RADAR Toolbox for MATLAB

Quick Start Guide

Version 1.8.0
Date 27 May 2024

Summary

1 Introduction

This Quick Start Guide is designed to get you up and running in a matter of minutes with the concepts used by the NXP RADAR Toolbox for S32R. This toolbox is designed to be used from MATLAB.

The first part of this document covers the toolbox installation while the second part shows how to run a simple application.

1.1 Purpose

The purpose of this document is to demonstrate how to install the toolbox and run an example application using it.

1.2 Audience

This document is intended to NXP S32R users that need to simulate applications run on SPT accelerator.

1.3 Definitions, Acronyms and Abbreviations

Acronym	Description
SPT	Signal Processing Toolbox

2 Installation

Installing the NXP RADAR Toolbox for S32R is the first step. The next sections present all the steps required to have the toolbox installed successful and ready for running the first application.

2.1 System Requirements

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

- Windows® 10 64bit Operating System or Red Hat® Enterprise Linux®
- At least 2 GHz CPU Speed
- At least 4 GB of RAM
- At least 20 GB of free disk space

2.2 Mandatory Software

NXP RADAR Toolbox is delivered as MATLAB Toolbox Package (MLTBX) that can be installed:

- Online from MathWorks File Exchange website. For convenience, a NXP Support Package for S32R is available to assist throughout the installation process of the NXP SPT Toolbox and supplementary software;
- Offline from NXP website as a MATLAB Add-on;

This section shows how to install the NXP RADAR Toolbox using online approach directly from MathWorks Add-ons File Exchange website. In case you have already downloaded the NXP RADAR Toolbox for S32R MLTB file from NXP's official web page then jump directly to section 2.2.2.

To have the NXP RADAR Toolbox installed and configured properly the following actions should be executed:

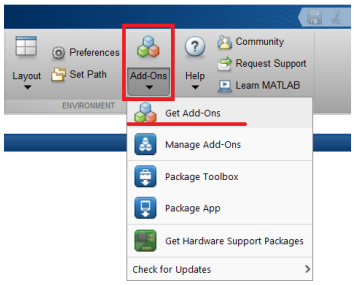
- Use `Get Add-ons` menu from MATLAB to search for "`S32R Support Package`" online and install the toolbox;
- Start the `NXP Support Package for S32R` and follow the steps indicated in the user interface;
- Download and install the `NXP RADAR Toolbox for S32R` from NXP website
- Register and activate the NXP RADAR Toolbox license

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

NOTE	It is recomanded to install all the software (MATLAB, and NXP Toolboxes) into system paths without spaces.

2.2.1 **NXP Support Package for S32R**

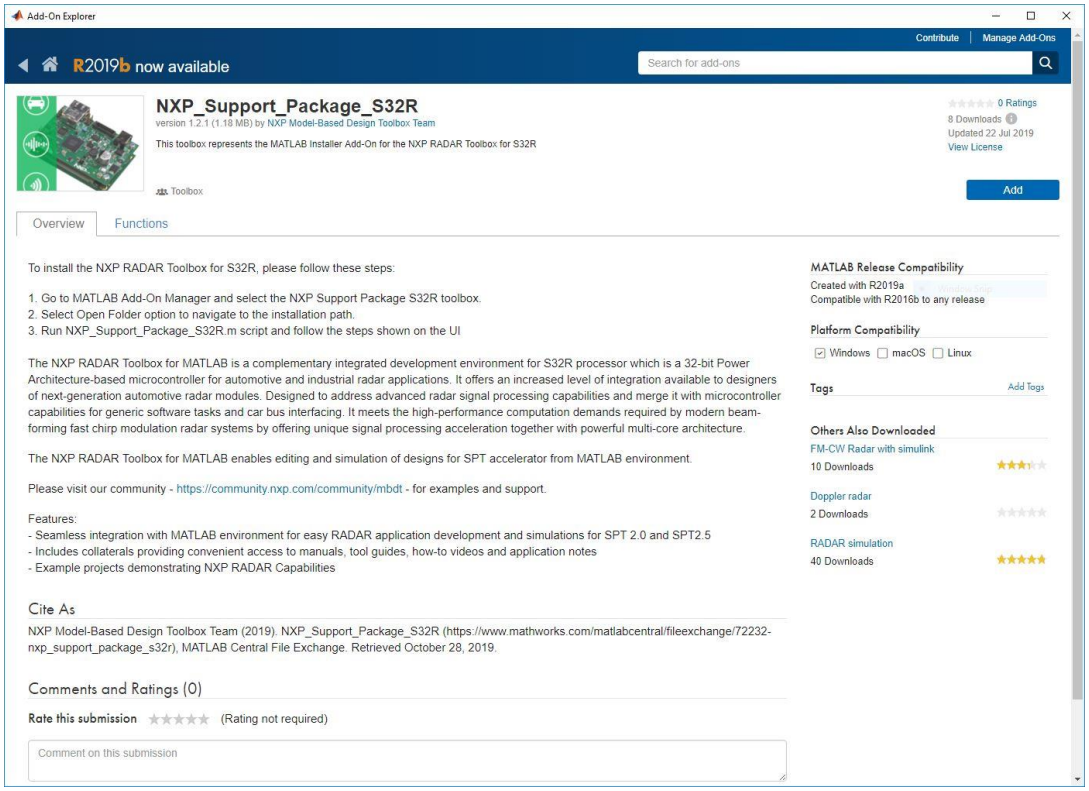
For convenience a step-by-step installer guide is available on MathWorks's File Exchange website. Open MATLAB and select `Get Add-Ons`:



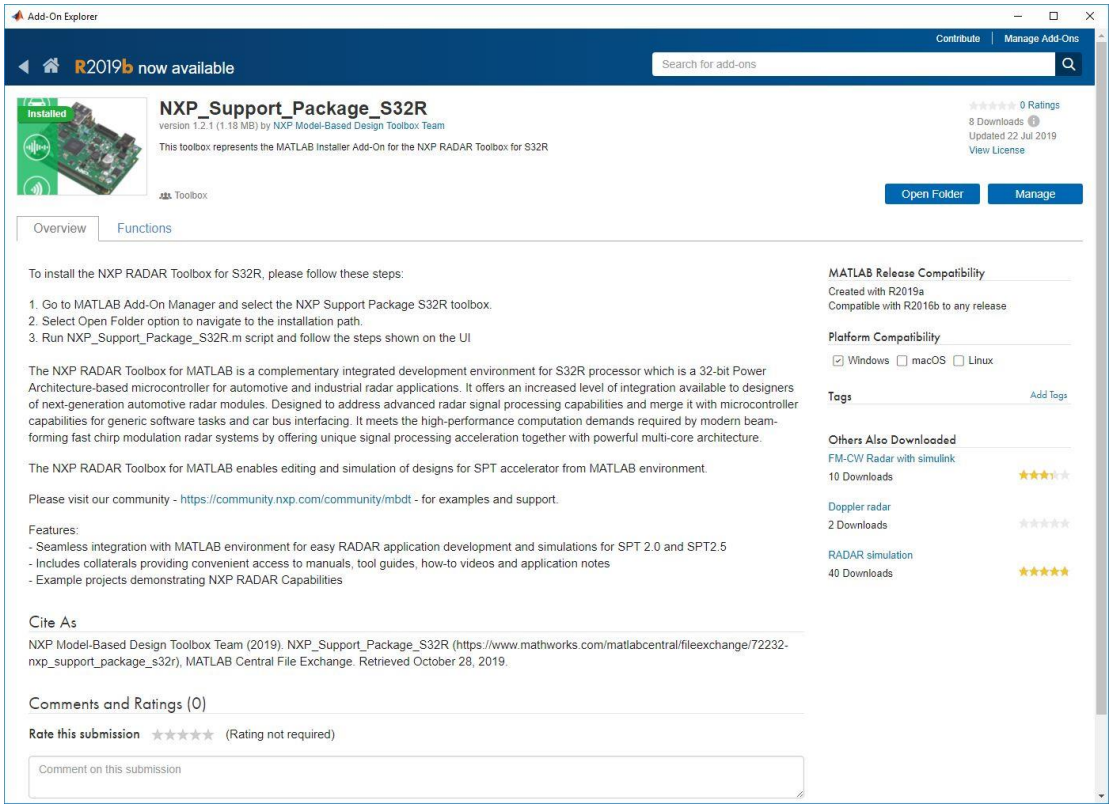
NOTE	The screenshots below have been taken for an existing release of NXP RADAR supporting S32R processor family since the final version was not yet published on the website at the time when this document was created. However, the entire process for RADAR Toolbox revision 1.8.0 RTM will be identical with the one presented below.

