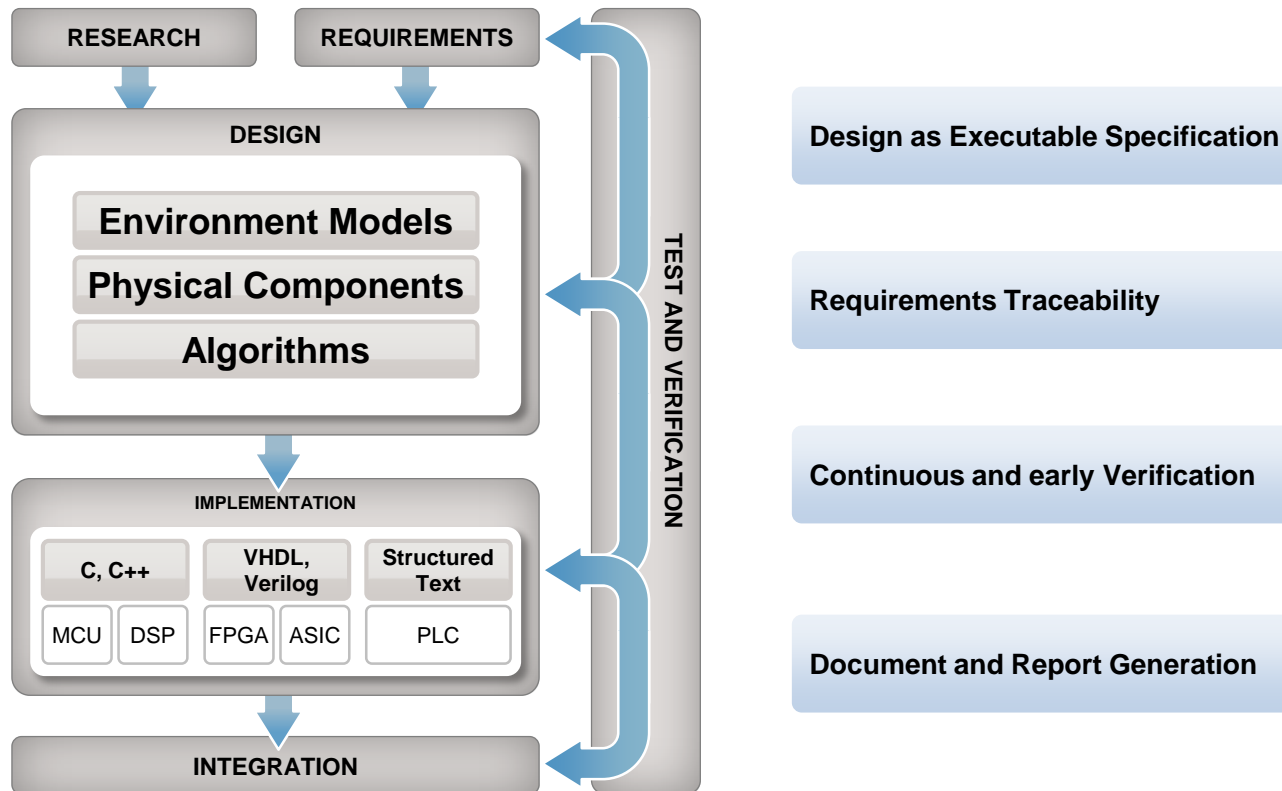


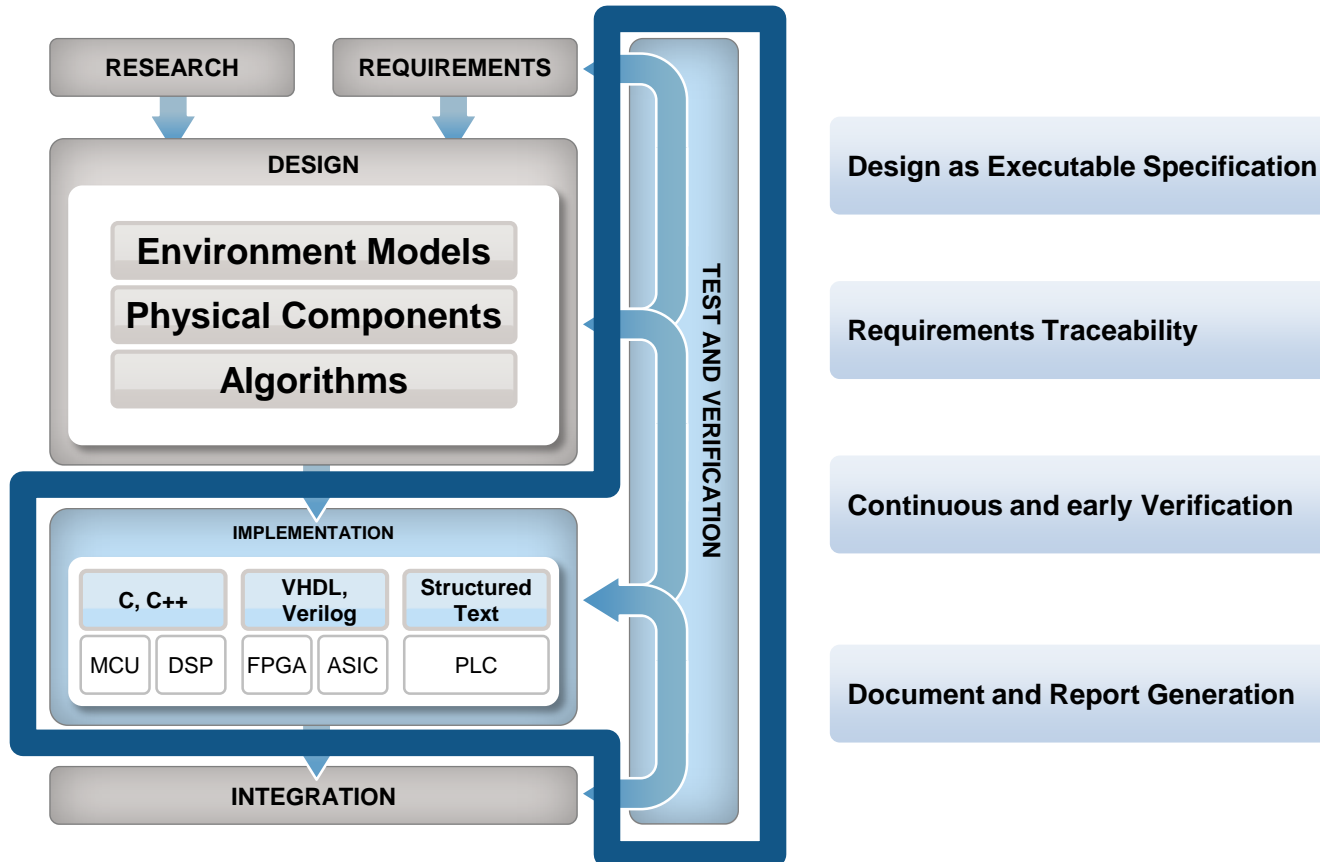
# Simulink to STM32

**Jean-Baptiste Lanfrey, Senior Application Engineer**

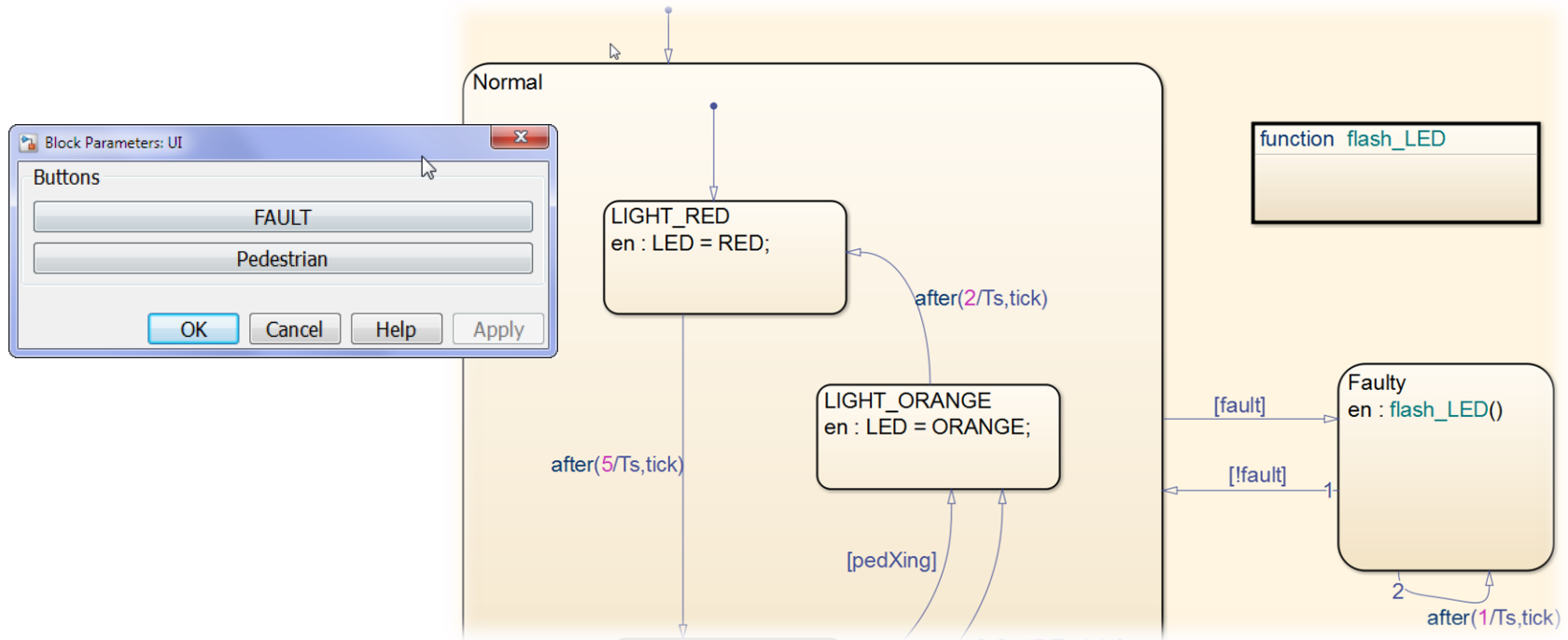
# Model-Based Design



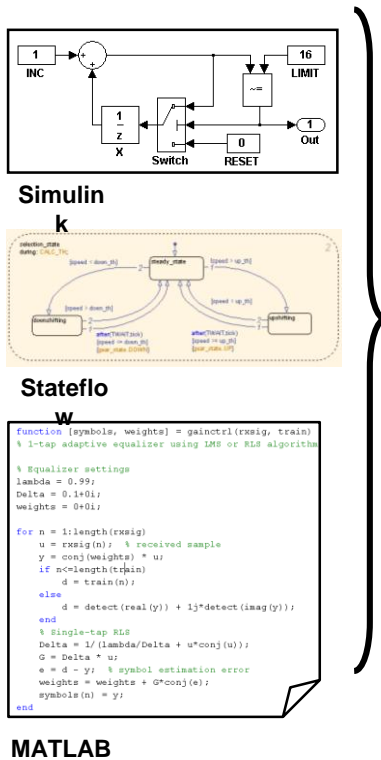
# Model-Based Design



# DEMO



# Coder Technology

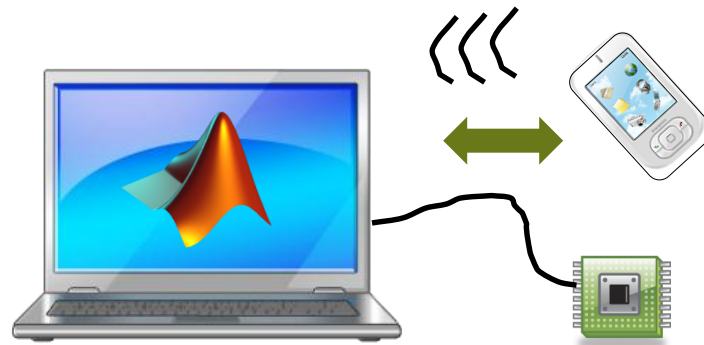


