MATLAB EXPO

2024年5月30日 | 東京

MATLAB and Simulink 最新情報

MathWorks Japan

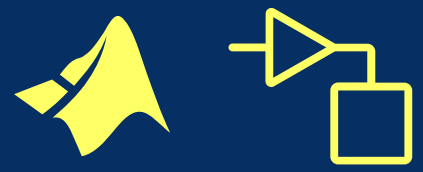
上野 敬志

MathWorks Japan

岩本 光平

MathWorks

3,744



MATLAB®
& SIMULINK®

Integrations

AI

MATLAB®
&SIMULINK®

Integrations

AI

Ease of Use

Performance

Verification

Local Functions

```
x = 1:10;
n = length(x);
avg = mymean(x,n);
```

```
function a = mymean(v,n)
% MYMEAN Local function

    a = sum(v)/n;
end
```

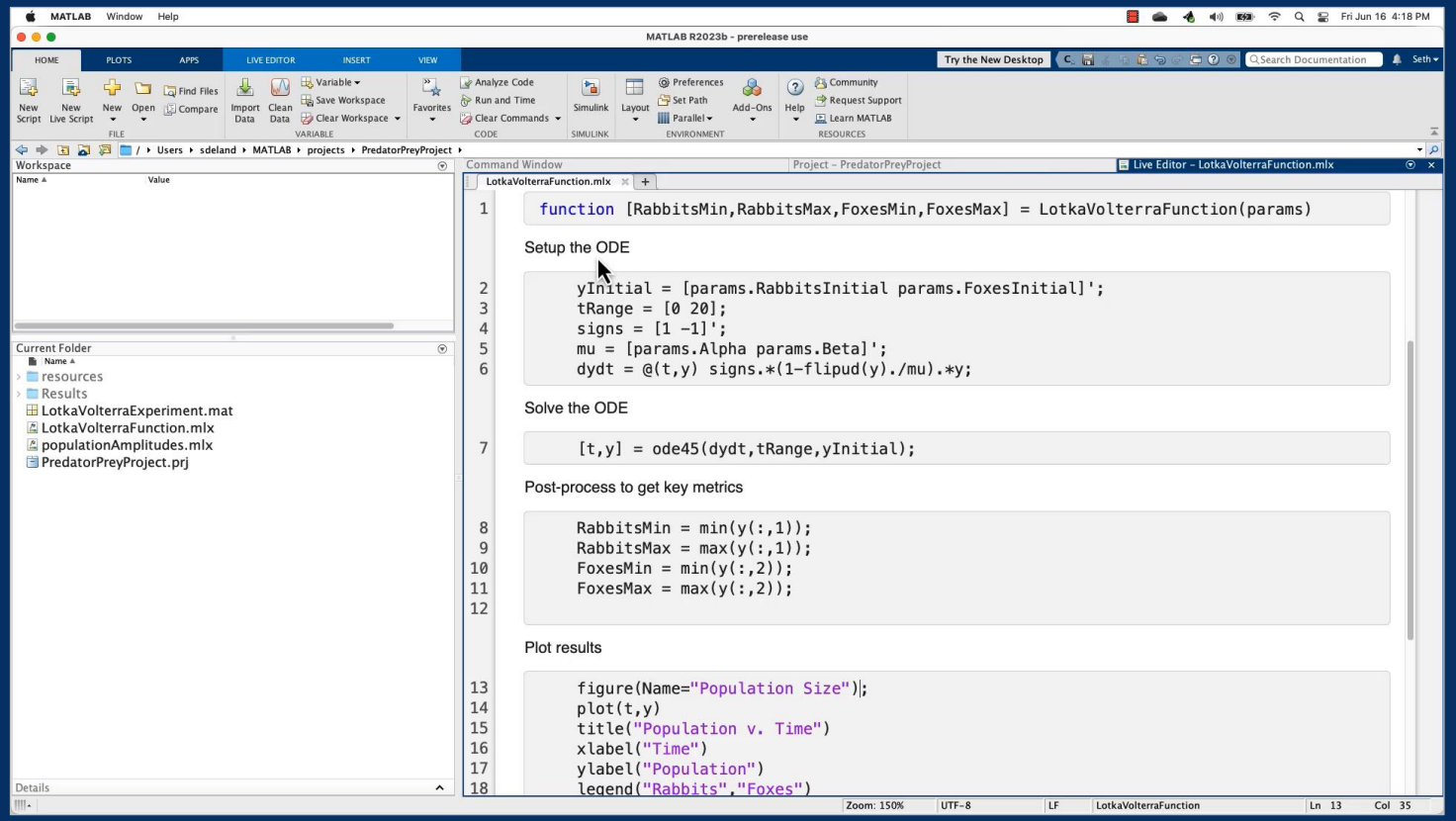
Local Functions: Define functions anywhere in scripts

```
x = 1:10;
n = length(x);

function a = mymean(v,n)
% MYMEAN Local function

    a = sum(v)/n;
end

avg = mymean(x,n);
```

Solve problems with little to no coding – *using apps*

Design experiments to run MATLAB code

– Visualize, filter, and compare results



Experiment Manager App

Solve problems with little to no coding – *using apps and tasks*

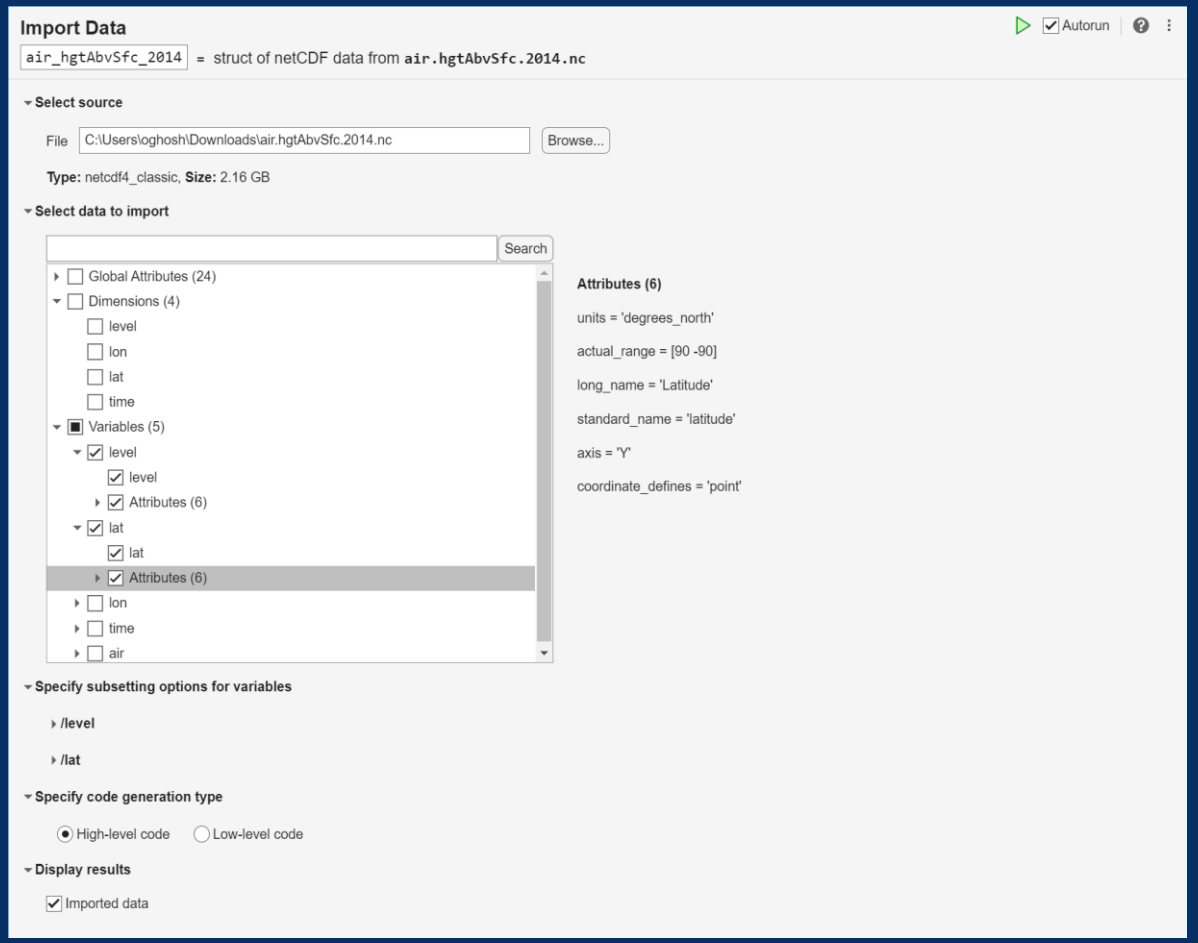
Design experiments to run MATLAB code

– Visualize, filter, and compare results

Interactively visualize and preview hierarchical data formats

– NetCDF

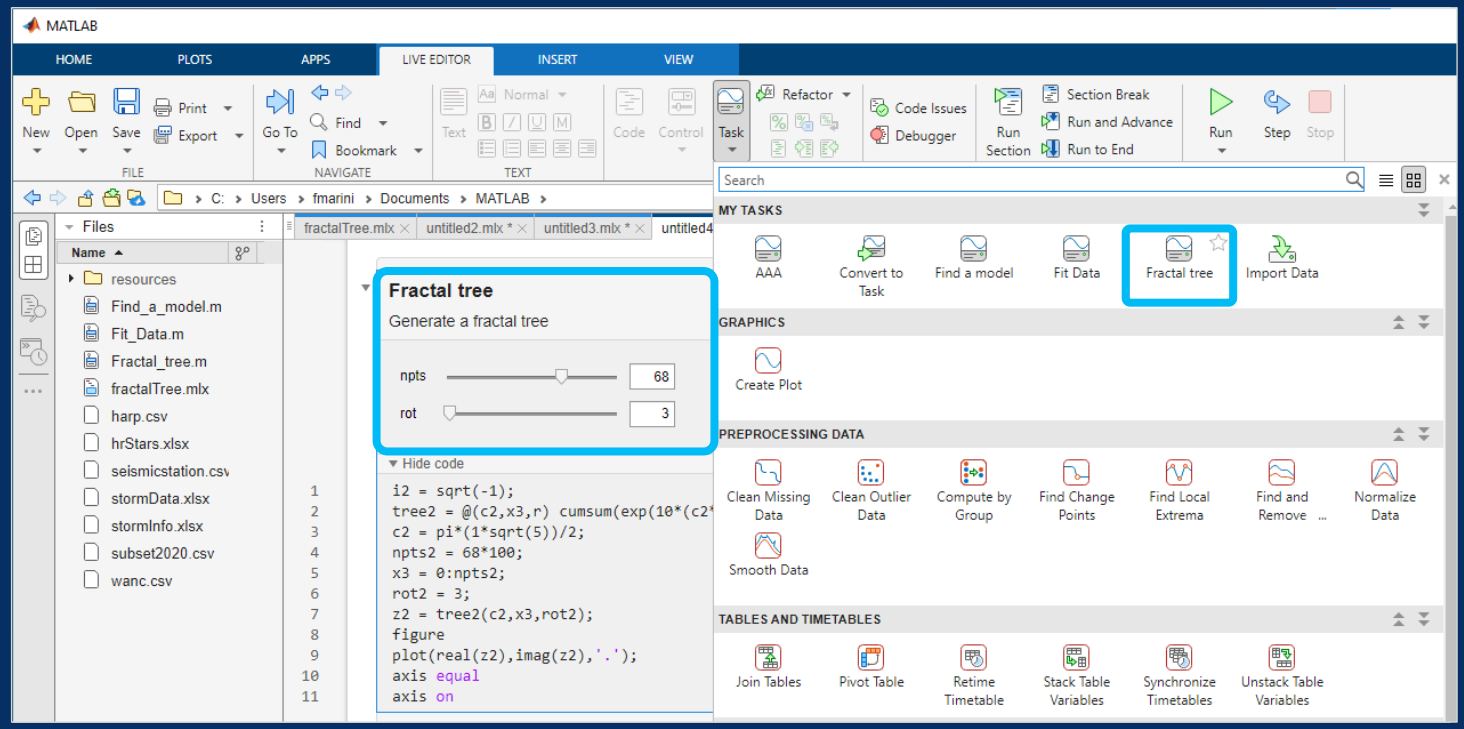
– HDF5



Import Data Live Editor Task

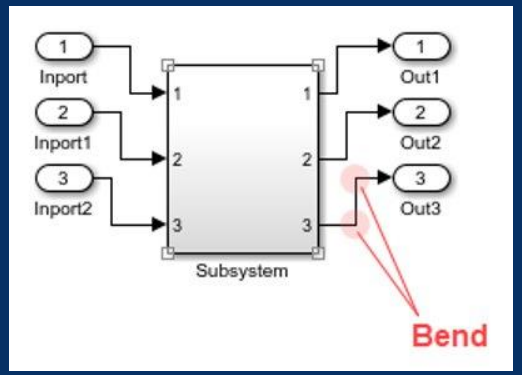
Easier to create custom Live Editor tasks

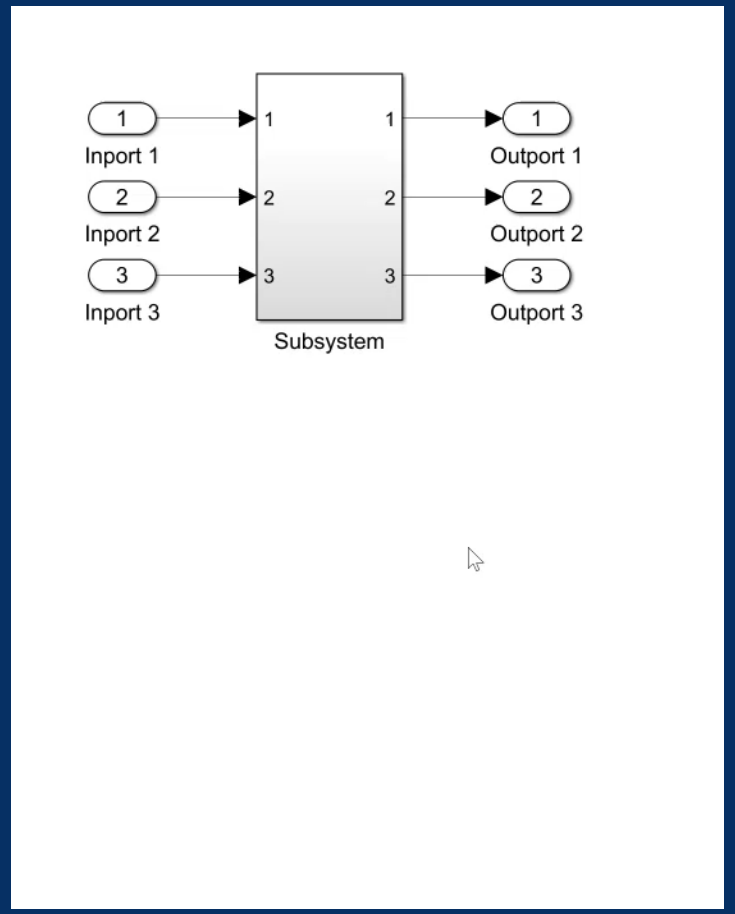
Convert a selection *(code and interactive controls)* into your own Live Editor task



Edit models at the speed of thought

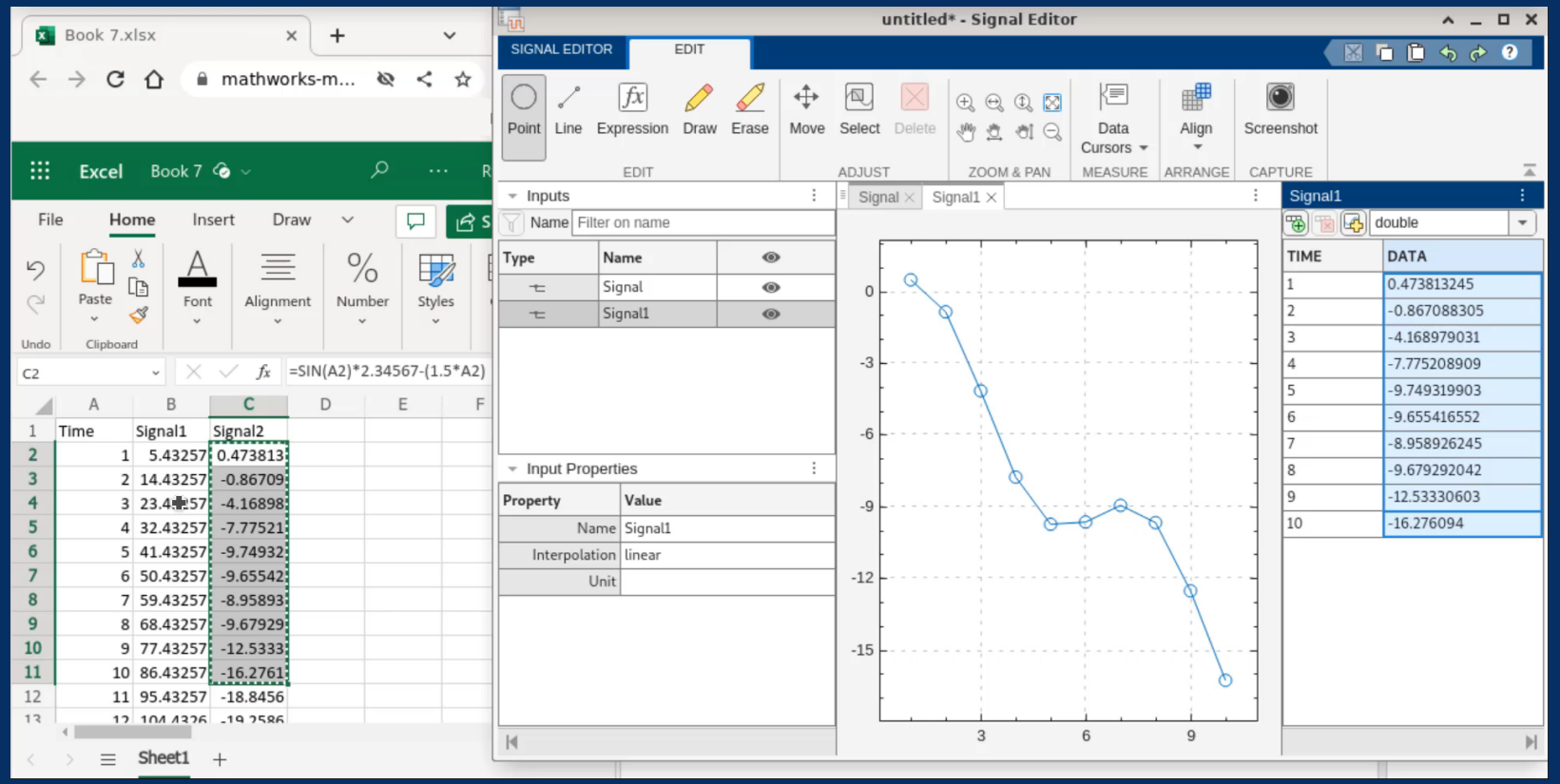
Automatically preserve signal line shape when moving or resizing blocks





