Lab 1: Include using SmartStart

This hands-on exercise will demonstrate how to flash a sample application to a device and use SmartStart to include it into a secure Z-Wave network.

This exercise is the first exercise in the "Z-Wave 1-Day Course" series.

1: Include using SmartStart

2: Decrypt Z-Wave RF Frames using the Zniffer

3A: Compile Switch On/Off and Enable Debug

3B: Modify Switch On/Off

4: Understand FLiRS devices

KEY FEATURES

- Flash a sample application to device
- Use SmartStart to secure inclusion
- Use PC Controller to test the basic functionality.

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1   Introduction

In this exercise, we will use the shipping sample application "Switch On/Off" from the Z-Wave Embedded SDK. We will flash it to an end-device and include it into a secure network using SmartStart.

For doing a SmartStart inclusion, we will need to find the DSK key. By knowing the DSK key, only authorized and intended devices are included in the Z-Wave network.

When included, we will learn how to decrypt the RF traffic when knowing the security keys.

1.1   Hardware Requirements

- 1 WSTK Main Development Board
- 1 Z-Wave Radio Development Board: ZGM130S SiP Module
- 1 UZB Controller
- 1 USB Zniffer

1.2   Software Requirements

- Simplicity Studio v4
- Z-Wave 7 SDK
- Z-Wave PC Controller
- Z-Wave Zniffer

Figure 1: Main Development Board with Z-Wave SiP Module

1.3   Prerequisites

While this is the first exercise in the "Z-Wave 1-Day Course" series, it is strongly recommended to be familiar with the following guides:

- INS14280 – Getting Started for End Devices.

- INS14278 – How to Use Certified Apps

These documents, along with the full Z-Wave 700 documentation, are found in the Documentation Section of Simplicity Studio.

2   Flash a Sample Application

2.1   Using Flash Programmer

In Simplicity Studio, open the Flash Programmer from the Tools Dialog.

1.   Connect your Z-Wave hardware to the USB port of the computer and it should show up in the "Debug Adapters" section in Simplicity Studio.

2.   Click once on the "J-Link Silicon Labs" which instructs the studio to show relevant information about Z-Wave 700.

3.   Several Demos and Software Examples are available here, but also documentation is linked.
     a.   We will cover the examples in later exercises.
     b.   The documentation section contains documentation for both end-device and controller development including getting started guides.

4.   Click on 'Tools' 🔧 and select "Flash Programmer'". See Figure 2.
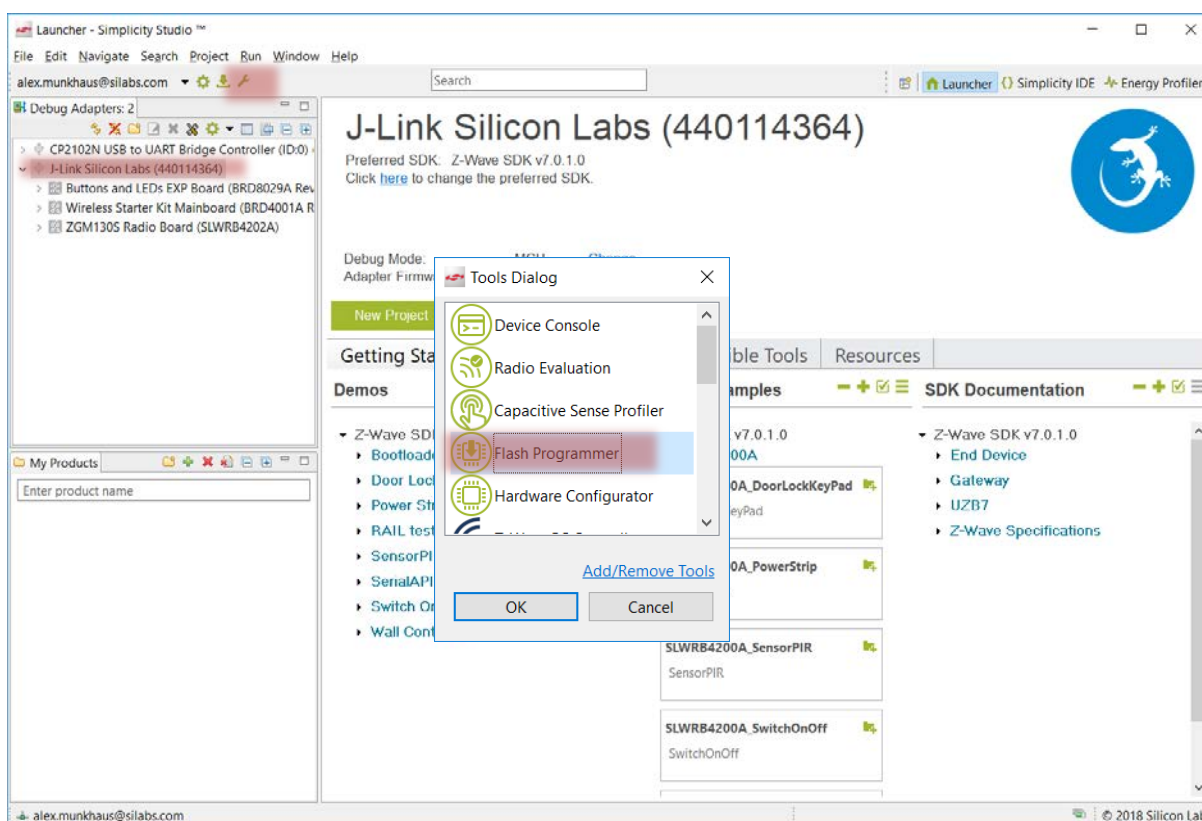
5.   Select your device in the pop-up menu.

