



Samsung
ARTIK[™] Modules



030 Getting Started Guide

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VERSION HISTORY

Revision	Date	Description	Maturity
1.0	10/12/2016	Initial Public Release	Release
1.01	03/13/2017	Updated IAR embedded workbench for ARM section.	Release Update



INTRODUCTION

The Samsung ARTIK™ 030 Development Kit is meant to help you evaluate the ARTIK 030 Module and get you started with your own software development.

This quick start guide helps you get started with the ARTIK 030 Development Kit.

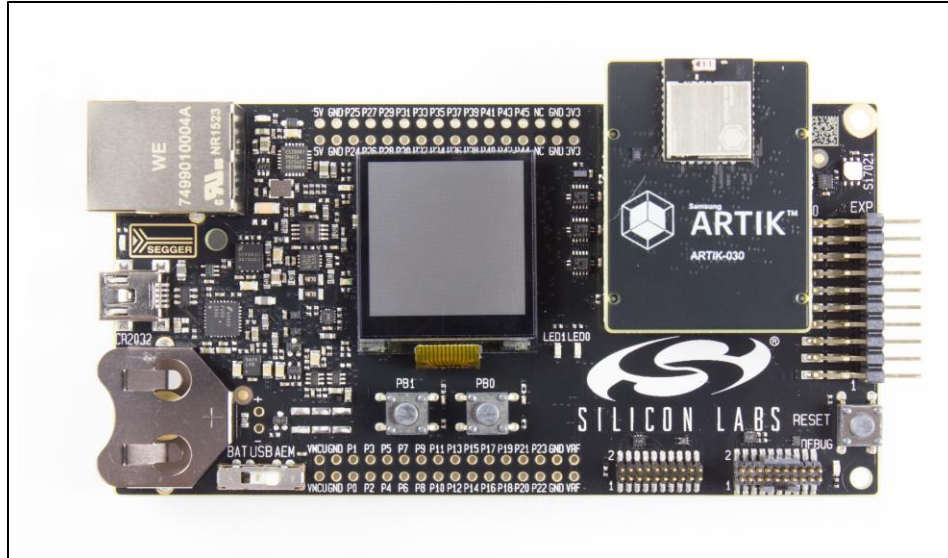


Figure 1. ARTIK 030 Main Board

ARTIK 030 DEVELOPMENT KIT SETUP

The following steps need to be completed to start testing the ZigBee functionality:

1. Connect the ARTIK 030 Radio Board to the ARTIK 030 Main Board.
2. Connect the ARTIK 030 Main Board to your development PC using USB cable.
3. Turn the power switch of the ARTIK 030 Main Board in the AEM position.
 - a. At this stage you might be prompted to install drivers, please ignore this step for now.
4. Verify that the blue USB connection indicator LED starts blinking.
5. Check that the ARTIK 030 Main Board LCD shows the Samsung ARTIK™ logo.

Figure 2, shows the picture of the ARTIK 030 Main Board with its associated switches and indicators.

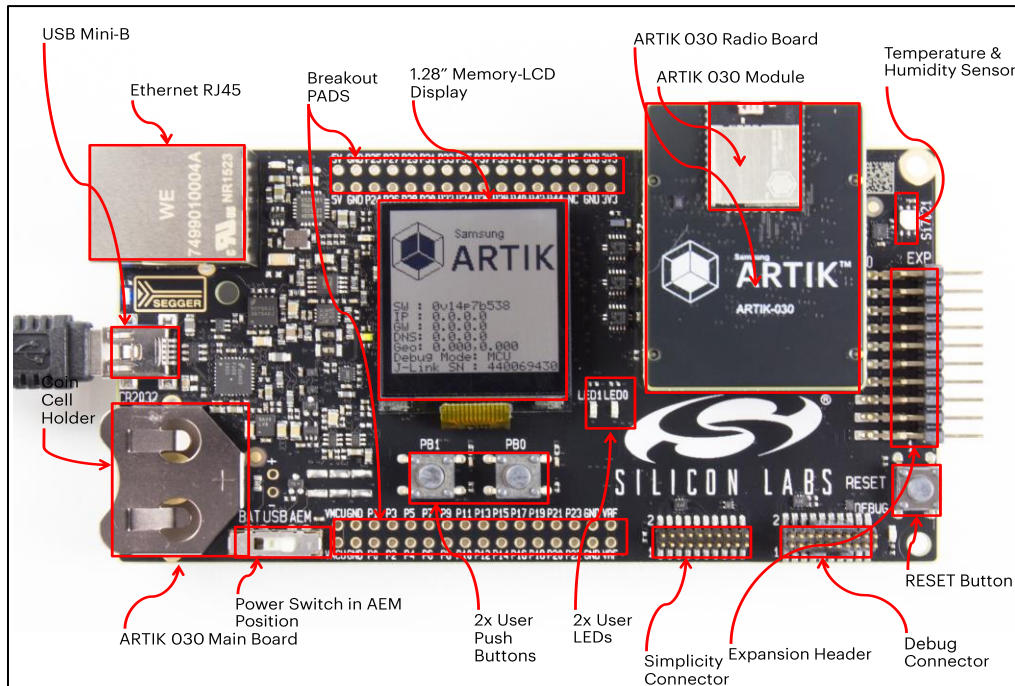


Figure 2. ARTIK 030 Development Kit

When the ARTIK 030 Main Board is up and running to the point discussed above, it is time to start showing the use of Silicon Labs® Simplicity Studio™ 4.0.

SILICON LABS® SIMPLICITY STUDIO™ 4.0

INSTALLATION

To install Silicon Labs® Simplicity Studio™ 4.0 first download the installer from <http://www.silabs.com/products/mcu/Pages/simplicity-studio-v4.aspx>. See also [Figure 3](#).

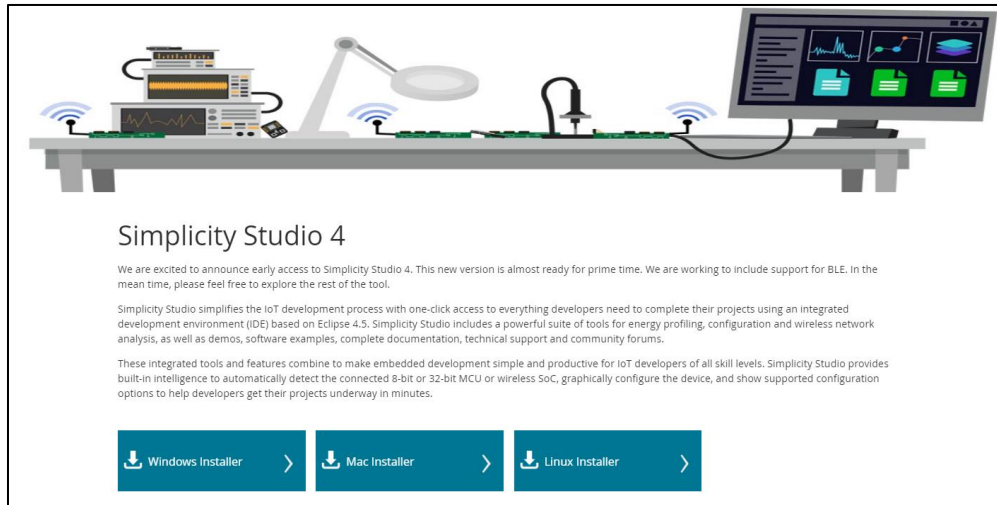


Figure 3. Simplicity Studio™ Installer

Simplicity Studio™ 4.0 is supported in Windows®, Mac® or Linux®. However, IAR EWARM is only supported in Windows, for this reason, if your host OS is Linux or MAC you will need to use Virtual Machine software with Windows as guest OS. For MAC users we recommend the use of VMware Fusion® located at <http://www.vmware.com/products/fusion.html>.

In this Getting Started Guide we will focus on the Windows installation path. Once your selection is made, in our case by clicking the 'Windows Installer', follow the installation instructions as described below:

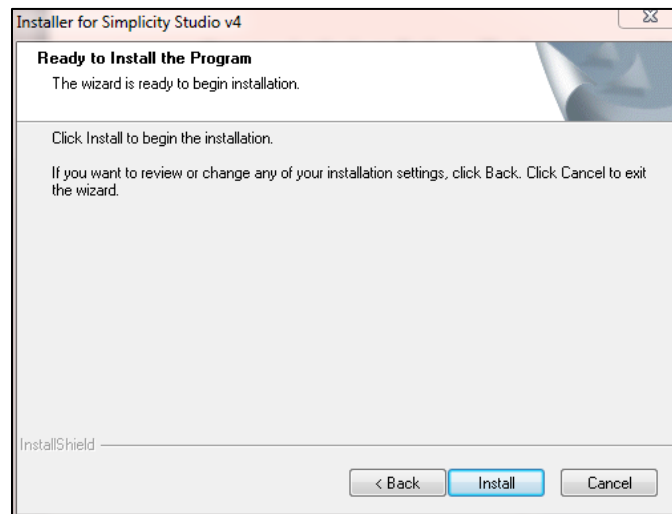


Figure 4. Simplicity Studio™ Installer

In order to get all the needed additional installation packages for your ARTIK 030 Development Kit, you need to sign into Simplicity Studio™ using your Silicon Labs® technical support account. If you do not have an account, click on the 'Create an Account' on the bottom of the Login Window in [Figure 5](#). This will take you to the Silicon Labs® web page to create an account.