Interactively create, edit, and visualize signal data

Copy, cut, or paste Excel data to or from Signal Editor



Create interactive simulation controls using dashboards

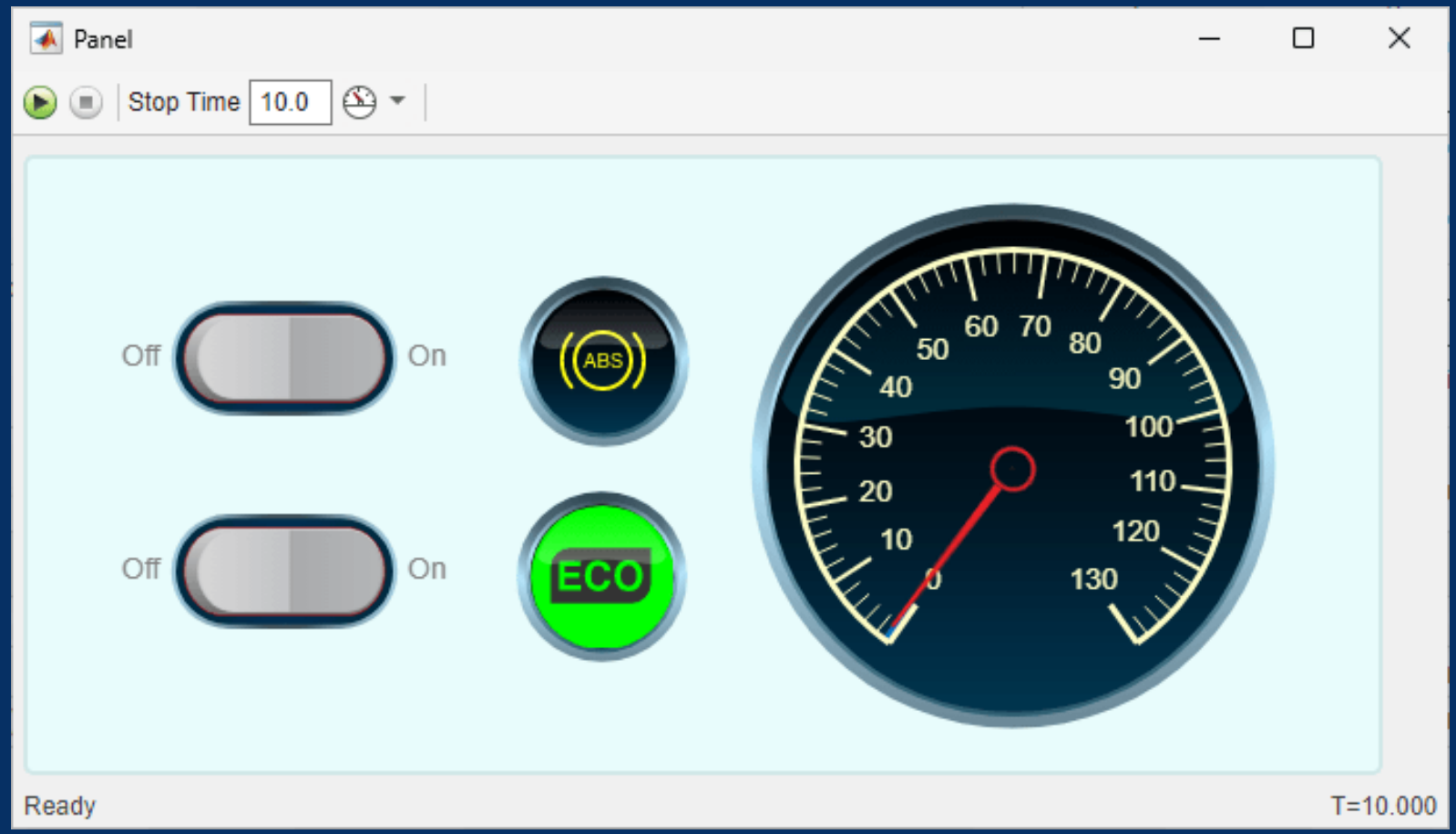
Dashboard blocks

Group and promote dashboard blocks to a panel

Dashboard panel

Deploy interactive simulation controls as apps

Convert dashboard panels into apps



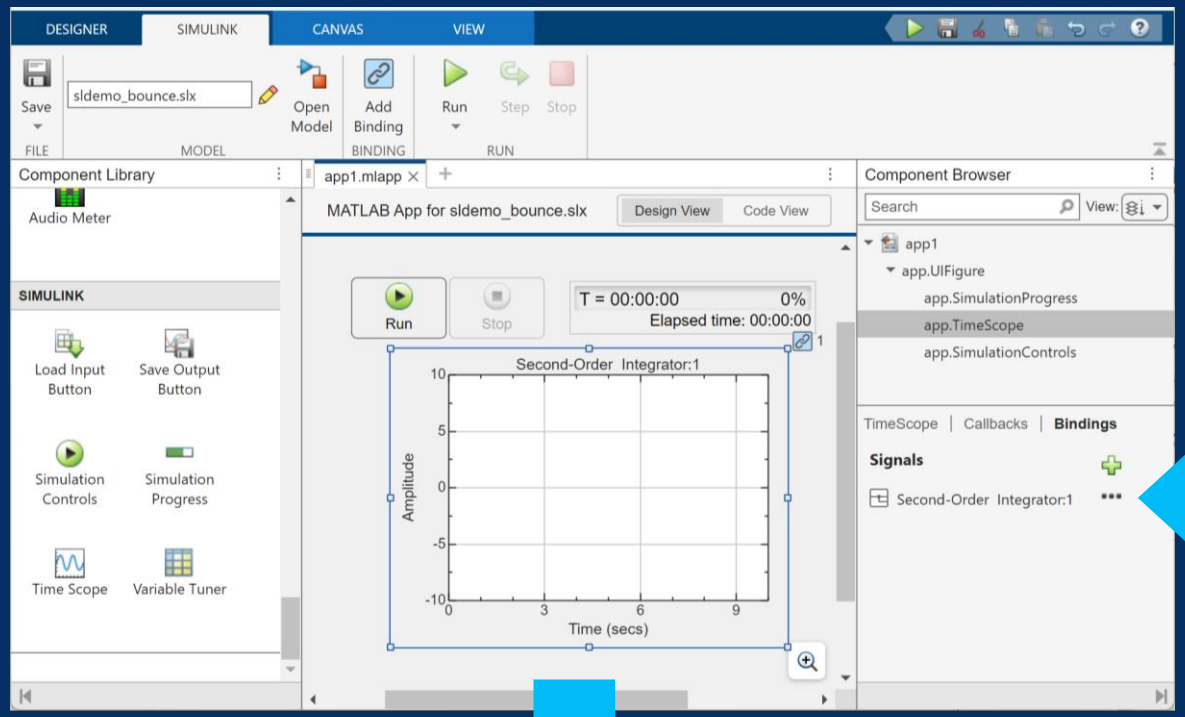
Simulink Compiler

Simulink

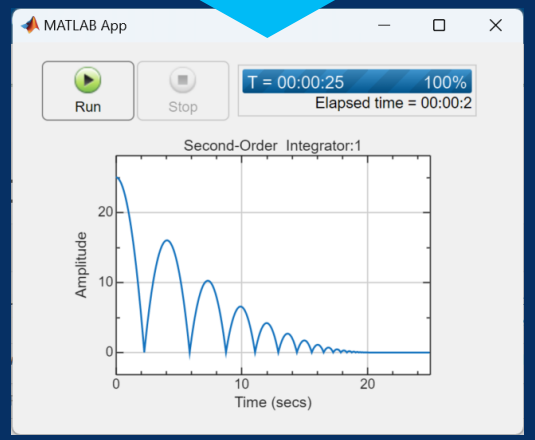
Design simulation apps without writing code

App integration with Simulink models, including signal binding

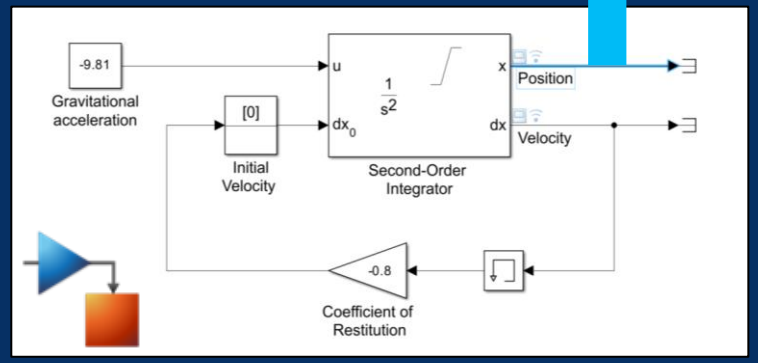
Out-of-the-box, Simulink-specific graphical components

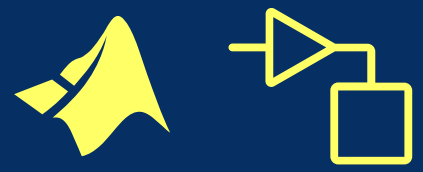


Signal binding with model



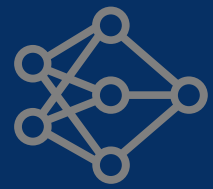
Simulation app





MATLAB® & SIMULINK®

Integrations



AI

Ease of Use

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MATLAB on Macs

MATLAB and Simulink
run natively on Apple silicon

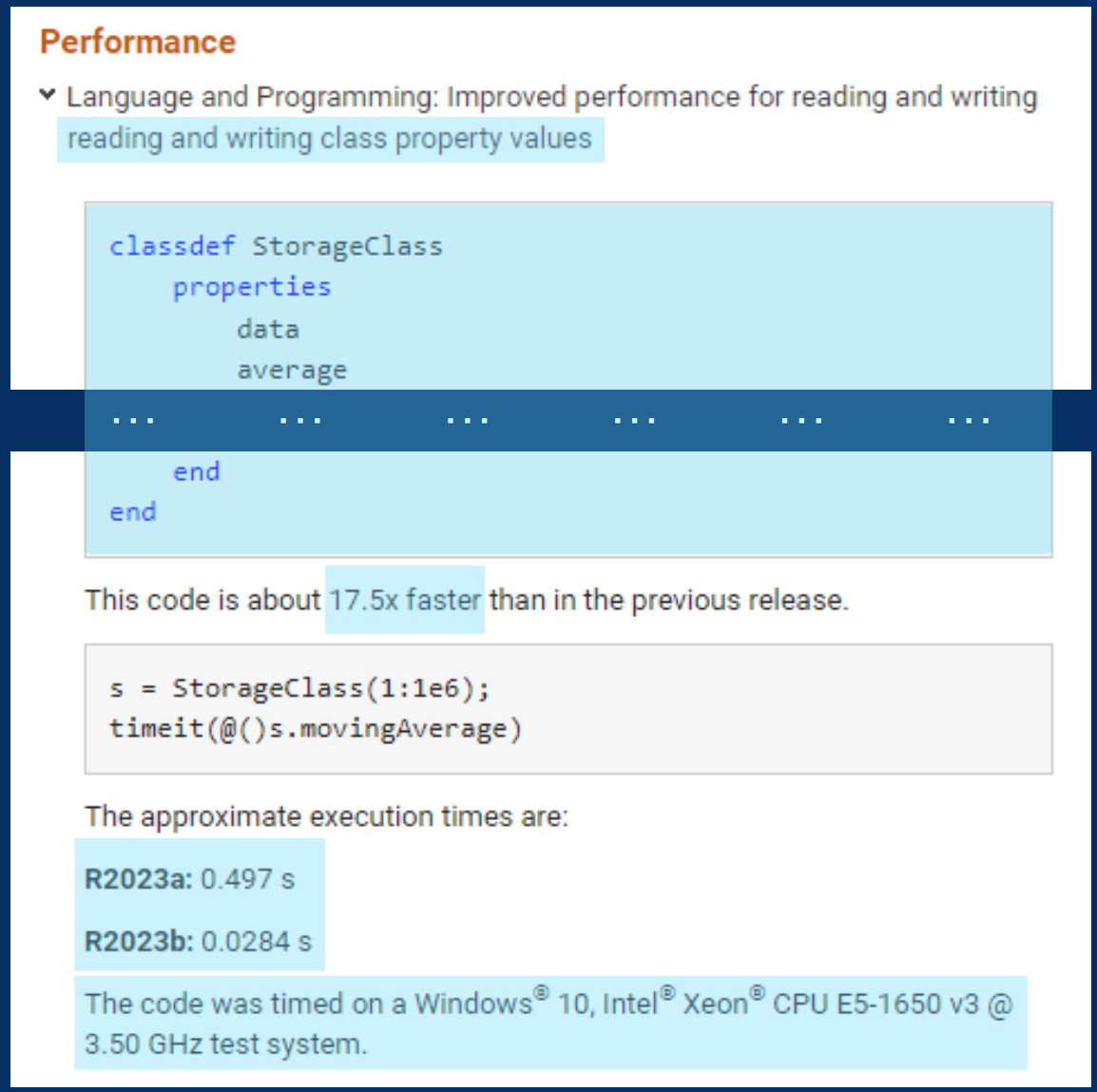
Better performance and
improved battery life on
MacBooks

Targeted Performance Improvements each Release

Release notes document the top examples

Each release note includes:

- Example code
- Measured performance improvement
- Hardware used



Performance

▾ Language and Programming: Improved performance for reading and writing reading and writing class property values

```
classdef StorageClass
    properties
        data
        average
...       ...       ...       ...       ...       ...
    end
end
```

This code is about 17.5x faster than in the previous release.

```
s = StorageClass(1:1e6);
timeit(@()s.movingAverage)
```

The approximate execution times are:

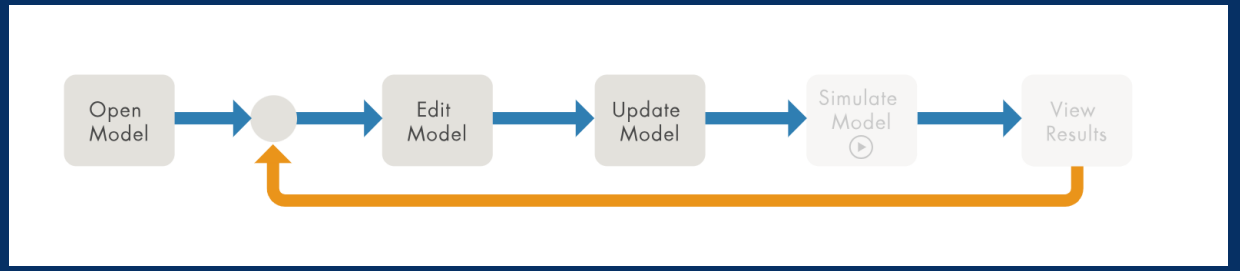
R2023a: 0.497 s

R2023b: 0.0284 s

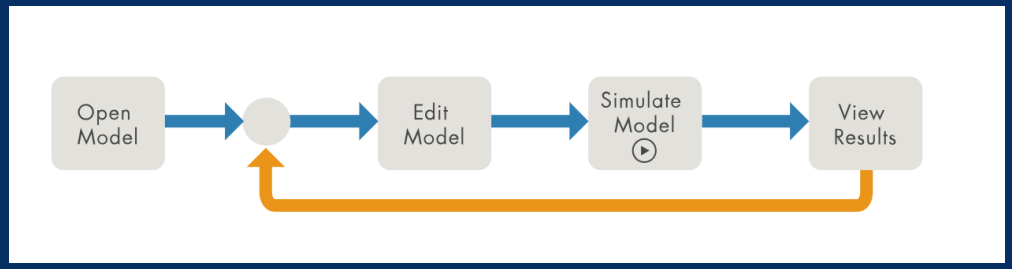
The code was timed on a Windows® 10, Intel® Xeon® CPU E5-1650 v3 @ 3.50 GHz test system.

