

Intel® Integrated Sensor Solution Bring-Up

Software Guide

Revision 0.9

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Revision History

Document Number	Revision Number	Description	Revision Date
571022	0.5	Initial Release	January 2017
	0.6	Removed the references to MEmanuf tool	August 2017
	0.7	Adjusted signing steps to support additional platforms	August 2017
	0.8	Adjusted signing and driver installer part	November 2019
	0.9	Added flow of ISH FW/PDT update	February 2020

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1 Introduction

This document covers the Intel® Integrated Sensor Solution 5.0 (Intel® ISS 5.0) bring-up for the Intel® Cannon Lake and Gemini Lake platforms.

This Bring-up guide is intended to help the user achieve the following tasks:

1. Install the necessary software drivers to the SUT.
2. Modify the platform descriptor table (PDT) to match the system sensor configuration.
3. Add the necessary Intel® ISS firmware components (FW, PDT) to the binary image.

Note: If customer will add third party algorithms or micro driver to the FW, the added models to be developed using the Firmware Development Kit (FDK) should be created before the bring-up of the Intel® Integrated Sensor Solution.

1.1 Expected Outcome

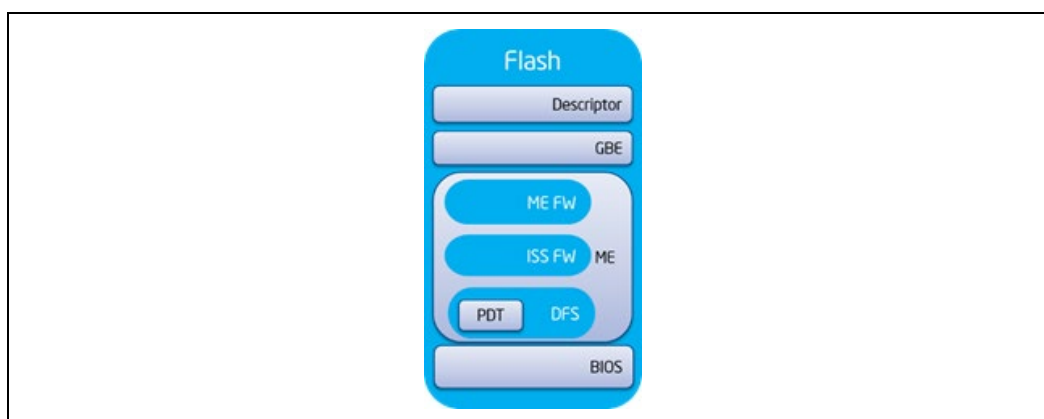
The expected outcome of this guide for the user is the following:

1. Create a binary image containing the Intel® ISS FW components that can be written to the SPI flash of the SUT.
2. Prepare the host OS of the SUT for using the Intel® Integrated Sensor Solution by installing the necessary SW drivers.

The location of the Intel® ISS FW components within the flash binary image are:

1. Intel® ISS FW – stored in an IUP within the Intel® ME region.
2. Intel® ISS PDT – stored within the DFS of the Intel® ME region.

Figure 1-1: FW Components Location in SPI Binary Image





1.2 Prerequisites

Download and install the following kits:

- Latest Intel® ME FW kit
- Intel® Integrated Sensor Solution FW kit

The kits can be downloaded from <https://platformsw.intel.com/>

1.3 Tools Used

The following tools are used:

- Flash Image Tool (FIT) [Intel® ME Kit]
- PDT Editor [Intel® Integrated Sensor Solution FW Kit]
- SW Calibration Tool [Intel® Integrated Sensor Solution FW Kit]

1.4 Terminology

Term	Description
DFS	Data File System (section within the ME Region)
FDK	Firmware Development Kit
IUP	Independent Upgradable Partition
ISH	Integrated Sensor Hub
I ² C	Inter-Integrated Circuit, referred to as I-squared-C, I-two-C, or IIC.
Intel® MEU	Intel® Manifest Extension Utility
PDT	Platform Descriptor Table consists of two sections: <ol style="list-style-type: none">1. Sensor configuration including sensor driver and I2C address.2. Calibration data including the sensor driver and I2C address.
Per-Model Calibration	Calibration process that is done for a specific platform design (SKU) and not for an individual system.
TPV	Third Party Vendor
SUT	System Under Test
Virtual sensor	A sensor that takes as input measurements from other sensors, either physical or virtual, and calculates a new measurement that may be exposed to the OS as a new sensor or consumed internally by Intel® ISS firmware.



