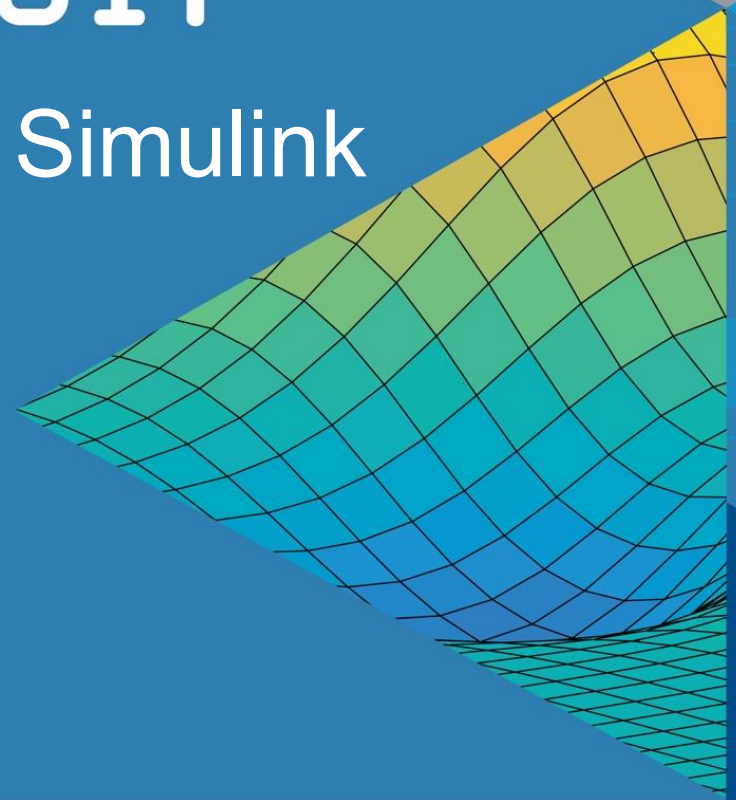
MATLAB EXPO 2017

What's New in MATLAB and Simulink

R2017a R2016b

Dr. Roland Michaely & Sebastien Dupertuis

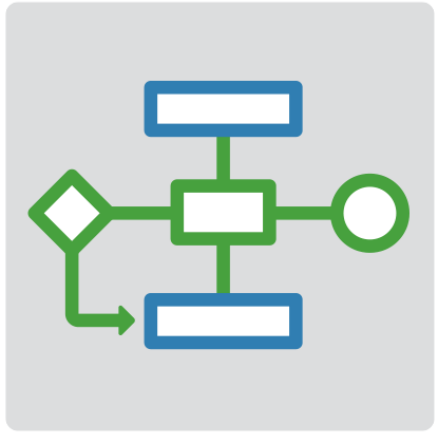


Agenda

Platform Productivity

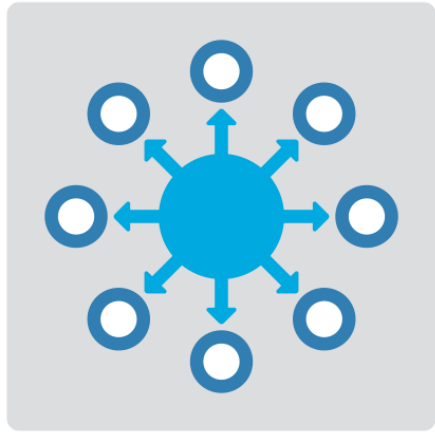
Getting your work done faster

Workflow Depth



Support for your entire workflow

Application Breadth



Products for the work you do

Agenda

Platform Productivity

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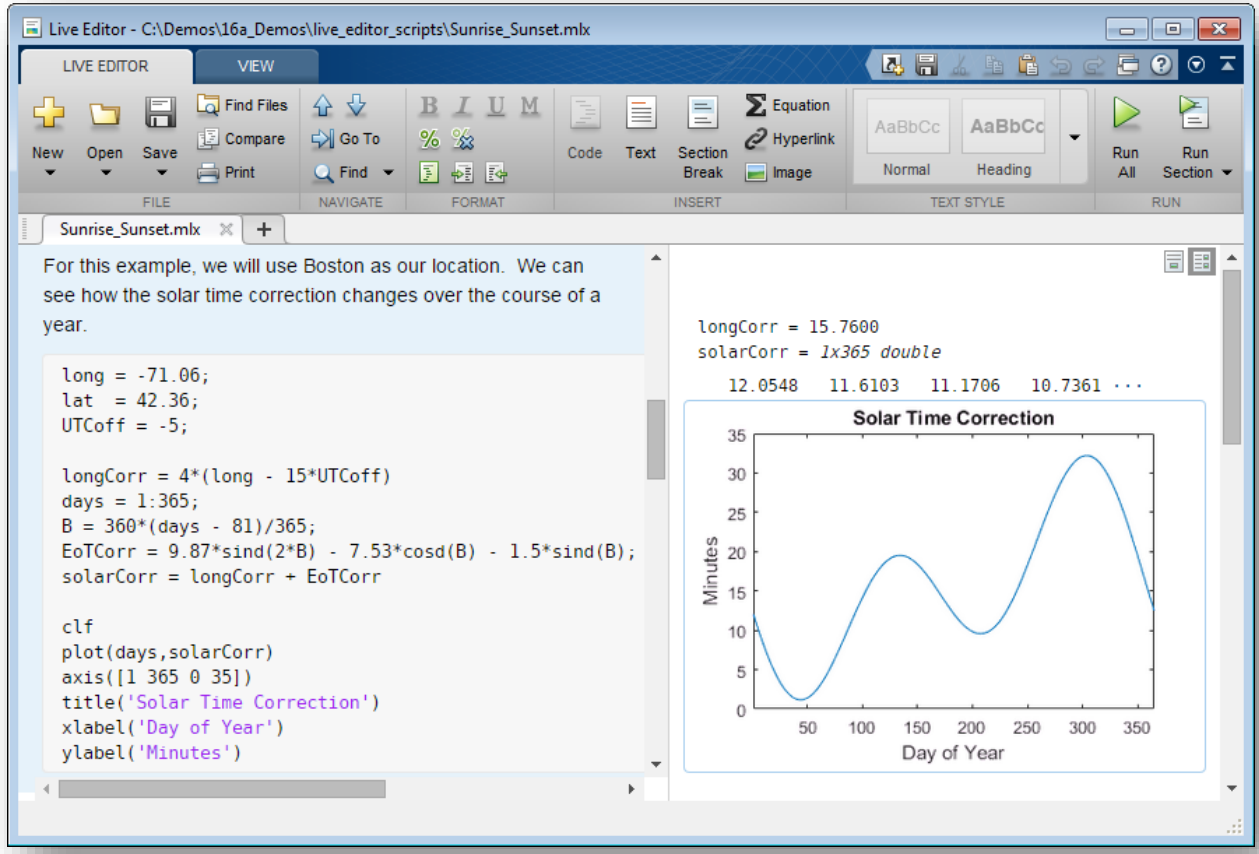
MATLAB Live Editor

See results together with your MATLAB code in the Live Editor
(introduced in R2016a)

