Model-Based Design Toolbox for HCP

Quick Start Guide

Automatic Code Generation for HCP Family
Version 1.3.0

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

Summary

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 flawless development experience the minimum recommended PC platform is:

- *Windows® OS* or *Ubuntu 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
Ubuntu 21.10		X

1.1.1 Installation prerequisites for Ubuntu

In order to use the S32R41, S32S2, S32G2 and S32G3 toolchains you must run the commands below. The user account installing the product needs to be a member of sudoers group.

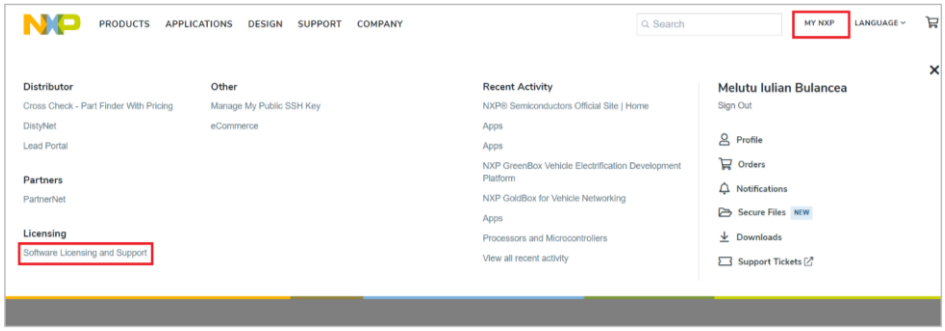
```
sudo dpkg --add-architecture i386
sudo apt-get update
sudo apt-get install lib32z1 libncurses5:i386 libstdc++6:i386 libbz2-1.0:i386
libc6:i386 libx11-6:i386 libxpm4:i386 libncursesw5:i386 libmpfr6:i386

sudo ln -s /lib/i386-linux-gnu/libncursesw.so.5 /lib/i386-linux-
gnu/libncursesw.so.6
sudo ln -s /usr/lib/i386-linux-gnu/libmpfr.so.6 /usr/lib/i386-linux-
gnu/libmpfr.so.4

sudo apt-get install python2-minimal
sudo apt-get install python-is-python2

sudo add-apt-repository universe
sudo apt update
sudo apt-get install curl

sudo curl https://bootstrap.pypa.io/pip/2.7/get-pip.py --output get-pip.py
sudo python2 get-pip.py
sudo pip install enum34

sudo apt-get install libpython2.7:i386
```

1.2 Installation Steps

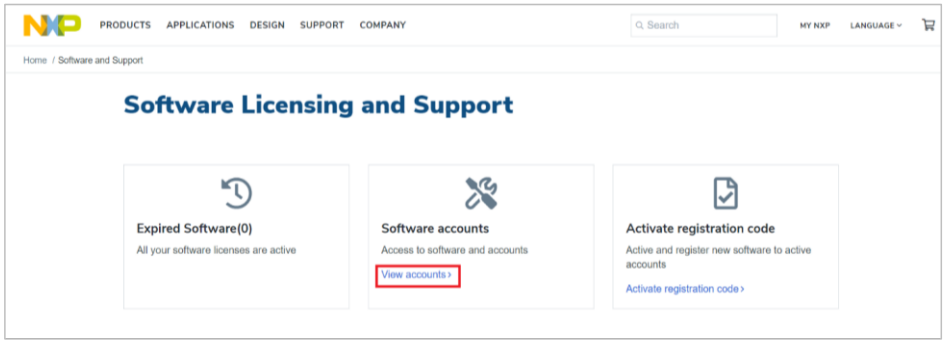
1.2.1 Download Add-on installer

To download the add-on installer, go to NXP website, sign in and follow the next instructions.

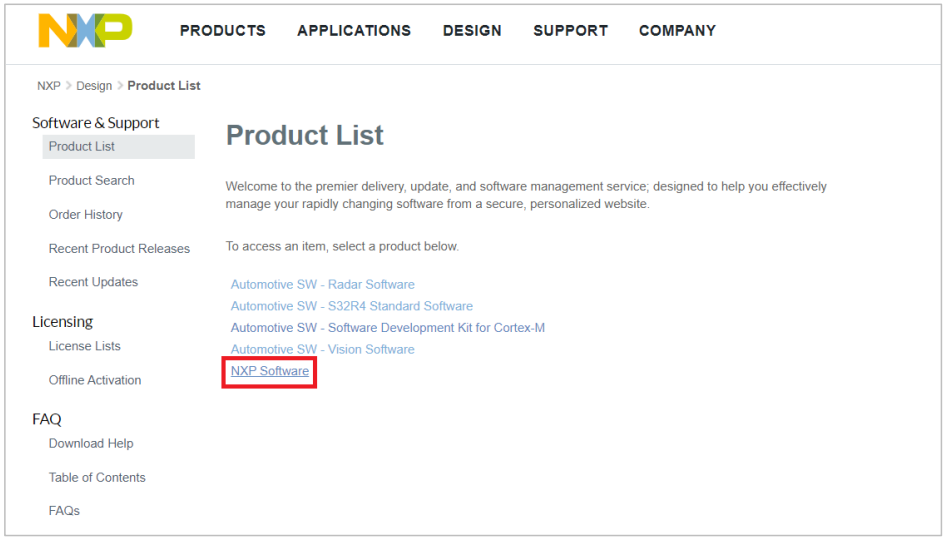
From the top right select the *MY NXP* button. This will reveal many options, one of them being *Software Licensing and Support*. Select it.



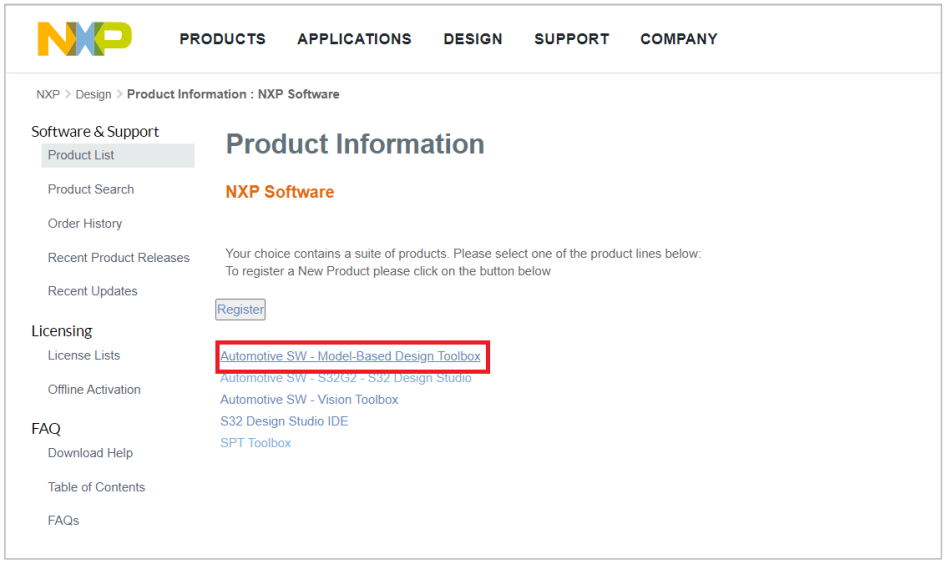
In the opened page select *View accounts* from the *Software accounts* group.