Figure 5. Login Window

After 'Log In', Simplicity Studio™ will download all needed additional packages.

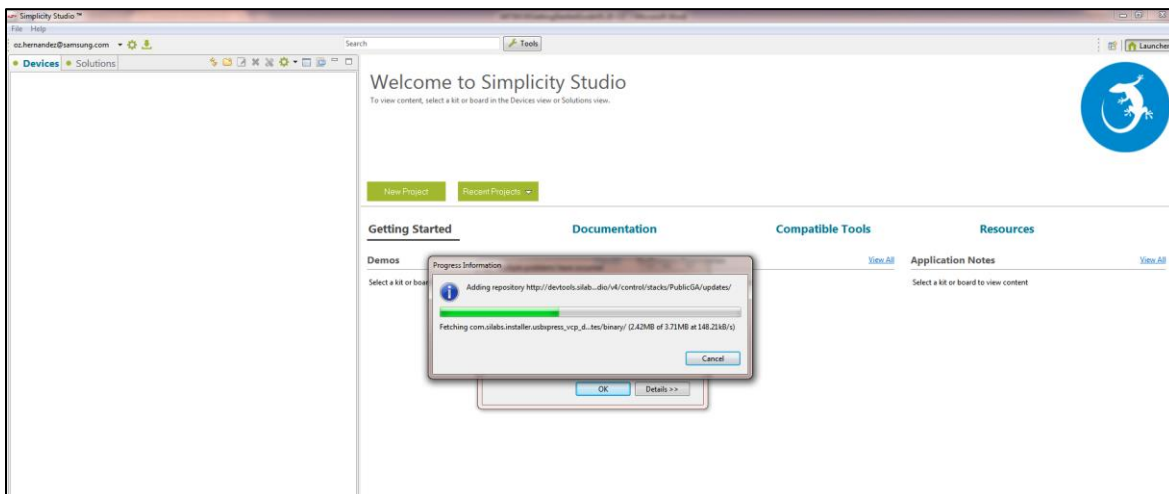


Figure 4. Checking for software updates in Simplicity Studio™ 4.0

Once all additional packages are installed, Simplicity Studio™ will check for connected hardware. If you have not connected your ARTIK 030 Main Board, you are prompted to do so now. In addition when asked to install drivers, please do so.

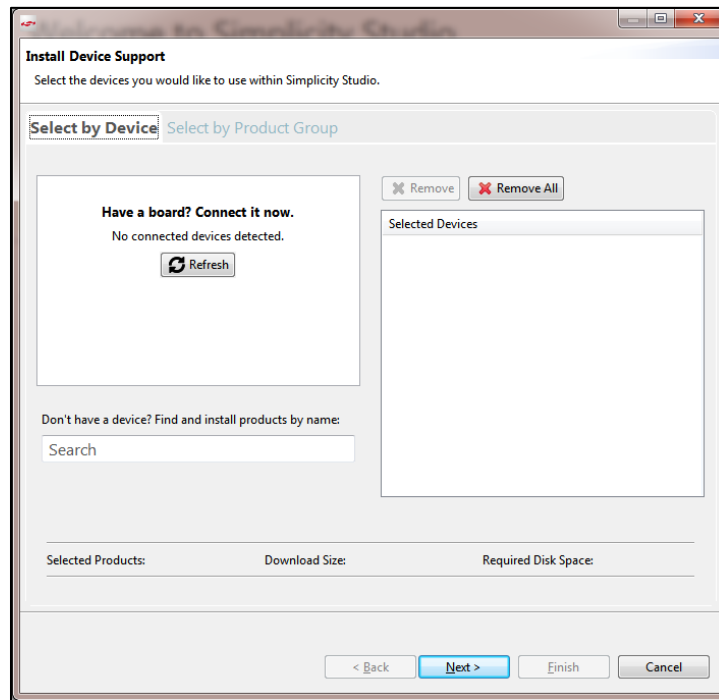


Figure 6. Connect ARTIK 030 Main Board

MANUAL SELECTION OF ADDITIONAL PACKAGES

If your board is not automatically detected, you can also manually select additional packages. Go to the 'Select by Product Group' tab and check 'Wireless Products'. A window will pop up with options to install. Keep the default options selected and click 'Finish'. See [Figure 7](#).

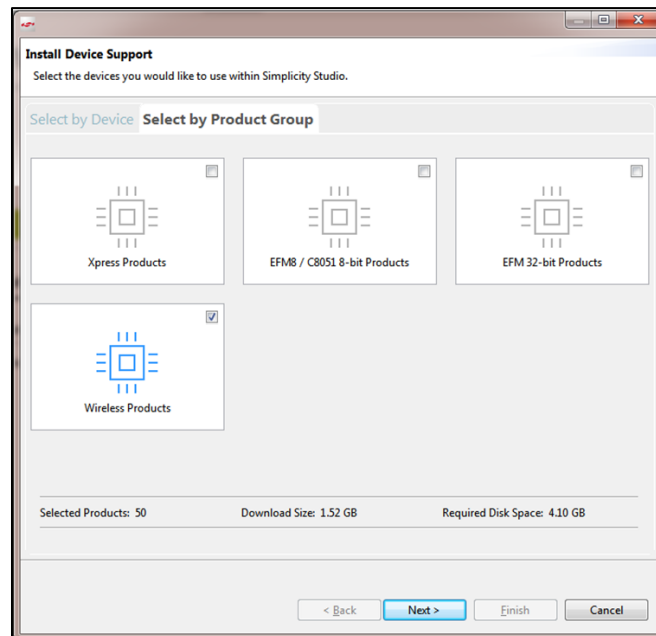


Figure 7. 'Select by Product Group' tab

When 'Wireless Products' is selected, Simplicity Studio™ will install additional software packages related to your connected evaluation boards, as shown in [Figure 8](#). This procedure can take some time, during which the green progress indicator may appear stationary. However, the update steps above the progress bar are continuously refreshed.

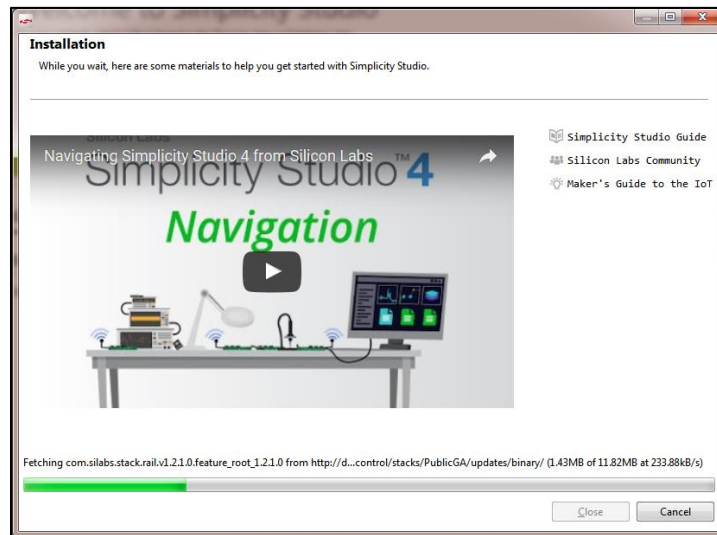


Figure 8. Installing Additional Packages for Wireless

After the update cycle is complete, restart Simplicity Studio™. See [Figure 9](#).

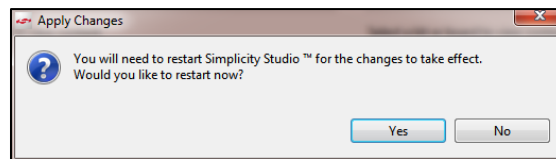


Figure 9. Restart Simplicity Studio™

Once restart is complete, a menu of setup tasks is displayed. Now you should be able to see your boards in the Devices section as shown in [Figure 10](#).

