feature sets



Problem Statement... continued

Reduced Time to Market



Development Strategy to solve the problem

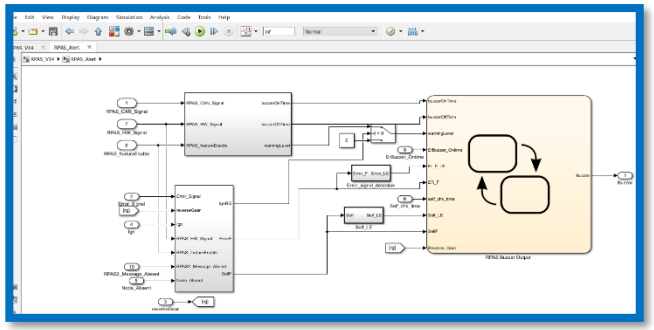
Approaches discovered for different scenarios of ECU development requirements.

1. Requirement of software development on an existing ECU hardware.

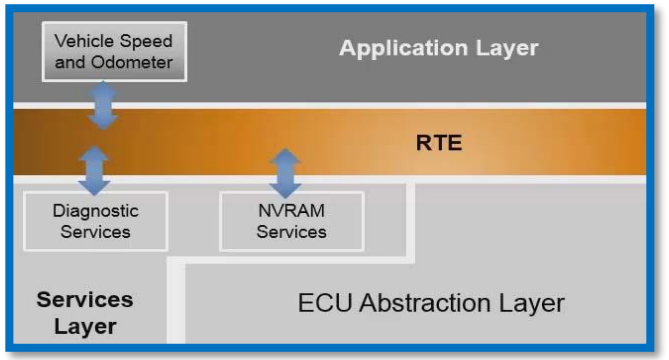
2. Requirement of a whole new ECU software and hardware.