Unified Code Generation



- C Code
- C++ Code
- HDL Code
- PLC Code

# Hardware Support Packages are...



- Downloadable add-ons that provide hardware support
- Often updated independent of the product release cycle
- Used by Simulink and Embedded Coder to deliver **targets**

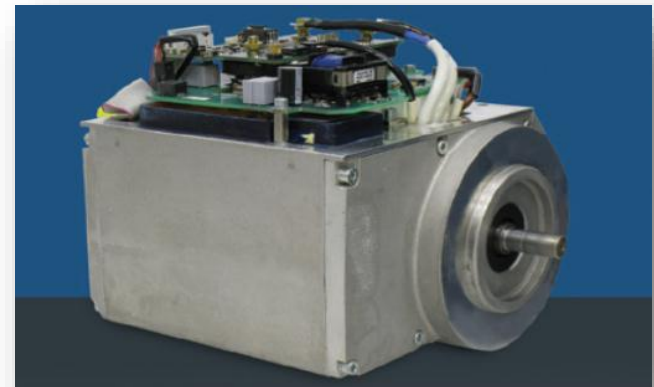
# What does a TARGET do?

1. Optimizes generated code
2. Automates the build process
  - Generated Makefile
  - Compile > Link > Download > Execute
3. Verifies algorithms on hardware with real-time, real-world data
4. Deploys full systems as standalone applications
  - RTOS, Multi-core threads, Device drivers

```

/* S-Function (sdspisine2): '<Root>/Sine Wave' */
  updateVal = rtb_SineWave[j] =
ex_fircmsis_tut_mab2013_P.SineWave_Amplitude *
arm_sin_f32(ex_fircmsis_tut_mab2013_DW.SineWave
_AccFreqNorm);

```



# Simulink Targets

- for Educational Purposes

as of June 2014

	User Downloads (R2012a – R2014a)
Arduino	11,281
LEGO MINDSTORM NXT	3,727
Raspberry Pi	2,909
BeagleBoard	753
LEGO MINDSTORM EV3	202
Samsung Galaxy (Android)	164
PandaBoard	135
Gumstix Overo	63
<b>Total</b>	<b>19,234</b>