Figure 2: Use the Flash Programmer

6. Browse to the pre-compiled sample applications and select: ZW_SwitchOnOff_7.0.0_EFR32FG13P_REGION_EU.hex
   a. NB: The last letters in the filename specifies the region (e.g., EU). Make sure the file matches the region of your controller.
   b. Default location:
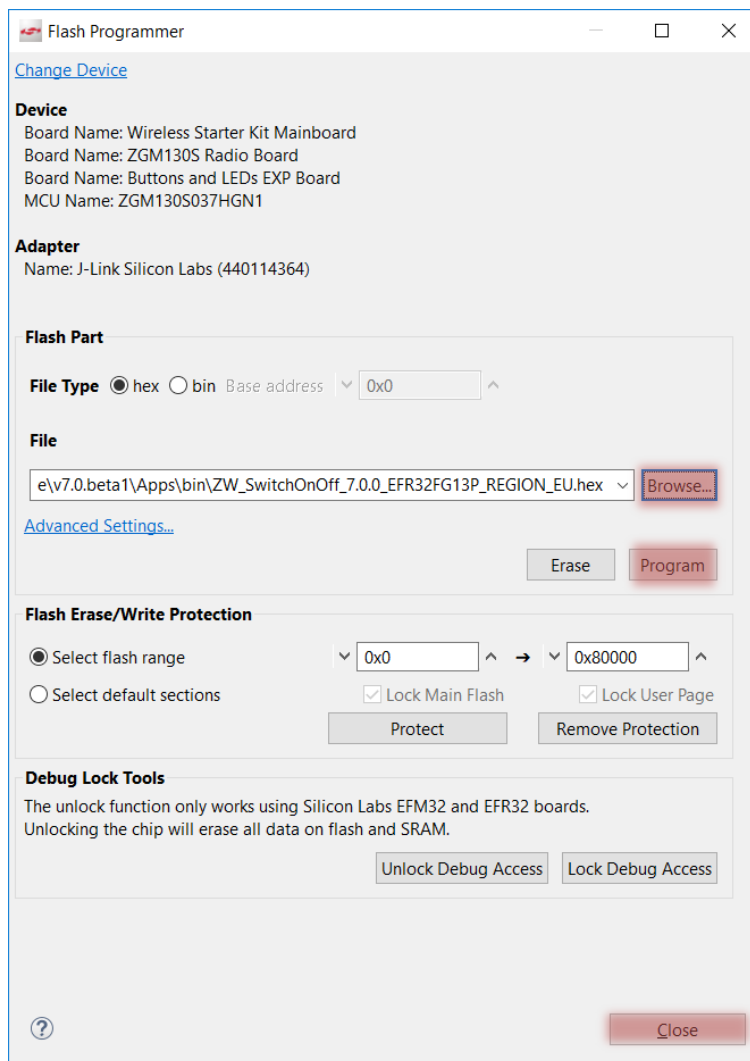   i. C:\SiliconLabs\SimplicityStudio\v4\developer\sdks\zwave\v7.0.beta1\Apps\bin