Development Strategy to solve the problem

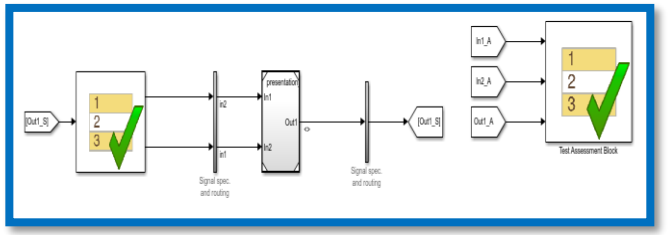
Model based Development



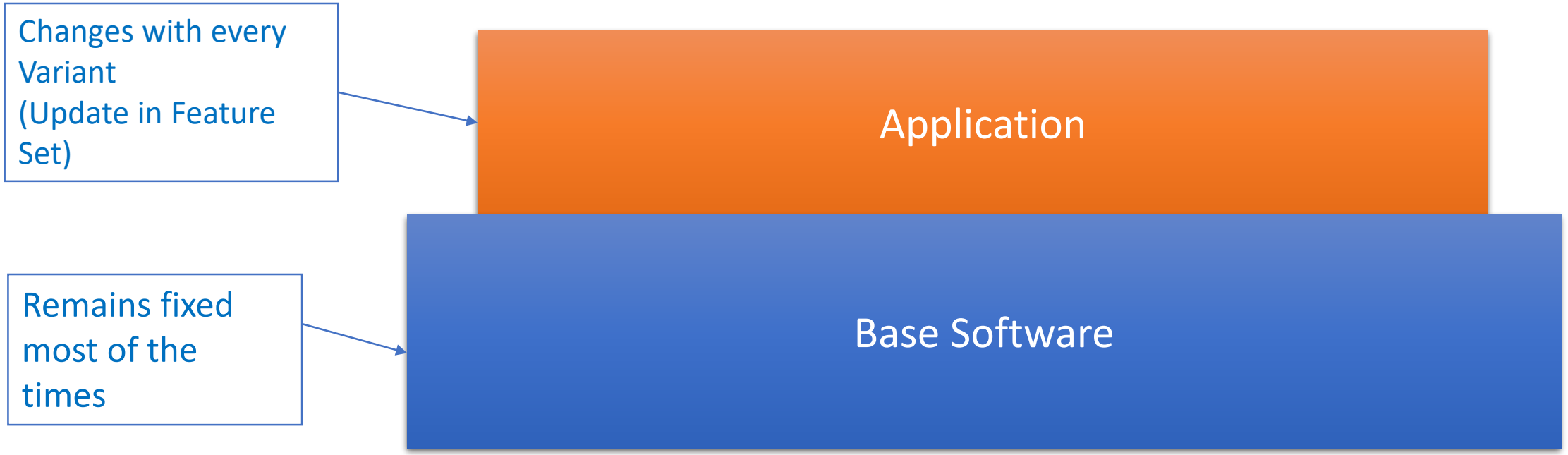
AutoSAR Platform Approach



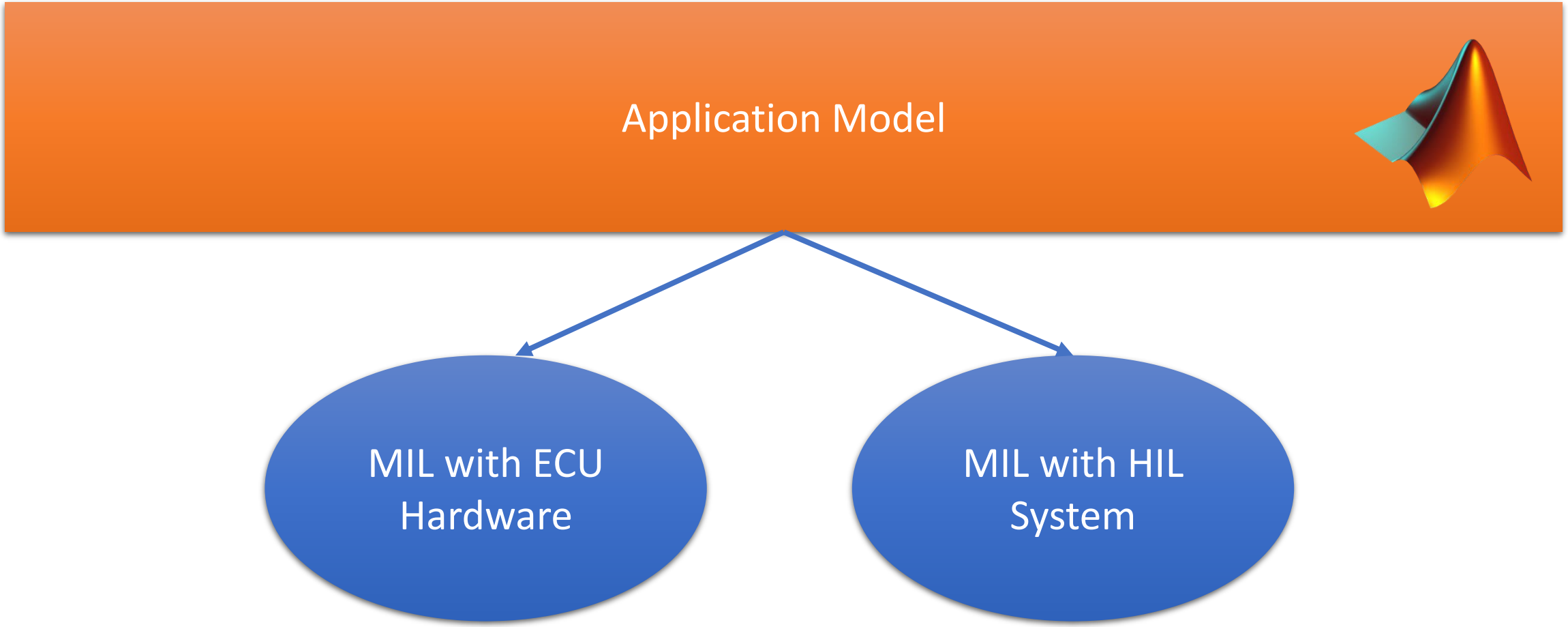
Test Driven Development



Development Strategy to solve the problem… continued



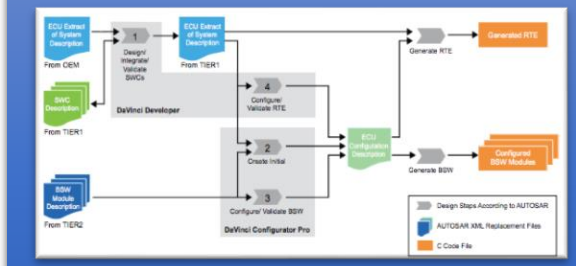
Development Strategy to solve the problem… continued