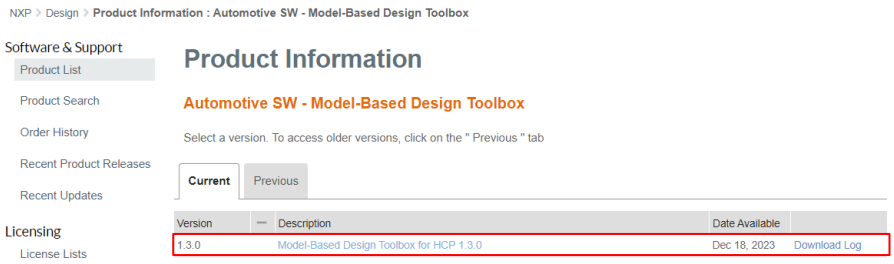
Next the *Product List* page is opened. From here select *NXP Software* product.



From the NXP Software product page select *Automotive SW – Model-Based Design Toolbox*.



From the Model-Based Design Toolbox product page select the *Model-Based Design Toolbox for HCP 1.3.0*, and then on the next page agree the Software Terms and Conditions.

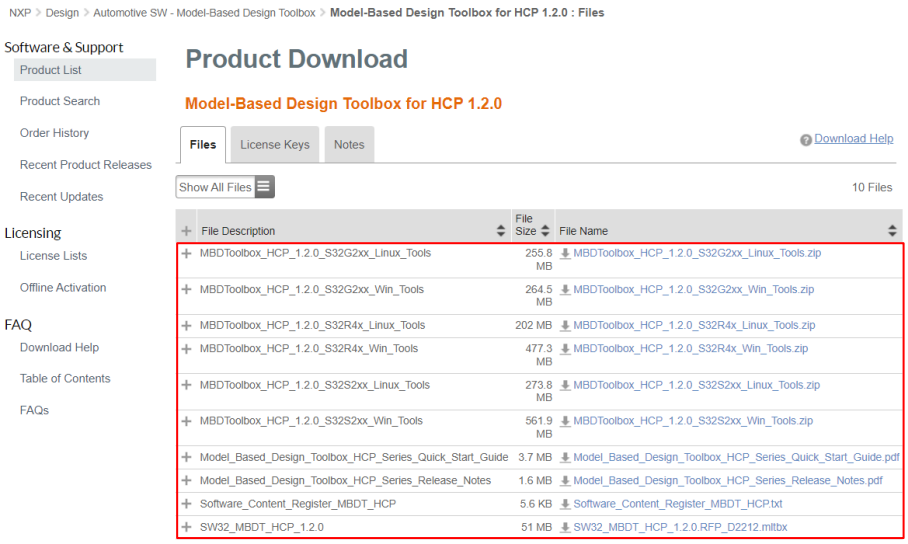


In the Model-Based Design Toolbox for HCP product page you can find:

- Model-Based Design Toolbox for HCP 1.3.0 installer which can be download by selecting *SW32_MBDT_HCP_1.3.0_RTM_D2312.mltbx*
- S32S2 Build Toolchain archive which can be downloaded by selecting
  - for Windows: *MBDToolbox_HCP_1.3.0_S32S2_Win_Tools.zip*
  - for Ubuntu: *MBDToolbox_HCP_1.3.0_S32S2_Linux_Tools.zip*
- S32G2 Build Toolchain archive which can be downloaded by selecting
  - for Windows: *MBDToolbox_HCP_1.3.0_S32G2_Win_Tools.zip*
  - for Ubuntu: *MBDToolbox_HCP_1.3.0_S32G2_Linux_Tools.zip*
- S32G3 Build Toolchain archive which can be downloaded by selecting
  - for Windows: *MBDToolbox_HCP_1.3.0_S32G3_Win_Tools.zip*
  - for Ubuntu: *MBDToolbox_HCP_1.3.0_S32G3_Linux_Tools.zip*
- S32R41 Build Toolchain archive which can be downloaded by selecting
  - for Windows: *MBDToolbox_HCP_1.3.0_S32R41_Win_Tools.zip*
  - for Ubuntu: *MBDToolbox_HCP_1.3.0_S32R41_Linux_Tools.zip*

Linux BSP Image for S32G274 RDB Evaluation Board archive which can be downloaded from NXP BSP Linux by selecting *s32g274ardb2_images.7z*

Commented [VM1]: Add location from where to find linux BSP image



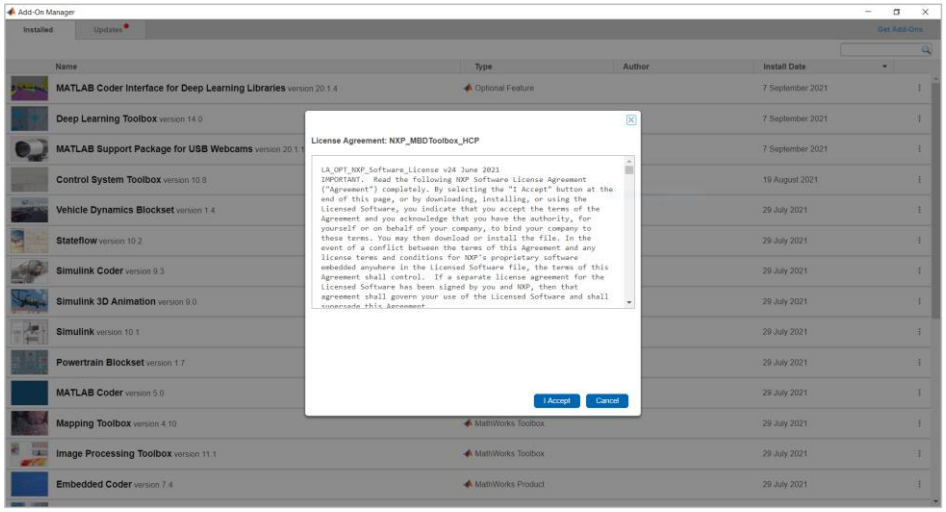
In case the link suggested to be selected does not appear in your list please contact the support team.

1.2.2 **Run Add-on installer**

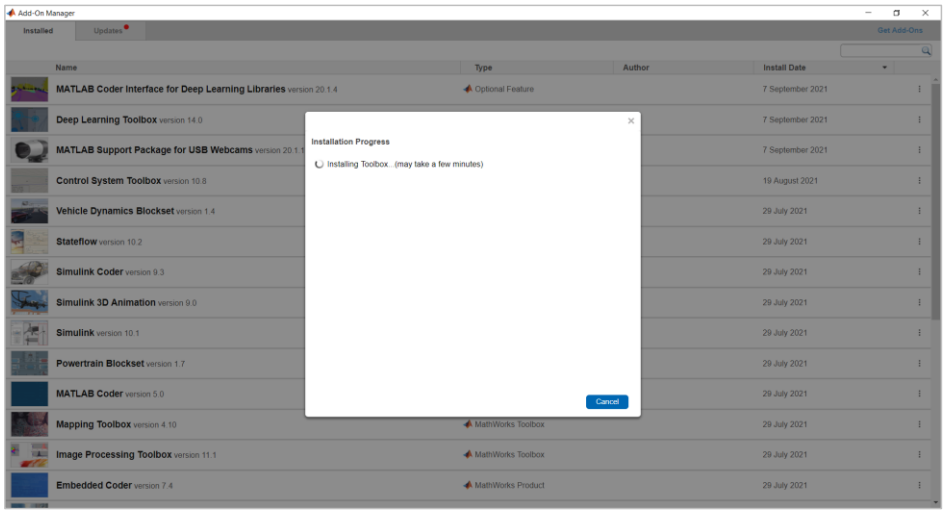
Install the NXP's Model-Based Design Toolbox by double-clicking the **.mltbx* file. This will activate the MATLAB Add-ons installer that will automatically start the installation process.