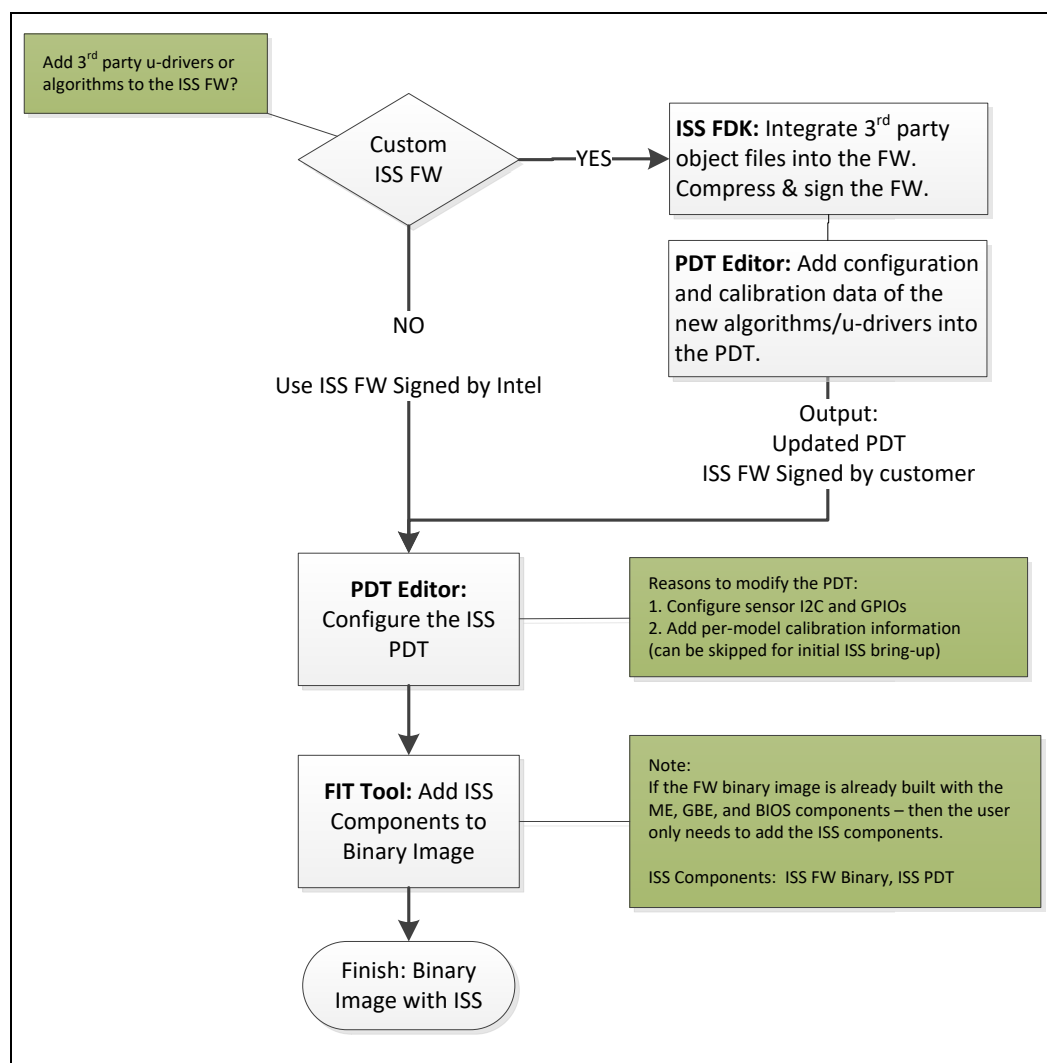


2 Adding Intel® ISS Components

A high-level overview of adding Intel® ISS components to the binary image is described below. The key steps include:

1. [Optional] Creating the custom Intel® ISS FW components (PDT, FW) with the FDK.
2. Modifying the PDT to match the sensor configuration on the system.
3. Adding the Intel® ISS components (PDT, FW) to the binary image using the FIT tool.

Figure 2-1: Adding Intel® ISS Components to Binary Image High Level Overview



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3 *Signing ISH Binary*

This chapter is only for Gemini Lake (GLK), Whiskey Lake (WHL), Comet Lake (CML), and Ice Lake (ICL).

Note: For Tiger Lake (TGL), refer to Signing and Manifesting User Guide from Intel® ME kit.

3.1 **Intel® ISS BOM vs. Intel FDK**

Intel® ISS supports two use cases of ownership of the ISH code:

Full Intel ownership – Intel® ISS defined BOMs

Intel® ISS code is signed and released by Intel. It can be integrated into the Intel® CSME binary using the FIT Tool without additional action required from the customer side. OEM/ODM can recreate, modify, update and configure the Intel® ISS PDT data region using the Intel PDT Editor tool, while Intel also releases five default BOM configuration that can be utilized by customers.

Full OEM ownership – Develop using Intel® ISS FDK

Customers who are interested to modify Intel® ISS firmware code by, for example, adding new sensors uDrivers/Algorithms that are not included in the default Intel® ISS FW, can use Intel FDK to support their development work.

In this case customer will be the owner of the new Intel® ISS binary that is created by the Intel FDK and will have to sign the firmware binary by applying his own private and public certificates.