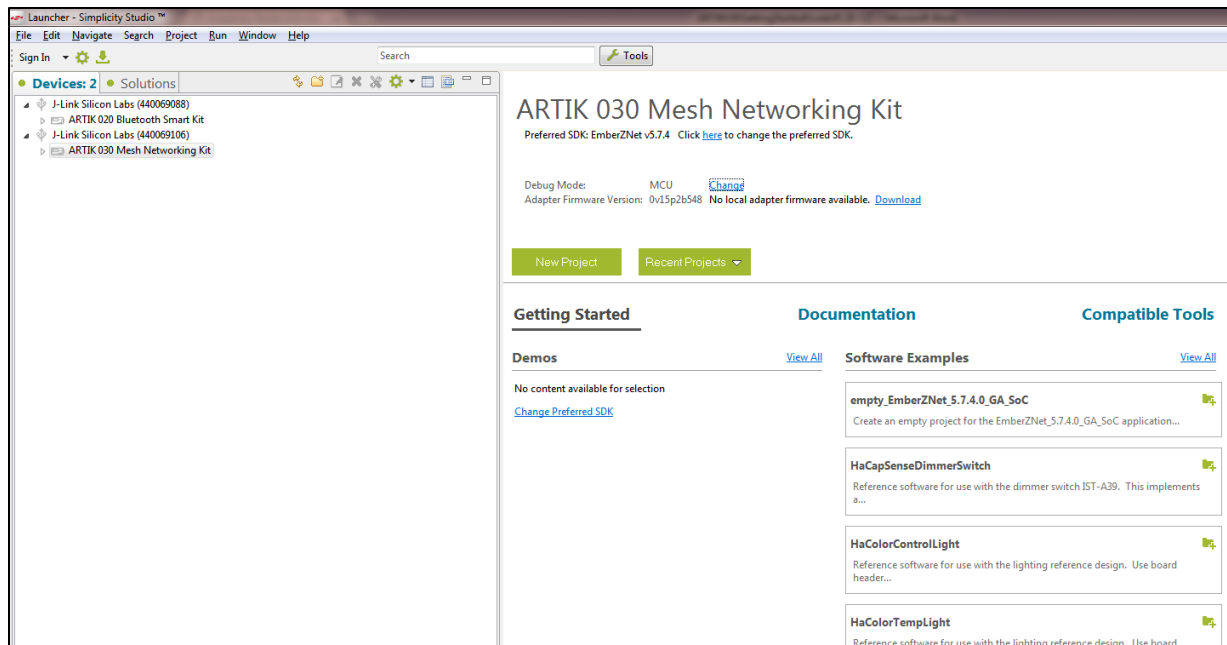
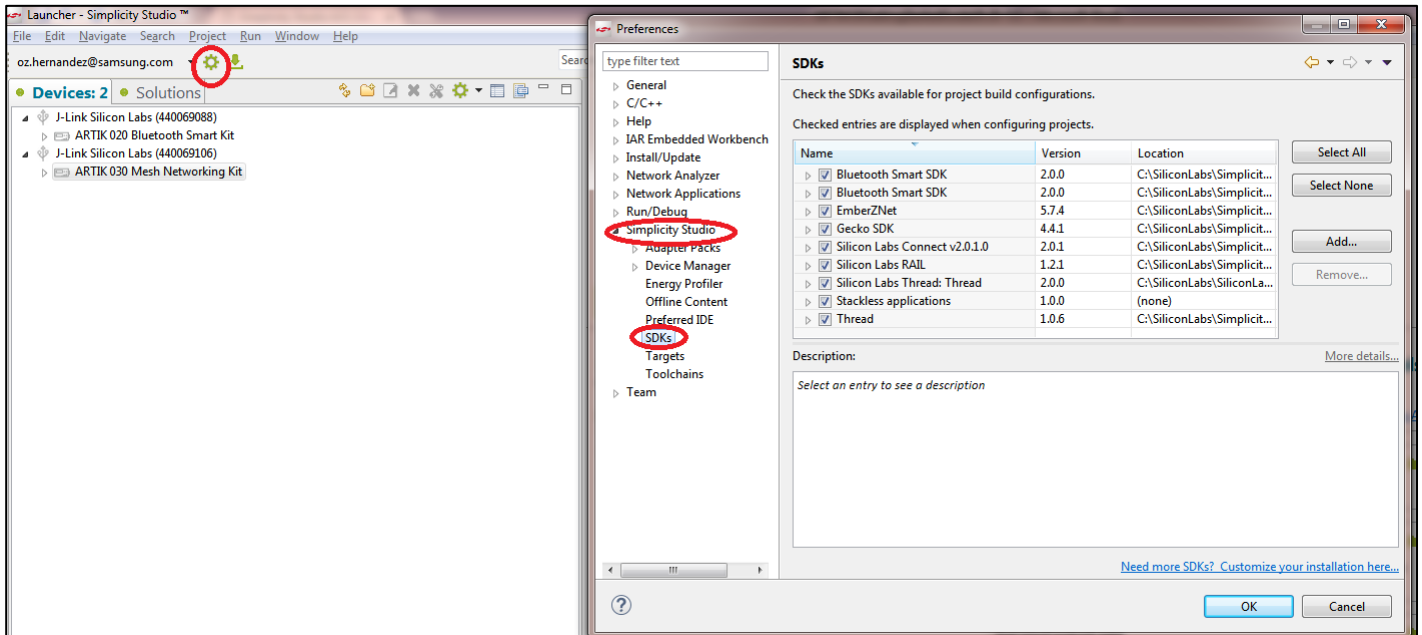
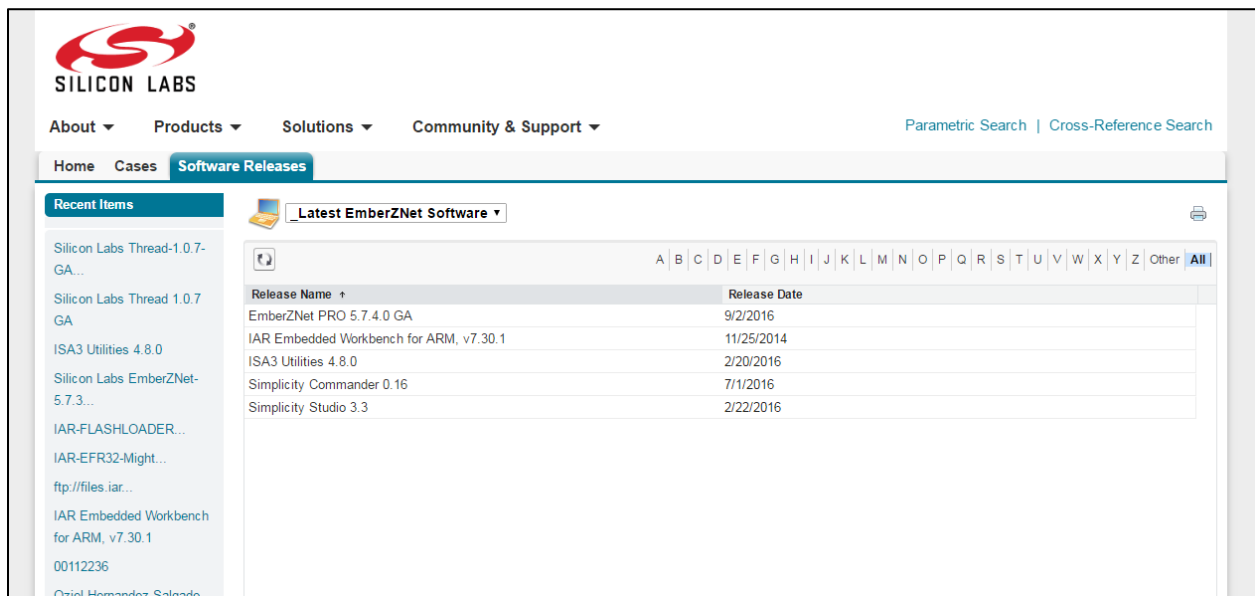


Figure 10. Simplicity Studio™ Launcher Panel

To make sure that the ZigBee and Thread SDKs are properly installed, consecutively click on 'Settings' (the green gear icon), 'Simplicity Studio' and 'SDKs'.



If the ZigBee and Thread SDK's are not already installed, you need to manually download and install them from the Silicon Labs® web page: <https://siliconlabs.force.com/home/home.jsp>.



After installing the ZigBee and Thread SDK's return to the 'Settings' (the green gear icon), 'Simplicity Studio', 'SDKs' window. Click on the 'Add' button and select the location for each SDK. See *Figure 11*.