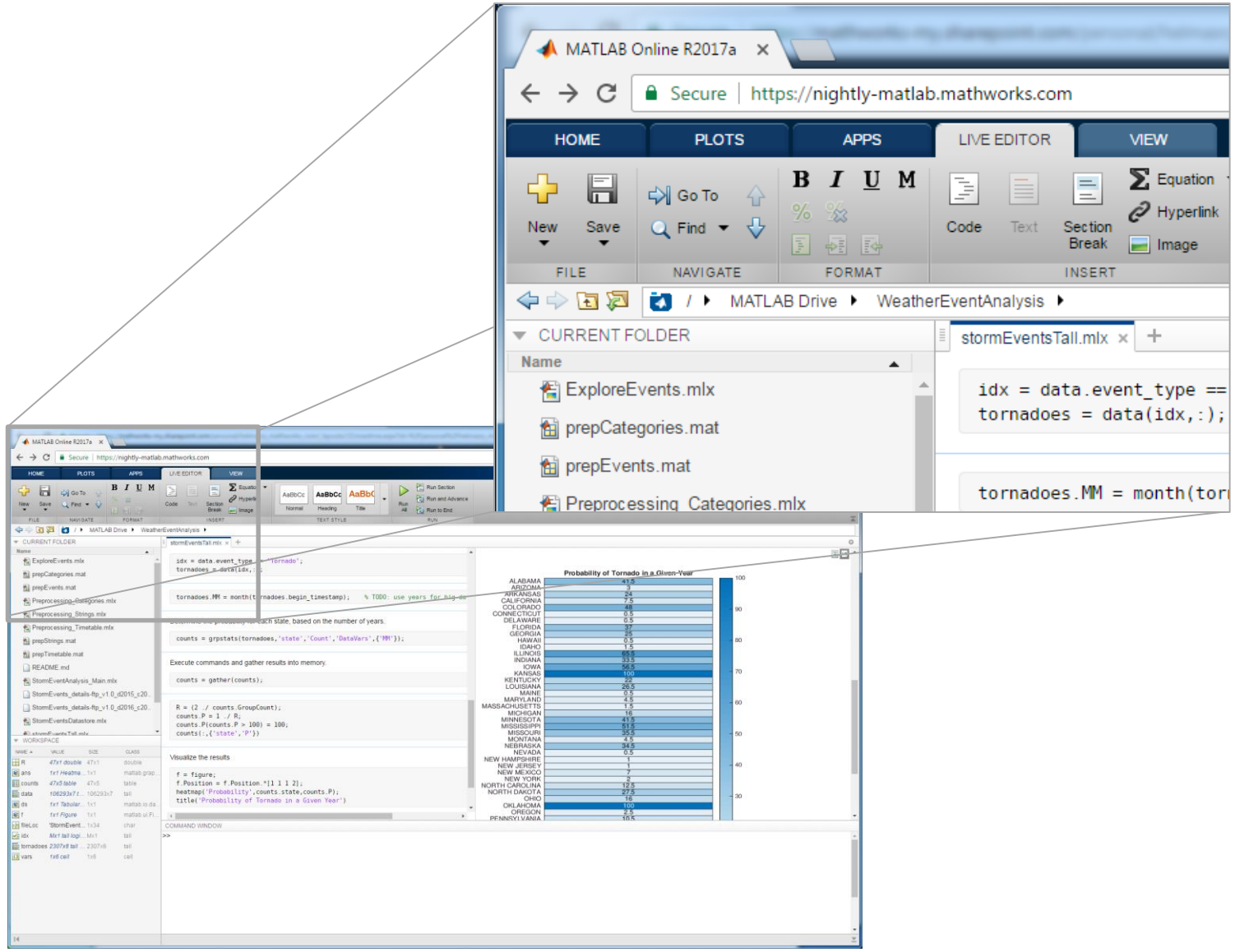
- Add equations, images, hyperlinks, and formatted text
- Present, share, and collaborate using interactive documents
- Interactive figure updates

- Interactive equation editor



MATLAB Online

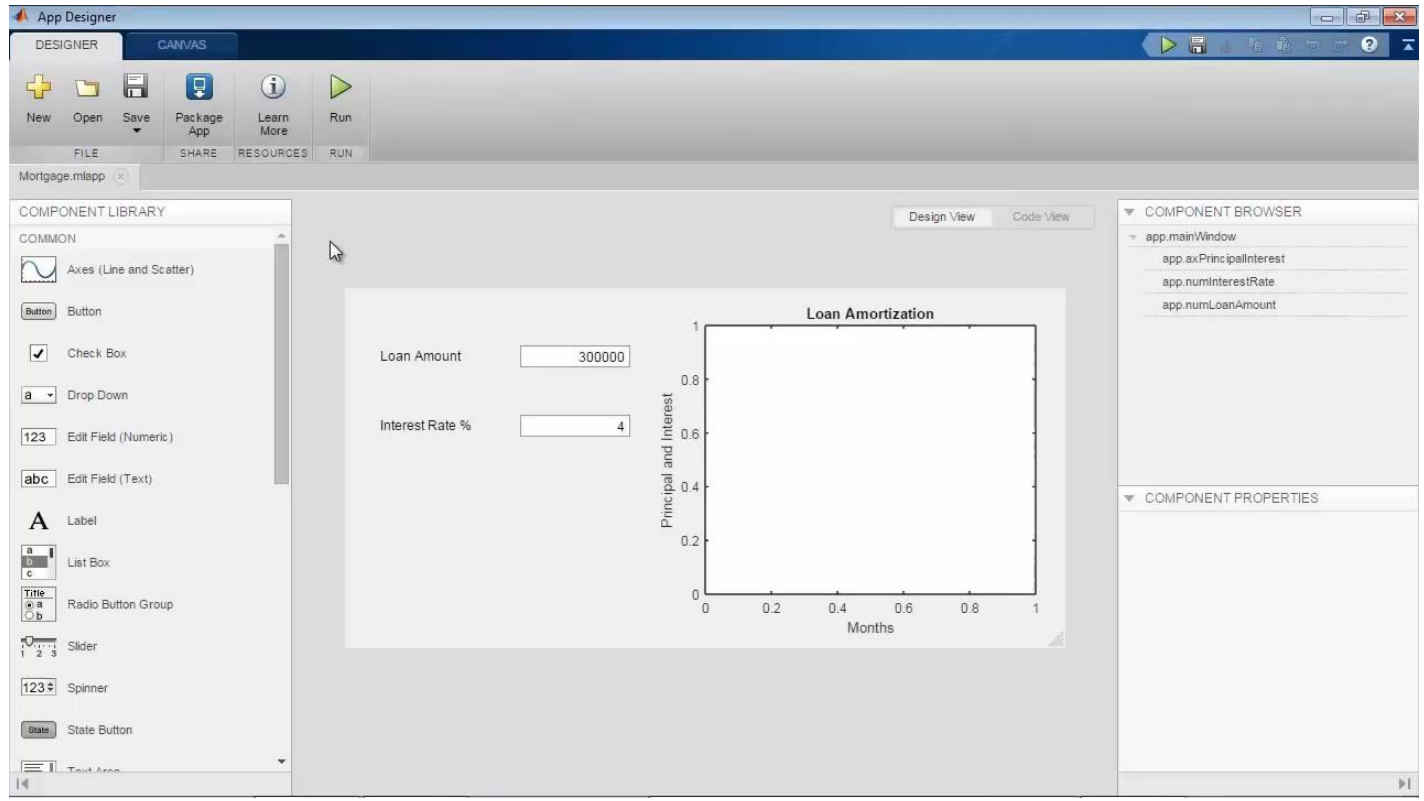
- Provides access to MATLAB desktop and full MATLAB language support from any standard web browser
- No downloads or installs.
- Cloud Storage and synchronization via MATLAB Drive
- Log in here with your MathWorks Account: https://matlab.mathworks.com/



App Designer

Environment for building MATLAB apps
(introduced in R2016a)