1. Once the Add-On Explorer window opens, search for "`nxp radar toolbox s32r`"

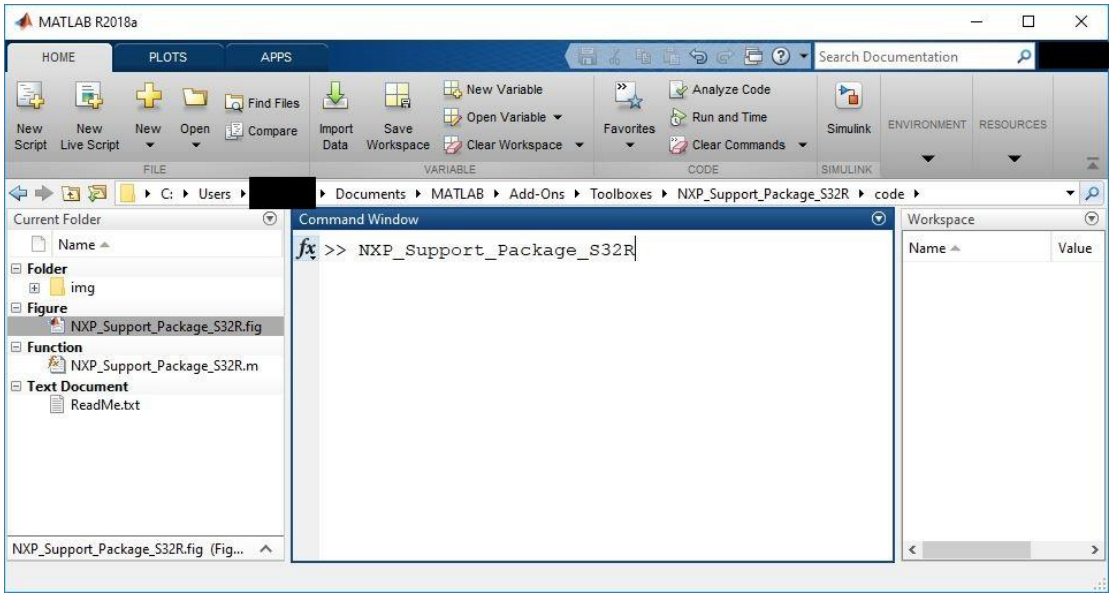
2. Select the NXP Support Package for S32R and click on `Add` button to start the installation of the installer guide into your MATLAB instance.



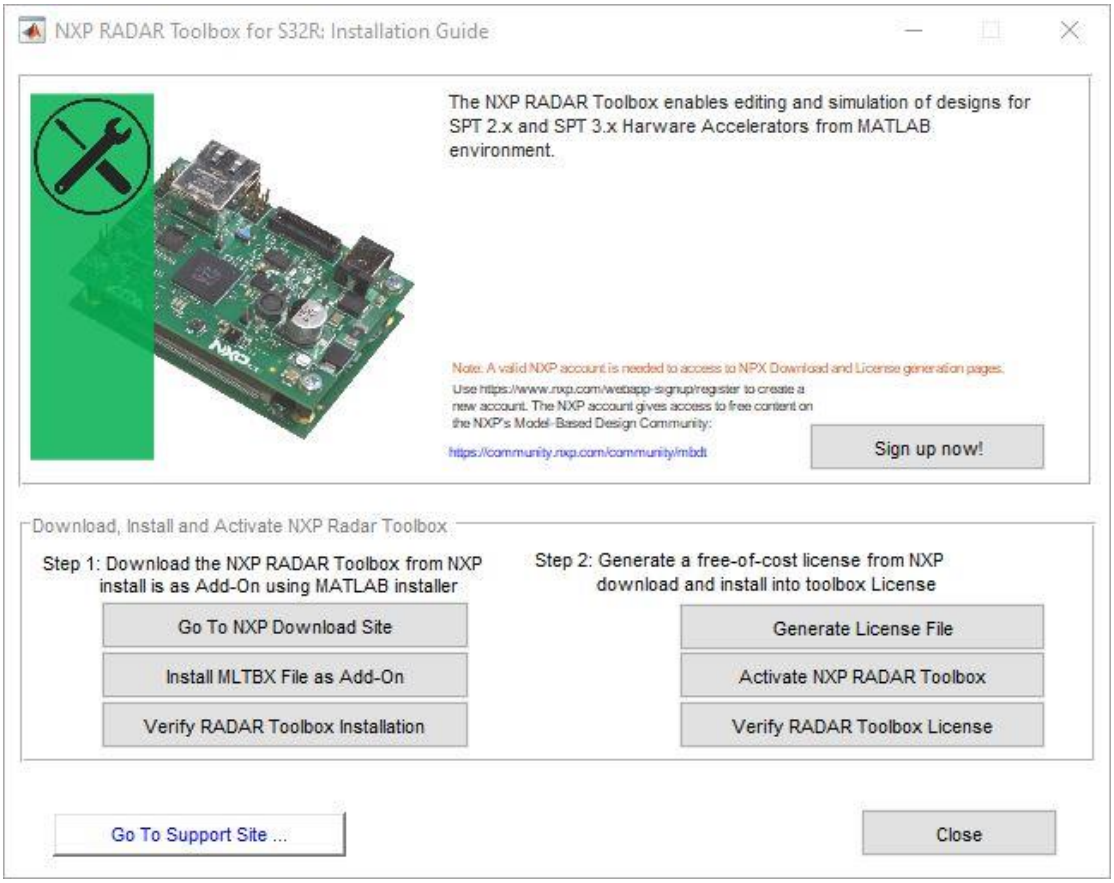
3. Wait until the toolbox is installed and then click on `Open Folder` button.



4. Run the `NXP_Support_Package_S32R` command in your MATLAB console to start the `Installer Guide`.



5. The `NXP Support Package for S32R - Installer Guide` User Interface is started



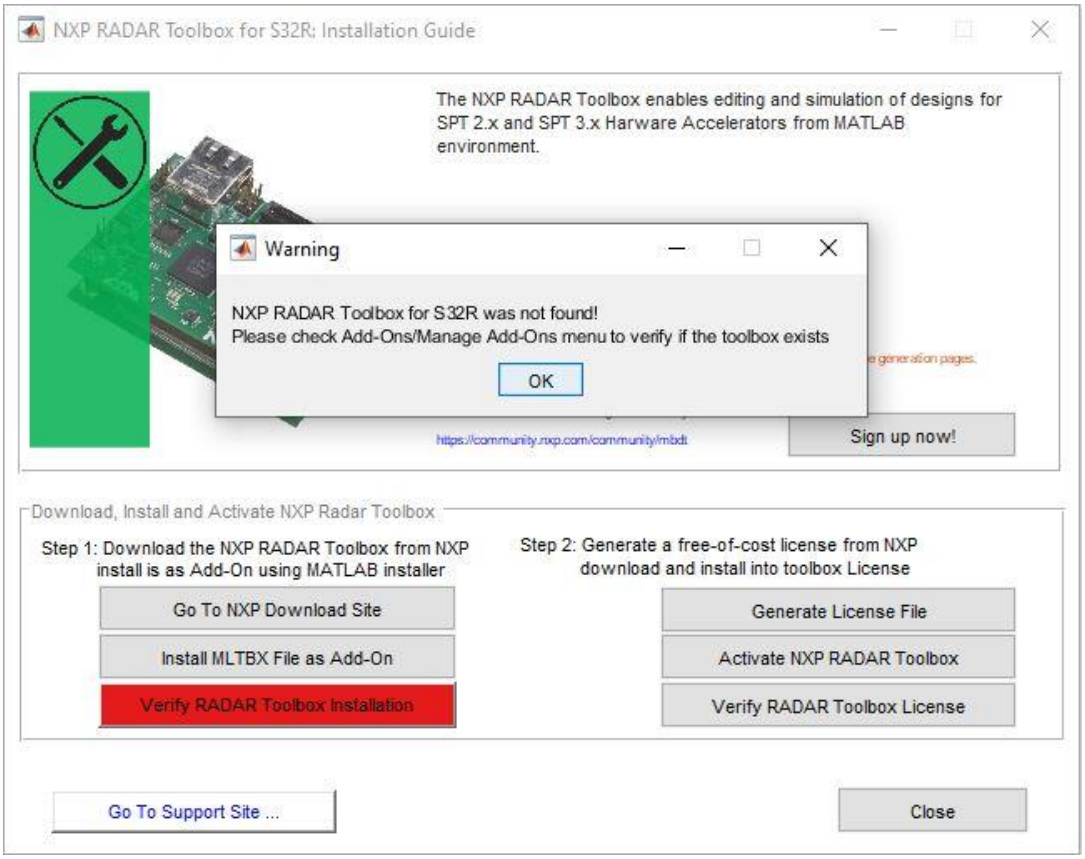
The Installer Guide contains instructions for downloading, installing and verification of all software components required for being able to develop RADAR application with MATLAB for NXP S32R automotive RADAR processors:

- Steps to download, install and verification of the NXP RADAR Toolbox for S32R
- Steps to generate, activate and verification of the license for NXP RADAR Toolbox for S32R

There are 2 main advantages of using this Installer Guide:

- Each step completion is automatically checked by the tool. If the action is completed successfully, then the tool is going to mark it as green. If a particular step cannot be verified, then the tool will issue a warning or error and is going to highlight in red that particular step that needs more attention for user side.
- Future updates will be made available via this online toolbox. In case you wish to keep your software up to date, then please install this into your MATLAB Add-ons and once a new update will be available your MATLAB instance will notify you.

