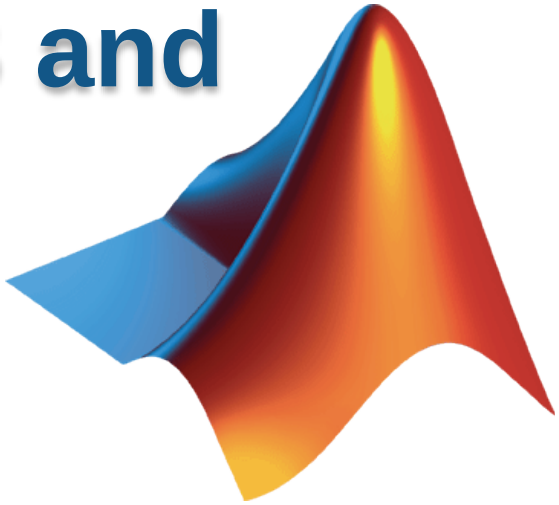
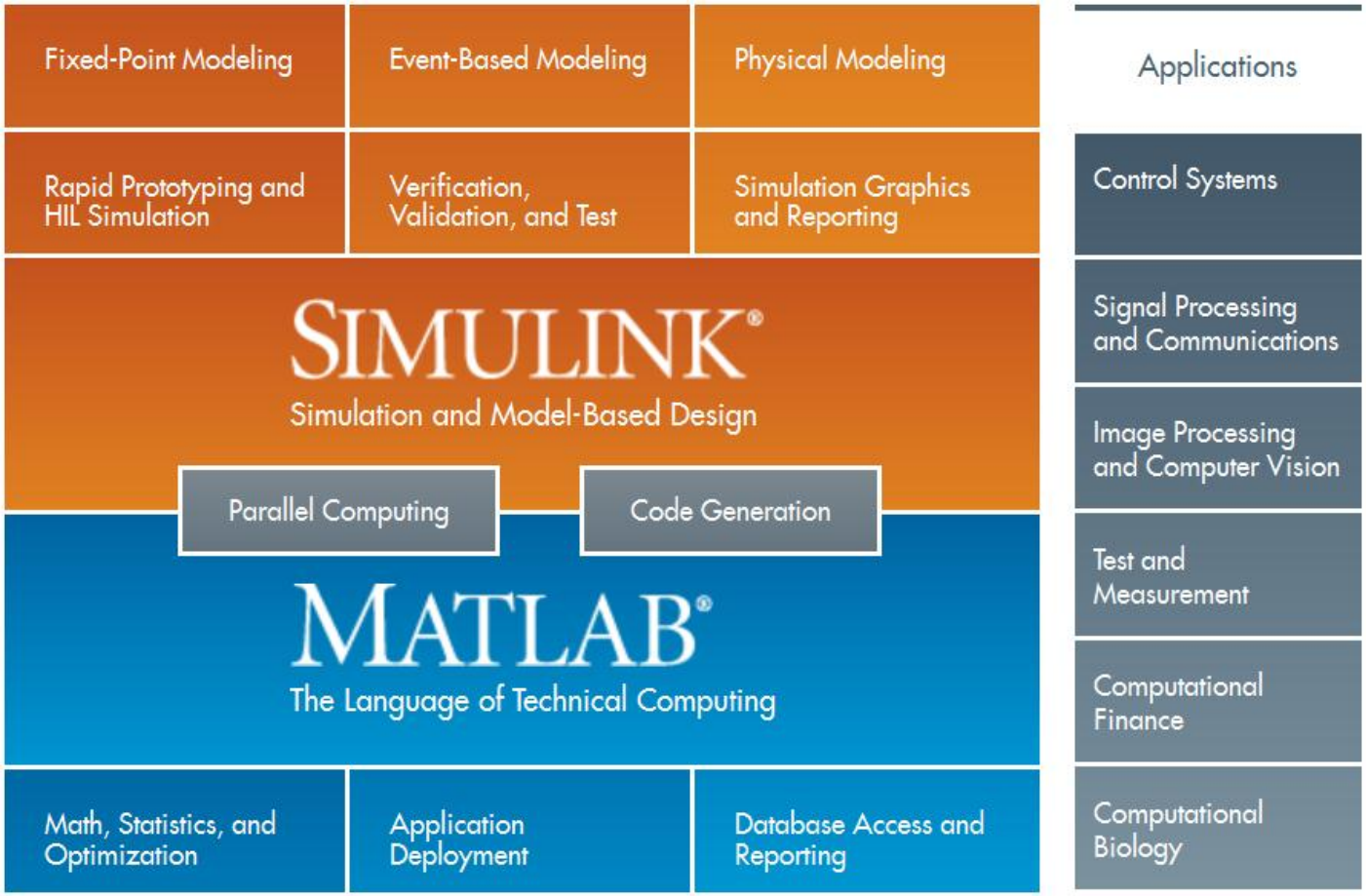
What's New in MATLAB and Simulink



Prashant Rao
Technical Manager
MathWorks India

MathWorks Product Overview

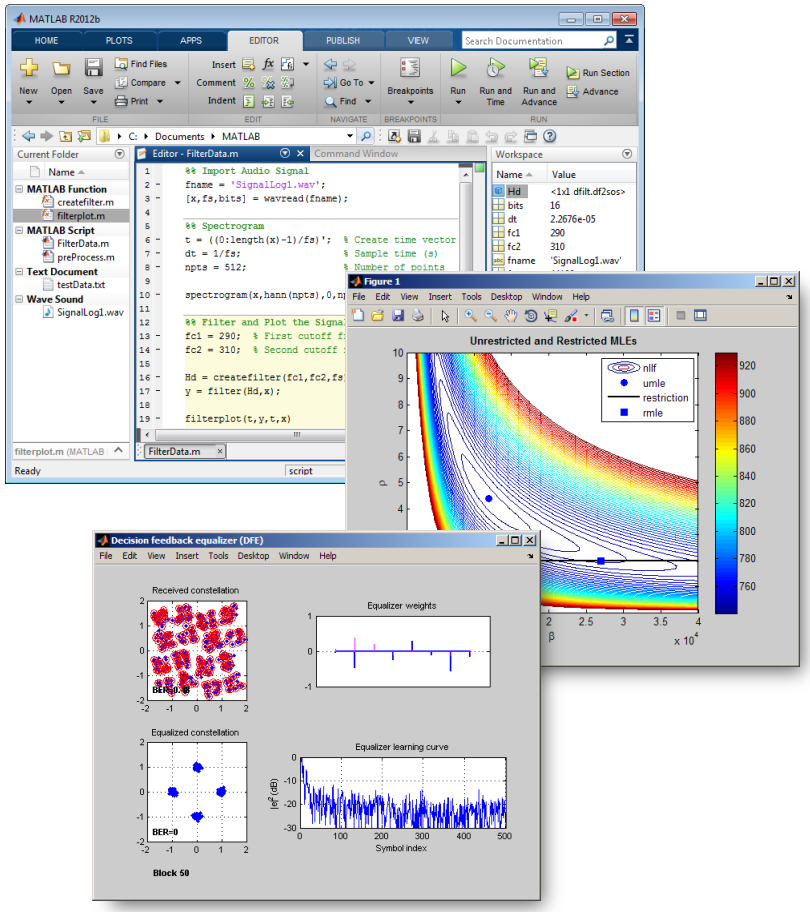


Core MathWorks Products

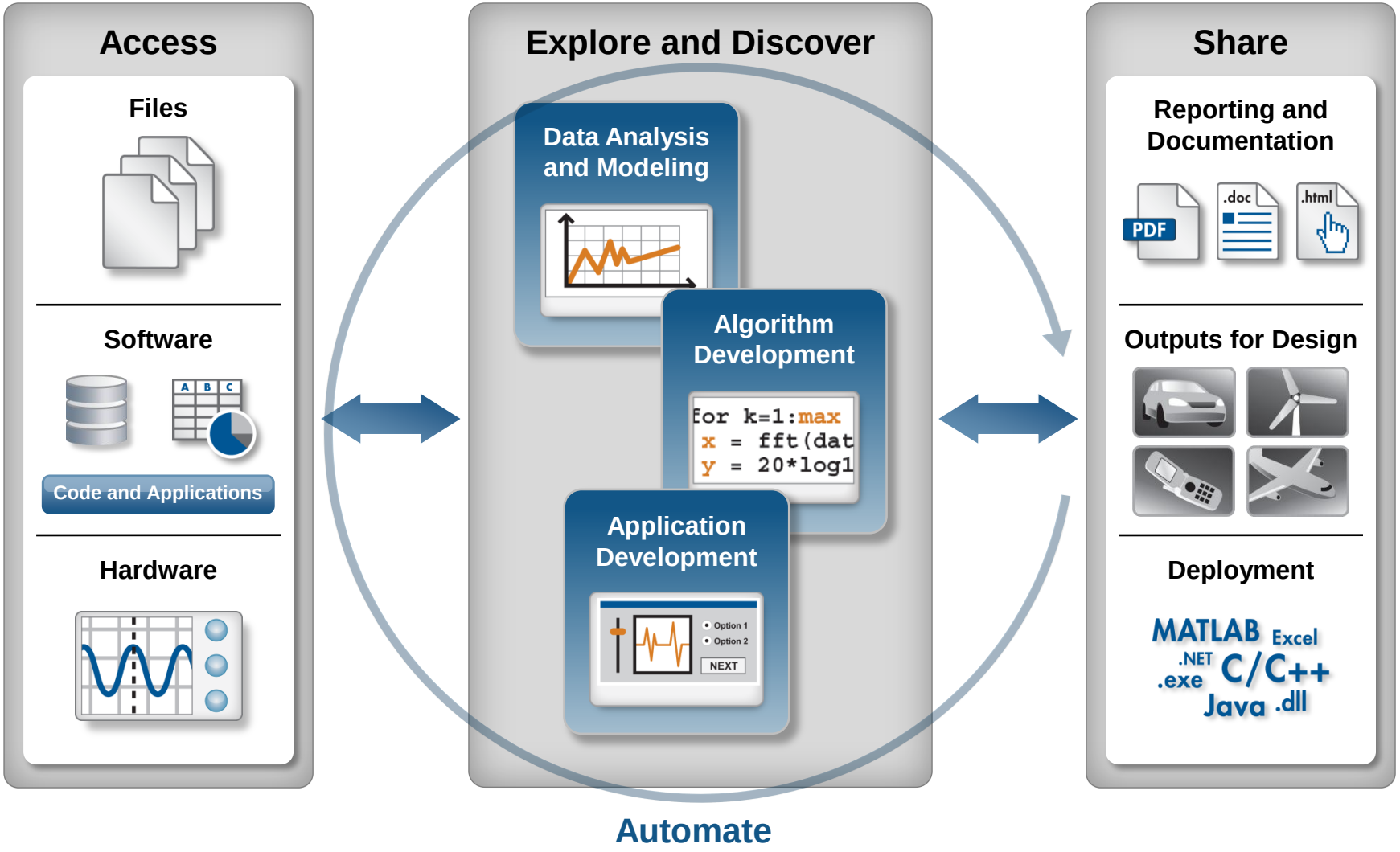
MATLAB®

The leading environment for technical computing

- The industry-standard, high-level programming language for algorithm development
- Numeric computation
- Parallel computing, with multicore and multiprocessor support
- Data analysis and visualization
- Toolboxes for signal and image processing, statistics, optimization, symbolic math, and other areas
- Tools for application development and deployment
- Foundation of MathWorks products



Technical Computing Workflow

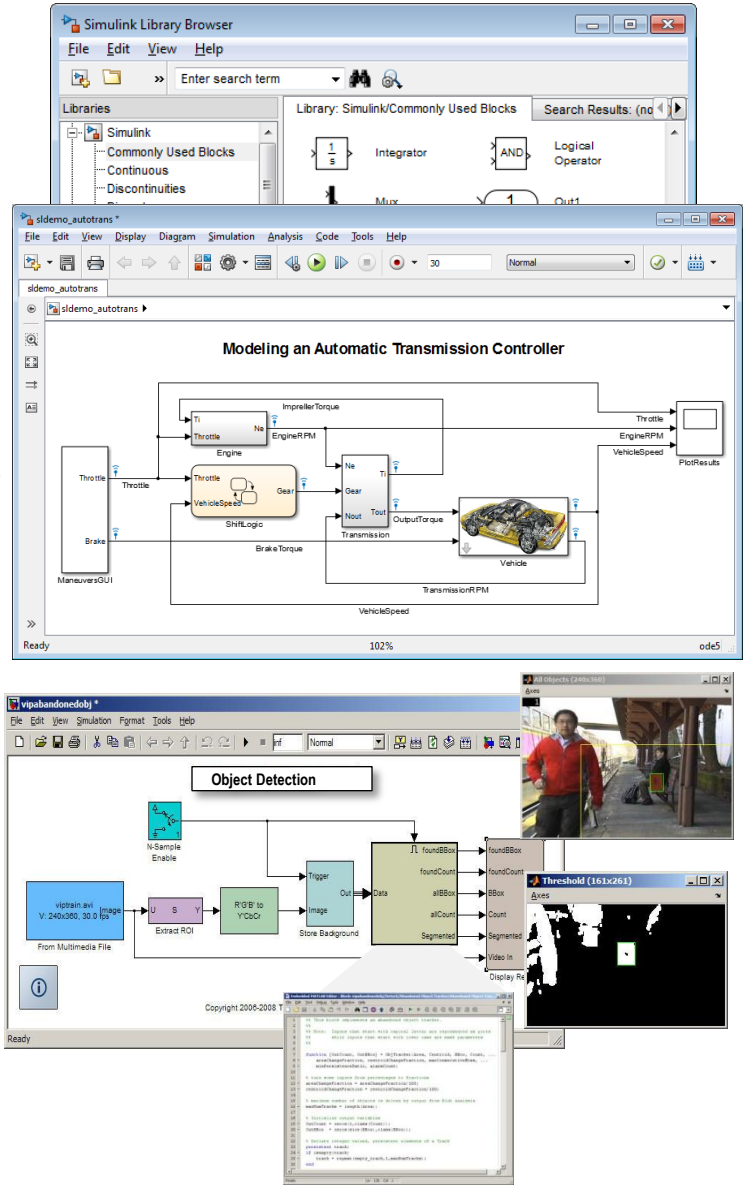


Core MathWorks Products

SIMULINK®

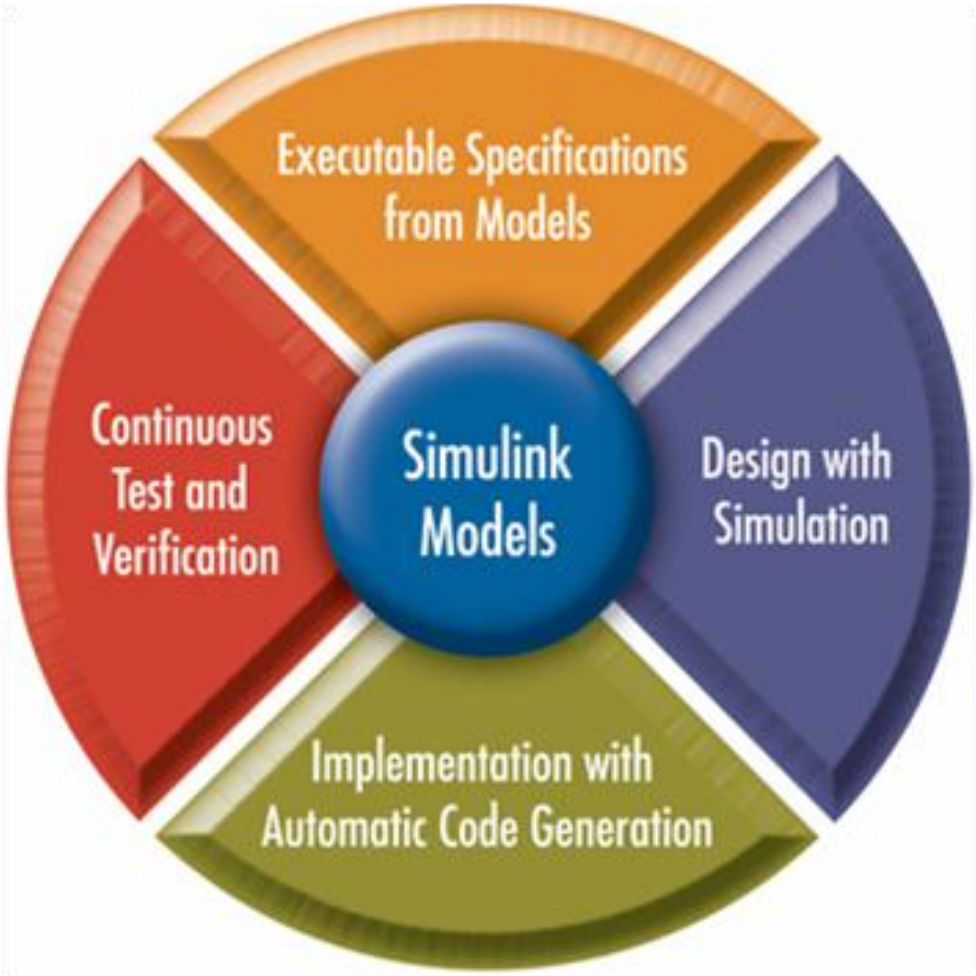
The leading environment for system-level modeling, simulation, and verification

- Block-diagram environment
- Model, simulate, and analyze multi-domain systems
- Design, implement, and test:
  - Control systems
  - Signal processing systems
  - Communications systems
  - Other dynamic systems
- Platform for Model-Based Design



Model-Based Design: Benefits

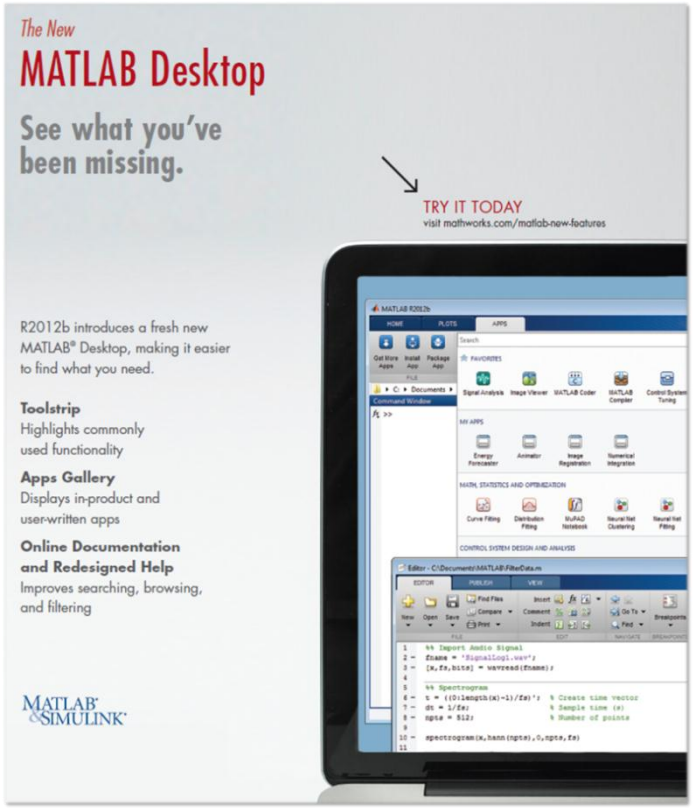
- **Cost**
  - Minimize prototypes and rework
  - Facilitates design reuse
- **Schedule**
  - Shortens time-to-market
  - Enhances team communication
- **Performance**
  - Fosters innovation
  - Improves quality



Release 2012b Highlights

MATLAB

Introducing the new MATLAB Desktop: making it easier to find what you need.



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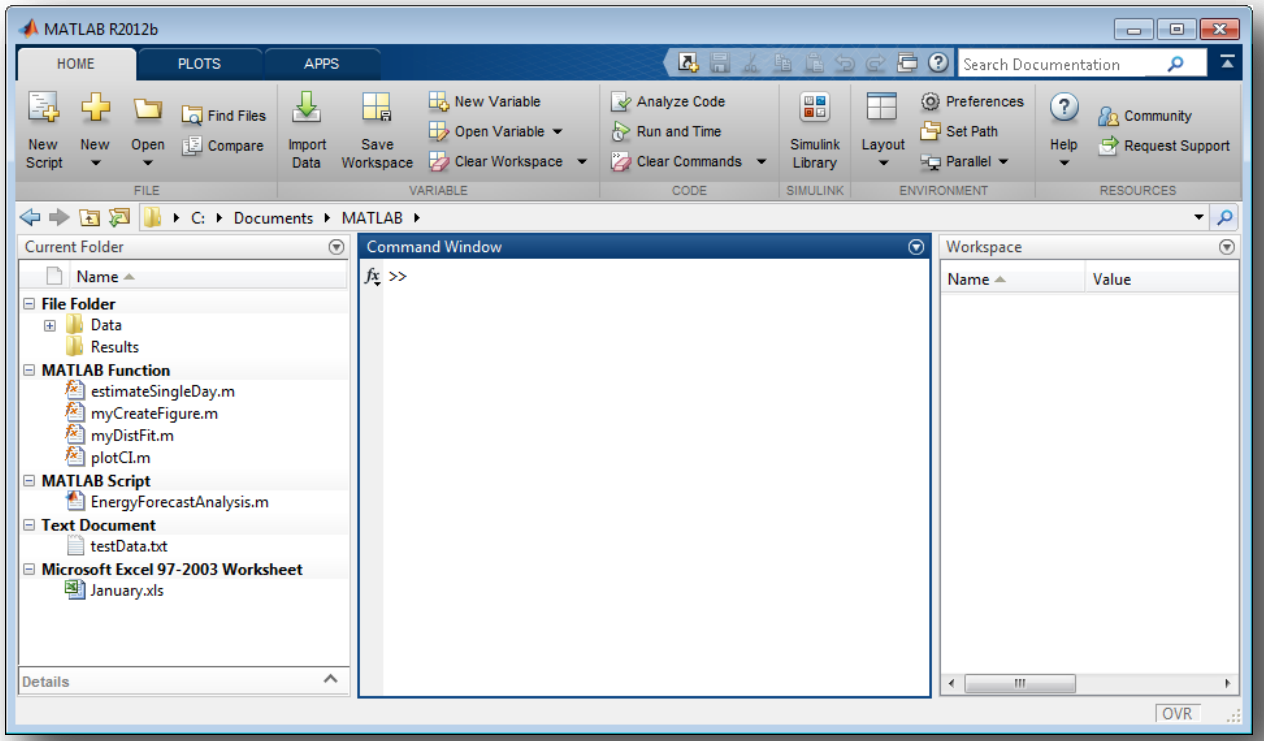
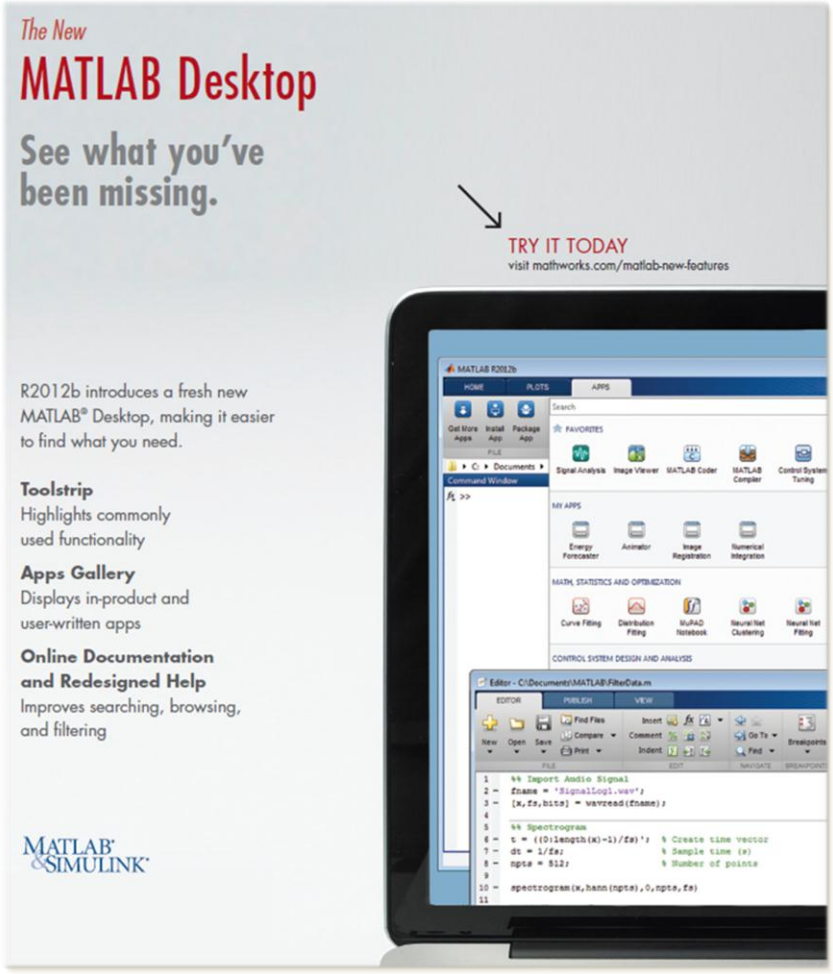


MATLAB

Introducing the New MATLAB Desktop

What's New in MATLAB?