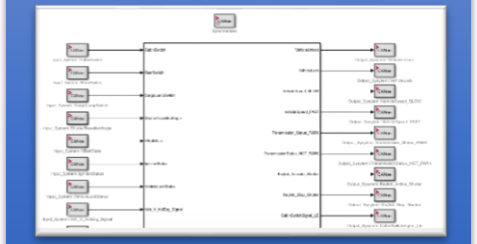
MIL with ECU Hardware

Pre-Requisites

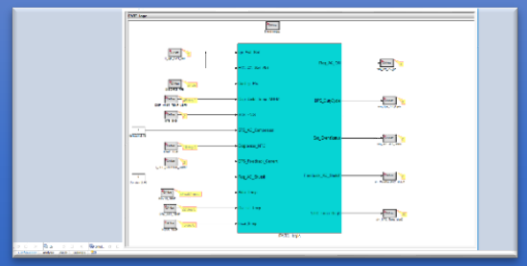
ECU H/W



Established BSW



COMM Layer

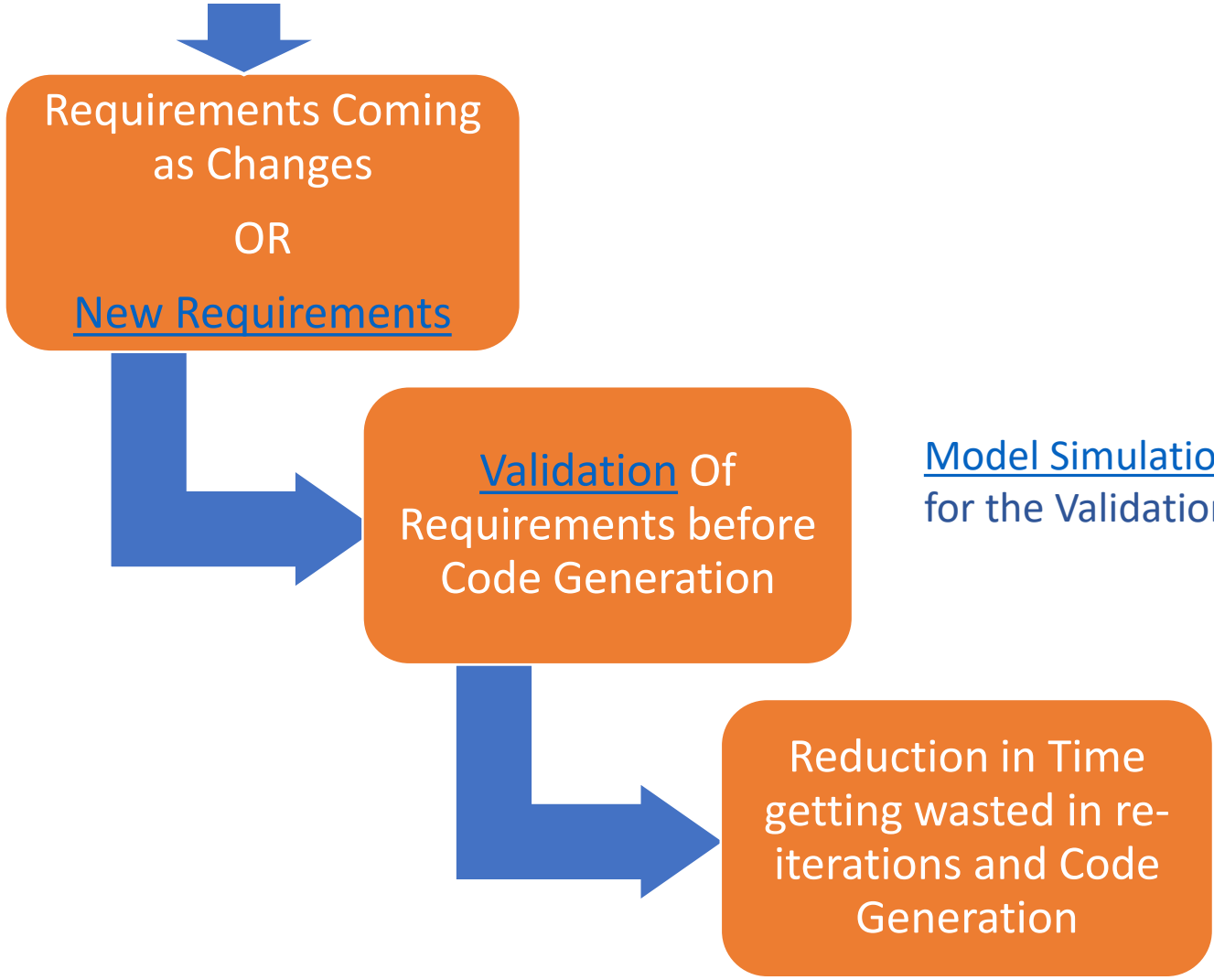


Test Setup MIL Capabilities

Benefits

- ✓ Actual H/W in-loop to drive the loads.
- ✓ Closed loop testing with actual sensor and load feedback.
- ✓ Model Developer does not need to wait for Software Integrator.
- ✓ Model and Signals can be traced/logged.
- ✓ Minimal change in HIL Setup and test cases when testing production ready part with Integrated H/W and S/W.

