

# **Model-Based Design Toolbox i.MX RT 1xxx Series**

## **Quick Start Guide**

**Automatic Code Generation for the i.MX RT 1xxx Family of Processors  
Version 1.3.0**

**Target Based Automatic Code Generation Tools**  
For MATLAB™/Simulink™/Stateflow™ Models working with Simulink Coder™ and Embedded Coder®



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# 1 Installation

Installing the Model-Based Design Toolbox is the first step in setting up and running automatic C code generation from MATLAB/Simulink for NXP's embedded target processors and development boards.

## 1.1 System Requirements

For a flowless development experience the minimum recommended PC platform is:

- *Windows® OS*: any x64 processor
- At least 4 GB of RAM
- At least 6 GB of free disk space.
- Internet connectivity for web downloads.

**Operating System Supported**

	SP Level	64-bit
Windows 7	SP1	X
Windows 10		X

## 1.2 Installation Steps

NXP's Model-Based Design Toolbox is delivered as MATLAB Toolbox Package that can be installed offline or online from MathWorks Add-ons. This document shows how to install the offline package, assuming you have already downloaded the file from NXP's [MBDT official download web page](#).

To have the toolbox installed and configured properly the following actions should be executed:

1. Run the MATLAB toolbox package file \*.mltbx downloaded from [NXP's Model-Based Design Toolbox web page](#) by pressing on the **Download** button.
2. Setup the MATLAB path for Model-Based Design Toolbox and generate the appropriate toolchain setting for the user MATLAB environment.

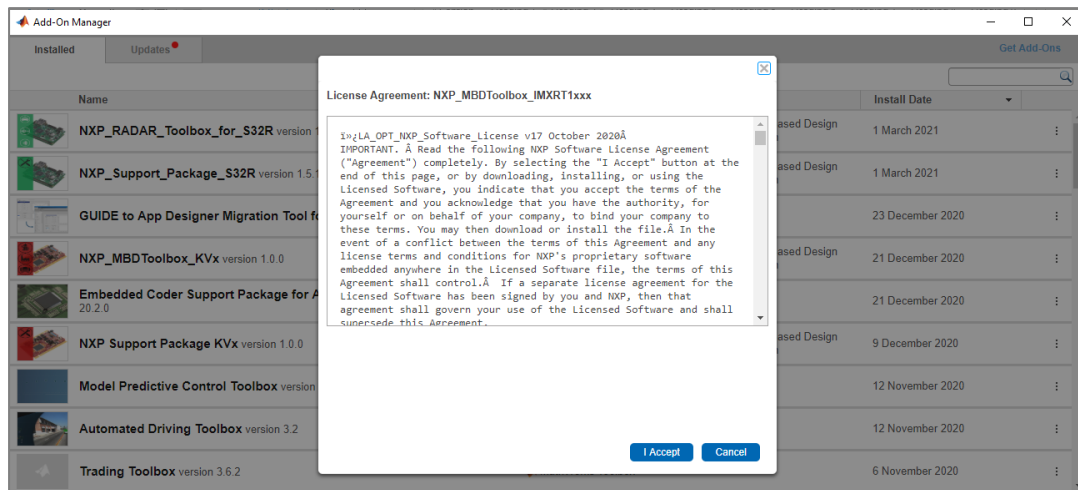
Each of these actions is explained in the following sub-chapters.

## 1.2.1 Run Add-on installer

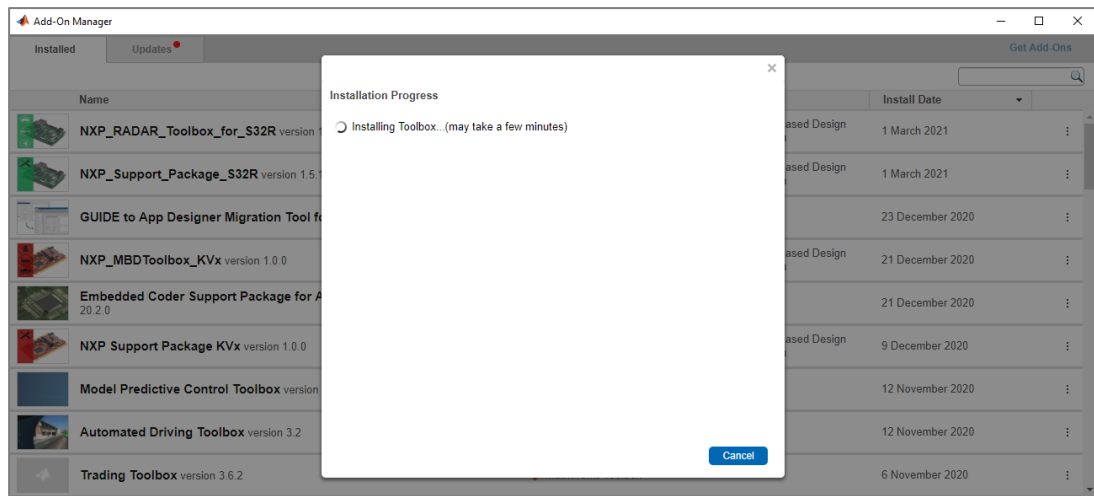
Install the NXP's Model-Based Design Toolbox by double-clicking the \*.mltbx file. This will activate the MATLAB Add-ons installer that will automatically start the installation process.

After the MATLAB opens, you will be prompted with the following options:

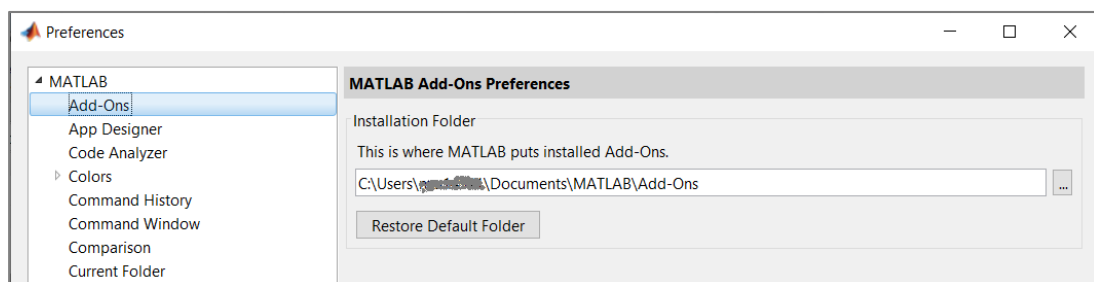
1. Indicate acceptance of the NXP Software License Agreement by selecting “I Accept” to proceed.