Improve simulation performance based on your workflow

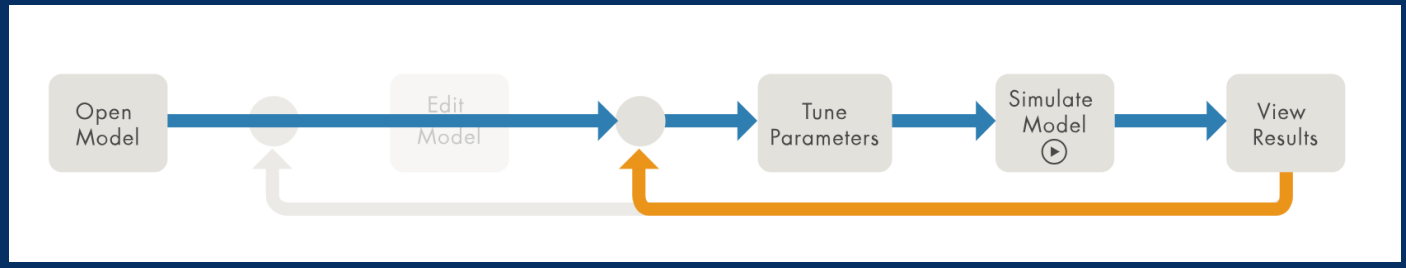
Edit-Update-Repeat



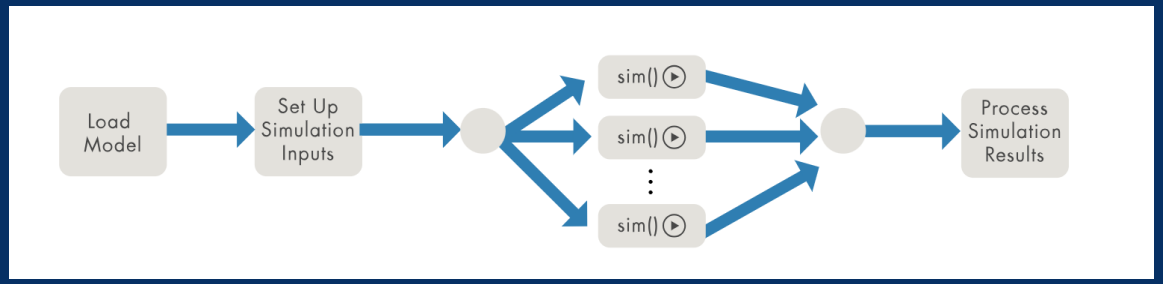
Edit-Sim-Repeat



Tune-Sim-Repeat

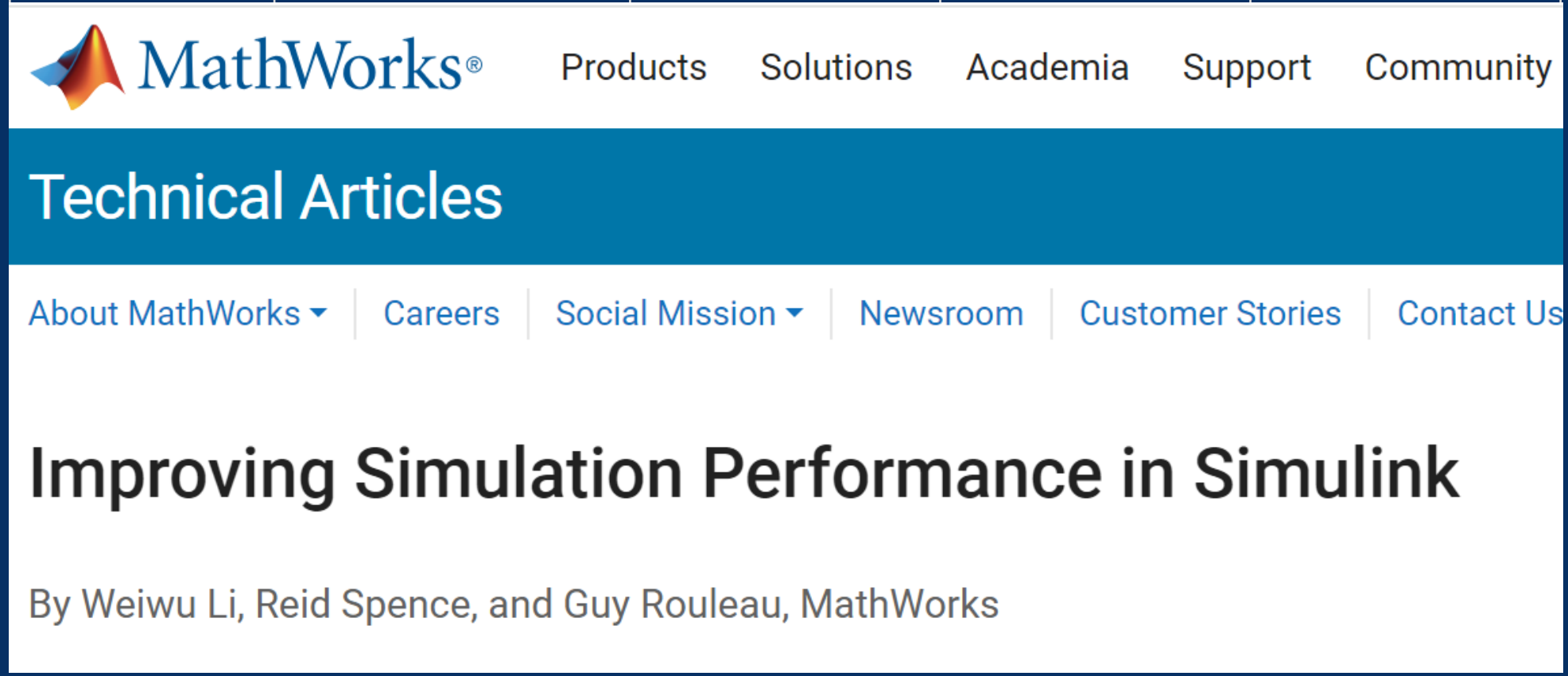


Multiple-Sim



Apply workflow-specific techniques to improve performance

Techniques	Workflow			
	Edit-Update-Repeat	Edit-Sim-Repeat	Tune-Sim-Repeat	Multiple-Sim



Apply workflow-specific techniques to improve performance



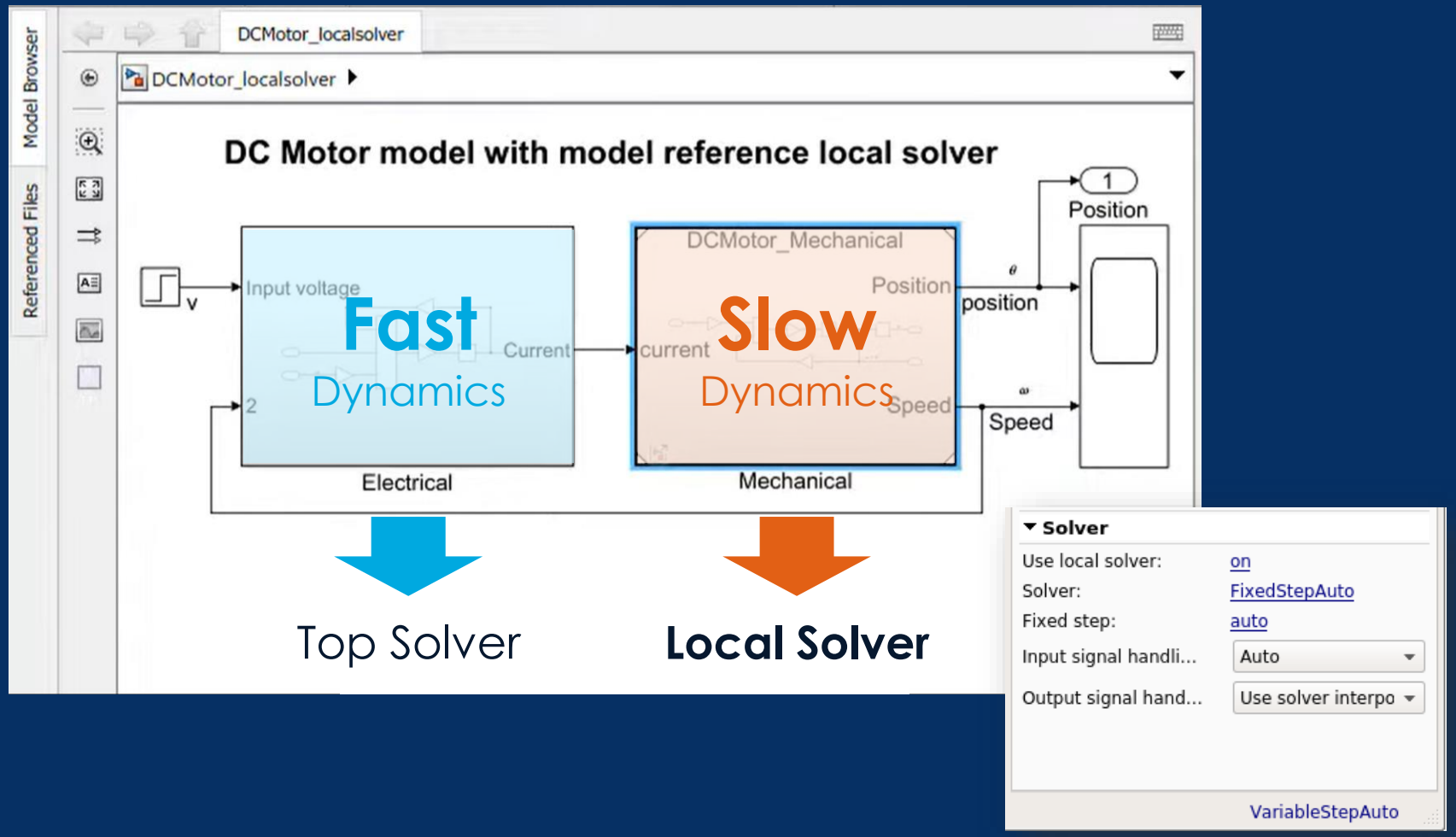




Techniques	Workflow			
	Edit-Update-Repeat	Edit-Sim-Repeat	Tune-Sim-Repeat	Multiple-Sim
Simulation Mode		x	x	x
Fast Restart			x	x
Simulation Cache	x	x	x	x
Model Reference - Parallel Build	x	x		
Model Reference - Incremental Loading & Rebuilding	x	x		
Simulink Profiler	x	x	x	x
Solver Profiler		x	x	x
Modify Your Models		x	x	x
Parallel Simulation				x

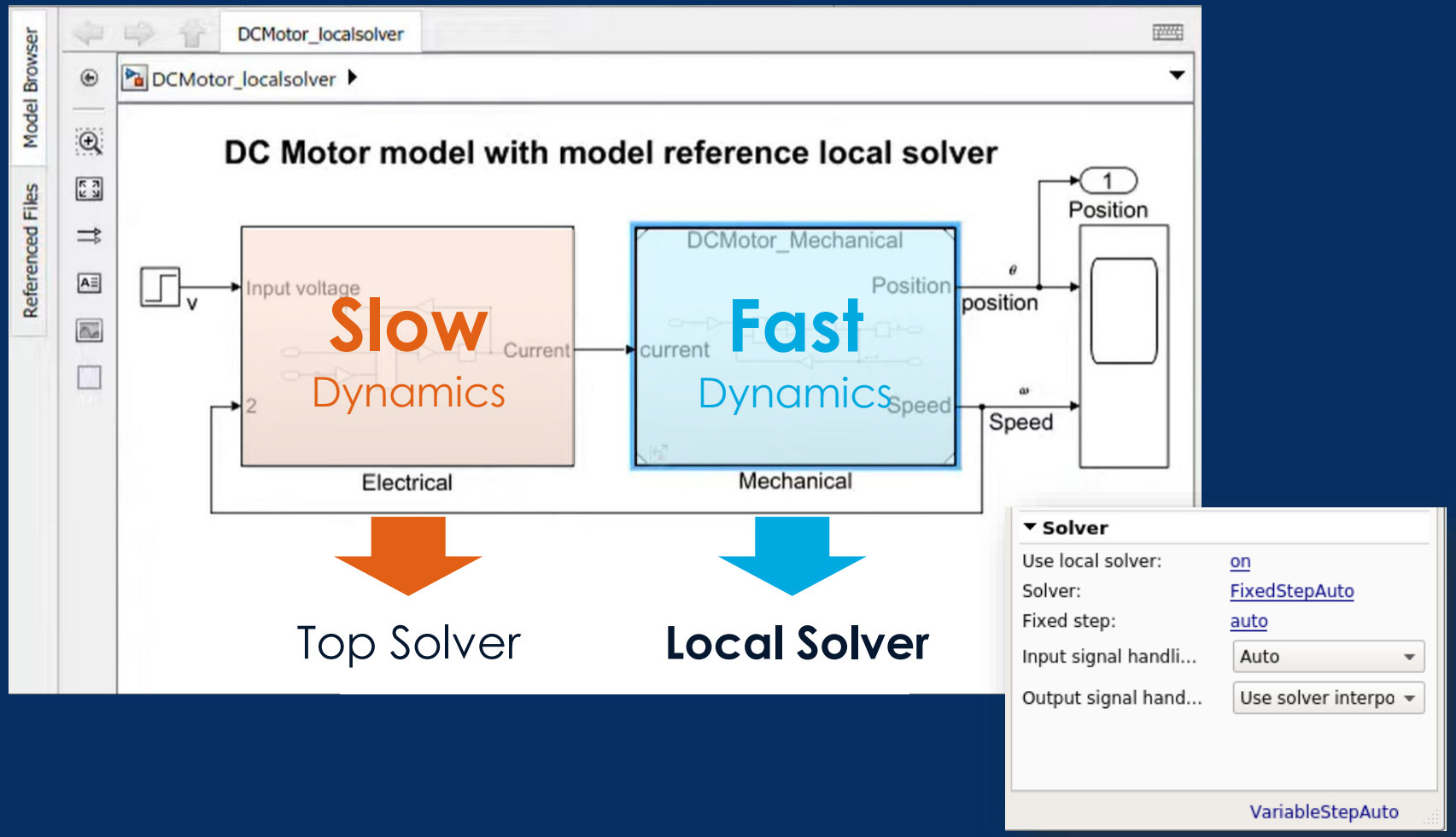
Speed up simulations using the local solver

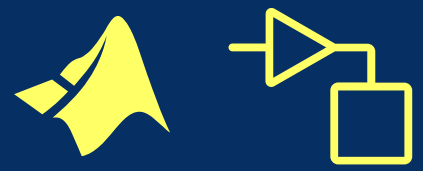
Decouple systems of different dynamics with the local solver



Speed up simulations using the local solver

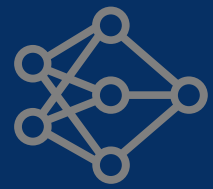
Support faster local dynamics





MATLAB® & SIMULINK®

Integrations



AI

Ease of Use

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New products

Major updates

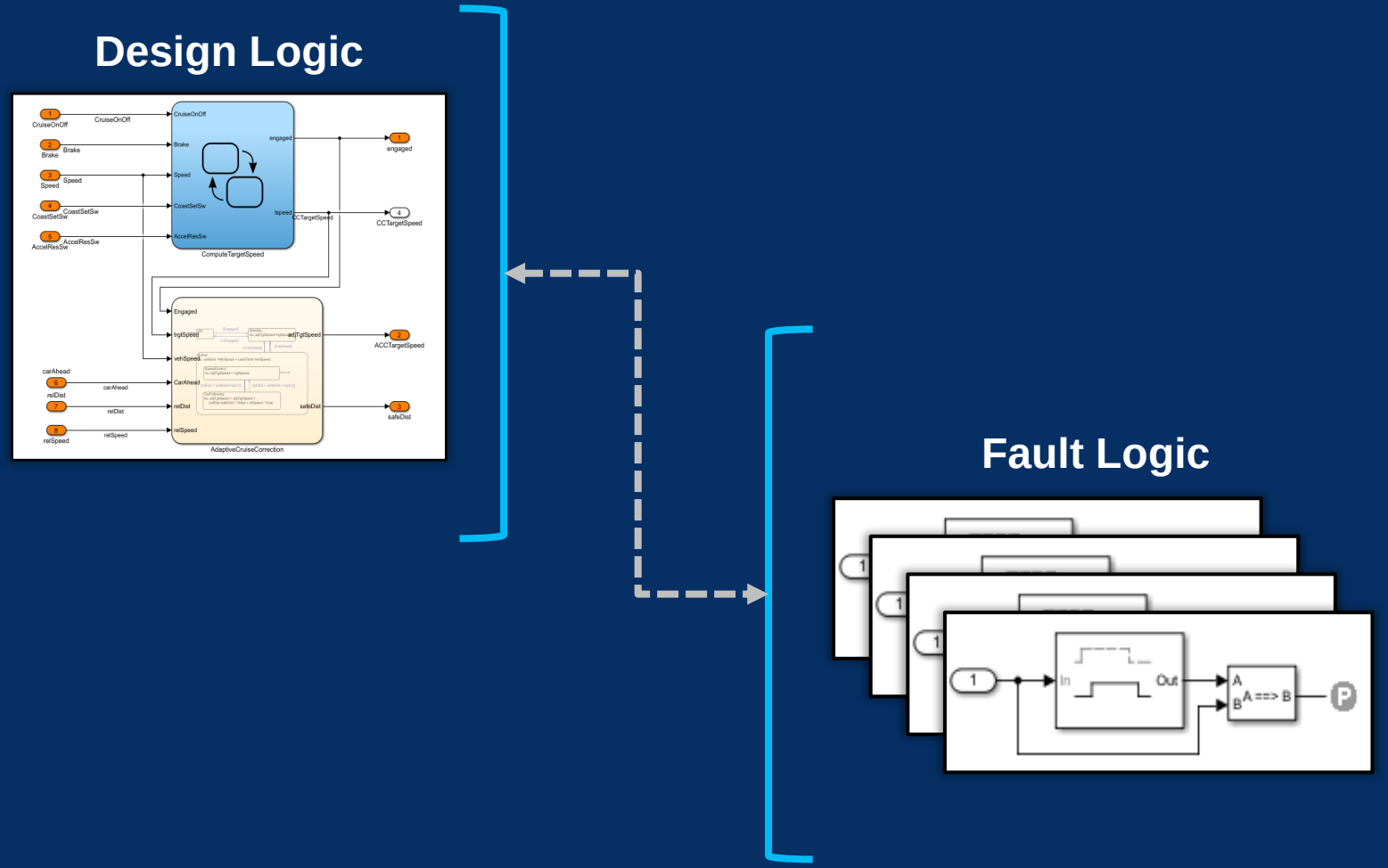
Find defects sooner

Design	Test	Code	Certify
Simulink Design Verifier	Simulink Coverage	Polyspace Bug Finder	DO Qualification Kit
Simulink Check	Simulink Test	Polyspace Code Prover	IEC Certification Kit
HDL Verifier	MATLAB Test	Polyspace Access	Simulink Code Inspector
Simulink Fault Analyzer	Polyspace Test		

