

# Model-Based Design Toolbox KVx Series

## Release Notes

**Automatic Code Generation for the KVx Family of Processors**  
**Version 1.0.0**

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

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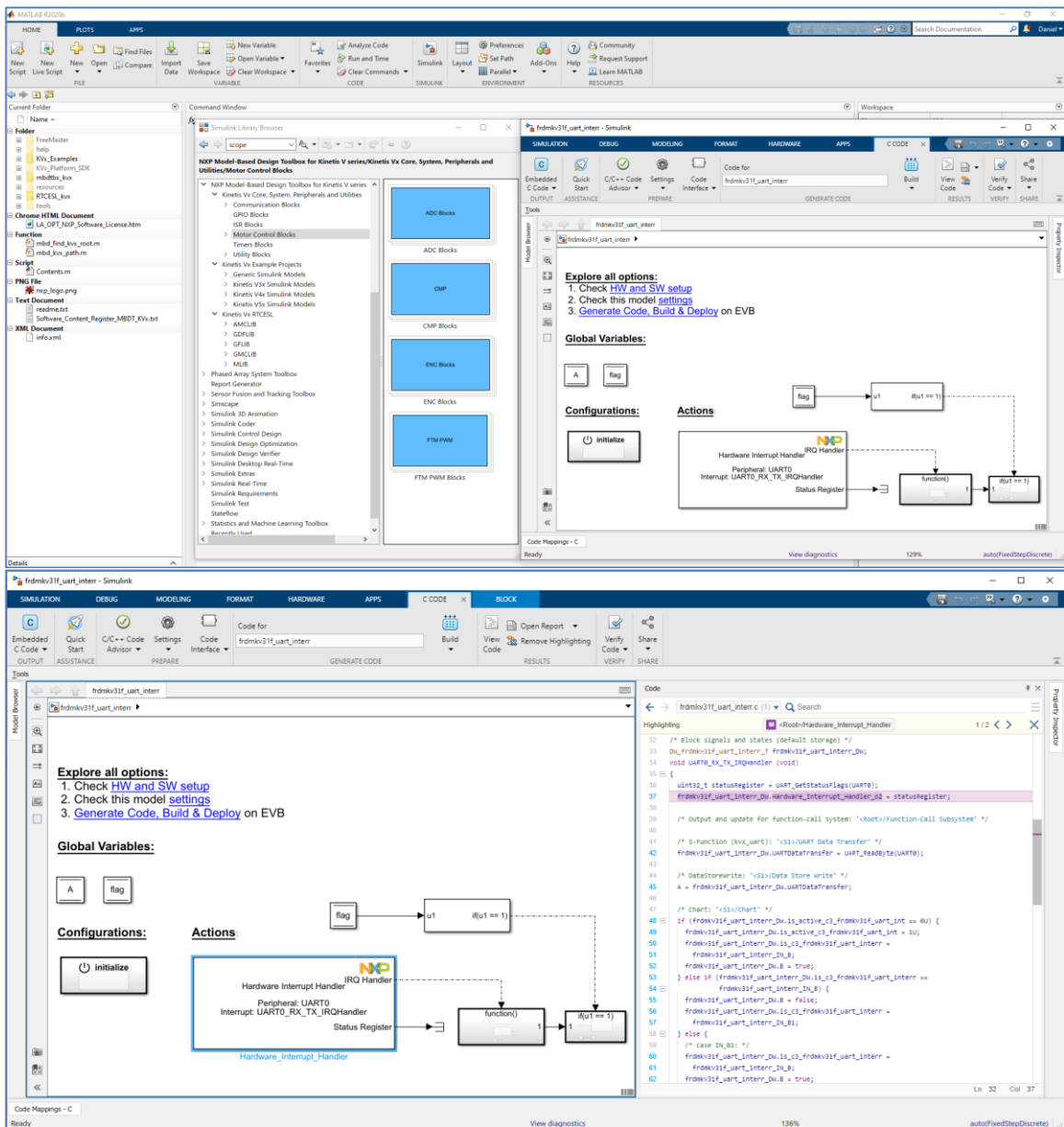
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# 1 Main Features

The [NXP's Model-Based Design Toolbox for KVx Series version 1.0.0](#) is designed to support all the Kinetis KV5x, KV4x and KV3x MCUs into MATLAB/Simulink environment, allowing users to:

- **Design** applications using Model-Based Design methodologies;
- **Simulate** and **Test** Simulink models for KVx before deploying the models to the hardware targets;
- **Configure** the MCU peripherals from Simulink Block via MCUXpresso Configuration Tools
- **Generate** the application code automatically without any needs for hand coding C/ASM
- **Deployment** of the application directly from MATLAB/Simulink to the NXP evaluation boards



The main features and functionalities supported in this release of the toolbox are:

- Support for the **Kinetis KV5x, KV4x and KV3x** MCUs and their correspondent Evaluation Boards [TWR-KV58F220M](#), [TWR-KV46F150M](#) and [FRDM-KV31F](#);
- Integrates the latest **MCUXpresso Kinetis SDK version 2.8.0**. NXP's Model-Based Design Toolbox generates codes based on standard SDK API, covering most of the functionalities exposed by SDK;
- Compatible with **Configuration Tools 9.0** and **GCC 9.2.1**;
- Compatible with MATLAB releases **R2019a/b** and **R2020a/b**;
- Fully integrated with **Simulink Toolchain**;
- Includes extensive **Simulink Library Blocks** for KVx devices, providing multiple dedicated NXP blocks to configure most of the MCU peripherals.
- Includes an **Example library with more than 130 examples** that cover a wide range of topics like:
  - I/O control: GPIO
  - Timers: Programmable (PIT), General Purpose (GPT),
  - Motor Control: Pulse Width Modulation (PWM), Analogue Converter (ADC), Sensors (ENC)
  - Communication: SPI, I2C, UART
  - Software-in-the-Loop, Processor-in-the-Loop, and External Mode

For more details about each of the topics highlighted above please refer to the following chapters.