- 
2. The rest of the process is silent and under MATLAB control. All the files will be automatically copied into the default Add-Ons folder within the MATLAB

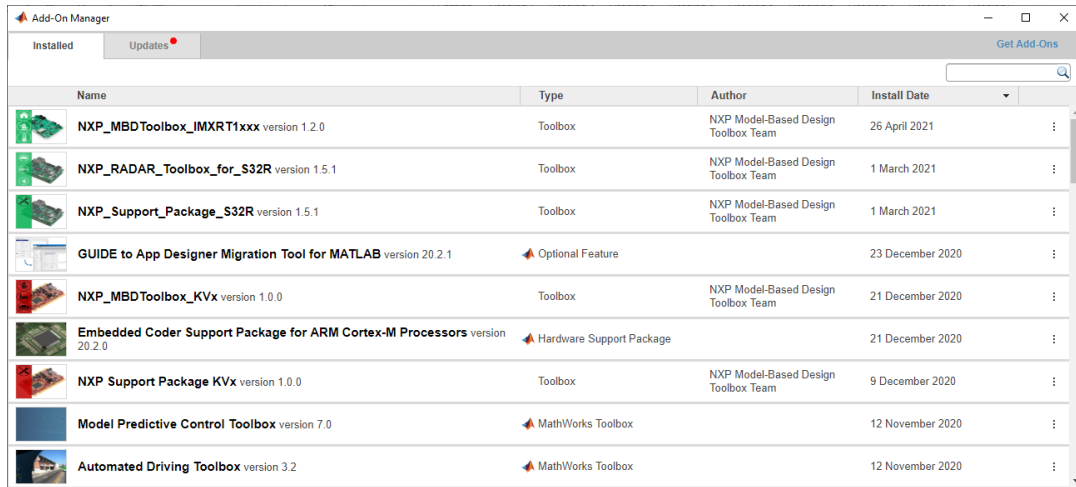


The default location can be changed before installation by changing the Add-Ons path from MATLAB Preferences



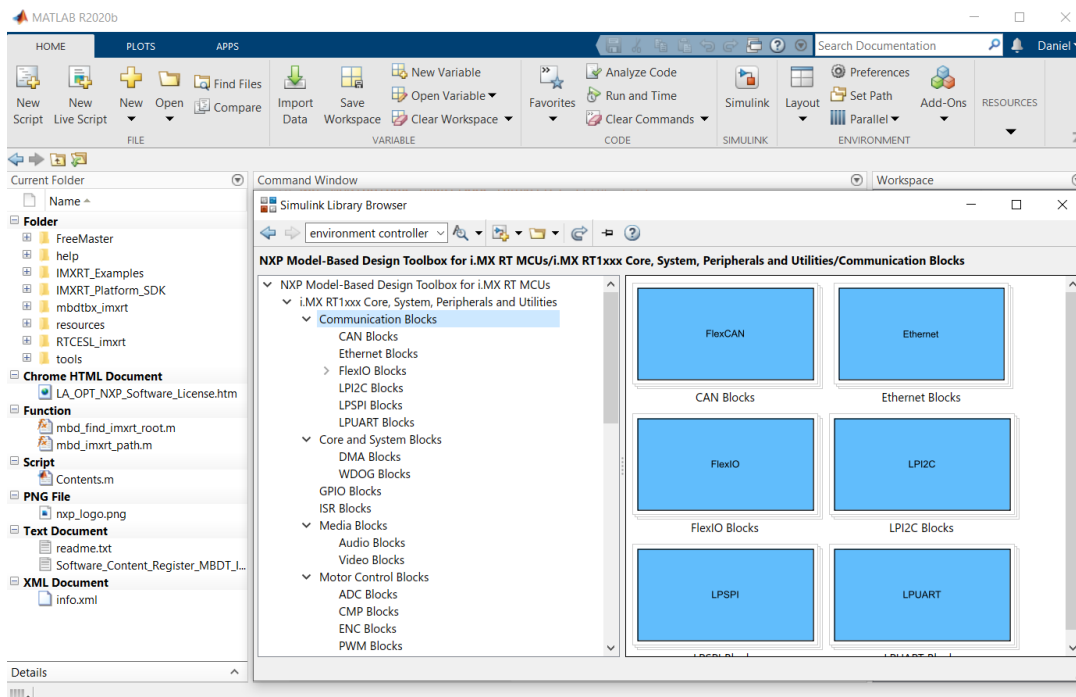
**Note:** *It is recommended to install the MATLAB and NXP Toolbox into a location that does not contains special characters, empty spaces, or mapped drives.*

- After a couple of minutes (4-5min), the NXP's Model-Based Design Toolbox should be visible as a new Add-ons.