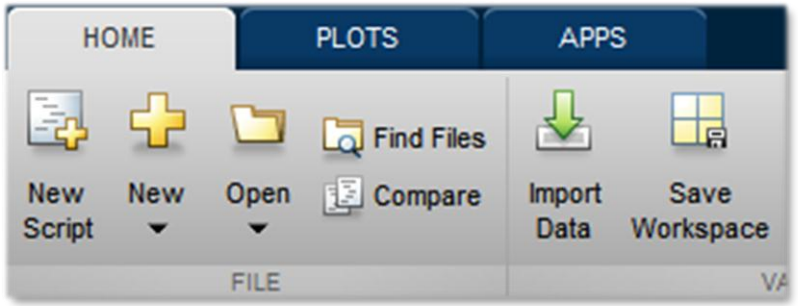
- MATLAB Toolstrip
- MATLAB apps
- Import Tool
- Command line suggestions
- Help System



MATLAB Toolstrip

Find what you need

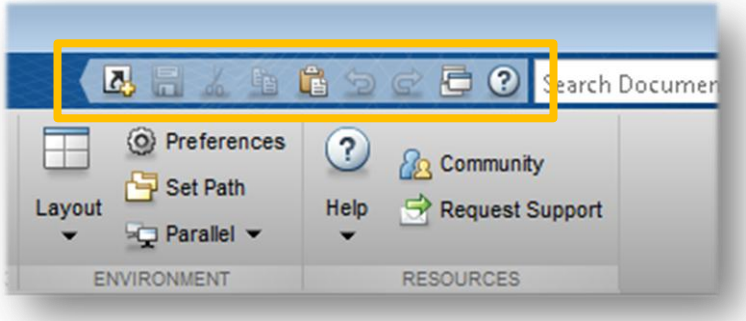
- Tabs organize commonly used functionality
  - Key features placed up front
  - Design optimized for common tasks



- Functionality only appears when needed

Quick Access Toolbar

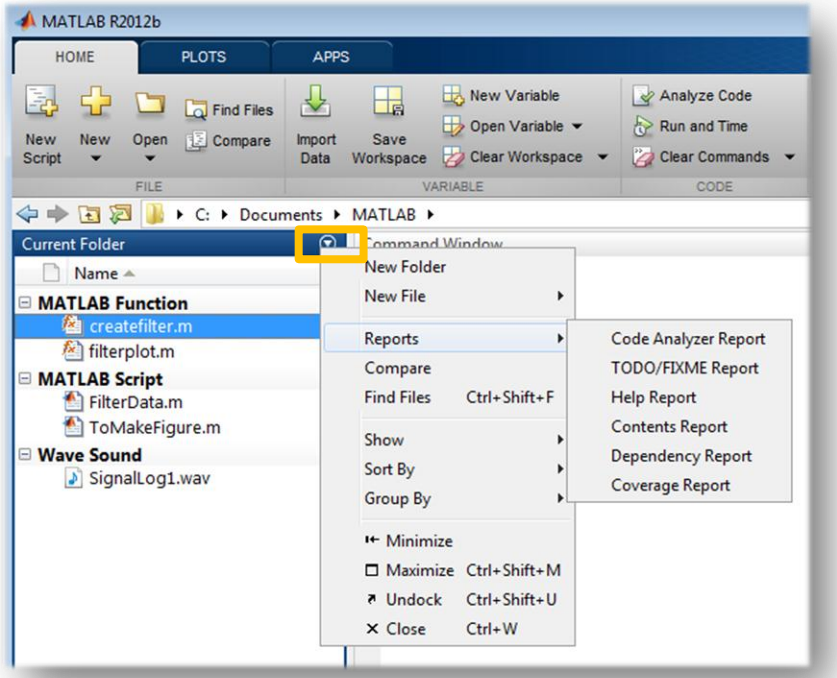
- Place to put commonly used commands



- Any item from a tab or shortcuts can be added to the toolbar
- Remains visible when the toolstrip is minimized

Action Menus

- Contain docking commands and relevant actions for the window
- Undock windows by using the action menu or by dragging the window out



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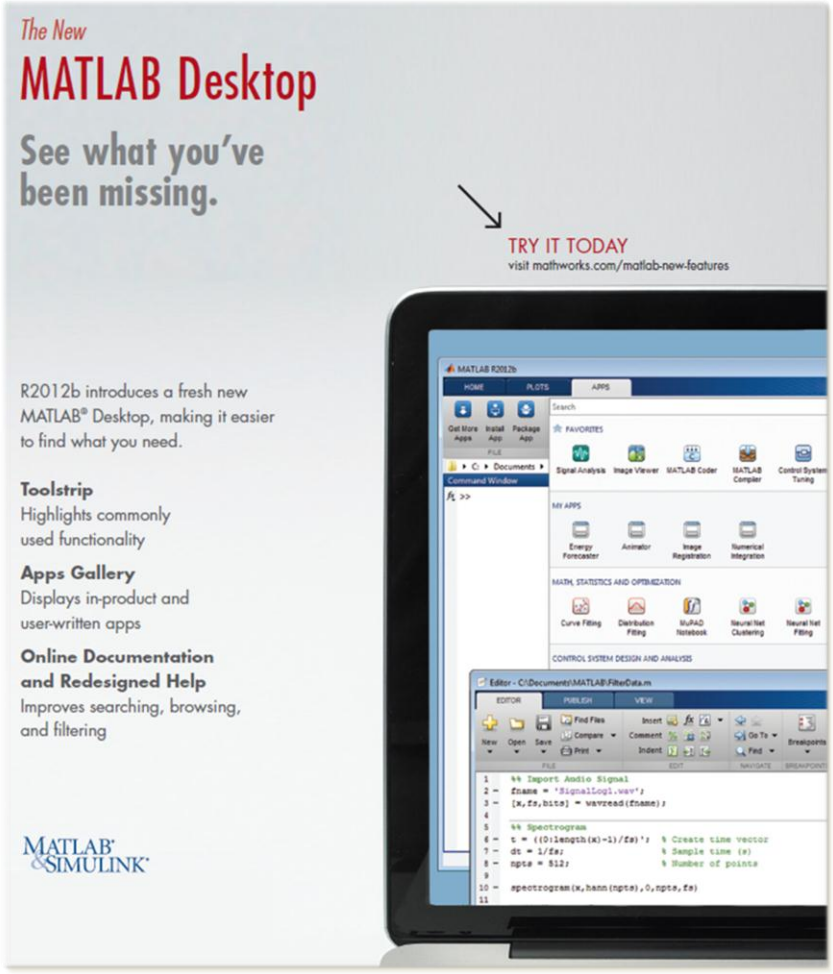
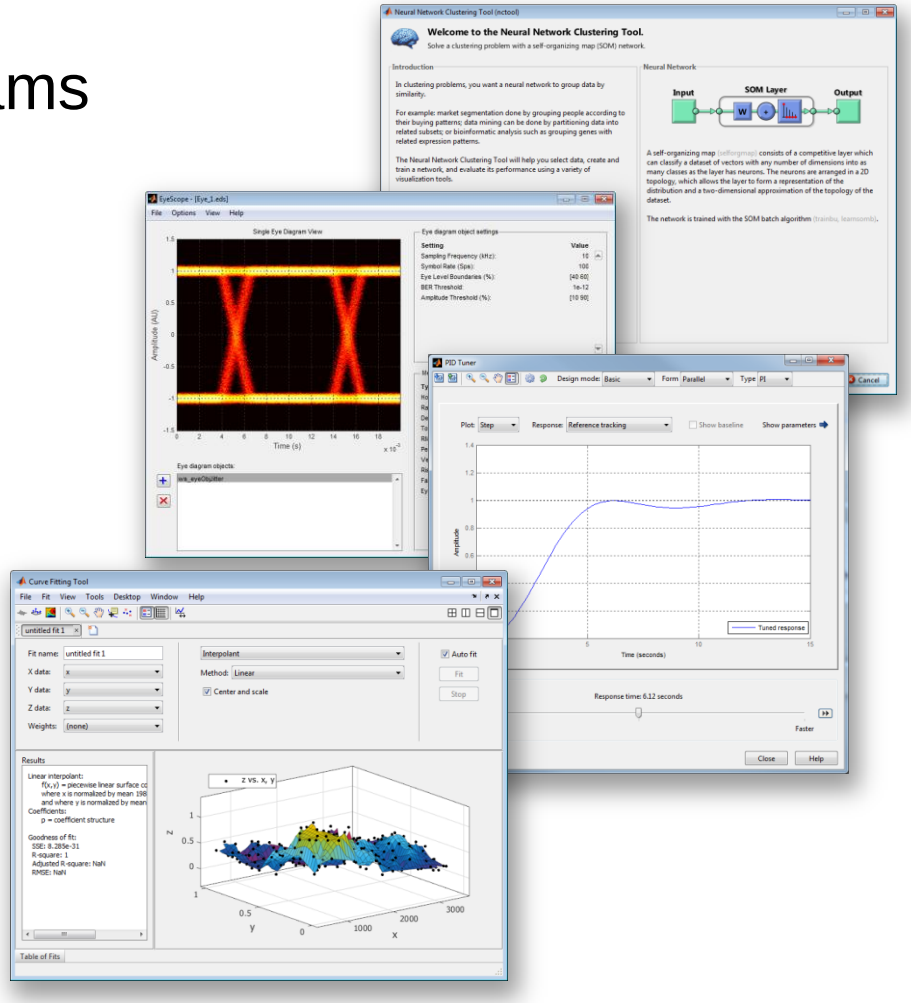


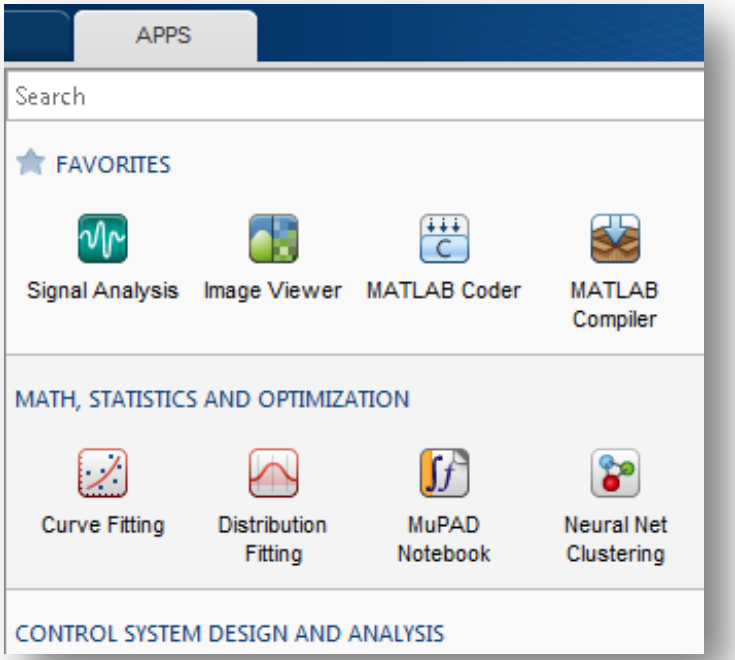
What are MATLAB Apps?

- Interactive MATLAB programs that include a GUI
- Apps are included in many MATLAB products
- There are also many user-written apps



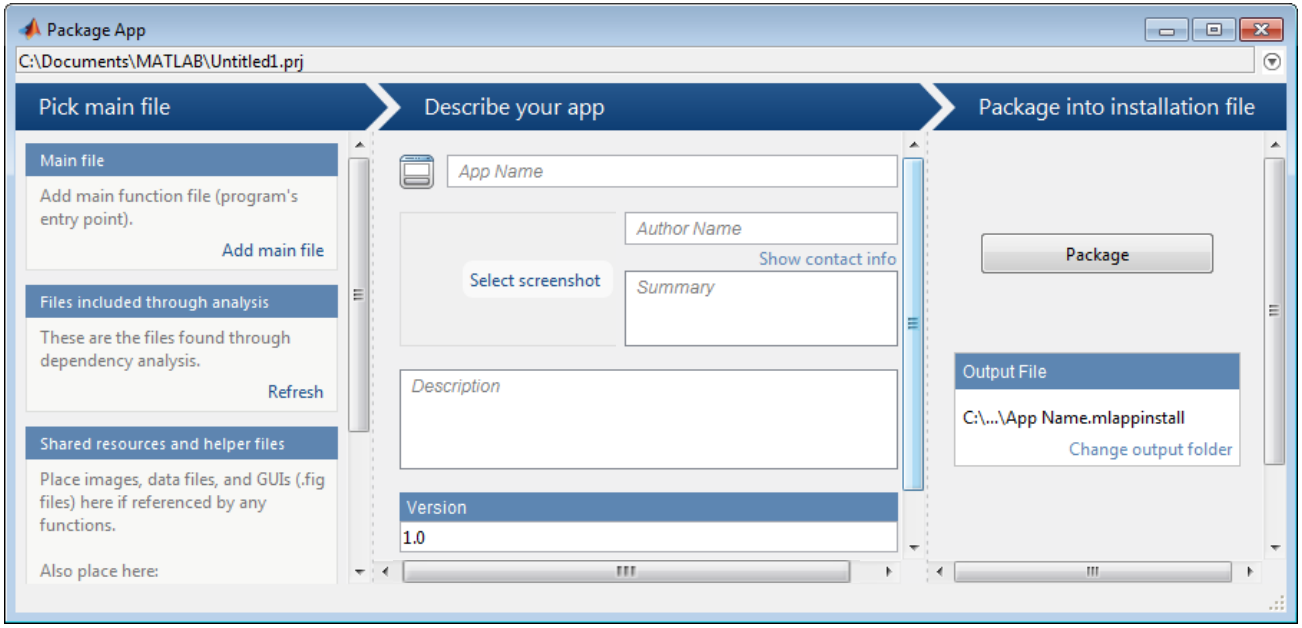
MATLAB Apps Gallery

- Tab within the MATLAB Toolstrip
- Prominently displays both user-written apps and apps included in MATLAB products
- Makes it easy to find and launch MATLAB apps

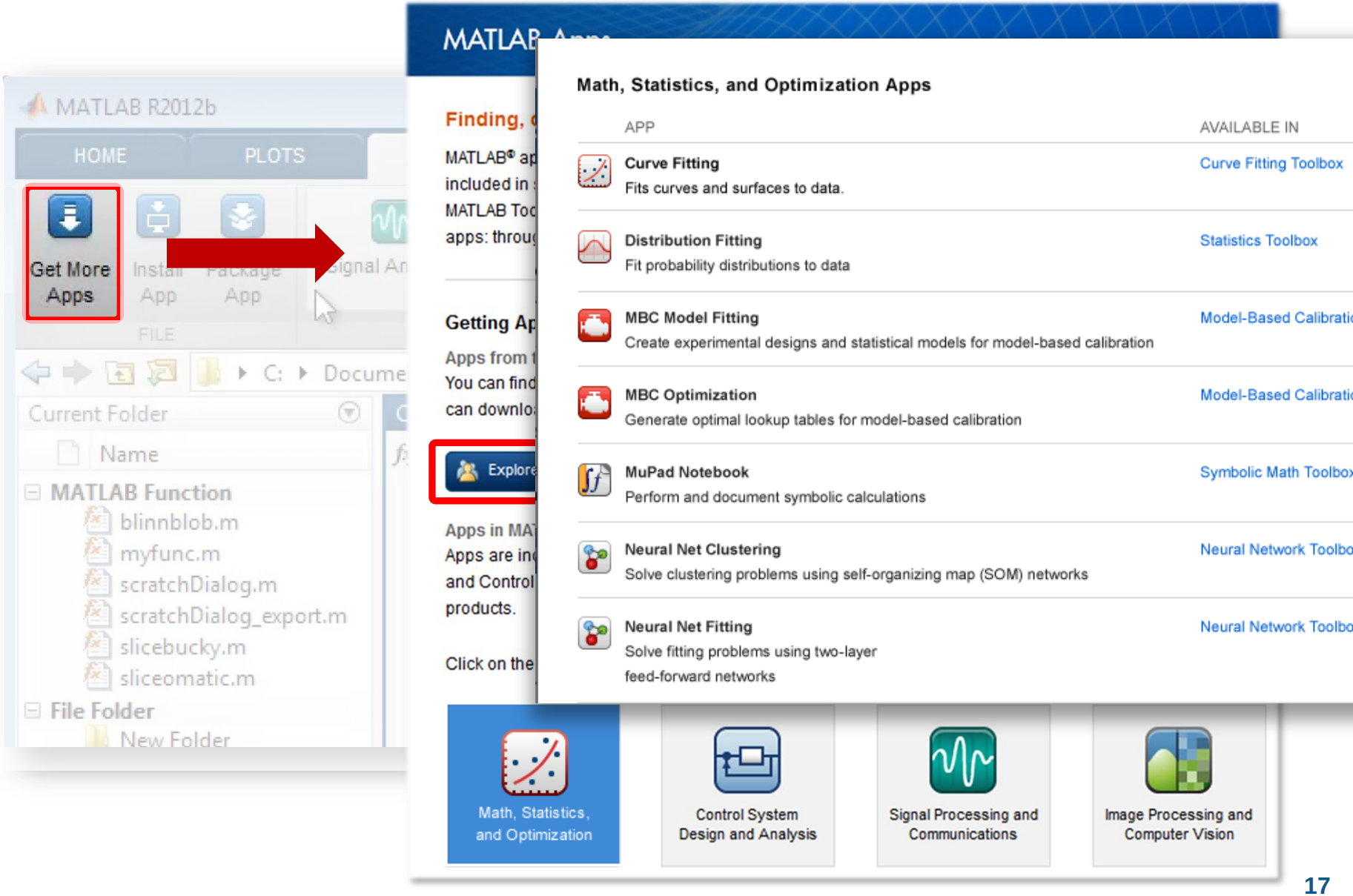


Packaging and Sharing MATLAB Apps

- Automatically includes all necessary files
- Documents required products
- Creates single installation file for easy distribution and installation into the MATLAB apps gallery



Getting More Apps



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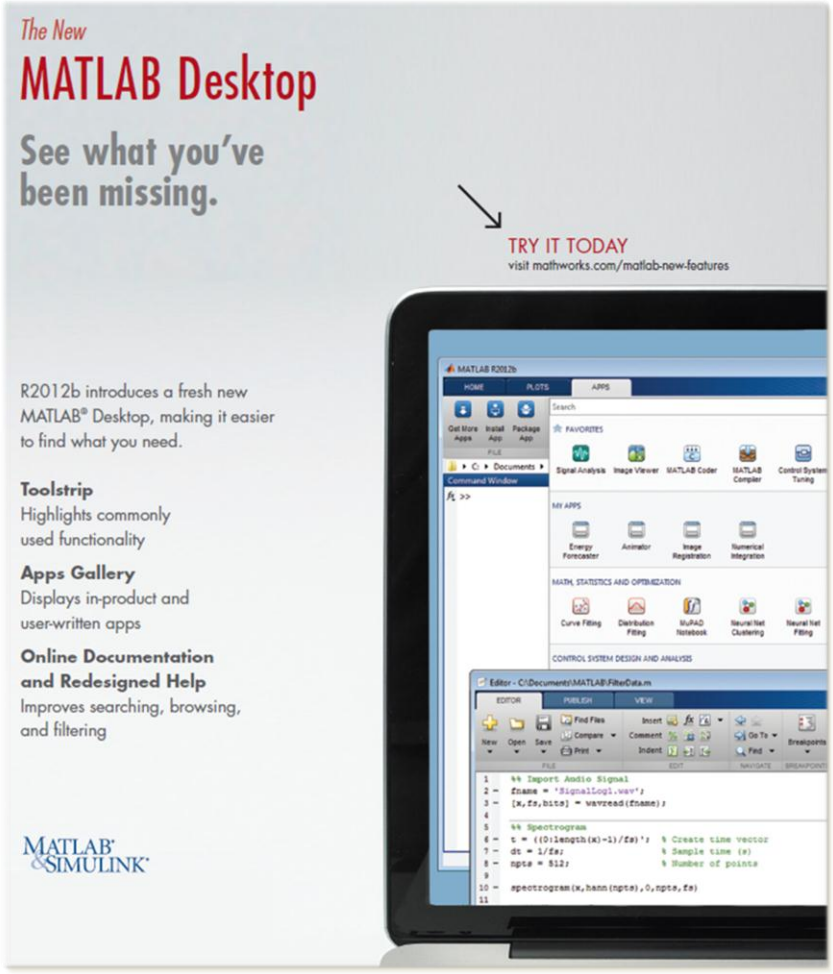
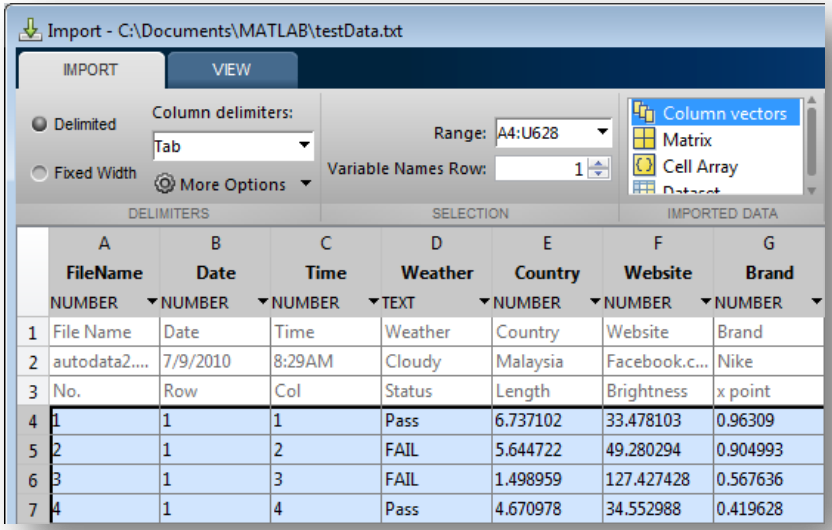