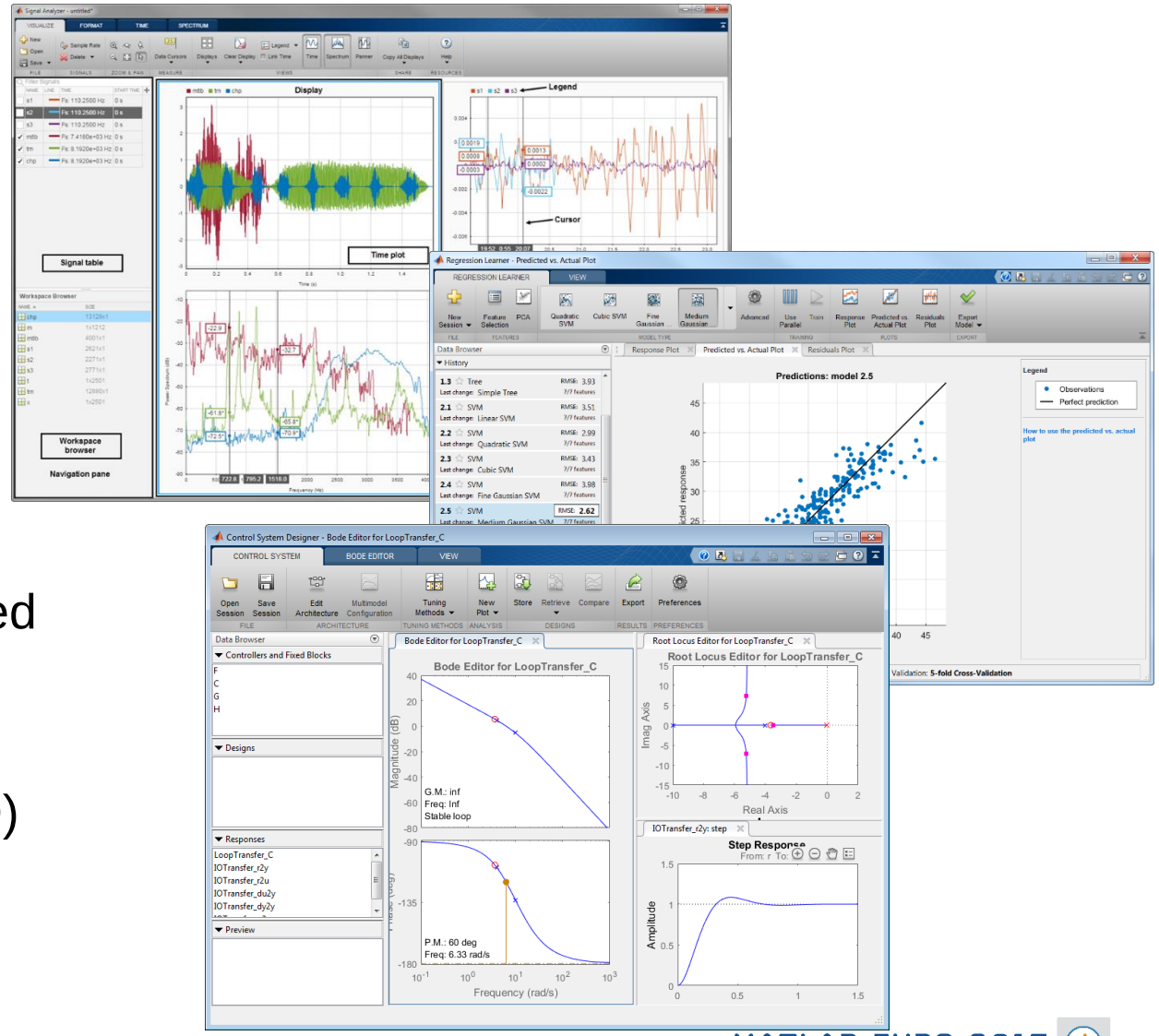
- Full set of standard user interface components
- Rich design environment for laying out apps
- Object-based code format for easily sharing data between parts of the app
- Enhancements include:
  - Majority of 2-D plots supported
  - Embed tabular displays using `uitable`
  - Zoom and pan plots in apps



Apps Simplify Modeling and Simulation

These interactive applications automate common technical computing tasks

- Signal Analyzer app
  - Perform time- and frequency-domain analysis of multiple time series
- Regression Learner app
  - Train regression models using supervised machine learning
- Control System Designer app
  - Design single-input, single-output (SISO) controllers



Signal Processing Toolbox
Statistics and Machine Learning Toolbox
Control System Toolbox

Working with Data Just Got Easier

Numeric

double, single, …

logical

categorical

datetime

duration

calendarDuration

Heterogeneous

structure

cell

table

timetable

Text

char

cell string

string

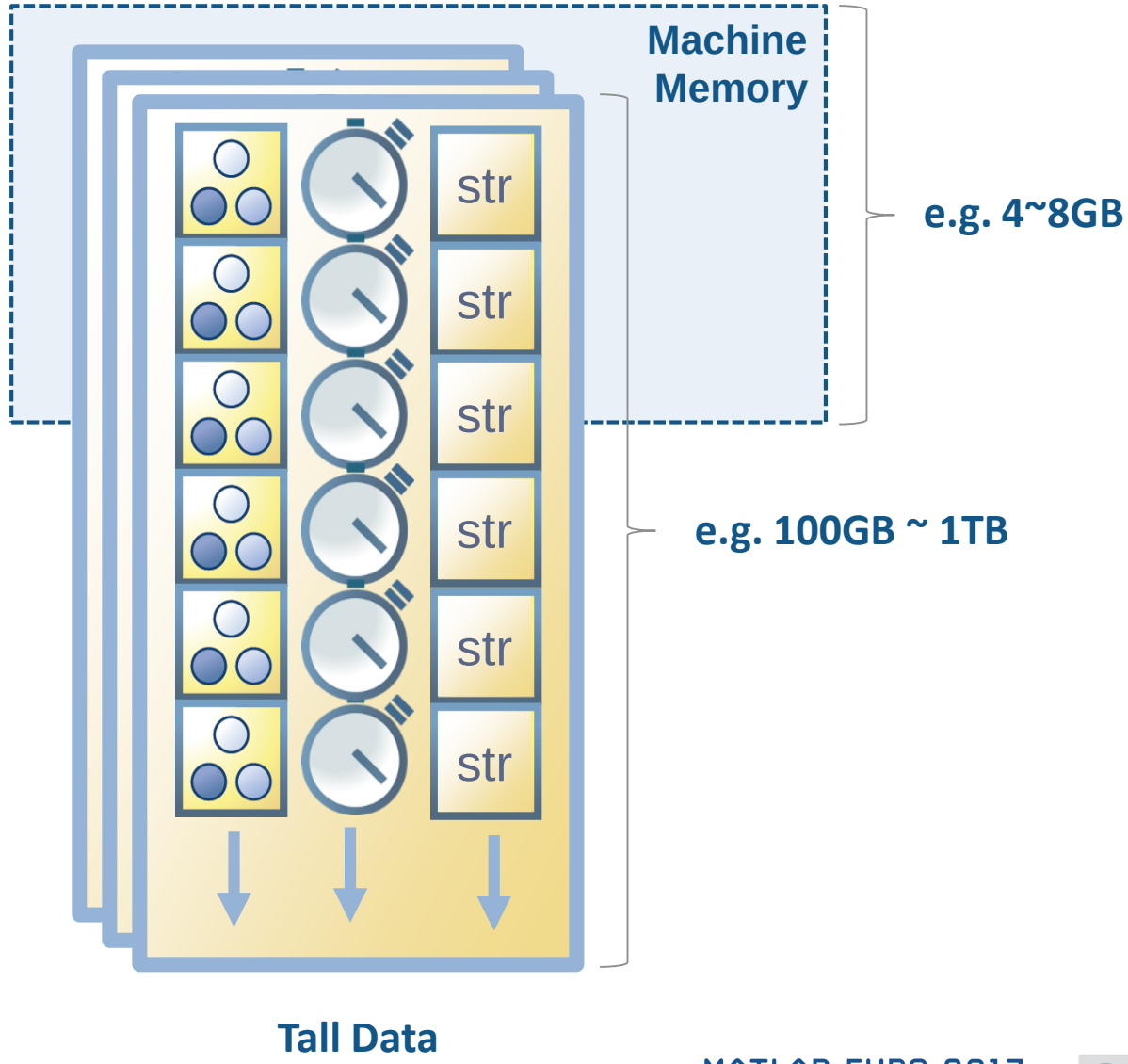
tall

R2013b R2014b R2016b

Working with Big Data Just Got Easier

Use tall arrays to manipulate and analyze data that is too big to fit in memory

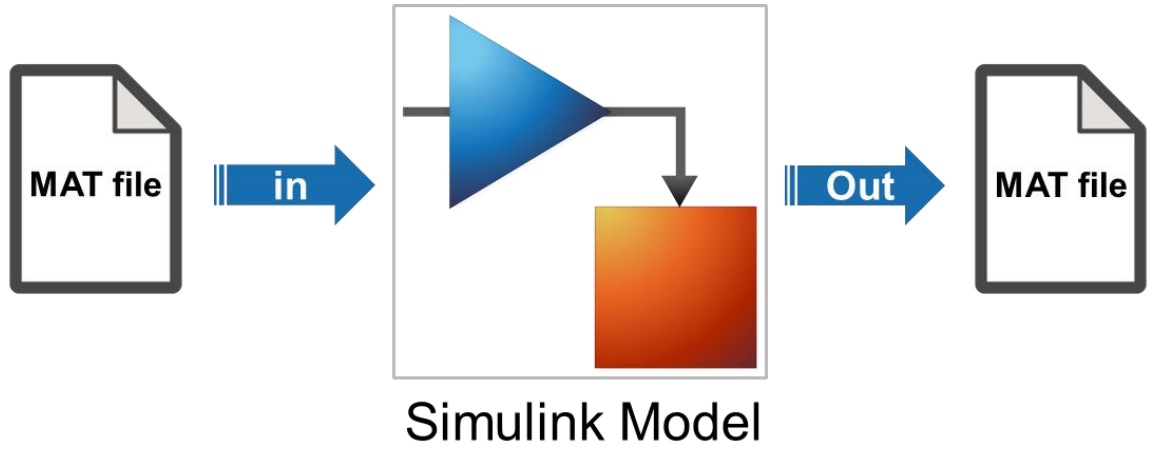
- Tall arrays let you use familiar MATLAB functions and syntax to work with big datasets, even if they don't fit in memory
- Support for hundreds of functions in MATLAB and Statistics and Machine Learning Toolbox
- Works with Spark + Hadoop Clusters