Requirements Toolbox

Model faults and analyze effects with Simulink Fault Analyzer

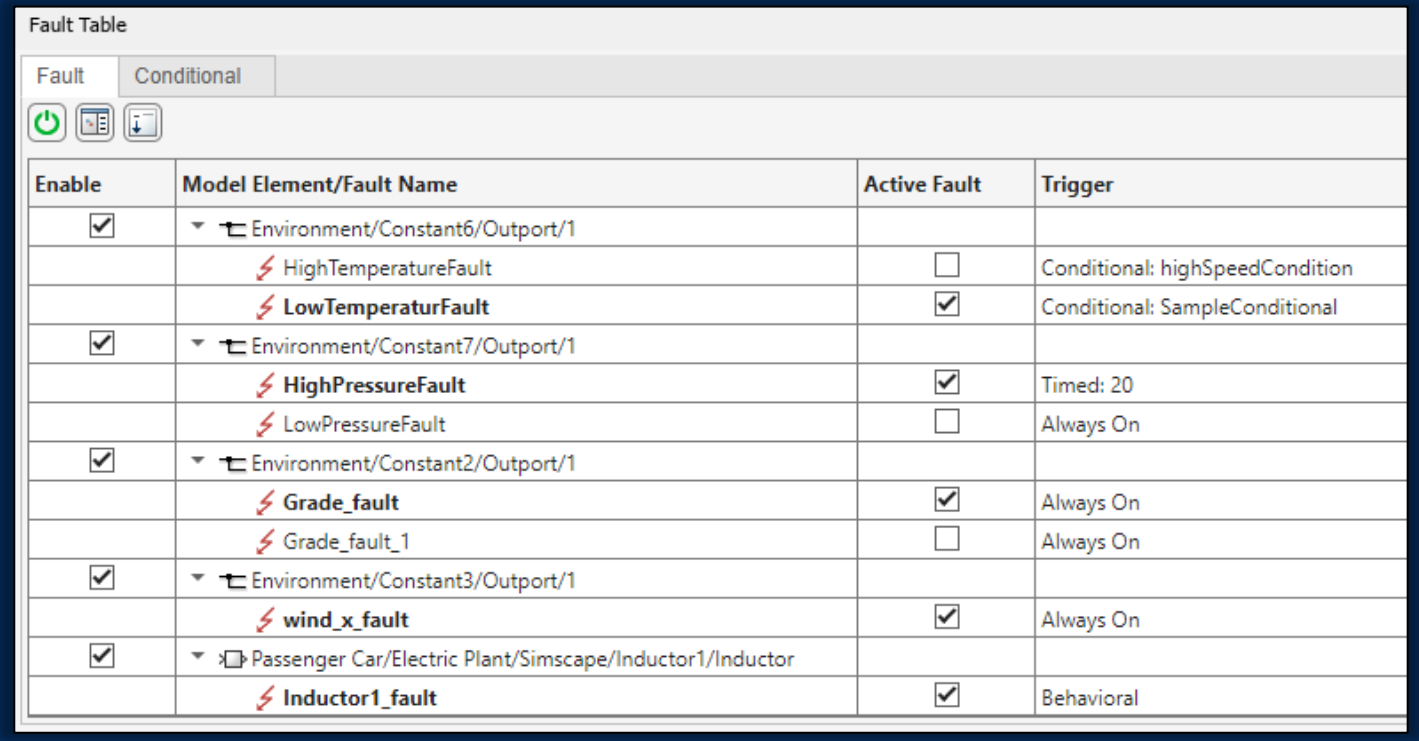
Model faults without modifying the design



Model faults and analyze effects with Simulink Fault Analyzer

Model faults without modifying the design

Manage faults across multiple domains

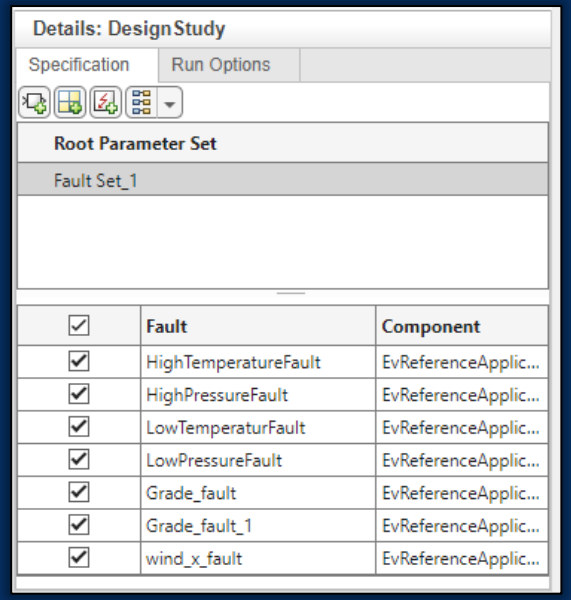


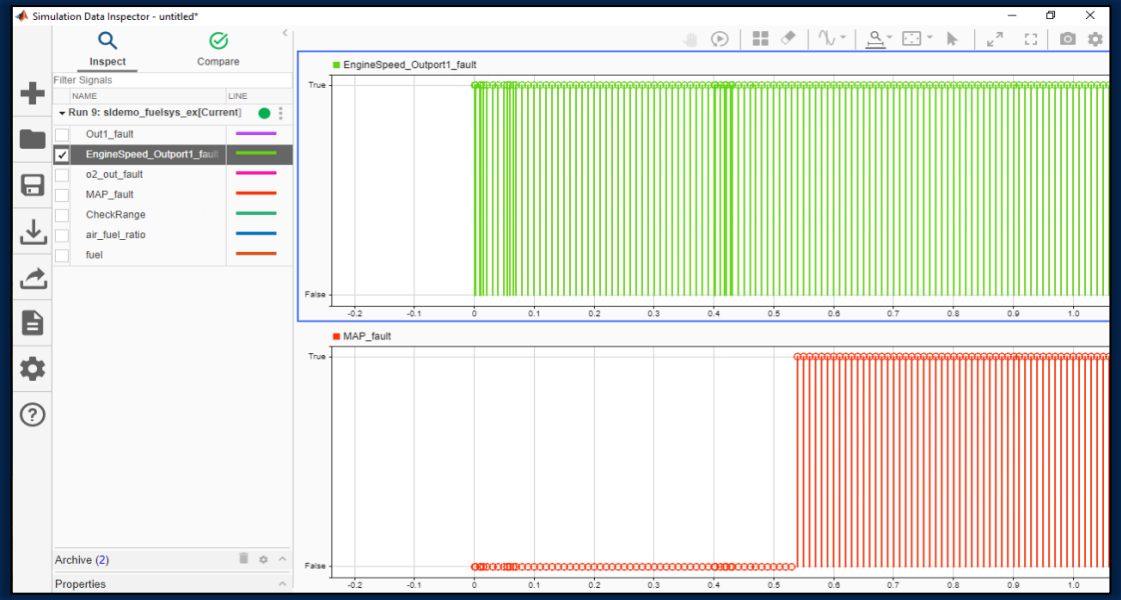
Model faults and analyze effects with Simulink Fault Analyzer

Model faults without modifying the design

Manage faults across multiple domains

Simulate, explore and analyze fault effects





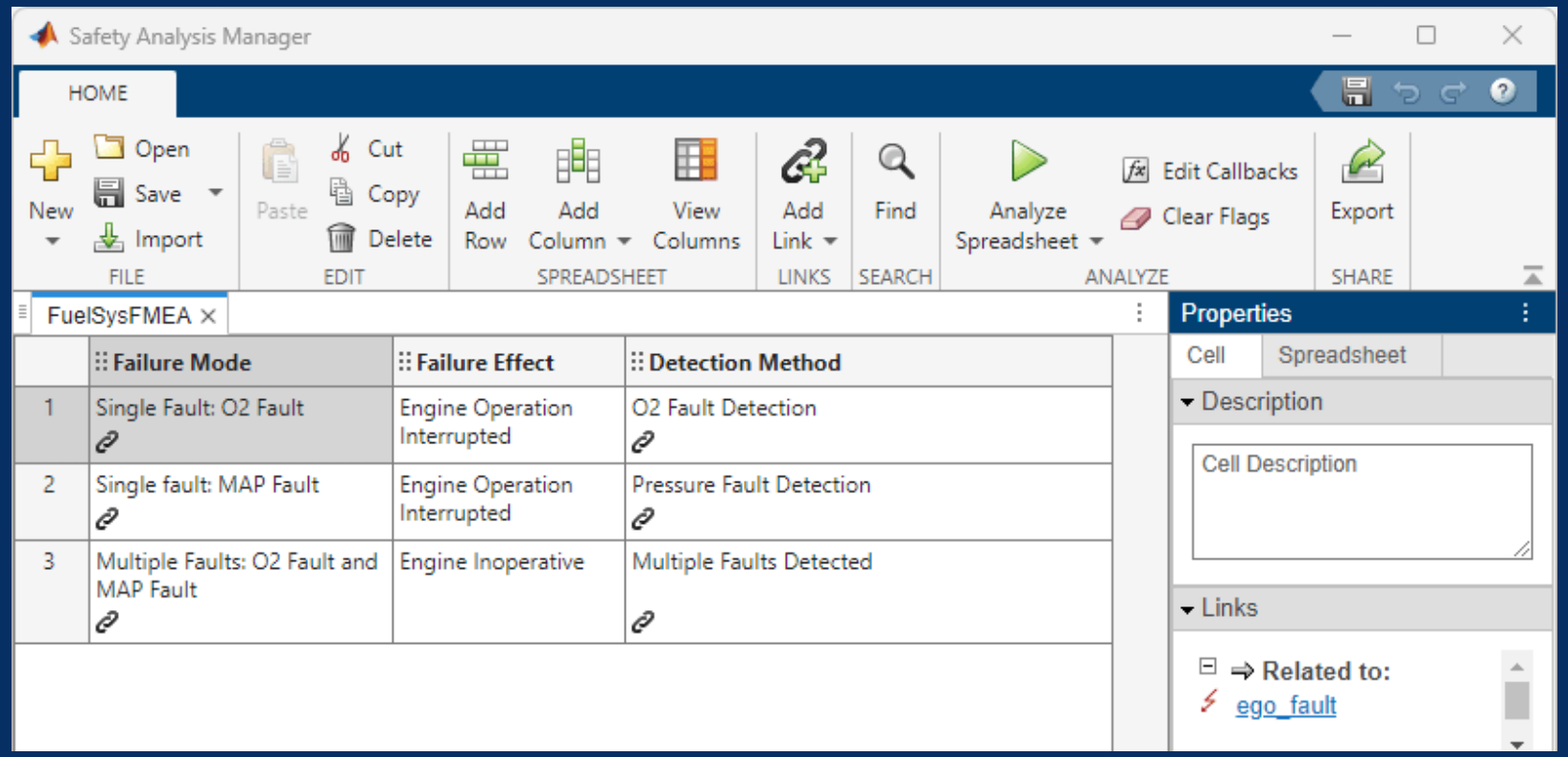
Model faults and analyze effects with Simulink Fault Analyzer

Model faults without modifying the design

Manage faults across multiple domains

Simulate, explore and analyze fault effects

Perform systematic safety analysis



New products

Major updates

Find defects sooner

Design	Test	Code	Certify
Simulink Design Verifier	Simulink Coverage	Polyspace Bug Finder	DO Qualification Kit
Simulink Check	Simulink Test	Polyspace Code Prover	IEC Certification Kit
HDL Verifier	MATLAB Test	Polyspace Access	Simulink Code Inspector
Simulink Fault Analyzer	Polyspace Test		

Requirements Toolbox

Test Product Family

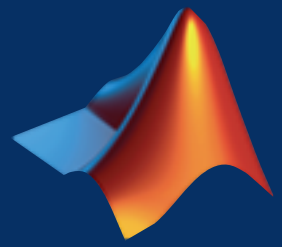
R2015a

Simulink Test

Model Centric

R2023a

MATLAB Test



MATLAB Code Centric

R2023b

Polyspace Test

C/C++ Code Centric

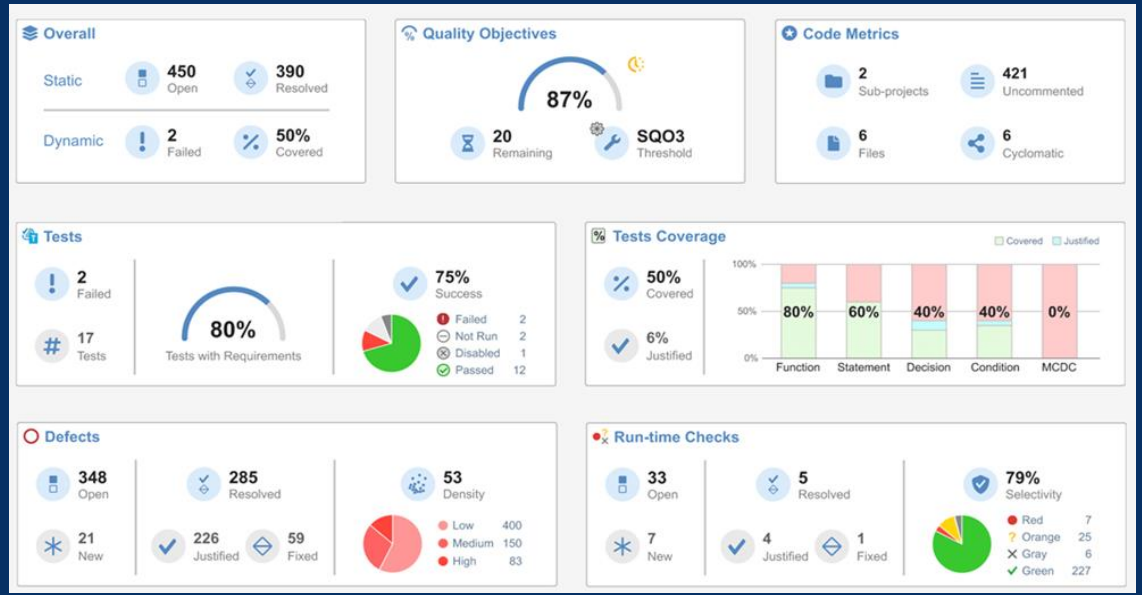
Develop, manage, and execute tests for C and C++ code in embedded systems