Import Tool

- Interactive import of delimited and fixed-width text files
- Improved handling of:
  - Mixed numeric and text data
  - Dates
- Define rules for handling nonnumeric values



- Automatically generate MATLAB code (scripts and functions) to automate the process

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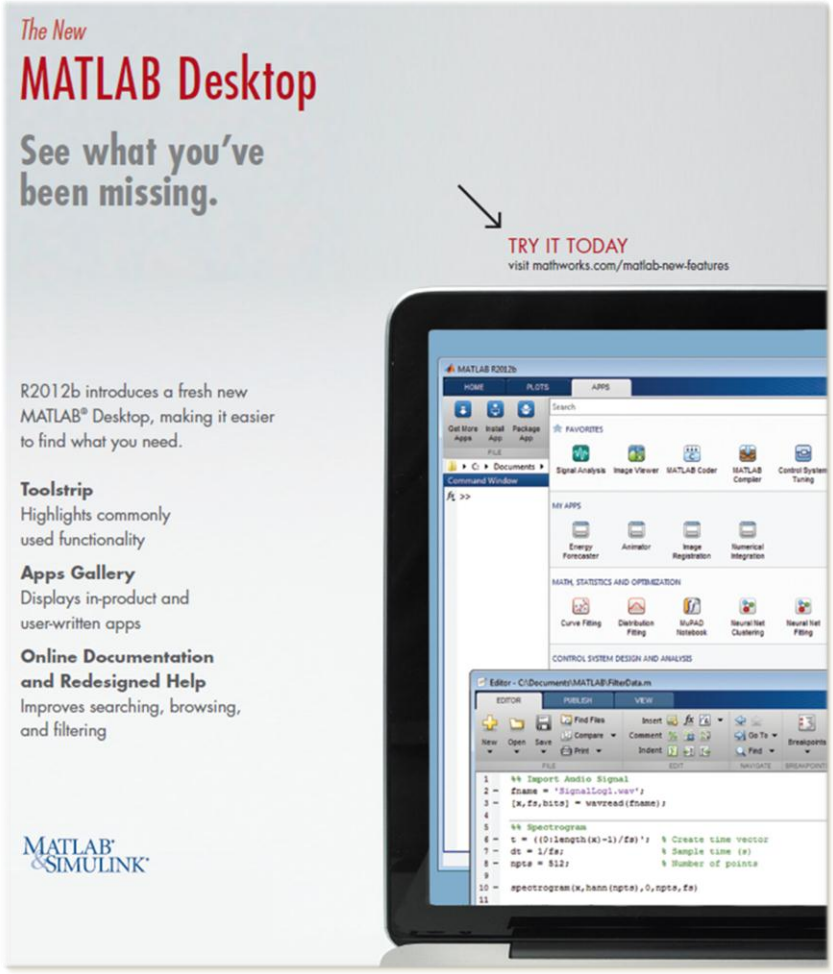

Command Line Suggestions

- Suggested corrections for mistyped functions and variables in the Command Window
- Press Enter to execute the suggested command, or Esc to delete it

```
>> datstr(Date(1))
Undefined function 'datstr' for input
arguments of type 'double'.

Did you mean:
>> datestr(Date(1))

ans =

01-Jan-2005 01:00:00
```

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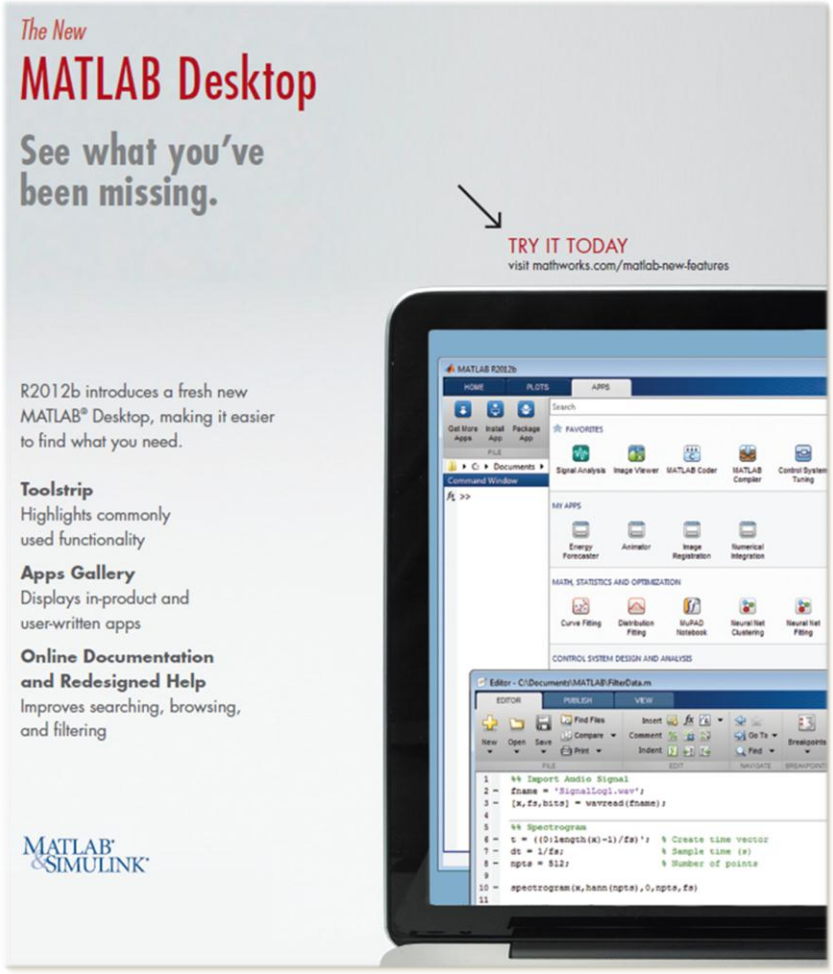
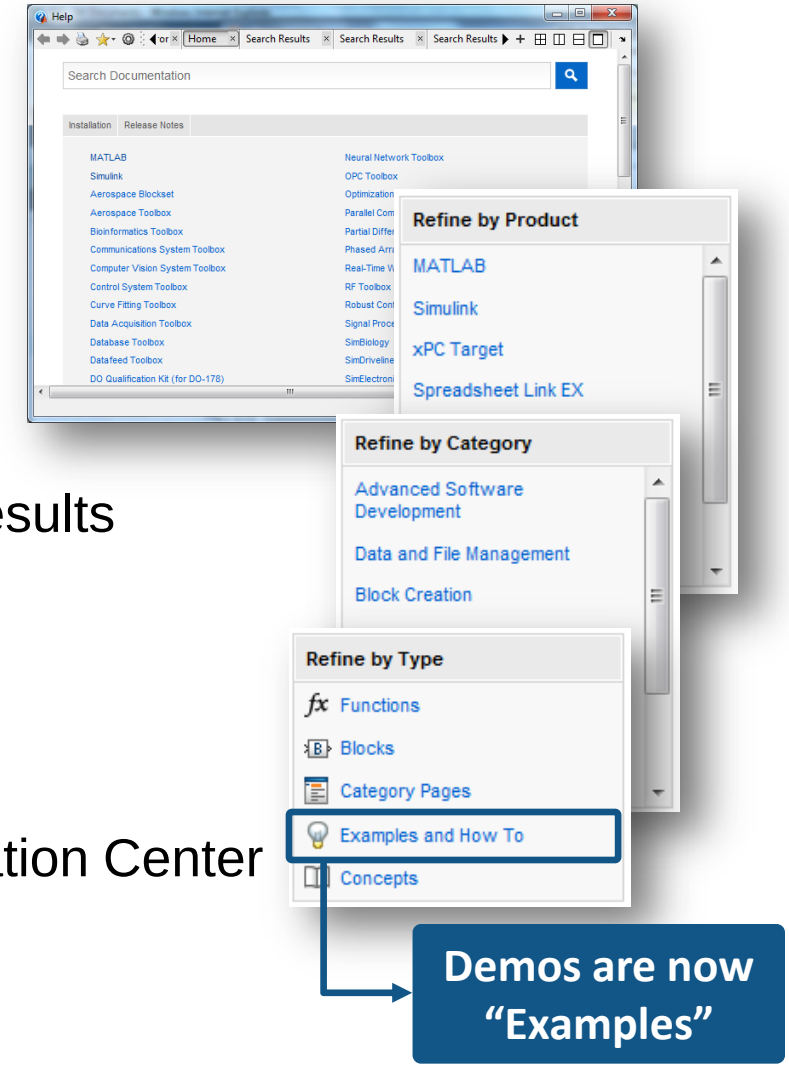


Documentation Center and Redesigned Help

- Content organized by topic rather than content type
- Browser-like interface, with improved search
  - Facets allow users to filter search results
  - Multiple tabs
- Documentation installed locally
  - Option to use the online Documentation Center



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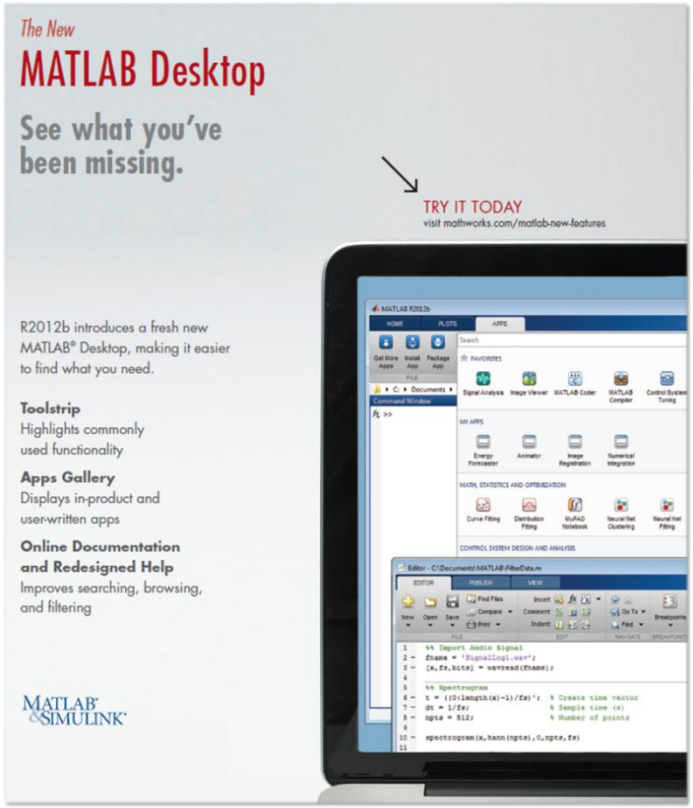

Simulink

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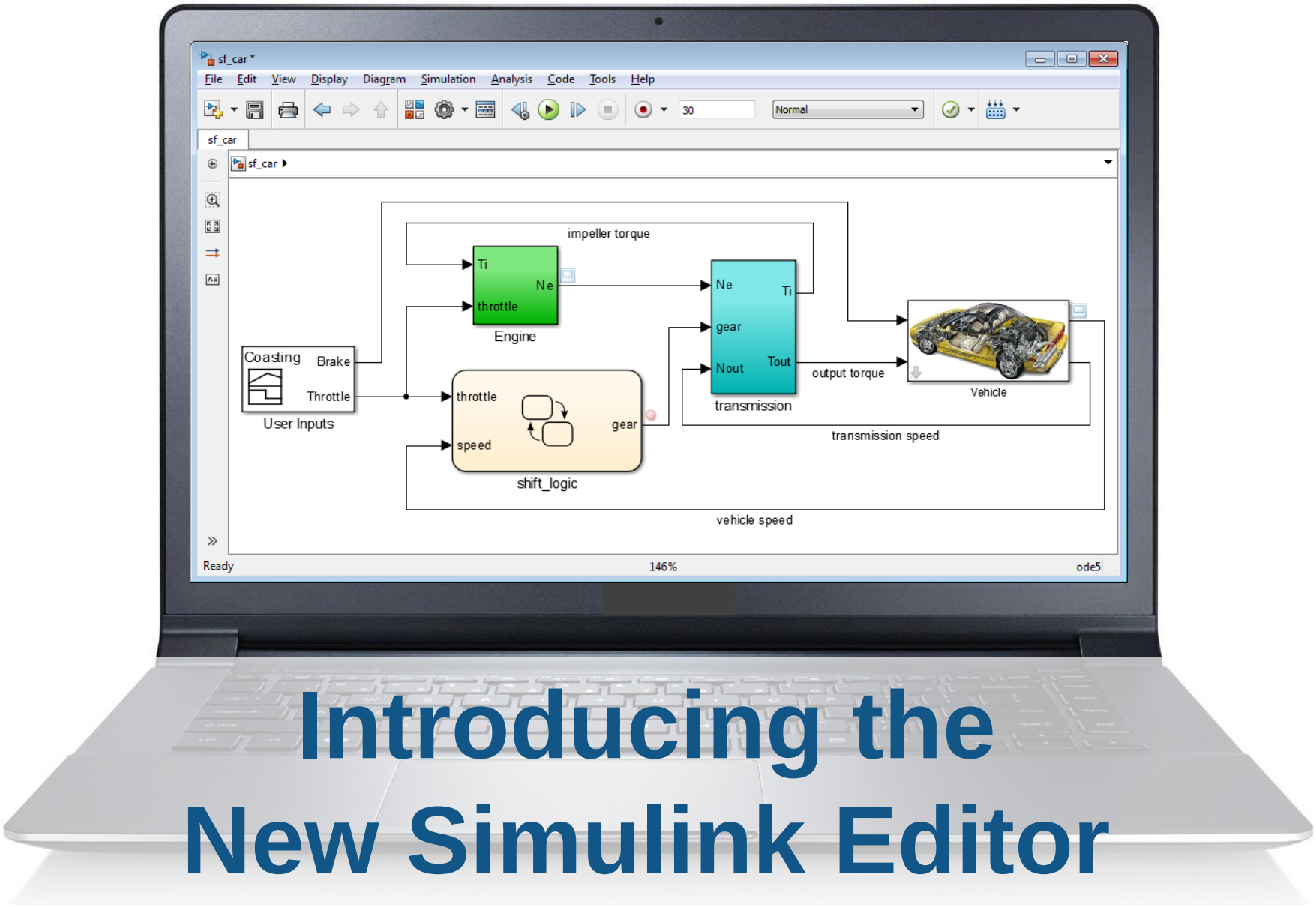


Introducing the New Simulink Editor

Simulink R2012b is the most significant upgrade to Simulink Ever!

Model-Based Design Industry Trends	Simulink R2012b Capabilities
Huge models to capture complex behavior across systems and in components	Tabbed windows and Explorer bar to navigate model hierarchy and access key sections of the design.
Models to communicate designs and specifications, not just to create them	Smart signal routing and new Stateflow Editor to help create clean-looking models.
Simulation to understand, design, verify and analyze systems	Ability to add signal breakpoints and step back and forth through a simulation.

What's New in Simulink?

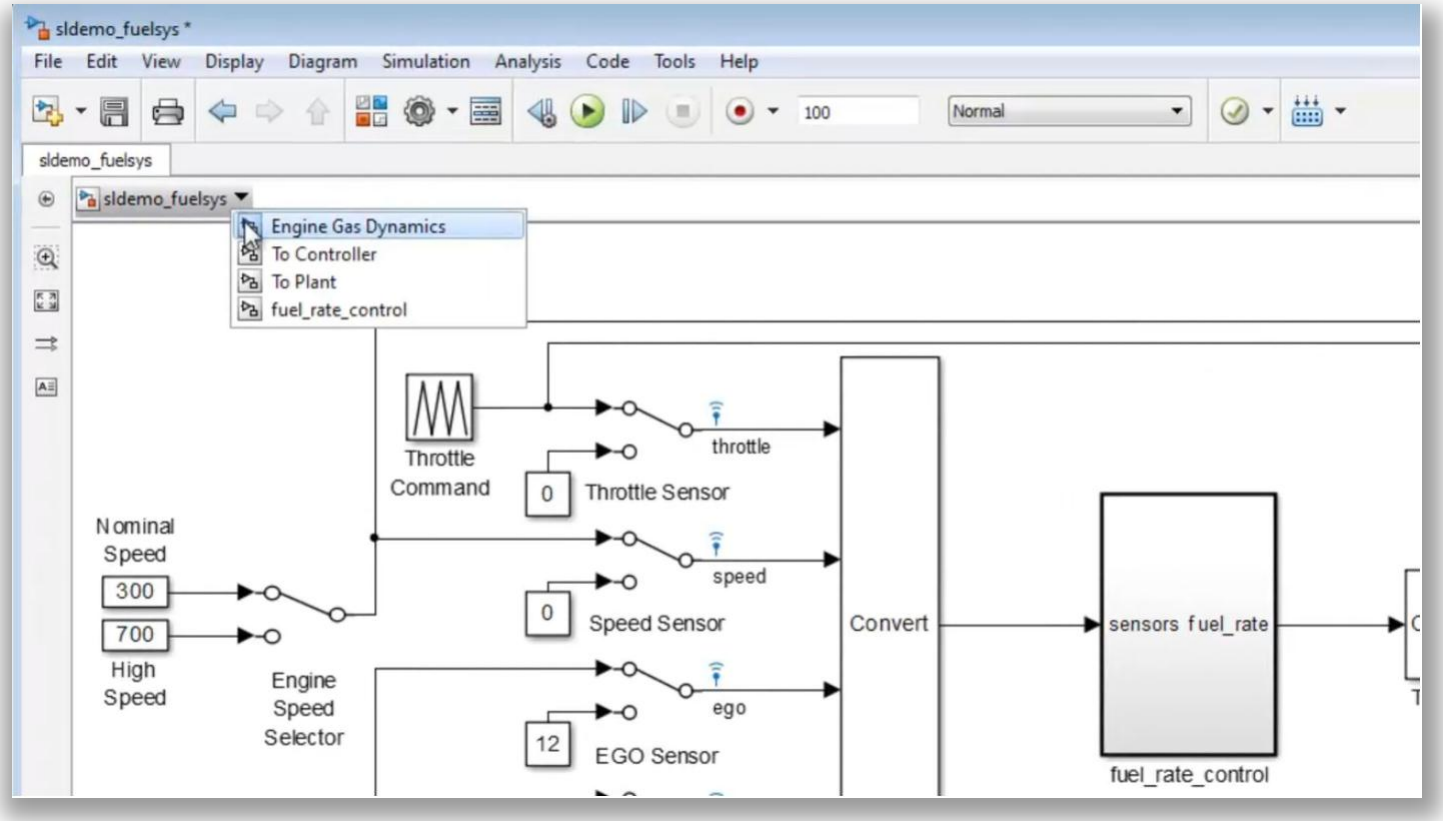
- Simulink Editor
- Smart Signal Routing
- Simulation & Analysis Tools
- Rapid Prototyping

Brand New Design Environment

- Build readable models efficiently
  - NEW LOOK AND FEEL, SMART GUIDES, ACCESSIBILITY
- Understand parts of a design file easily
  - TABS, EXPLORER BAR
- Exclude parts of a design
  - COMMENT OUT
- Use rich modeling semantics
  - CONTROL LOGIC (STATEFLOW),
  - DISCRETE EVENT (SIMEVENTS),
  - PHYSICAL MODELING (SIMSCAPE)