Working with Big Data Just Got Easier in Simulink Too

Stream large input signals from MAT-files without loading the data into memory

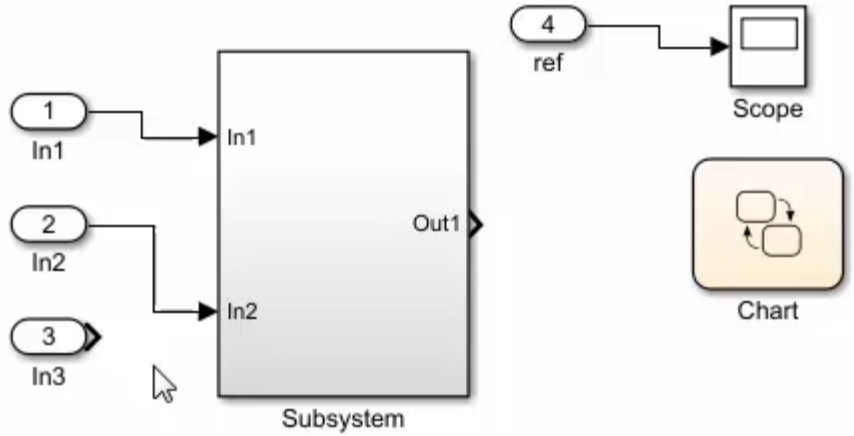
- Provides a big data workflow for Simulink simulations
- Use big data in Simulink logging and loading
- Especially useful when running many simulations where data retrieved is too large to fit into memory



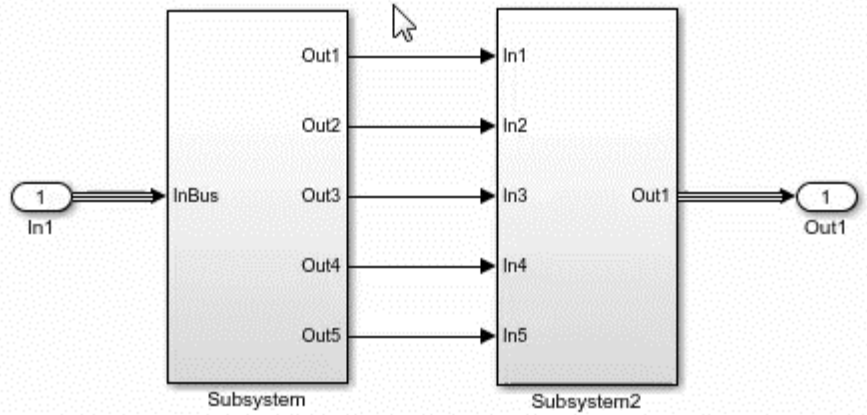
Create Your Models Faster

Use automatic port creation and reduced bus wiring

- Add inports and outports to blocks when routing signals



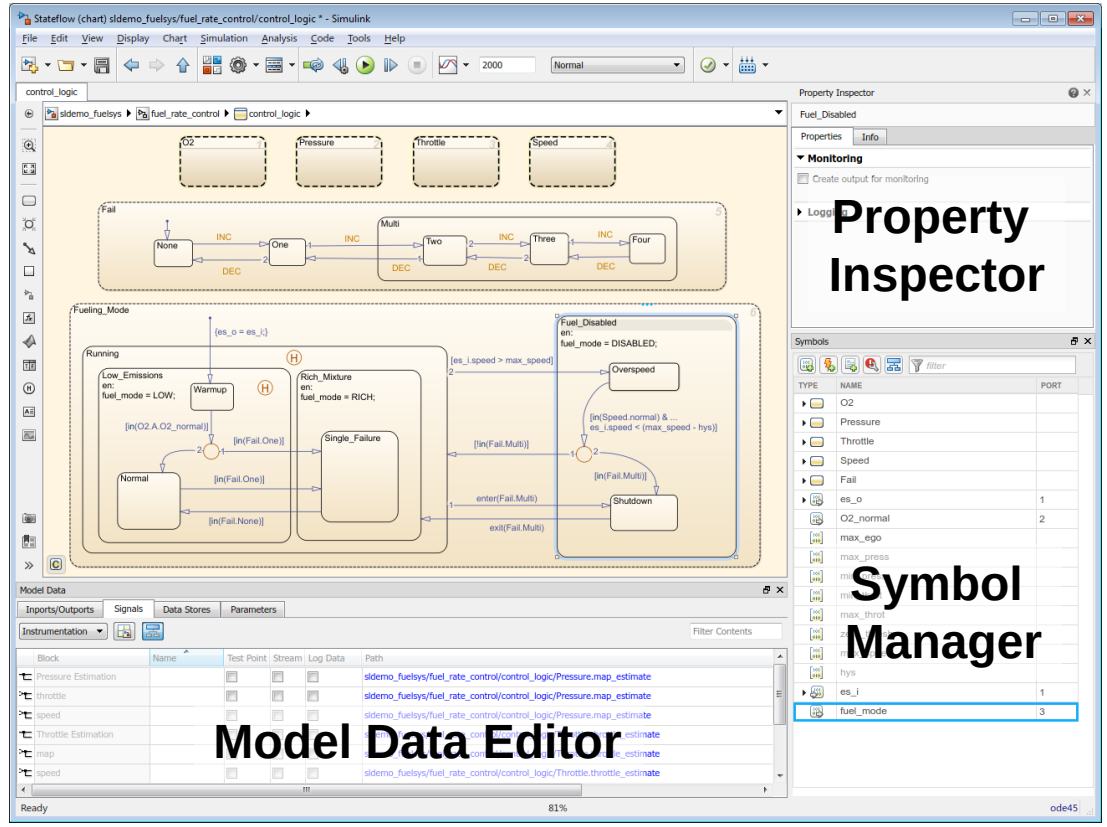
- Quickly group signals as buses and automatically create bus element ports for fewer signal lines



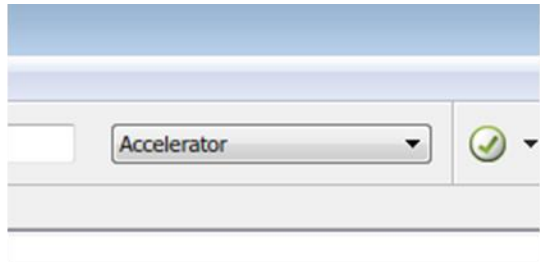
Define your Data Faster

Reduces the need to open separate dialog boxes

- Model and block parameter data is now accessible within the main editor window
- Accessing and defining Stateflow data is also much easier

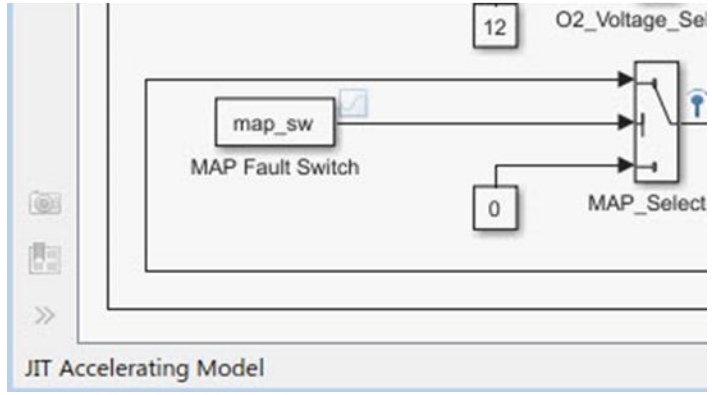


Simulate your Model Faster



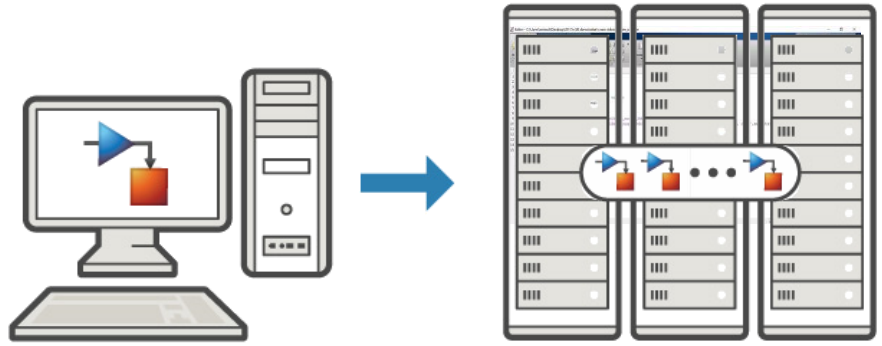
Use JIT acceleration and the new `parsim` command to speed up your simulations