Polyspace

Static Analysis

- Polyspace Bug Finder
- \+
- Polyspace Code Prover
- \+

Dynamic Testing ← Polyspace Test



Centrally manage and combine static analysis with dynamic testing

ISO 26262 DO-178 IEC 61508 IEC 62304

MATLAB & SIMULINK

Integrations

AI

Languages

Simulation

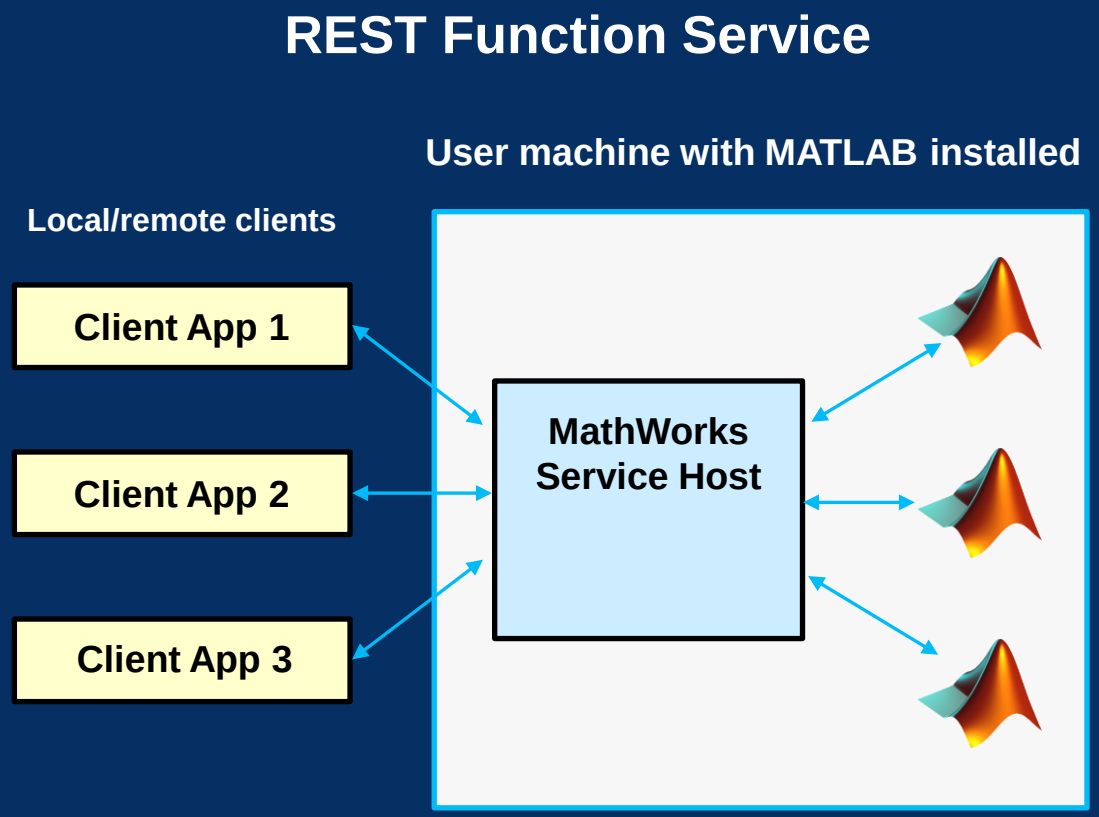
Visualization

Hardware

Call MATLAB from any local or remote client program using REST

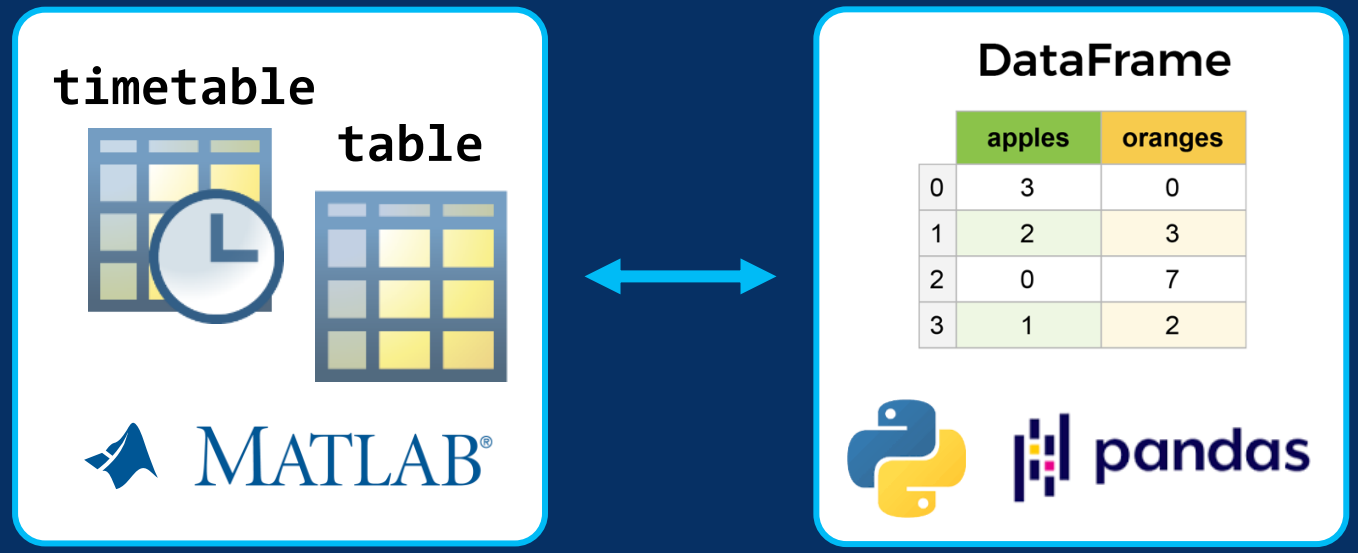
Write client programs to call MATLAB using the MATLAB Function Service

The service uses HTTPS protocol



Use MATLAB with Python

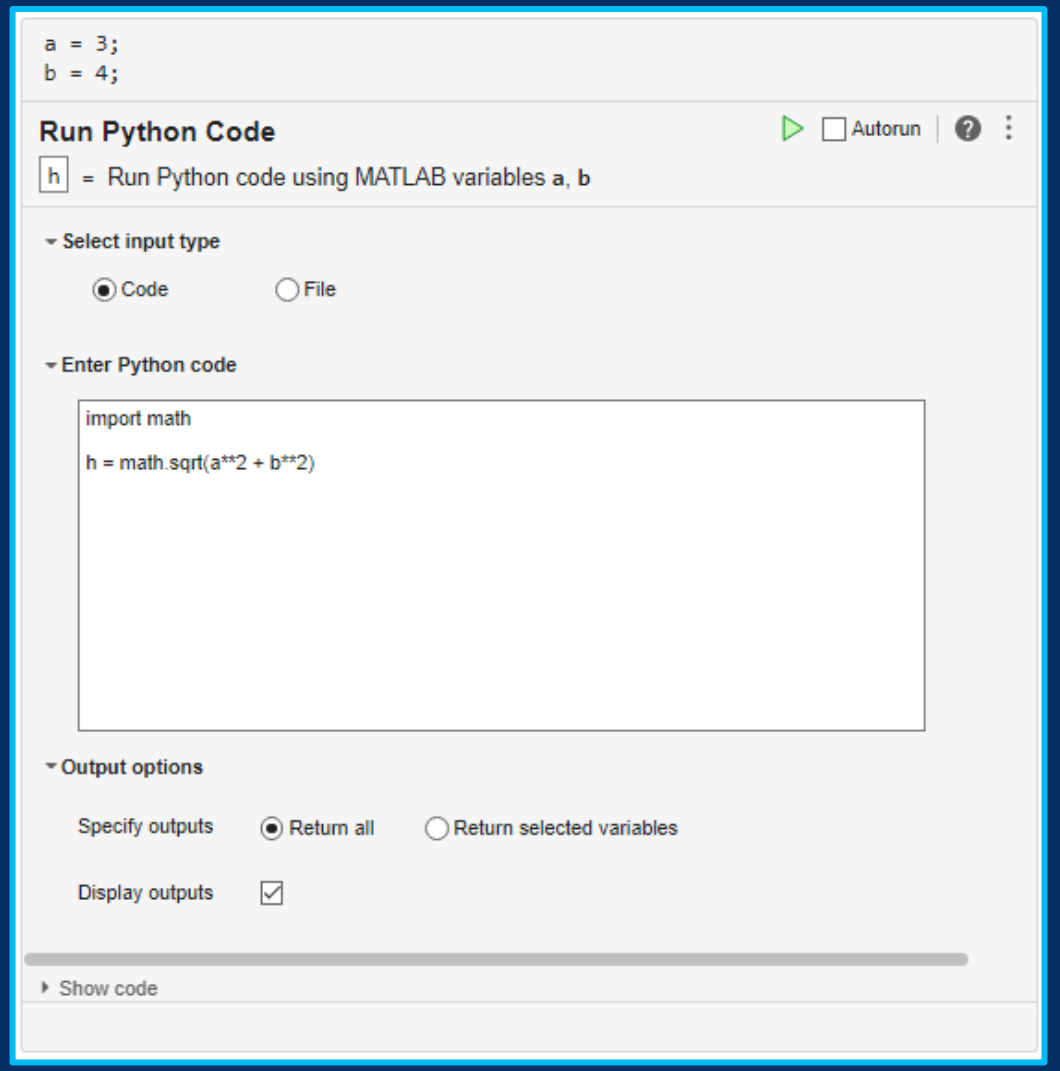
Automatically convert between MATLAB **`table`** or **`timetable`** and Python Pandas DataFrame



Use MATLAB with Python

Automatically convert between MATLAB **`table`** or **`timetable`** and Python Pandas DataFrame

Interactively run Python code with Run Python Code Live Editor task



Simulink is a Simulation Integration Platform

Ecosystem and interoperability with 100+ third-party languages and tools

Import custom code into Simulink

Build custom code components using C, C++, and Python

R2018b

<FunctionName>

C Caller

R2020a

C

C Function

R2021a

Code Importer

R2022a

C

C Function Supports C++

R2023a

Python Importer

Import Python functions within classes

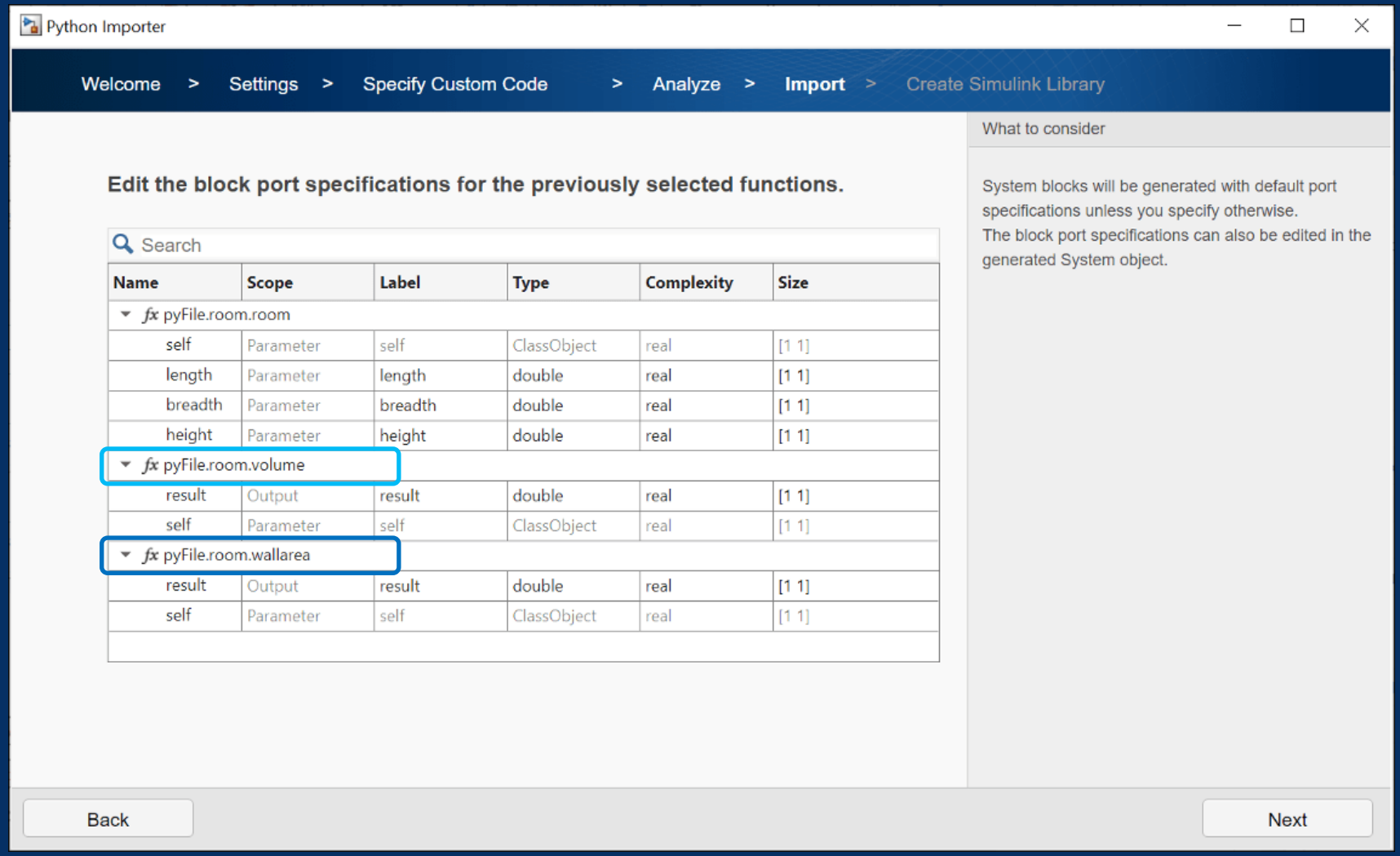
Python importer supports Python functions specified within Python classes

```
class room:

    def __init__(self, length, breadth, height):
        self.length = length
        self.breadth = breadth
        self.height = height

    def volume(self):
        result = self.length * self.breadth * self.height
        return result

    def wallarea(self):
        result = 2 *(self.length * height + self.breadth * height)
        return result
```

Python class definition

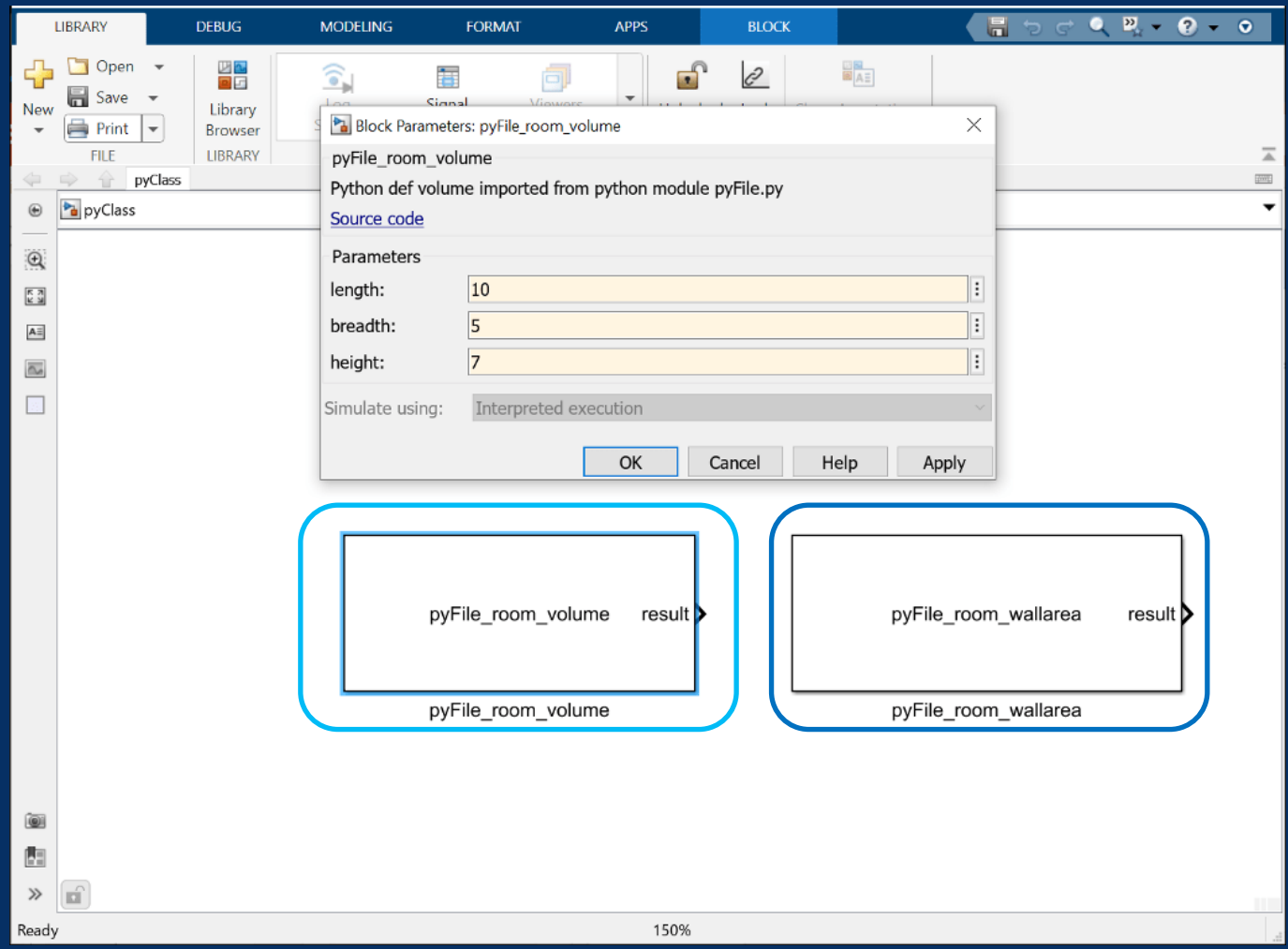
Import Python functions within classes

Wizard UI provides step-by-step import guidance



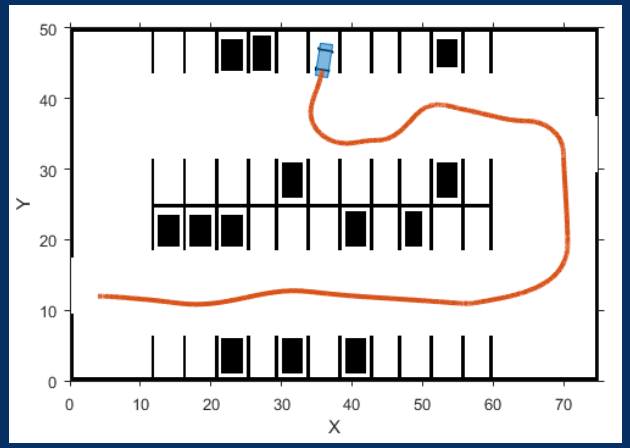
Import Python functions within classes

Export as custom blocksets for simulations

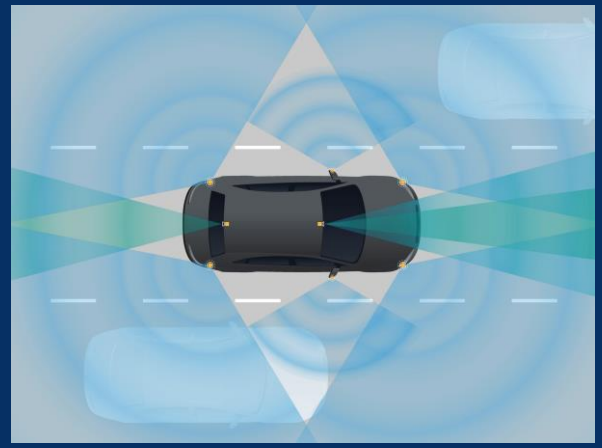


Support for unbounded variable-size signals

Flexibility to model signals without specifying a finite signal size



Autonomous parking maneuver system



Radar system

Sizes of signals are unknown at compilation and can grow/shrink during simulation