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

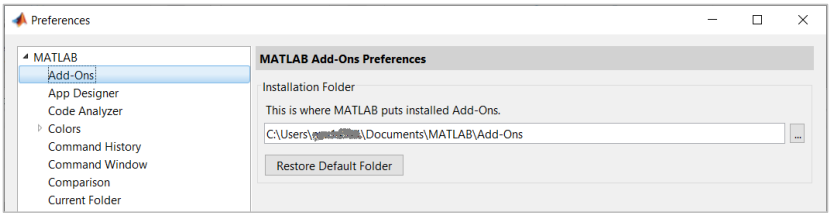
1 Indicate acceptance of the NXP Software License Agreement by selecting "*I Accept*" to proceed.



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

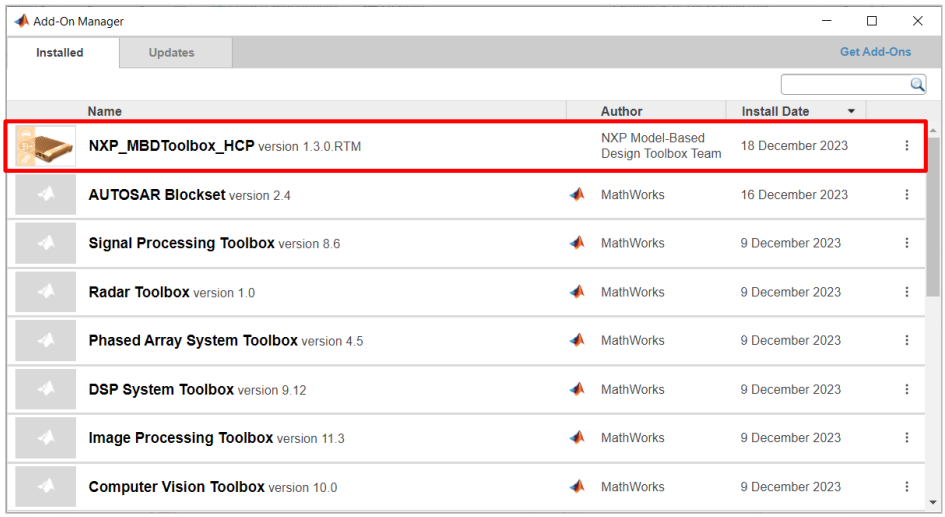


The default location can be changed before installation by changing the *Add-Ons* path from *MATLAB* Preferences



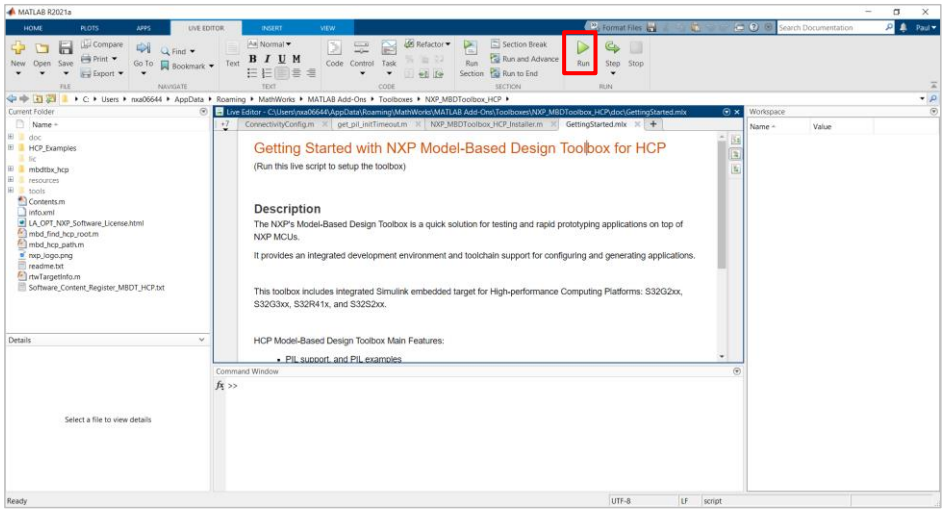
Note: *It is recommended to install the MATLAB and NXP Toolbox into a location that does not contains special characters, empty spaces, or mapped drives.*

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



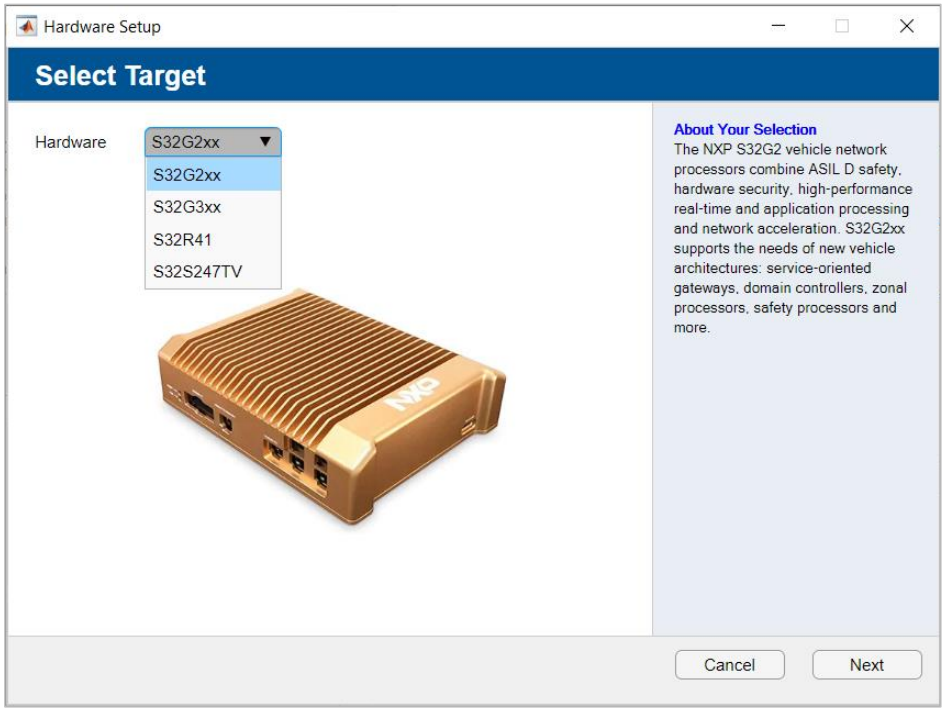
4 Run `GettingStarted.xml` to configure the toolbox

After the installation has finished the `GettingStarted.xlm` is opened. To run it go to the *LIVE EDITOR* tab and push the *Run* button. Running it will open the Setup GUI that helps the user to configure the toolbox.