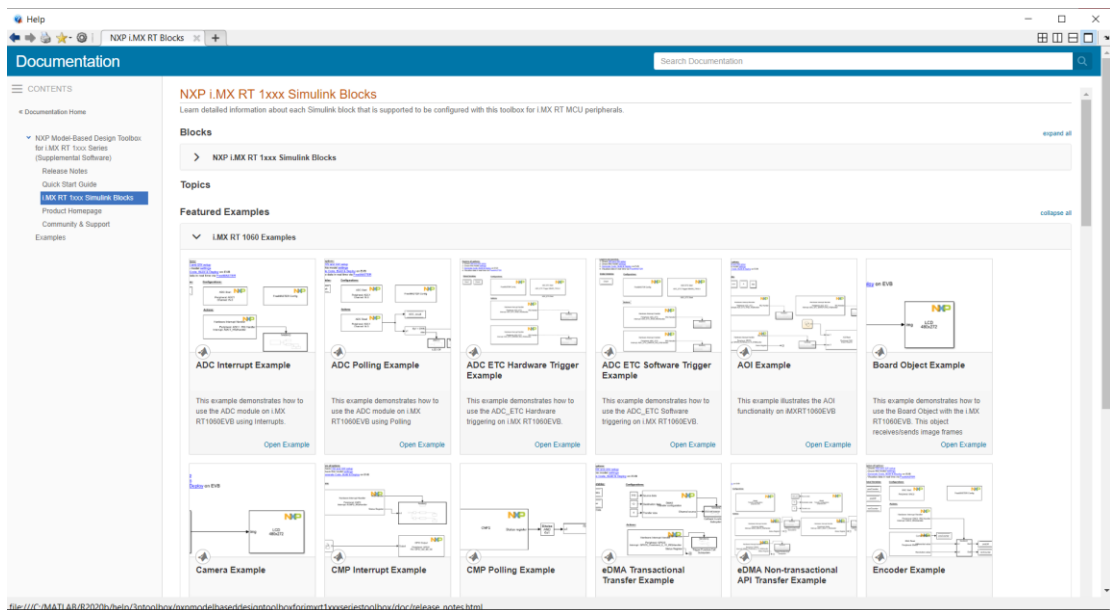


Name	Type	Author	Install Date
NXP_MBDToolbox_IMXRT1xxx version 1.2.0	Toolbox	NXP Model-Based Design Toolbox Team	26 April 2021
NXP_RADAR_Toolbox_for_S32R version 1.5.1	Toolbox	NXP Model-Based Design Toolbox Team	1 March 2021
NXP_Support_Package_S32R version 1.5.1	Toolbox	NXP Model-Based Design Toolbox Team	1 March 2021
GUIDE to App Designer Migration Tool for MATLAB version 20.2.1	Optional Feature		23 December 2020
NXP_MBDToolbox_KVx version 1.0.0	Toolbox	NXP Model-Based Design Toolbox Team	21 December 2020
Embedded Coder Support Package for ARM Cortex-M Processors version 20.2.0	Hardware Support Package		21 December 2020
NXP Support Package KVx version 1.0.0	Toolbox	NXP Model-Based Design Toolbox Team	9 December 2020
Model Predictive Control Toolbox version 7.0	MathWorks Toolbox		12 November 2020
Automated Driving Toolbox version 3.2	MathWorks Toolbox		12 November 2020

- NXP's Model-Based Design Toolbox layout and Simulink Library are shown below



5. NXP's Model-Based Design Toolbox documentation, help, and examples are fully integrated with the MATLAB development environment. Get more details by accessing the standard Help and **Supplemental Software** section

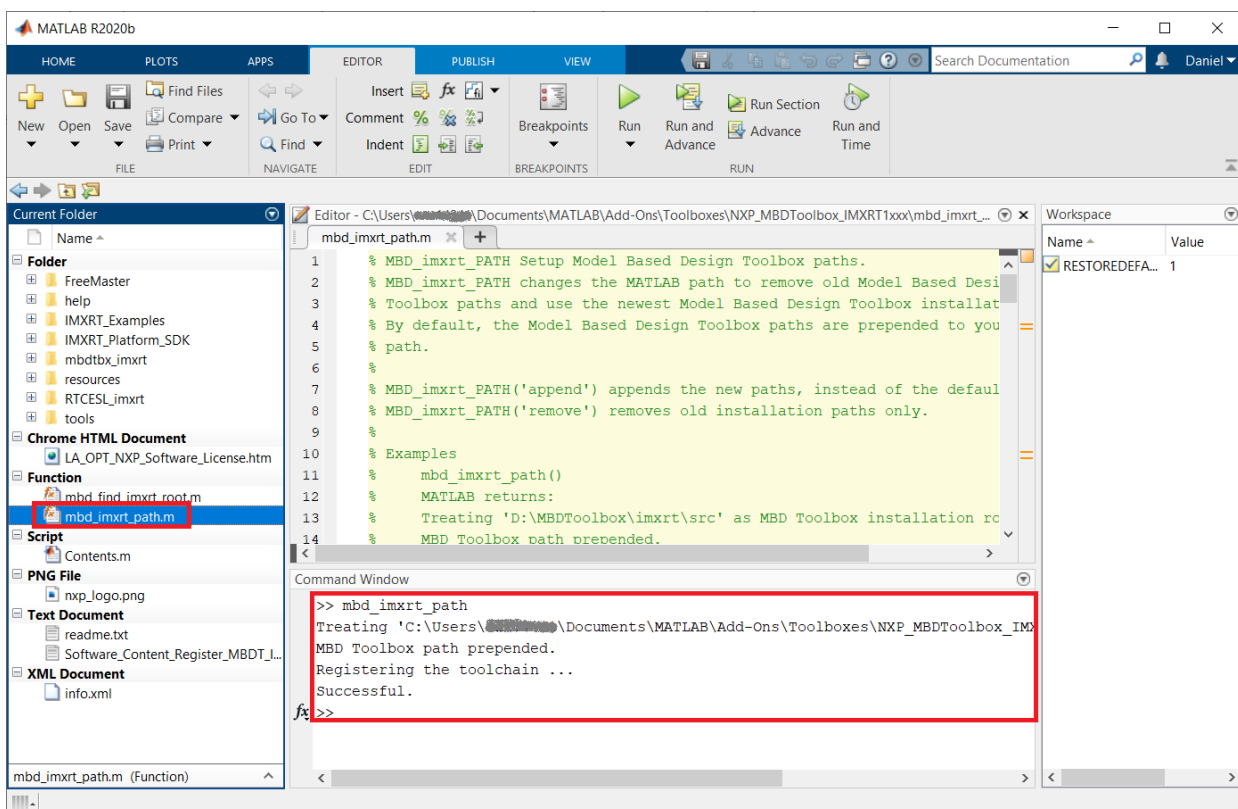


## 1.2.2 Setting the Path for Model-Based Design Toolbox and Toolchain Generation

The Model-Based Design Toolbox uses the Toolchain mechanism exposed by the Simulink to enable automatic code generation with the Embedded Coder toolbox. By default, the toolchain is configured for the MATLAB 2019a release. For any other MATLAB release, the user needs to execute a toolbox m-script to generate the appropriate settings for his/her installation environment.