The next screen capture shows how the Installer Guide notify user of successful or failed actions. At the end of installation all push buttons should be green.

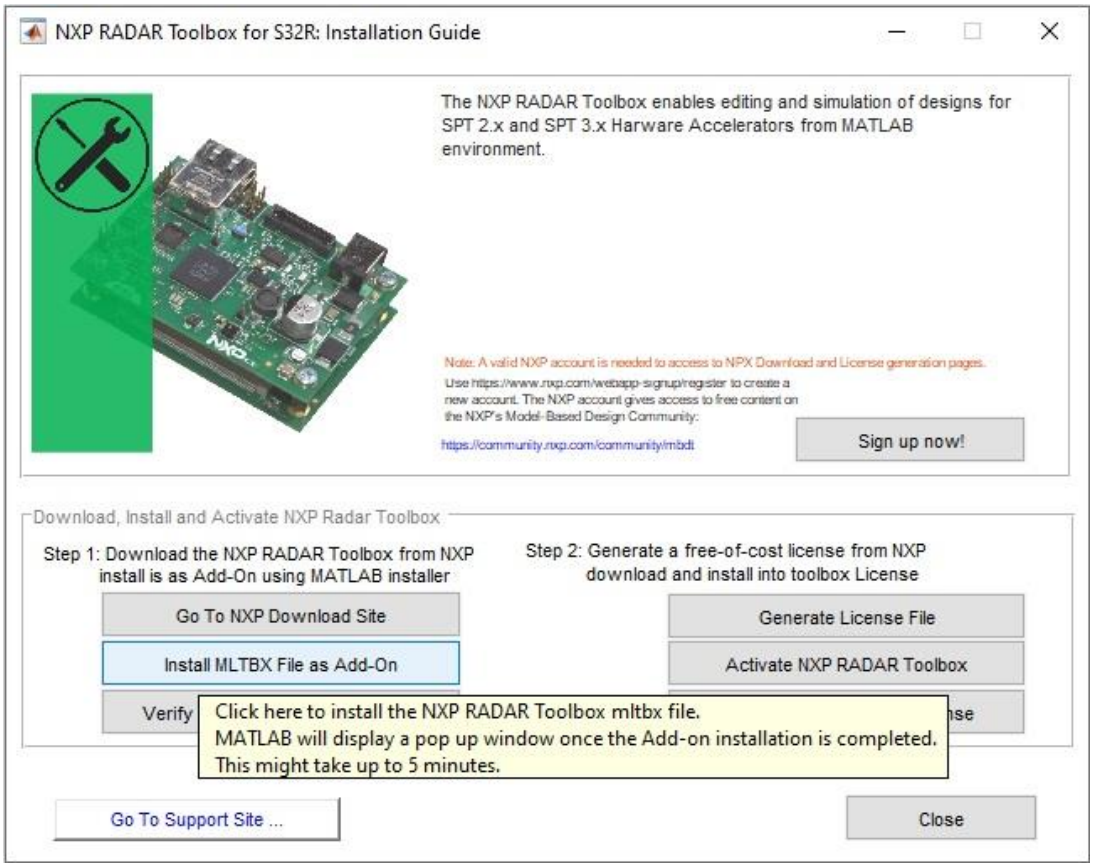


2.2.2 **NXP RADAR Toolbox for S32R**

You can obtain the NXP RADAR Toolbox for S32R by:

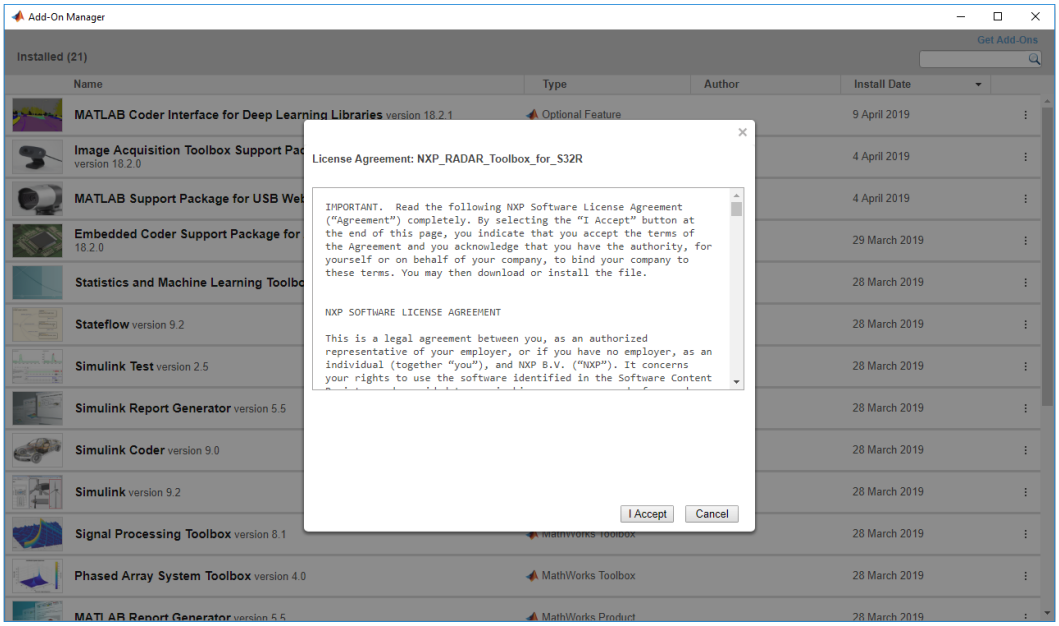
- Using the Installer guide "`Go To NXP Download Site`" button

- Go directly into your NXP Software Account and download the toolbox

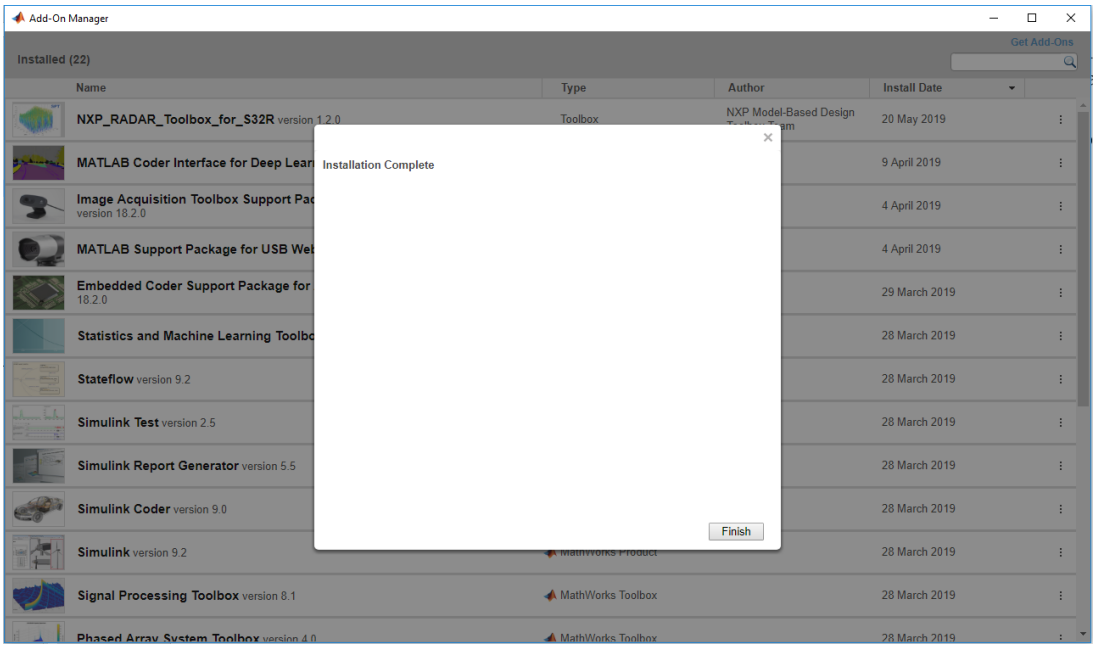


You will be prompted with the following options:

1. Accept the NXP Software License Agreement by clicking "`I Accept`" to start toolbox installation.

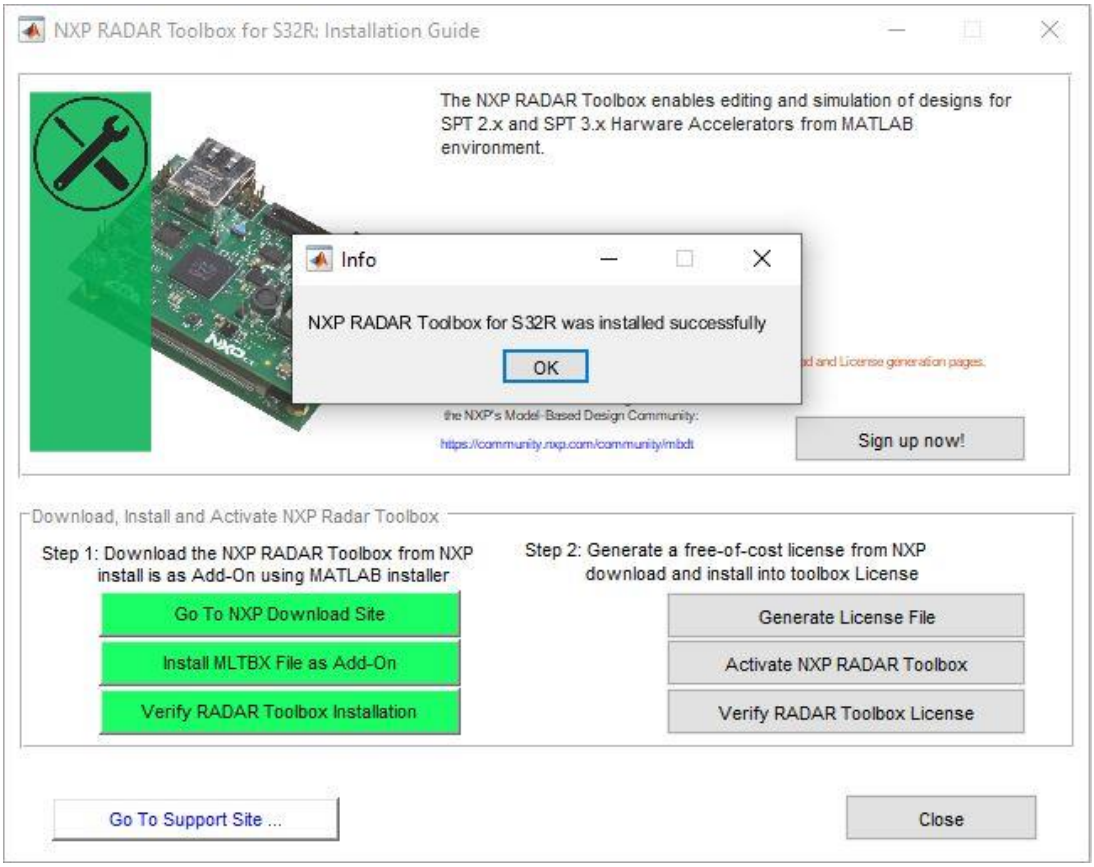


2. Click "`Finish`" and NXP's RADAR Toolbox should be visible as a new Add-ons. The default location can be changed prior to installation by changing the Add-Ons path from MATLAB Preferences

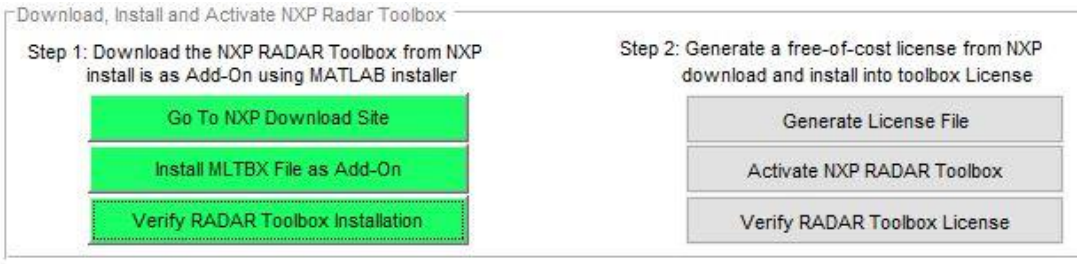


3. More details about the NXP's RADAR Toolbox can be found by clicking on `View Details`

4. NXP RADAR Toolbox documentation, help and examples are fully integrated with MATLAB development environment. Get more details by accessing the standard Help and Supplemental Software section
5. In case you are using the `Installer Guide`, then you have the option to check if the NXP RADAR Toolbox is installed correctly on your MATLAB environment by simply clicking on "`Verify RADAR Toolbox Installation`" button



After this step you should see all button related with RADAR Toolbox Step 1, green

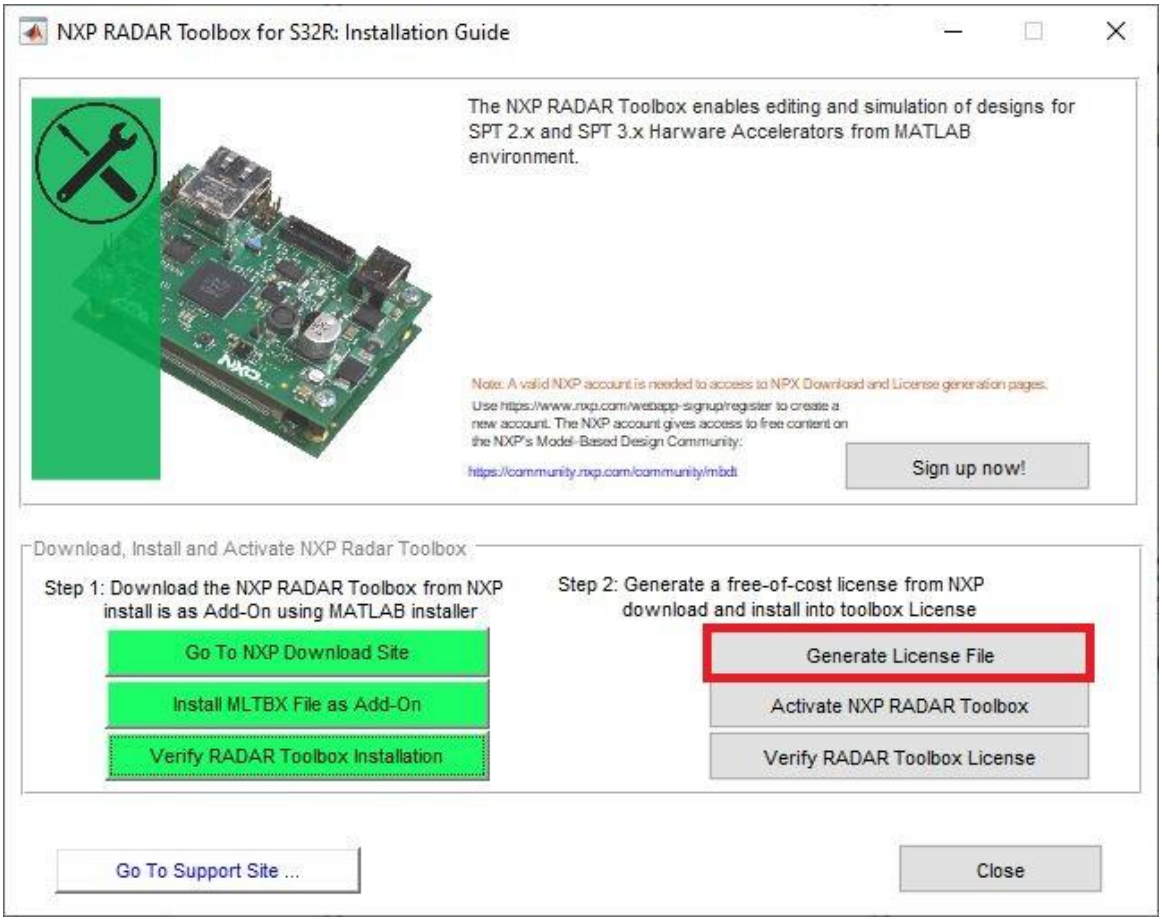


2.2.3 License Generation and Activation

The NXP RADAR Toolbox for S32R is available free of charge, however, a valid license is required.

