



eIQ: Getting Started Guide for i.MX RT

Revision 5

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1 Document Overview

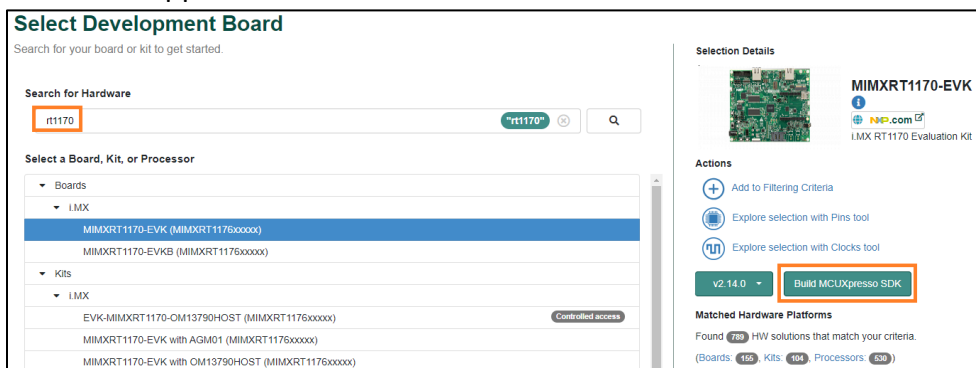
This document describes how to download the eIQ software that is included as part of the MCUXpresso SDK and run an eIQ demo for i.MX RT devices. The last section includes useful links to learn more about eIQ for MCUs. The document assumes you have already installed the desired IDE.

eIQ currently supports the following devices in MCUXpresso SDK:

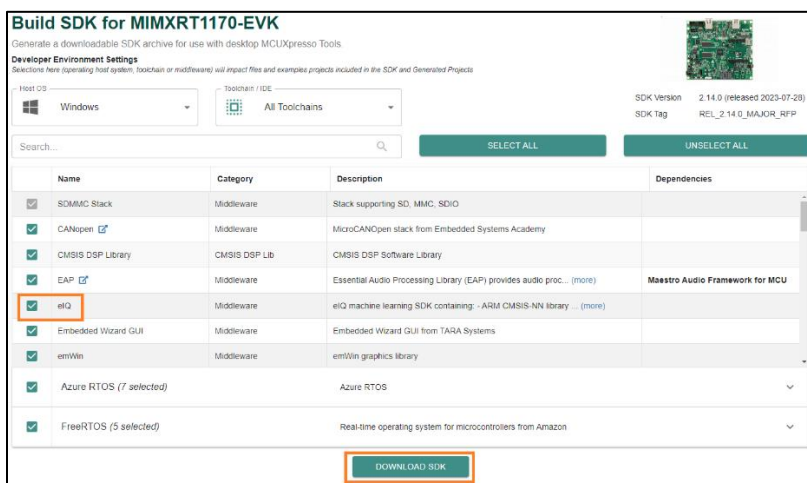
- i.MX RT595
- i.MX RT685
- i.MX RT1050
- i.MX RT1060
- i.MX RT1064
- i.MX RT1160
- i.MX RT1170