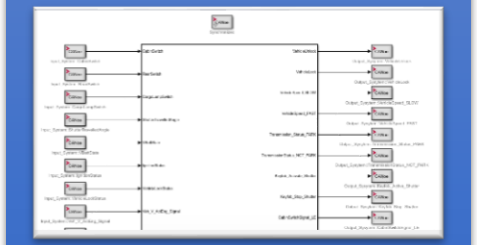
MIL with ECU Hardware



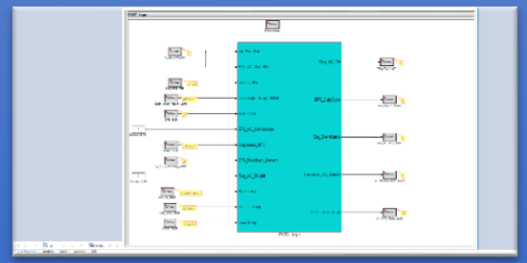
Model Simulation is also done for the Validation.

MIL with HIL System

Pre-Requisites



COMM Layer



Test Setup with MIL Real Time

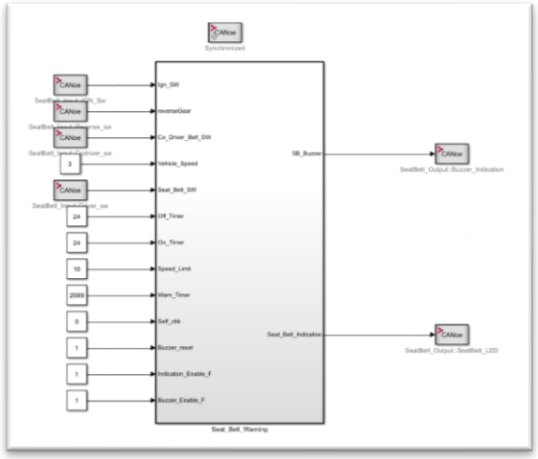
Benefits

- ✓ No actual H/W required to drive the loads.
- ✓ Closed loop testing with actual sensor and load feedback.
- ✓ Model Developer need not to wait for Software Integrator.
- ✓ Co-development of Model and Test cases.
- ✓ Model and Signals can be traced/logged.
- ✓ Minimal change in HIL Setup and test cases with each iteration.

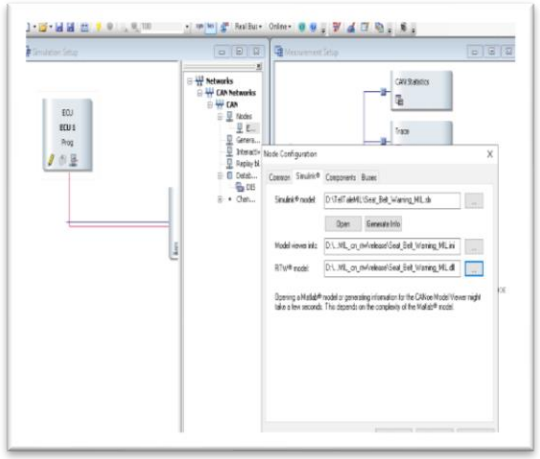
MIL with HIL System

- MATLAB model as Requirement for better understanding and better test results
- By Simple mapping available in HIL, tester can switch between Model under test setup and ECU under test setup
- Reduces Time

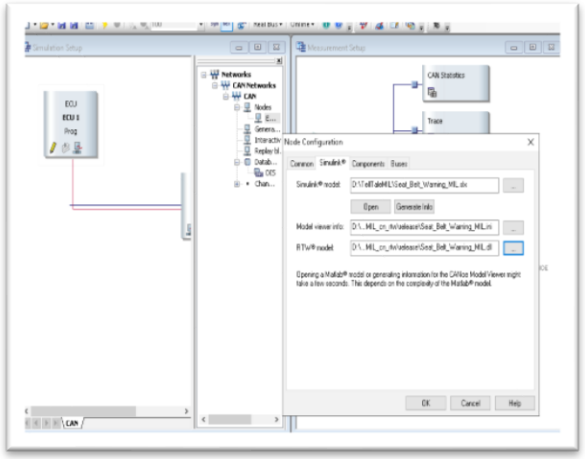
Work Flow for MIL in Test-Driven Development