Support for unbounded variable-size signals

Provide a mapping between Simulink signals and dynamic arrays in C++

Easily exchange data with other external software components

Unbounded variable-size signals	**Dynamic arrays**
Signal size as `Inf`	Resizable data
Memory allocated at run time	Dynamic memory

MATLAB & SIMULINK

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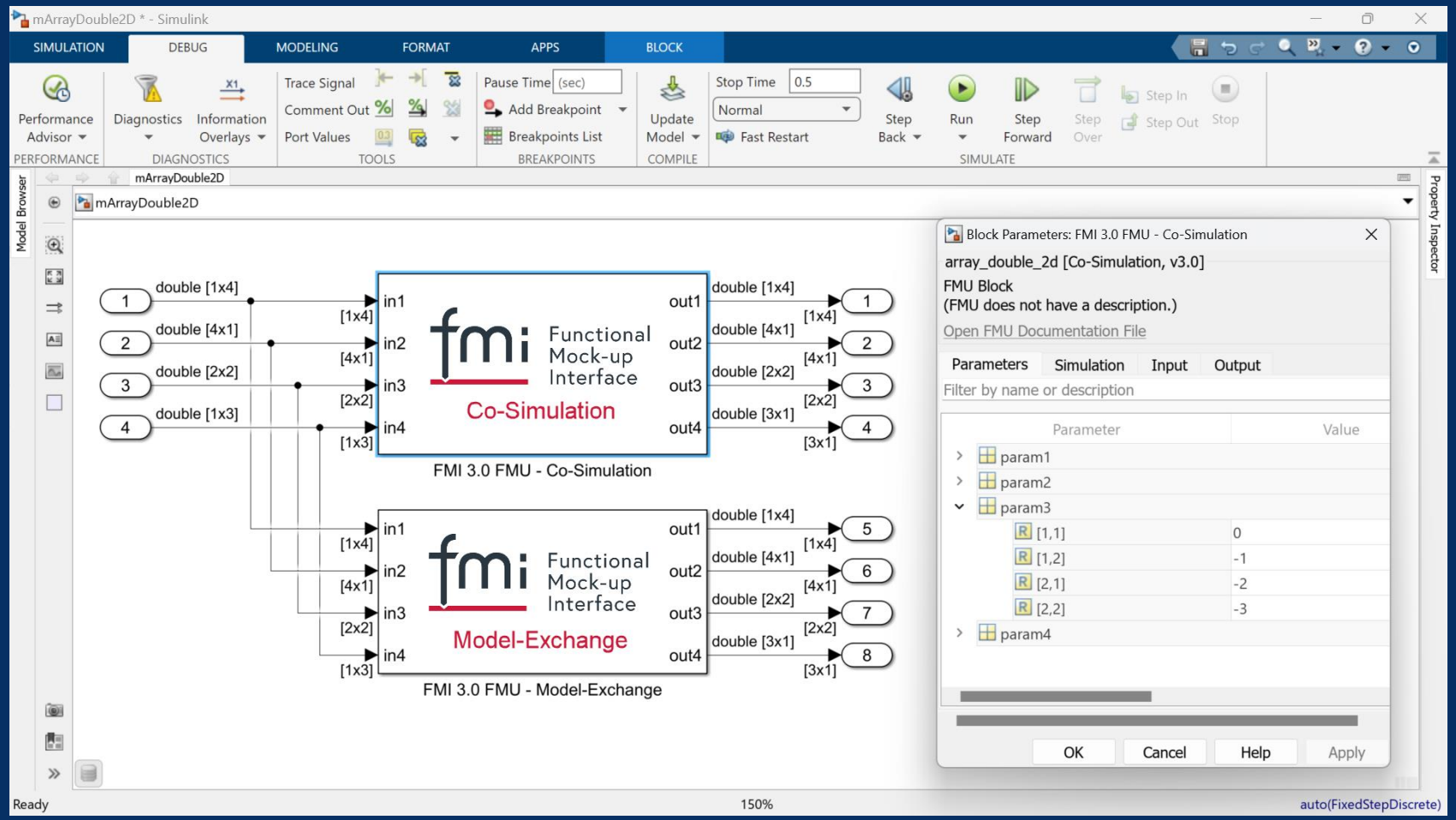
Hardware

Import FMI 3.0 Function Mockup Units (FMUs)

FMU block supports
FMI version 3.0



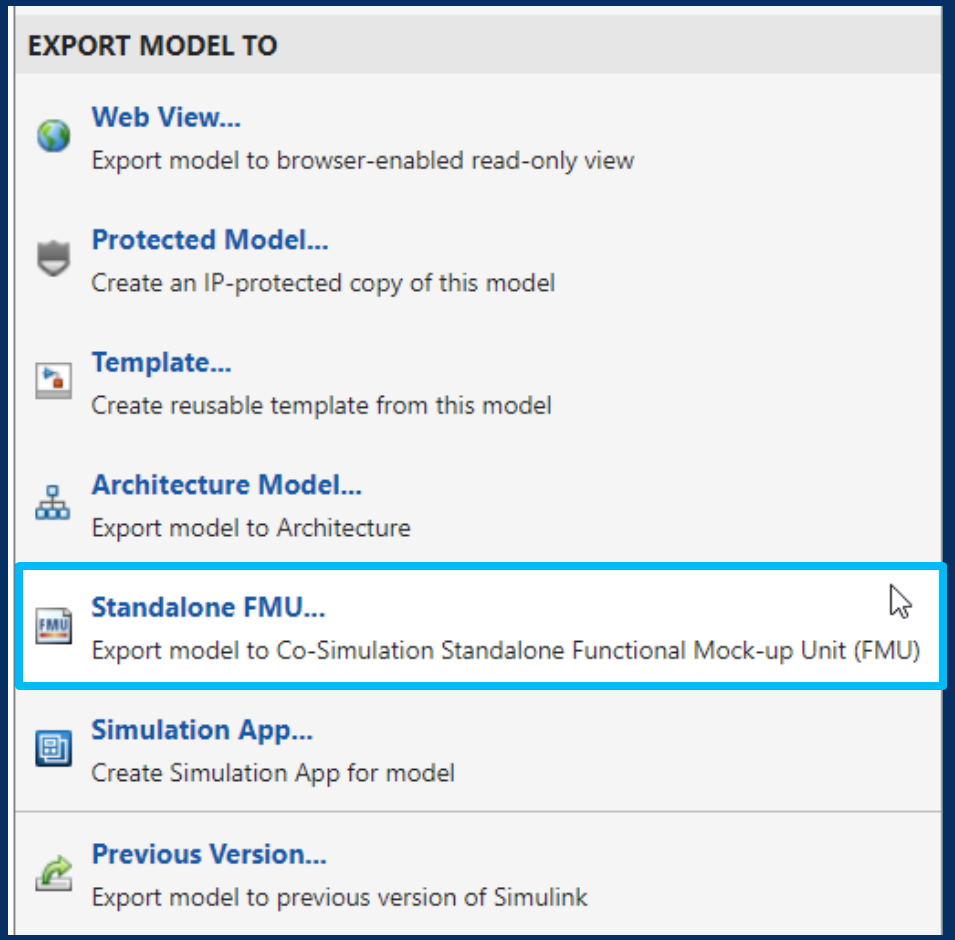
Export simulations as FMI 3.0 FMUs

FMU Builder for Simulink Support Package

Create standalone FMUs from Simulink models or source code

Validate FMI 3.0 FMUs

Export FMUs to be used in other simulation environments



Control scripted simulations using `Simulation` object

Configure, run, and interact with simulations, including stepping

Access in-simulation status and outputs

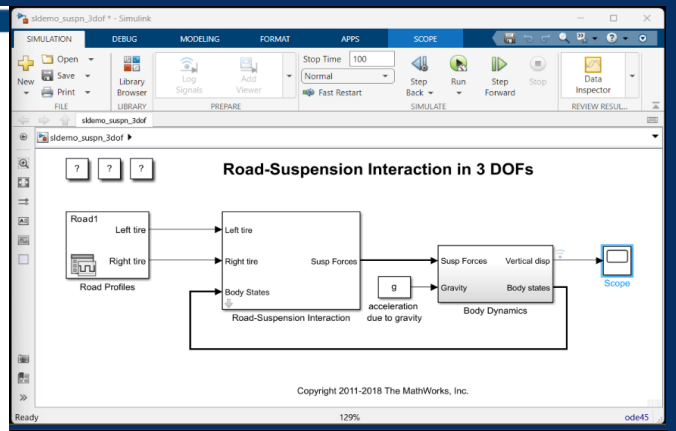
Deployable to other environments with compiler workflows

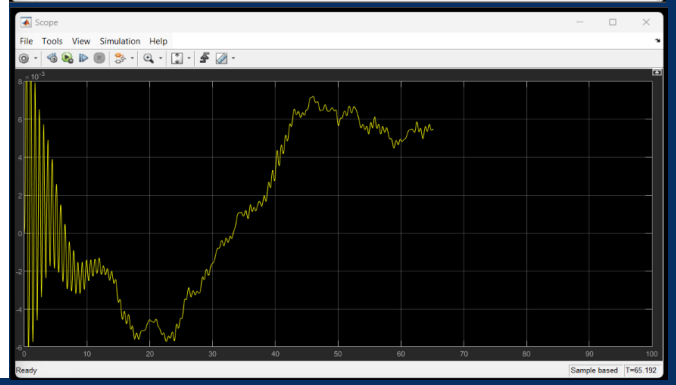
`initialize`
`start`
`step`
`pause`
`resume`
`stop`
`terminate`

```
Command Window
>> mdl = 'sldemo_suspn_3dof';
>> open_system(mdl);
>> sm = simulation(mdl);
>> initialize(sm)
>> start(sm);
>> pause(sm);
>> sm.Status

ans =

    "paused"

>> sm.Time

ans =

   16.8811

>> step(sm,PauseTime=40);
>> resume(sm)
>> stop(sm);
>> sm.Status

ans =

    "inactive"
```

Scripted simulation

Simulink model

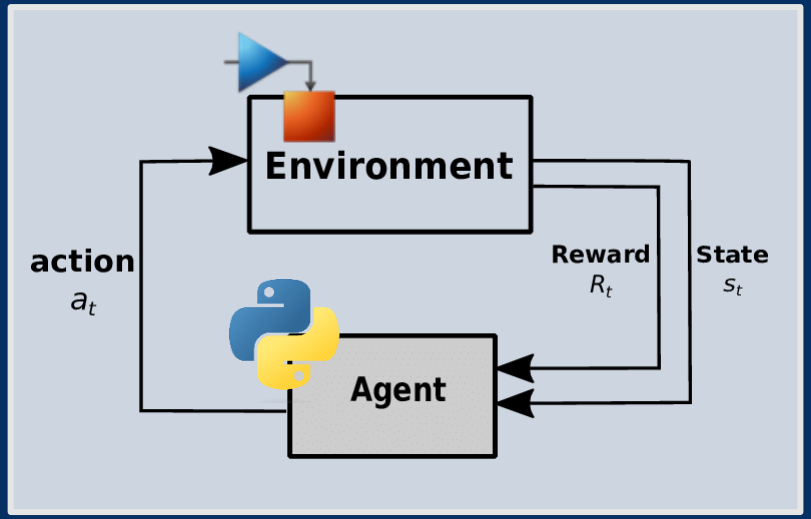




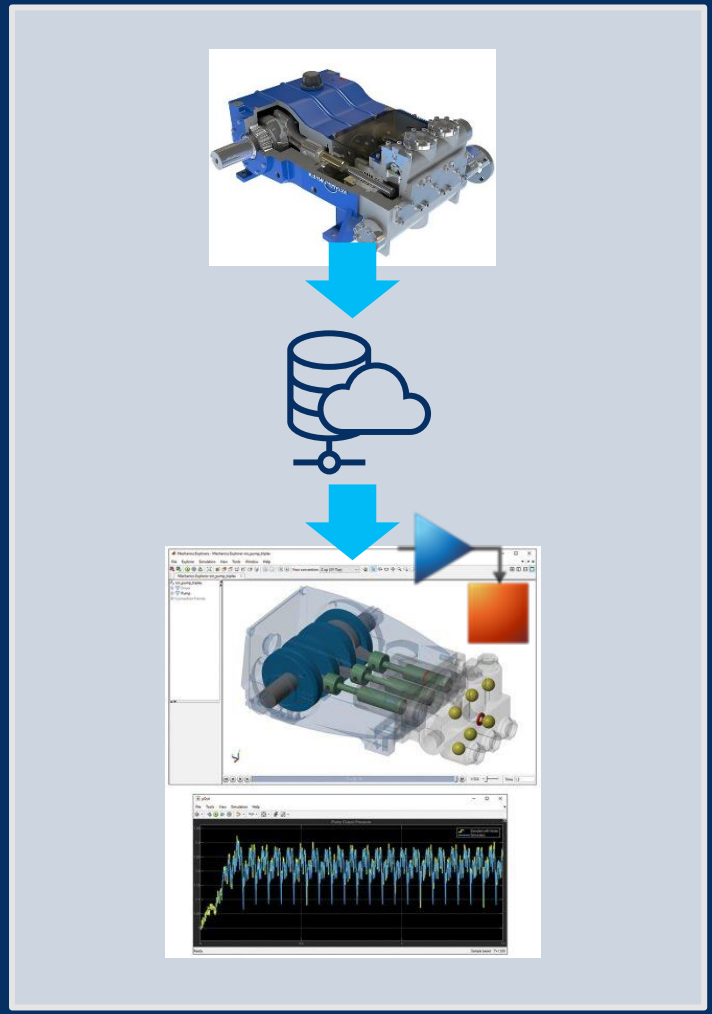
In-simulation outputs

Control scripted simulations using `Simulation` object

Enable simulation integration in new applications such as reinforcement learning and digital twins



Reinforcement Learning



Digital Twins

Simulink Compiler

Simulink

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&SIMULINK®

Integrations

AI

Languages

Simulation

Visualization

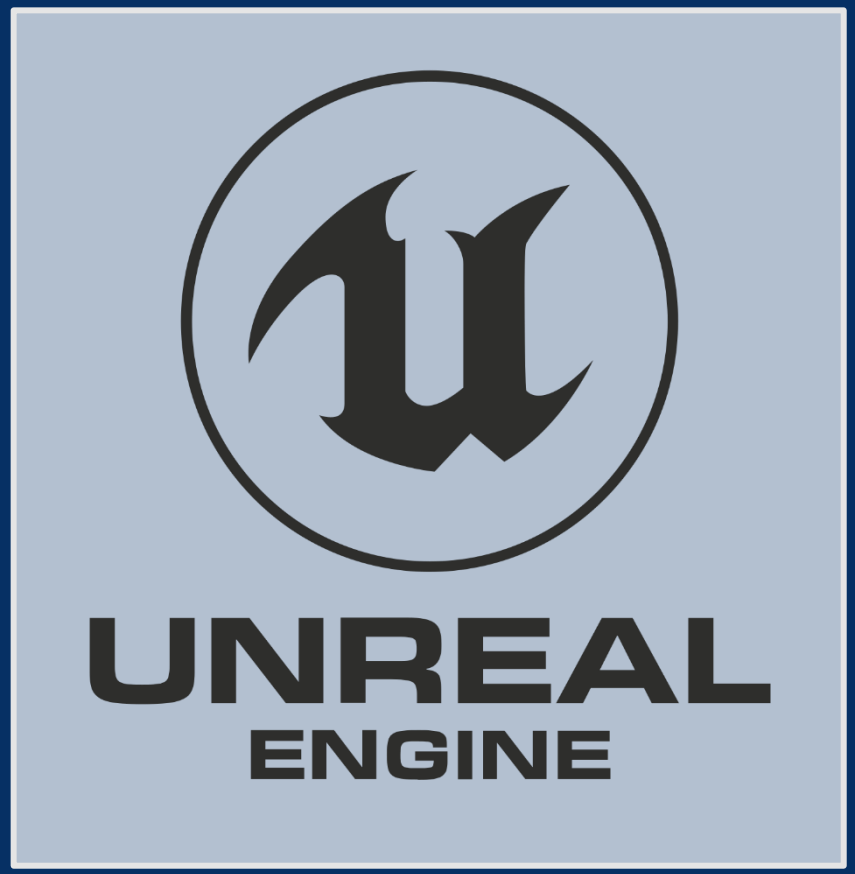
Hardware

Visualize 3D simulations

Simulink 3D Animation provides foundational 3D assets, platform, and integration to the Unreal Engine for vertical product

Simulink 3D Animation supports Unreal Engine 5.1

3D Visualizations



Visualize 3D simulations

Photorealistic 3D scenes, actions, and sensors for simulating dynamic system behavior

Aerospace Blockset

Aerospace Blockset
Simulink 3D Animation

Visualize 3D simulations

Photorealistic 3D scenes, actions, and sensors for simulating dynamic system behavior

UAV Toolbox

UAV Toolbox

Simulink 3D Animation

Visualize 3D simulations

Photorealistic 3D scenes, actions, and sensors for simulating dynamic system behavior

Vehicle Dynamics Blockset

Vehicle Dynamics Blockset

Simulink 3D Animation

Visualize 3D simulations

Photorealistic 3D scenes, actions, and sensors for simulating dynamic system behavior

Automated Driving Toolbox

Automated Driving Toolbox

Simulink 3D Animation

Visualize 3D simulations

Photorealistic 3D scenes, actions, and sensors for simulating dynamic system behavior