2 Installation

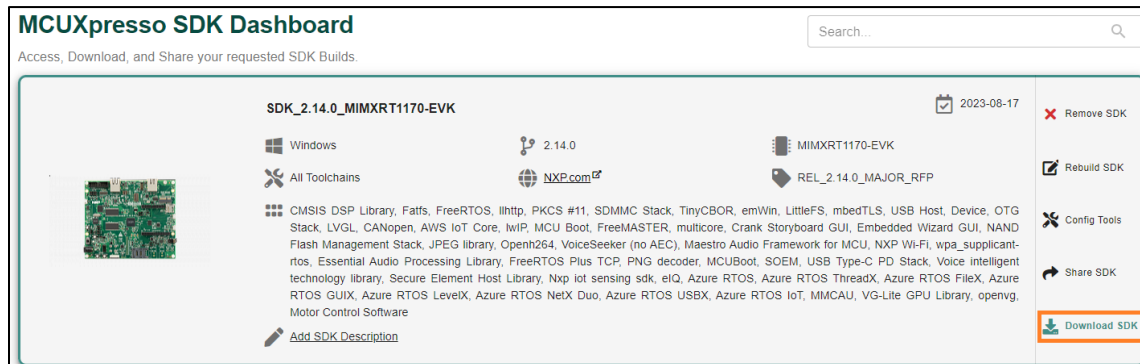
1. Go to <https://mcuxpresso.nxp.com> and search for the SDK for your board. By default, the latest available version of the SDK will be selected and then click on **Build MCUXpresso SDK**. In this lab the RT1170-EVK is the board that will be used as an example, but it will be very similar for any other eIQ supported device.



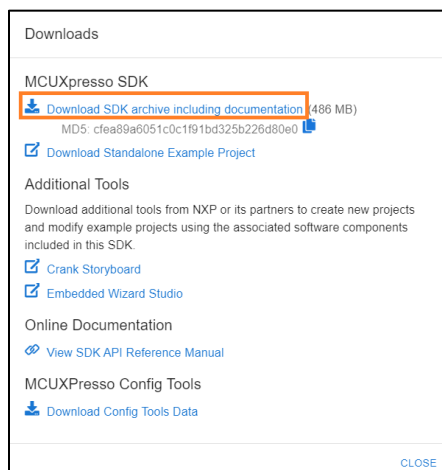
2. On the SDK Builder screen, ensure the “eIQ” middleware option is checked and then click on **Download SDK**



3. On the Dashboard click on Download SDK for the board you selected



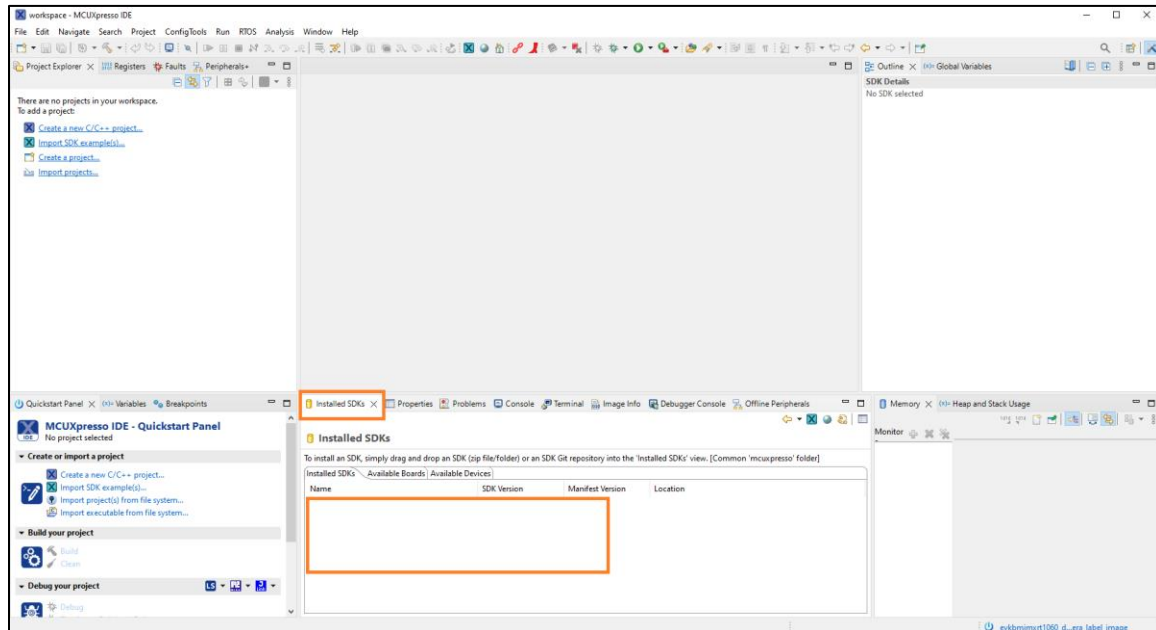
4. In the pop-up, click the **Download SDK archive including documentation** link and accept the User Agreement to download the zip file to your hard drive. Make note of the download location as it'll be used later in the lab.