Figure 3: Flash Programmer with Switch On/Off Sample Application

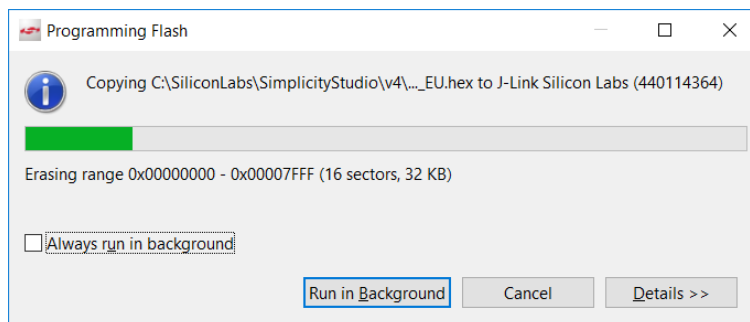7. With the image for Swicth On/Off selected, click on "Program".

Figure 4: Programming Device

8. When the programming finished; Close the "Flash Programmer".

2.2 Readout the DSK

When a device has been programmed, a DSK has also been generated and written to the device. We need to know the DSK in order to include the device using SmartStart.

1. From the Launcher perspective in Simplicity Studio, right click on your connected device.

2. Click on 'Device Configuration'.

3. You might be presented with an "Initialize CTUNE" pop-up window. Select "Yes".

4. Select the 'Z-Wave Device Settings' tab.

The QR Code string, the QR Code Image and the DSK key is shown in this tab.

We need the entire DSK key for SmartStart inclusion.

- Copy the DSK string to your clipboard; In this example we will be using
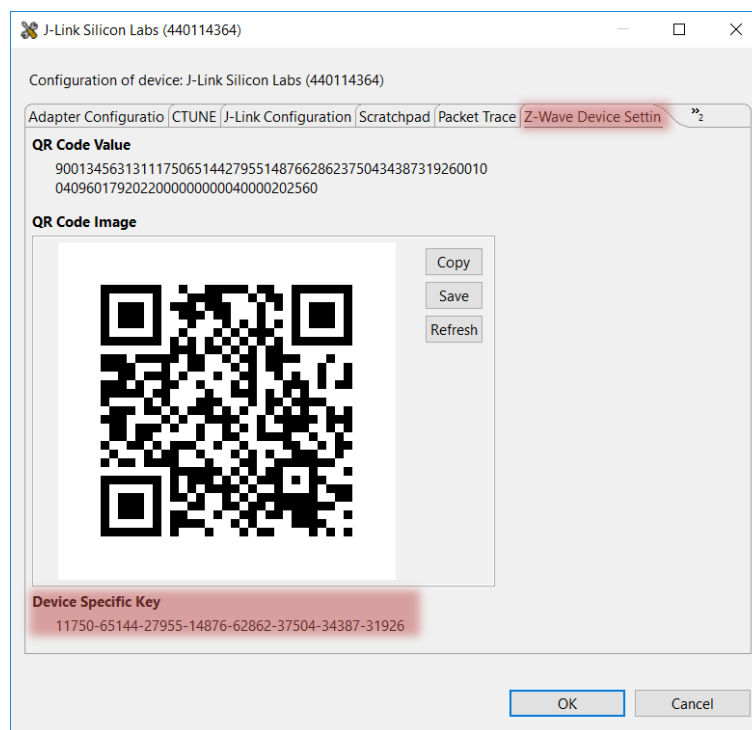 o DSK: 11750-65144-27955-14876-62862-37504-34387-31926


Figure 5: QR Code and DSK key

Hint: More information on the DSK can be found the Knowledge Base:

Secure S2 DSK

2.3   Connect Hardware UZB to PC Controller

In this section we will start the tool "PC Controller" and connect to the Z-Wave UZB Controller that comes as part of the Z-Wave development kit.

1. From the Launcher perspective in Simplicity Studio, click on "Tools" (same menu as when opening "Flash Programmer" tool).