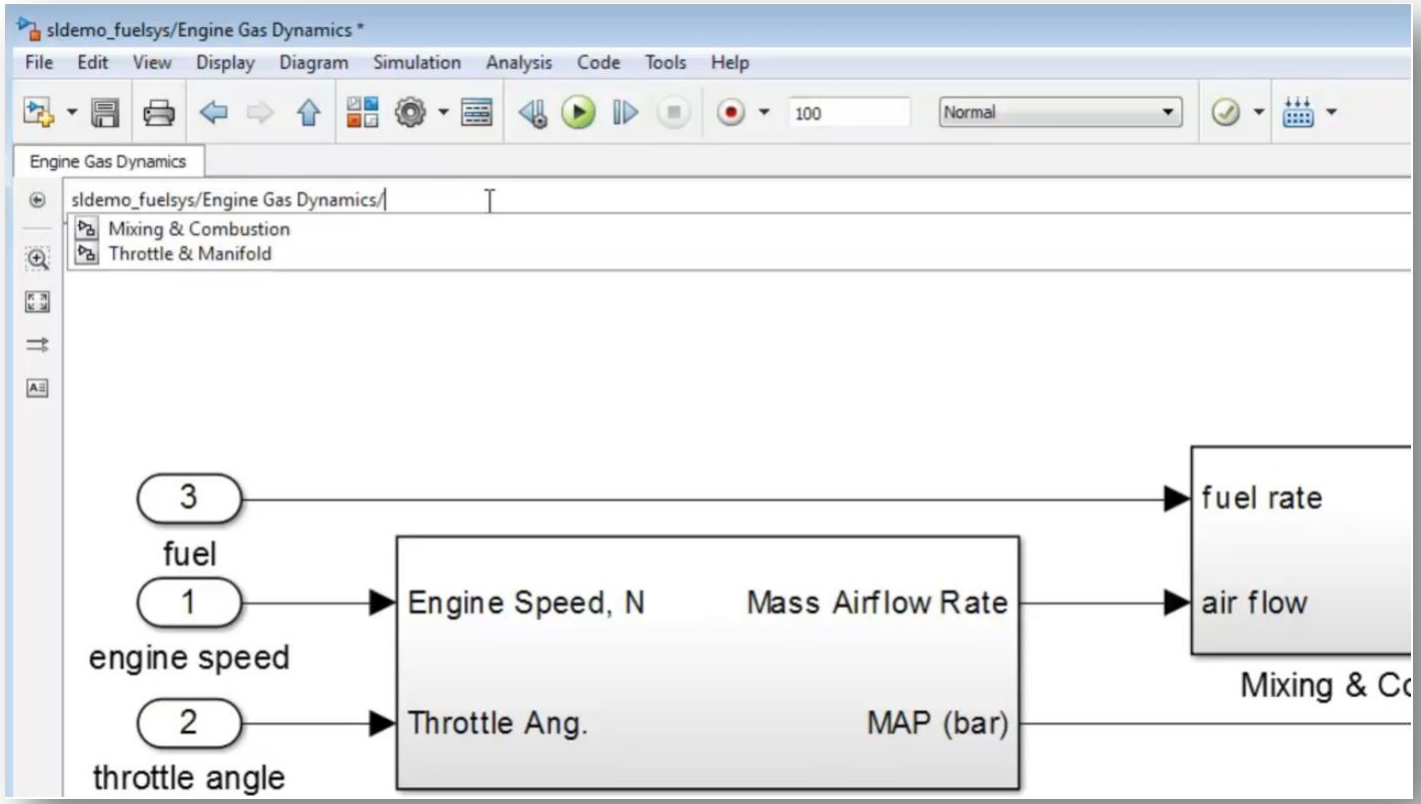
Explorer Bar

Navigate model hierarchy



Explorer Bar

Navigate model hierarchy



Explorer Bar

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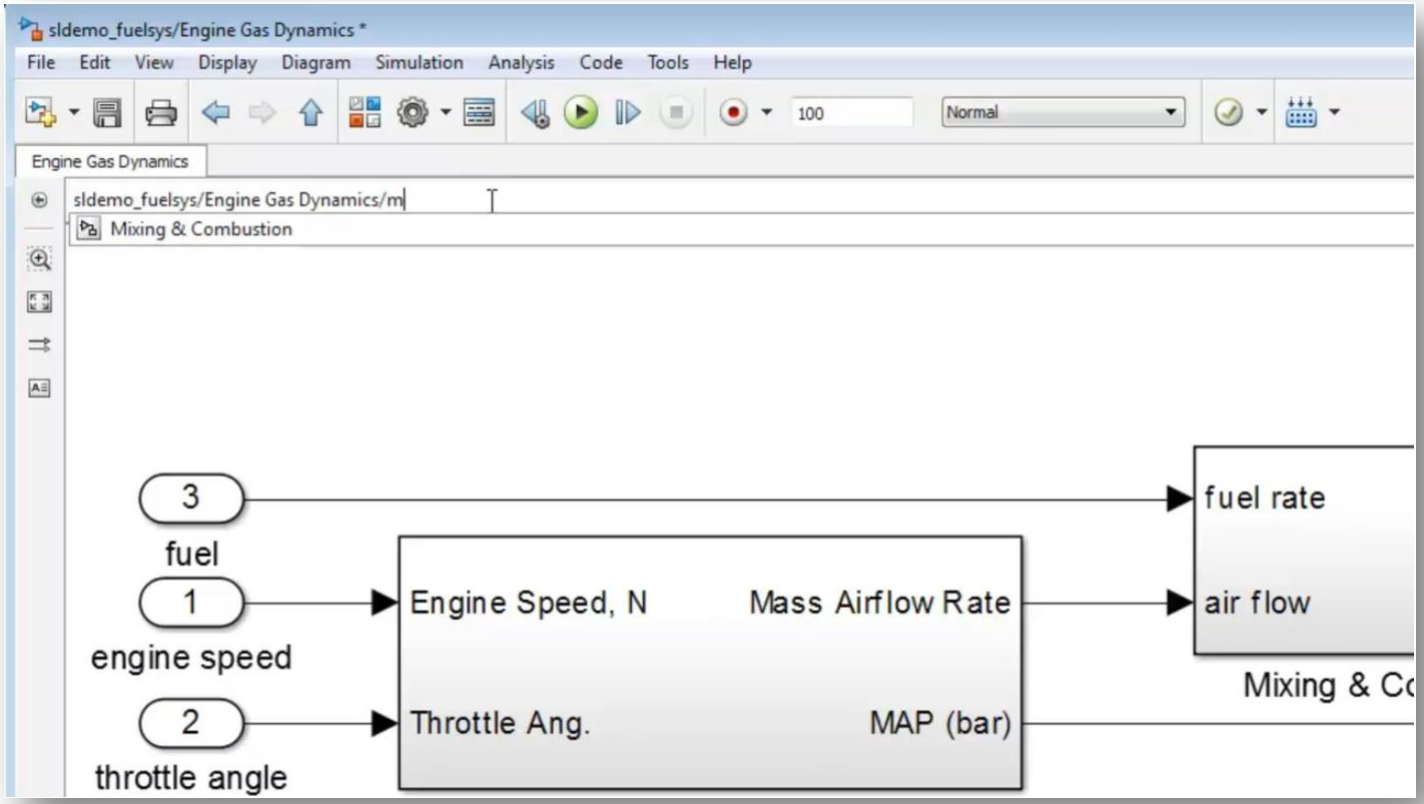

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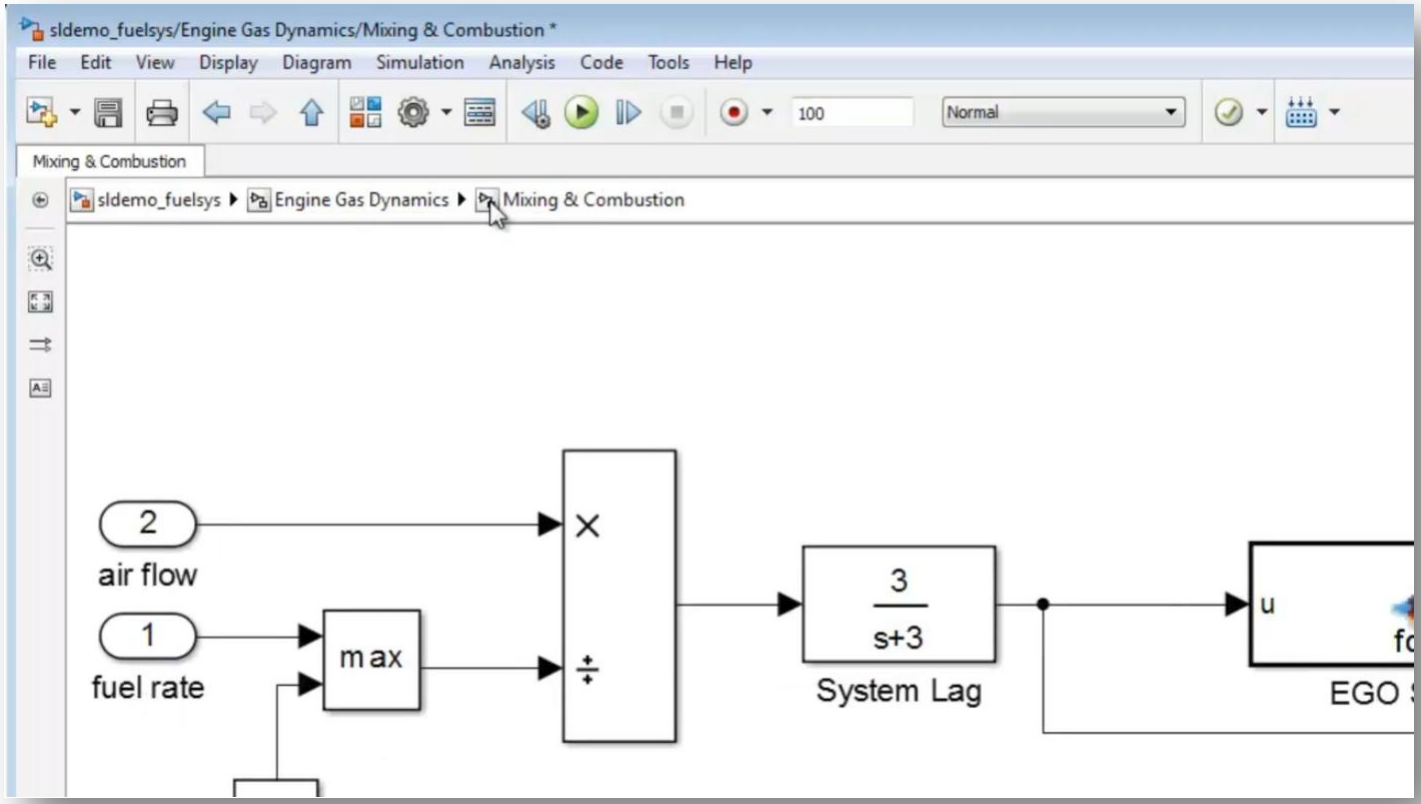
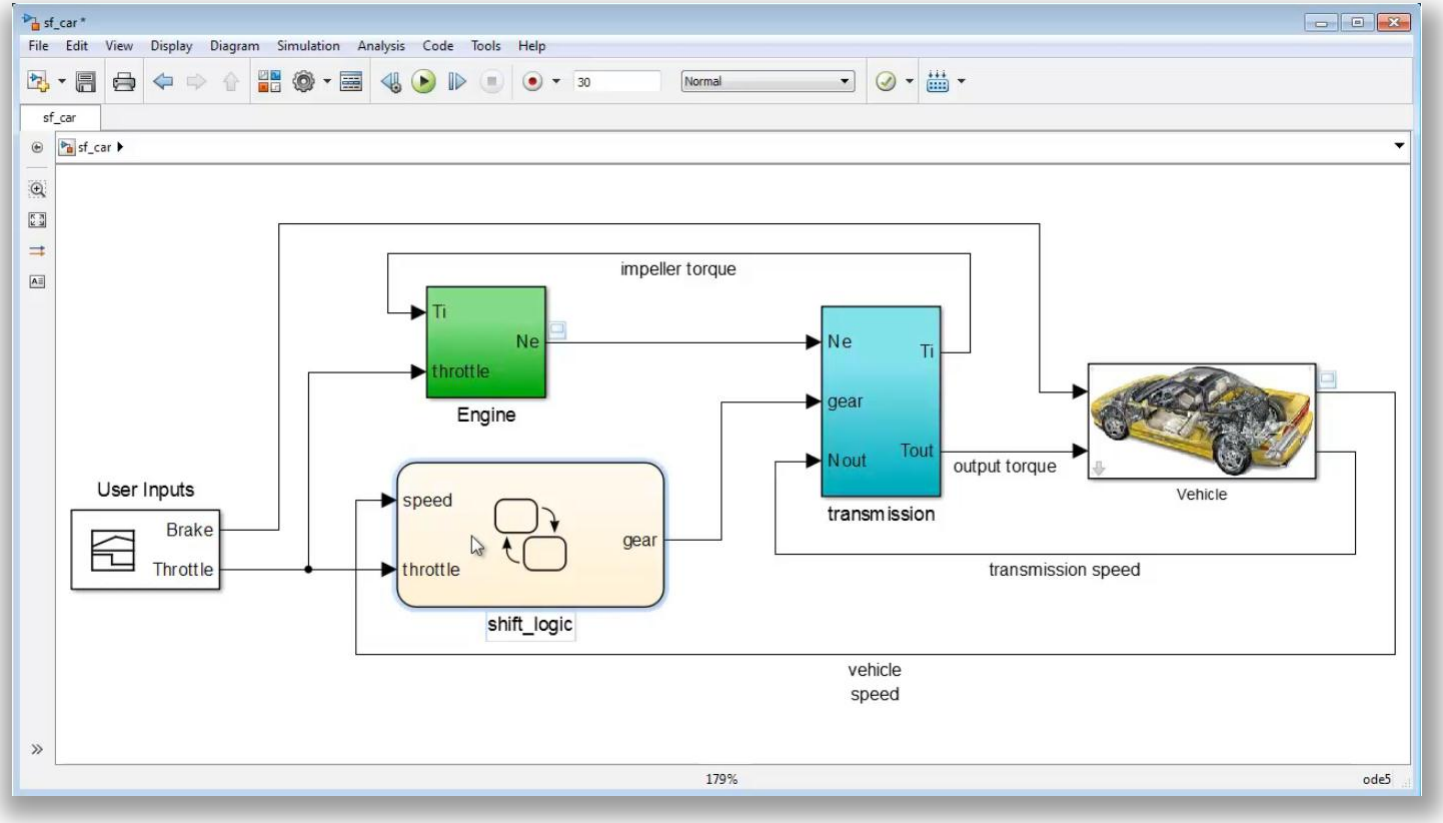


Tabbed Windows

Key sections of the model at your fingertips



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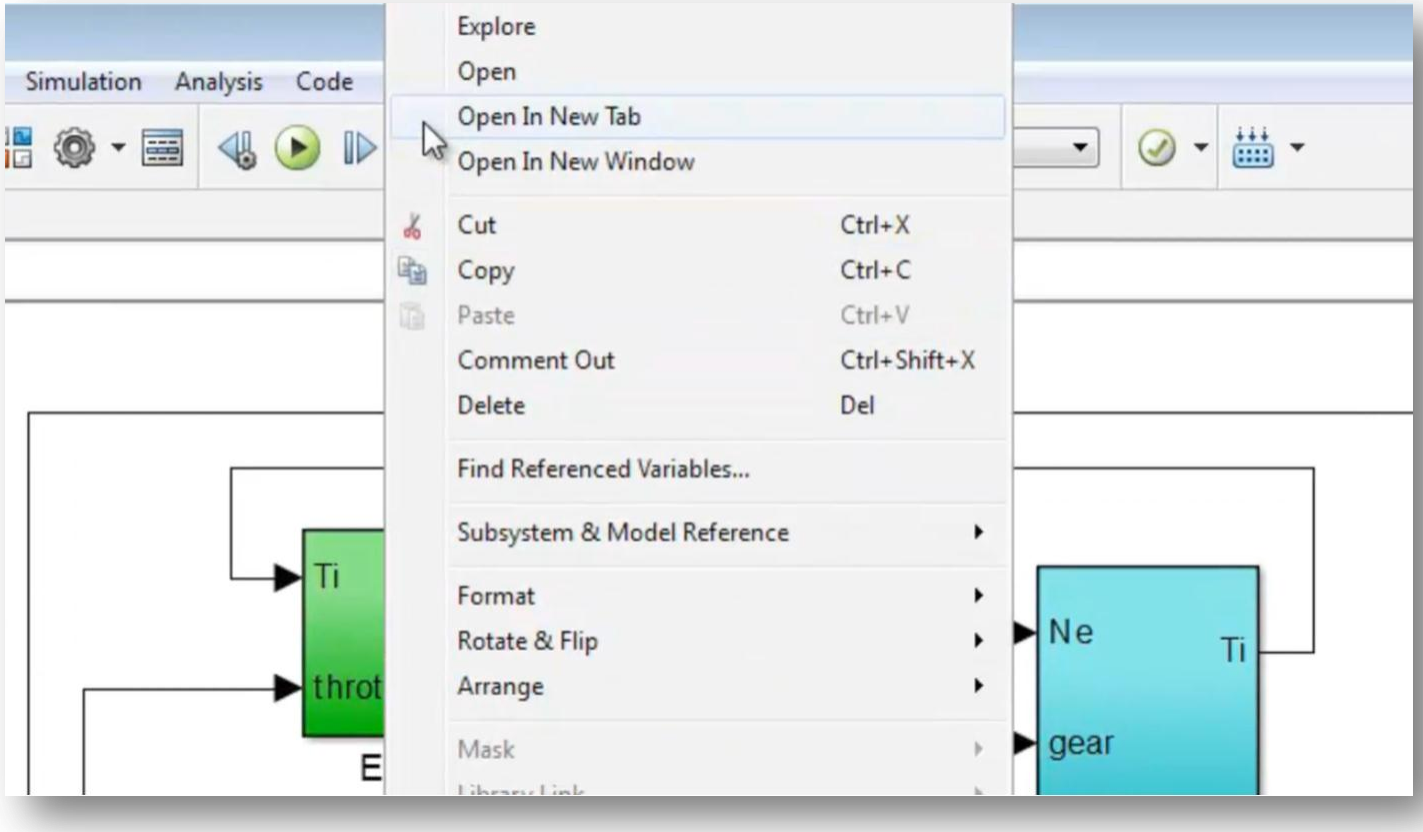

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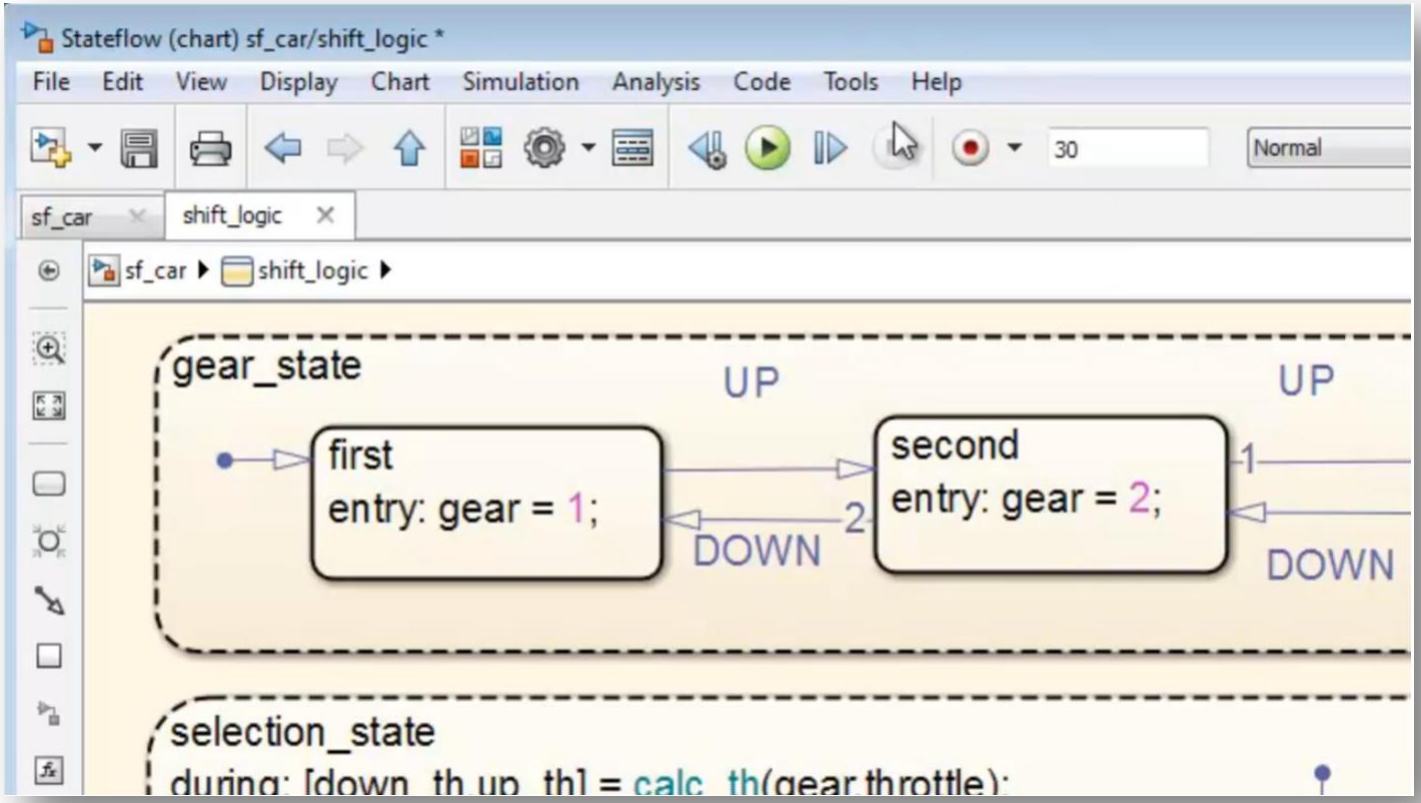

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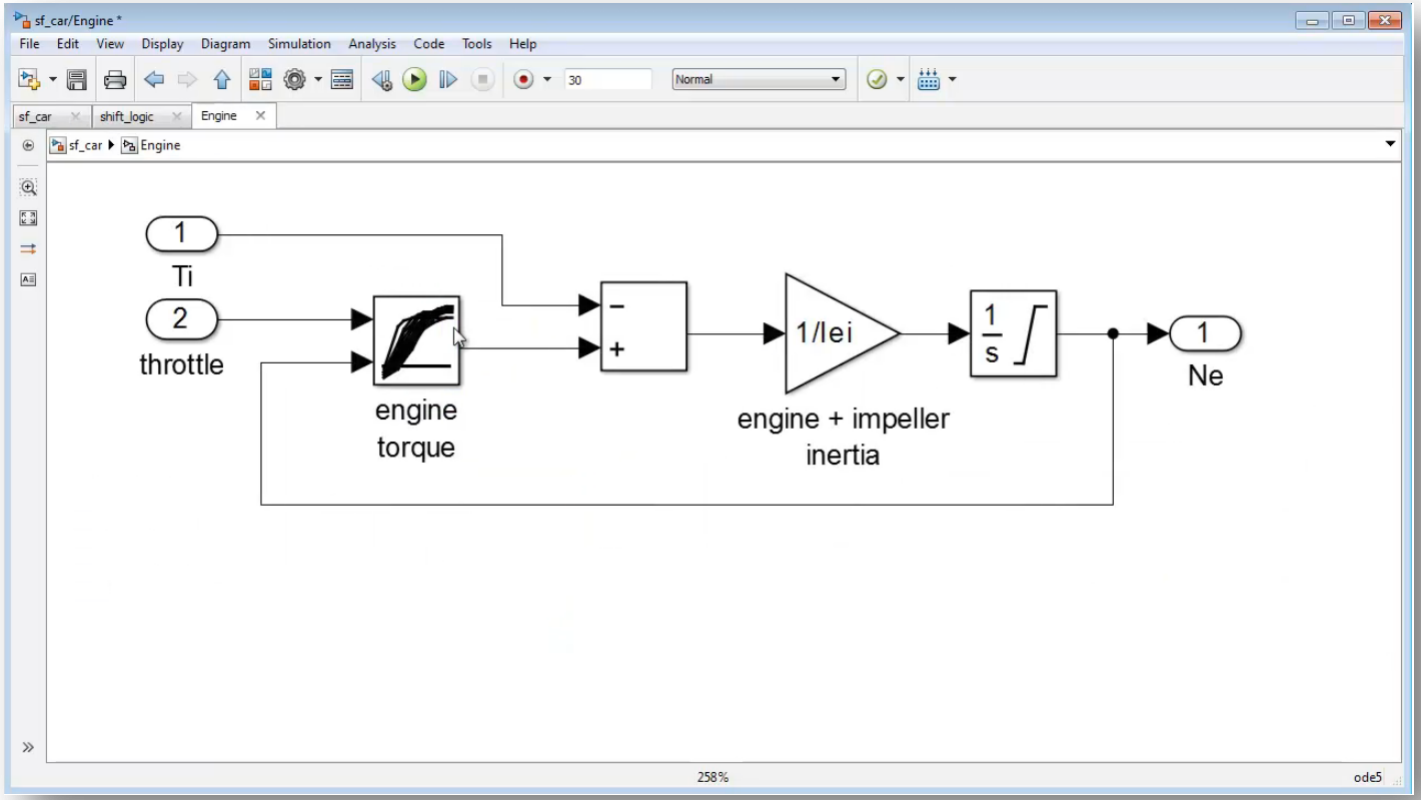