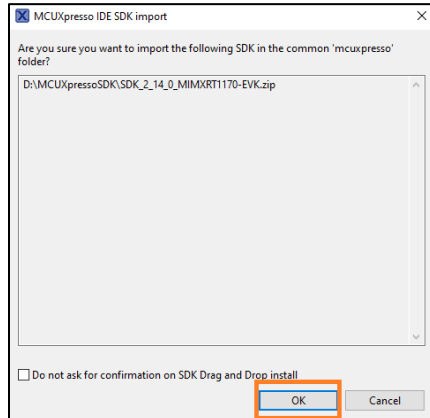
5. If interested in using Glow to compile your own models, also download the [Glow Tools package](#).
6. If interested in using the eIQ Toolkit to create or convert custom models or to convert a model to run on the eIQ Neutron NPU found on the MCX family, download the [eIQ Toolkit package](#).

3 eIQ Demo with MCUXpresso IDE

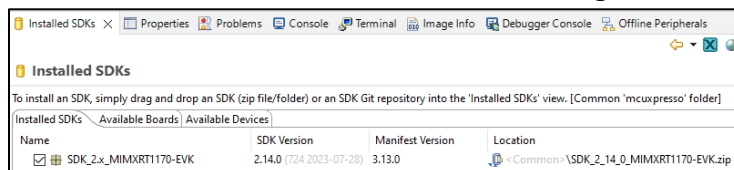
1. Open MCUXpresso IDE 11.8 or later. Select a workspace location and then when MCUXpresso IDE opens, close the Welcome screen.
2. Drag-and-drop the zipped SDK file into the Installed SDKs window.



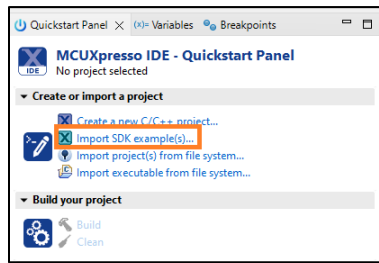
3. You will get the following pop-up, so hit OK.



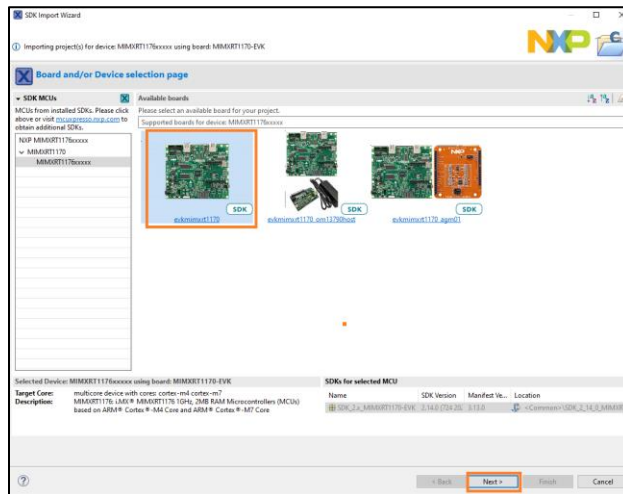
4. The Installed SDK tab will then look something like this:



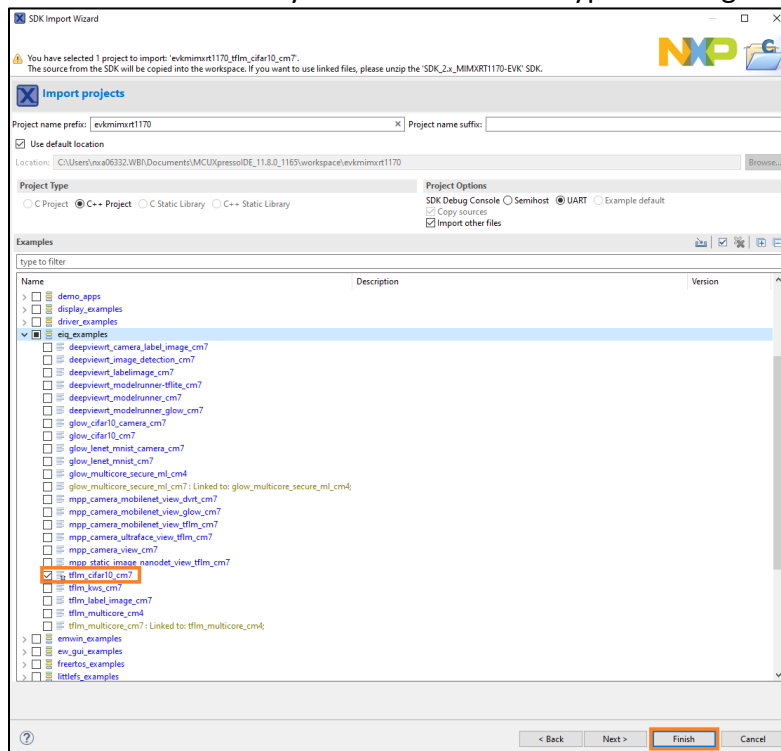
- Next import the desired project. Look in the lower left corner and in the Quickstart Panel tab, select **Import SDK examples(s)...**



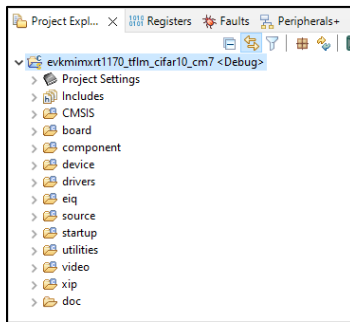
- Select the **evkmimxrt1170** board and click on **Next**



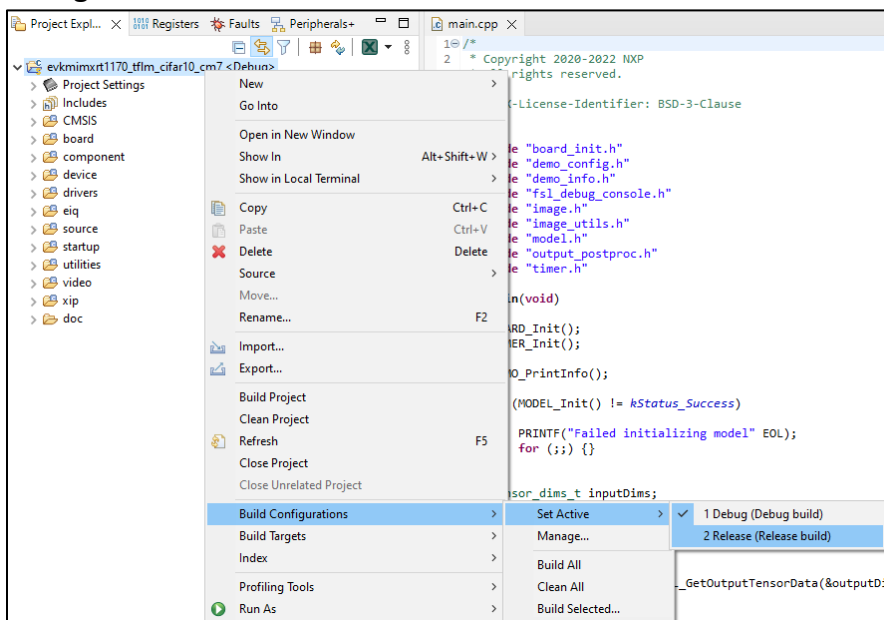
- Expand the **eiq_examples** folder and select the eiQ project you want to explore. For this lab we'll use the **tflm_cifar10_cm7** example which uses the camera that came with the i.MX RT1170 EVK to identify one of 10 different types of images that make up the [CIFAR10 dataset](#).