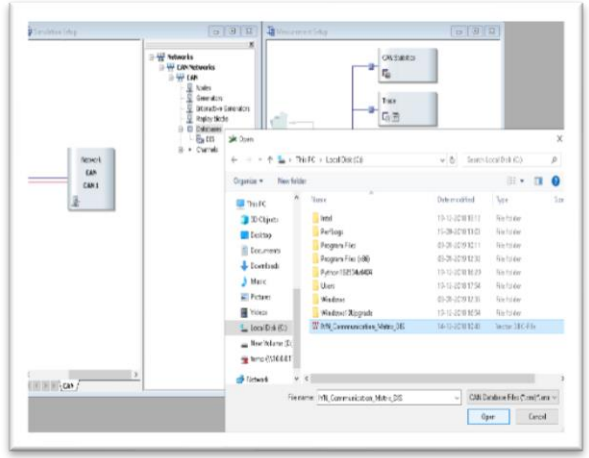
Create model & map to signals/system variables



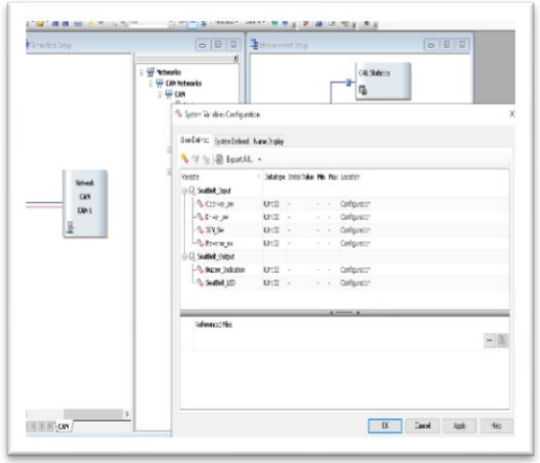
Create Configuration in test environment