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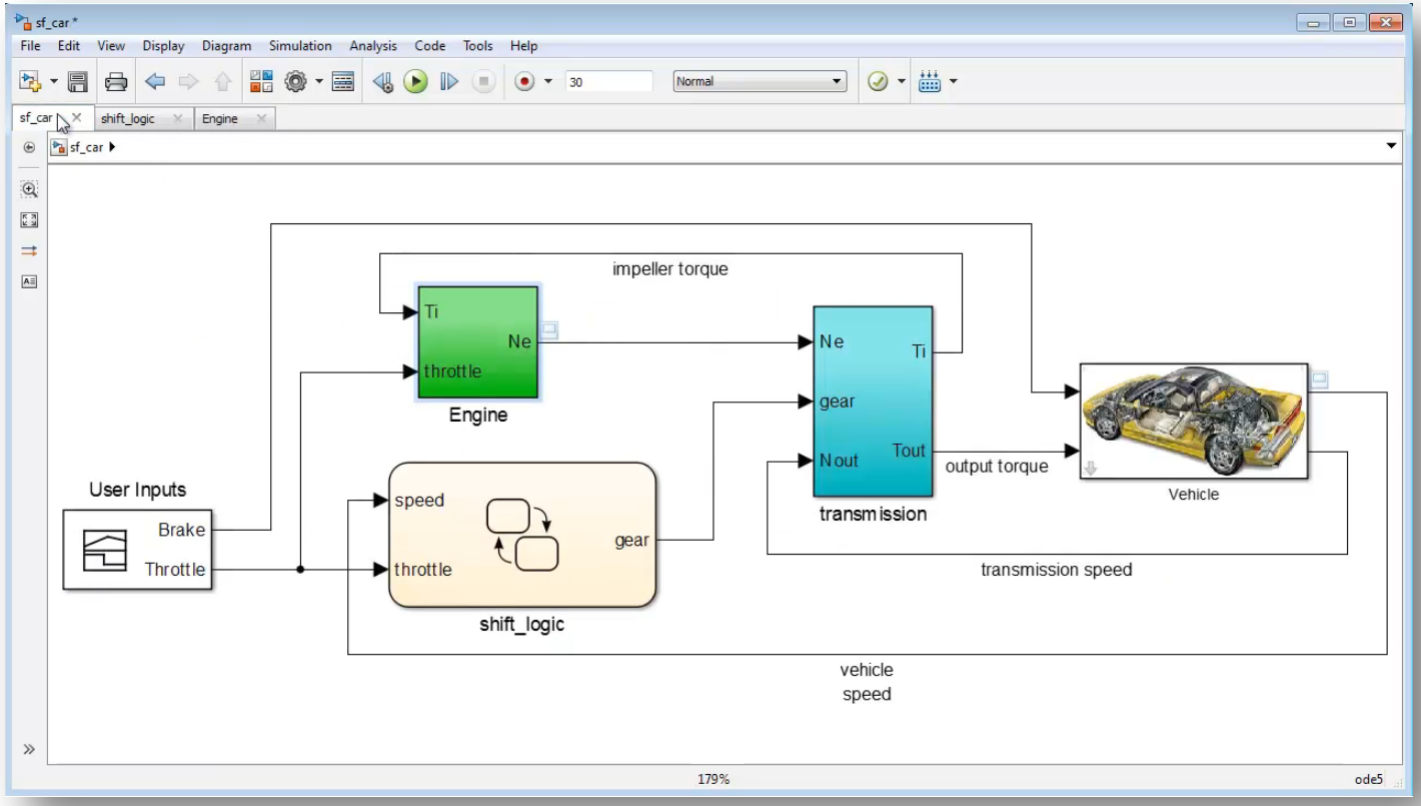
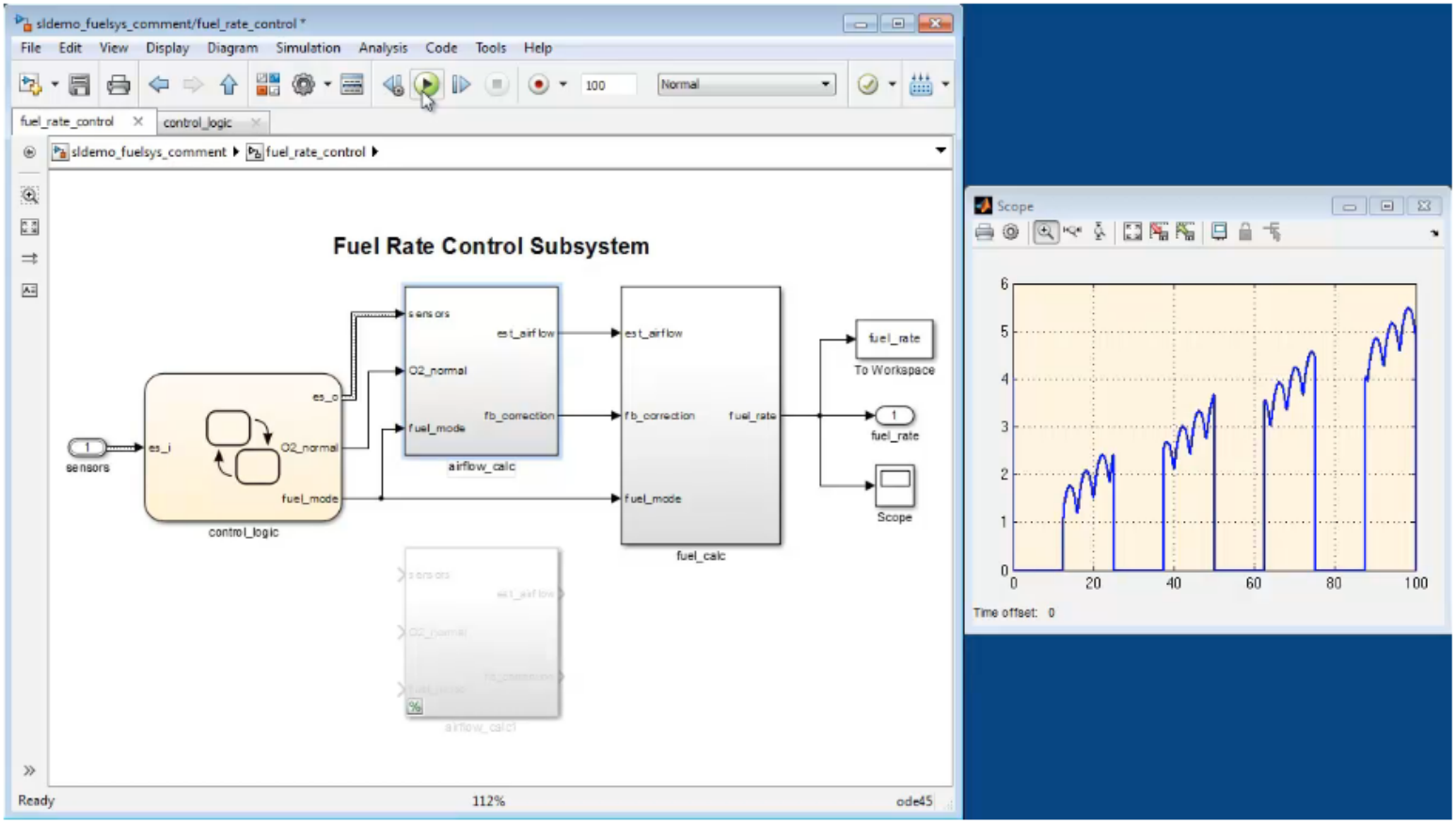


Comment Out Blocks

Test variations of the model

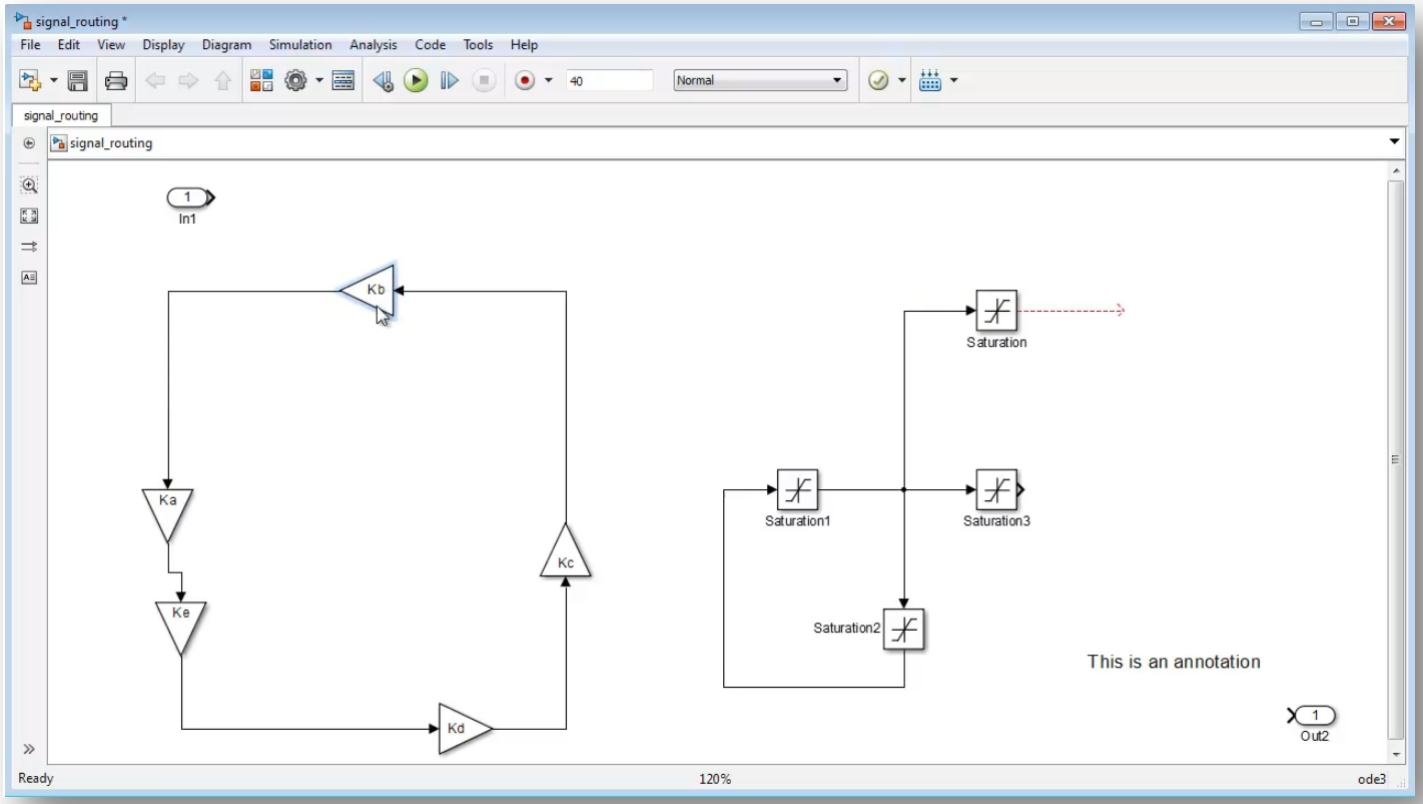


What's New in Simulink?

- Simulink Editor
- Smart Signal Routing
- Simulation & Analysis Tools
- Rapid Prototyping

Smart Signal Routing

Determine the optimal signal path



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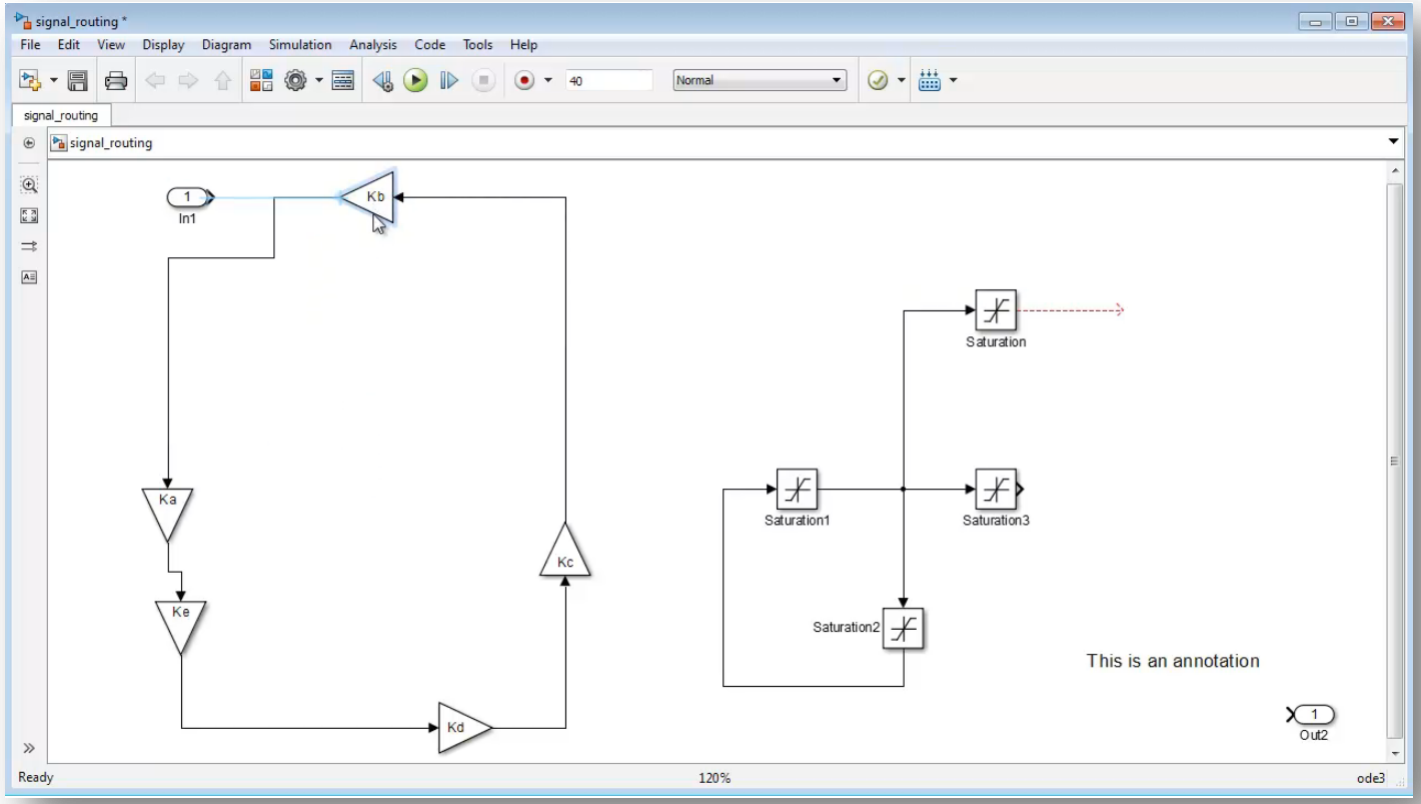

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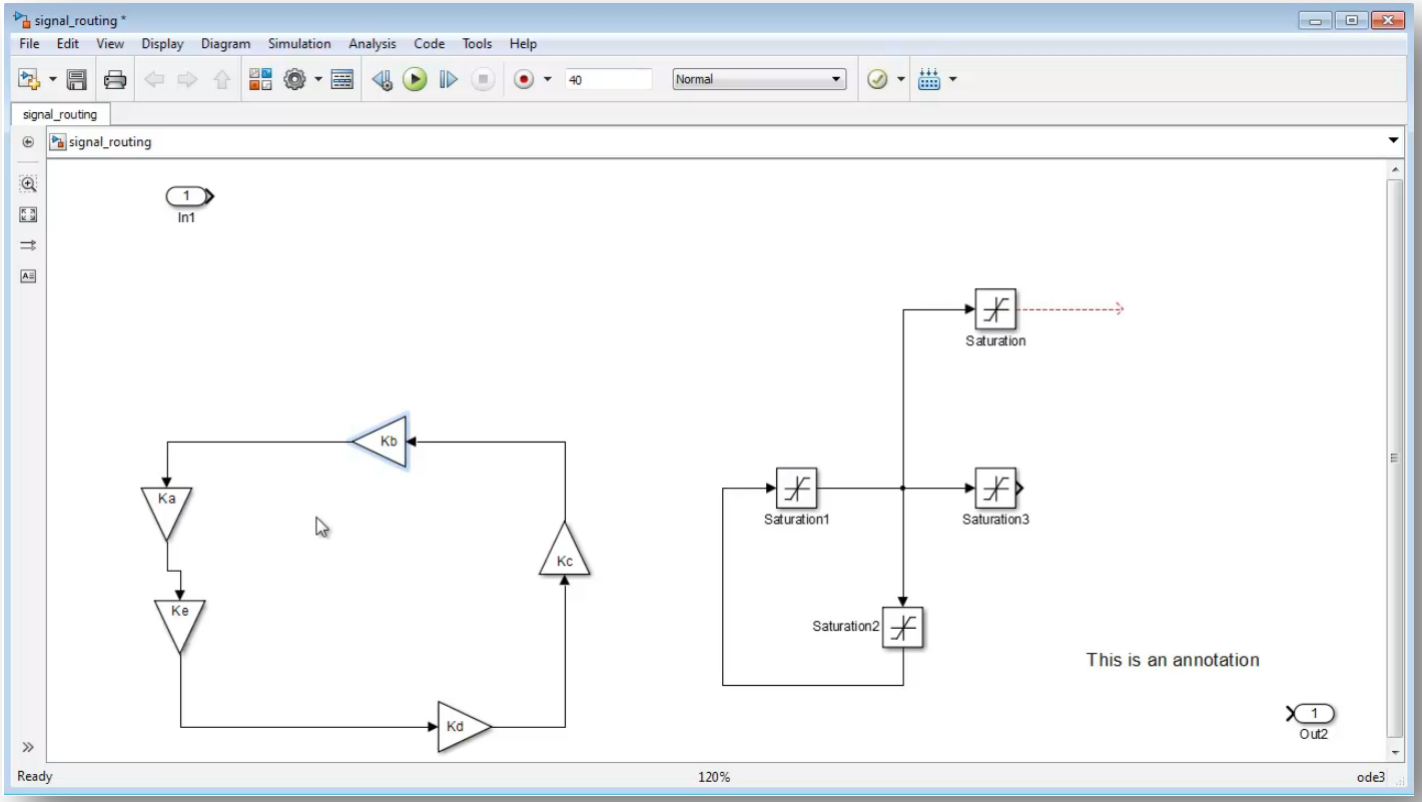

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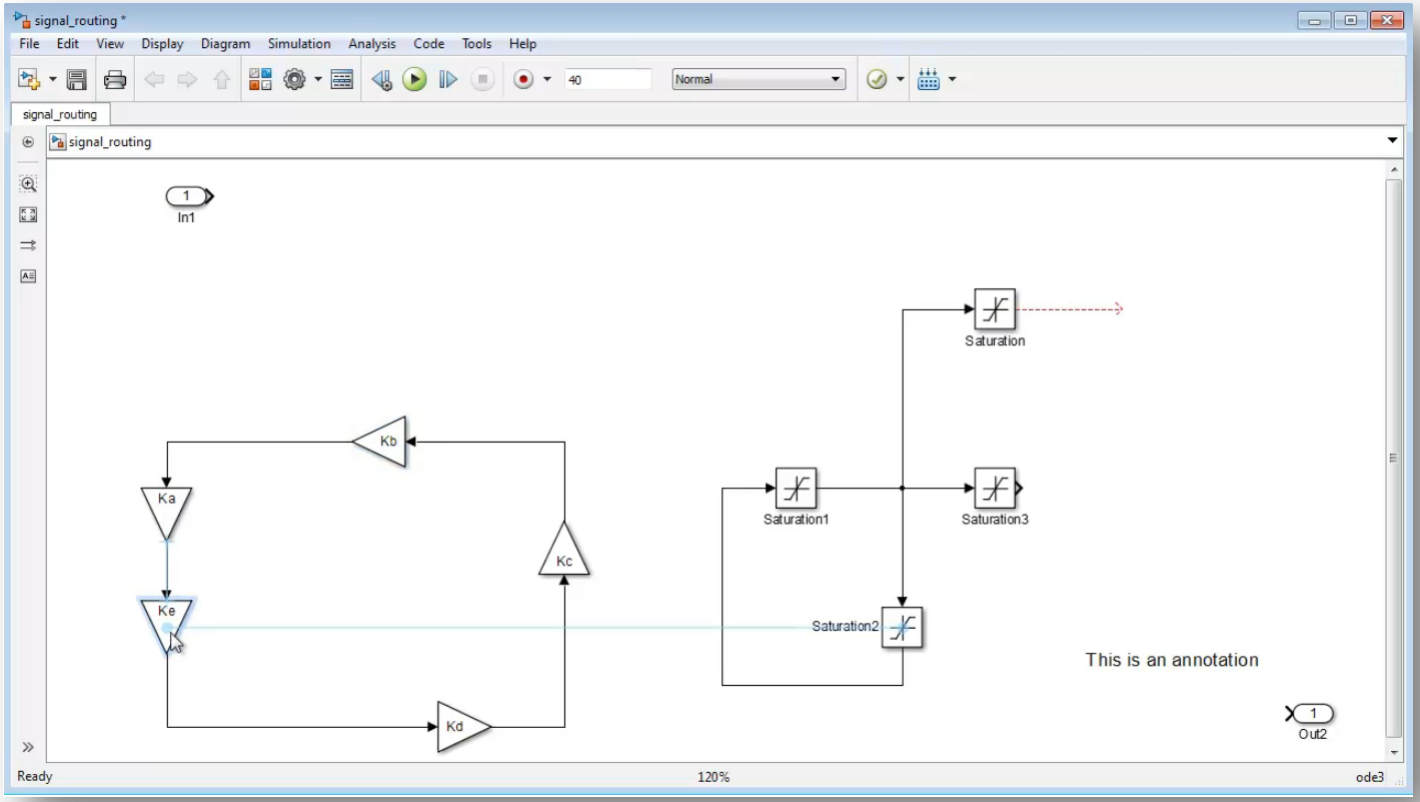