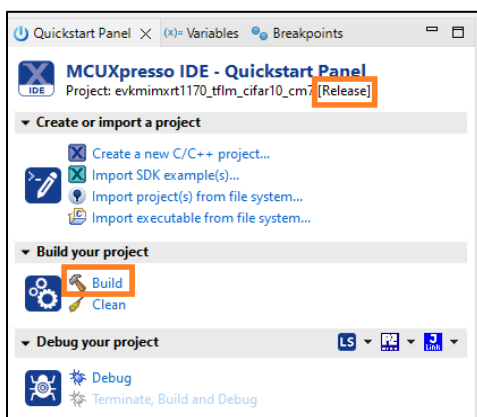
8. It will look like the following when imported into the Project Explorer window:



9. For fastest inference time when using TensorFlow Lite project, change the build target to Release to use the highest compiler optimizations. Right click on the project and go to **Build Configurations->Set Active->Release**

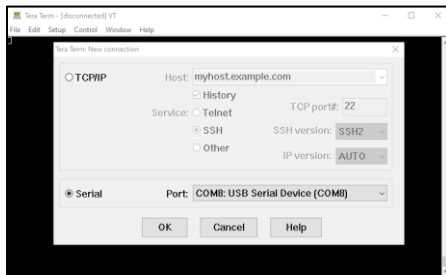


10. Make sure the Release target is being used and then compile the project by clicking on **Build** in the Quickstart Panel.

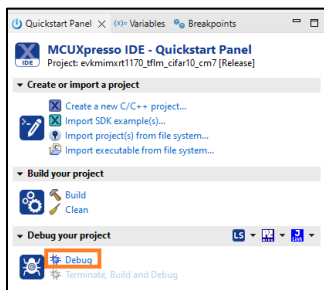


11. Connect a USB-micro cable to your board (J11 for i.MX RT1170 EVK) which provides power, debugging, and serial port capabilities.

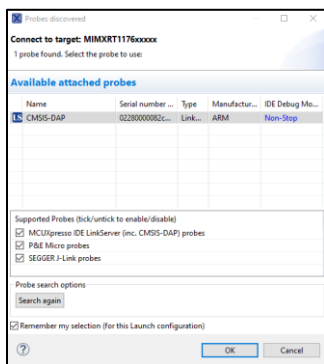
12. Optionally [connect the camera and an LCD screen](#) (sold separately) to your board. If using the LCD, you must also use the extra 5V power supply to power the board and move J38 to pins 1-2 due to the extra power requirements for the LCD.
13. Open up a terminal program and connect to the COM port that the board enumerated as. Use 115200 baud, 8 data bits, 1 stop bit, no parity.



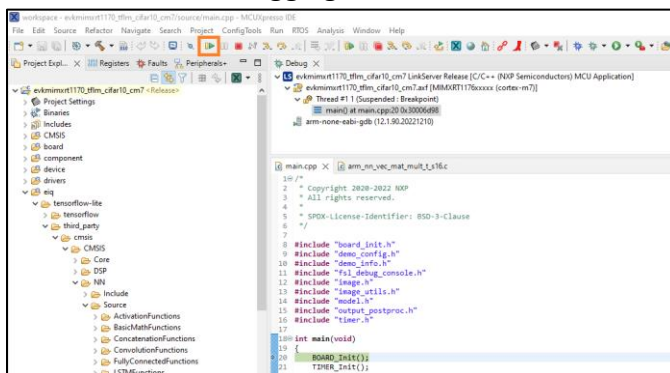
14. Debug the project by clicking on “Debug” in the Quickstart Panel.