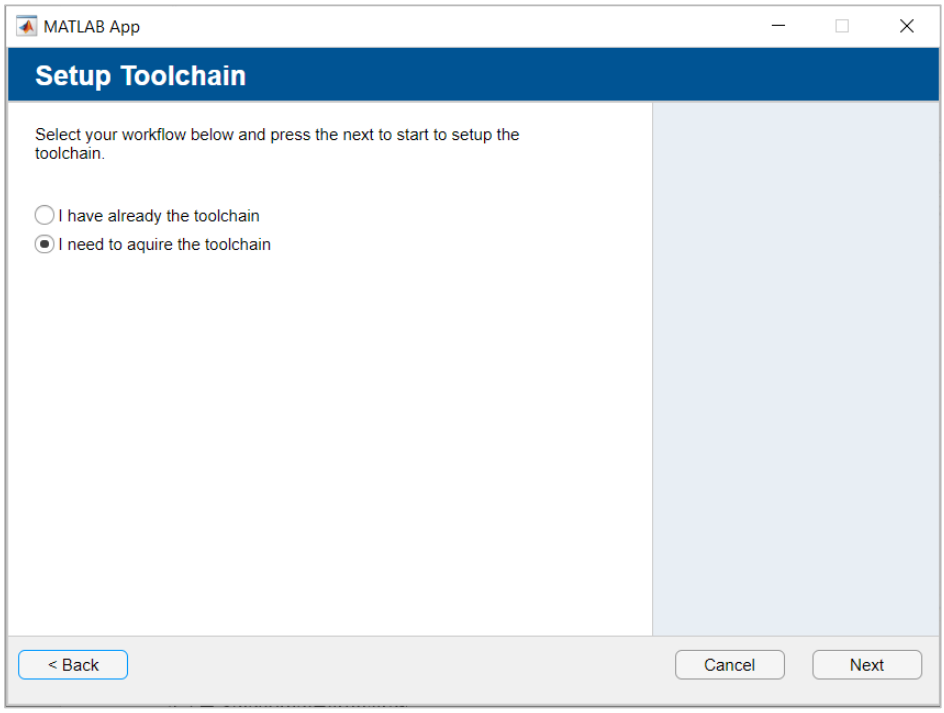
4.1 Select the hardware board

We are going to select S32G274A and push the *Next* button.

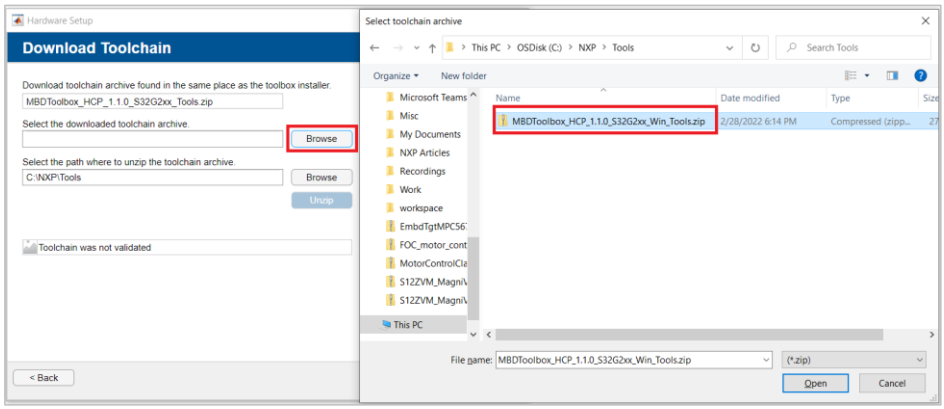


4.2 Setup the toolchain

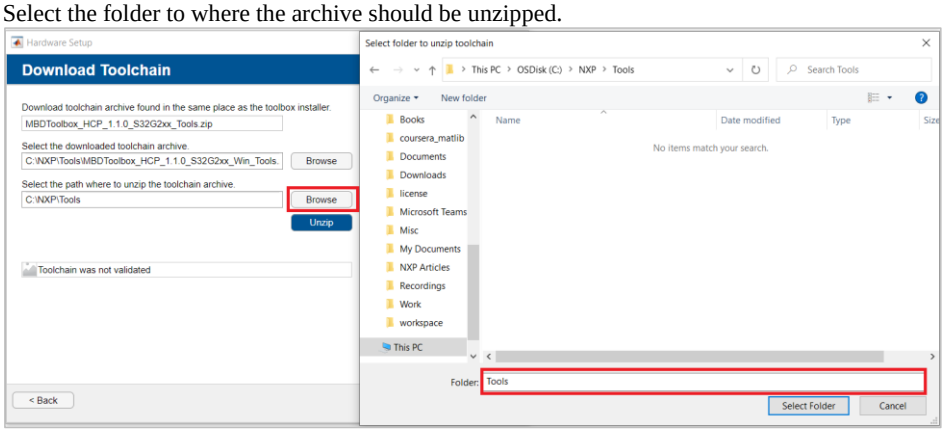
Select "*I need to acquire the toolchain*" and push the *Next* button. In case you already have the toolchain the steps are a subset of the one below.



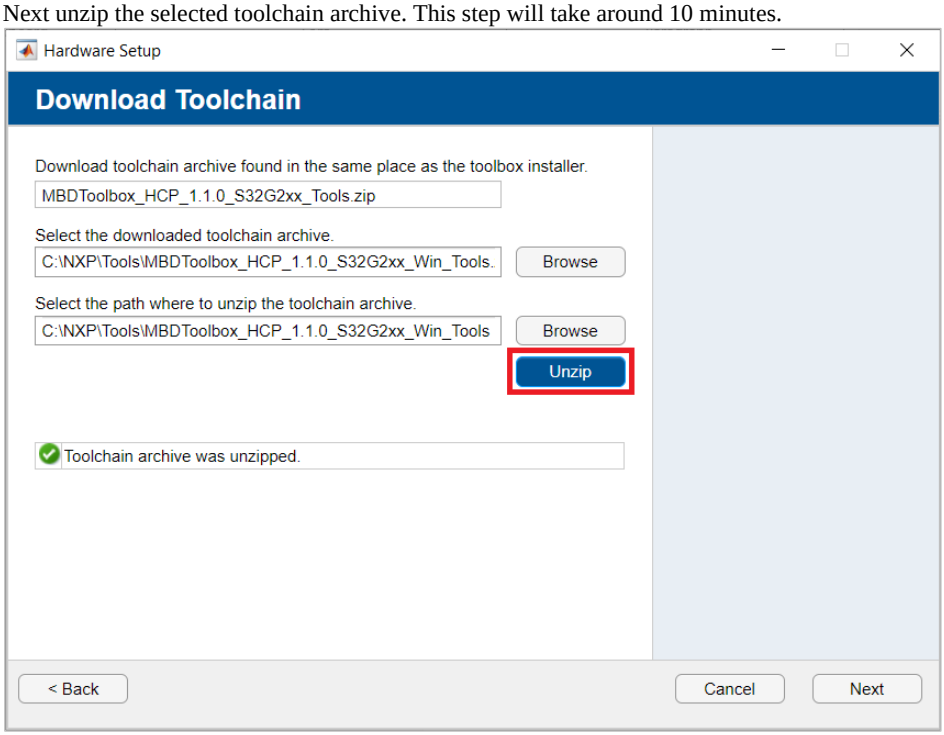
Next download the S32G2xx toolchain by following the steps from 1.2.1, and then select the path to the downloaded toolchain archive.



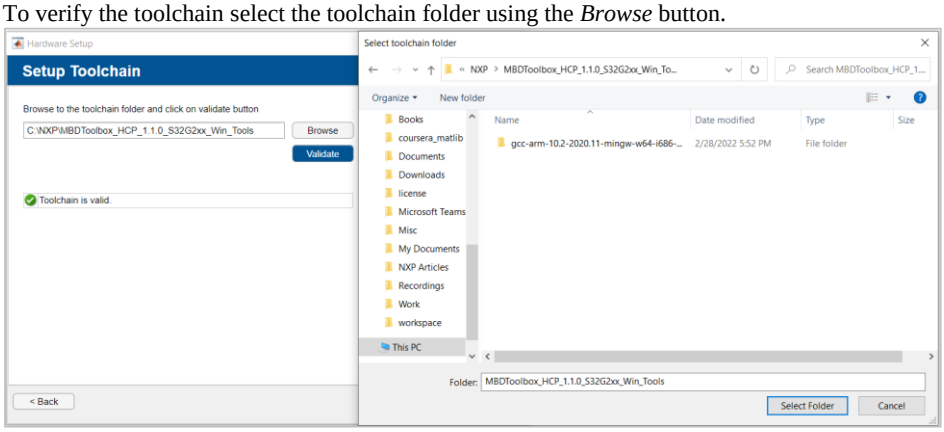
Select the folder to where the archive should be unzipped.