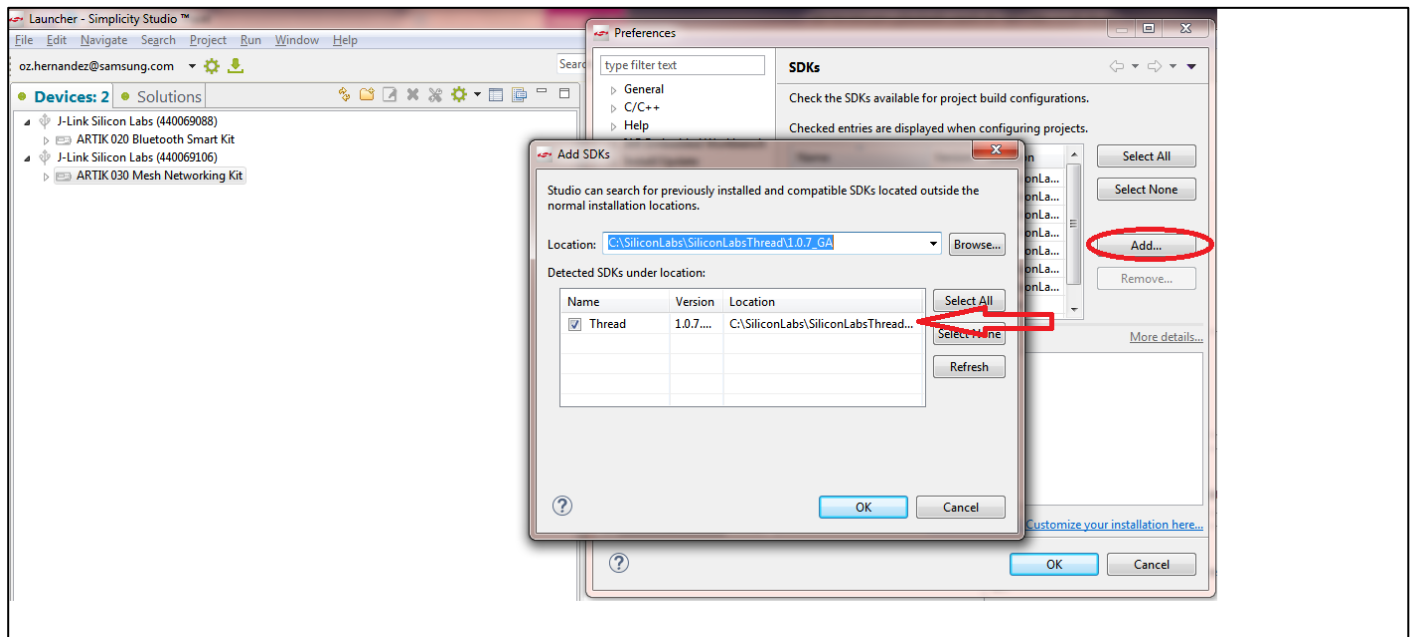


Figure 11. Manually Install Additional Drivers

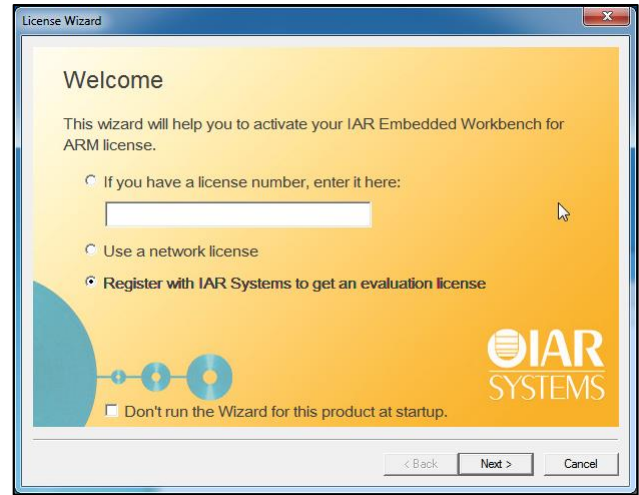
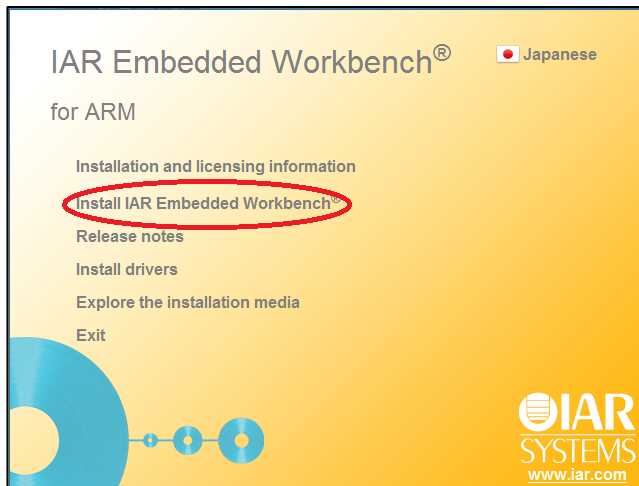
INSTALLING THE IAR EMBEDDED WORKBENCH ARM® IDE

To install the IAR Embedded Workbench ARM IDE, go directly to IAR's website using the following link: <https://www.iar.com/iar-embedded-workbench/#!?architecture=ARM>. Scroll down till you see the ARM® 'Download a free trial' section and click on ARM® and then click on 'Download Software'.

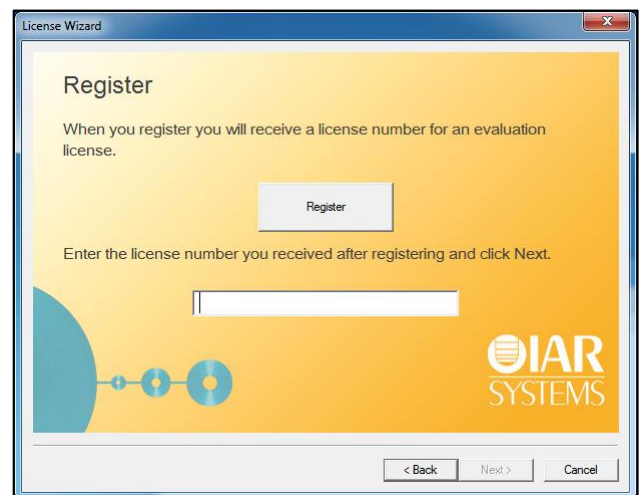
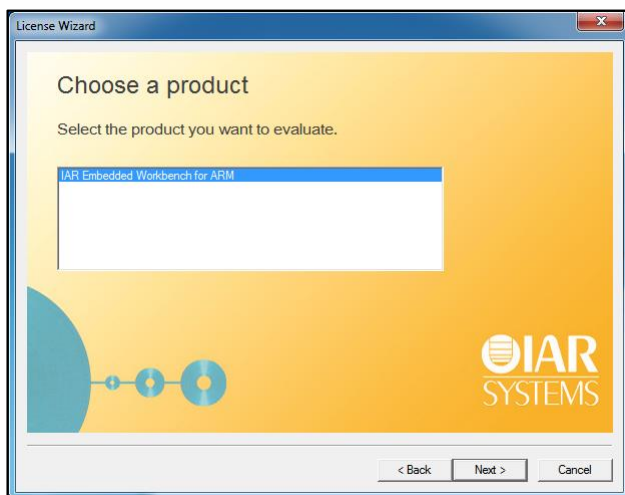
Make certain that you download version 7.80 of the IAR Embedded Workbench ARM IDE. IAR will give you a 30 day free evaluation license.

Once downloaded, click 'Install' to start the installation. Make sure 'Install a new instance of this application.' is checked. Click 'Next' to continue. If asked, do not install the dongle drivers. Click 'Finish' when done.

Now apply for a 30 day evaluation license. From the 'Start' menu, find and execute 'IAR License Manager'. Check 'Register with IAR systems to get an evaluation license'. Click 'Next' to continue.

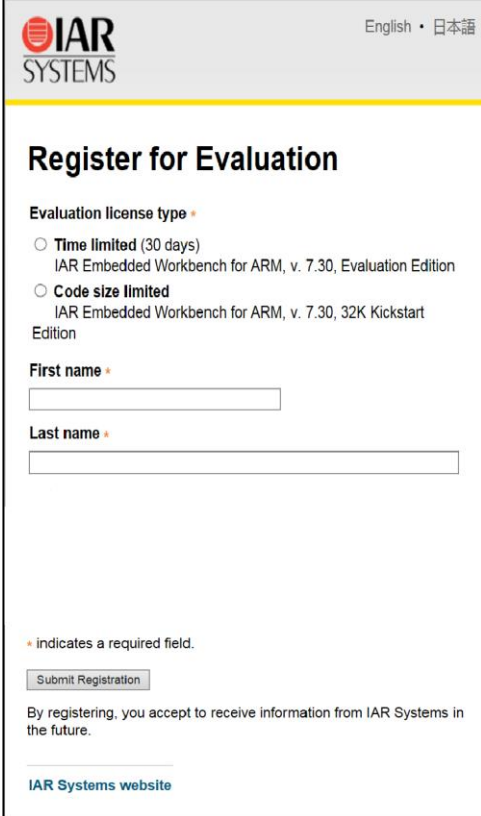


Select the 'IAR Embedded Workbench for ARM' product and click 'Next' to continue. Click 'Register' to go to the Silicon Labs® registration web page.