This is done by changing the MATLAB Current Directory to the toolbox installation directory (e.g.: `..\MATLAB\Add-Ons\Toolboxes\NXP_MBDToolbox_IMXRT1xxx\`) and running the “`mbd_imxrt_path.m`” script.

```
>> mbd_imxrt_path
Treating '...\MATLAB\Add-Ons\Toolboxes\NXP_MBDToolbox_IMXRT1xxx' as MBD
Toolbox installation root.
MBD Toolbox path prepended.
Registering the toolchain ...
Successful.
>>
```



This mechanism requires users to install the [Embedded Coder Support Package for ARM Cortex-M Processor](#) as a prerequisite.



Add-On Manager				
Installed		Updates		Get Add-Ons
Name	Type	Author	Install Date	
 <b>NXP_MBDToolbox_IMXRT1xxx</b> version 1.2.0	Toolbox	NXP Model-Based Design Toolbox Team	26 April 2021	:
 <b>NXP_RADAR_Toolbox_for_S32R</b> version 1.5.1	Toolbox	NXP Model-Based Design Toolbox Team	1 March 2021	:
 <b>NXP_Support_Package_S32R</b> version 1.5.1	Toolbox	NXP Model-Based Design Toolbox Team	1 March 2021	:
 <b>GUIDE to App Designer Migration Tool for MATLAB</b> version 20.2.1	Optional Feature		23 December 2020	:
 <b>NXP_MBDToolbox_KVx</b> version 1.0.0	Toolbox	NXP Model-Based Design Toolbox Team	21 December 2020	:
 <b>Embedded Coder Support Package for ARM Cortex-M Processors</b> version 20.2.0	Hardware Support Package		21 December 2020	:
 <b>NXP_Support_Package_KVx</b> version 1.0.0	Toolbox	NXP Model-Based Design Toolbox Team	9 December 2020	:
 <b>Model Predictive Control Toolbox</b> version 7.0	MathWorks Toolbox		12 November 2020	:
 <b>Automated Driving Toolbox</b> version 3.2	MathWorks Toolbox		12 November 2020	:

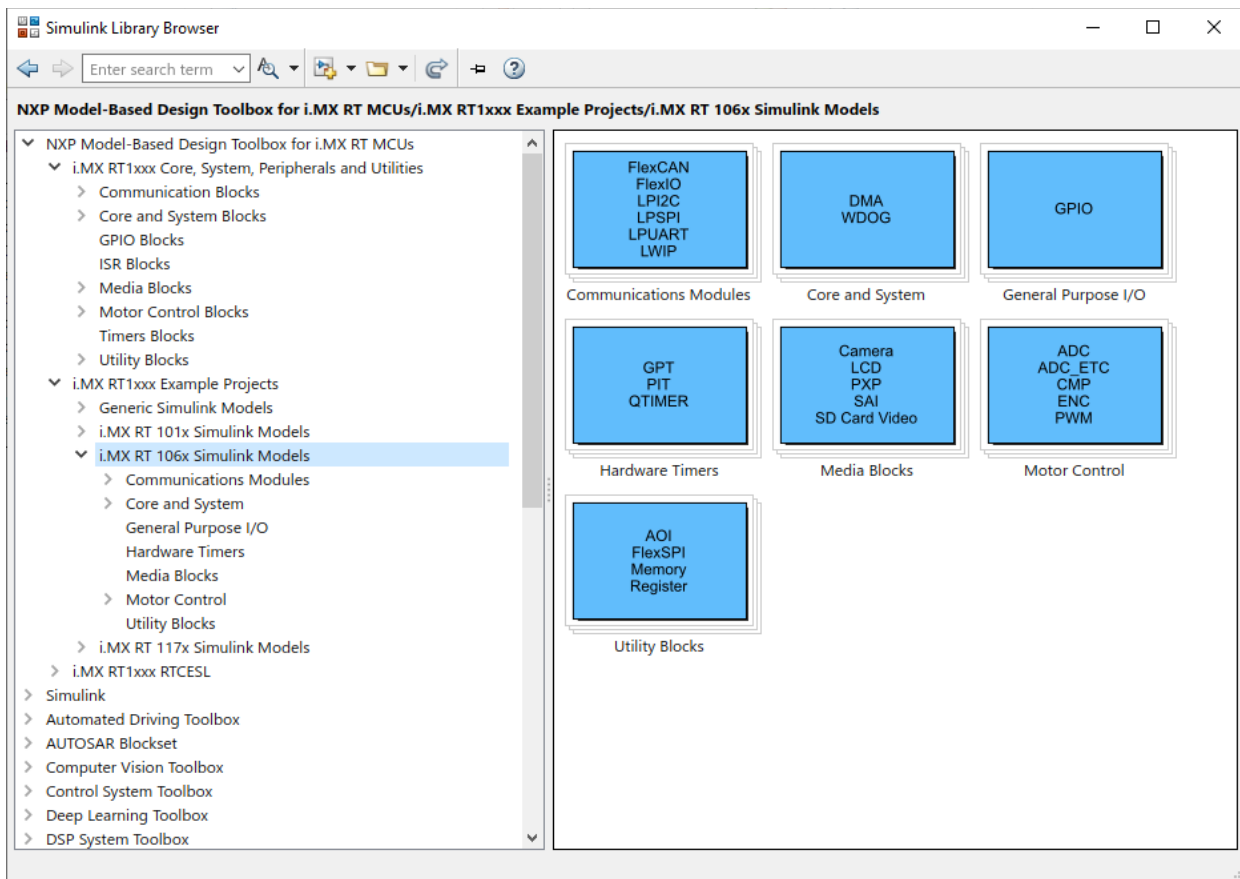
The “`mbd_imxrt_path.m`” script verifies the user setup dependencies and will issue instructions for a successful installation and configuration of the toolbox.