Robotics System Toolbox

Robotics System Toolbox

Simulink 3D Animation

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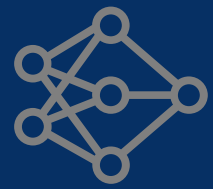
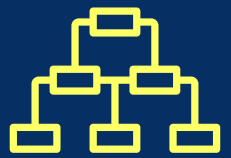
Integrations



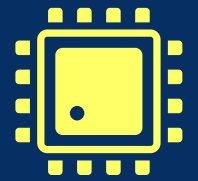
AI

Languages



Simulation

Visualization



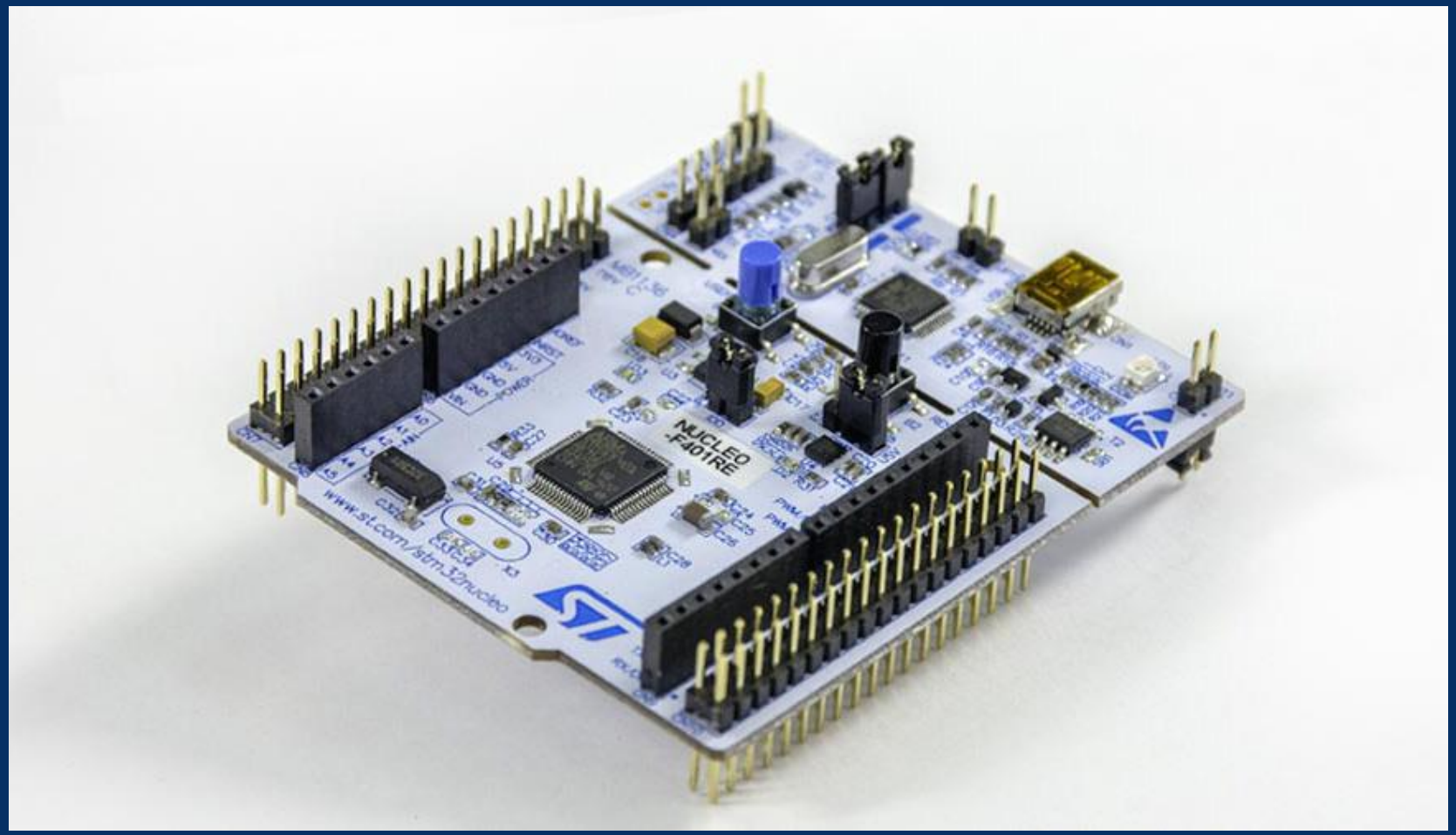
Hardware

ST Microelectronics

Support for dual-core devices

Support for 4 new device families:

U5, L4, L5, WB



Infineon

Support for AURIX TC3x

Support for AURIX TC4x PPU accelerator

Embedded Coder

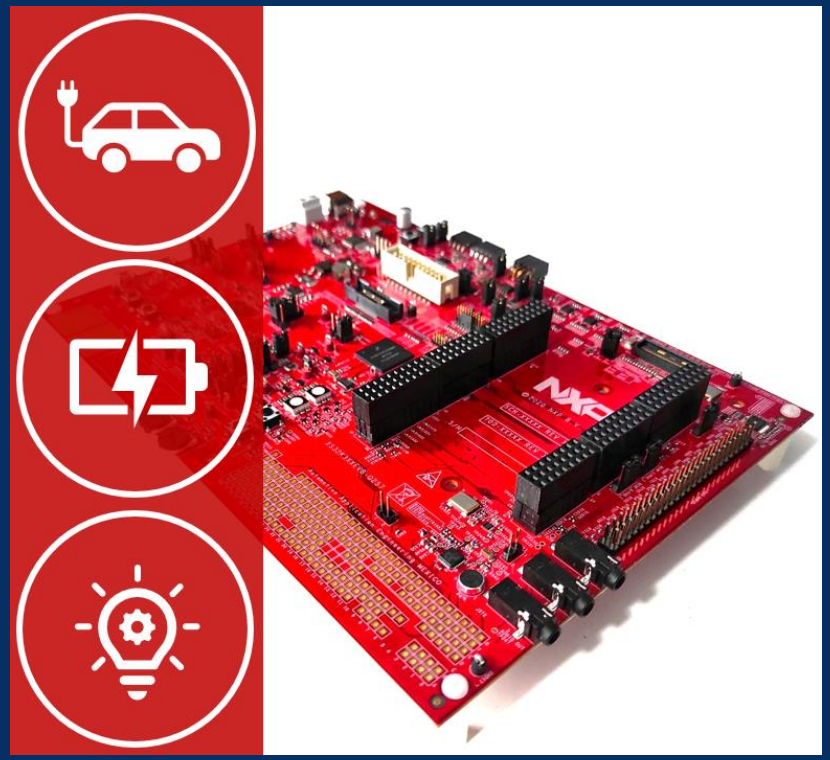
Embedded Coder Support Package for Infineon® AURIX™ TC3x Microcontrollers

Embedded Coder Support Package for Infineon® AURIX™ TC4x Microcontrollers

NXP

Support for S32M2, S32K396, LAX (S32R45), LPC553x, and BMS

Support for S32K3, S32ZE, and HCP



S32K3xx

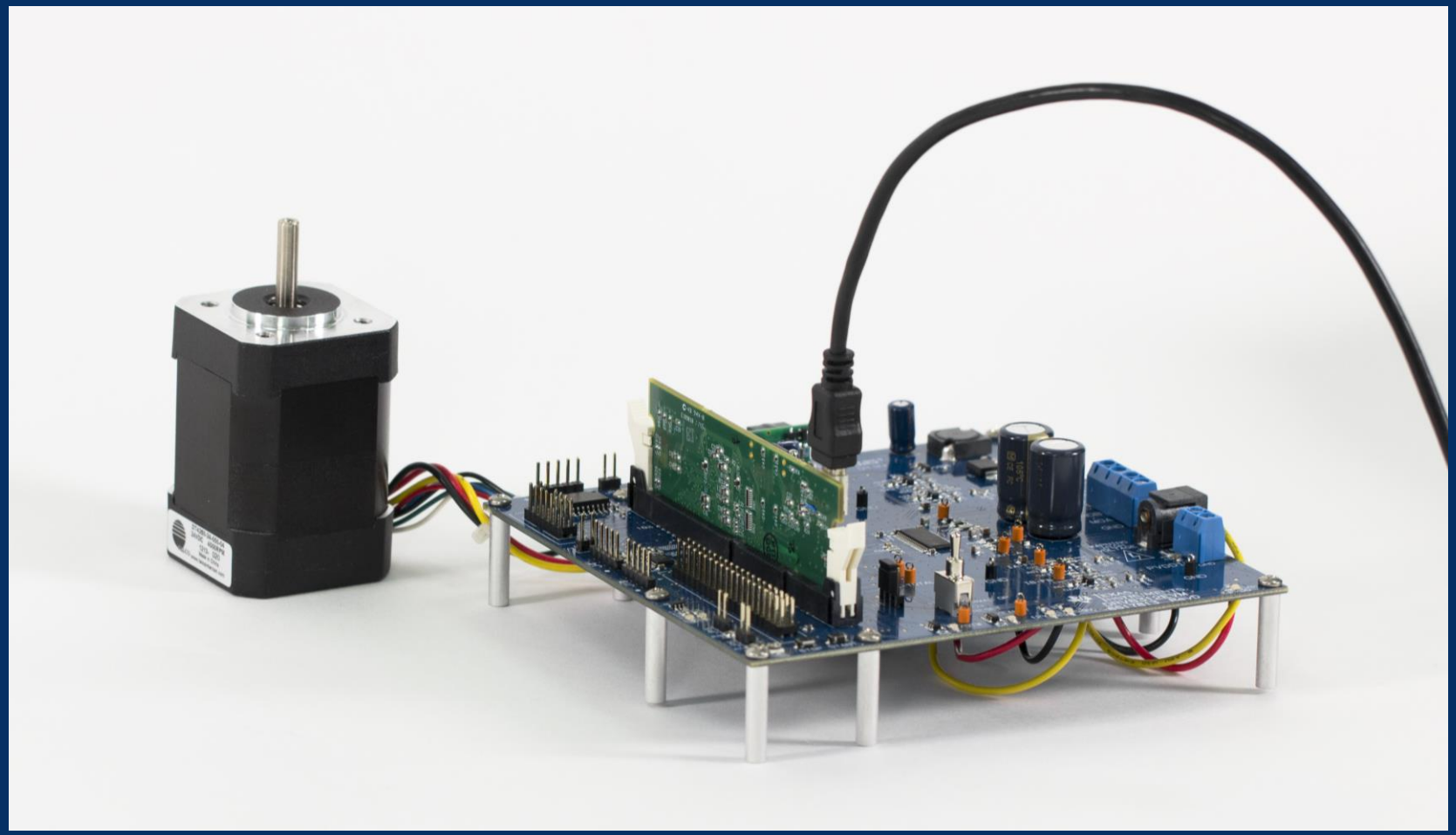
HCP

Embedded Coder

Texas Instruments (TI)

C2000 Microcontroller Blockset

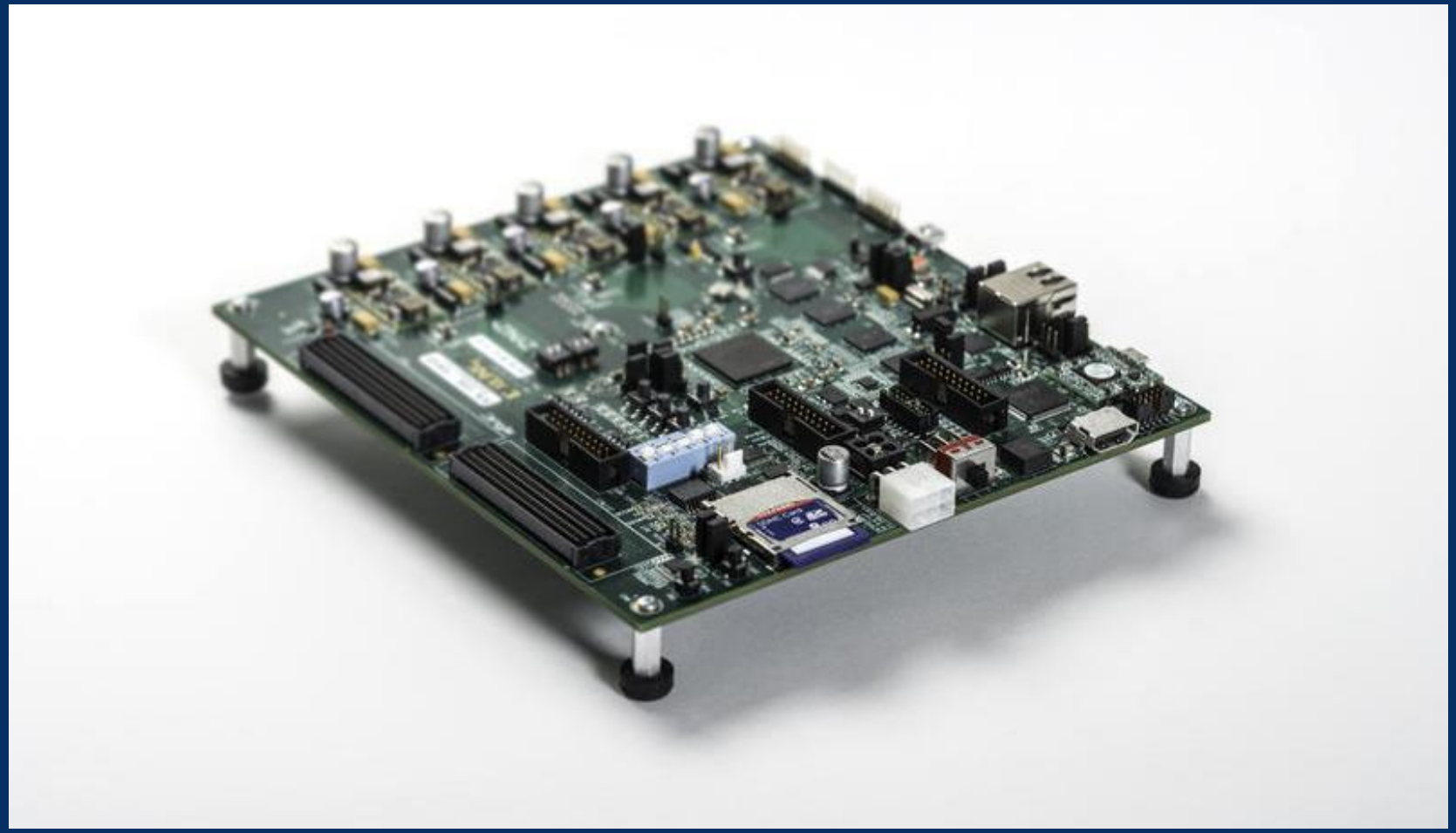
Design, simulate, and implement applications for TI C2000 Microcontrollers



AMD

Design, analyze, and prototype for Versal Adaptive SoCs, Zynq SoCs, and Xilinx FPGA devices

Generate and deploy HDL code and Embedded Software for Xilinx FPGA and SoC devices



SoC Blockset, HDL Coder

SoC Blockset Support Package for Xilinx® Devices, HDL Coder Support Package for Xilinx® FPGA and SoC Devices