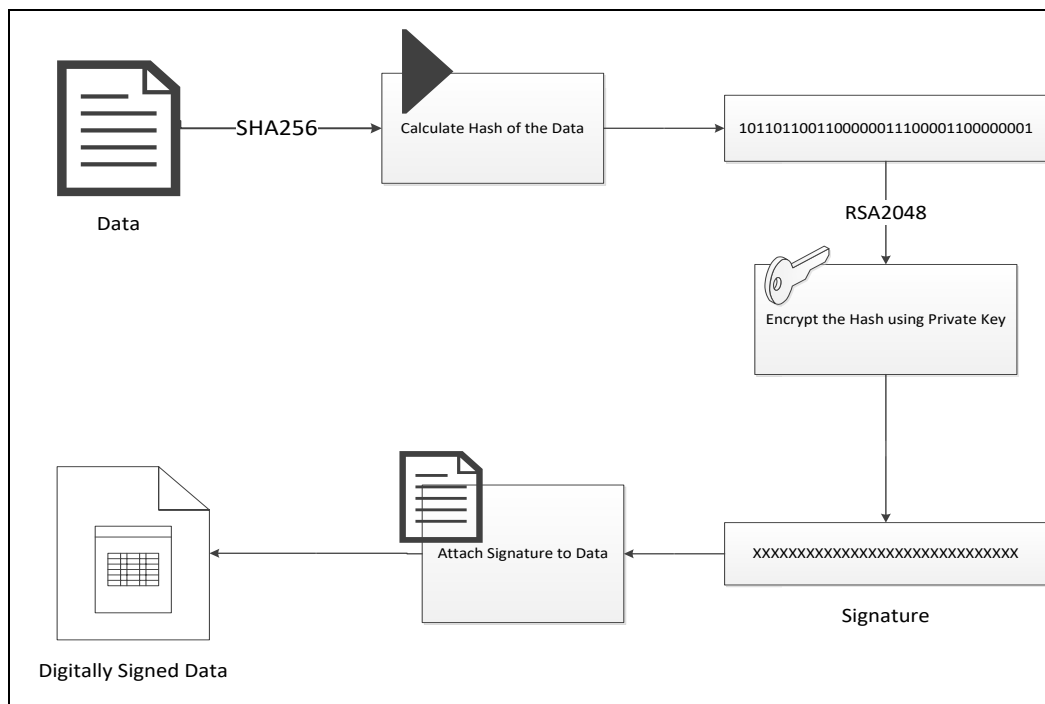
3.2 **ISH Signing Basic Concept**

The next section reviews the public key infrastructure.

Intel® ISS signing for CNL/GLK platforms (similar to the Intel® Boot Guard technology) employs RSA 2048 public key infrastructure (PKI) mechanism to sign and verify the Firmware image. The private key is used to sign the image as shown in the Figure below.



Figure 3-1: ISH Firmware Signing Process Schematic View



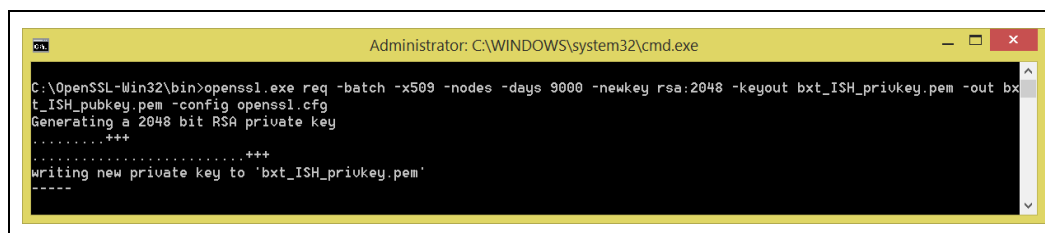
Note: Private keys should be always stored securely and kept secret to provide a robust secure boot flow or ISH firmware load. Public keys are used to verify the integrity of the images. Public keys are stored inside the manifest and hash of the public key is stored in the fuses on the PSH.

3.3 Generating Key Pair for Signing

Users are requested to generate the key pairs to be used for signing in the RSA-2048 PKC-1.5 format. **This is the only key format, which is supported for ISH signing flow.**

It is recommended to use [openssl.exe](#) from [Shining Light Productions to generate the key pairs:](#)

```
# openssl.exe req -batch -x509 -nodes -days 9000 -newkey
rsa:2048 -keyout privkey.pem -out pubkey.pem -config
openssl.cfg
```



**NOTES:**

1. Use OpenSSL 1.0.2b or higher versions.
2. If the user has the private key from third party, the user must verify that the key complies with the above requirements for keys that are used in ISH signing. Any other key format or length will trigger signing failure.

3.4 Reasons to Use Intel® MEU Tool

Using the Intel FDK, a customer can integrate other third party code (uDrivers, algorithms) into the unsigned FW included in the Intel FDK. The output FW binary must be transformed into a signed IUP before it can be used on the system. Intel® MEU tool provided by Intel is designed to execute Intel® ISS FW signing.

The Intel® MEU tool therefore:

1. Calls an external compression tool to compress the binary.
2. Calls an external signing tool to sign the FW binary.

The resulting signed FW binary can be added to an Independent Updateable Partition (IUP) within the Intel® ME FW region using the Firmware Integration Tool (FIT).

NOTES:

1. The Intel® MEU tool supports only the LZMA tool to compress the Intel® ISS FW.
2. The Intel® MEU tool supports only the OpenSSL for Intel® ISS FW signing tool.
3. Other compression and signing tools cannot be used with Intel® MEU.

Tool Name	Released By	Location
Intel® ISS FDK	Intel	FDK Kit on Intel VIP portal
Intel® MEU Tool	Intel	Intel® ME FW Kit on VIP portal
LZMA Tool	Intel	Intel® ISS FW Kit on VIP portal Intel FDK package
OpenSSL	Open source	Internet: Shining Light Productions

NOTES:

1. Use OpenSSL 1.0.2b or higher versions (32b or 64b).
2. If the FDK is not being used, the customer can use Intel® ISS signed FW binary that is included in the Intel® ISS FW kits released to the Intel VIP portal.