## 2 Run Models

### 2.1 Examples Library & Help

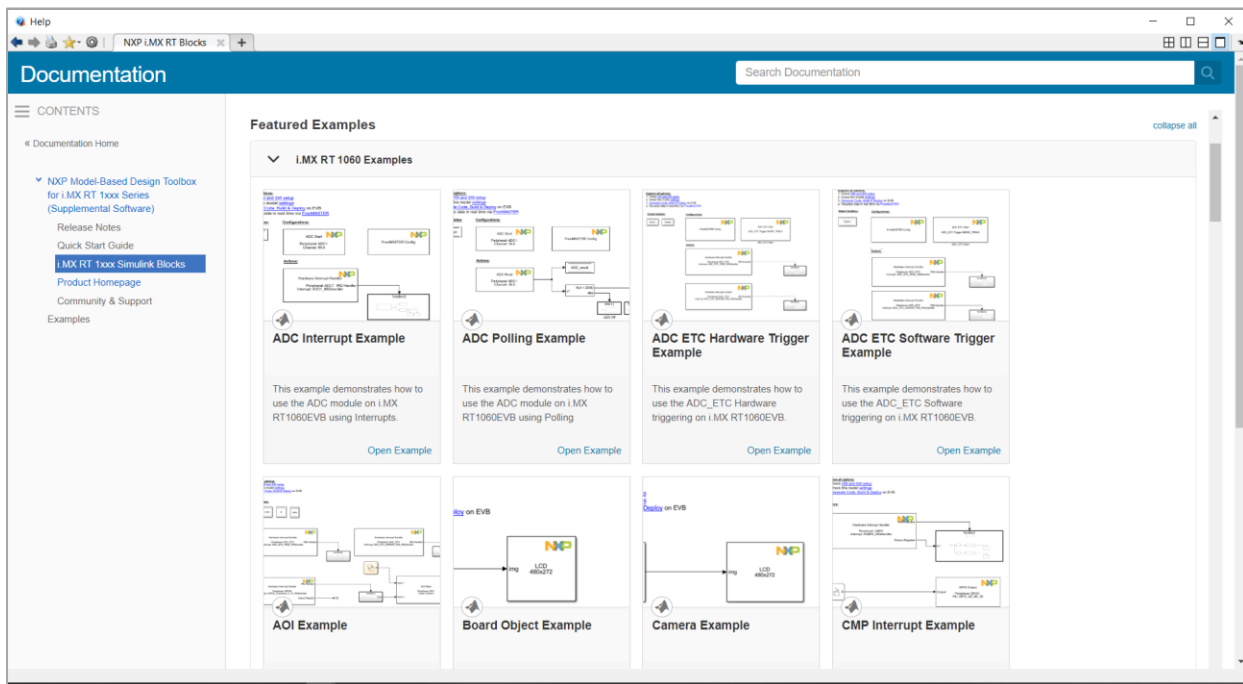
NXP's Model-Based Design Toolbox comes with an Examples Library collection that lets you test different MCU on-chip modules and run complex applications.

The Examples Library `mbd_imxrt_examples.slx` can be opened from “{Model Based Design Install Directory}\IMXRT\_Examples\” folder or directly from the Simulink Library Browser main window



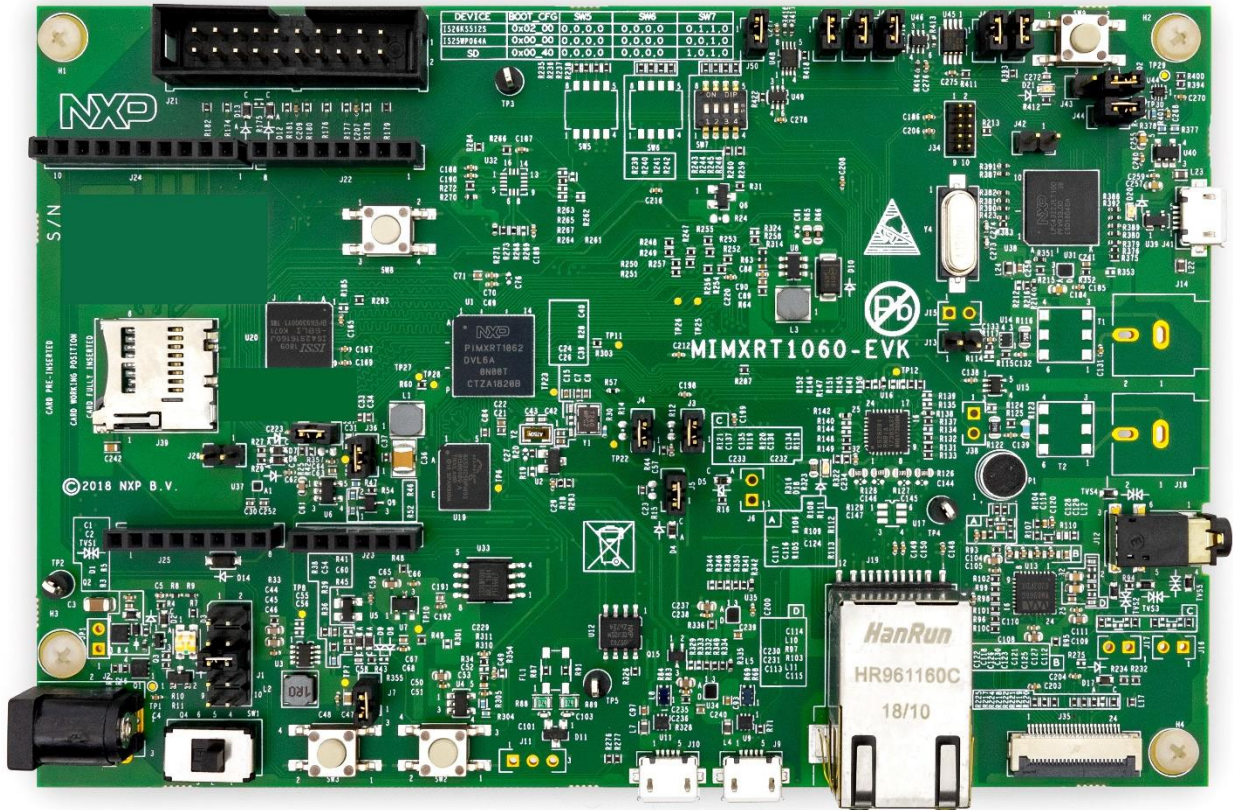
Each category contains multiple examples that showcase different Model-Based Design Toolbox capabilities that are categorized into different groups.