2. Select "Z-Wave PC Controller". When the PC Controller opens, no hardware is selected. Version 5.37 or newer should be used.
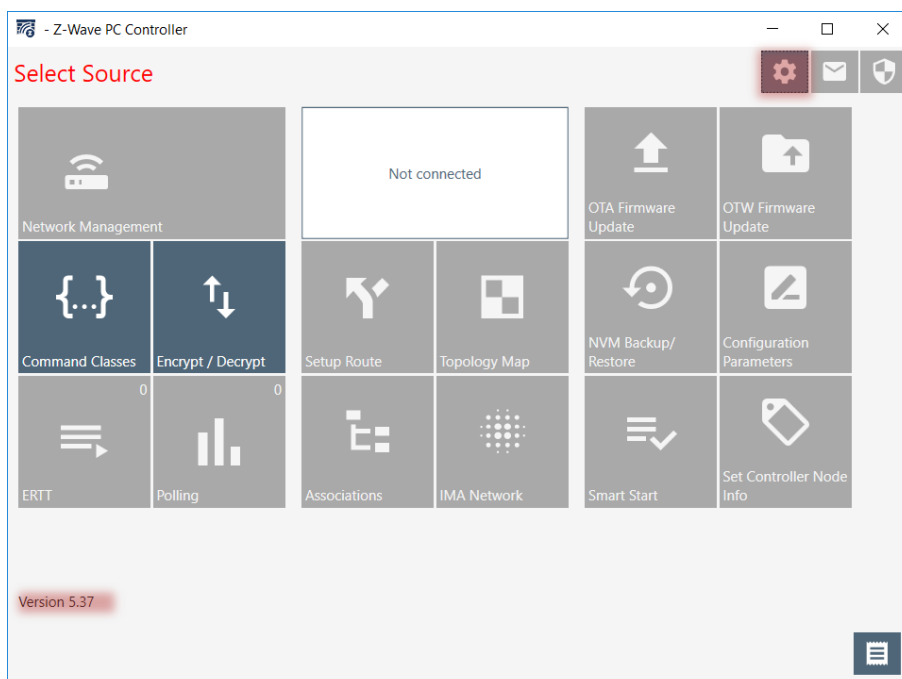
Figure 6: PC Controller

3. Click on "Settings" icon [⚙] to open the settings windows. See Figure 6.

4. Select your COM port corresponding to your hardware and click "OK". See Figure 7.

    o   As a tip, you can unplug and plug in your device while clicking on "Refresh". This way, you can tell which COM port to use.
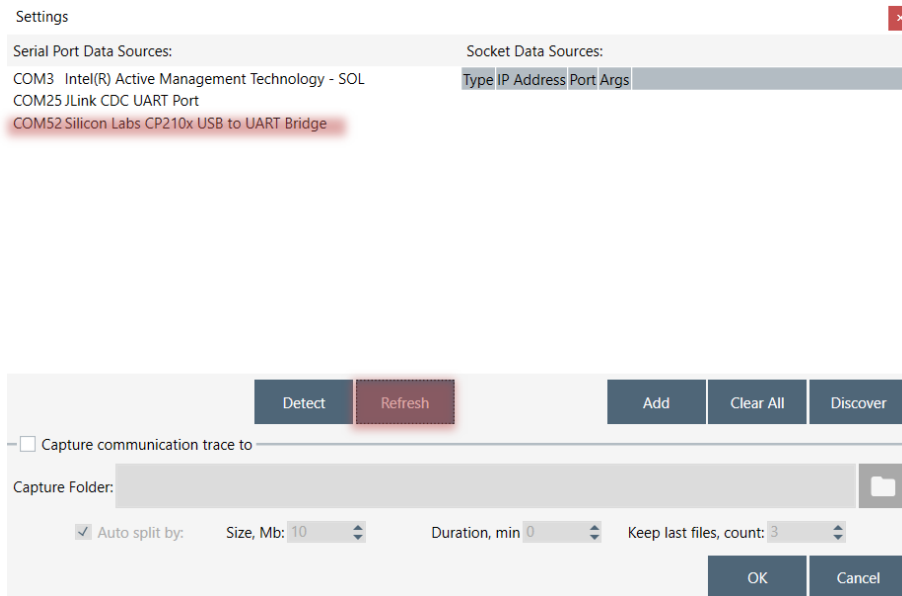
Figure 7: Settings Windows

Your UZB is now connected to the PC Controller tool, with Id 1.