3.5 Before Running Intel® MEU Tool

Gather the following components:

- Unsigned FW binary created using the Intel FDK
- Intel® Manifest Extension Utility (MEU)
- LZMA tool (LZMA.exe)
- OpenSSL.exe tool – ver 1.0.2b and above
- Customer specific Private key¹

¹Private keys are owned by the customer and not provided by Intel.



3.6 Expected Outcome

The expected outcome is a signed Intel® ISS FW binary that has been ready to add to the Intel® ME region to build the SPI full image. This includes:

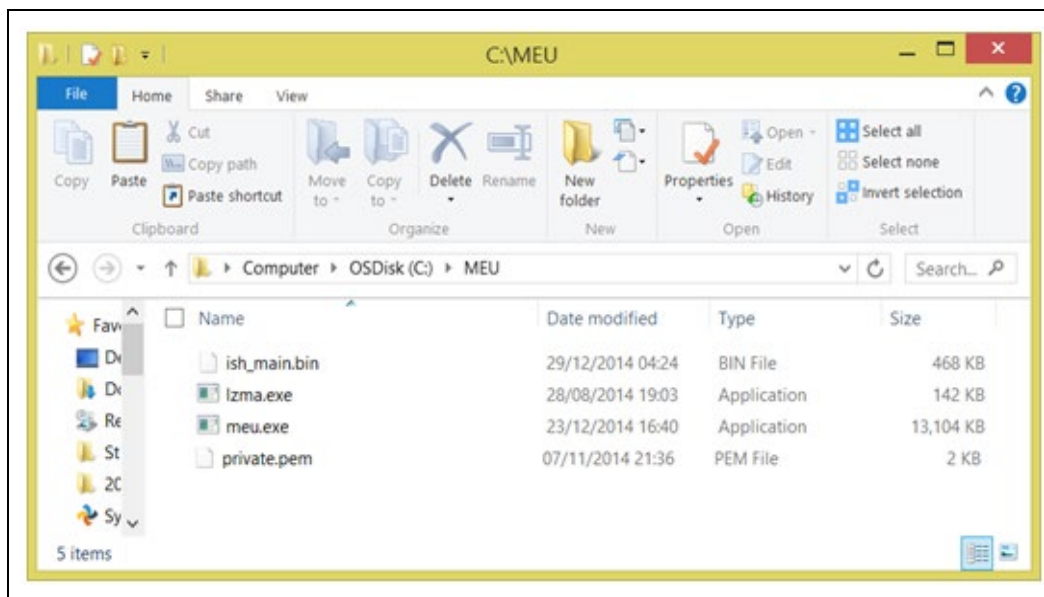
- Adding a manifest to the Intel® ISS binary.
- Compressing and signing the binary.

Note: The hash of the public key is added to the silicon/PCH and is used during the authentication of the signed FW binary, which happens during the system boot.

3.7 Signing Flow Steps

1. Place the required components into the same folder:
 - a. Intel® MEU Tool
 - b. Compression tool (LZMA.exe)
 - c. Signing Tool (OpenSSL.exe) – should be placed in the openssl folder (<path>:\OpenSSL-Win32\bin\)
 - d. FW binary created using FDK (Example, ISH_SI.bin)
 - e. Private Key (Example, Private.pem)

Figure 3-2: Components Needed to Run Intel® MEU Sequence

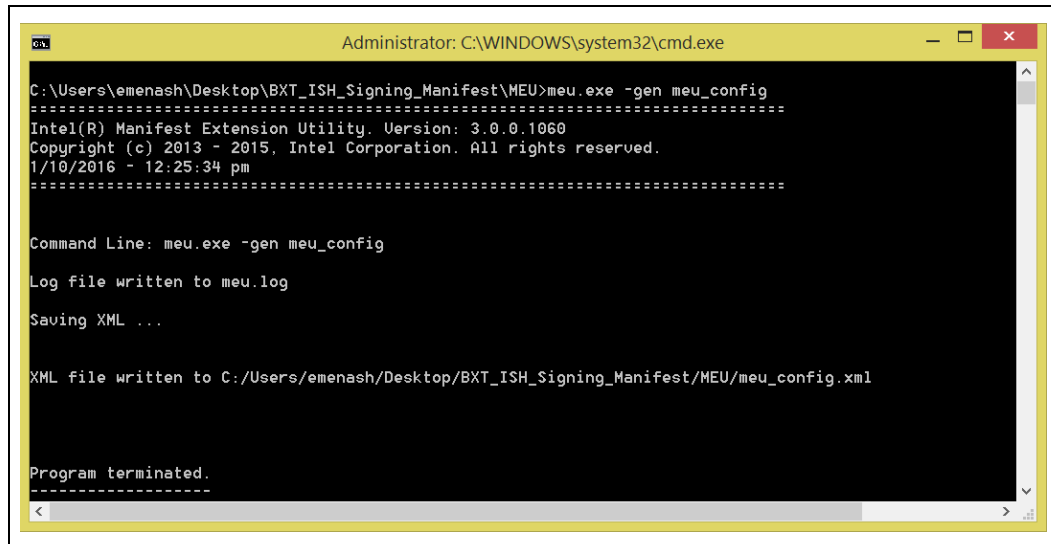


2. Create the signing configuration file:
 - a. Open a command prompt as an administrator and
 - b. Run the following commands.

```
# MEU.exe -gen meu_config
# MEU.exe -gen CodePartition
```