The examples are also available from standard MATLAB Help for NXP's Model-Based Design Toolbox Example



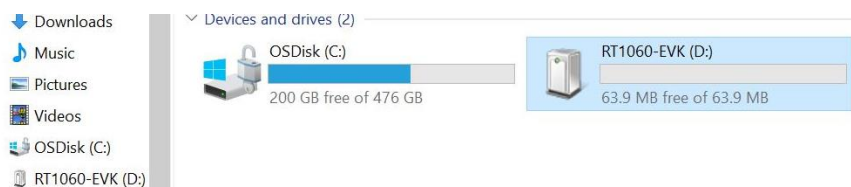
## 2.2 Hardware Setup

All examples provided with the Model-Based Design Toolbox were developed on MIMXRT1060-EVK as the primary hardware target. Additional information about this development kit can be found on NXP official web page [here](#).



Before running any example on the MIMXRT1060-EVK a proper communication setup between the board and the host PC must be enabled. Please follow the next steps to ensure a working setup:

1. Connect the EVK micro USB connector to a host PC USB connector;
2. Allow the PC to automatically configure the USB drivers if needed. Windows OS should automatically detect the MIMXRT1060-EVK and should assign a virtual COM port and a virtual mass storage device to the host;
3. Once the board is recognized, it should appear as a mass storage device in your PC with the name RT1060-EVK;



## 2.3 A “Hello World” Example

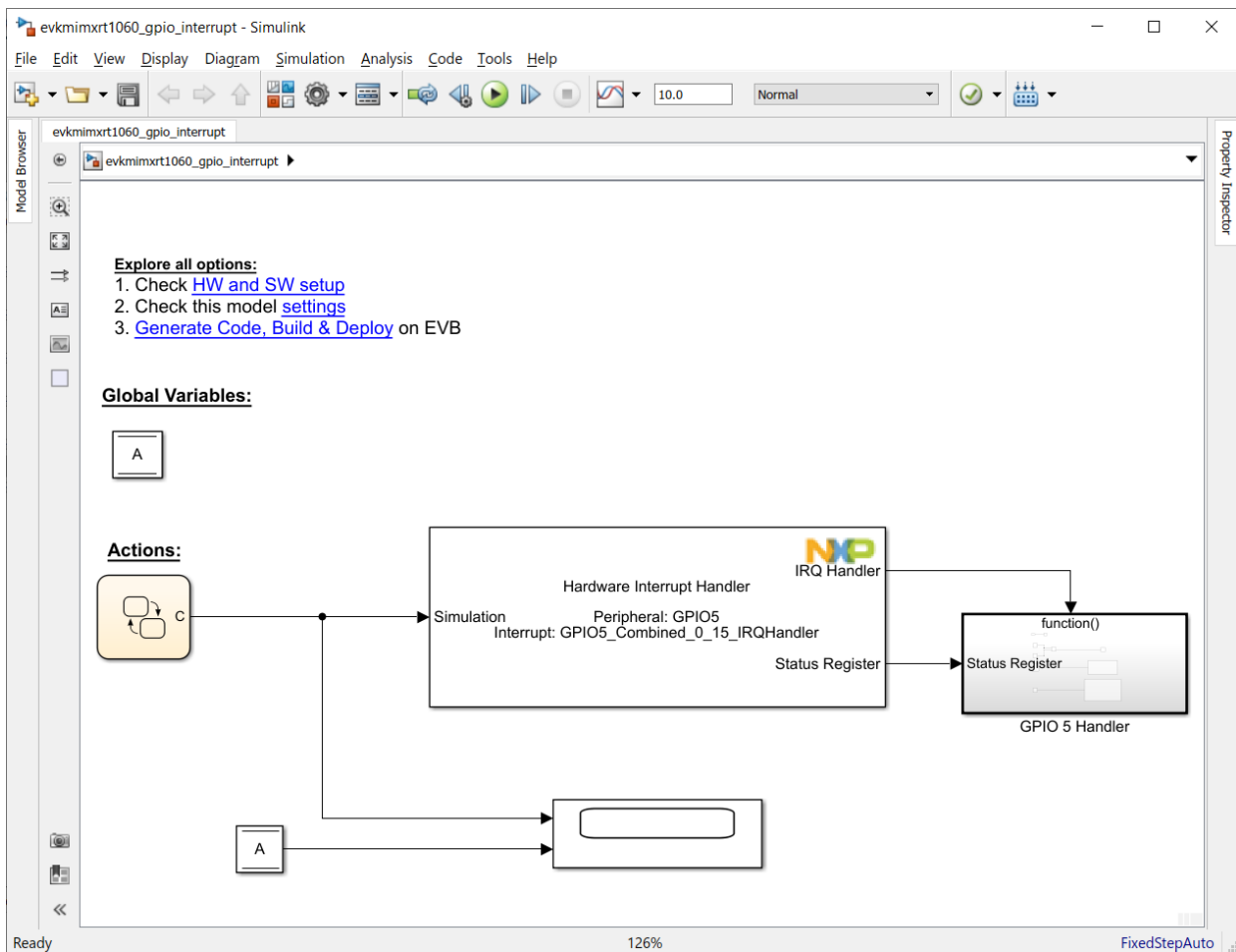
If the hardware setup is completed successfully:

- a virtual COM port is created and visible in Control Panel -> Device Manager -> Port (COM & LPT)
- a virtual mass storage device is present

then all ingredients are present for running successfully the Model-Based Design Toolbox for i.MX RT 1xxx specific examples.