You can obtain the NXP RADAR Toolbox for S32R license free of charge by:

- Using the Installer guide "`Generate License File`" button

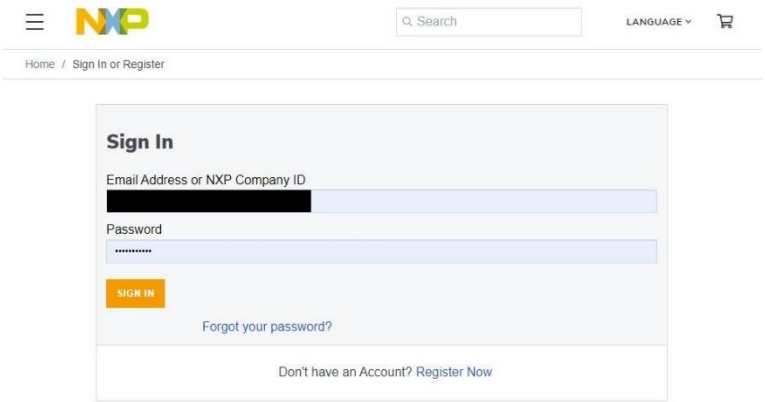


- Go directly into your NXP Software Account and Generate the license

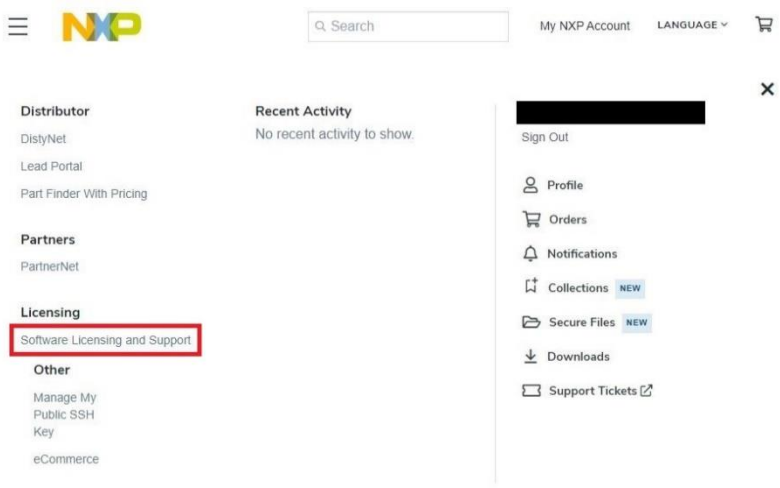
Perform the following steps to obtain the NXP RADAR Toolbox for S32R license:

1. Go to https://nxp.flexnetoperations.com/control/frse/product?child_plneID=782957

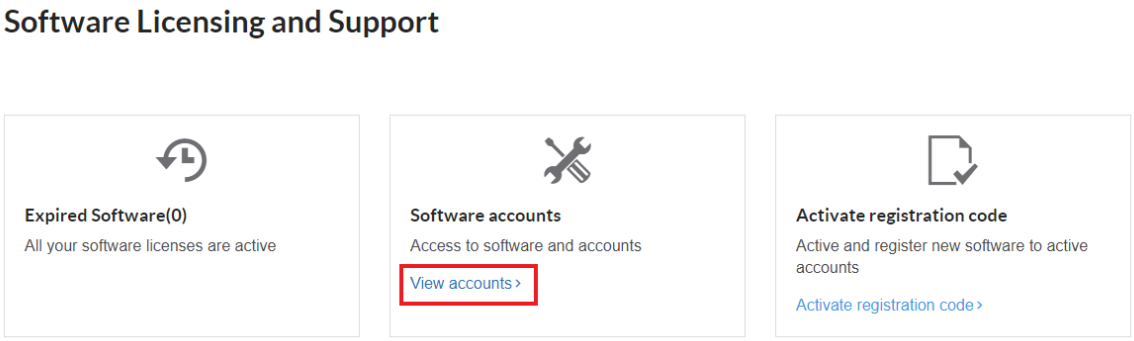
2. Sign in. If not registered yet, click the Register button to obtain a NXP account.



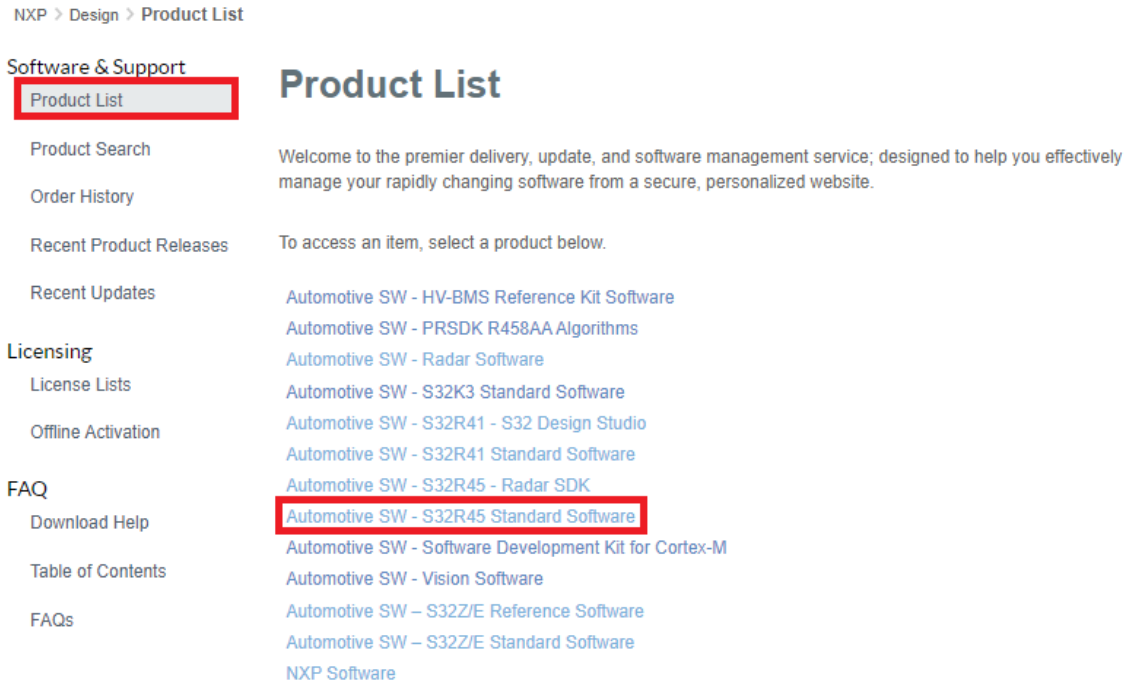
3. Select "`Software Licensing and Support`" link from "`My NXP Account`" block



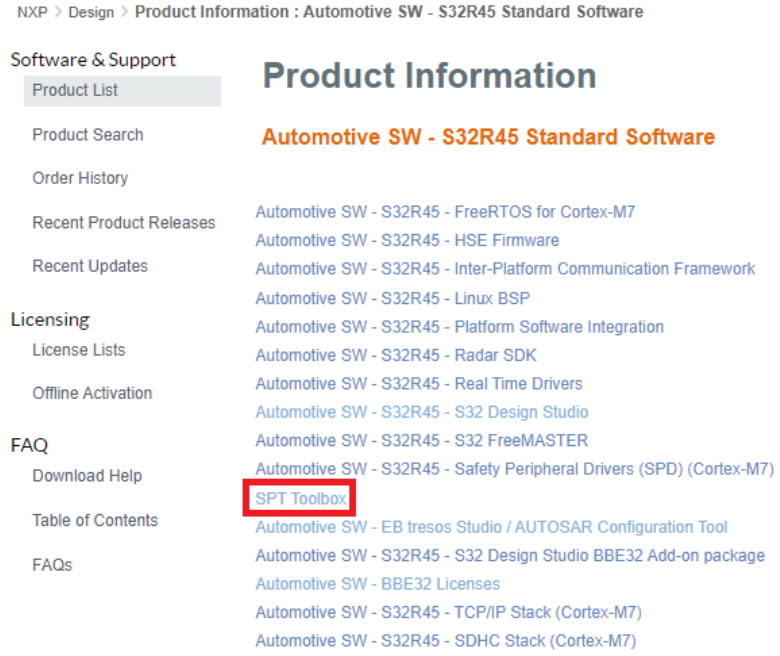
4. Select "`View accounts`" link from "`Software accounts`" block