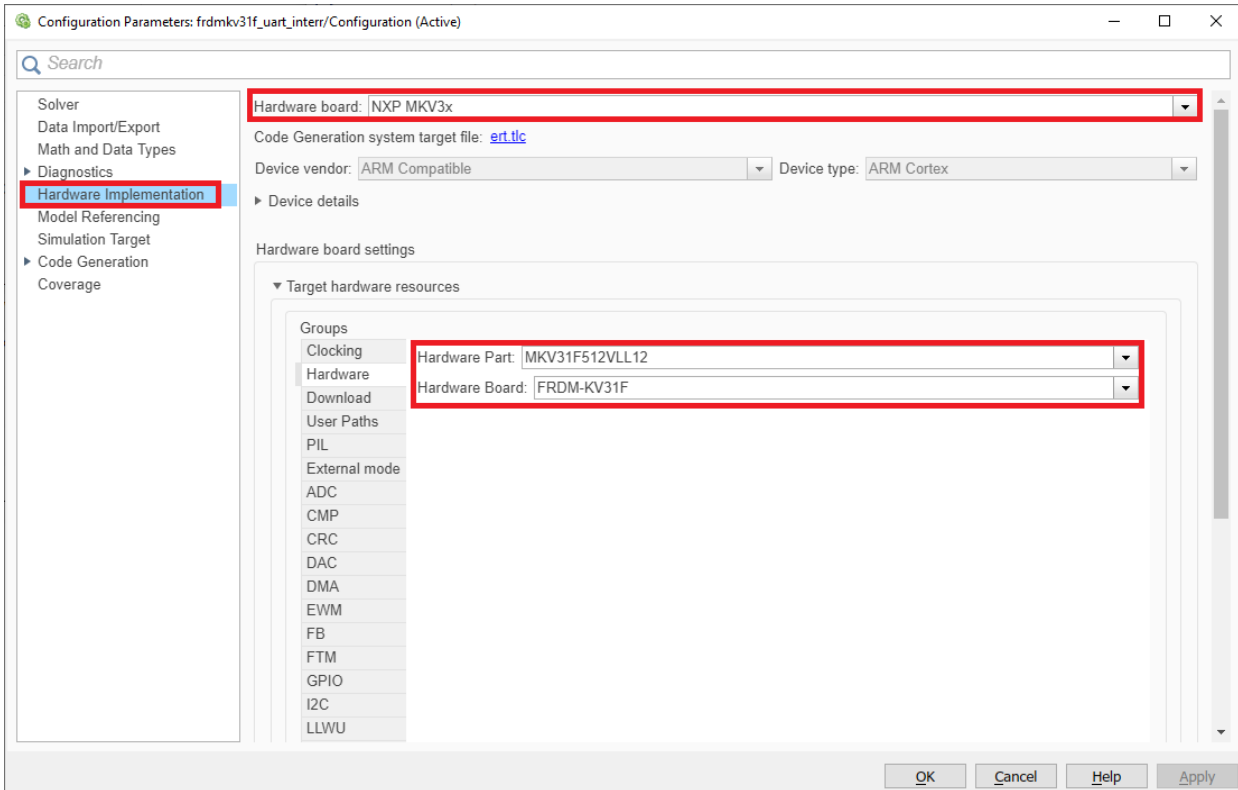
## 2 Kinetis KVx MCU Support

### 2.1 Packages & Derivatives

The [NXP's Model-Based Design Toolbox for KVx Series version 1.0.0](#) supports:

- Kinetis KV5x MCU Packages:
  - o MKV56F1M0VLL24, MKV56F1M0VLQ24, MKV56F1M0VMD24
  - o MKV56F512VLL24, MKV56F512VLQ24, MKV56F512VMD24
  - o MKV58F1M0VLL24, MKV58F1M0VLQ24, MKV58F1M0VMD24
  - o MKV58F512VLL24, MKV58F512VLQ24, MKV58F512VMD24
  
- Kinetis KV4x MCU Packages:
  - o MKV42F128VLF16, MKV42F128VLH16, MKV42F128VLL16
  - o MKV42F256VLH16, MKV42F256VLL16
  - o MKV42F64VLF16, MKV42F64VLH16
  - o MKV44F128VLF16, MKV44F128VLH16, MKV44F128VLL16
  - o MKV44F256VLH16, MKV44F256VLL16
  - o MKV44F64VLF16, MKV44F64VLH16
  - o MKV46F128VLH16, MKV46F128VLL16
  - o MKV46F256VLH16, MKV46F256VLL16
  
- Kinetis KV3x MCU Packages:
  - o MKV30F128VFM10, MKV30F128VLF10, MKV30F128VLH10
  - o MKV30F64VLF10, MKV30F64VFM10, MKV30F64VLH10
  - o MKV31F128VLH10, MKV31F128VLL10
  - o MKV31F256VLH12, MKV31F256VLL12
  - o MKV31F512VLL12, MKV31F512VLH12

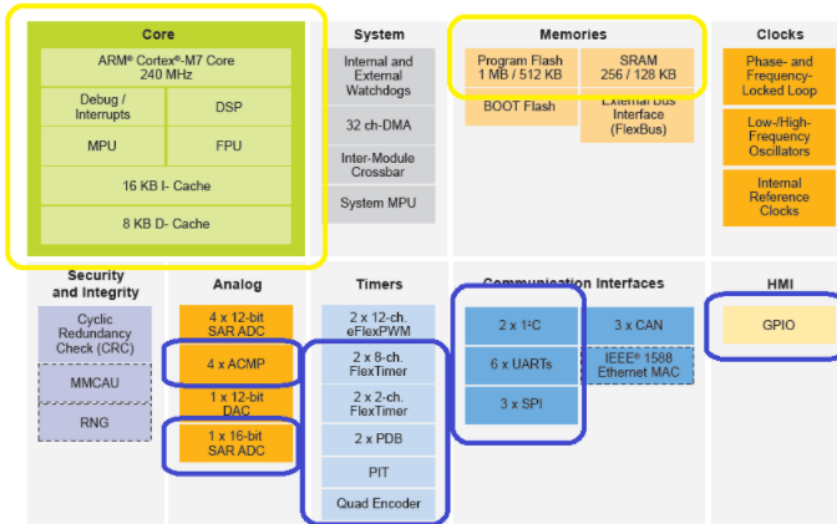
The configurations can be easily changed for each Simulink model from the **Model Configuration Parameters** menu:



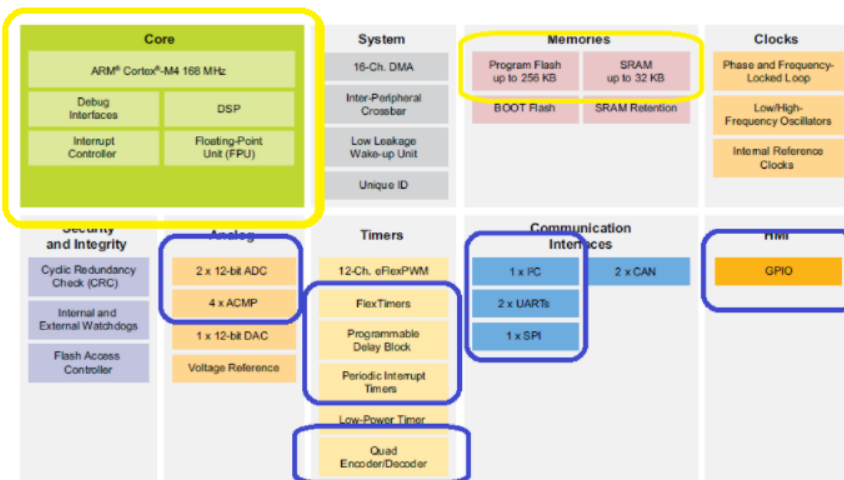
## 2.2 Peripherals & Devices

The [NXP's Model-Based Design Toolbox for KVx Series version 1.0.0](#) supports the following peripherals and devices that are highlighted:

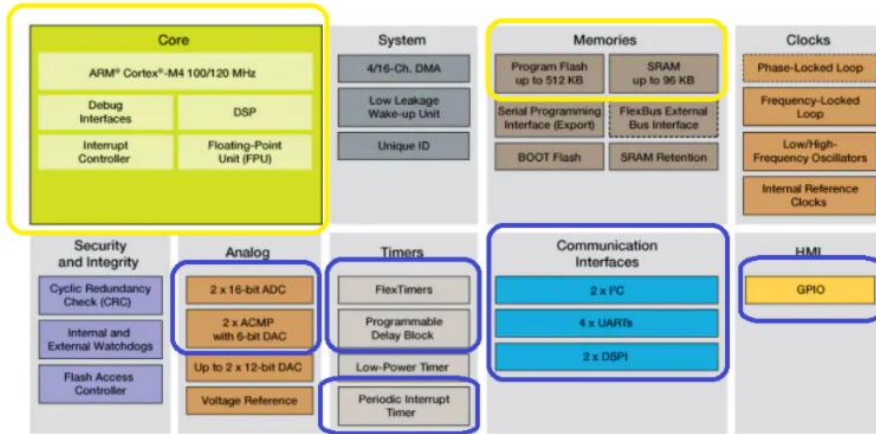
### Kinetis KV5x derivatives



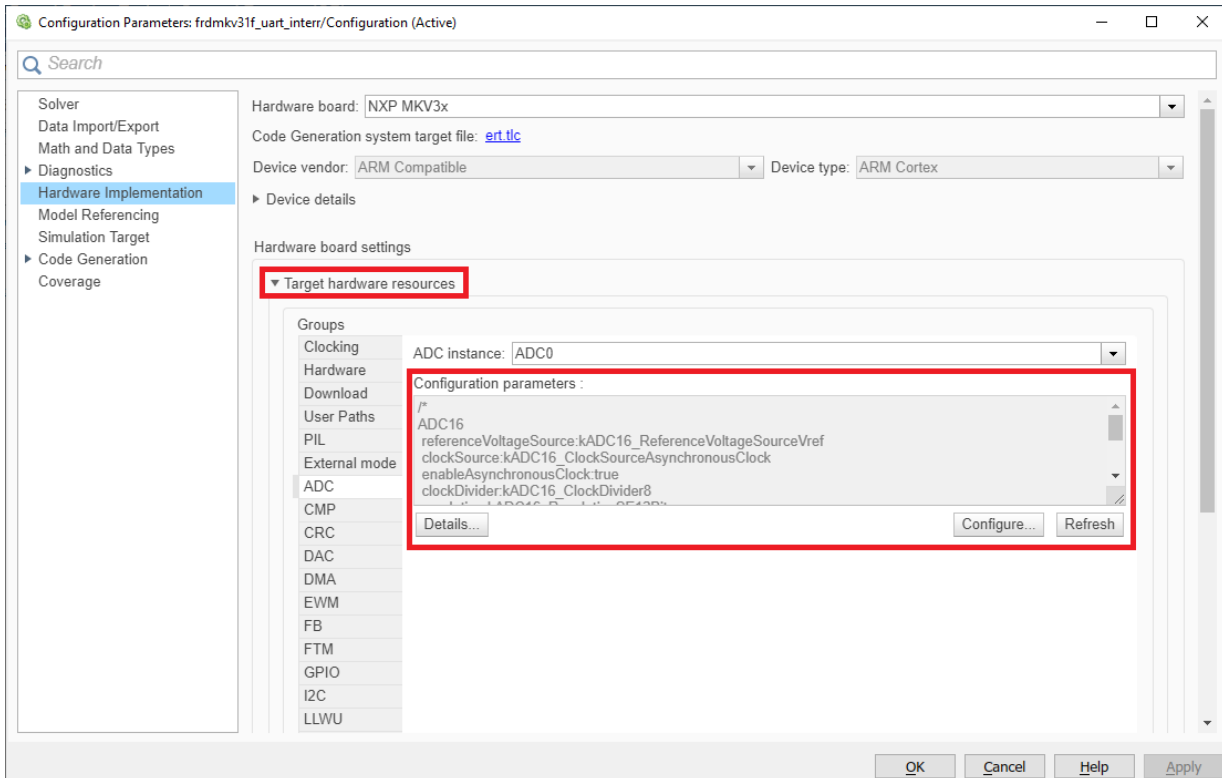
### Kinetis KV4x derivatives



## Kinetis KV3x derivatives



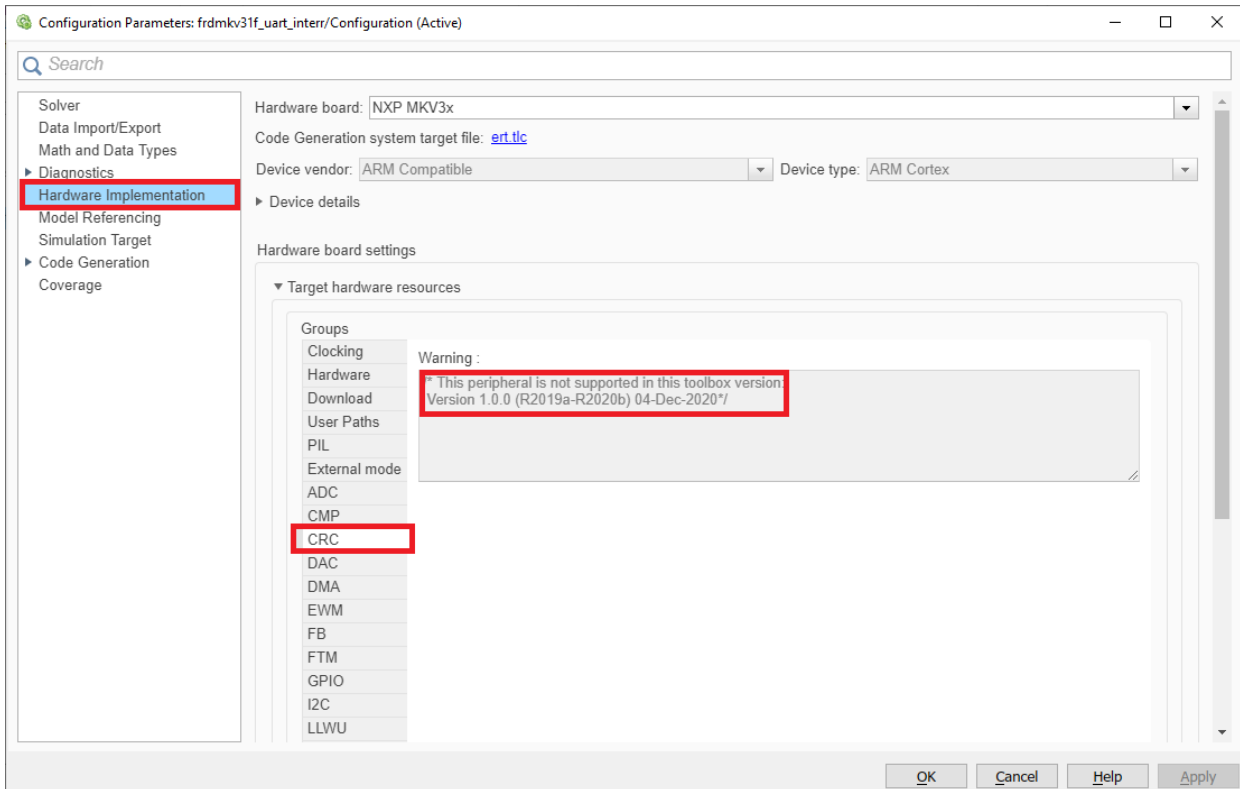
The default configuration supported by the toolbox for each peripheral is available Target Hardware Resources panels.



From this panel, the user can access the PDF document using the **Details...** button or update the model configuration using the **Configure...** button to open the MCUXpresso Configuration Tools

The peripherals which are not currently supported in this release will be marked accordingly:





The [NXP's Model-Based Design Toolbox for KVx Series version 1.0.0](#) has been tested using the official NXP Evaluation Boards for Kinetis KVx MCUs:

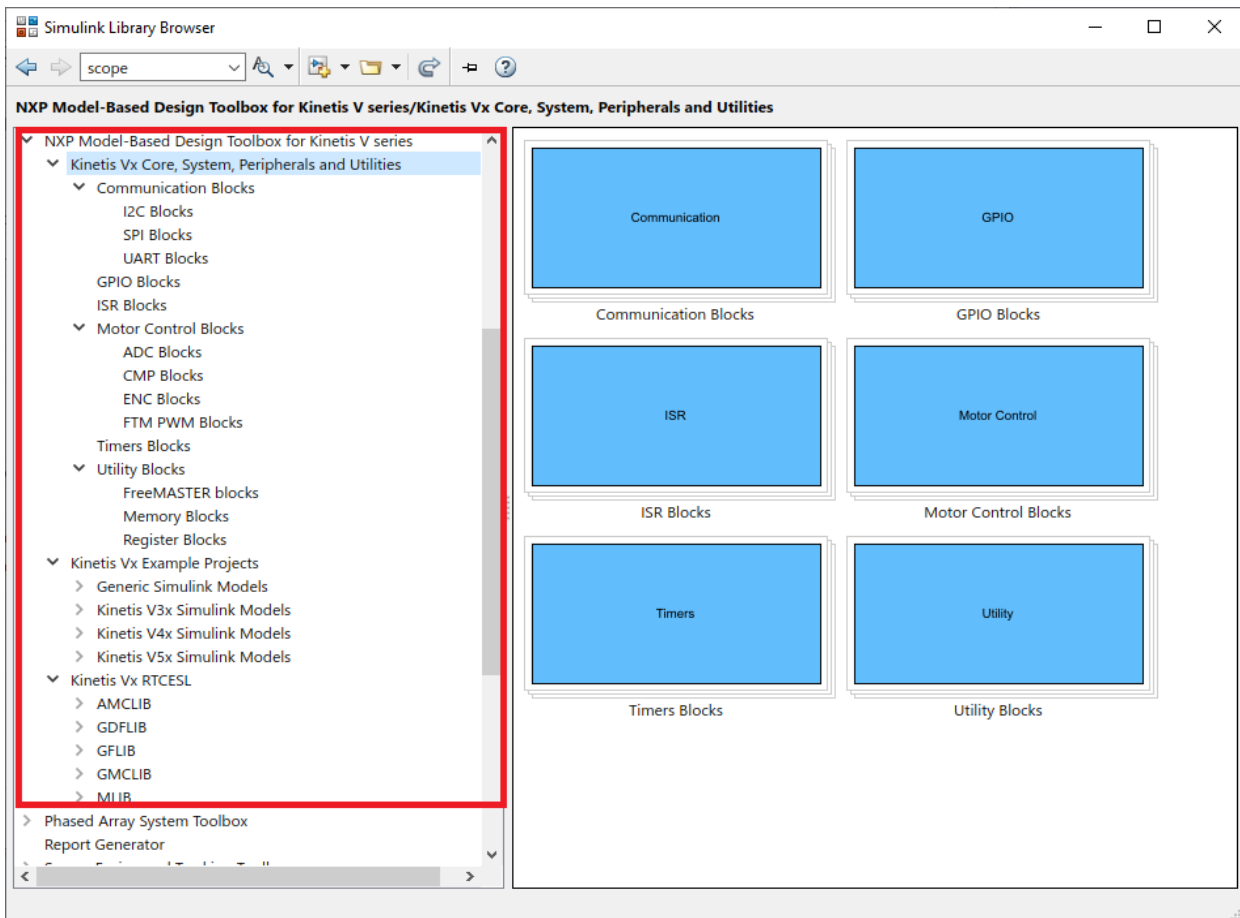
- [TWR-KV58F220M](#)
- [TWR-KV46F150M](#)
- [FRDM-KV31F](#)

### 3 Model-Based Design Toolbox Features

The [NXP's Model-Based Design Toolbox for KVx Series version 1.0.0](#) is delivered with complete KVx MCUs Simulink Block Library as shown below.

There are three main categories:

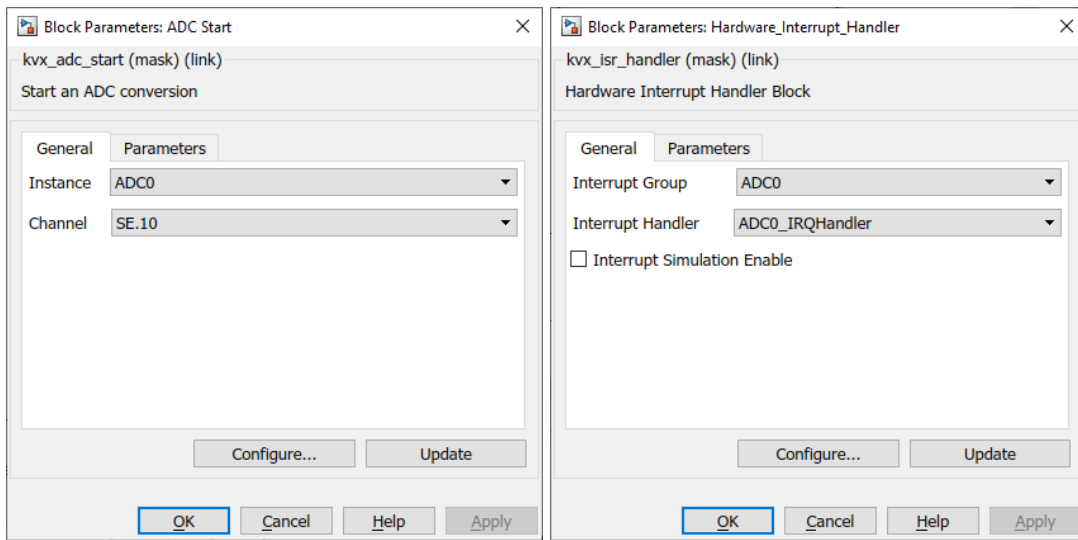
- **Core and System, Peripherals and Utilities** which contains all blocks related to MCU configuration
- **KVx Example Projects** which contains all the examples that exercise all the other blocks
- **KVx RTCESL** which contains Simulink blocks for NXP Real-Time Control Embedded Software Motor Control and Power Conversion Libraries



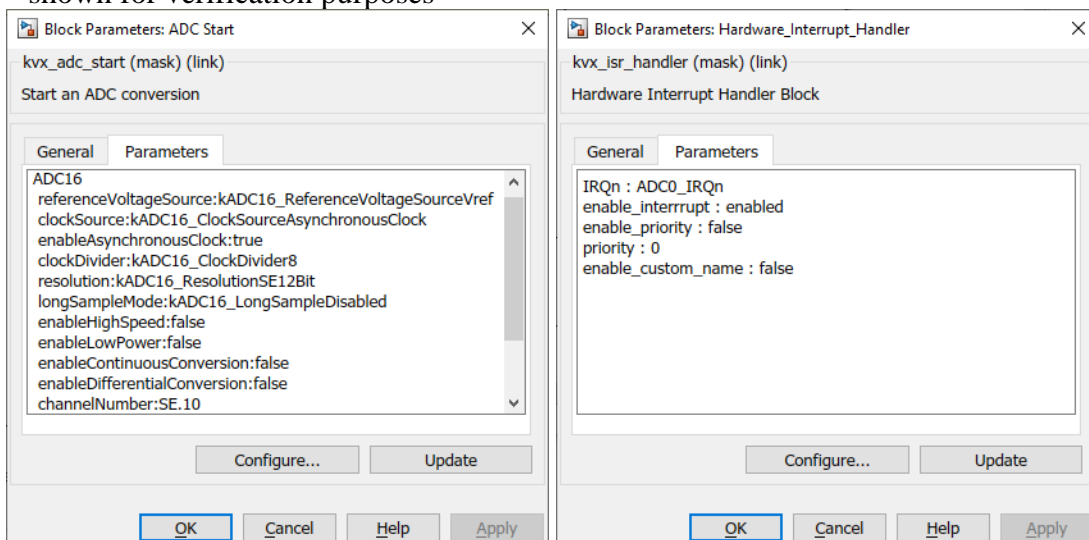
### 3.1 KVx Simulink Library Blocks

All Simulink blocks supported by the NXP Toolbox are designed to offer the best experience out-of-the-box by providing a basic peripheral configuration that covers most of the hardware capabilities. Most of the Simulink Blocks contains just two tabs:

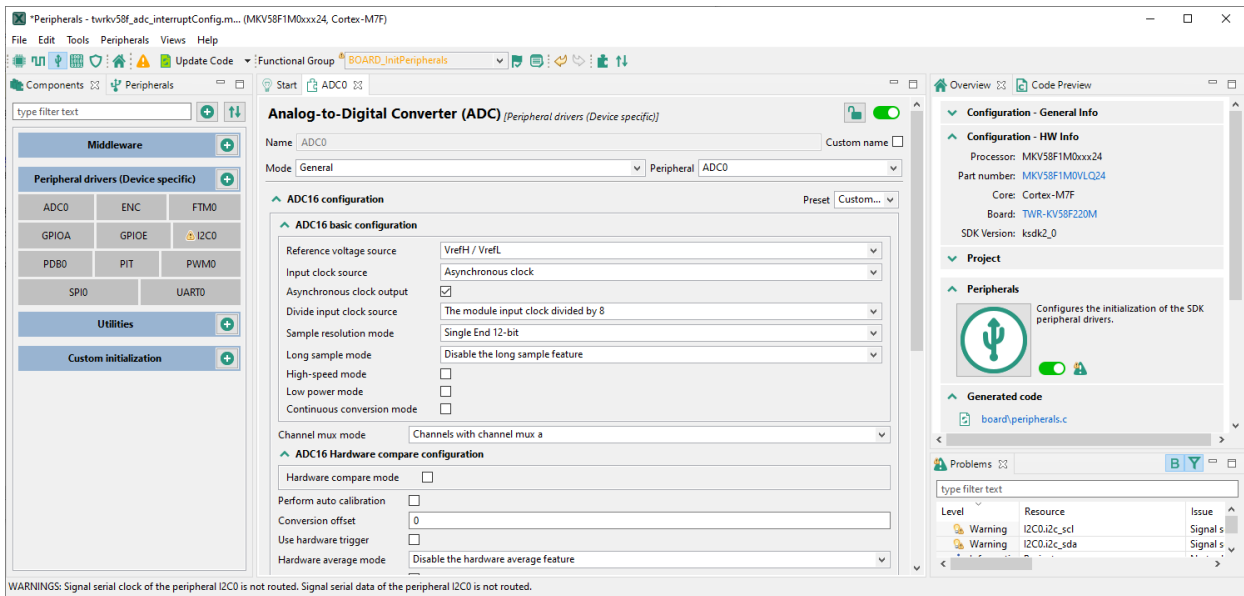
1. **General** Tab allows various selections that are defined in the default configuration. This represents the BASIC operation mode, where the user just picks up only what has been enabled as “default toolbox” configuration



2. **Parameters** Tab which contains the detailed configuration available. This information is shown for verification purposes



From any of these blocks by clicking on the **Configure...** button, the users can open the Configuration Tools to alter the default configuration used by the Simulink model.

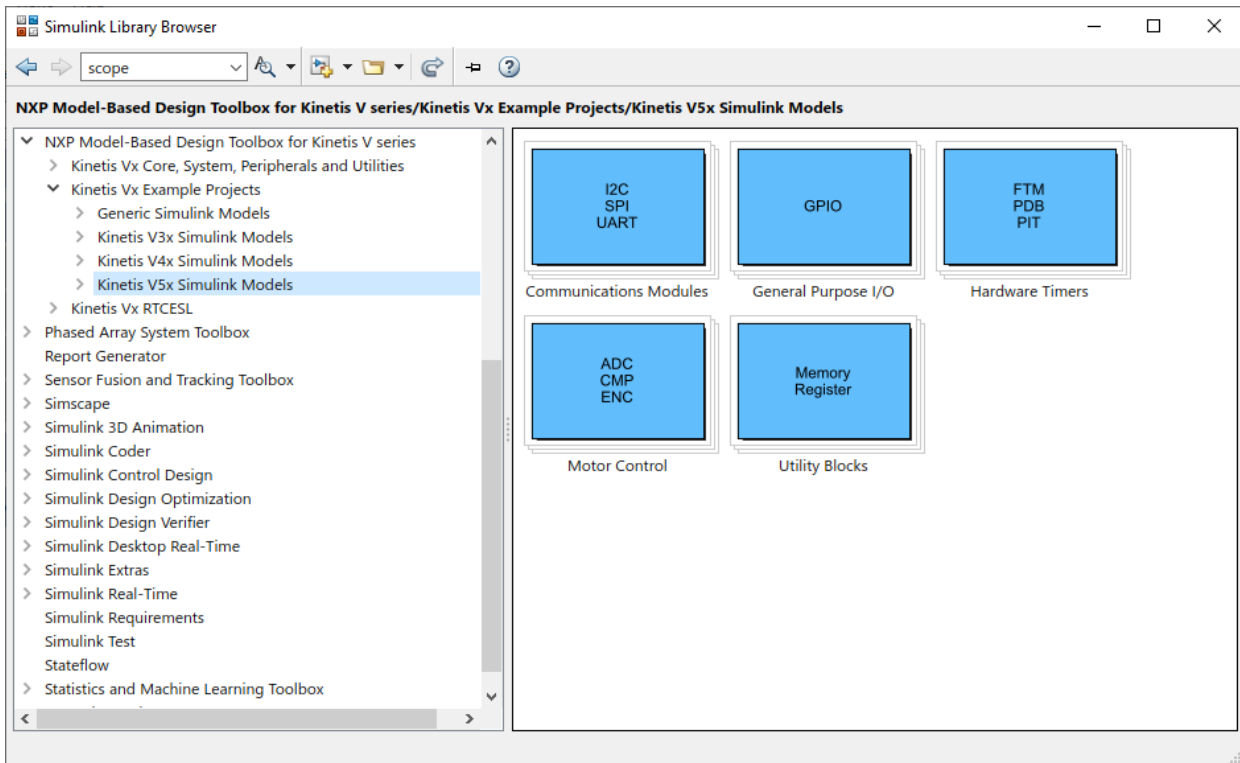


Using MCUXpresso Configuration Tools, the users can perform **ADVANCED** configurations and then use these new options into Simulink models. The validation of the configuration and peripheral code generation is done outside of Simulink.