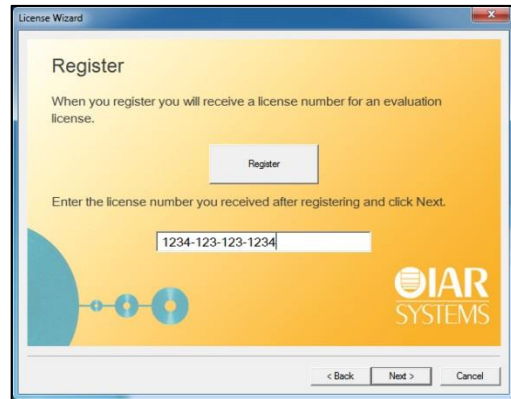


The IAR Systems product requires purchase of a license, but you can start with a free 30-day trial license that gives you complete use of the solution and a fully functional binary image. When downloading an evaluation or making a purchase, please select the ARTIK Module 020/030 platform in the required field at the IAR website.

Select the 'Time limited (30 days)' license. Fill out the form and click 'Submit Registration' at the bottom of the form. A conformation e-mail will be sent to the supplied e-mail address. Follow the link in the e-mail to complete your registration. The link in your registration competition e-mail will complete your registration and display your registration number. Copy/Paste your license number from the competition webpage to the IAR License Manager. Click 'Next' to continue. Confirm the license details and click 'Next' again. When your license has been activated, click 'Done'.



The image shows a web browser window displaying the IAR Systems registration page. The page title is "Register for Evaluation". It features the IAR Systems logo at the top left and a language selector (English / 日本語) at the top right. The main content area contains two radio button options for "Evaluation license type": "Time limited (30 days) IAR Embedded Workbench for ARM, v. 7.30, Evaluation Edition" and "Code size limited IAR Embedded Workbench for ARM, v. 7.30, 32K Kickstart Edition". Below these are input fields for "First name" and "Last name". A "Submit Registration" button is located at the bottom of the form. A note indicates that an asterisk (*) denotes a required field. At the bottom, there is a link to the "IAR Systems website" and a disclaimer: "By registering, you accept to receive information from IAR Systems in the future."



EXAMPLE APPLICATION

INTRODUCTION

When working with example applications in Simplicity Studio™ 4.0, you will typically execute the following steps:

- Select an example application. To demonstrate the connectivity features of a network, you may need to build two or more different example applications. For example, a client and a server application. Or the Home Automation example scenario involving a gateway, a light and a switch.
- Generate application files.
- Compile and flash the application to the radio board.
- Execute the application.

The following sections will show how to build and execute a ZigBee Network application.

ZIGBEE NETWORK APPLICATION

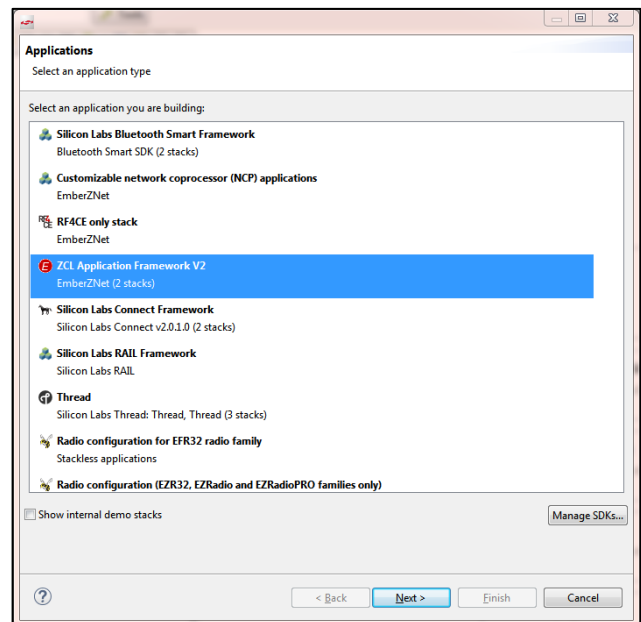
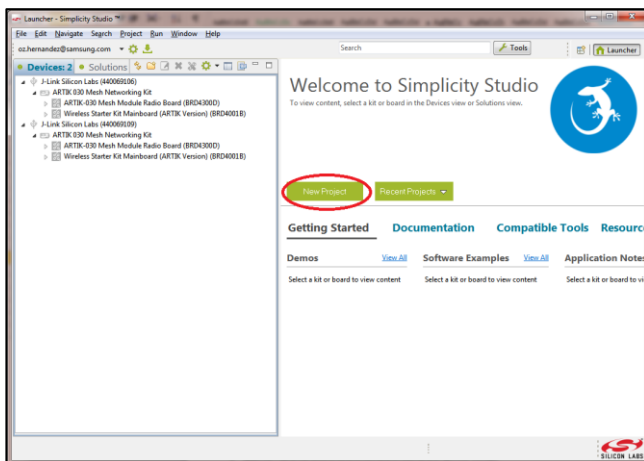
The prerequisites when building and executing the ZigBee Network application are:

- Simplicity Studio™ version 4.0.
- EmberZNet stack SDK.
- IAR EWARM installed.
- Two ARTIK 030 Main Boards with two ARTIK 030 Radio Boards.

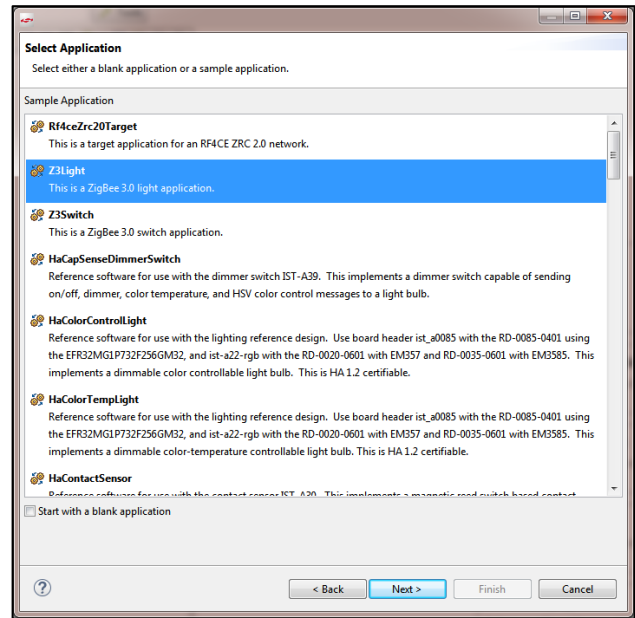
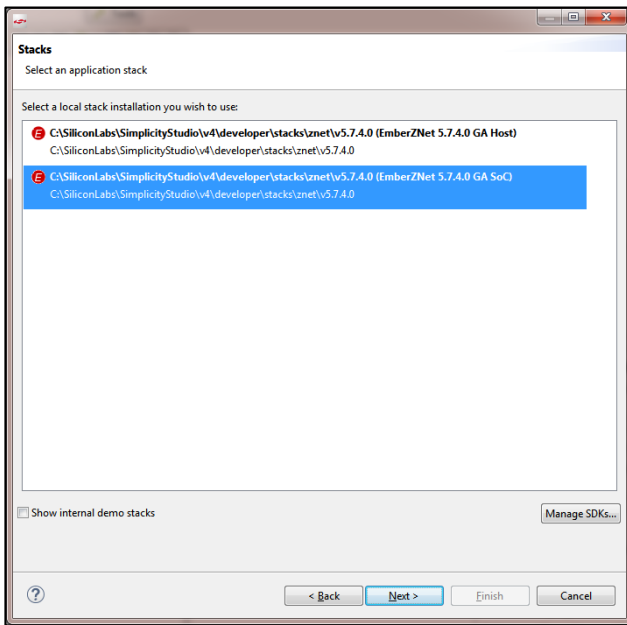
CREATING THE PROJECT

Launch Simplicity Studio™ 4.0:

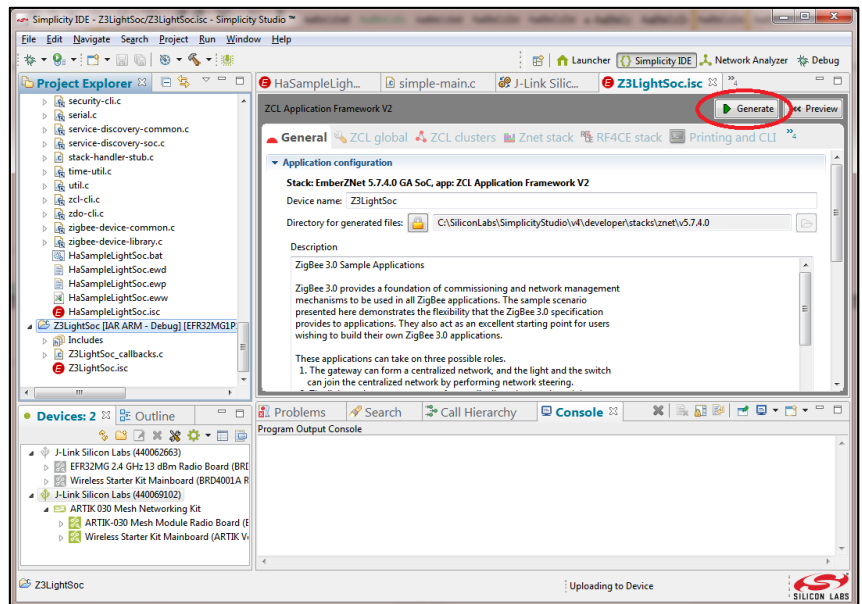
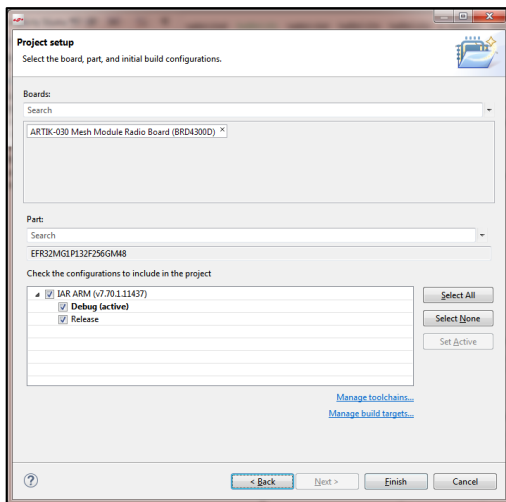
- Make sure you have two fully populated ARTIK 030 Main Boards and connect them to your Windows Laptop using a mini-usb cable.
- In Simplicity Studio™ 4 home page, select 'New Project'. Then select the 'EmberZnet' stack, then click 'Next'.



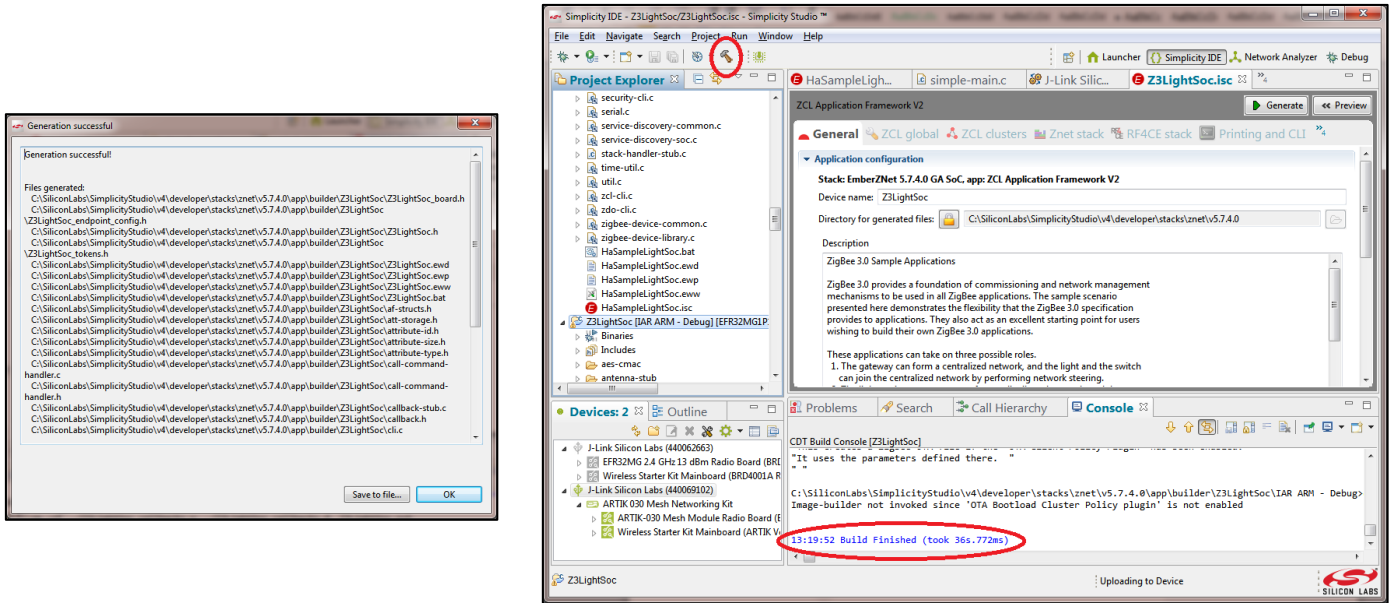
- Select 'Ember Znet 5.7.4.0 GA SoC' and click 'Next'. Then select 'Z3Light' Project and click 'Next'. Then follow all the steps with default options until you see 'Finish' as shown below.



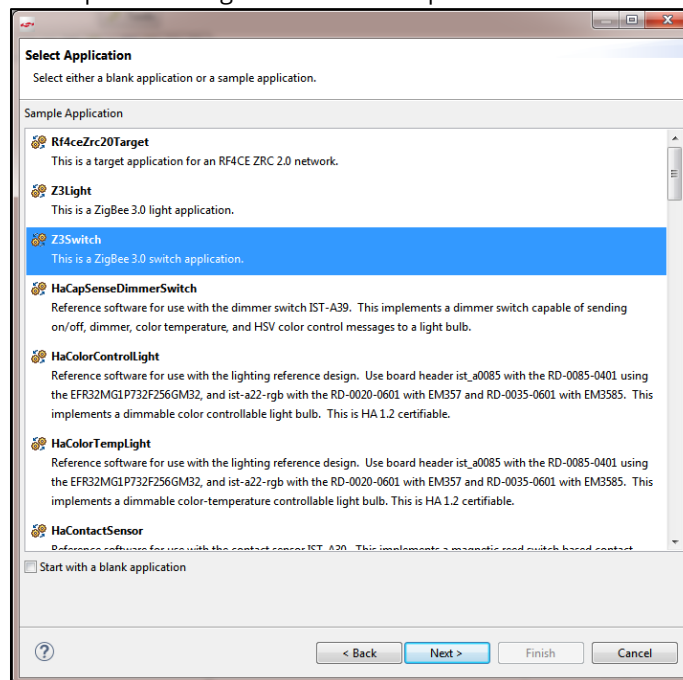
- Make sure you see the ARTIK 030 Radio Board and then click 'Finish'. Now click 'Generate' to create the project source files as shown below.



- Back in Simplicity Studio™ IDE click the build icon and wait until the build process finishes.



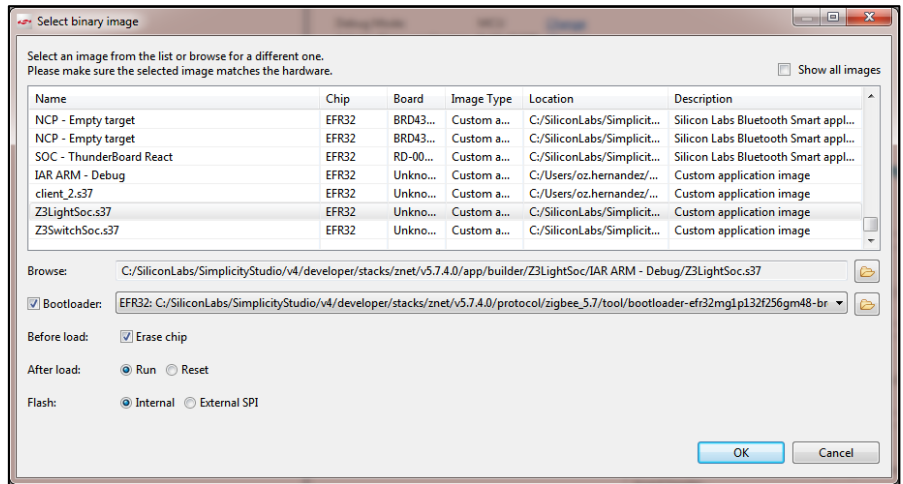
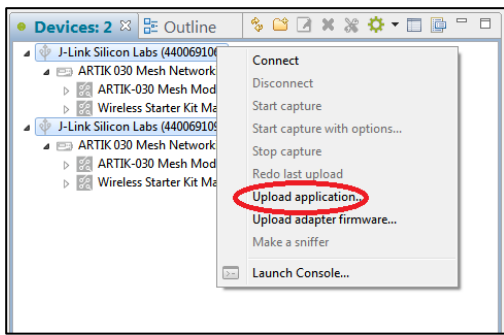
- Repeat the Generate and Build steps above to generate a HASampleSwitch.