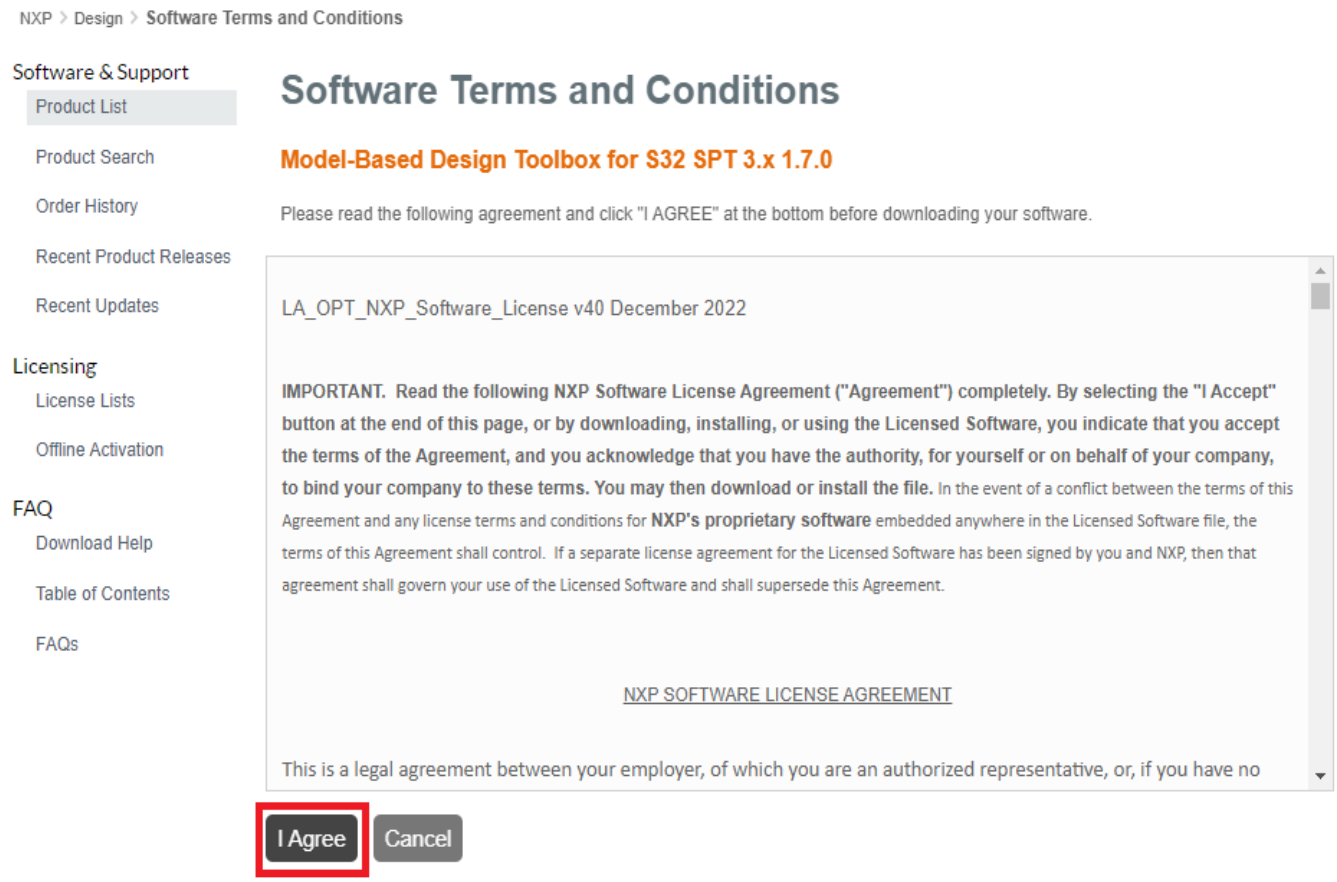
5. Select "`Product List`" option on the left to see all products you are entitled to use. Within Product Information page, select "`Automotivr SW – S32R45 Standard Software`".



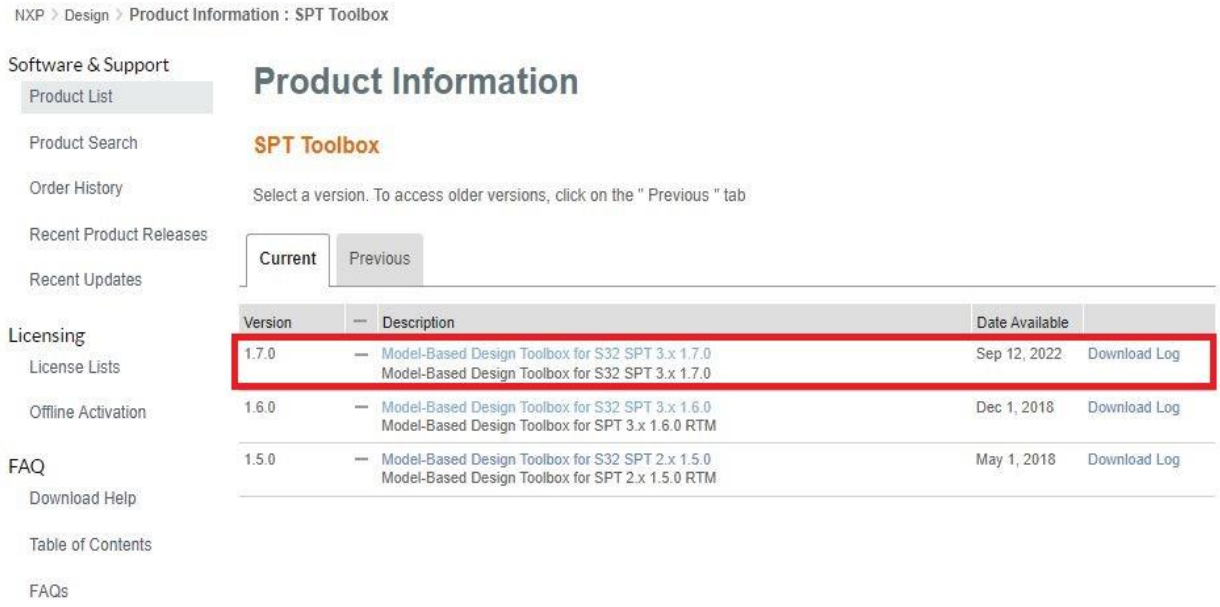
6. Select "SPT Toolbox" link to go to download and license management page.



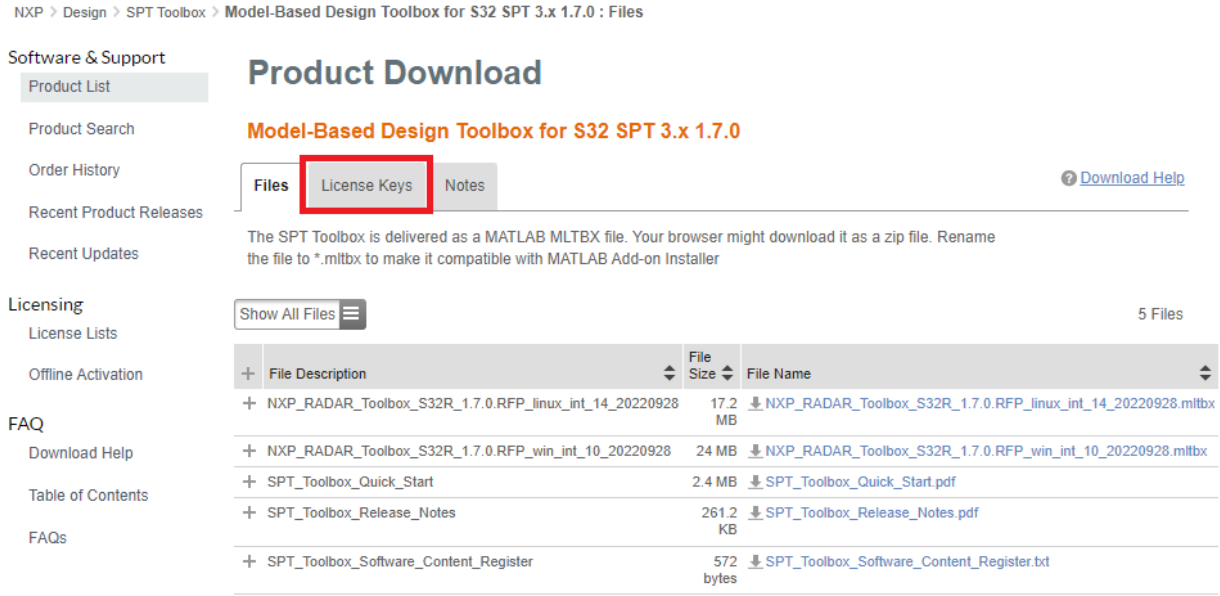
7. For the first-time log-in, the "Software Terms and Conditions" page will be displayed. Click on "I agree" button to consent to the software license agreement.