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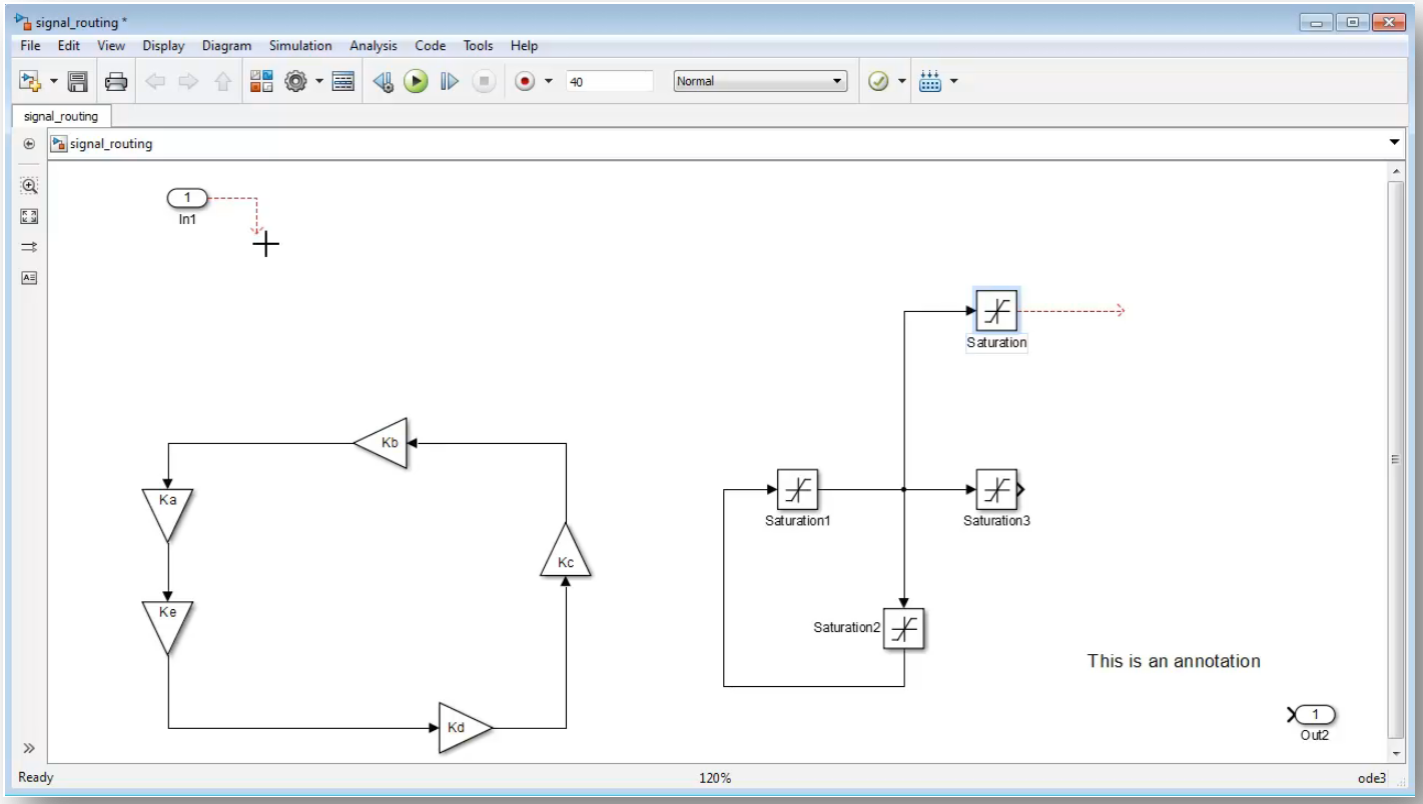

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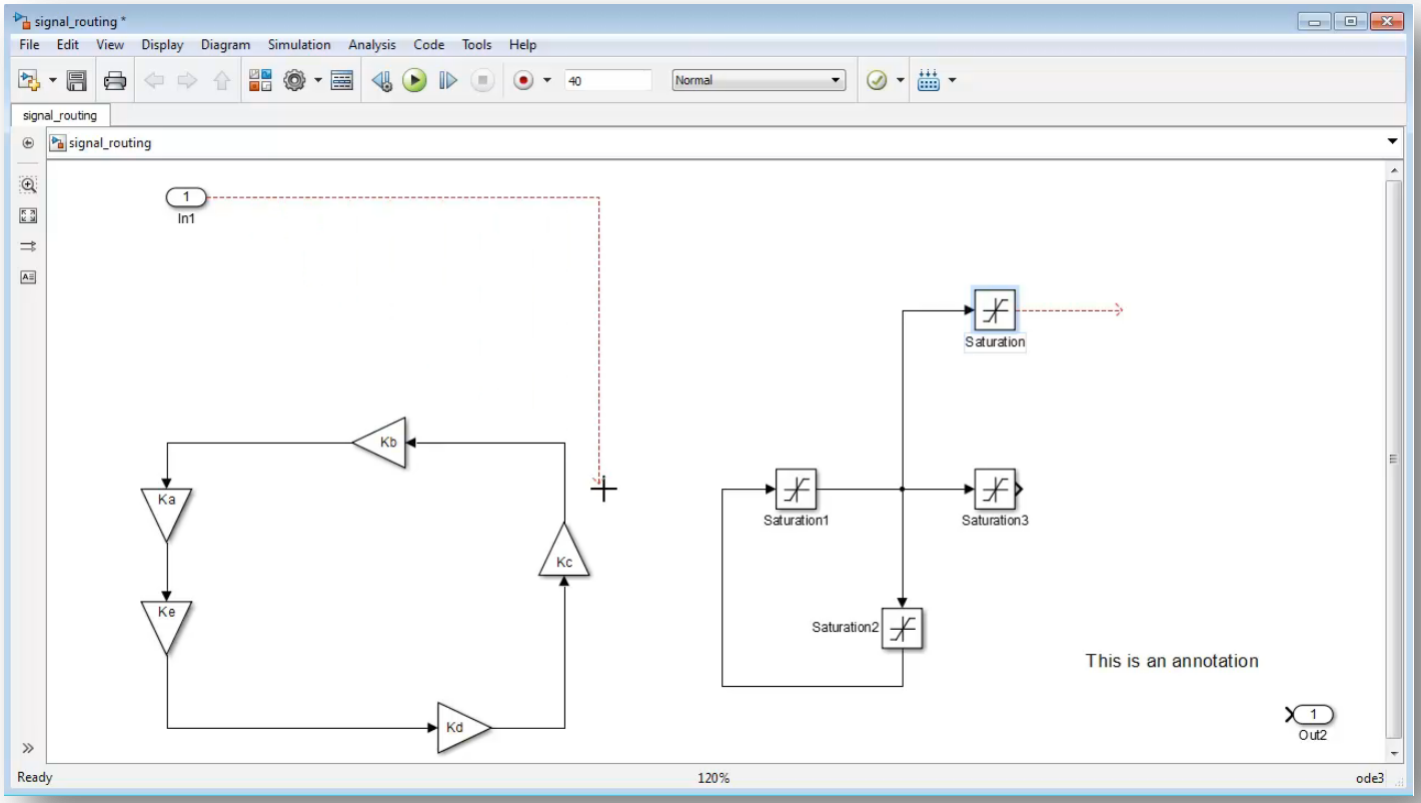

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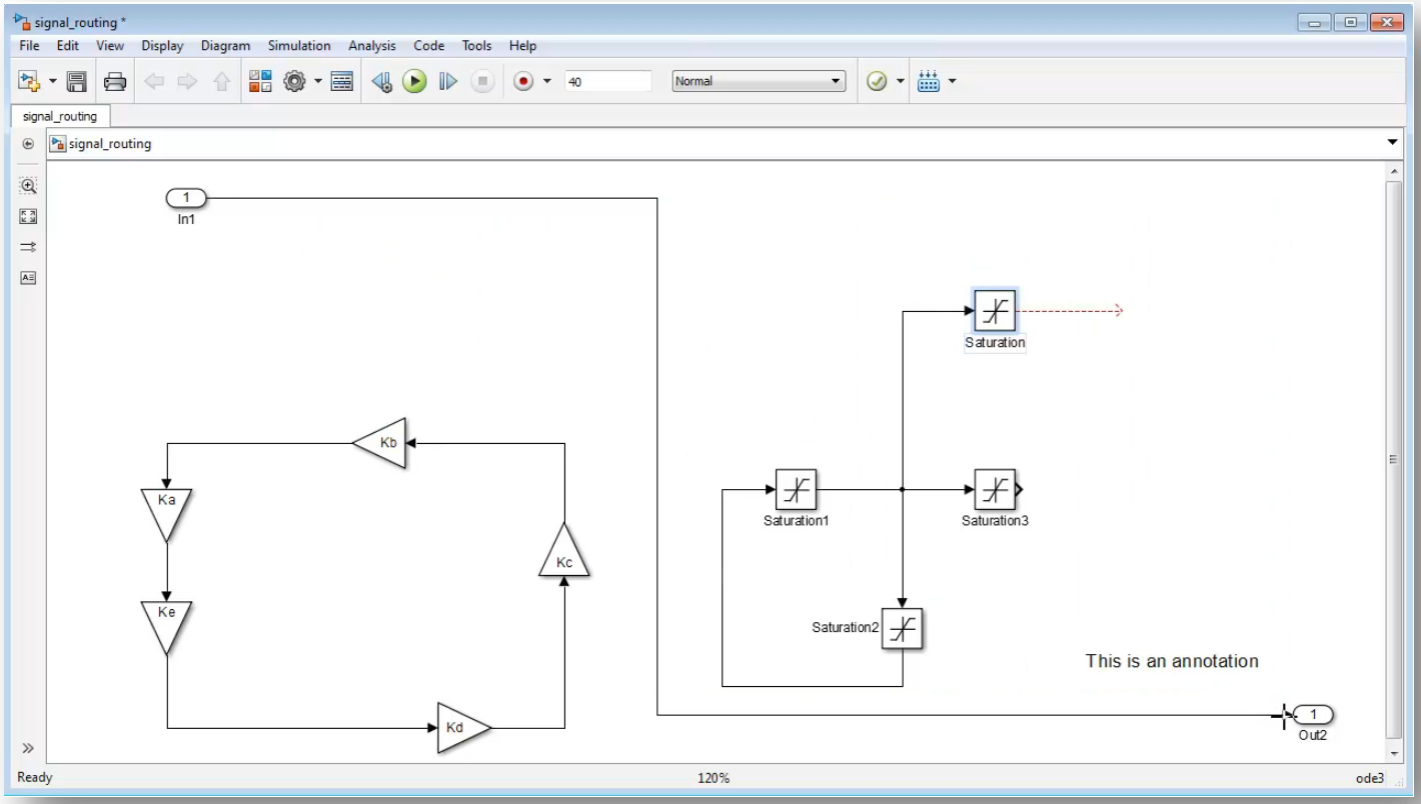
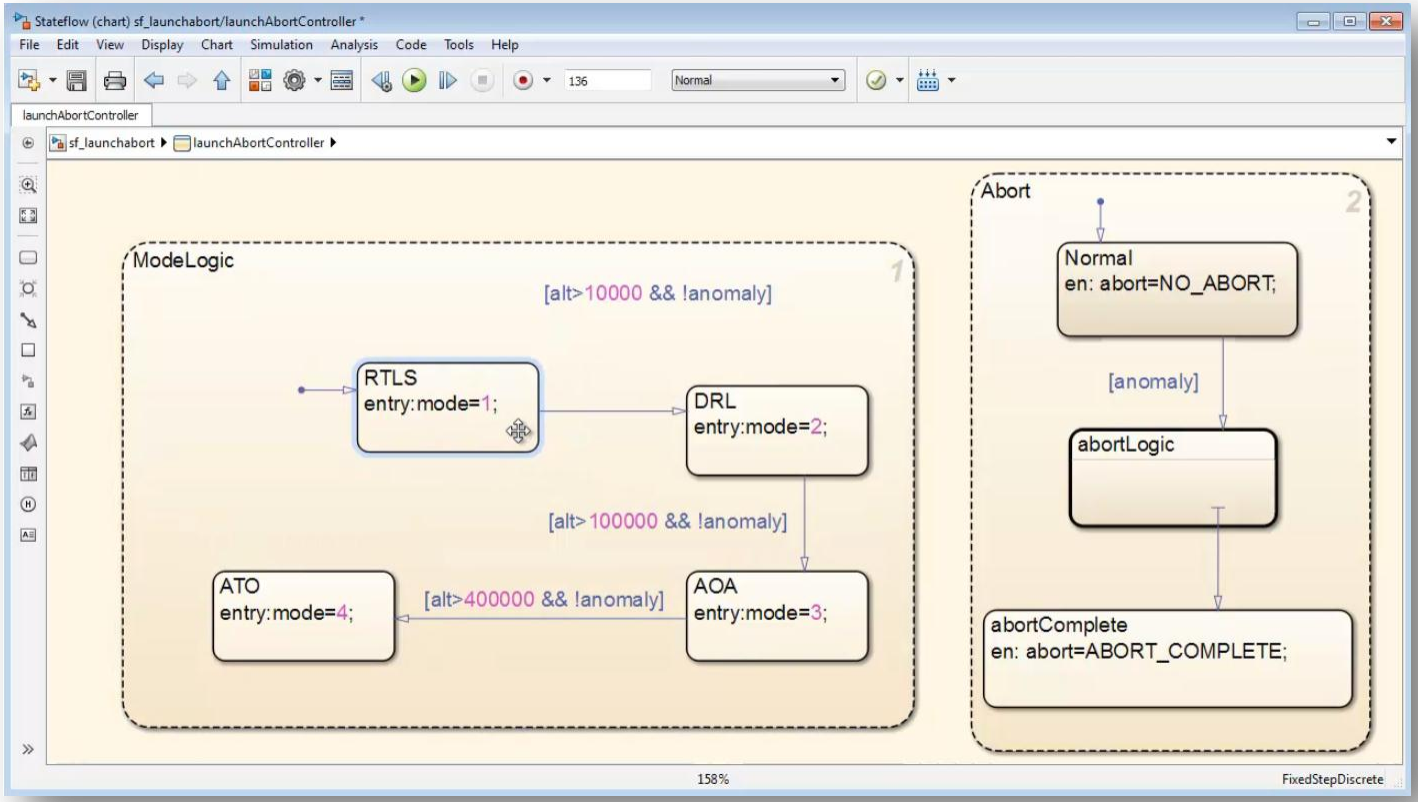


New Stateflow Editor

Organize the logic



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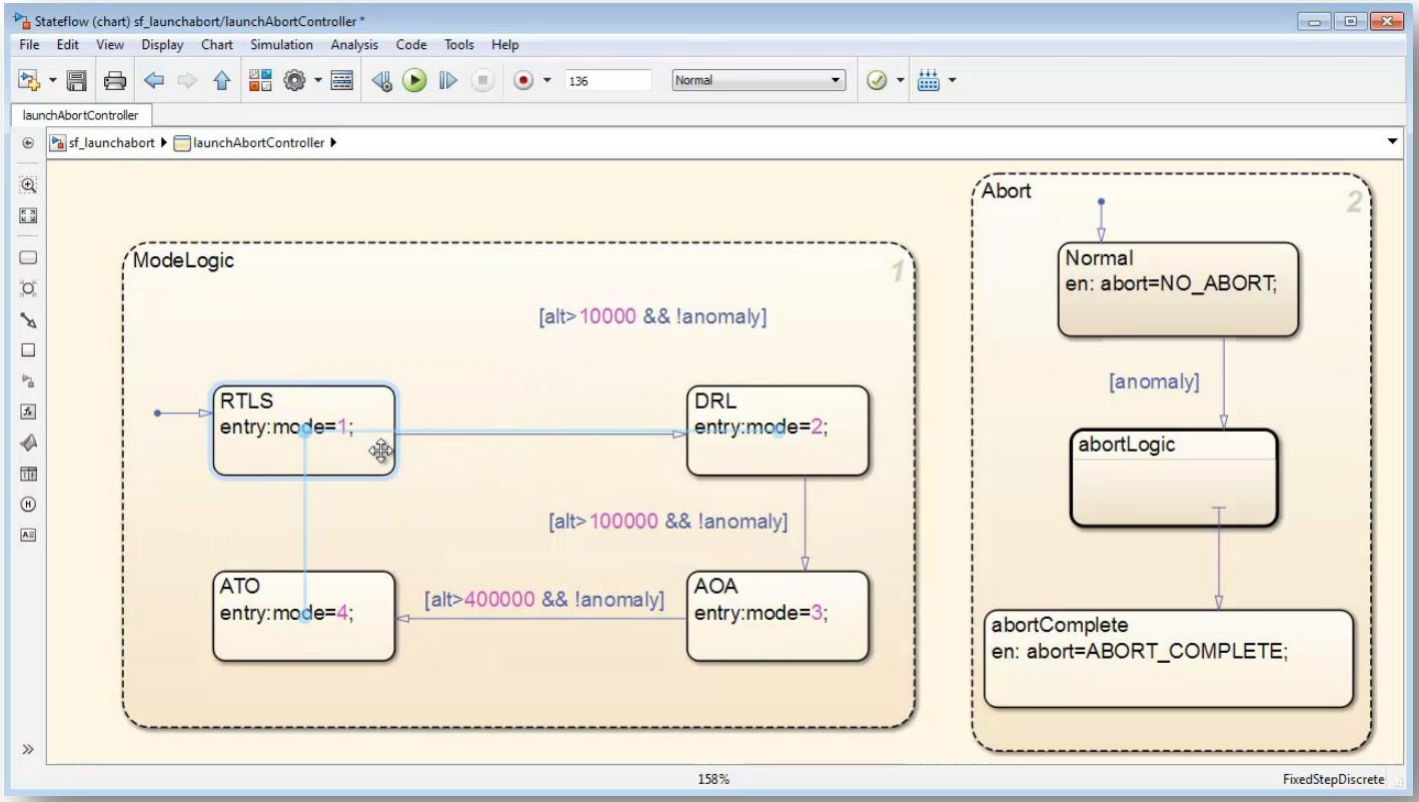
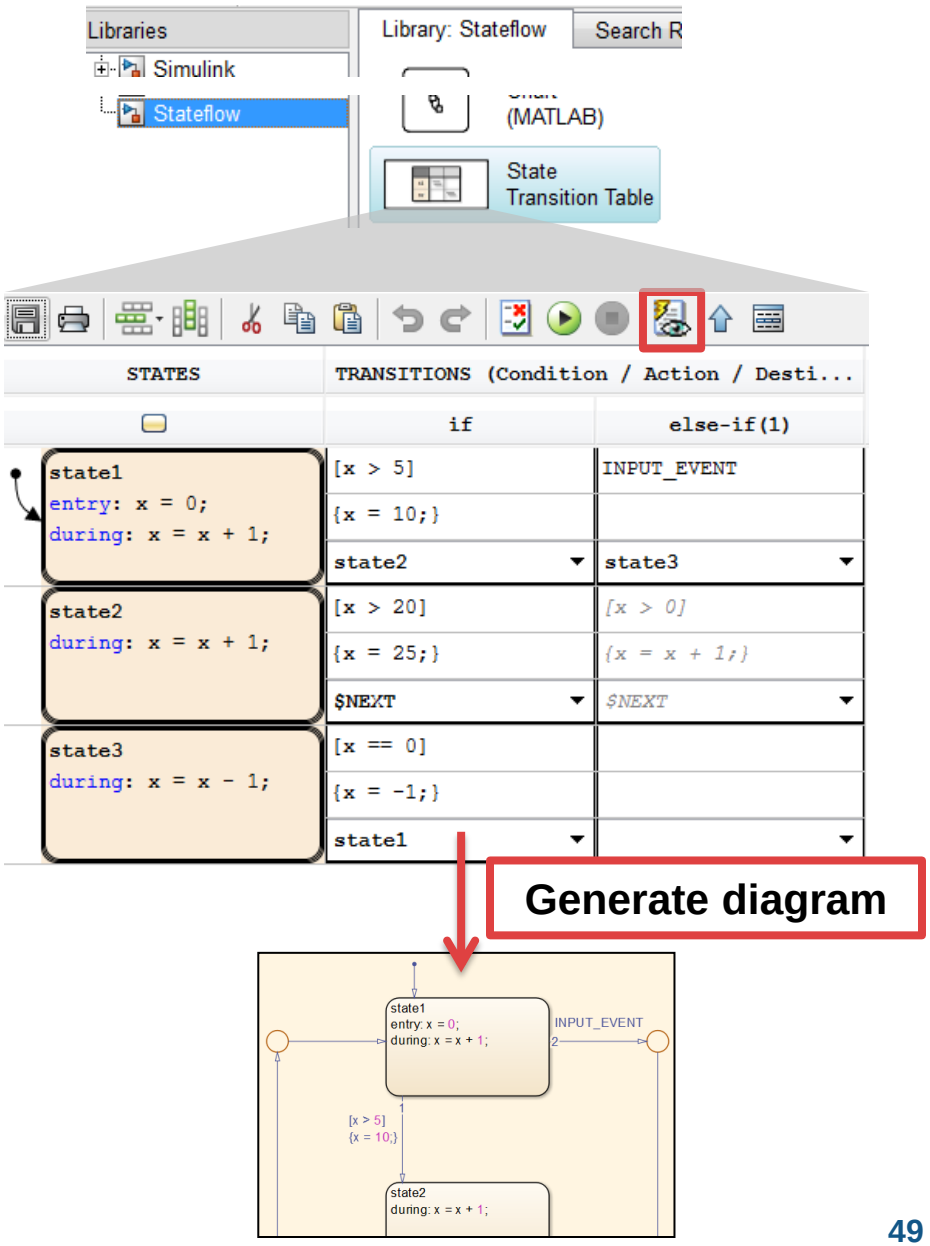


State Transition Tables

Build state machines quickly using tabular interface

- Structured interface to guide diagram construction
- Automatically complete state machine syntax
- Diagnostics identify syntax errors and incomplete transitions