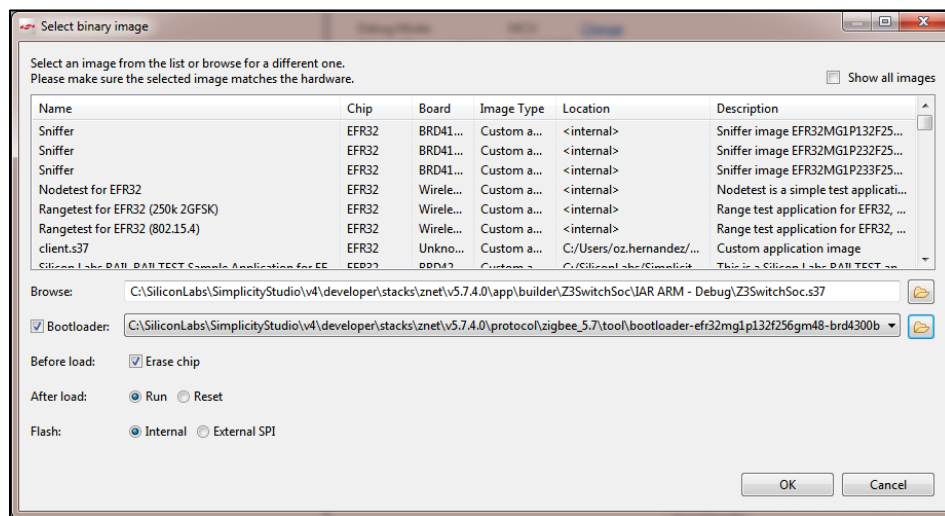
LOADING THE APPLICATION

Once the applications are built, load the applications onto the two ARTIK 030 Main Boards with the following steps.

- In the 'Devices Window', select one of the ARTIK 030 Main Boards and right click 'Upload application...'



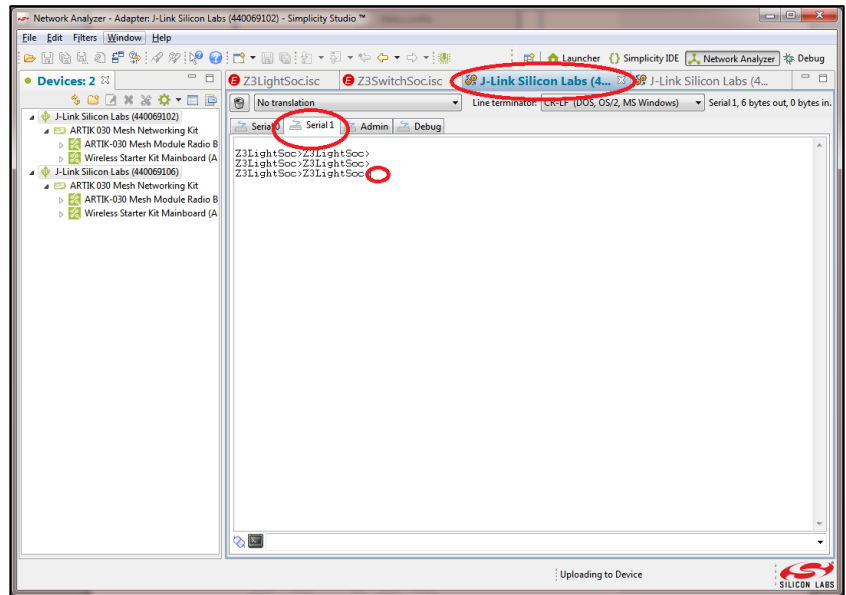
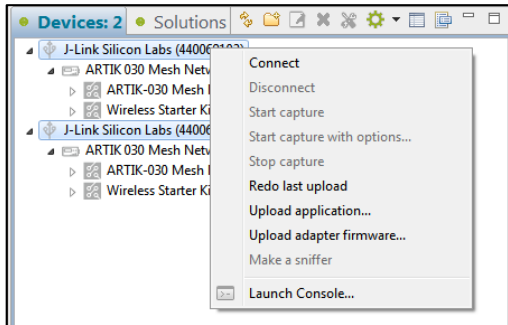
- Make sure to load the Z3 Light application '.s37' file you built in the previous steps by browsing to your compiled application folder in 'app\builder\IAR ARM - Debug'.' Select the Light application '.s37' file.
- Select the bootloader '.s37' file in the 'bootloader' pulldown list, 'C:\SiliconLabs\SimplicityStudio\v4\developer\stacks\znet\v5.7.4.0\protocol\zigbee_5.7\tool\bootloader-efr32mg1p132f256gm48-brd4300b'.
- Make sure that 'Erase chip' is checked to erase the flash before programming.
- Click 'OK' to flash the application'.
- Select 'Erase chip'.
- Repeat previous steps for the second ARTIK 030 Main Board with the Z3 Switch application.



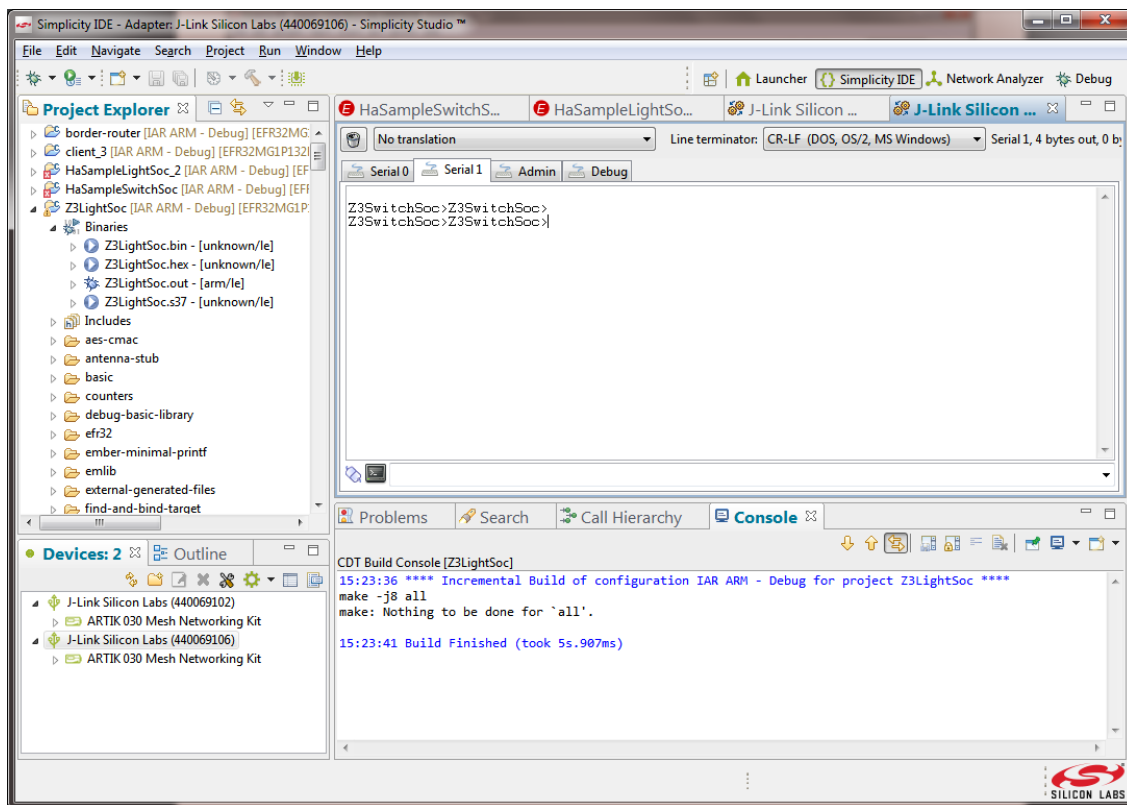
TESTING THE APPLICATION

Once the application instances are loaded onto both ARTIK 030 Main Boards we can start creating a ZigBee network.

- In the 'Devices window' select both boards and do a right click and then select 'Connect'.
- After a connection is established, right click again and select 'Launch Console...'