5. Click on "Network Management" to start the main page on the PC Controller.
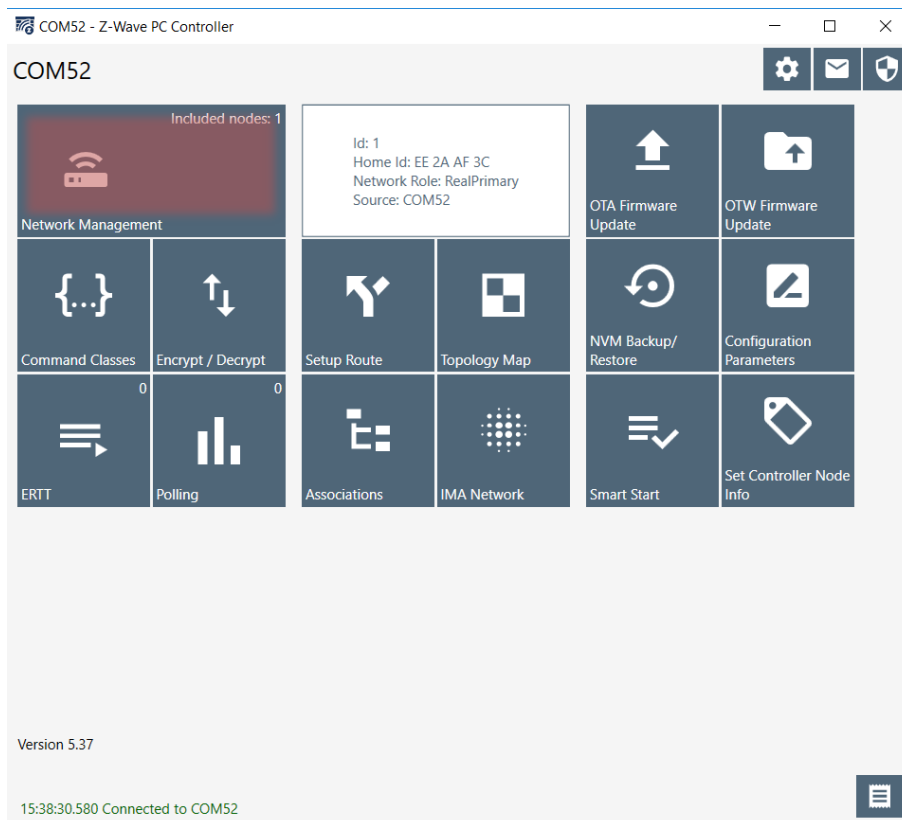

Figure 8: Hardware connected to PC Controller

As a final step, you need to set the PC Controller as SIS in the network. Being a SIS in the network means it always has the latest update of the network topology and capability to include/exclude nodes in the network.
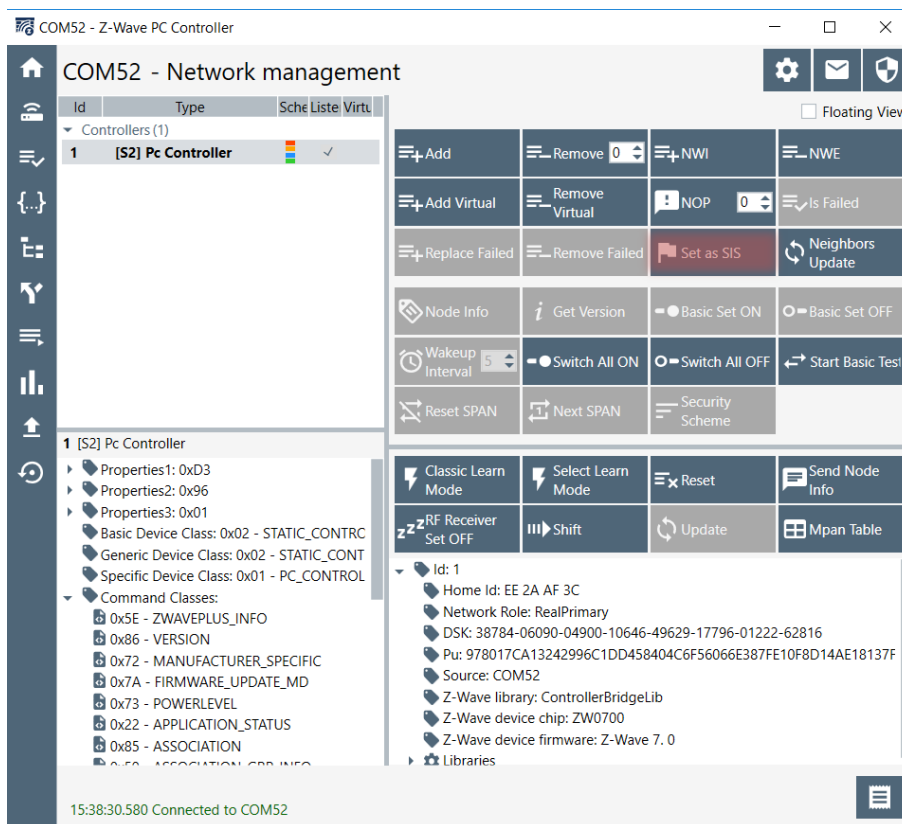
6. Click on "Set as SIS".