15. It will ask what interface to use. Select CMSIS-DAP.



16. The debugger will download the firmware and open up the debug view. Click on the Resume button to start debugging.

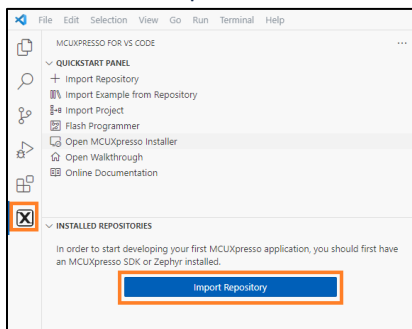


- You will see the following output in the terminal window where it identifies a preloaded image in flash. If the camera+LCD are connected to the EVK, you can point it to other CIFAR10 objects for identification:

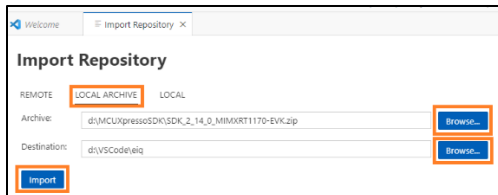
```
COM8 - Tera Term VT
File Edit Setup Control Window Help
|||CIFAR-10 example using a TensorFlow Lite Micro model.
Detection threshold: 60%
Model: cifarnet_quant_int8
Static data processing:
-----
Inference time: 66 ms
Detected: ship <2%>
```

4 eIQ Demo with VS Code

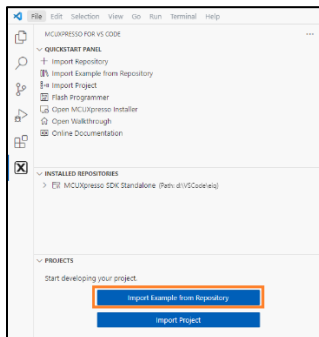
- Open up VS Code and ensure that the MCUXpresso for VS Code extension and MCUXpresso Installer have already been installed.
- Go to the MCUXpresso For VS Code tab and click on Import Repository



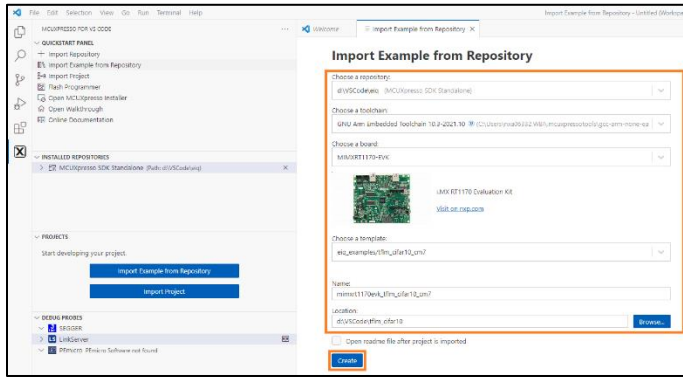
- Go to the **Local Archive** tab and click on **Browse...** to find the downloading SDK zip file. Then pick a location for it to export the SDK to and then click on **Import**



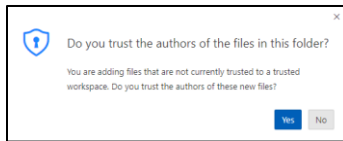
- It will take a while to import the repository. Once its finished, then click on Import Example from Repository



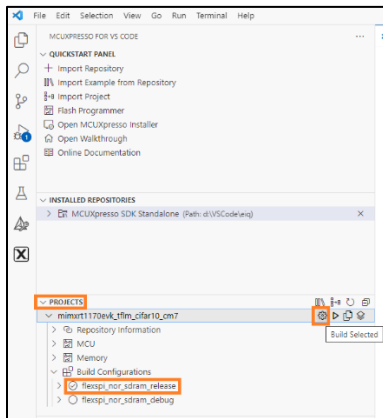
- Then in the screen that comes up, select the repository that was just imported. Then pick the GNU Arm Toolchain, select the RT1170-EVK, and then select the **eiq_examples/tflm_cifar10_cm7** project. And finally pick a location to save the project to. Then click on Create.