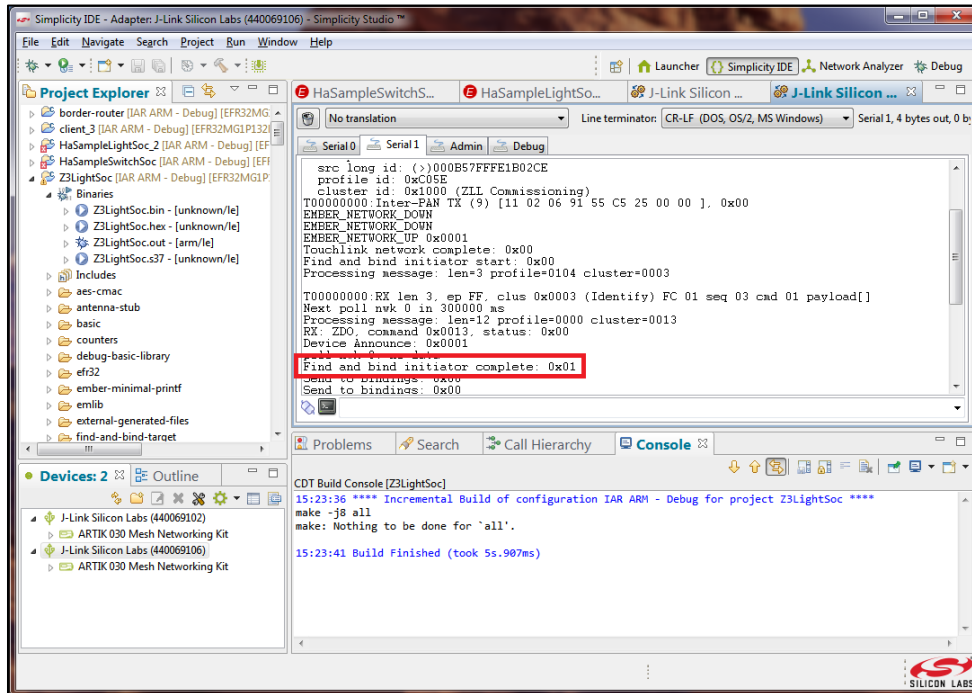


- Go to the console of the device where you flashed the Z3 Light terminal and switch to the 'Serial 1' tab and type enter a few times to get to the command prompt.
- Repeat the same steps. Go to the Console of the device where you flashed the Z3 Switch application.



Once you have downloaded both the Light and the Switch applications to different devices, you can work with a network. When devices are connected to their consoles, the device icons will be green as shown above.

Make sure that the Switch device is close to the Light device. With the console of and the switch device open, press button 1 (PB1) on the switch, see [Figure 2](#), to initiate commissioning. If commissioning and find-and-bind are successful, you should see the following print outs in the console window of the Switch board.



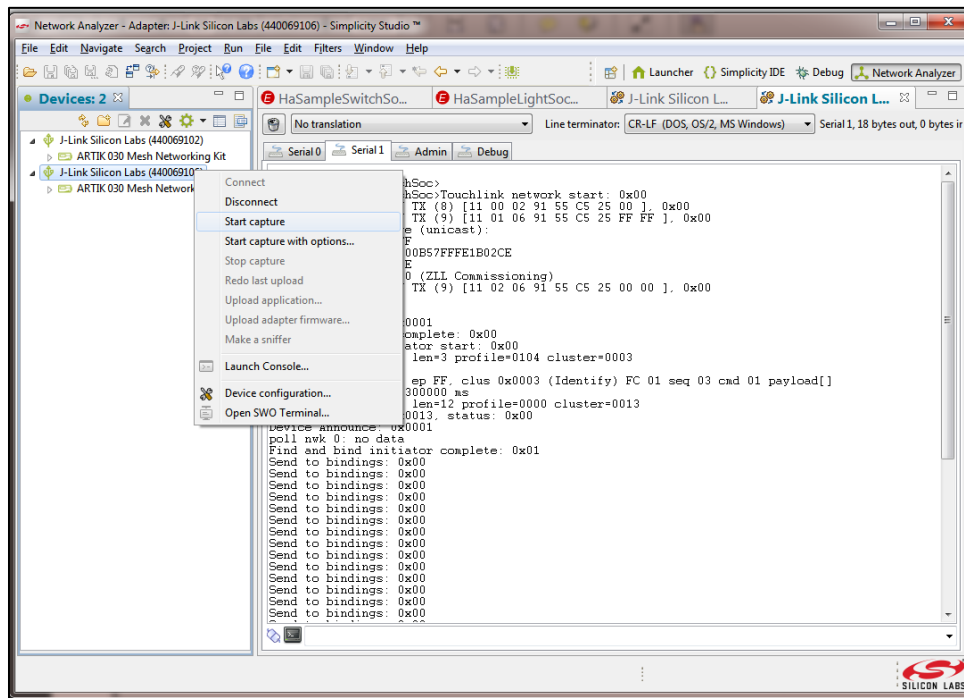
Now press the button 0 (PB0) on the switch board. You will see the following typical message indicating you are sending an 'On/Off' toggle command to the light.

```
T0000000:RX len 5, ep 01, clus 0x0006 (On/off) FC 08 seq 0C cmd 0B payload[02 00 ]
```

If your first attempt at finding and binding a device is not successful, try pressing button 0 (PB0) again. If still unsuccessful, try moving the devices to be paired closer together.

USING THE NETWORK ANALYZER

Now that your network is set up, you can evaluate the data being transmitted using the Network Analyzer tool. Right click in any of your devices listed in the Device window and select 'Start Capture'.



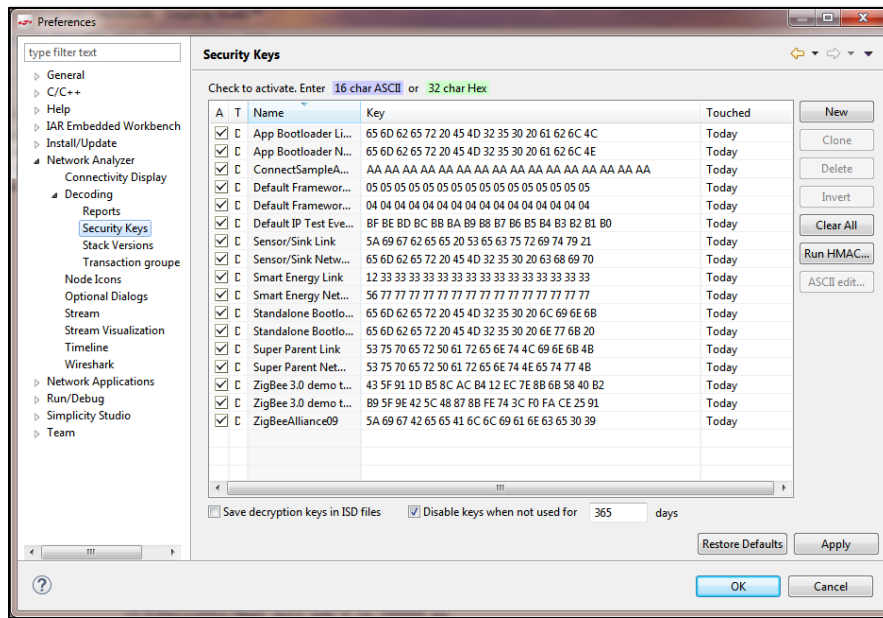
To make sure that packets decode correctly, manually enter the 'NWK' key. In either the Switch or Light console window, type the following command:

```
Z3SwitchSoc>Z3SwitchSoc> Keys print
```

In the information returned, find the network key and copy it. See example below.

```
Z3SwitchSoc>Z3SwitchSoc>keys print
EMBER_SECURITY_LEVEL: 05
NWK Key out FC: 00000004
NWK Key seq num: 0x00
NWK Key: 76 72 4F A0 08 87 D0 53 08 6F 93 E1 47 83 24 DE
Link Key Out FC: 00000000
TC Link Key
Index IEEE Address      In FC      Type Auth Key
- (>)FFFFFFFFFFFFFFFF 00000000  L   y   D0 D1 D2 D3 D4 D5 D6 D7  D8 D9 DA DB DC DD DE DF
Link Key Table
Index IEEE Address      In FC      Type Auth Key
0/0 entries used.
Z3SwitchSoc\
```

In File → Preferences, open Network Analyzer → Decoding → Security Keys, click **New**, name the new entry, and paste the copied key into it. Click **Apply**. Click **OK** to leave.



Note: Start capture with options allows you to narrow the data captured, for example, to a specific PAN ID or time frame.

Press 'Button0' on the switch device to send a toggle command, and you should see the over-the-air message being captured live in the Transactions window:

Time	Duration	Summary	NWK Src	NWK Dest	P#	M#	E#	Status
20:50:52.269	1.051	ZCL: Toggle	0001	0002	4			
20:50:53.290	0.036	ZCL: DefaultResponse	0002	0001	3			
20:50:58.153	1.083	ZCL: Toggle	0001	0002	4			
20:50:59.173	0.066	ZCL: DefaultResponse	0002	0001	2			

Time	Type	Summary	MAC Src	MAC Dest	Status
20:50:52.269	Packet	ZCL: Toggle	0001	0002	
20:50:53.290	Packet	ZCL: DefaultResponse	0002	0001	
20:50:53.294	Packet	Data Request	0001	0002	
20:50:53.310	Packet	APS Ack	0002	0001	
20:50:53.315	Packet	Data Request	0001	0002	
20:50:53.324	Packet	APS Ack	0001	0002	
20:50:54.266	Packet	Data Request	0001	0002	

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