Figure 3-3: Creating me_config File using Intel® MEU Tool



```
Administrator: C:\WINDOWS\system32\cmd.exe

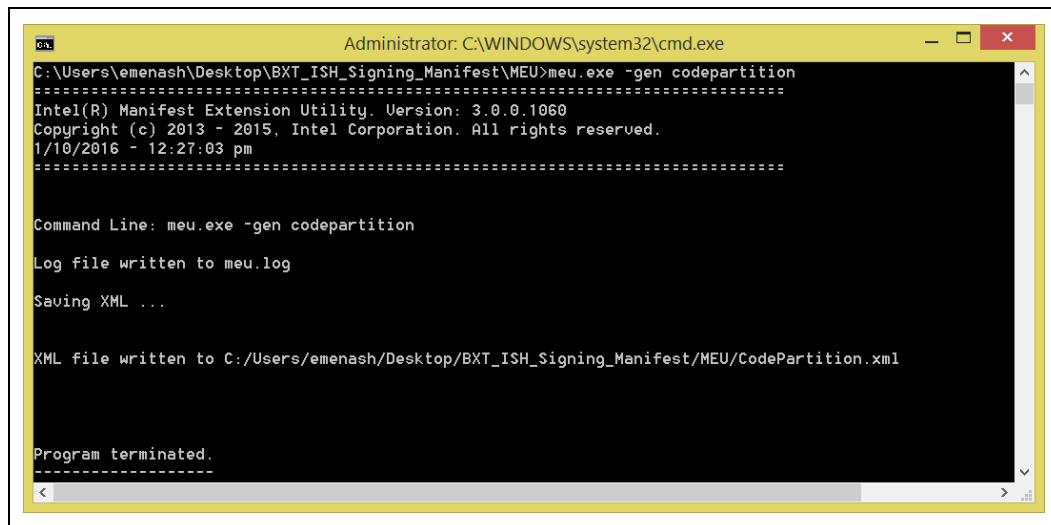
C:\Users\emenash\Desktop\BXT_ISH_Signing_Manifest\MEU>meu.exe -gen meu_config
=====
Intel(R) Manifest Extension Utility. Version: 3.0.0.1060
Copyright (c) 2013 - 2015, Intel Corporation. All rights reserved.
1/10/2016 - 12:25:34 pm
=====

Command Line: meu.exe -gen meu_config
Log file written to meu.log
Saving XML ...

XML file written to C:/Users/emenash/Desktop/BXT_ISH_Signing_Manifest/MEU/meu_config.xml

Program terminated.
=====
```

Figure 3-4: Creating CodePartition file using Intel® MEU Tool



```
Administrator: C:\WINDOWS\system32\cmd.exe

C:\Users\emenash\Desktop\BXT_ISH_Signing_Manifest\MEU>meu.exe -gen codepartition
=====
Intel(R) Manifest Extension Utility. Version: 3.0.0.1060
Copyright (c) 2013 - 2015, Intel Corporation. All rights reserved.
1/10/2016 - 12:27:03 pm
=====

Command Line: meu.exe -gen codepartition
Log file written to meu.log
Saving XML ...

XML file written to C:/Users/emenash/Desktop/BXT_ISH_Signing_Manifest/MEU/CodePartition.xml

Program terminated.
=====
```

- a. Verify the creation of two files (meu_config.xml, CodePartition.xml), which are the Intel® MEU configuration files for signing.
- b. Change the CPDataModule parameter in the CodePartition.xml file to the following:
 - i. Set "SecurityVersionNumber" to be 0x1.
 - ii. Set VendorId < OEM/ODM should use non-intel vendor ID@0x8086 >
 - iii. Set Input File value = <ISH image full path>ISH_Si.bin Example 1.