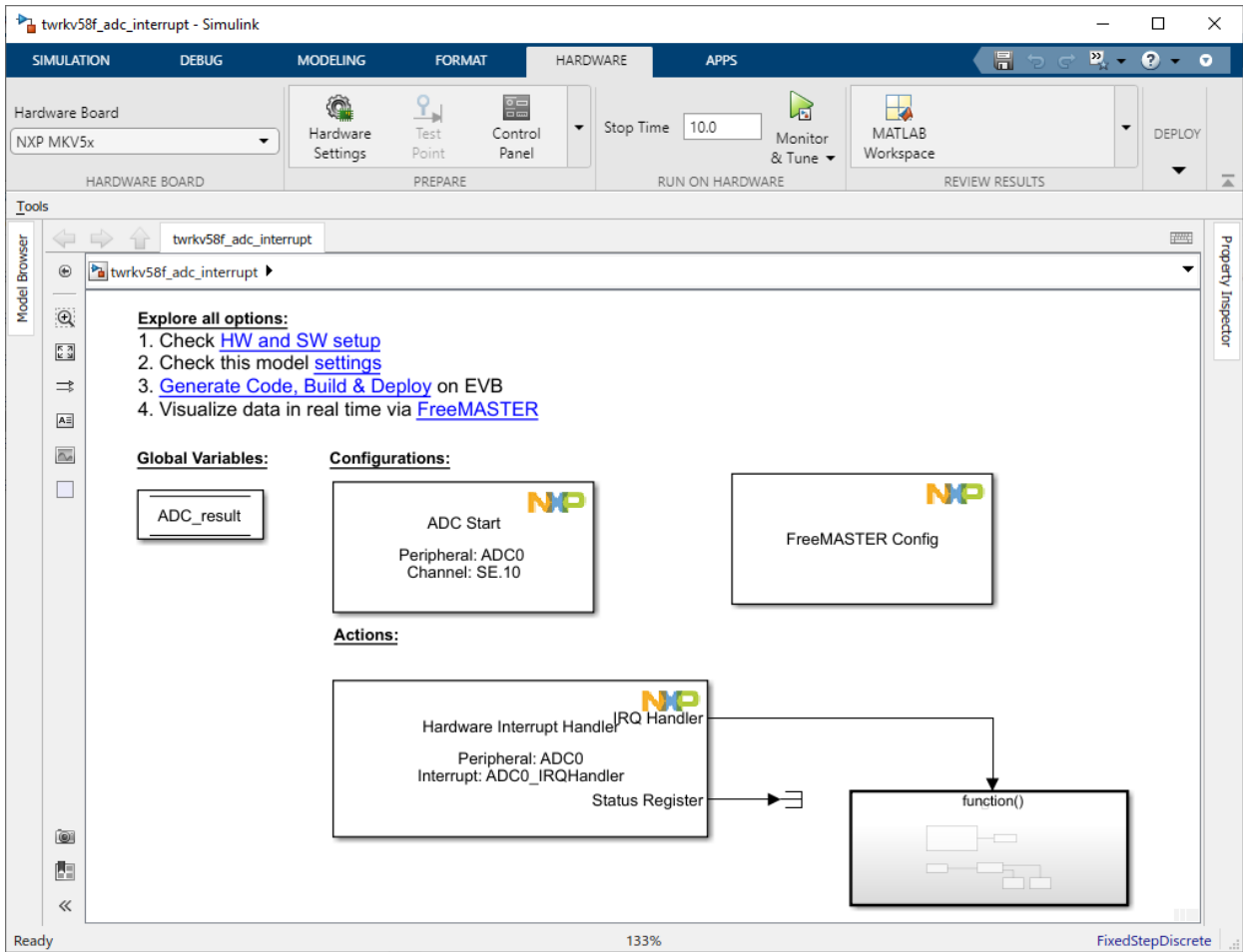
## 3.2 KVx Example Library

The Examples Library represents a collection of Simulink models that let you test different MCU on-chip modules and run complex applications.

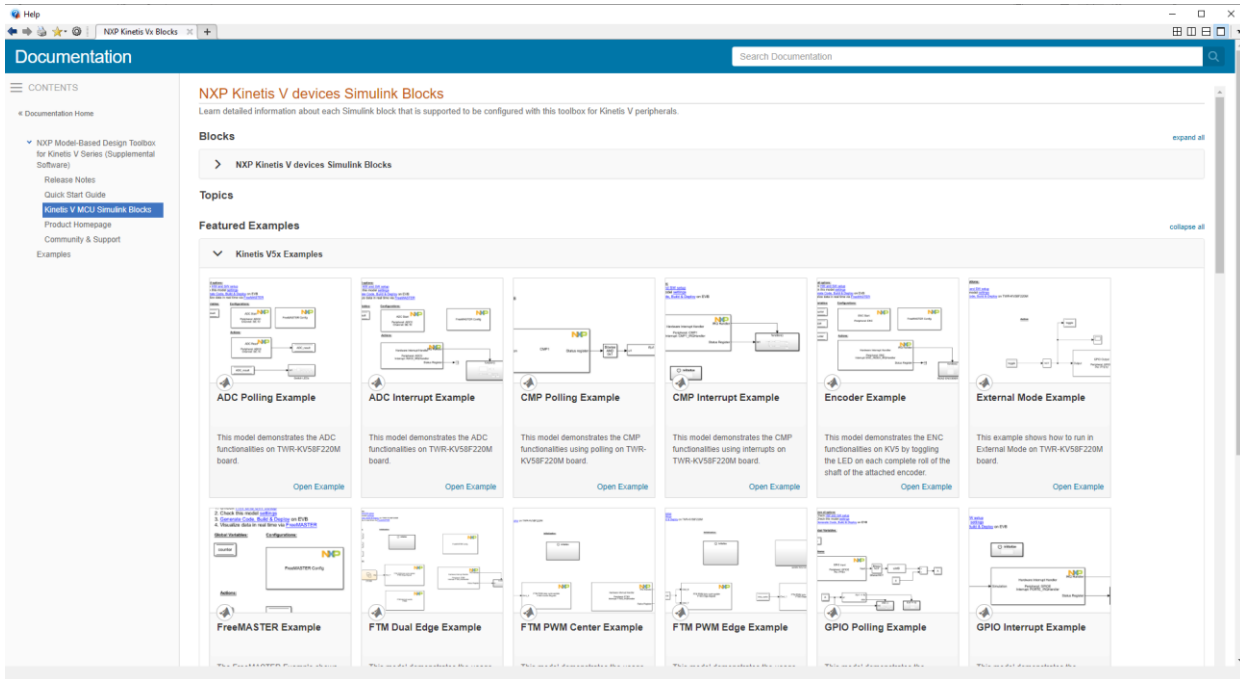
The examples are grouped in different layers that mimic a typical development flow: starting with basic building blocks that expose the MCU HW functionalities up to more complex applications that incorporate multiple building blocks.



The Simulink models shown as examples are enhanced with a comprehensive description to help users understand better the functionality that is exercised, hardware setup instructions whenever are necessary, and a result validation section.



The examples are available from the MATLAB help page too:



## 4 Prerequisites

### 4.1 MATLAB Releases and OSes Supported

This toolbox is developed and tested to supports the following MATLAB releases:

- R2019a;
- R2019b;
- R2020a;
- R2020b;

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



## 4.2 Build Toolchain Support

The following compilers are supported:

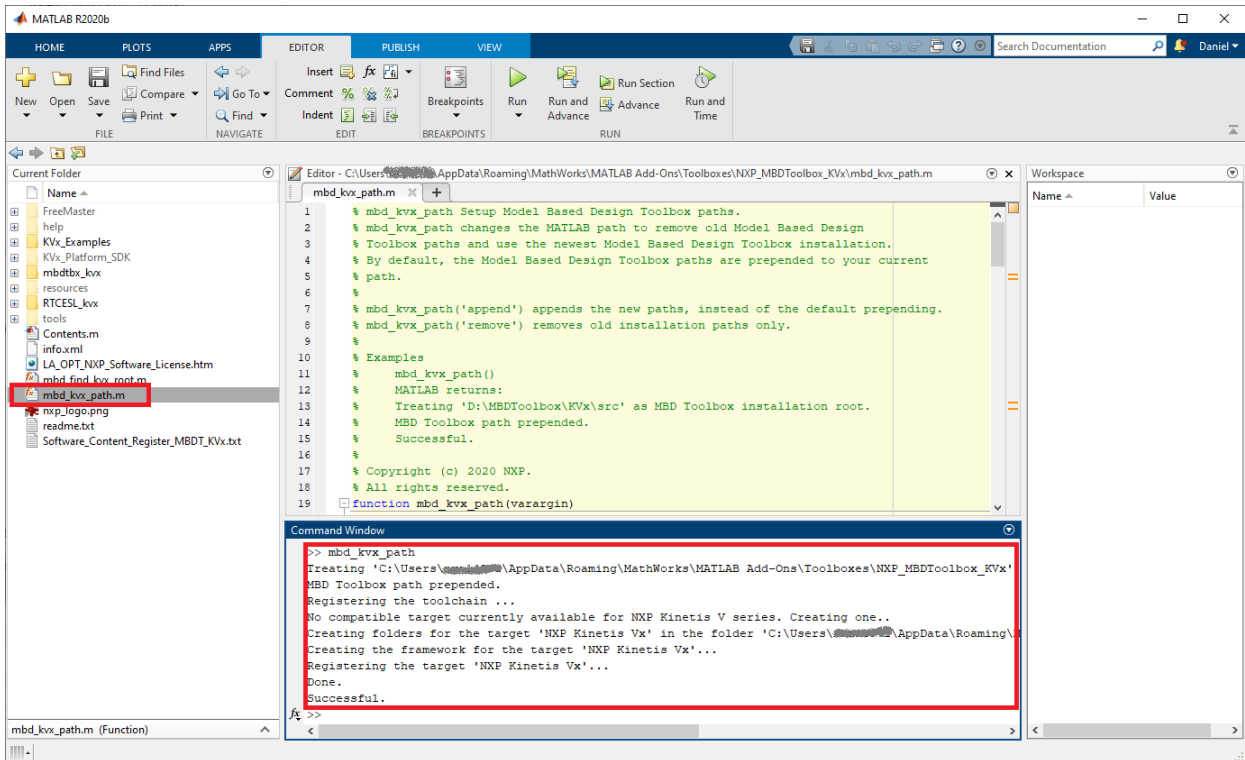
Compiler Supported	Release Version
GCC for ARM Embedded Processors	V9.2.1