**Simulink Targets do not require Coder products**



# Embedded Coder Targets

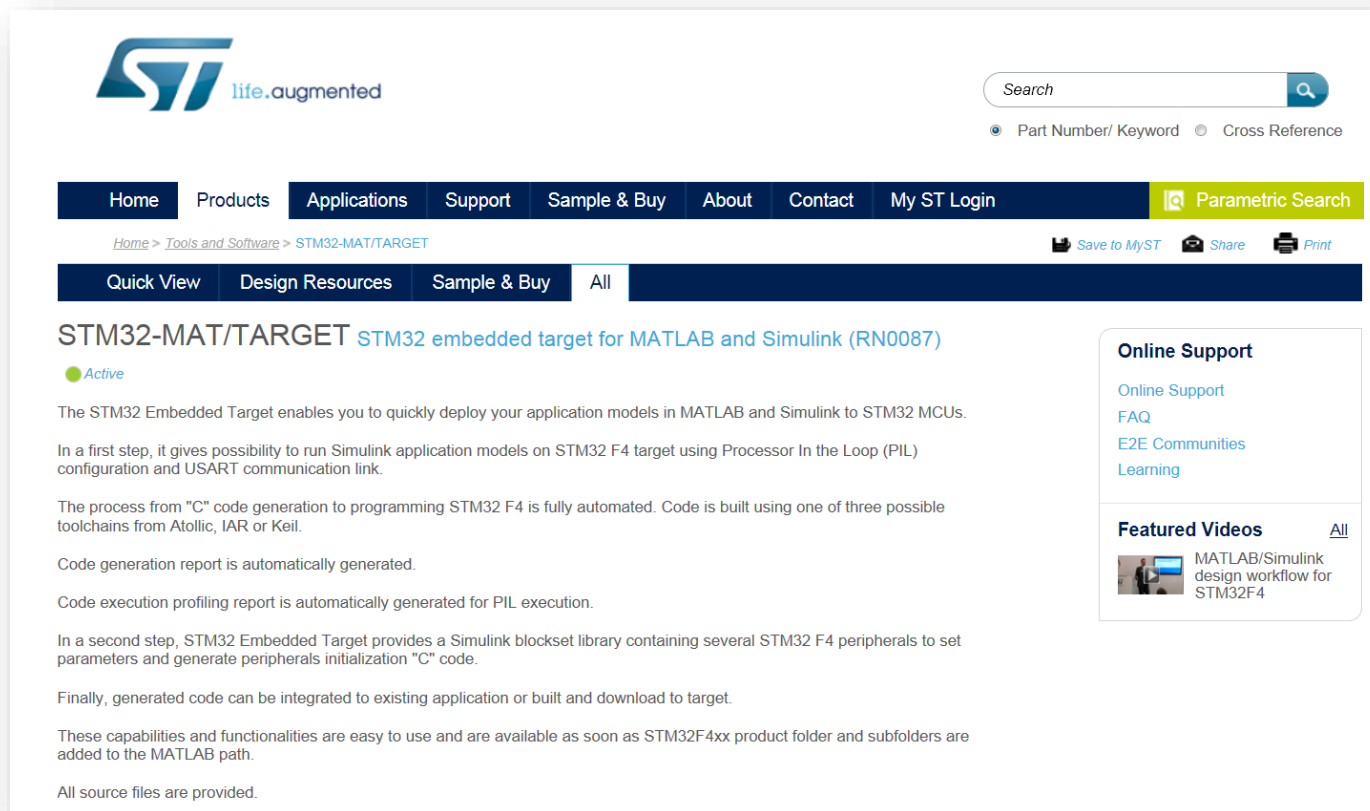
- for Prototyping and Deployment

as of June 2014

	User Downloads (R2013a – R2014a)
Texas Instruments C2000	645
ARM Cortex-M	548
Xilinx Zynq-7000	350
ST Microelectronics F4 Discovery	243
ARM Cortex-A	141
Texas Instruments C6000	83
Analog Devices DSP	81
Green Hills MULTI	52
Wind River VxWorks	34
<b>Total</b>	<b>2,177</b>


**Documented APIs available for building custom targets**

# STM32 Support Package






The screenshot shows the STMicroelectronics website for the STM32 Support Package. The page features the ST logo and 'life.augmented' tagline. A search bar is located in the top right corner. The navigation menu includes Home, Products, Applications, Support, Sample & Buy, About, Contact, My ST Login, and Parametric Search. The breadcrumb trail indicates the path: Home > Tools and Software > STM32-MAT/TARGET. The main content area is titled 'STM32-MAT/TARGET STM32 embedded target for MATLAB and Simulink (RN0087)' and is marked as 'Active'. The text describes the capabilities of the STM32 Embedded Target, including code generation, execution profiling, and integration with MATLAB and Simulink. A sidebar on the right contains 'Online Support' links (Online Support, FAQ, E2E Communities, Learning) and 'Featured Videos' (MATLAB/Simulink design workflow for STM32F4).