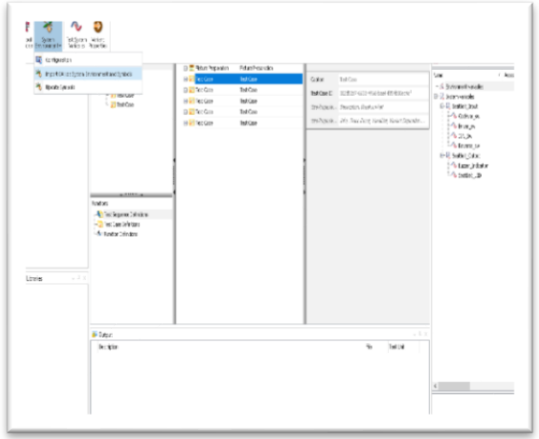
Build model for Test Environment & Load



Load CAN database in Test Environment

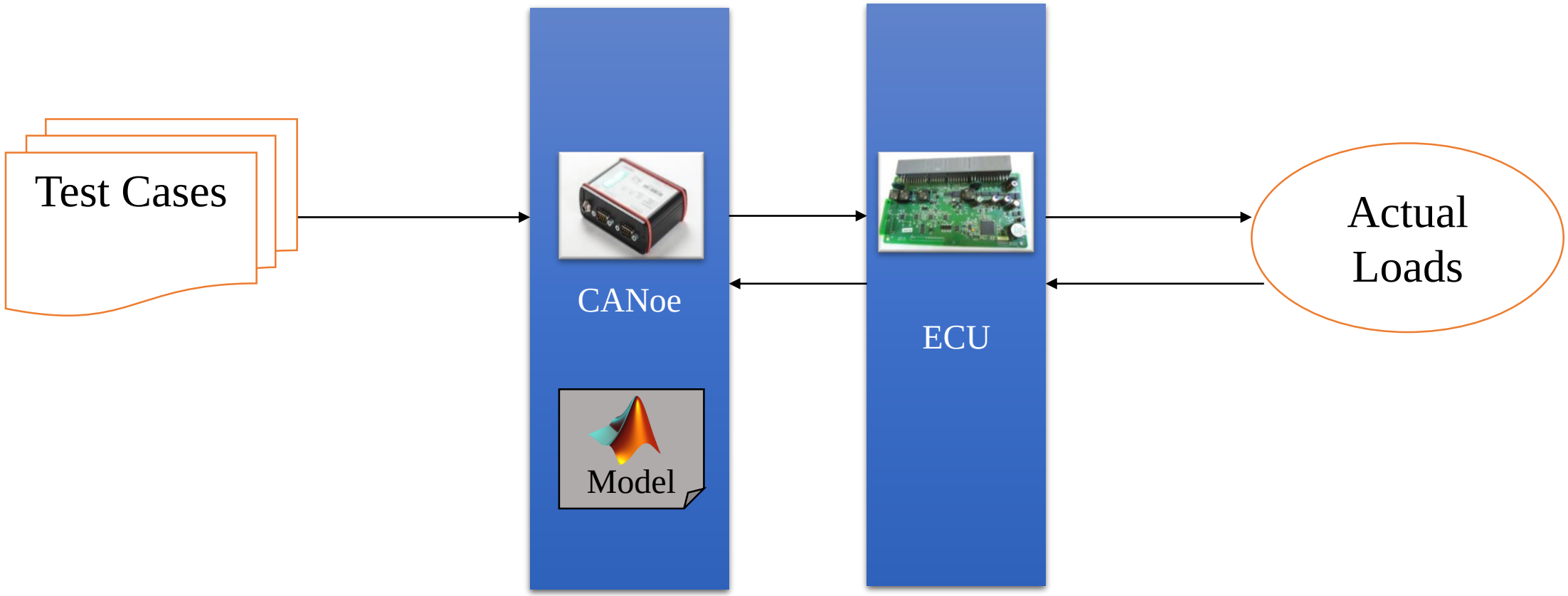


Map System Variables with model & H/W IOs

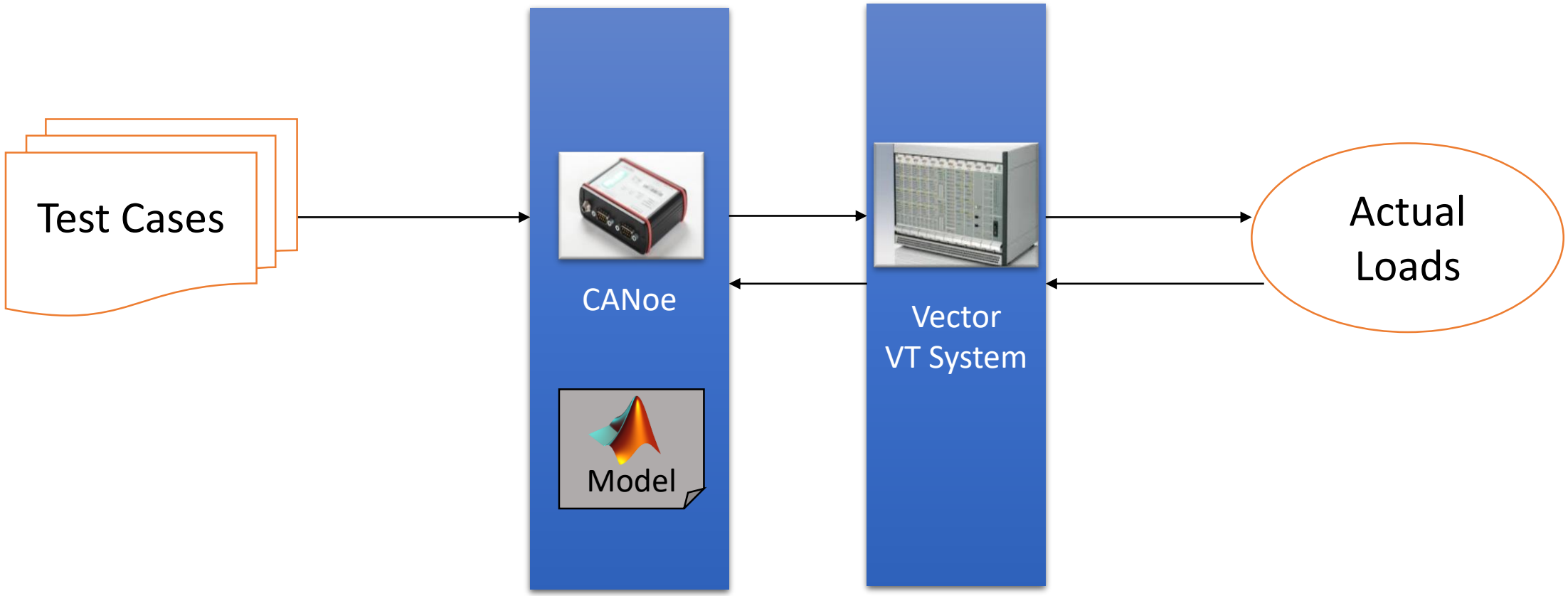