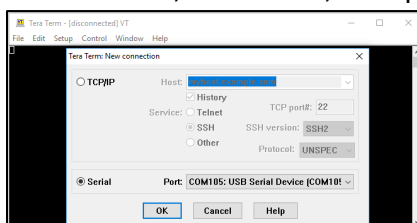
6. The following message will pop up. Click on **Yes**.



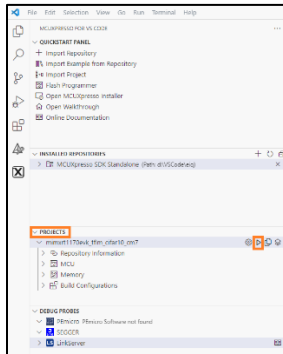
7. Now in the project panel, make sure the Build Configuration is set to the release target, and then click on the gear icon next to the project name to build the project.



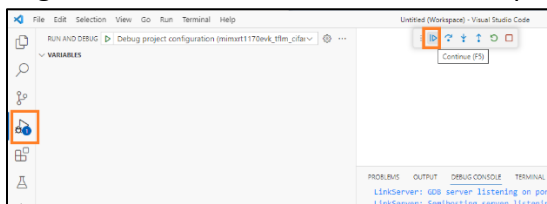
8. Connect a USB-micro cable to your board (J11 on a i.MX RT1170 EVK) which provides power, debugging, and serial port capabilities.
9. Optionally [connect the camera and an LCD screen](#) (sold separately) to your board. If using the LCD, you must also use the extra 5V power supply to power the board and move J38 to pins 1-2 due to the extra power requirements for the LCD.
10. Open up a terminal program and connect to the COM port that the board enumerated as. Use 115200 baud, 8 data bits, 1 stop bit, no parity.



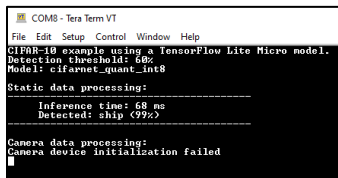
11. Click on the debug icon to download the firmware to the board and debug it.



12. In the control box that comes up, click on the Continue button (or press F5). The Debug tab might be blank since the code was compiled with the highest optimization settings.



13. You will see the following output in the terminal window where it identifies a preloaded image in flash. If the camera+LCD are connected to the EVK, you can point it to other CIFAR10 objects for identification:




5 eIQ Demo with IAR

1. Open up IAR.
2. Unzip the previously downloaded SDK.
3. Go to File->Open Workspace and navigate to the eIQ example directory for each type. It will be at:

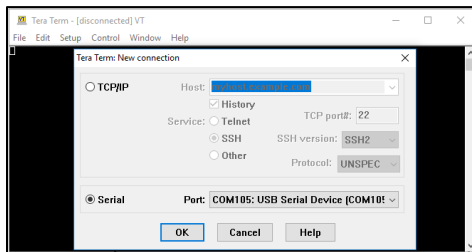
- **SDK_2_14_0_MIMXRT1170-EVK\boards\evkmimxrt1170\eiq_examples**
\<example_type>\iar


For example to run the CIFAR10 TensorFlow Lite example on the RT1170-EVK board, open up:

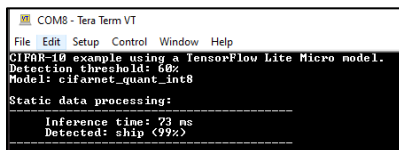
- **\SDK_2_14_0_MIMXRT1170-**
EVK\boards\evkmimxrt1170\eiq_examples\tflm_cifar10\iar\tflm_cifar10_cm7.eww

4. Compile by hitting the Make button in the toolbar: 
5. Connect a USB-micro cable to your board (J11 on a i.MX RT1170 EVK) which provides power, debugging, and serial port capabilities.
6. Optionally [connect the camera and an LCD screen](#) (sold separately) to your board. If using the LCD, you must also use the extra 5V power supply to power the board and move J38 to pins 1-2 due to the extra power requirements for the LCD.