- Quickly build the top-level model for improved performance when running simulations in Accelerator mode



- Directly run multiple parallel simulations from the `parsim` command

- Especially use for Monte Carlo simulations and Design of Experiments



Parallel Computing Toolbox
MATLAB Distributed Computing Server

Agenda

Platform Productivity

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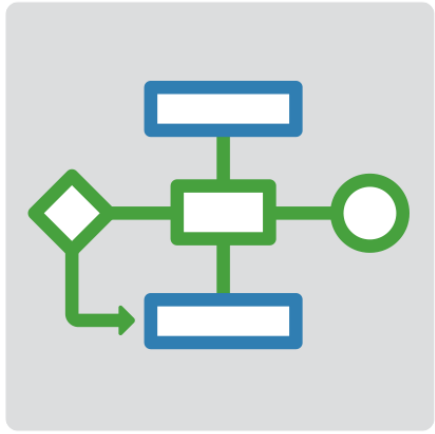
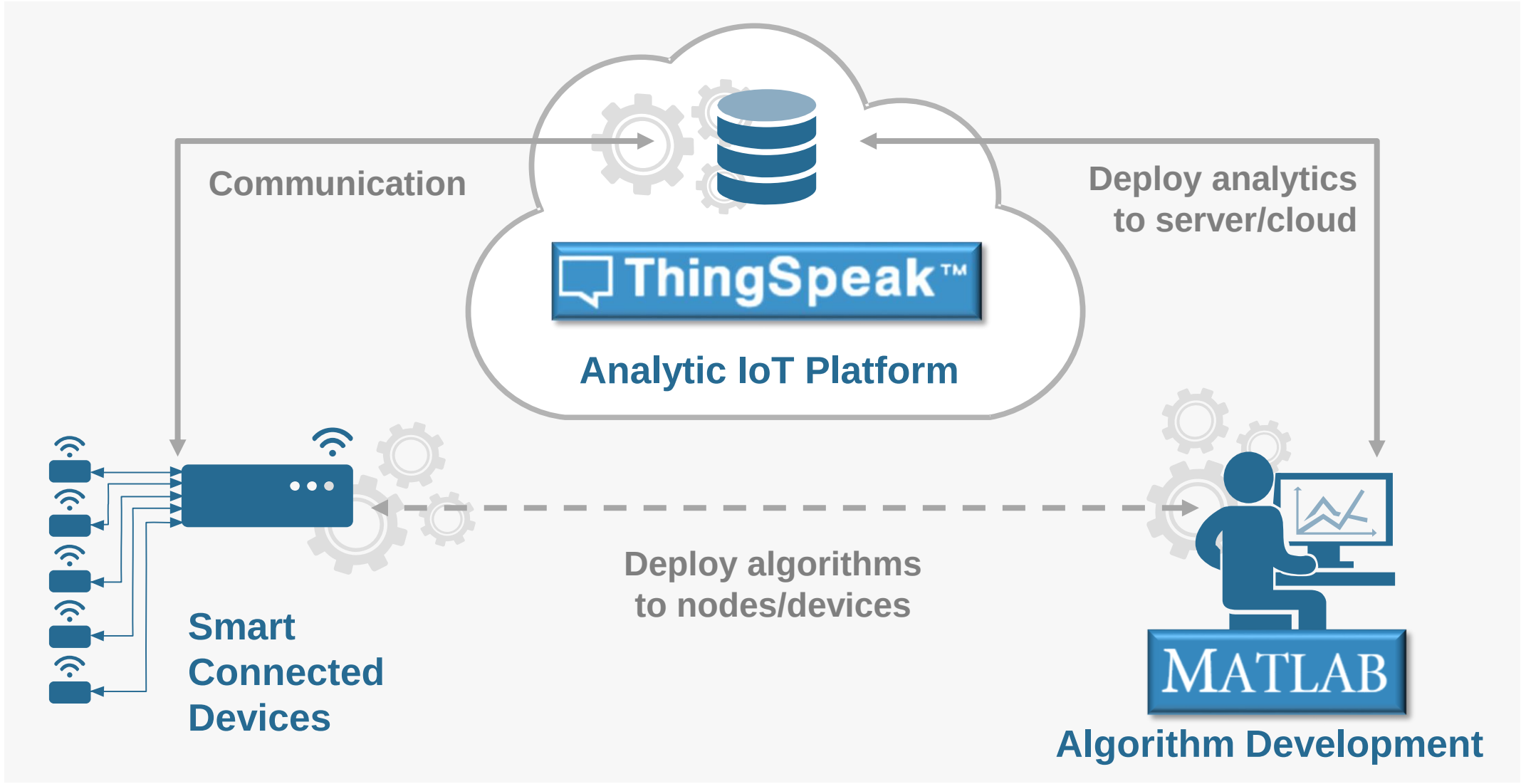
Workflow Depth



Support for your entire workflow

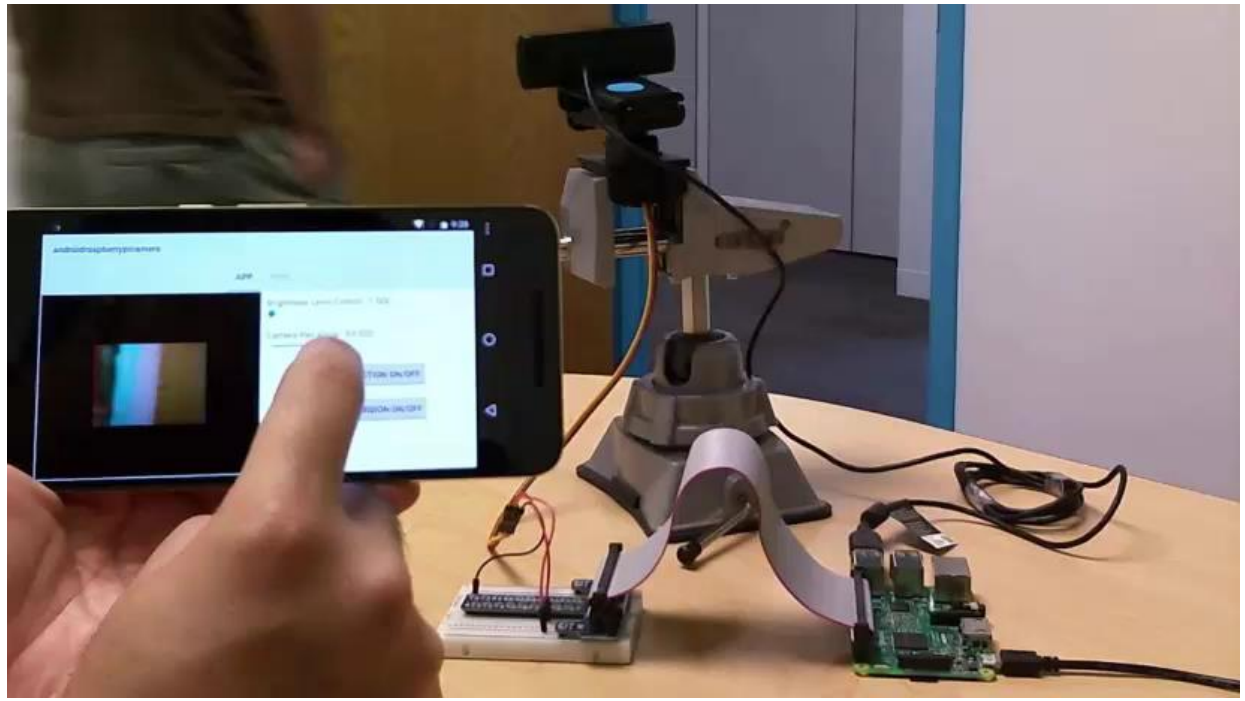
Connecting MATLAB Analytics to IoT Systems