Run model & test Cases in the test env

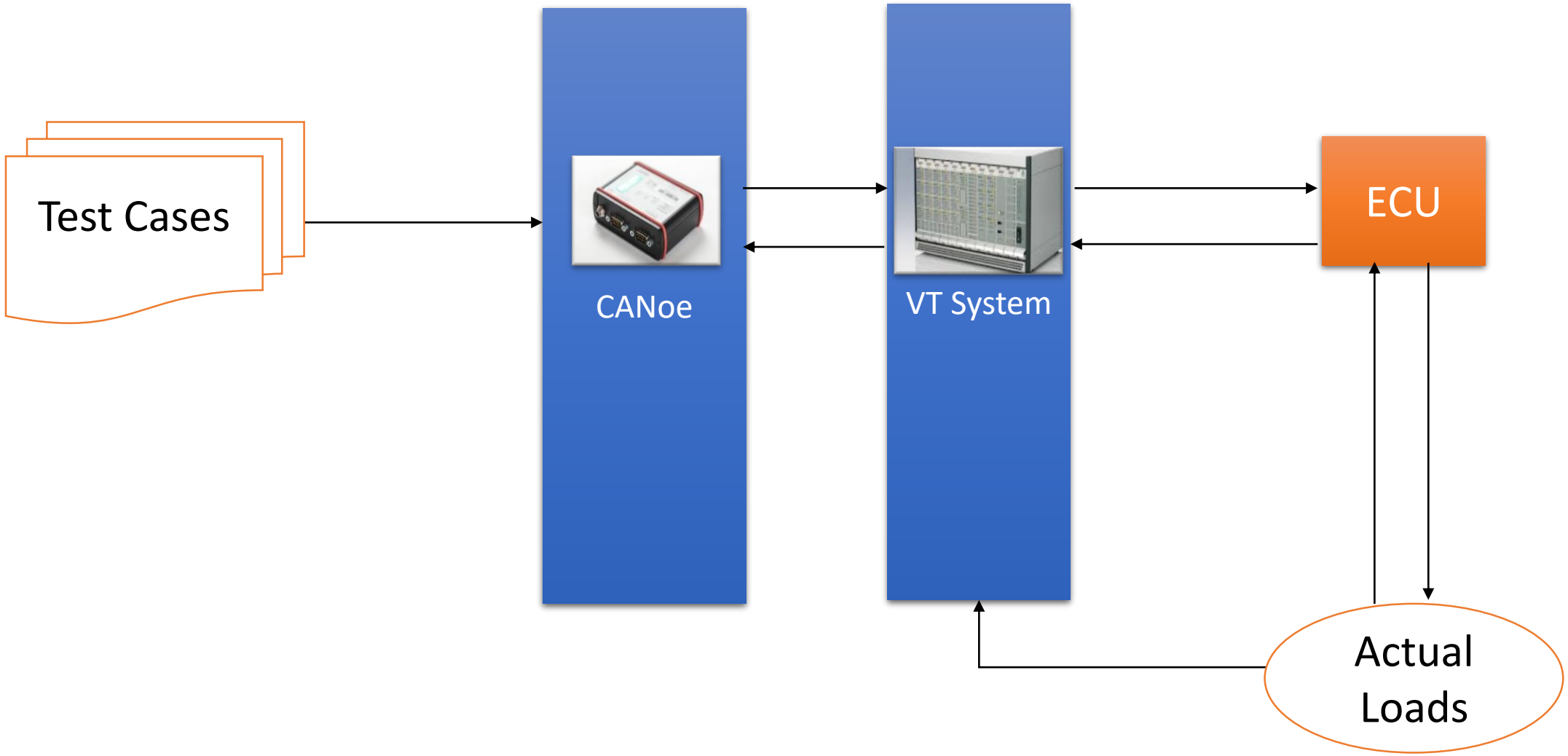
MIL with ECU Hardware System - Testing Flow Diagram



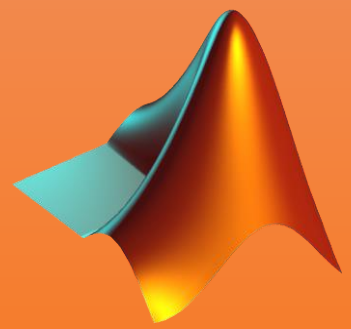
MIL with HIL System - Testing Flow Diagram