7. Open up a terminal program and connect to the COM port that the board enumerated as. Use 115200 baud, 8 data bits, 1 stop bit, no parity.



8. Download and debug by hitting the Download and Debug button 
9. You will see the following output in the terminal window where it identifies a preloaded image in flash. If the camera+LCD are connected to the EVK, you can point it to other CIFAR10 objects for identification:




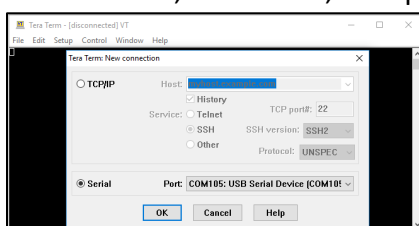
6 eIQ Demo with Keil MDK

10. Open up Keil MDK
11. Unzip the previously downloaded SDK.
12. Go to **Project->Open Project** and navigate to the eIQ example directory for each type. It will be at:
 - **SDK_2_14_0_MIMXRT1170-EVK\boards\evkmimxrt1170\eiq_examples**
\<example_type>\mdk

For example to run the LeNet MNIST Glow example on the RT1060-EVK board, open up:

- **\SDK_2_14_0_MIMXRT1170-EVK\boards\evkmimxrt1170\eiq_examples\tflm_cifar10\mdk\tflm_cifar10_cm7.uvpr
ojx**

13. Compile by hitting the Build button in the toolbar: 
14. Connect a USB-micro cable to your board (J11 on a i.MX RT1170 EVK) which provides power, debugging, and serial port capabilities.
15. Optionally [connect the camera and an LCD screen](#) (sold separately) to your board. If using the LCD, you must also use the extra 5V power supply to power the board and move J38 to pins 1-2 due to the extra power requirements for the LCD.
16. Open up a terminal program and connect to the COM port that the board enumerated as. Use 115200 baud, 8 data bits, 1 stop bit, no parity.



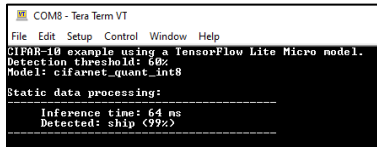
17. Download and debug by hitting the Debug button



18. Then hit the Run button to begin execution of the code.



19. You will see the following output in the terminal window where it identifies a preloaded image in flash. If the camera+LCD are connected to the EVK, you can point it to other CIFAR10 objects for identification:



```
COMB - Tera Term VT
File Edit Setup Control Window Help
CIFAR-10 example using a TensorFlow Lite Micro model.
Detection threshold: 60%
Model: cifarnet_quant_int8
Static data processing:
Inference time: 64 ms
Detected: ship (99%)
```

7 Further Reading

For more information about eIQ and some hands-on labs for the i.MX RT family, see the following links:

- [eIQ FAQ](#)
- [Getting Started with eIQ Toolkit and DeepViewRT for i.MX RT](#)
- [Getting Started with Glow for i.MX RT](#)
- [Getting Started with TensorFlow Lite for Microcontrollers for i.MX RT](#)
- eIQ Porting Guides for [Glow](#)
- [Anomaly Detection App Note](#)
- [Handwritten Digit Recognition App Note](#)
- [Datasets and Transfer Learning App Note](#)
- [Security for Machine Learning Package App Note](#)
-

You can also explore the many other eIQ examples located in the MCUXpresso SDK which includes examples for the DeepViewRT, Glow, and TensorFlow Lite for Microcontroller inference engines. Also make sure to check out the [NXP eIQ Community](#) for support on using ML on NXP devices and future updates.