Figure 9: Network Management Page of PC Controller

The PC Controller is now configured as the main controller in the network and is ready to build the secure Z-Wave network.

2.4   Configure PC Controller for SmartStart.

Next, we need to configure the PC Controller for SmartStart inclusion of our device we previously flashed with Switch On/Off. This section covers how to add the DSK to the provisioning list (i.e., the list of approved devices that can join our network).

1.   Click on the SmartStart icon

2.   Enter the "DSK key" in the "DSK Value" field.
     o   The DSK key you need to enter is found in section "2.2 Readout the DSK" of this document.

3.   Click Add.

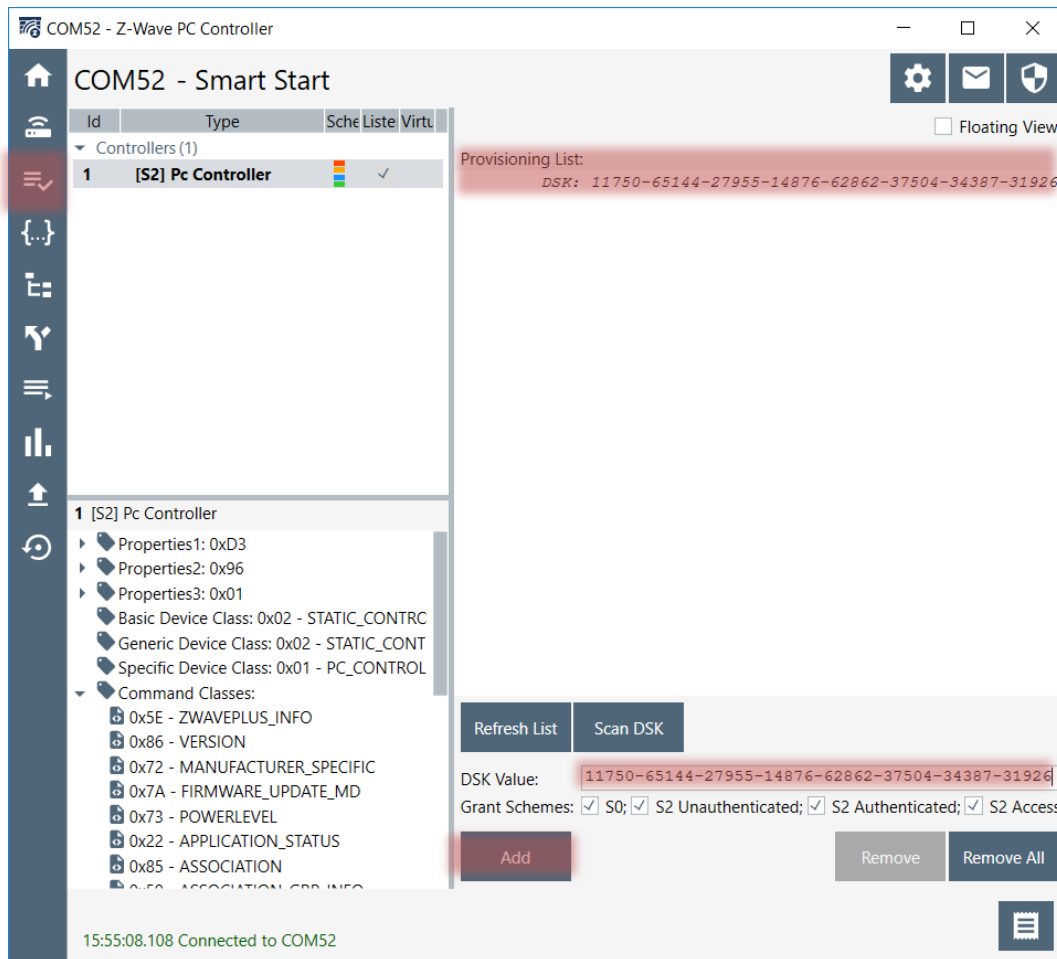Notice the DSK key has now been added to the provisioning list.