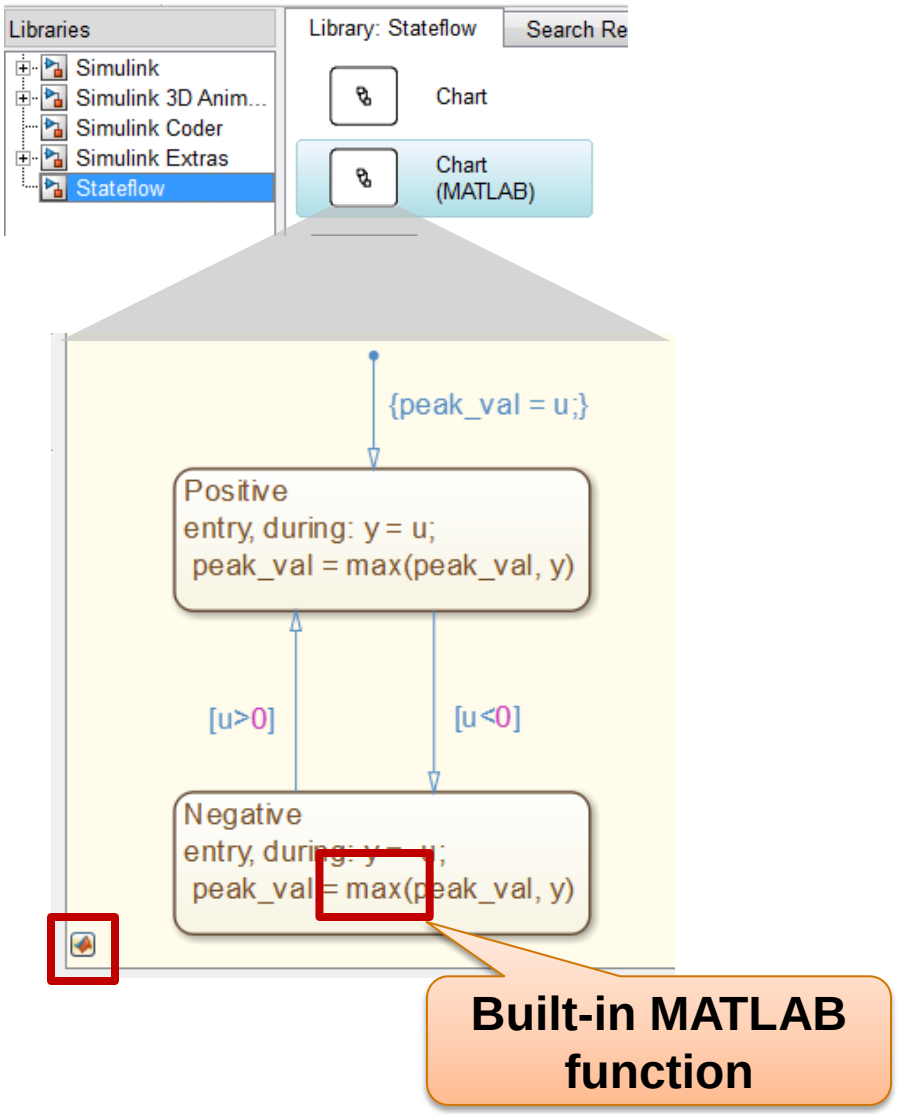
```
» sf_cdplayer_STT
```



MATLAB as the Action Language

Define state and transition labels with MATLAB language

- Call built-in and custom MATLAB functions directly in state diagram
- Automatic placement of brackets for transition labels
- Automatic inference of data size, type and complexity



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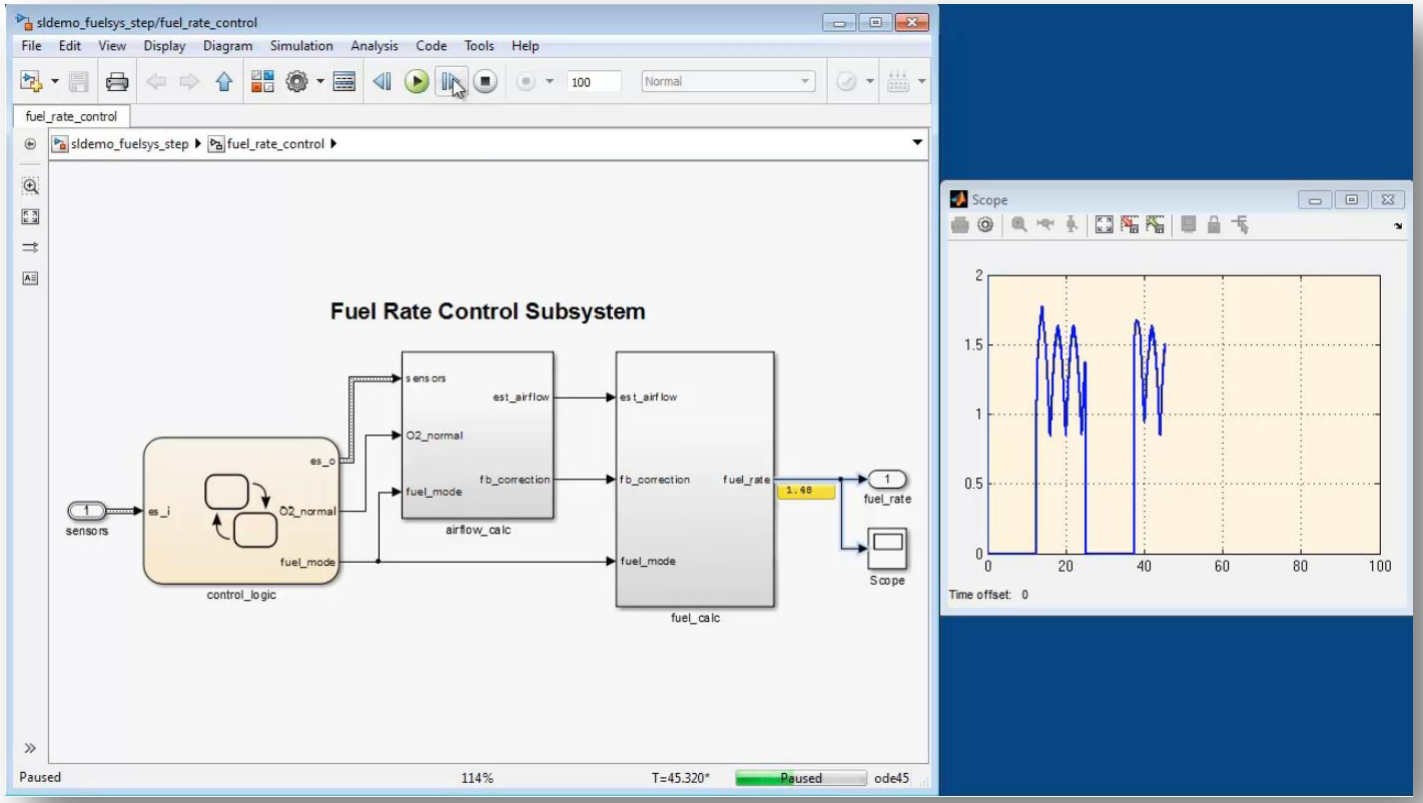
New Simulation and Analysis Tools

- Control simulation step “rewind” and “forward”
  - SIMULATION STEPPER
- Compare simulation data across simulation runs
  - SIMULATION DATA INSPECTOR
- Scan and Speed-up Simulink models
  - PERFORMANCE ADVISOR
- Access simulation data visually
  - SCOPE ENHANCEMENTS
  - PORT VALUE DISPLAYS
  - 3D VISUALIZATION (SIMULINK 3D ANIMATION)

Simulation Stepper with Breakpoints

Understand the system, debug the design



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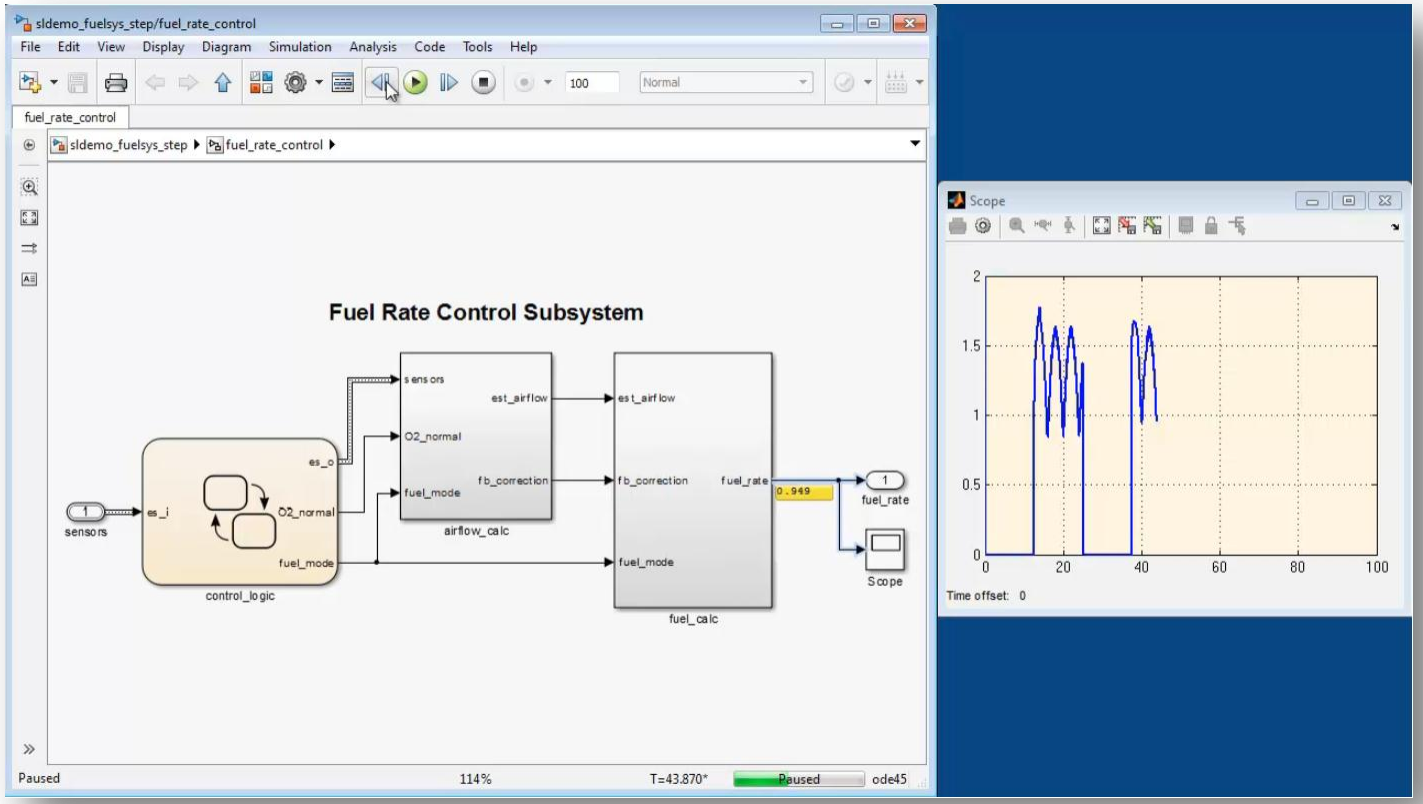
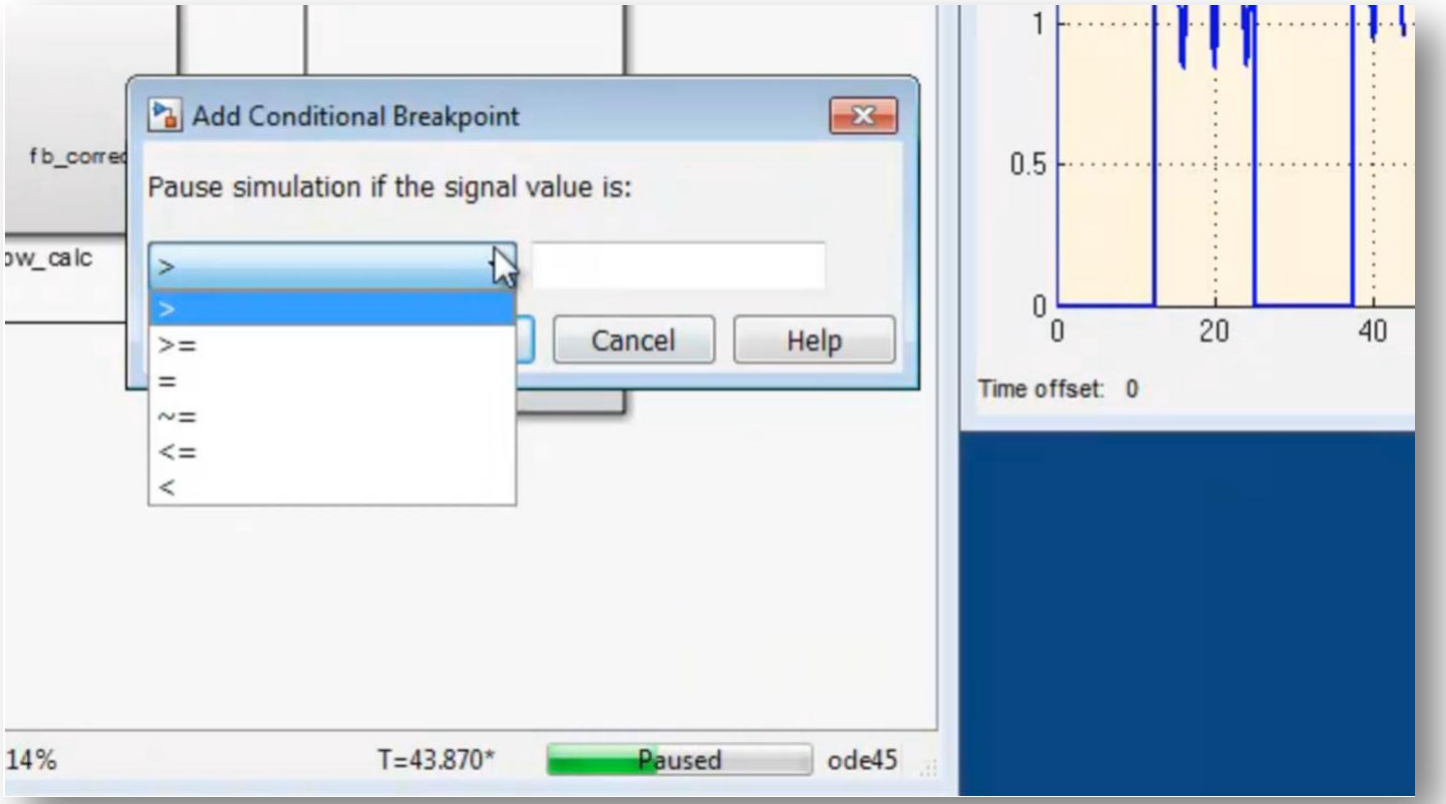


Simulation Stepper with Breakpoints

Understand the system, debug the design



Simulation Stepper with Breakpoints

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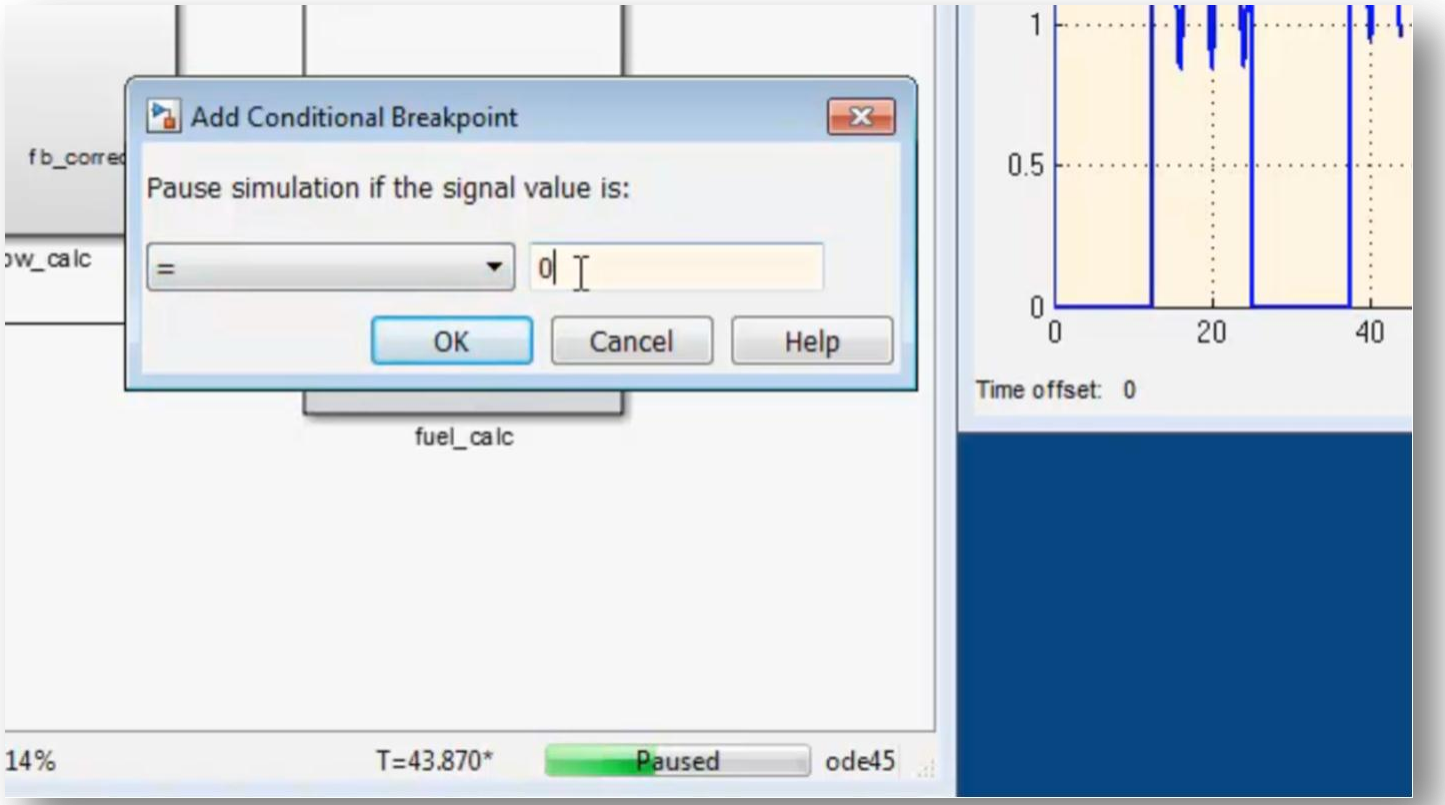

Simulation Stepper with Breakpoints

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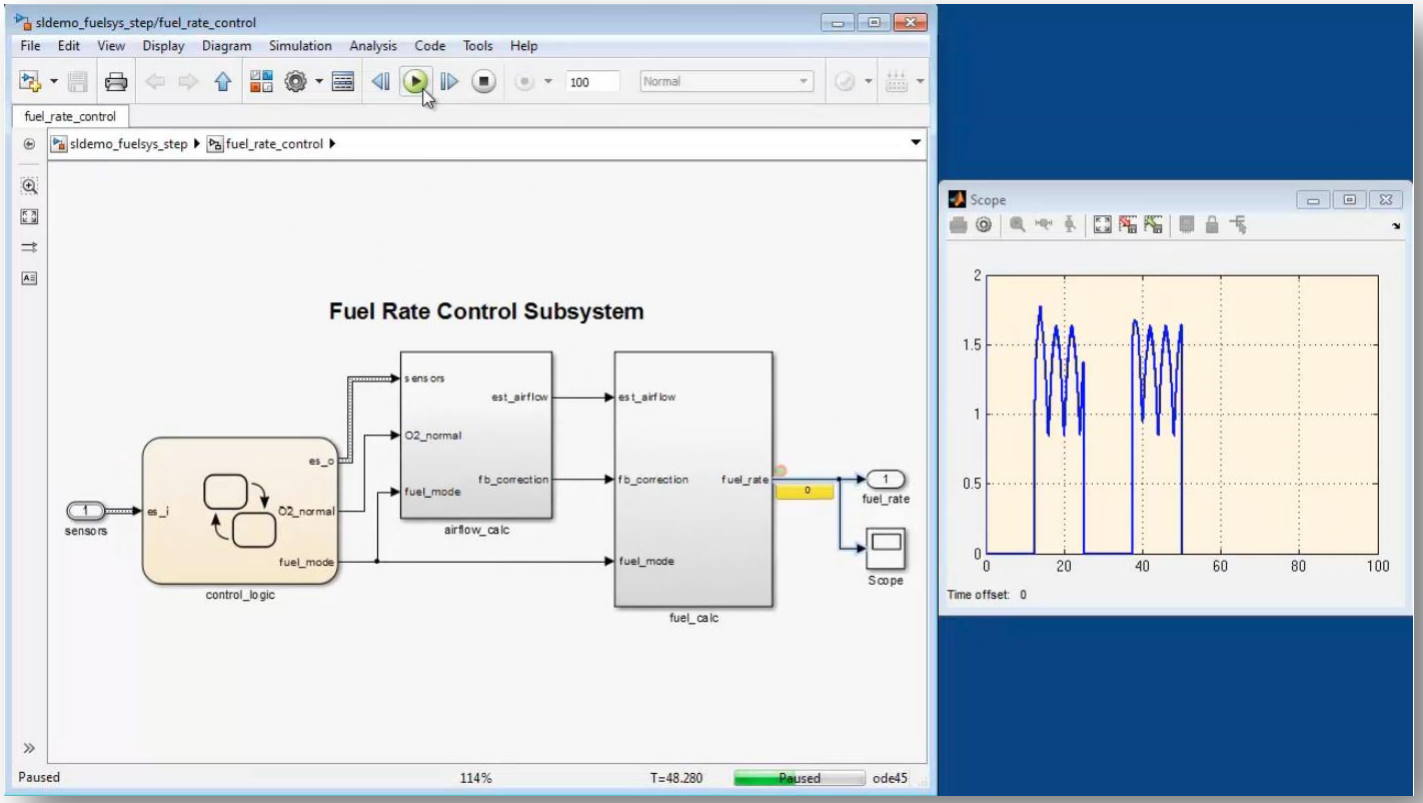
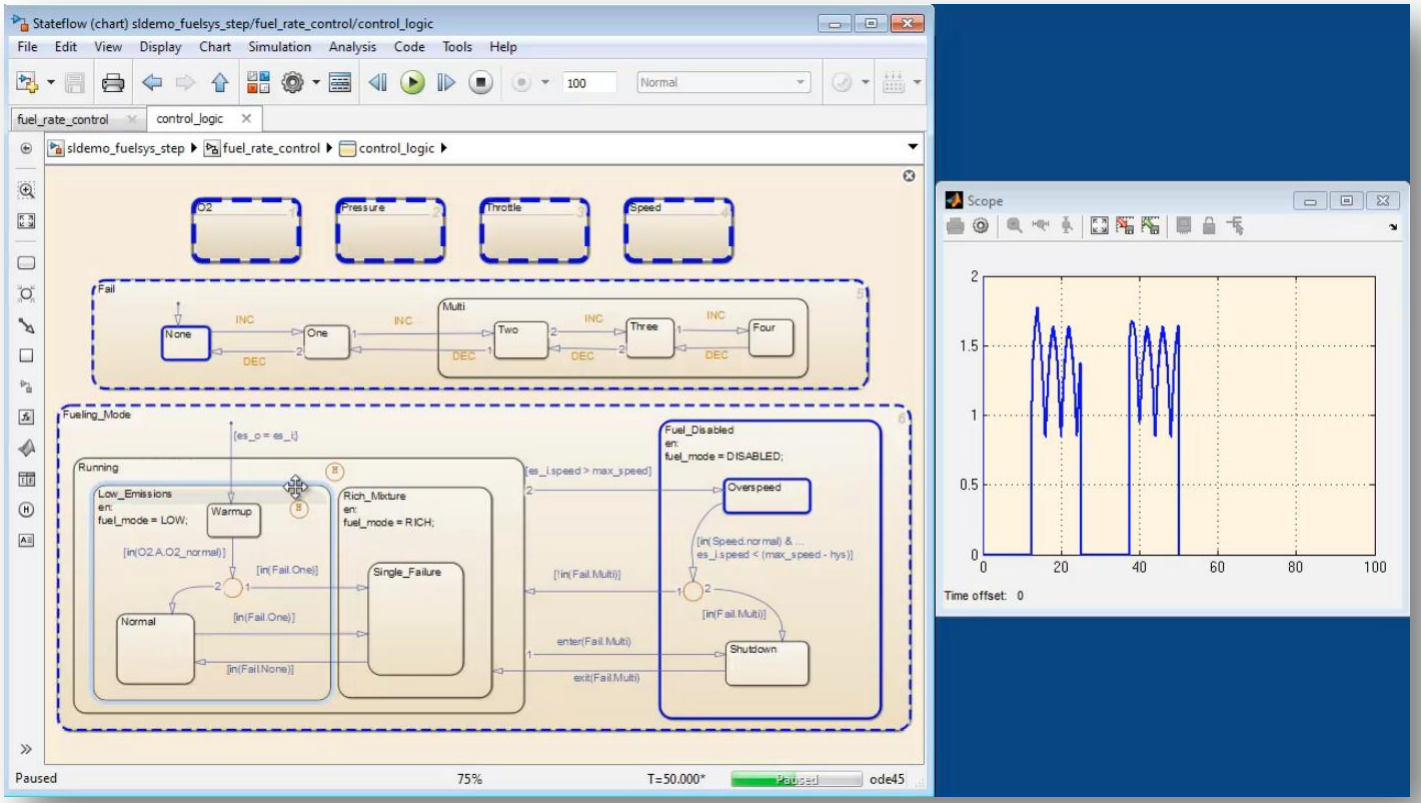