**ST** life.augmented

Search  

Part Number/ Keyword  Cross Reference

Home Products Applications Support Sample & Buy About Contact My ST Login Parametric Search

Home > Tools and Software > STM32-MAT/TARGET  Save to MyST  Share  Print

Quick View Design Resources Sample & Buy All

## STM32-MAT/TARGET [STM32 embedded target for MATLAB and Simulink \(RN0087\)](#)

● Active

The STM32 Embedded Target enables you to quickly deploy your application models in MATLAB and Simulink to STM32 MCUs.

In a first step, it gives possibility to run Simulink application models on STM32 F4 target using Processor In the Loop (PIL) configuration and USART communication link.

The process from "C" code generation to programming STM32 F4 is fully automated. Code is built using one of three possible toolchains from Atollic, IAR or Keil.

Code generation report is automatically generated.

Code execution profiling report is automatically generated for PIL execution.

In a second step, STM32 Embedded Target provides a Simulink blockset library containing several STM32 F4 peripherals to set parameters and generate peripherals initialization "C" code.

Finally, generated code can be integrated to existing application or built and download to target.


These capabilities and functionalities are easy to use and are available as soon as STM32F4xx product folder and subfolders are added to the MATLAB path.

All source files are provided.

**Online Support**

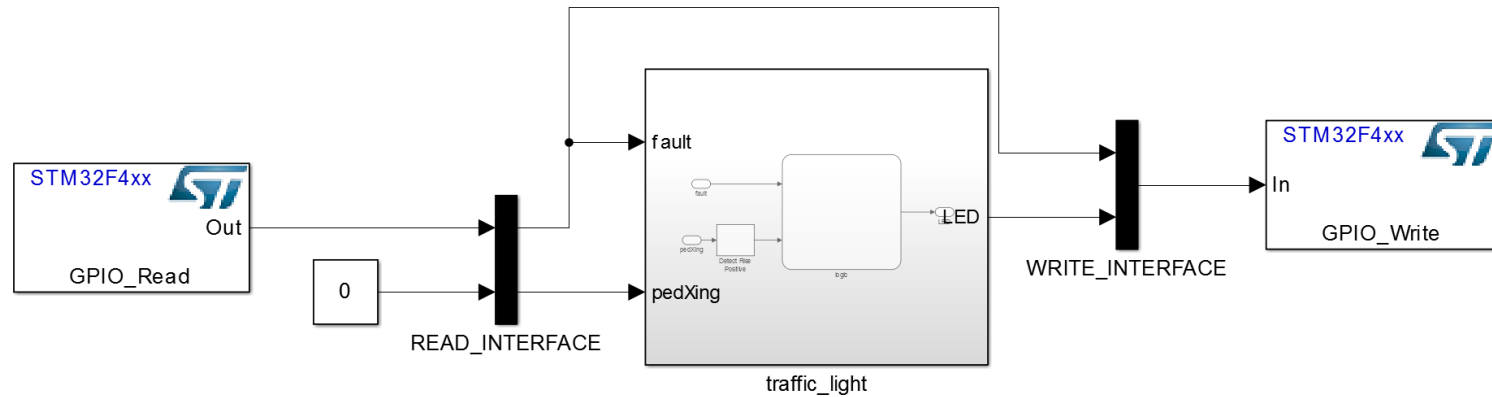
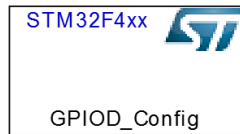
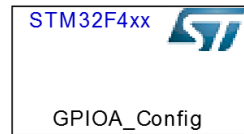
[Online Support](#)  
[FAQ](#)  
[E2E Communities](#)  
[Learning](#)