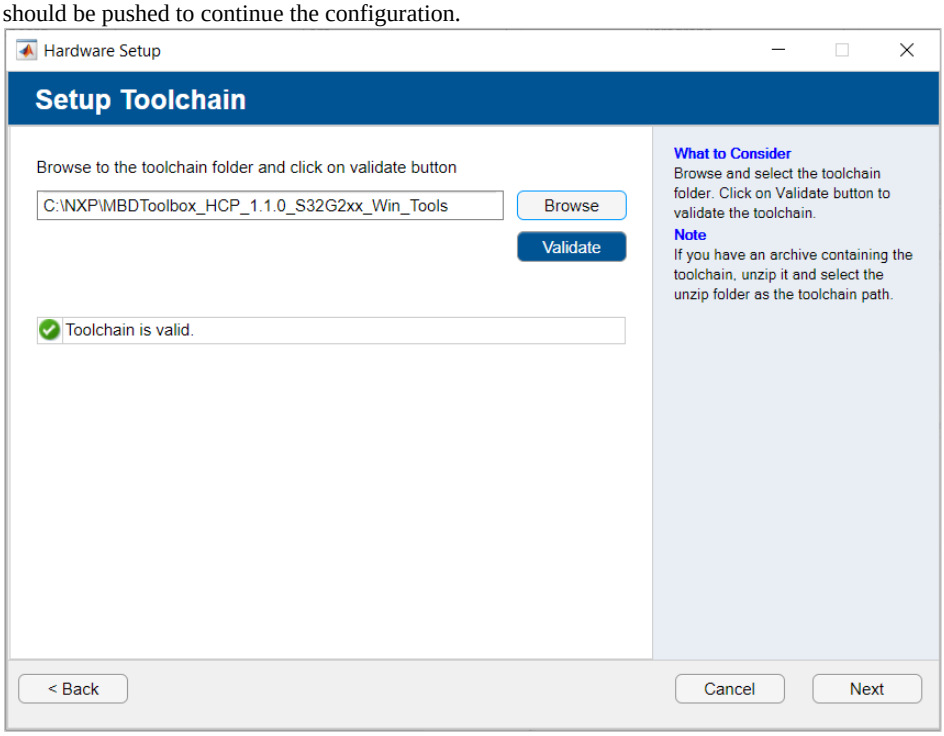
Next unzip the selected toolchain archive. This step will take around 10 minutes.



To verify the toolchain select the toolchain folder using the *Browse* button.

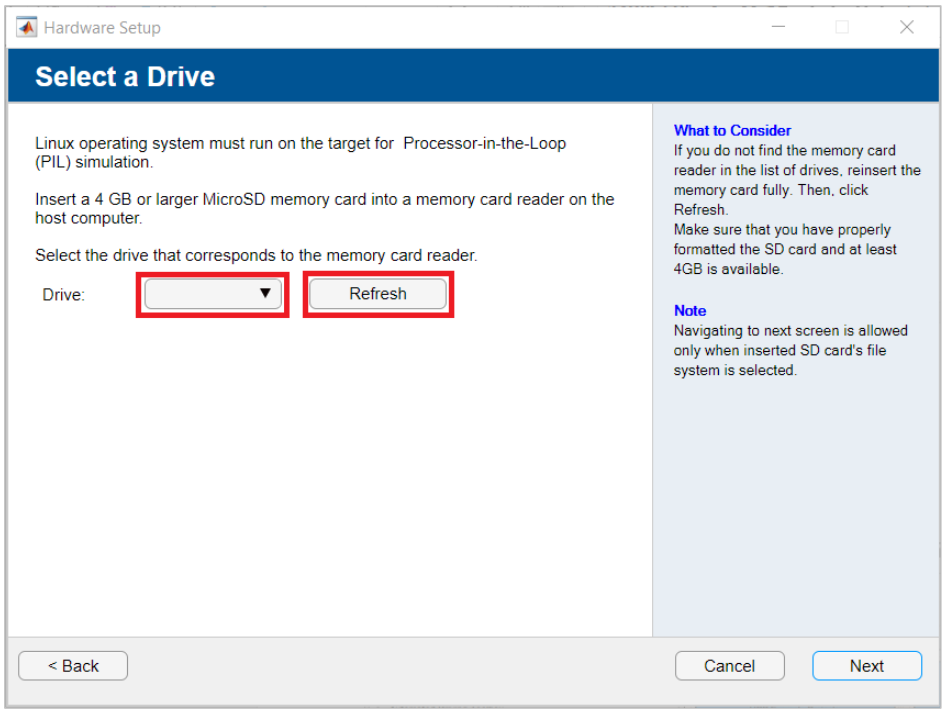


Push the *Validate* button. If everything is allright the message is *Toolchain is valid*, otherwise the message is *Toolchain is not valid*. If the toolchain is valid the *Next* button is enabled, and should be pushed to continue the configuration.