Production Ready HIL Setup - Testing Flow Diagram

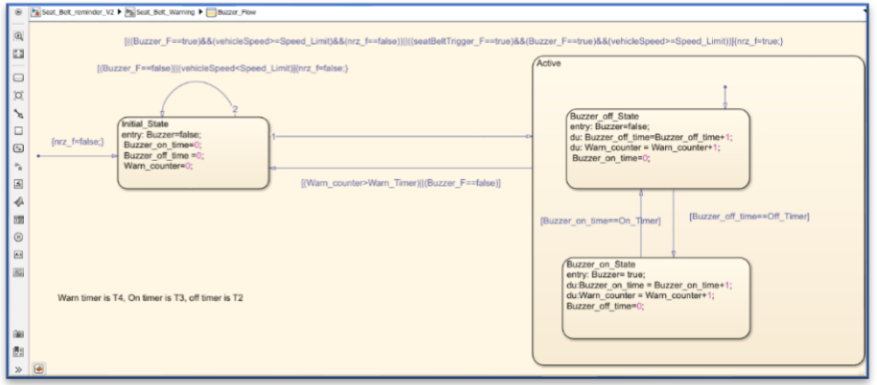


Tools Required



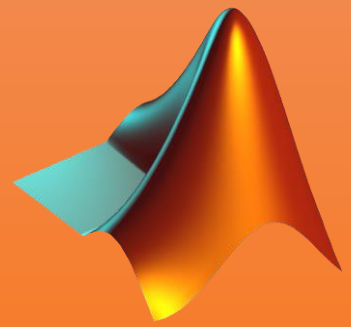
Application Design Through Model Based Approach

Design - Simulink/State-Flow



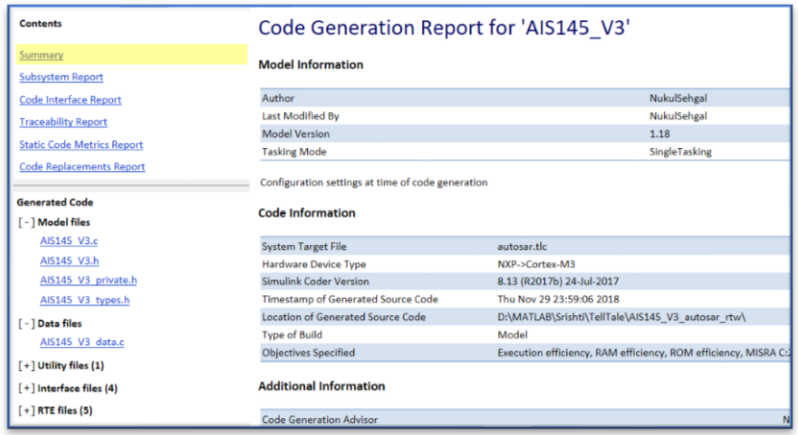
Simulation & Test - Design Verifier/Simulink test

Tools Required

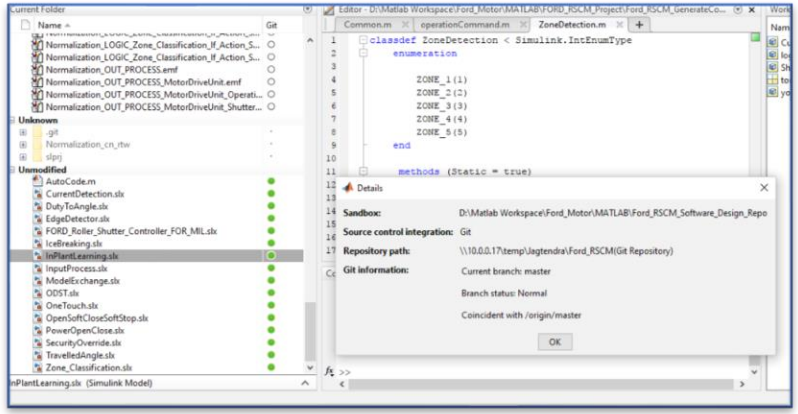


Application Design Through Model Based Approach

Code Generation – Embedded Coder/AutoSAR Tool Box



Change Management- Integrated Version Control-Git



Summary

Requirement of less time to deliver and huge feature set for ECUs are challenging in traditional ECU development approach.

Re-using test cases used in MIL testing with actual ECU with less or no efforts in test case change further saves time to deliver and reduces number of iterations.

Interface Microsystems
341 ~ 342, Udyog Vihar, Phase -2, Gurgaon – 122 016, Haryana, India
Tel: +91 124 4736950, Fax: +91 124 4736951
Email: marketing@interfaceauto.com
Website: www.interfaceauto.com