Example 1

CodePartition.xml file that is being ready for **Intel** key signing

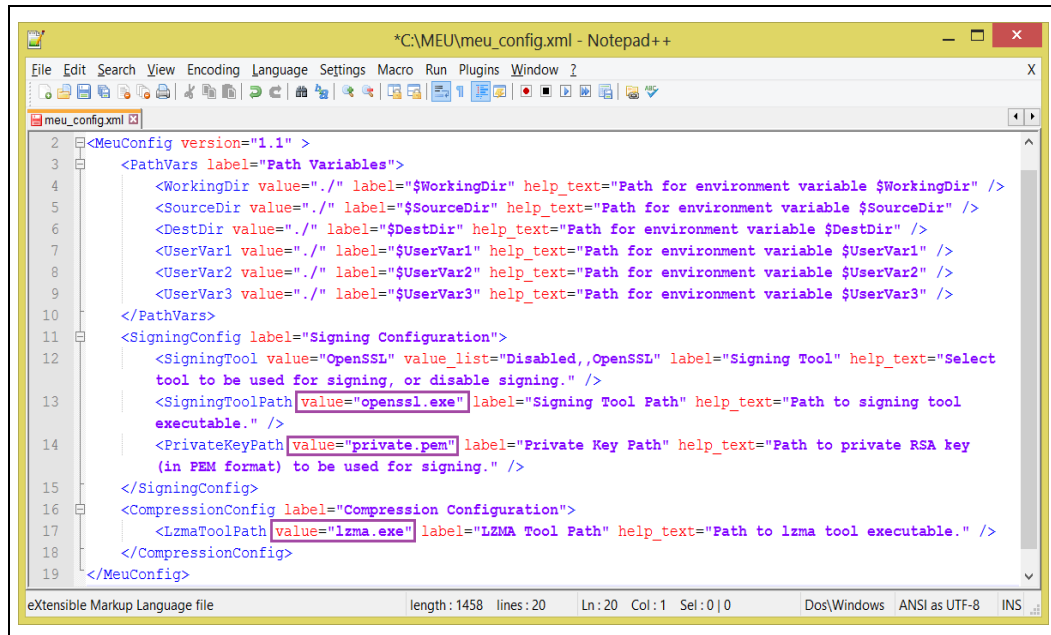
```
<?xml version="1.0" encoding="UTF-8"?>
- <CodePartition version="1.1">
  <Name value="ISHC"/>
  <Length value="0x0"/>
  <InstanceId value="0x1"/>
  <VersionMajor value="0x0" label="Version Major"/>
  <VersionMinor value="0x0" label="Version Minor"/>
  <VersionHotfix value="0x0" label="Version Hotfix"/>
  <VersionBuild value="0x0" label="Version Build"/>
  <VendorId value="0x8086"/>
  <PartitionFlags value="0x00000000"/>
  <PartitionVersion value="0x10000000"/>
  <DataFormatVersion value="0x00010000"/>
  <VersionControlNumber value="0x00000000"/>
  <SecurityVersionNumber value="0x1"/>
  -<CPModules>
    -<CPDataModule enabled="true" name="ISH_si.bin">
      <InputFile value="c:\ISH\ISH_si.bin"/>
      <CompressionType value="LZMA" value_list="NOT_COMPRESSED,,LZMA"/>
      <ProcessId value="0xf6"/>
    </CPDataModule>
  </CPModules>
</CodePartition>
```

3. Change the following parameters in the meu_config.xml file:

- a. SigningTool value="OpenSSL"
- b. <SigningToolPath value = C:\OpenSSL-Win32\bin\OpenSSL.exe> (according to the actual tools path)
- c. <PrivateKeyPath = c:\OpenSSL-Win32\bin\Private.pem> The private key file is the one that is generated in the previous section with openssl tool
- d. <CompressionConfig LzmaToolPath value -in MEU directoty> = c:\MEU\LZMA.exe>