The target compiler for the Model-Based Design Toolbox needs to be configured.

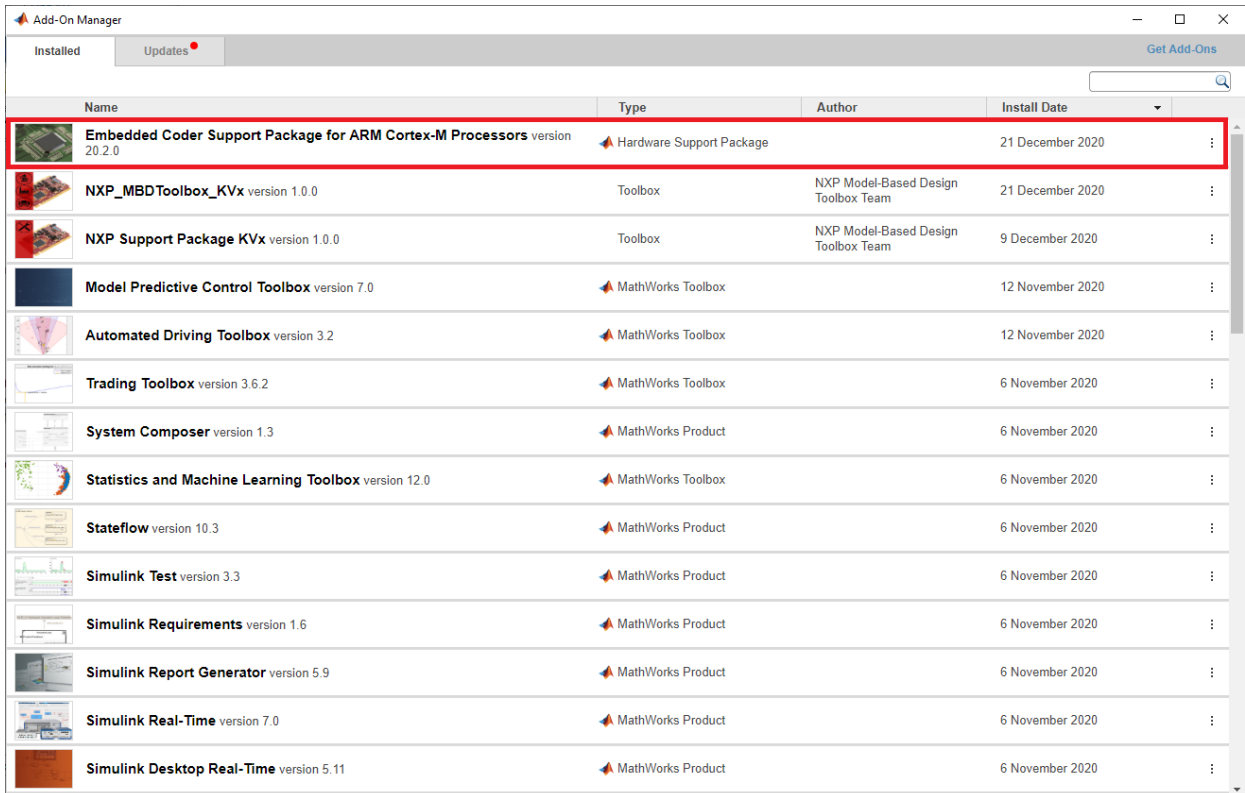
The Model-Based Design Toolbox uses the Toolchain mechanism exposed by the Simulink to enable automatic code generation with the Embedded Coder toolbox. By default, the toolchain is configured for the MATLAB 2019a release. For any other MATLAB release, the user needs to execute a toolbox m-script to 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_KVx\`) and running the “`mbd_kvx_path.m`” script.

```
>> mbd_kvx_path
Treating ..\MATLAB Add-Ons\Toolboxes\NXP_MBDToolbox_KVx' as MBD
Toolbox installation root.
MBD Toolbox path prepended.
Registering the toolchain ...
No compatible target currently available for NXP Kinetis V series.
Creating one..
Creating folders for the target 'NXP Kinetis Vx' in the folder
..\MATLAB Add-
Ons\Toolboxes\NXP_MBDToolbox_KVx\mbdtbx_kvx\codertarget'...
Creating the framework for the target 'NXP Kinetis Vx'...
Registering the target 'NXP Kinetis Vx'...
Done.
Successful.
>>
```