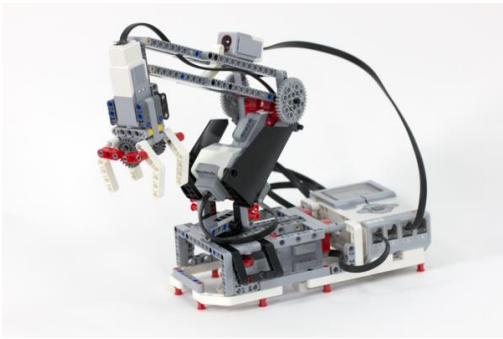


New Hardware Support

Run Simulink models on low-cost hardware devices

- Run Simulink models on Raspberry Pi 3 and Google Nexus devices
- Adds to existing hardware support, including LEGO, Arduino, iPhone, and Android devices

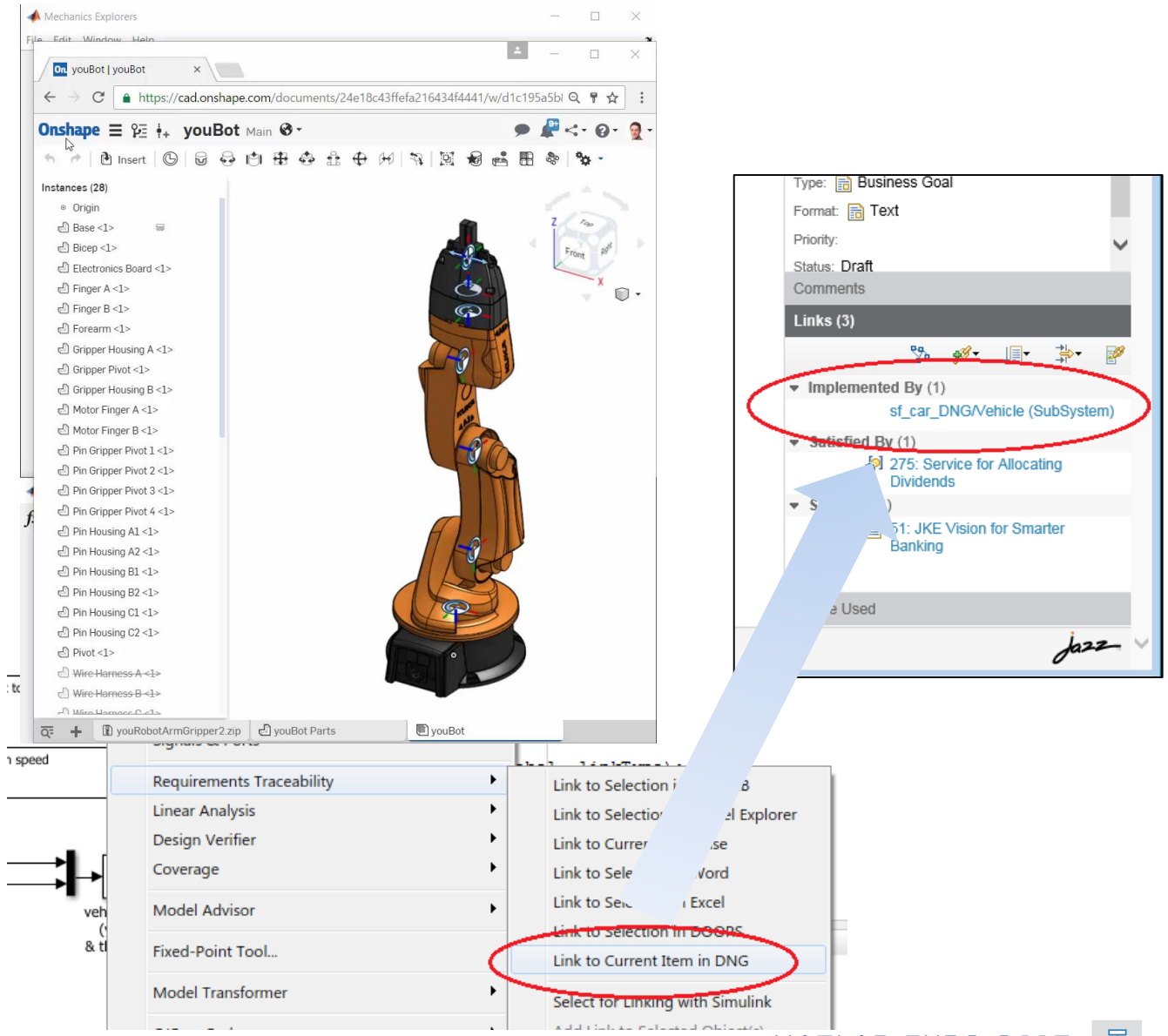




More Connections to 3rd Party Tools

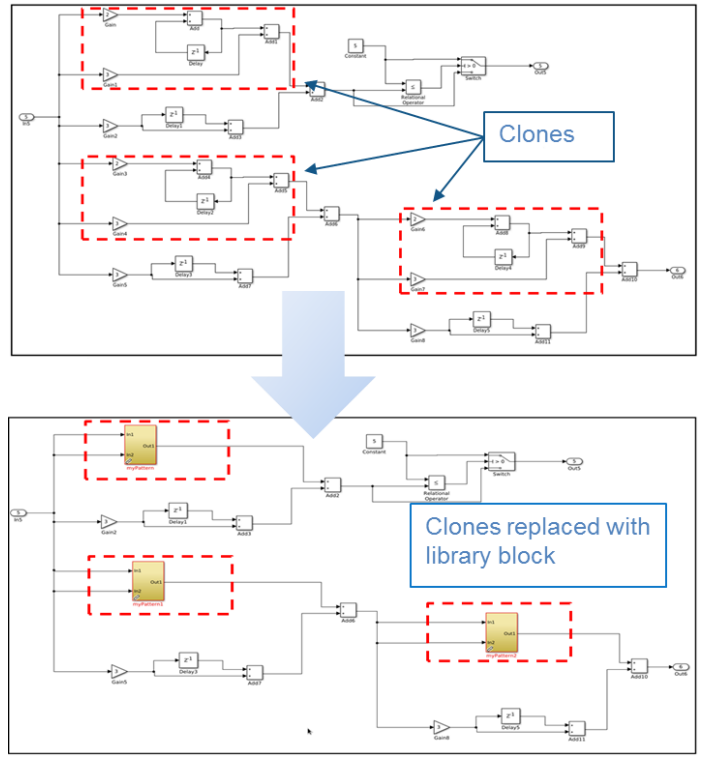
Connect your models to Onshape and DOORS Next Generation

- Convert an Onshape CAD assembly into a Simscape Multibody model
- Link and trace model elements to requirements in DOORS Next Generation



Efficient Code Generation

Improve code quality with clone detection and dynamic memory allocation

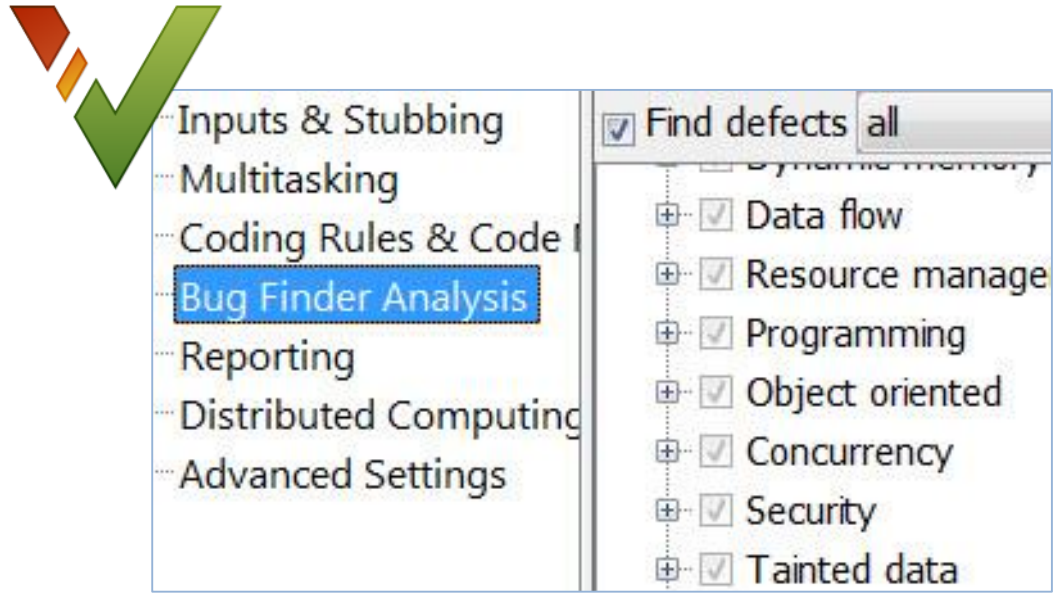


- Refactor repeating library patterns and subsystem clones
  - Reduces redundancy
  - Improves reusability
- Generate C code that uses dynamic memory allocation from MATLAB Function blocks
  - Allocate memory as needed at runtime

```
118    /* MATLAB Function: '<Root>/MATLAB Function' */
119    /* MATLAB Function 'MATLAB Function': '<S1>:1' */
120    if (!mymdl_DW.p_not_empty) {
121      /* '<S1>:1:4' */
122      /* '<S1>:1:5' */
123      k = mymdl_DW.p->size[0] * mymdl_DW.p->size[1];
124      mymdl_DW.p->size[0] = 1;
125      mymdl_DW.p->size[1] = 0;
126      mymdl_emxEnsureCapacity((emxArray__common_mymdl_T *)mymdl_DW.p, k, (int
127        sizeof(real_T));
128      mymdl_DW.p_not_empty = false;
129    }
```