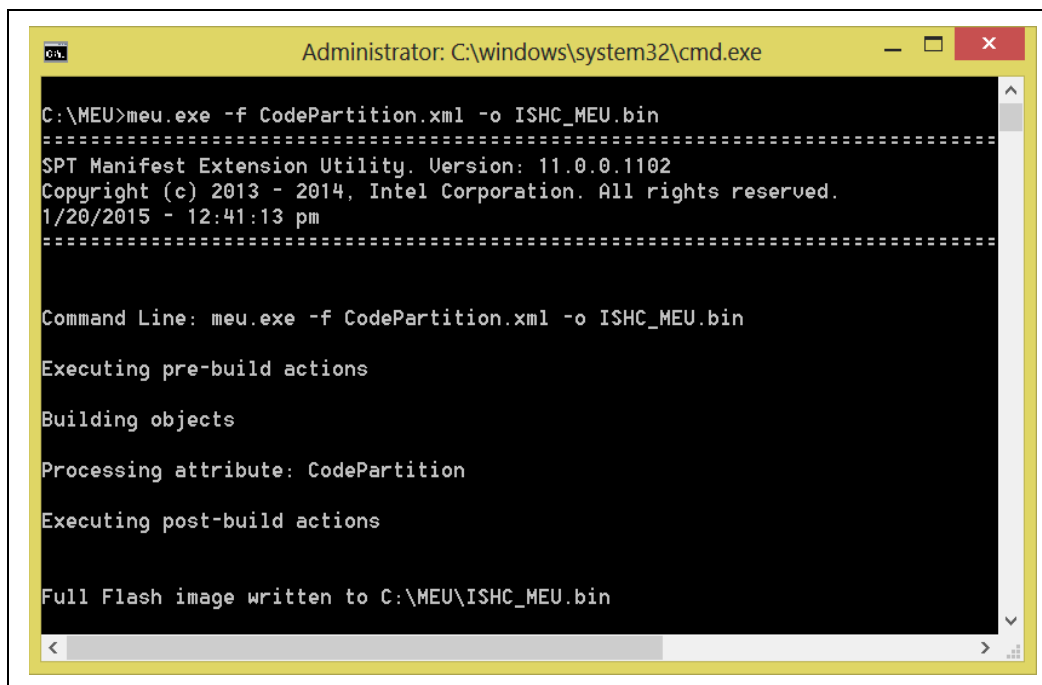


Figure 3-5: Edits to meu_config.xml File



```
*C:\MEU\meu_config.xml - Notepad++
File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
meu_config.xml
2 <MeuConfig version="1.1" >
3   <PathVars label="Path Variables">
4     <WorkingDir value="." label="$WorkingDir" help_text="Path for environment variable $WorkingDir" />
5     <SourceDir value="." label="$SourceDir" help_text="Path for environment variable $SourceDir" />
6     <DestDir value="." label="$DestDir" help_text="Path for environment variable $DestDir" />
7     <UserVar1 value="." label="$UserVar1" help_text="Path for environment variable $UserVar1" />
8     <UserVar2 value="." label="$UserVar2" help_text="Path for environment variable $UserVar2" />
9     <UserVar3 value="." label="$UserVar3" help_text="Path for environment variable $UserVar3" />
10  </PathVars>
11  <SigningConfig label="Signing Configuration">
12    <SigningTool value="OpenSSL" value_list="Disabled,,OpenSSL" label="Signing Tool" help_text="Select
13    tool to be used for signing, or disable signing." />
14    <SigningToolPath value="openssl.exe" label="Signing Tool Path" help_text="Path to signing tool
15    executable." />
16    <PrivateKeyPath value="private.pem" label="Private Key Path" help_text="Path to private RSA key
17    (in PEM format) to be used for signing." />
18  </SigningConfig>
19  <CompressionConfig label="Compression Configuration">
20    <LzmaToolPath value="lzma.exe" label="LZMA Tool Path" help_text="Path to lzma tool executable." />
21  </CompressionConfig>
22 </MeuConfig>
eXtensible Markup Language file      length: 1458  lines: 20  Ln: 20  Col: 1  Sel: 0 | 0  Dos\Windows  ANSI as UTF-8  INS
```

4. Run the Intel® MEU tool to create the compressed and signed ISH firmware image.
 - a. Open the command prompt as administrator.
 - b. Run the commands with the following parameters (case sensitive):
 - c. # MEU.exe -f CodePartition.xml -o ISHC_MEU.bin
 - d. Verify if the command has generated and signed binary file exists.

**Figure 3-6: Running Intel® MEU Tool to Create Signed Binary File Example**

```
Administrator: C:\windows\system32\cmd.exe

C:\MEU>meu.exe -f CodePartition.xml -o ISHC_MEU.bin
=====
SPT Manifest Extension Utility. Version: 11.0.0.1102
Copyright (c) 2013 - 2014, Intel Corporation. All rights reserved.
1/20/2015 - 12:41:13 pm
=====

Command Line: meu.exe -f CodePartition.xml -o ISHC_MEU.bin

Executing pre-build actions

Building objects

Processing attribute: CodePartition

Executing post-build actions

Full Flash image written to C:\MEU\ISHC_MEU.bin
```

3.8 Creating Hash

After the ISH firmware image has been signed, need to create the hash string that will be put into the FIT and the manifest file to create the trust relations between the FW and HW.

1. Run the following command:
 - a. `meu.exe -keyhash Hash_bxt_ISH -key pubkey.pem`

This command will generate a hash file based on the private key generated in the previous section using openssl tool. The hash key file will be used for creating the trust relations between the HW and ISH firmware image



Figure 3-7: Running Intel® MEU Tool with `meu.exe -keyhash Hash_bxt_ISH -key bxt_ISH_privkey.pem` Command

```
Administrator: C:\WINDOWS\system32\cmd.exe

C:\Users\emenash\Desktop\BXT_ISH_Signing_Manifest\MEU>meu.exe -keyhash Hash_bxt_ISH -key bxt_ISH_privkey.pem
=====
Intel(R) Manifest Extension Utility. Version: 3.0.0.1060
Copyright (c) 2013 - 2015, Intel Corporation. All rights reserved.
1/10/2016 - 12:35:19 pm
=====

Command Line: meu.exe -keyhash Hash_bxt_ISH -key bxt_ISH_privkey.pem

Log file written to meu.log

Loading XML file: C:/Users/emenash/Desktop/BXT_ISH_Signing_Manifest/MEU/meu_config.xml

Signing Tool:
OpenSSL 1.0.2e 3 Dec 2015

Signing Tool Path: C:\OpenSSL-Win32\bin\openssl.exe
Key Path: C:\Users\emenash\Desktop\BXT_ISH_Signing_Manifest\MEU\bxt_ISH_privkey.pem

Public Key Hash Value:
BE 07 F6 47 3D FE 9B 9C 32 10 FC 51 77 9B 19 AB 60 62 DE 1B 5C D0 07 D2 FD 20 7A 59 88 AF 23 D8

Public Key Hash Saved to:
Hash_bxt_ISH.bin
Hash_bxt_ISH.txt

Program terminated.
=====
```

Refer to hash value shown on the screen:

**BE 07 F6 47 3D FE 9B 9C 32 10 FC 51 77 9B 19 AB 60 62 DE 1B 5C D0 07 D2
FD 20 7A 59 88 AF 23 D8**

3.9 Creating Manifest File

The ISH image was signed and the hash files are prepared for ISH firmware and other components (only if needed). It is time to prepare the manifest file itself:

To prepare the key manifest configuration file we will use the Intel® MEU tool with the command: `meu.exe -gen OEMKeyManifest`



```

Administrator: C:\WINDOWS\system32\cmd.exe

C:\Users\emenash\Desktop\BXT_ISH_Signing_Manifest\MEU>meu.exe -gen OEMKeyManifest
=====
Intel(R) Manifest Extension Utility, Version: 3.0.0.1060
Copyright (c) 2013 - 2015, Intel Corporation. All rights reserved.
1/10/2016 - 12:36:22 pm
=====

Command Line: meu.exe -gen OEMKeyManifest

Log file written to meu.log

Saving XML ...

XML file written to C:/Users/emenash/Desktop/BXT_ISH_Signing_Manifest/MEU/OEMKeyManifest.xml

Program terminated.
=====

```

The OEMkeymanifest contains two major sections that refer to ISH and all other components. Since ISH and other components hash files are created, need to enter the hash files locations in the file.