8. Select the desired release, for example "Model-Based Design for S32 SPT 3.x 1.8.0".

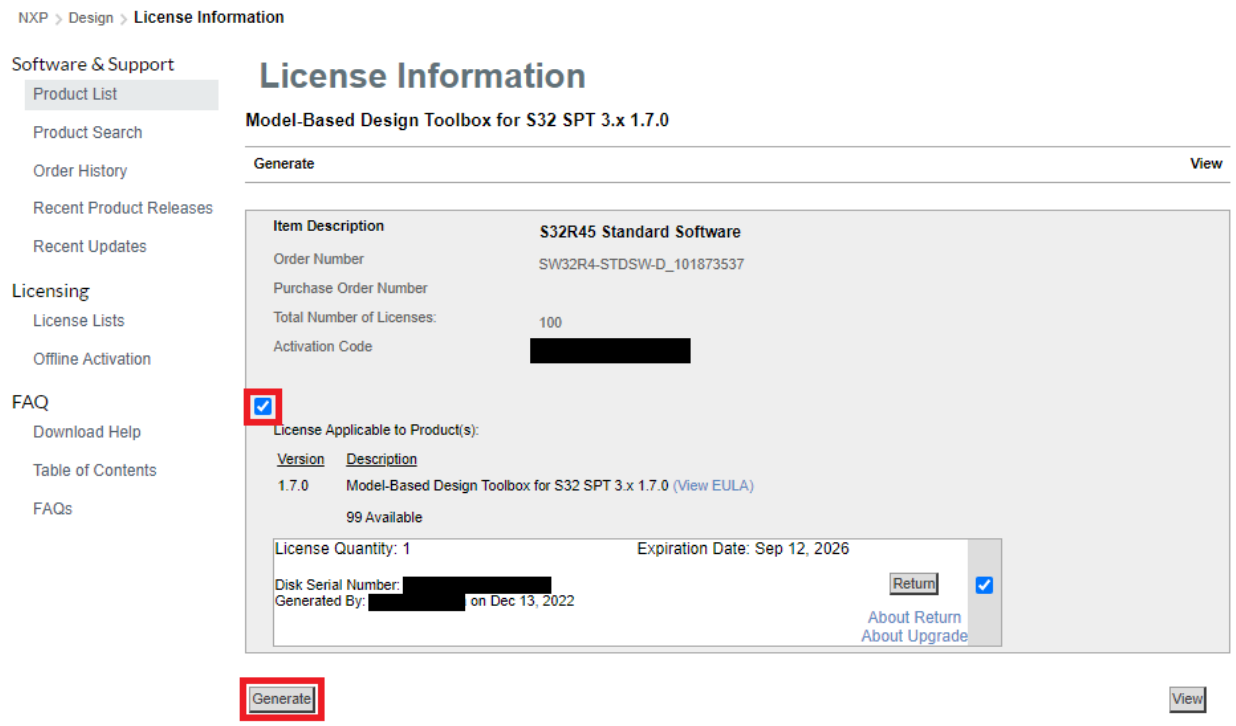


9. Click on "License Keys" tab



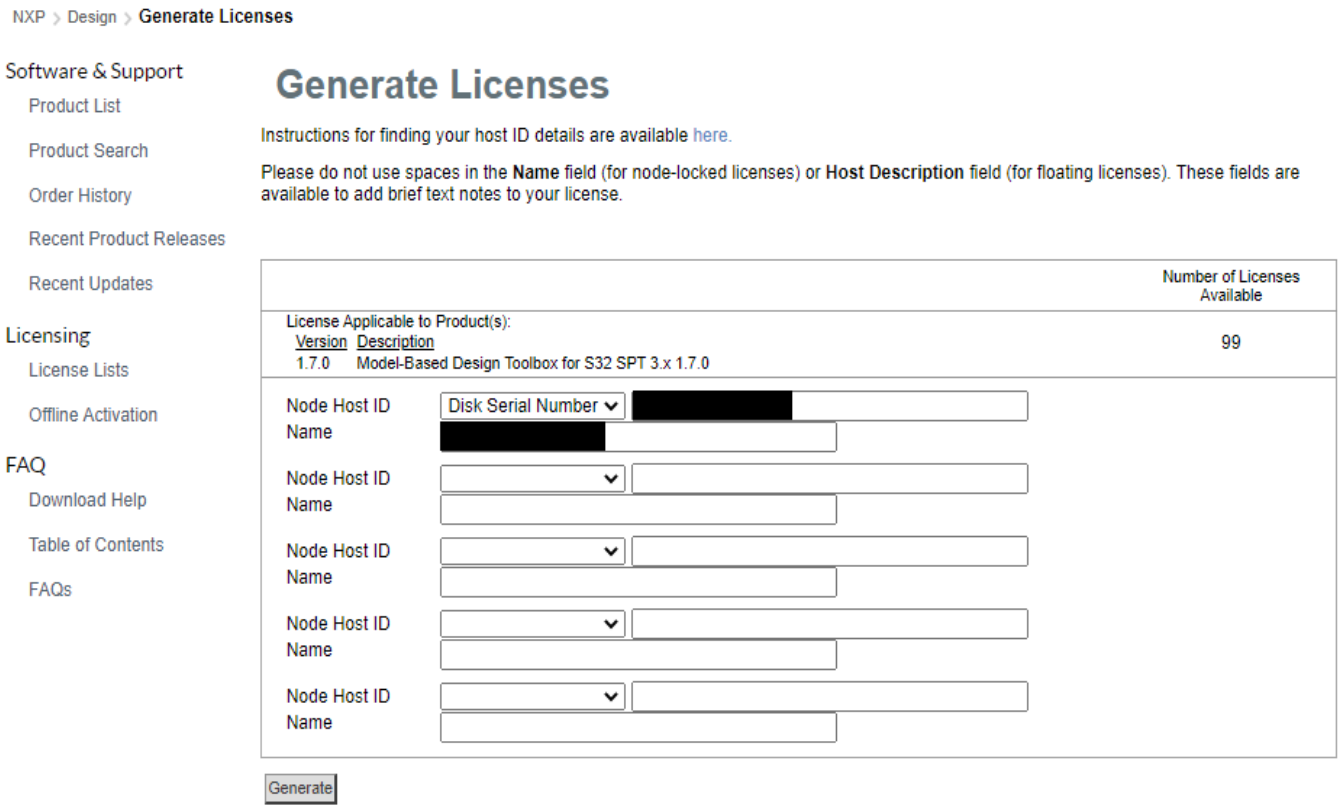
10. Verify if the correct tool and version are identified and then check the box and click on "Generate" button.

NOTE	NXP RADAR Toolbox is keeping the same licensing scheme between various releases. If you have a valid license generated for the previous releases then you can use it for the newer version 1.8.0 too



11. Select `Disk Serial Number` or `Ethernet address` as the "`Node Host ID`". If you do not know your Disk Serial Number nor the Ethernet address then go to paragraph 12. There is also a link available on this page with details about License Generation.

    Enter a name for license to help managing them in case you need to use the RADAR Toolbox on multiple computers. (Optional)