Code Verification

Detect and prove the absence of run-time errors in your source code using static analysis



- Identify CERT C violations using defect checkers and coding rules
- Detect security vulnerabilities highlighted by the CERT C standard
- Addresses growing concern over software security with the rise in system connectivity

```
if (output_v7 >= 0) {
    saved_values[output_v7] = s8_ret;
    return s8_ret
}
return reset_temp
```

Assignment to element of static array (int 16): [-32 .. 112]
array size: 127
array index value: [0 .. 555]

CERT C	Description	Polyspace Code Prover
ARR30-C	Do not form or use out-of-bounds pointers or array subscripts	Array access out of bounds

Learn more at:
Demo Station
Code Verification

Agenda

Platform Productivity

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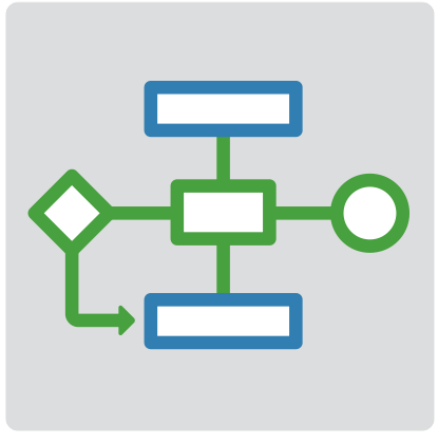
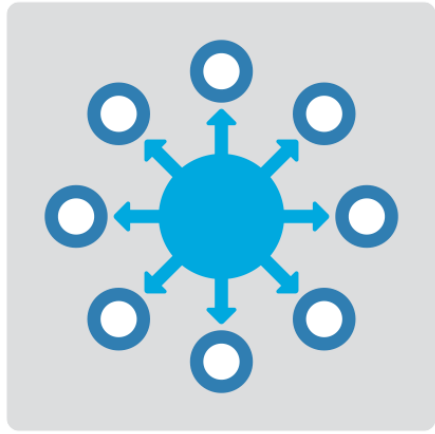


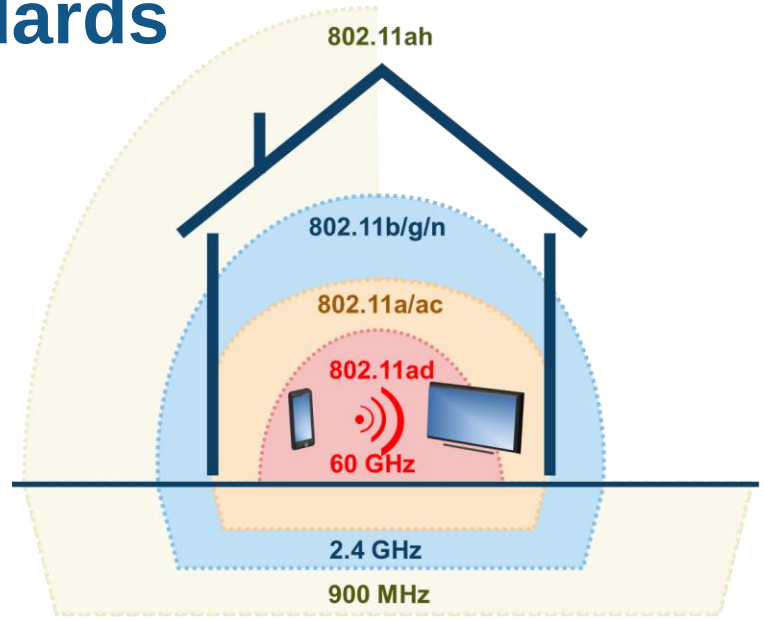
Support for your entire workflow

Application Breadth



Products for the work you do

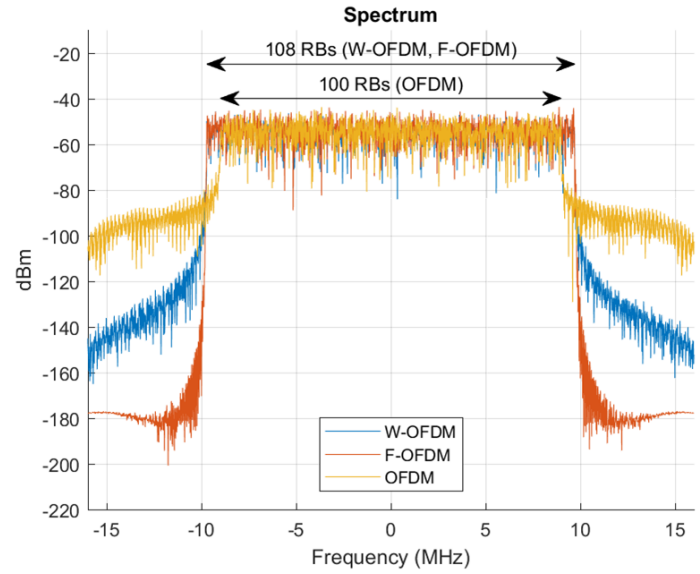
Support for the Latest Wireless Standards



Generate IEEE 802.11ad compliant waveforms and simulate 3GPP 5G radio technologies

- IEEE 802.11ad is a new Wi-Fi standard intended for high data rate short range communication

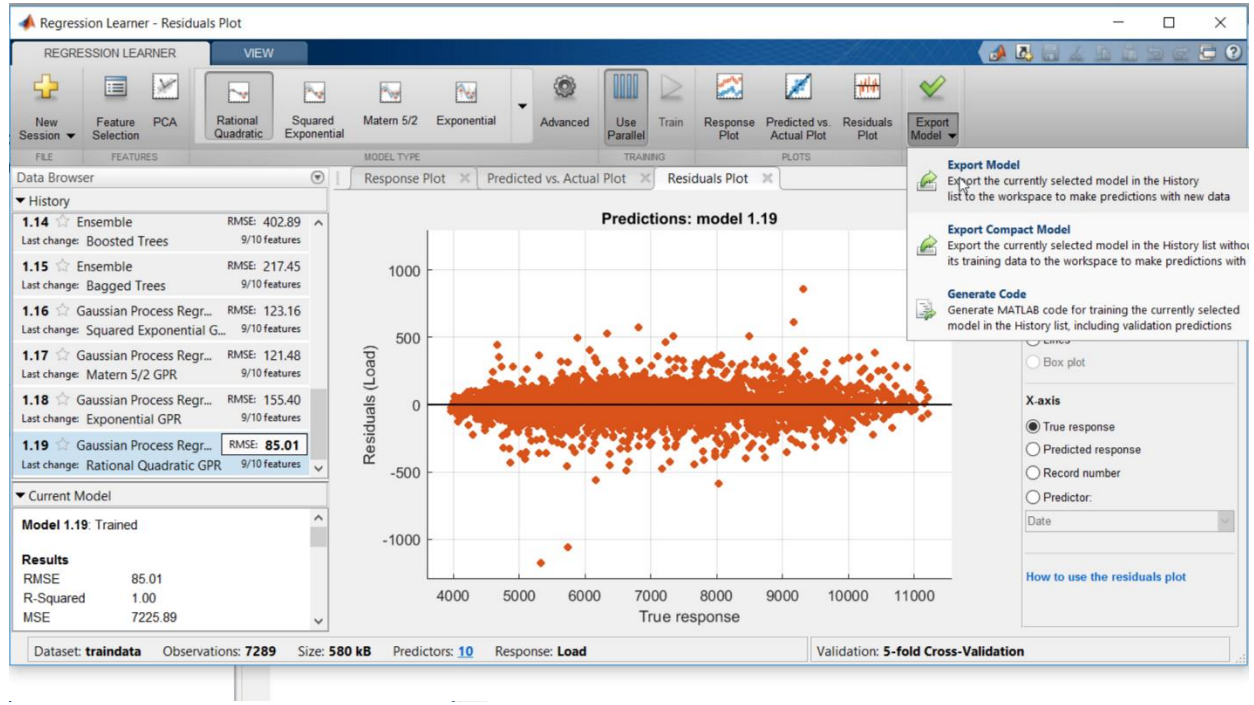
- A new 5G library is available to explore the behavior and performance of new proposed 5G radio technologies