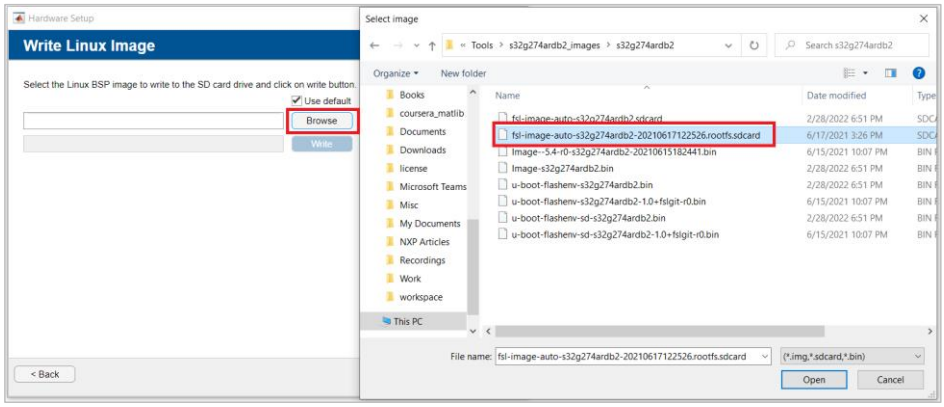


4.3 Write Linux on microSD card

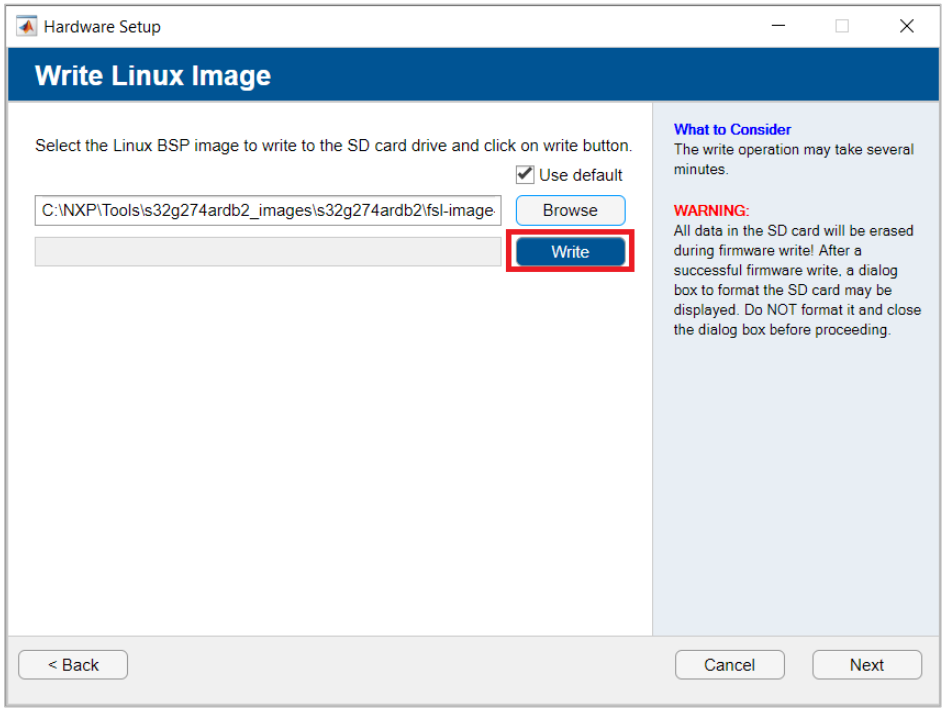
The next page helps you to write the Linux on an microSD card. First insert the microSD card, then push the *Refresh* button to actualize the drive list. If the miscroSD card is available in Windows, the list should not be empty. Select the drive from the list and push the *Next* button.



Select the Linux image using the *Browse* button.



Finally push the *Write* button to write the Linux image.



4.4 Get additional software

In order to find the boards IP you need to install additional software. You can use Terminal Emulator familiar to you, such as Tera Term, Putty or other. Also install FTDI CDM WHQL driver for serial configuration from FTDI chip.

4.5 Connect the board using the following instructions:

1. Remove the memory card from the host computer and insert into the S32G2 board micro SD card slot.

2. Connect the Ethernet cable to the S32G2 board. Connect the other end of the Ethernet cable to your LAN or HOME network.

This connection will be used to download the application and the PIL Ethernet communication between Matlab and the application running on the target.

3. Connect an USB cable between the S32G2 board and your host computer.

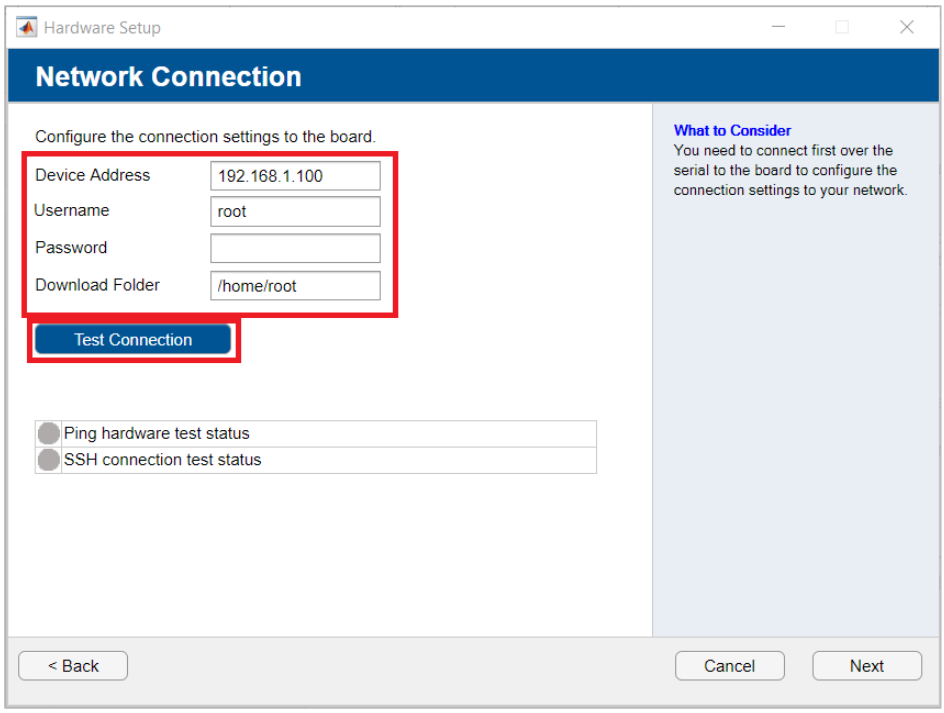
This connection will be used for initial Linux setup.

4. Connect the 12 V power supply to the S32G2 board and power on the board.

5. Use a serial communication terminal (e.g. putty) to connect to the board and configure the network settings.

4.6 Setup network connection

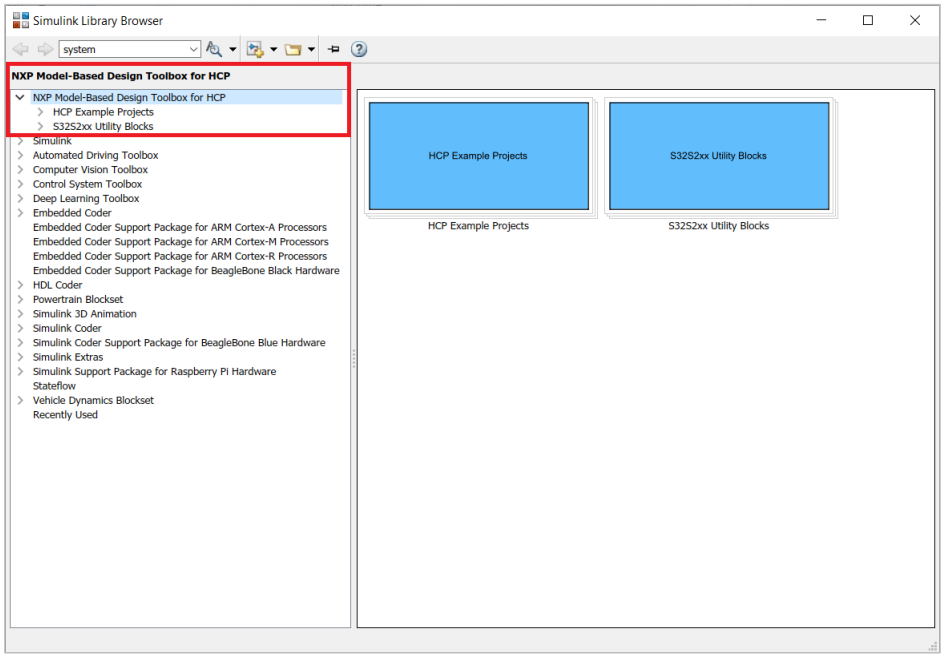
Fill in the *Device Address*, *Username*, *Password*, and *Download folder*, and then push the *Test Connection* button. This tests if the device address is available, and also if the a SSH commands can be run.