Simulation Stepper with Breakpoints

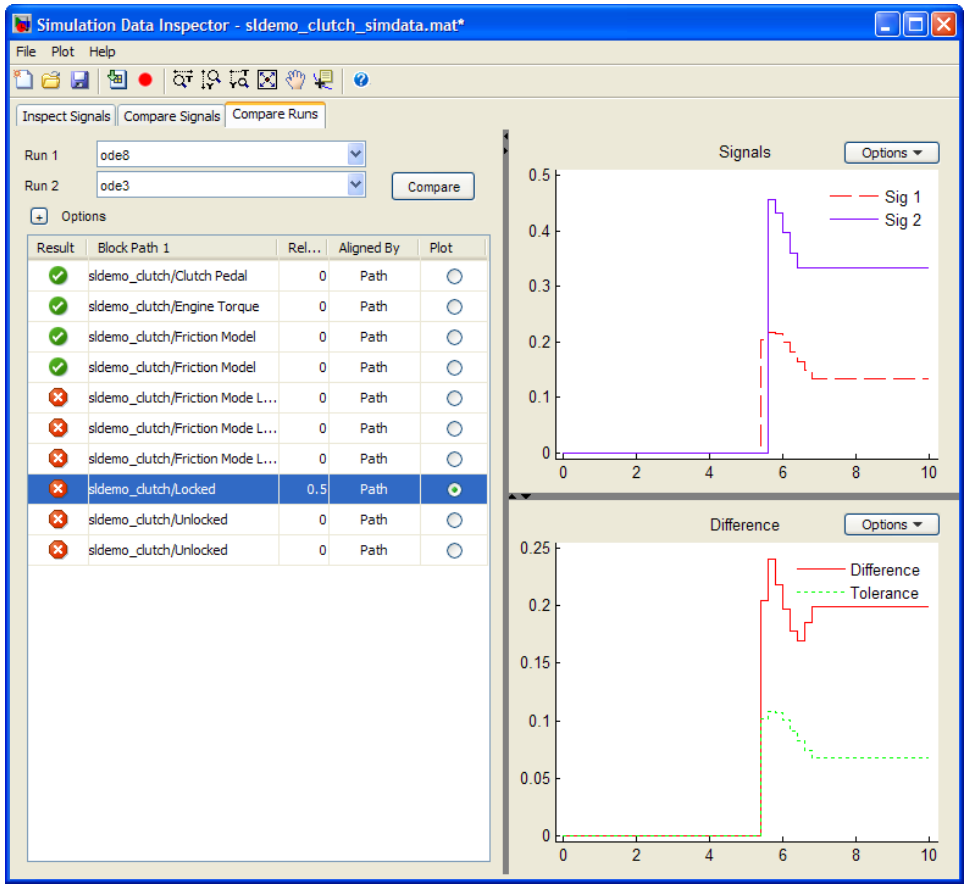
Understand the system, debug the design



Simulation Data Inspector

Quickly compare results for multiple simulation runs

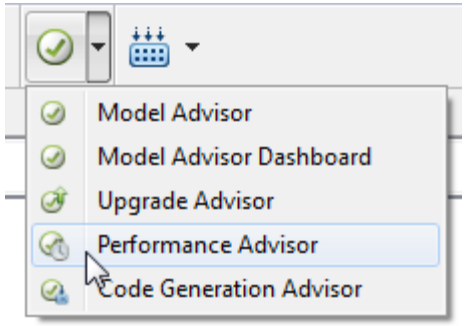
- View and compare data from multiple simulations
- Validate the generated code against simulation
- Import external data for comparison with simulation data

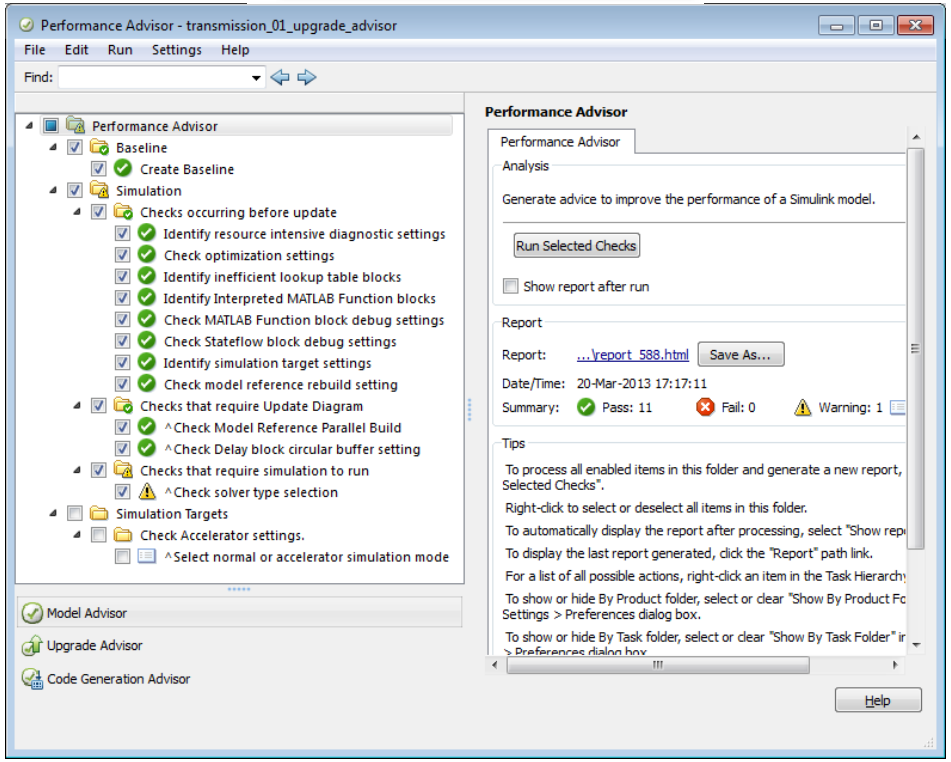


Performance Advisor

Speed up your simulation and update diagram performance

- Performance Advisor analyzes your model for common performance bottlenecks
- Option to automatically apply the advice you receive
- Tool verifies whether its advice does indeed speed up your model





What's New in Simulink?

- Simulink Editor
- Smart Signal Routing
- Simulation & Analysis Tools
- Rapid Prototyping

Simulink Support for Low Cost Hardware

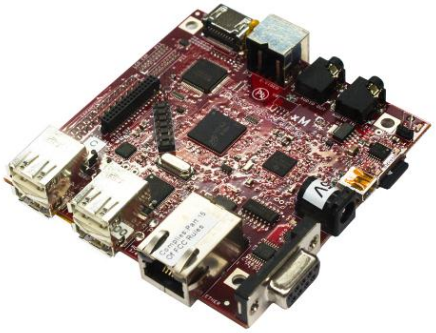
- Prototype on low cost hardware
- Avoid writing driver blocks
- Avoid installation issues
- Deploy smoothly

ARDUINO

PANDABOARD

RASPBERRY PI

GUMSTIX OVERO HARDWARE

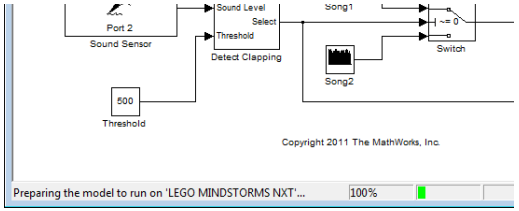


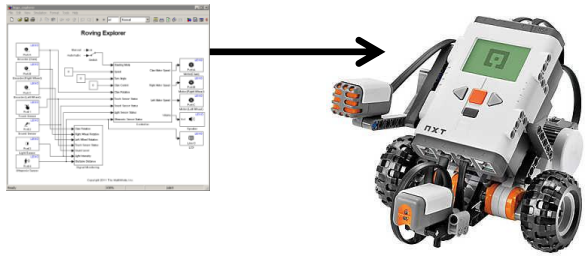
BEAGLE BOARD

LEGO MINDSTORMS NXT

Simulink Support for Low Cost Hardware

- Prototype on low cost hardware
  - BUILT-IN SUPPORT IN SIMULINK
  - ARDUINO, LEGO MINDSTORMS NXT, RASPBERRY PI
- Avoid writing driver blocks
  - HARDWARE SUPPORT PACKAGES
- Avoid installation issues
  - SUPPORT PACKAGE INSTALLER
- Deploy smoothly
  - 1-CLICK DEPLOYMENT





Other Updates

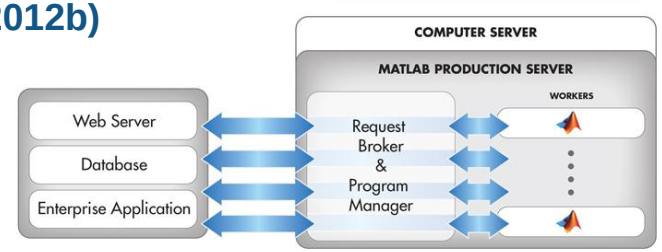
MATLAB Product Family

- MATLAB – xUnit-style testing framework **(R2013a)**
  - For writing and running unit tests, and analyzing test results

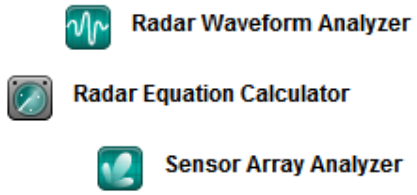
```
classdef Test1 < matlab.unittest

    methods (Test)
        function testRealSolutio
            actSolution = quadra
            expSolution = [2,1];
```

- MATLAB Production Server **(New product – R2012b)**
  - Run MATLAB programs as a part of web, database, and enterprise applications



- Phased Array System Toolbox
  - FMCW generation and processing, MATLAB Compiler support **(R2012b)**
  - Polarization support, three new MATLAB apps **(R2013a)**

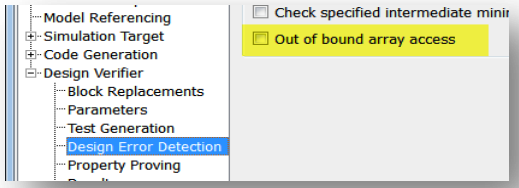


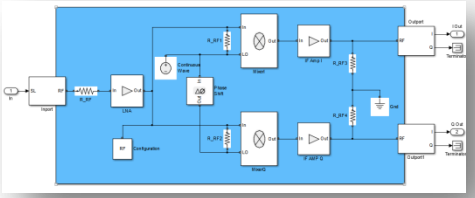
- GPU computing **(R2012b)**
  - Performance improvements to GPU-enabled MATLAB functions
  - More GPU-enabled functions (e.g., `convn`, `cov`, and `normest`)
  - Additional support for toolboxes
    (Neural Networks Toolbox, Signal Processing Toolbox, Phased Array System Toolbox, Statistics Toolbox)

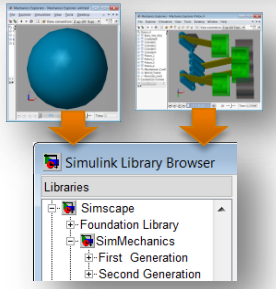
Other Updates

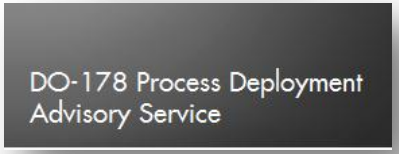
Simulink Product Family

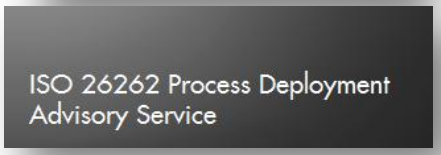
- Verification and Validation **(R2013a)**
  - Improved Design Error Detection in Simulink Design Verifier
- RF modeling **(R2013a)**
  - SimRF has improved circuit envelope solver
- SimMechanics **(R2012b)**
  - Generate code and import CAD models with SimMechanics 2G technology
- Industry Standards Support **(R2012b)**
  - DO Qualification Kit and IEC Certification Kit support latest standards: DO-178C, ISO-26262, IEC 61508, EN-51028
- Fixed Point Designer **(New product – R2013a)**
  - Unified Fixed-Point Toolbox and Simulink Fixed Point



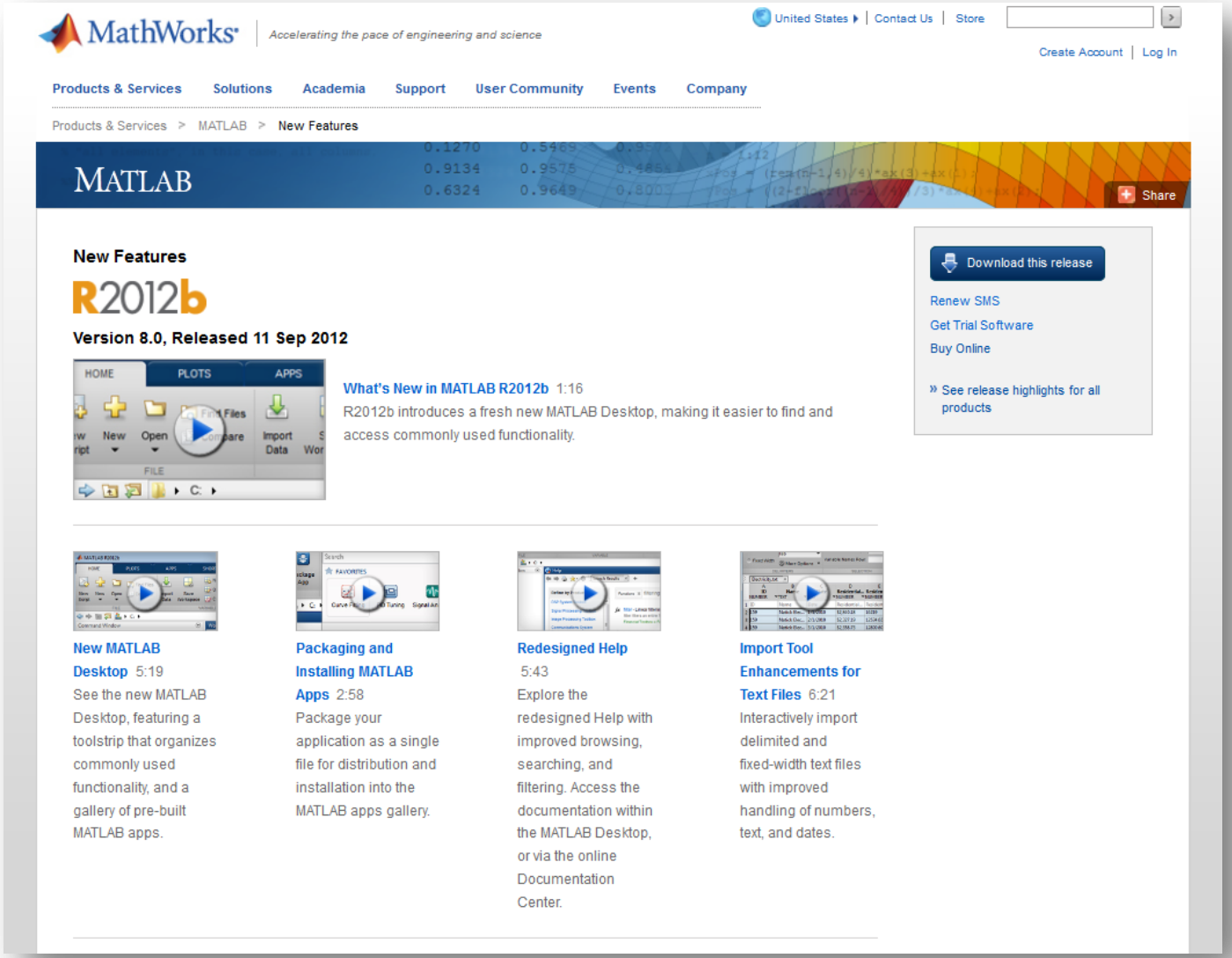






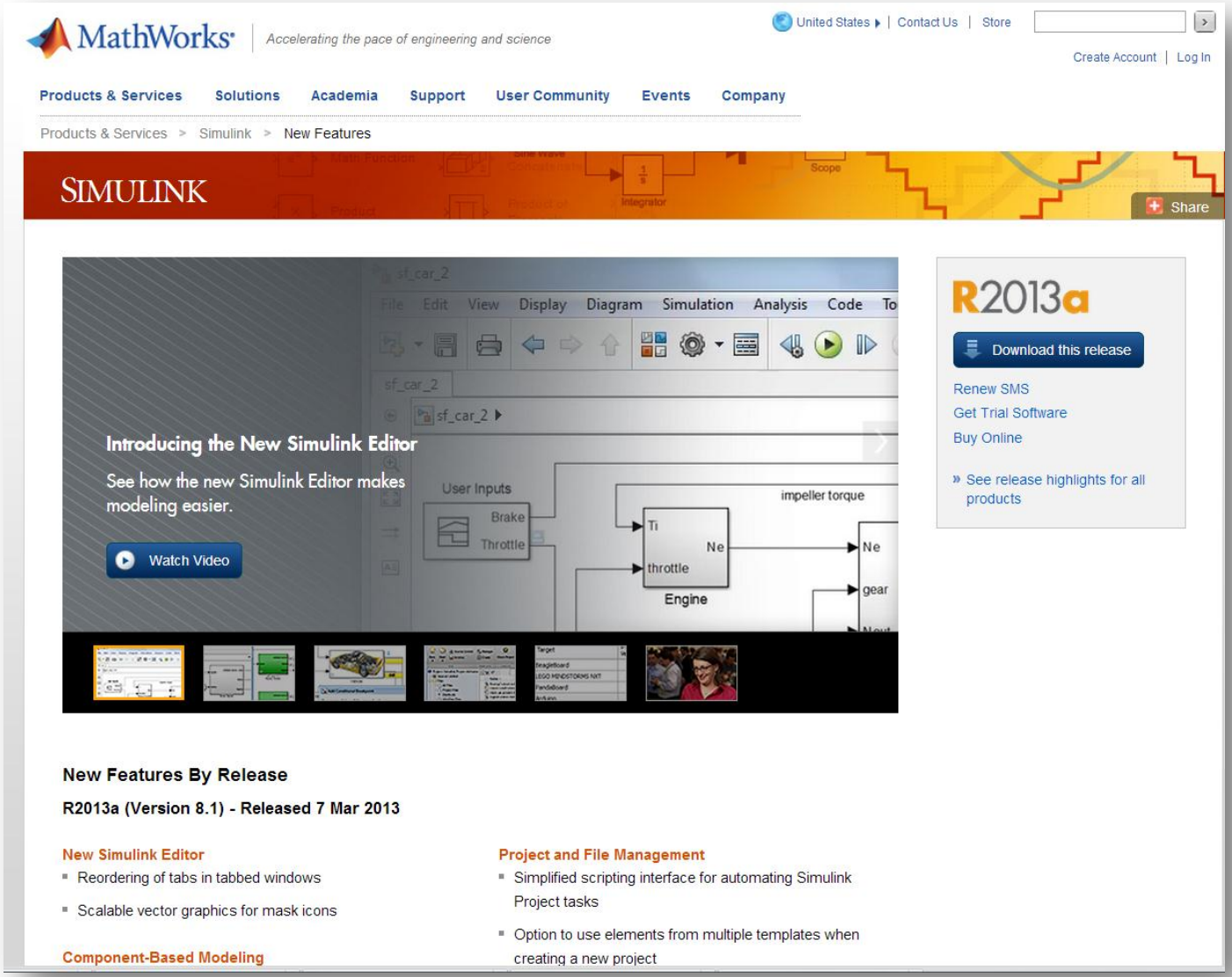


Learn More



http://www.mathworks.com/products/matlab/whatsnew.html

Learn More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Component-Based Modeling
Project and File Management
Simplified scripting interface for automating Simulink Project tasks
Option to use elements from multiple templates when creating a new project

Q&A