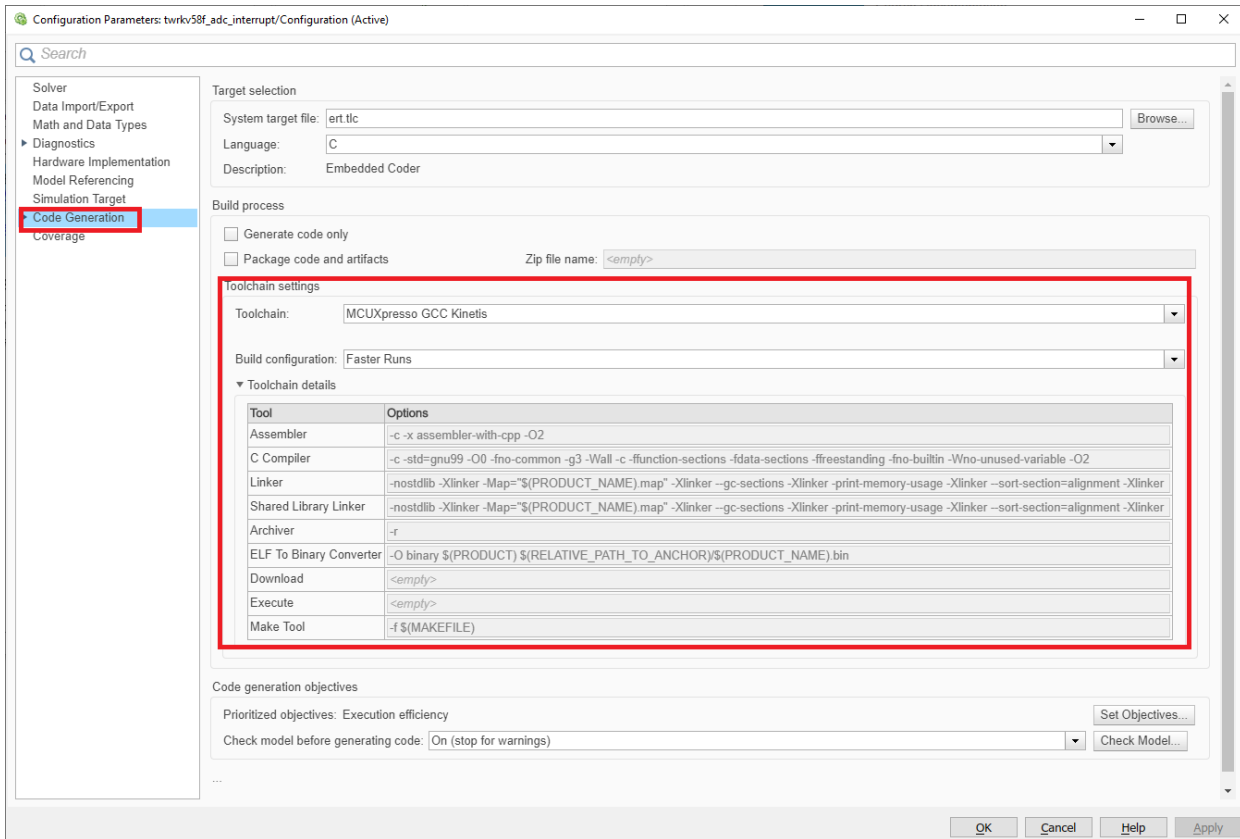


This mechanism requires users to install the [Embedded Coder Support Package for ARM Cortex-M Processor](#) as a prerequisite.



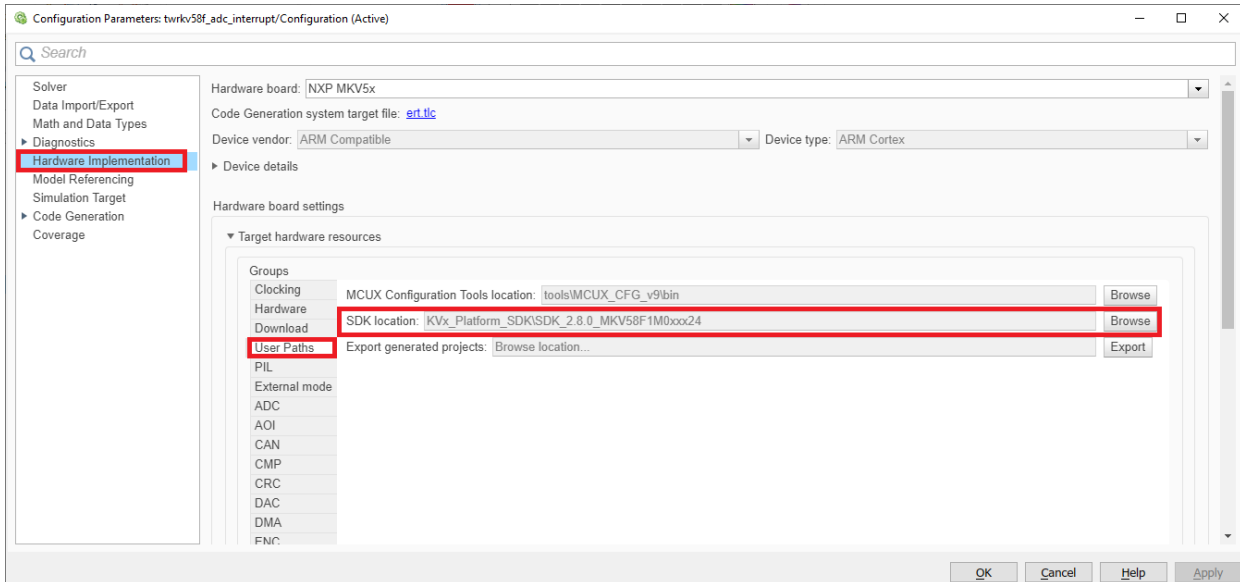
The “mbd\_kv\_path.m” script verifies the user setup dependencies and will issue instructions for a successful installation and configuration of the toolbox.

The toolchain can be further enhanced using the Simulink **Model Configuration Parameters** menu:



## 4.3 MCUXpresso SDK Support

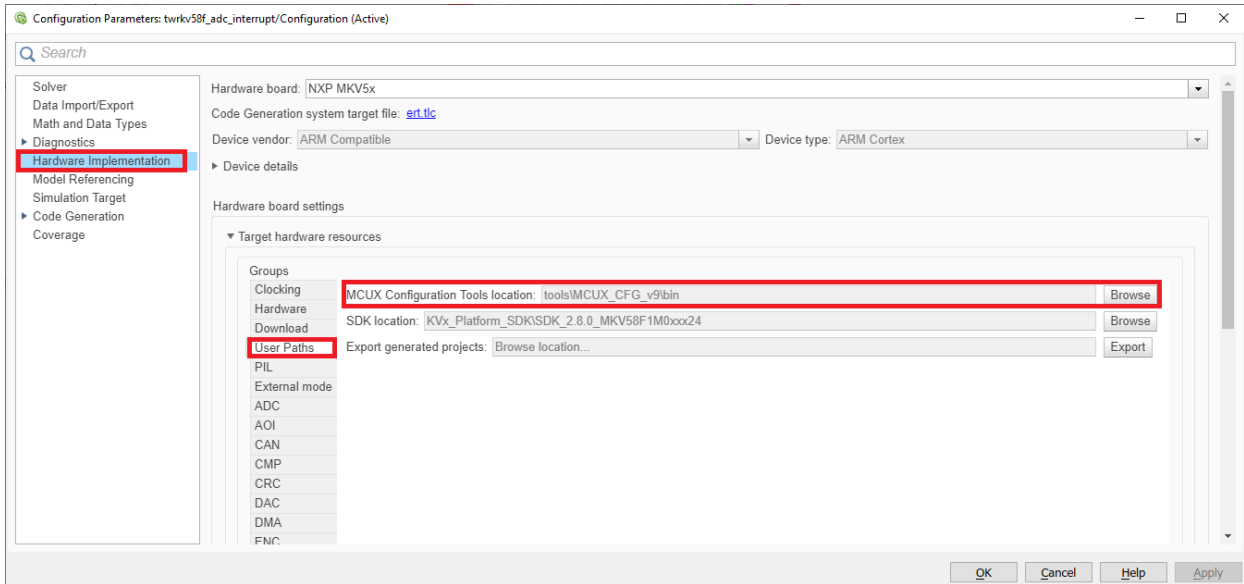
The toolbox is delivered with SDK 2.8.0 support. The user can change the SDK package from the Simulink **Model Configuration Parameters** menu



New SDK packages can be created online with the MCUXpresso SDK Builder here: <https://mcuxpresso.nxp.com/en/welcome>

## 4.4 MCUXpresso Configuration Tools Support

The toolbox is delivered with Configuration Tools version 9.0. The user can change the Configuration Tools version used by the Simulink from the Simulink **Model Configuration Parameters** menu



## 5 Known Limitations

The list of know limitations can be found in the readme.txt file that is delivered with the toolbox and can be consulted in the MATLAB Add-on installation folder of the Model-Based Design Toolbox for KVx Series.

## 6 Support Information

For technical support please sign on to the following NXP's Model-Based Design Toolbox Community: <https://community.nxp.com/community/mbdt>

**How to Reach Us:**

**Home Page:**

[www.nxp.com](http://www.nxp.com)

**Web Support:**

[www.nxp.com/support](http://www.nxp.com/support)

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