**Featured Videos** [All](#)

 MATLAB/Simulink design workflow for STM32F4

[www.st.com/stm32-mat-target](http://www.st.com/stm32-mat-target)

# DEMO

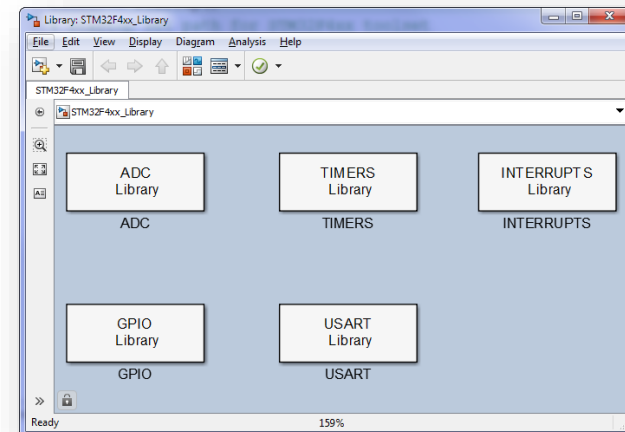
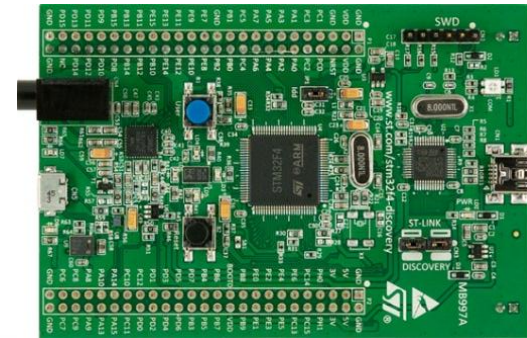


# Benefit of using the STM32 Support Package

- quickly deploy your application models in MATLAB and Simulink to STM32 MCUs
  
- Automate
  - the process from "C" code generation to programming STM32 F4 or STM32F30x
  - Code generation reporting
  - Code execution profiling reporting for PIL execution

# Summary for STM32 embedded target for MATLAB and Simulink release 3.1:

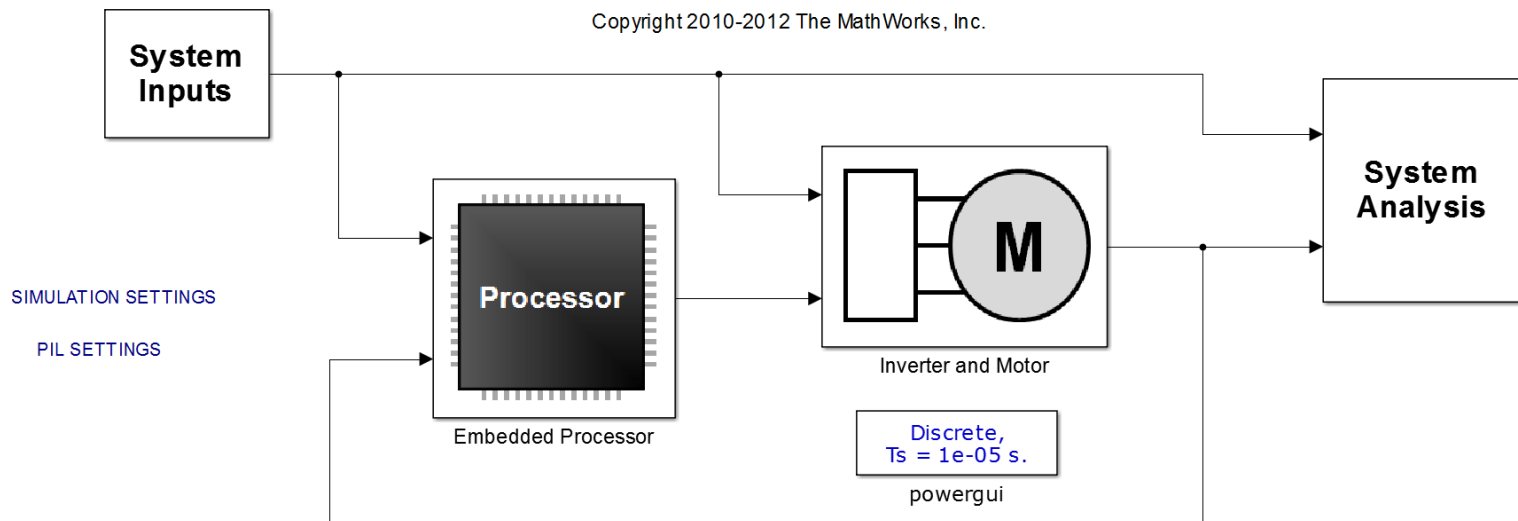
- Supported MCUs: STM32 F4 and F30x series
- Automated Processor-in-the-Loop (PIL) Testing using USART communication link
- Support for
  - IAR EWARM
  - Atollic TrueSTUDIO
  - Keil MDK-ARM
- Peripheral driver blockset including ADCs, GPIOs, USARTs, and Timers