Figure 10: Adding DSK Key to Provisioning List

2.5   Device added using SmartStart

When the device has been added to the provisioning list, the PC Controller will automatically add the device in the network, the next time the device asks to be included.

To minimize power consumption, the device will only ask for inclusion at specific "random" times defined by the Z-Wave protocol.

- You can wait to see the device will automatically be included.

- You can also reset the end-device by pressing on the "RESET" button the mainboard ("simulating" an end-consumer turning on the device for the first time). This will trigger the inclusion process.

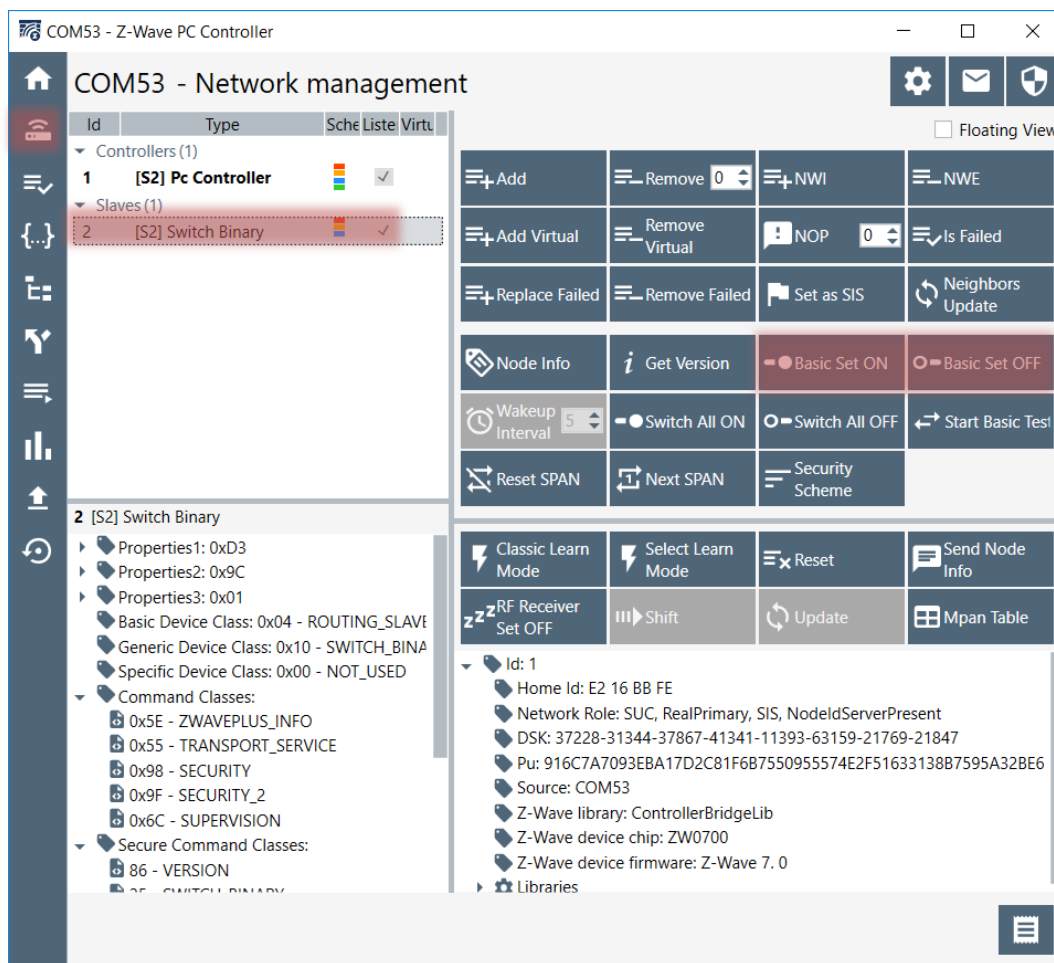- Click on "Network Management" to return to the main page .

Figure 11: End Device included using SmartStart

Test the device by turning the LED on and off.

1. Select the Slave device named "[S2] Switch Binary".

2. Click on "Basic Set ON" and observe that LED0 turns on.

3. Click on "Basic Set OFF" and observe that LED0 turns off again.

This concludes the tutorial in how to flash a sample application to a device and include it into a secure Z-Wave network using SmartStart.