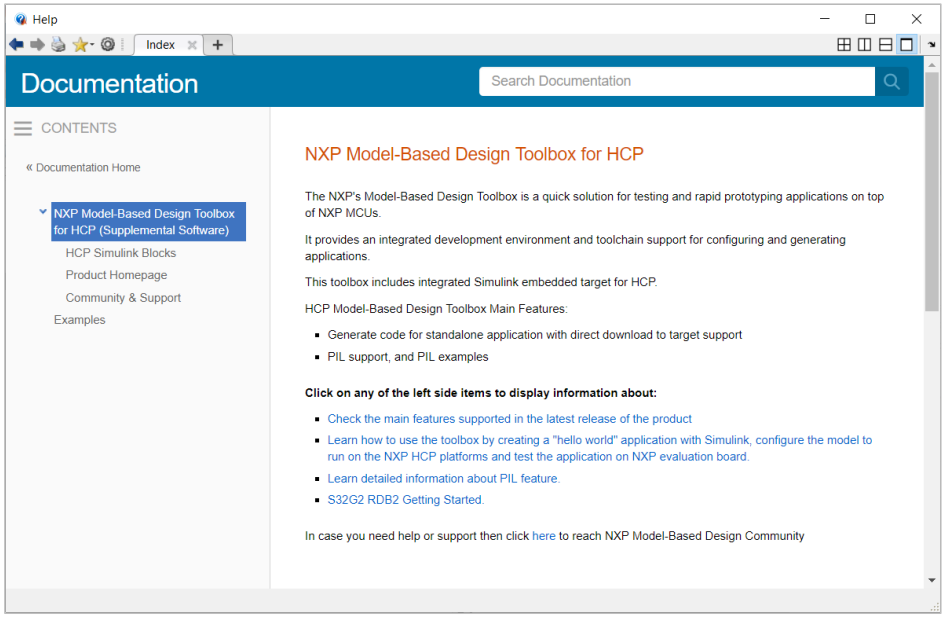
4.7 Setup done

Congratulations! You are ready to use the Model-Based Design for HCP toolbox.

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



6 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:



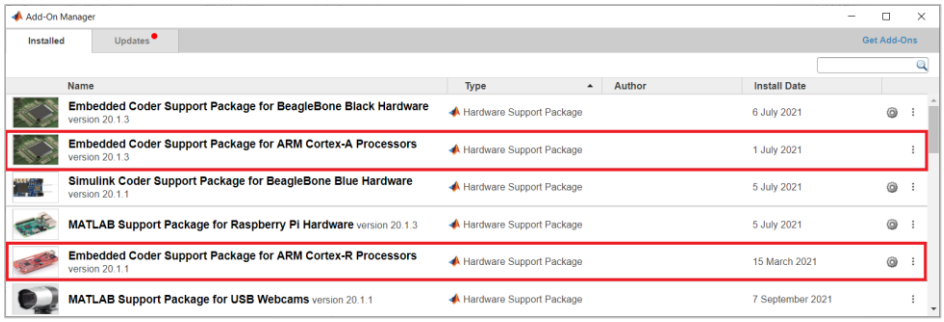
1.2.3 Setting the Path for Model-Based Design Toolbox and Toolchain Generation

The Model-Based Design Toolbox uses the Toolchain mechanism exposed by the Simulink to enable automatic code generation with Embedded Coder toolbox. By default, the toolchain is configured for the MATLAB R2021a - R2023b 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_HCP\`) and running the "`mbd_hcp_path.m`" script.

```
>> mbd_hcp_path
No compatible target currently available for NXP S32G2xx. Creating
one..
Creating folders for the target 'NXP S32G2xx' in the folder
'C[…]\NXP_MBDToolbox_HCP\mbdtbx_hcp\codertarget\2021b\s32g2'...
Creating the framework for the target 'NXP S32G2xx'...
Registering the target 'NXP S32G2xx'...
Done.
No compatible target currently available for NXP S32S2xx. Creating
one..
Creating folders for the target 'NXP S32S2xx' in the folder
'C[…]\NXP_MBDToolbox_HCP\mbdtbx_hcp\codertarget\2021b\s32s2'...
Creating the framework for the target 'NXP S32S2xx'...
Registering the target 'NXP S32S2xx'...
Done.
Successful.
```

This mechanism requires users to install the Embedded Coder Support Package for ARM Cortex-A Processor and Embedded Coder Support Package for ARM Cortex-R Processor as a prerequisite.



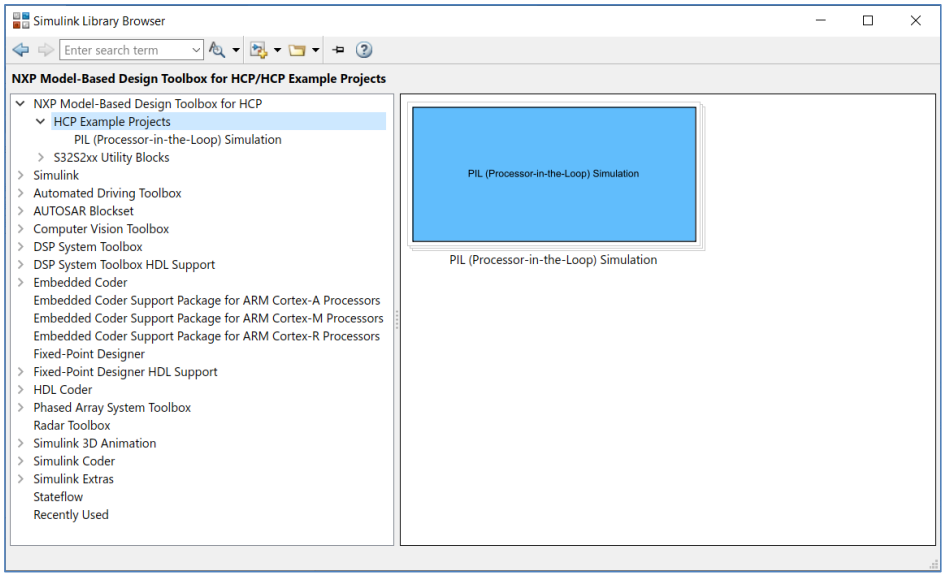
The "`mbd_hcp_path.m`" script verifies the user setup dependencies and will issue instructions for a successful installation and configuration of the toolbox.

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_hcp_examples.slx` can be opened from "`{Model Based Design Install Directory}\HCP_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 for S32G2xx provided with the Model-Based Design Toolbox were developed on GoldBox Development Platform (S32G-VNP-RDB2 Reference Design Board) as the primary hardware target.

All examples for S32R4x provided with the Model-Based Design Toolbox were developed on S32R41 Development Platform (X-S32R41-EVB Reference Design Board) as the primary hardware target.