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Integrations

AI

New capabilities across the entire AI workflow

Data Preparation

AI Modeling

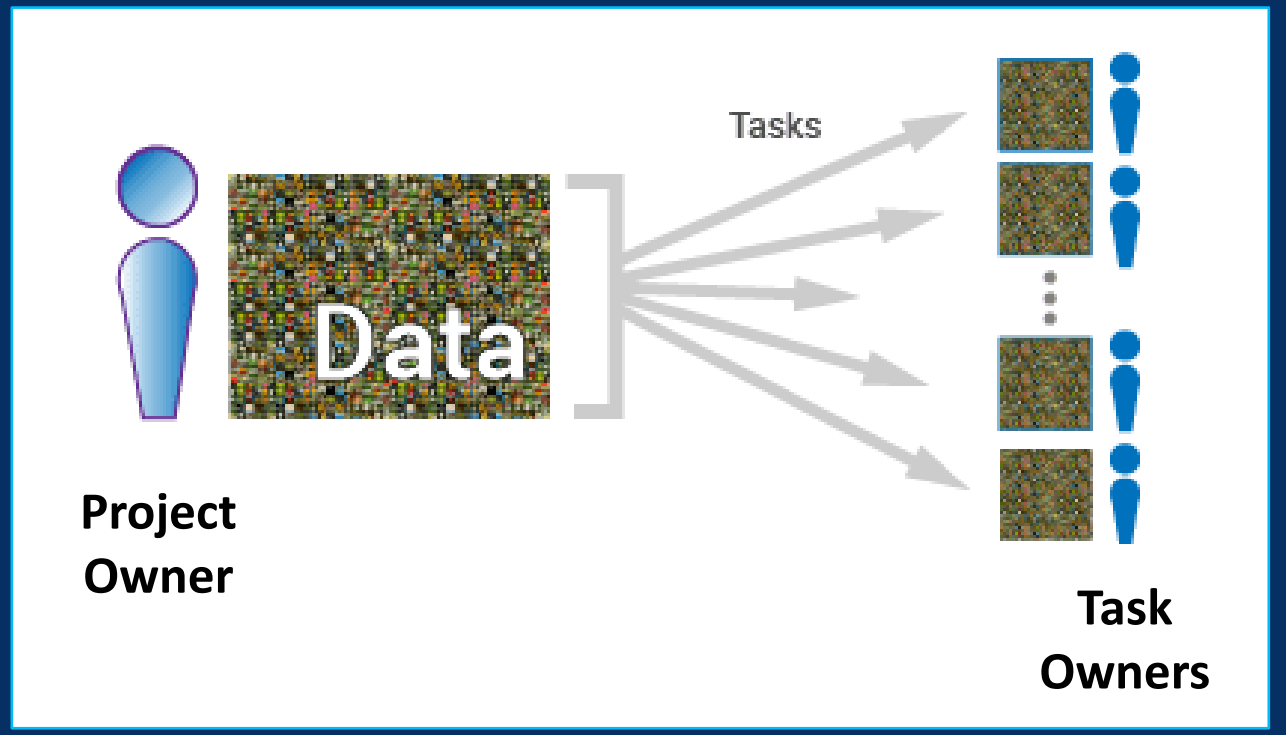
Simulation & Test

Deployment

Collaborative, multiuser, team-based labeling

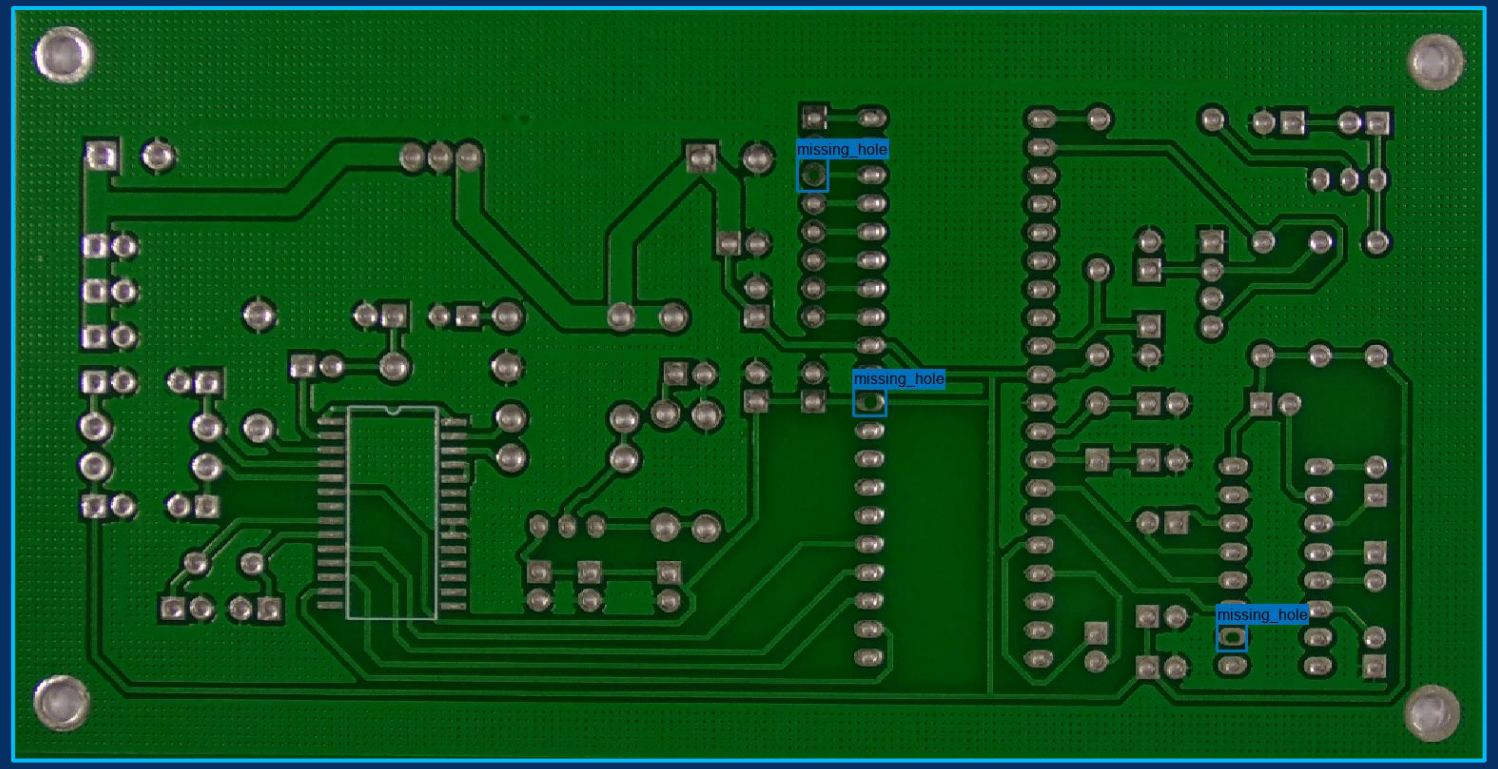
Distribute, monitor, and review labeling tasks across a team

Create an executable labeling app, which team members can use to label or review tasks without a MATLAB license



Detect objects in images using a YOLOX deep learning network

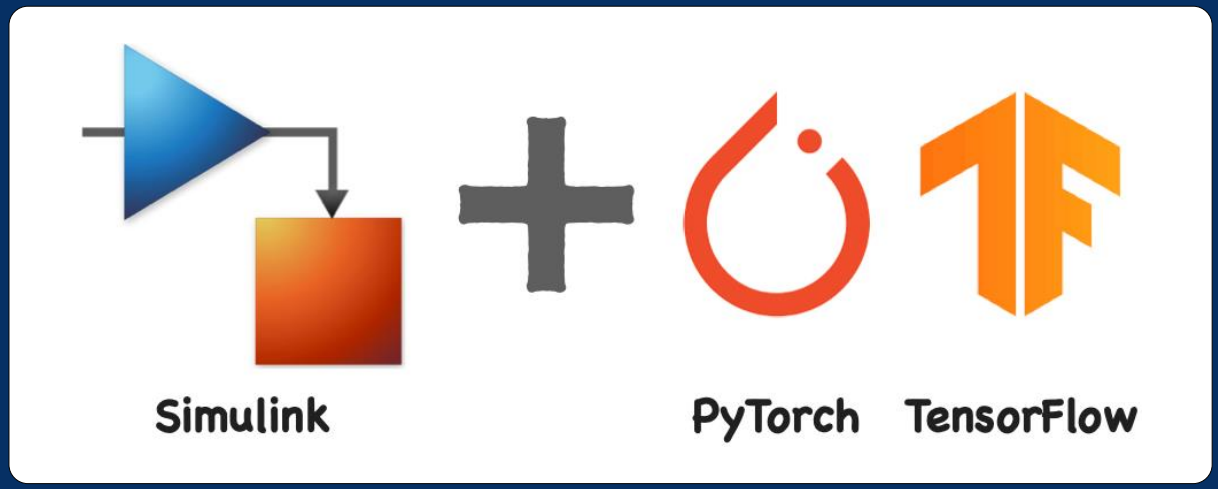
Create pretrained or custom YOLOX object detectors



Automated Visual Inspection Example
Detect, localize, and classify defects in printed circuit boards (PCBs) using a YOLOX object detector.

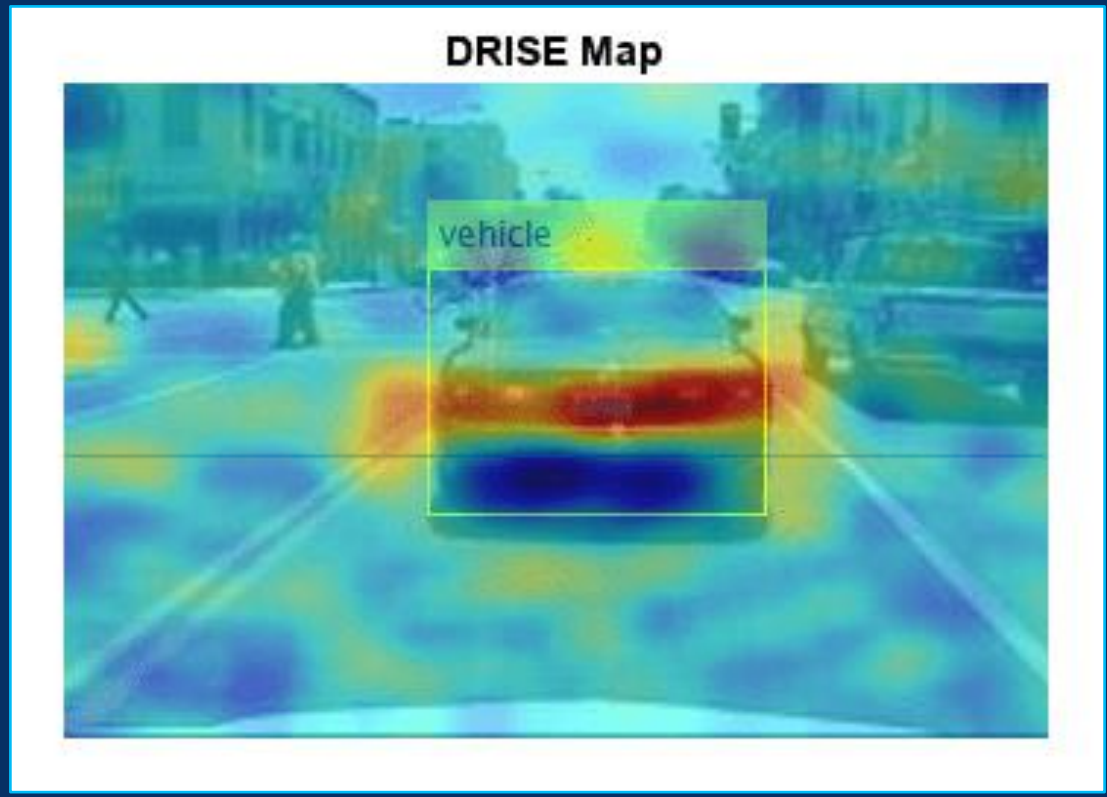
Execute Python deep learning models in Simulink

Coexecute TensorFlow and PyTorch models in Simulink together with other deep learning and machine learning blocks



Explain object detection network predictions using D-RISE

Generate visual explanations for the prediction results of object detection networks



Generate generic CUDA code for deep learning

Generate deep learning CUDA code that does not require NVIDIA deep learning libraries

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Ease of Use

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Integrations

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Hardware

AI

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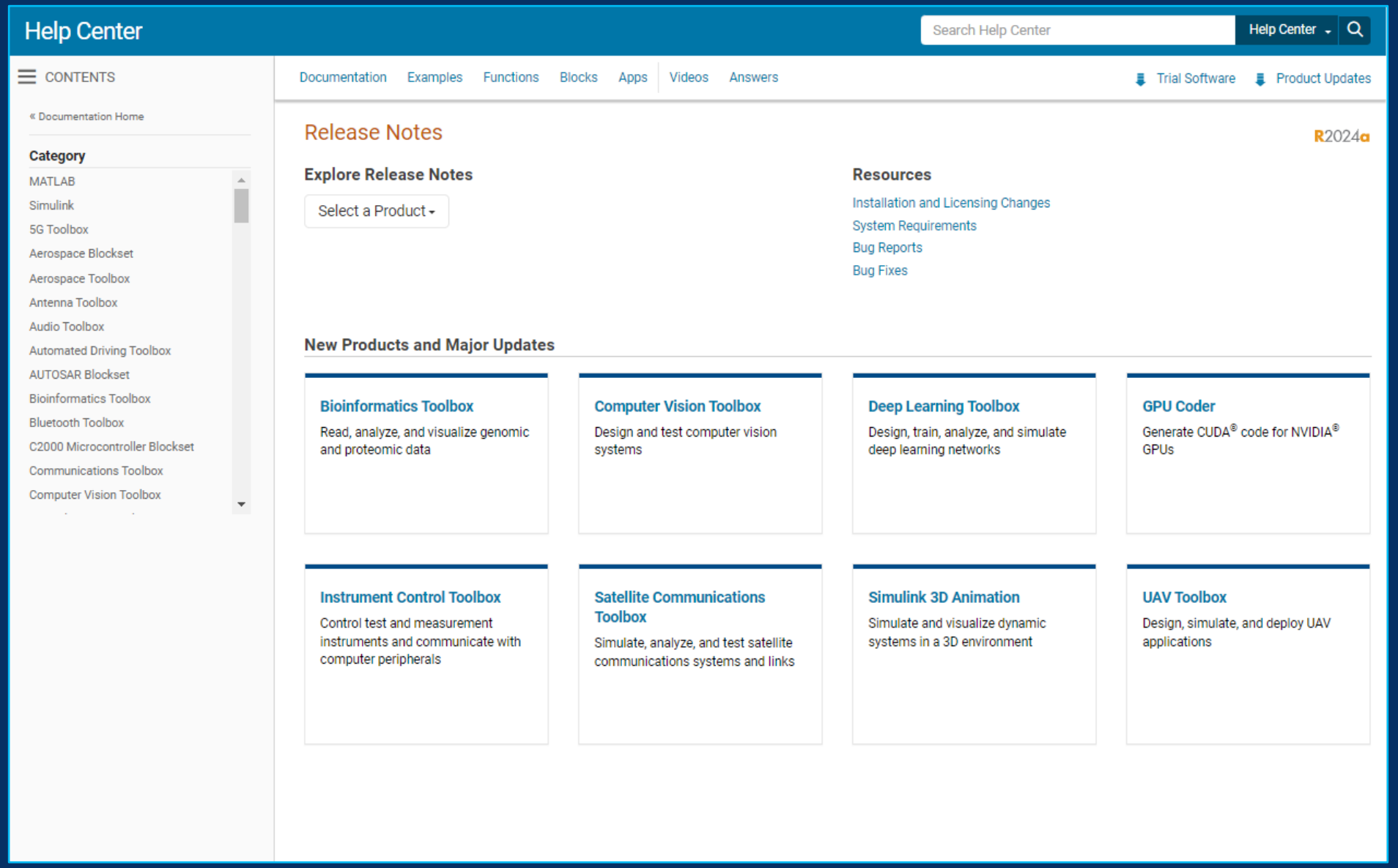
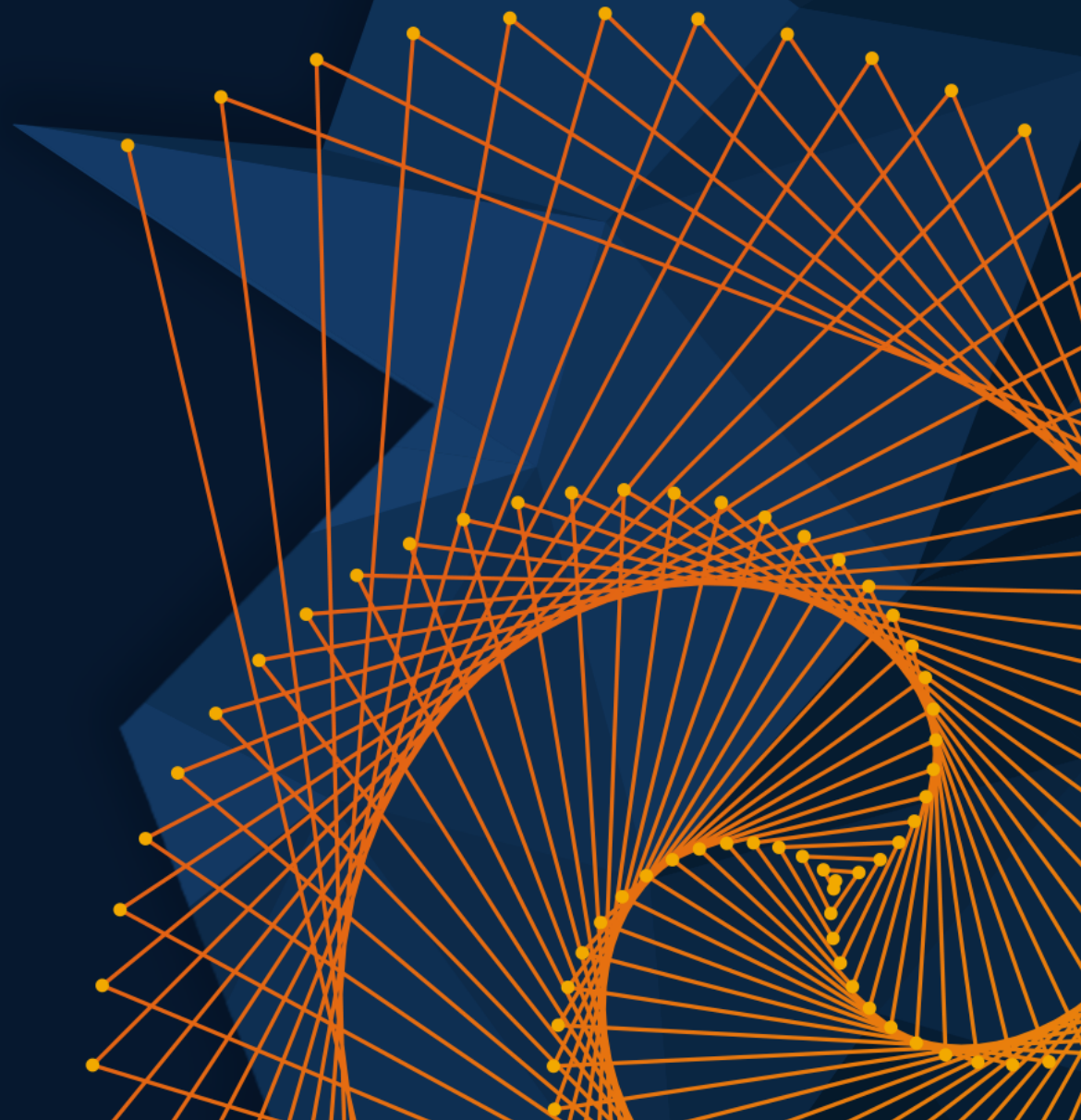


MATLAB EXPO

Thank you!



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