WLAN System Toolbox
LTE System Toolbox

Machine Learning

“Learn" information directly from data without assuming a predetermined equation as a model



- Regression Learner app
  - Point and click interface
  - Train and compare multiple models
  - Select and export most accurate model

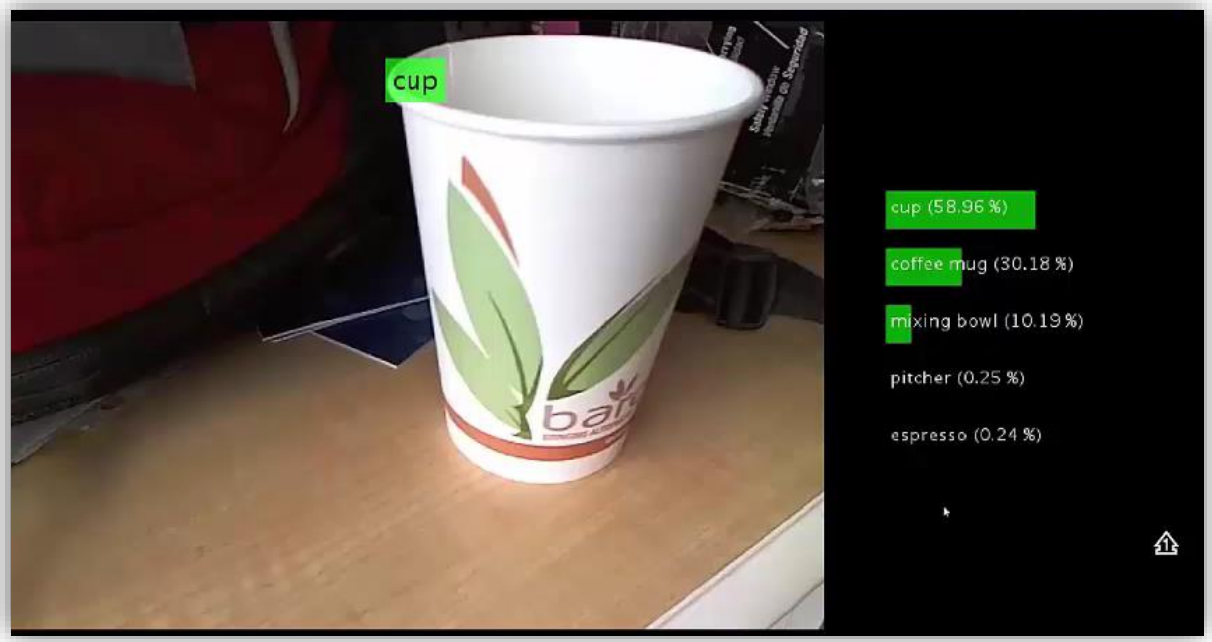
- Code generation
  - Generate C code for predictive models

Deep Learning

R2016b R2017a

Apply deep learning to computer vision problems

- Configure and train models using object detection algorithms
- Leverage pretrained models for transfer learning
- Import models from Caffe
- Train networks using multiple GPUs



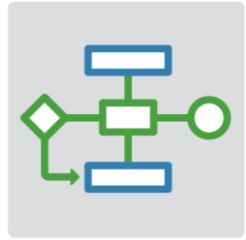
Neural Network Toolbox
Computer Vision System Toolbox

What's New in MATLAB and Simulink?

Platform Productivity

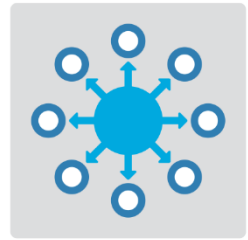
- Live Editor
- MATLAB Apps
- New (big) data types
- Modeling enhancements
- Release adoption

Workflow Depth



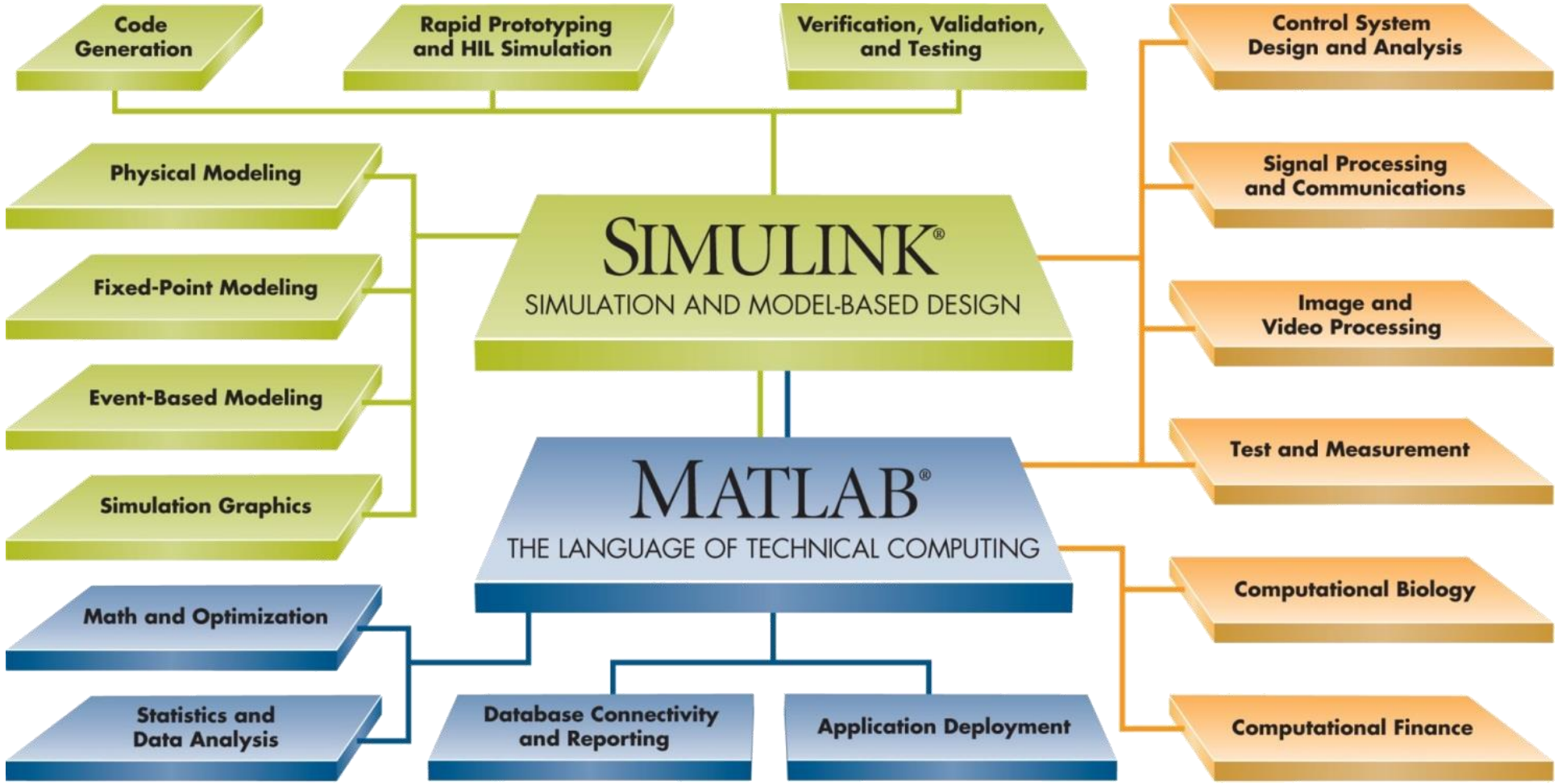
- Enterprise applications
- IoT systems
- 3rd party tool integration
- Standards compliance
- Code generation and verification

Application Breadth



- MathWorks Services
- New wireless standards
- Machine learning
- Deep learning
- Regression Learner App

Why Choose MathWorks for MATLAB and Simulink Training?



More than 50 trainings + customized