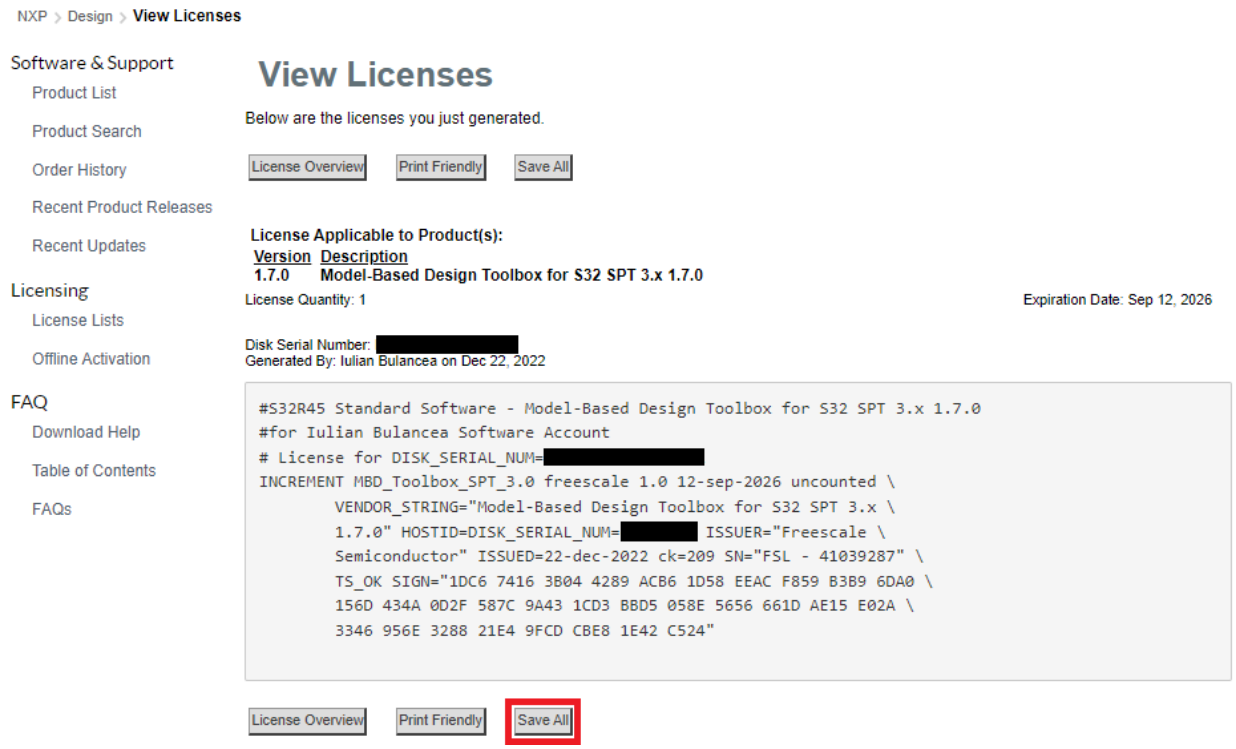


12. Locating the Node Host ID

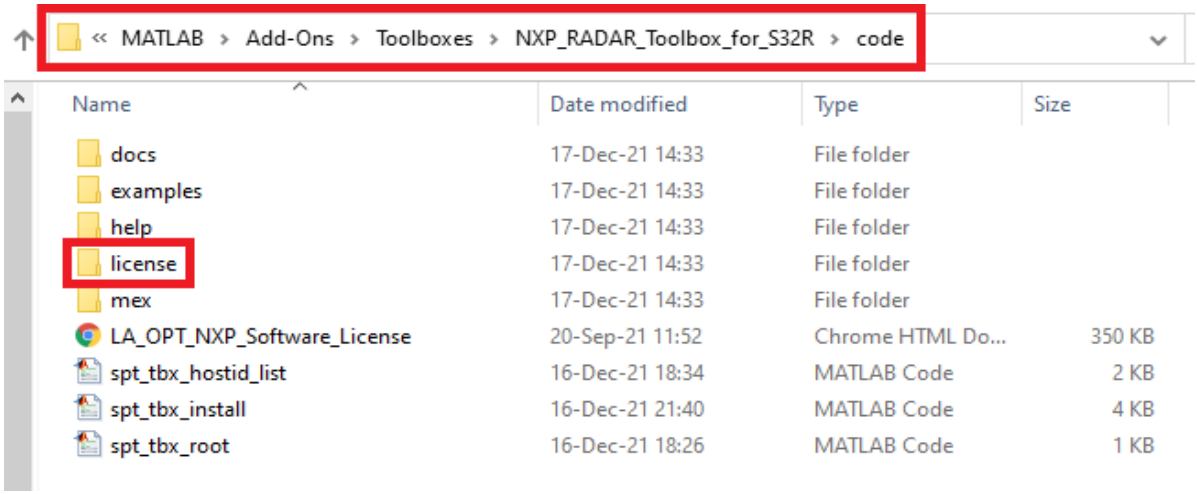
The entire list of possible `Host ID` can also be found by calling the script `spt_tbx_hostid_list`. Calling the script you can get:

```
On the machine xxxxxxxx the hostIDs that can be used to generate
the license are the following:
1) Disk Serial Number = 66B7-2EBD
2) Ethernet Address = 28F10E111C1D
```

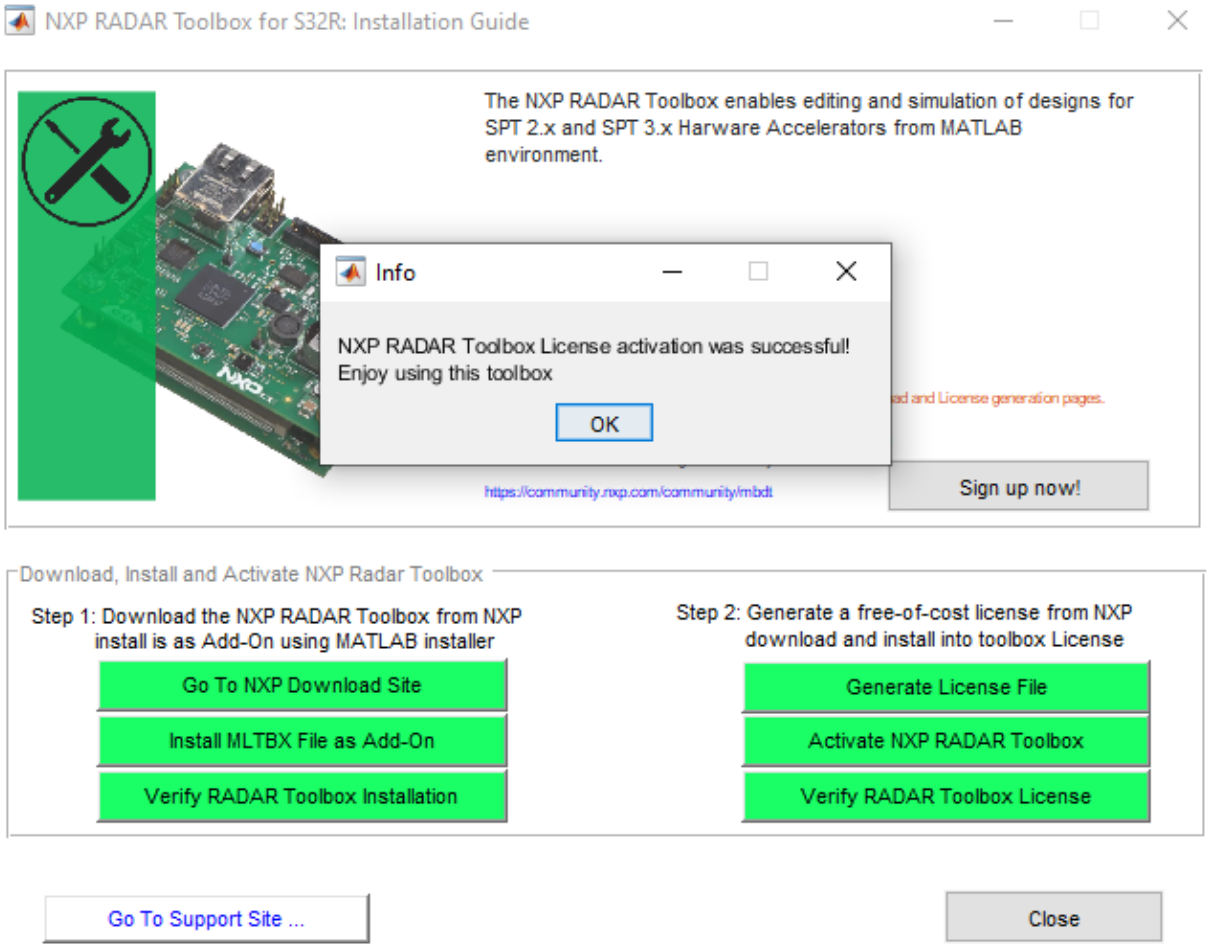
13. Click on "`Generate`" button to get the license. Verify if the information is correct: Toolbox version, expiration date, Node Host ID



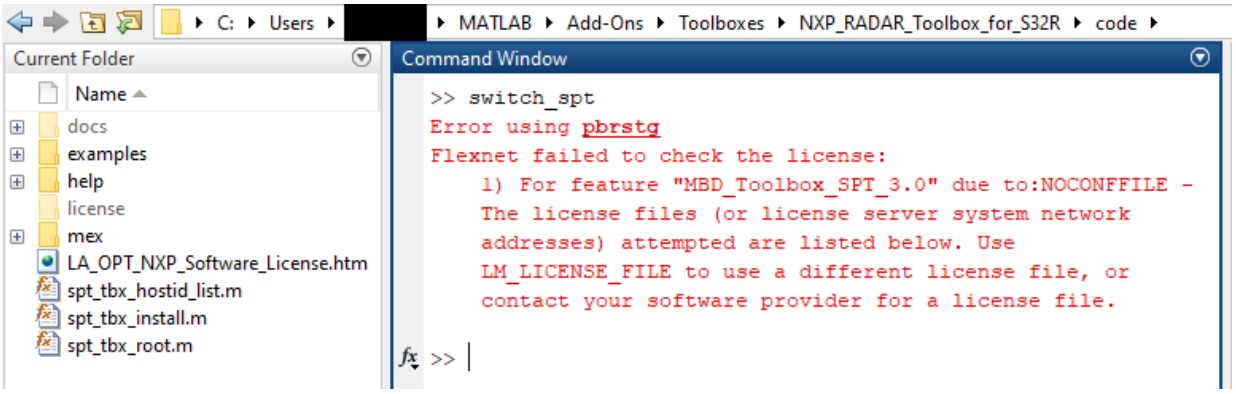
14. Either click on "`Save All`" or copy and paste the file into a text editor and save the file as "`license.dat`" into the "`RADAR Toolbox installed directory\license`" folder.



15. License installation is now complete.
16. Check if the license file is installed correctly by using the "`Verify Vision Toolbox License`" button. If everything is ok, then the Installer Guide will confirm the action



Alternatively, invoke the `switch_spt` function to verify the license errors.



3 RADAR Application

The RADAR application consists on linking of RADAR algorithms:

range FFT, doppler FFT, beam forming, magnitude computation, histogram computation, threshold deduction and peak search.

For each SPT version there is a separate application which will have as result the identification of the objects in front of the RADAR antennas. For each such detected object one can find the distance from the RADAR and the object and the radial velocity of the object.

In order to run the RADAR application called *Object detection* one should change to the folder *NXP_RADAR_Toolbox_for_S32R\code\examples\advanced\object_detection*. To run the object detection application for SPT 2.0 go to folder *spt20* where you are going to find the live script called *object_detection_spt20.mlx*. The script is self-expiatory.

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