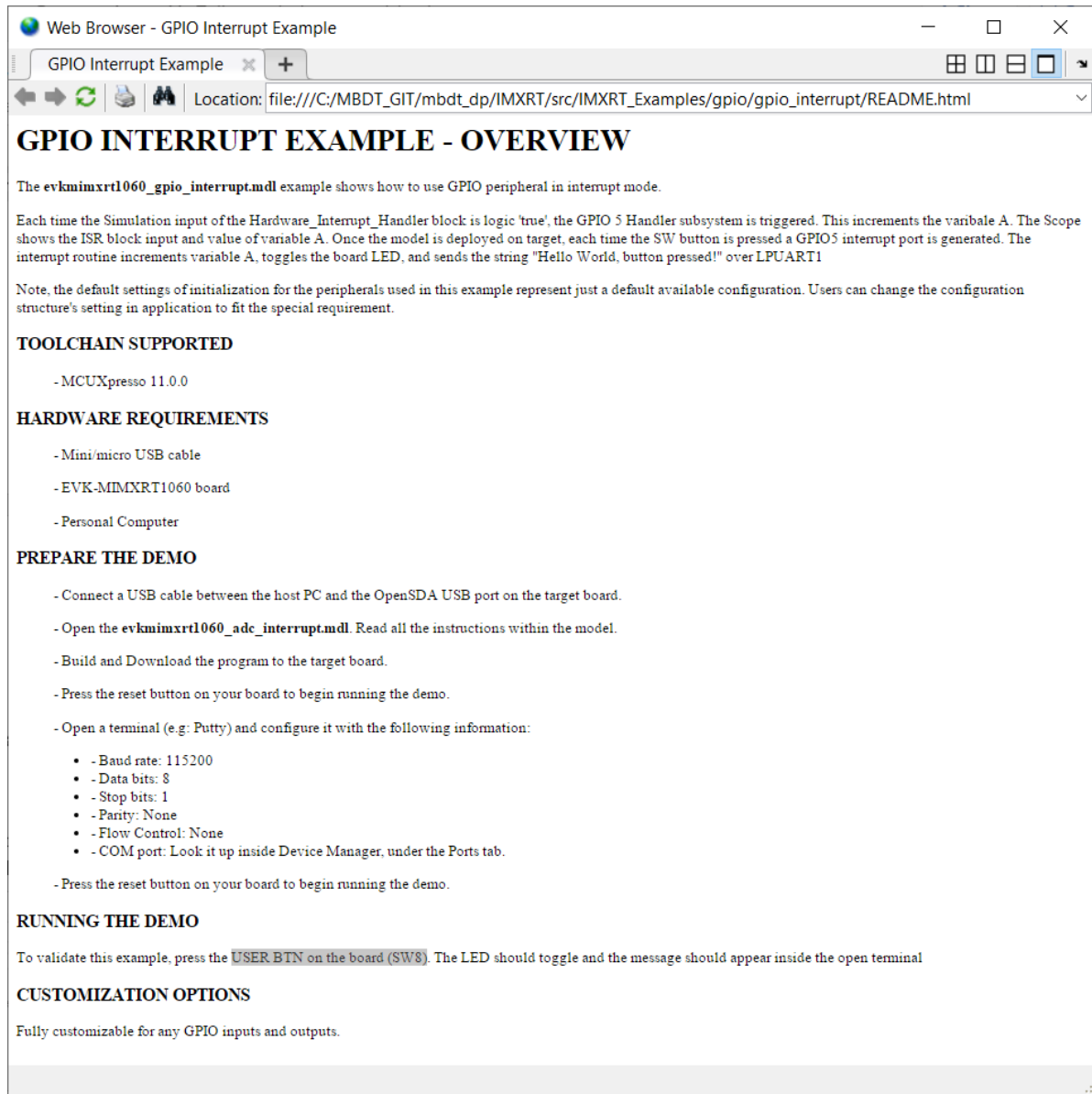
Navigate to “\IMXRT\_Examples\imxrt106x\gpio\gpio\_interrupt” folder and open the evkmimxrt1060\_gpio\_interrupt.mdl Simulink model.

This model programs the MIMXRT1060-EVK to sent a “Hello World” type of message over the UART each time the USER BTN on the board (SW8) is pressed. The LED should toggle and the message should appear inside the UART terminal.



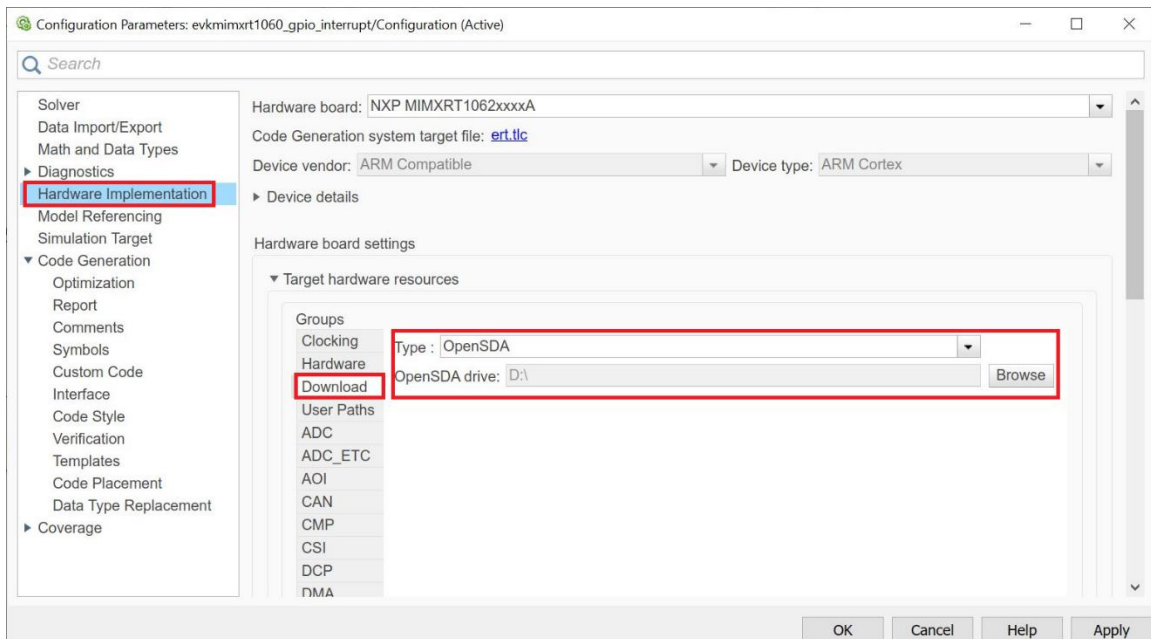
Follow the next steps to run the example:

1. Open and README.html file to understand the hardware and software requirements for running the application

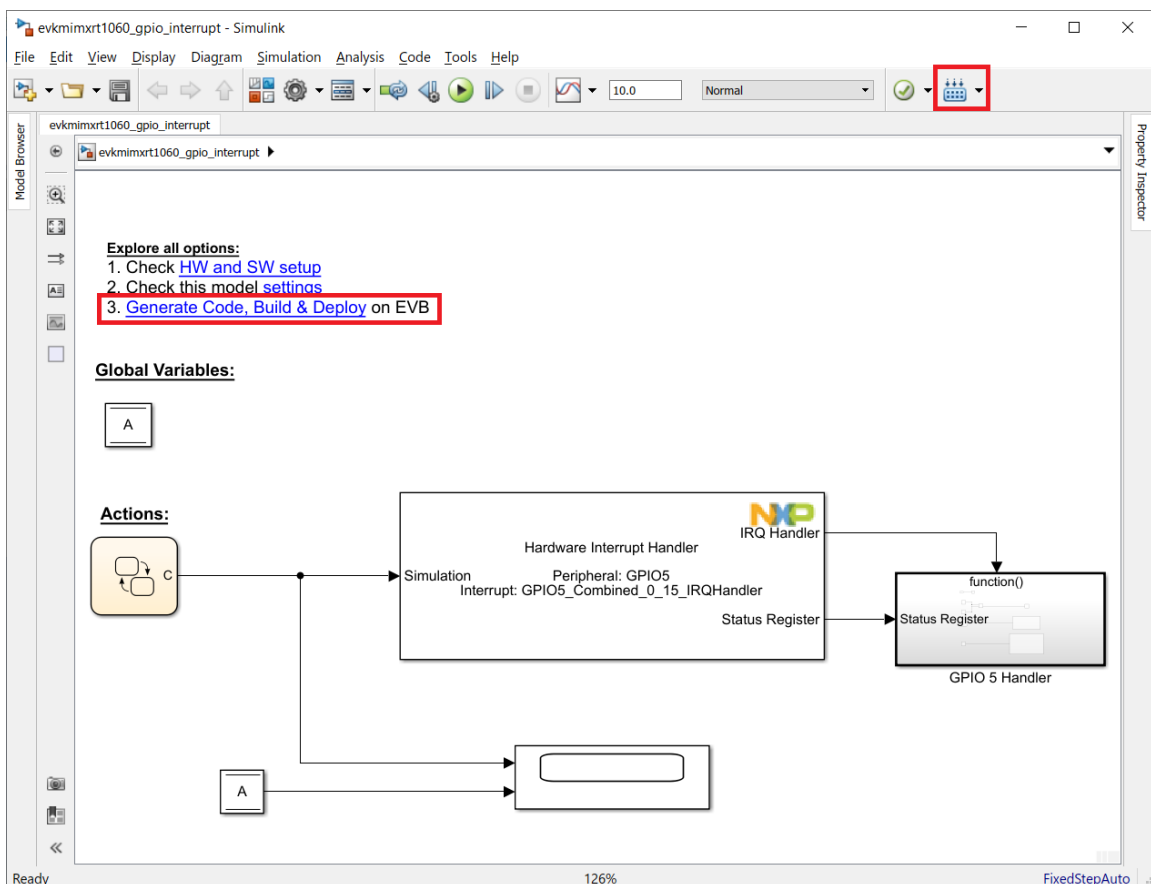




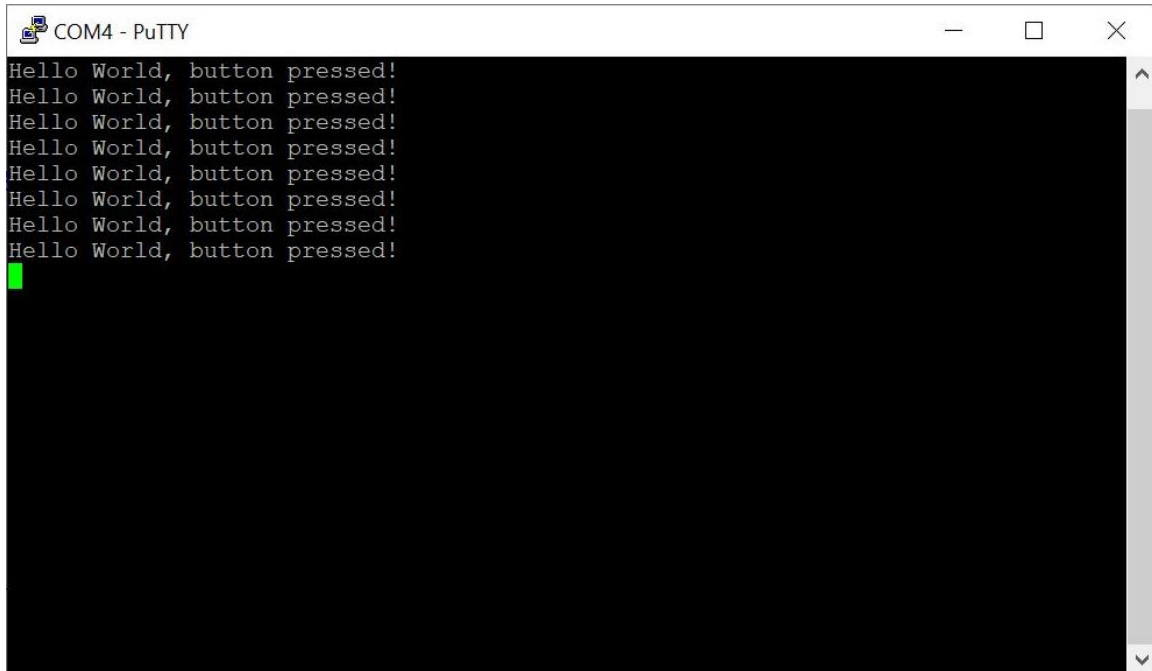
- Open the Simulink Model Configuration Parameters and select the appropriate OpenSDA drive used to application download to the MIMXRT1060-EVK.



- Press the Build Model button and wait until the code is generated, compiled, and downloaded to the evaluation board. Alternatively, you can press on the text highlighted in the model to start the process automatically.



4. Open any UART terminal (e.g.: puTTY.exe) for the virtual COM port assigned and set up the baud rate at 115200, data bits 8 and parity none.
5. Press the reset button on the evaluation board.
6. Now, press the USER BTN on the board (SW8). The board should send “Hello World, button pressed!” message over the UART and the UART terminal should display it.



```
COM4 - PuTTY
Hello World, button pressed!
Hello World, button pressed!
Hello World, button pressed!
Hello World, button pressed!
Hello World, button pressed!
Hello World, button pressed!
Hello World, button pressed!
Hello World, button pressed!
█
```

Congratulations! You succeeded with running your first example created with  
Model-Based Design Toolbox for IMXRT1xxx



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