# DEMO

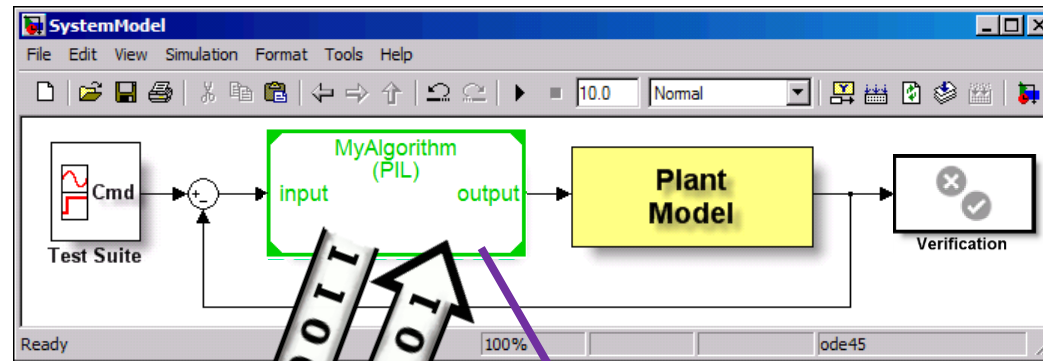
## Field-Oriented Control of Permanent Magnet Synchronous Machine System Test Bench

Copyright 2010-2012 The MathWorks, Inc.

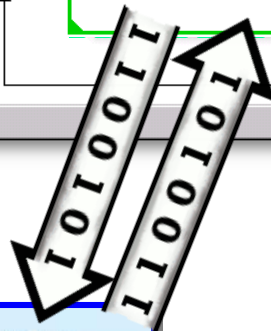
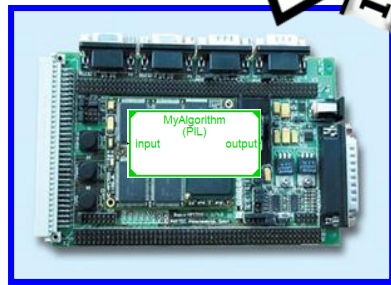


# Processor-in-the-Loop (PIL)

Verify compiled object code matches simulation



Non-real-time execution:  
synchronized with simulation



- Verify numerical equivalence
- Assess execution time
- Collect code coverage
- Create certification artifacts

- **Software-In-the-Loop (SIL)** can be leveraged as well

# Benefit of using the STM32 Support Package

- quickly deploy your application models in MATLAB and Simulink to STM32 MCUs
  
- Automate
  - the process from "C" code generation to programming STM32 F4 or STM32F30x
  - Code generation reporting
  - Code execution profiling reporting for PIL execution