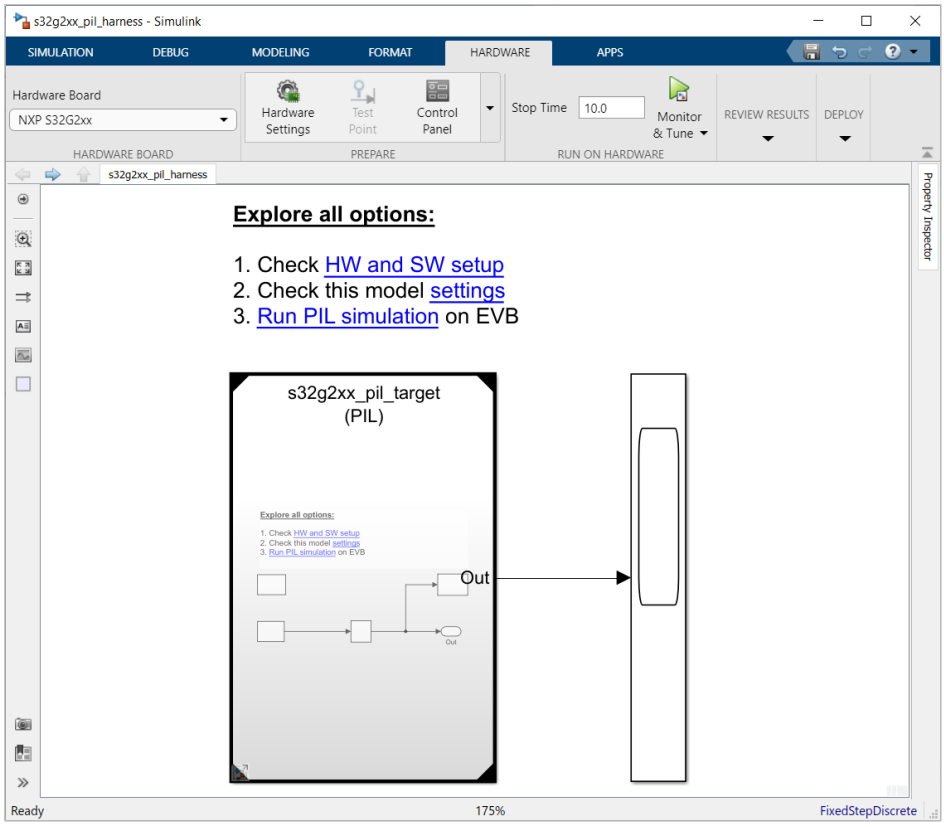
All examples for S32S2xx provided with the Model-Based Design Toolbox were developed on GreenBox II Development Platform as the primary hardware target.

2.3 A “Hello World” Example

If the hardware setup is completed successfully, then all ingredients are present for running successfully the Model-Based Design Toolbox for HCP specific examples.

Navigate to “`\HCP_Examples\s32g2\pil\simple\`” folder and open the `s32g2xx_pil_harness.mdl` Simulink model.

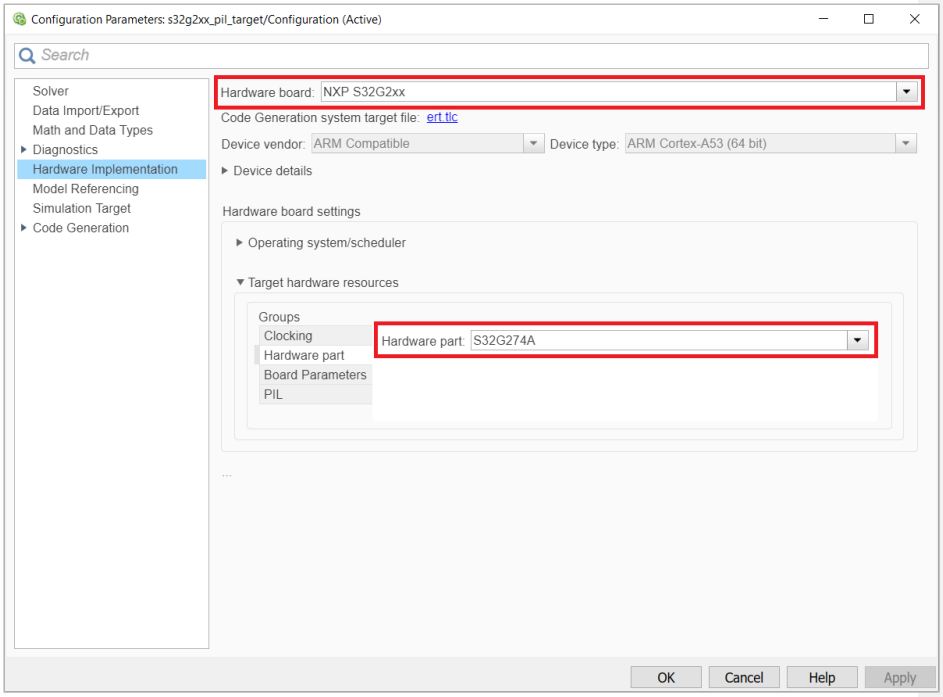
This model is set in PIL mode, and it uses the model `s32g2xx_pil_target.mdl` as a submodel. Simulink generates the code for the submodel, compiles it, downloads it on the board, and then runs it. At the end of each step, Simulink reads the data generated by the submodel from the port of IP address priviously selected. The data can be viewed in the scope block.



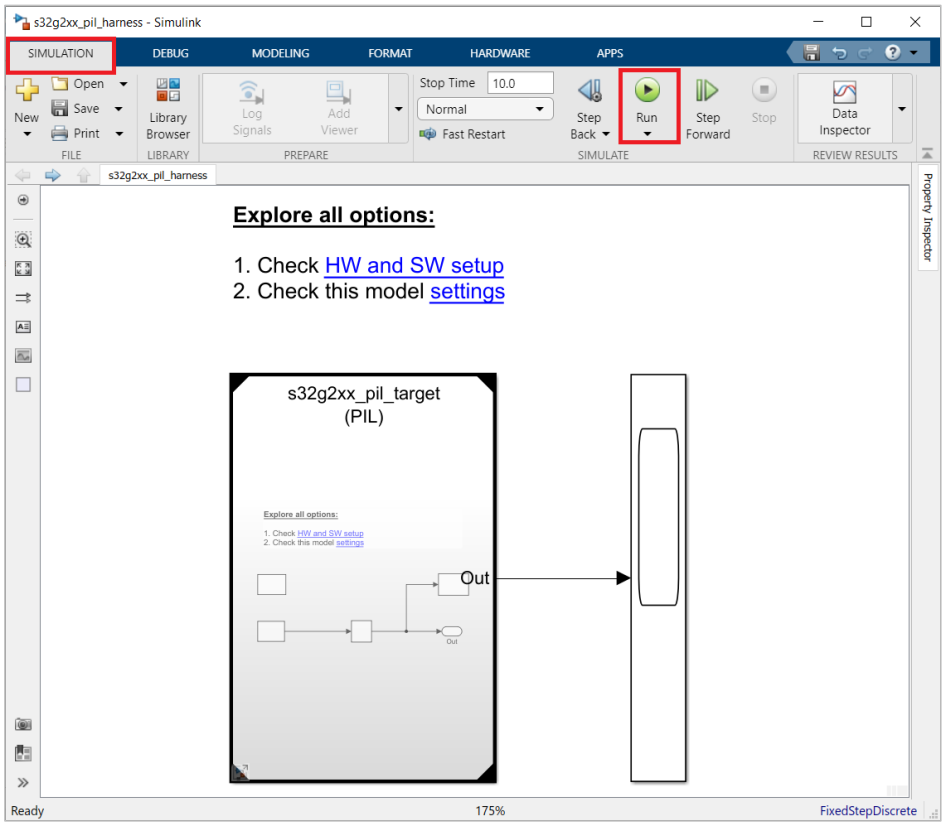
Follow the next steps to run the example:

1. Open and s32g2xx_pil_harness_example_readme.html file to understand the hardware and software requirements for running the application.

2. Open both models `s32g2xx_pil_harness.mdl` and `s32g2xx_pil_harness.mdl` and for each model in the `Configuration Parameters` select the appropriate Hardware board (in this case NXP S32G2xx) and then select the Hardware part (S32G274A).



3. In the model `s32g2xx_pil_harness.mdl` go to `SIMULATION` tab, push the `Run` button and wait until the code is generated, compiled, and downloaded to the evaluation board.



At the end you shoud see a report generated with all the PIL test passed. You succeeded in running your first example created with **Model-Based Design Toolbox for HCP**

How to Reach Us:

Home Page:
www.nxp.com

Web Support:
www.nxp.com/support

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