1. Modify the OEMKeyManifest.xml:

Remarks: the OEMKeyManifest file is configured uniquely by each OEM and it depends on the OEM firmware configuration priorities.

The following section shows a common configuration where the key manifest file is divided into two nodes – one for ISH with a unique key and the other for all the firmware section that are being signed with a different key.

For more comprehensive data about manifesting, refer to signing and manifesting guide.

- a. First one – ISH manifest

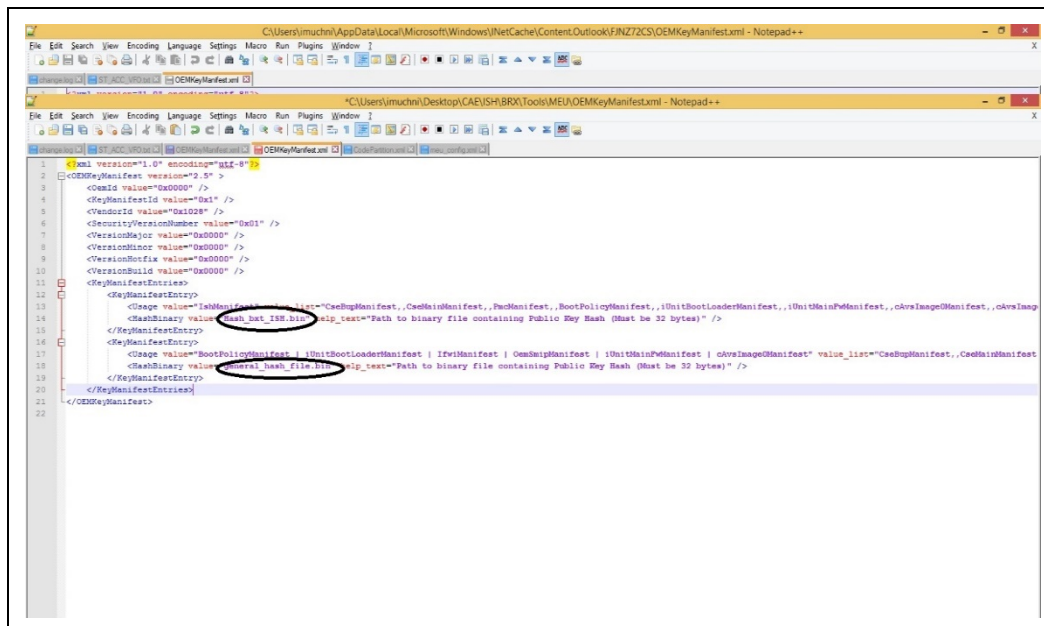
- i. KeyManifestEntry Usage = **IshManifest**
 - ii. HashBinary value= Path to binary file containing Public Key Hash (in this case - **Hash_bxt_ISH is the hash file produced in previous section**)

- b. Second one – all other sections that are **not** ISH

- i. KeyManifestEntry Usage = **BootPolicyManifest | iUnitBootLoaderManifest | IfwiManifest | OemSmipManifest | iUnitMainFwManifest | cAvsImage0Manifest**
 - ii. HashBinary value= Path to binary file containing Public Key Hash (in this case general_hash_file is the file we have produced to be used with all other components. But it can come from other groups as the organization decides)



Figure 3-8: OEMKeyManifest.xml file shows Places where Hash Files are Inserted



By having the key manifest configuration file, need to make the actual manifest file and sign it with the key provided as parameter to “-key” command argument.

The command is:

meu.exe -f OEMKeyManifest.xml -o OEMKeyManifest.bin -key <the key file decided to sign the manifest>



Figure 3-9: Creating and Signing Manifest

```
Administrator: C:\WINDOWS\system32\cmd.exe
C:\Users\emenash\Desktop\BXT_ISH_Signing_Manifest\MEU>meu.exe -f OEMKeyManifest.xml -o OEMKeyManifest.b
riv_key.pem
=====
Intel(R) Manifest Extension Utility. Version: 3.0.0.1060
Copyright (c) 2013 - 2015, Intel Corporation. All rights reserved.
1/10/2016 - 12:44:22 pm
=====

Command Line: meu.exe -f OEMKeyManifest.xml -o OEMKeyManifest.bin -key bxt_dbg_priv_key.pem

Log file written to meu.log

Loading XML file: C:/Users/emenash/Desktop/BXT_ISH_Signing_Manifest/MEU/meu_config.xml
Loading XML file: OEMKeyManifest.xml

Signing Tool:
OpenSSL 1.0.2e 3 Dec 2015

Signing Tool Path: C:\OpenSSL-Win32\bin\openssl.exe
Key Path: C:\Users\emenash\Desktop\BXT_ISH_Signing_Manifest\MEU\bxt_dbg_priv_key.pem

Executing pre-build actions

Building objects

Processing attribute: OEMKeyManifest

Executing post-build actions

Calling signing tool to generate signature

Verifying signature

Full Binary written to C:\Users\emenash\Desktop\BXT_ISH_Signing_Manifest\MEU\OEMKeyManifest.bin

Program terminated.
-----
C:\Users\emenash\Desktop\BXT_ISH_Signing_Manifest\MEU>
```

The signing and manifest creation is finished.

3.10 Creating Image

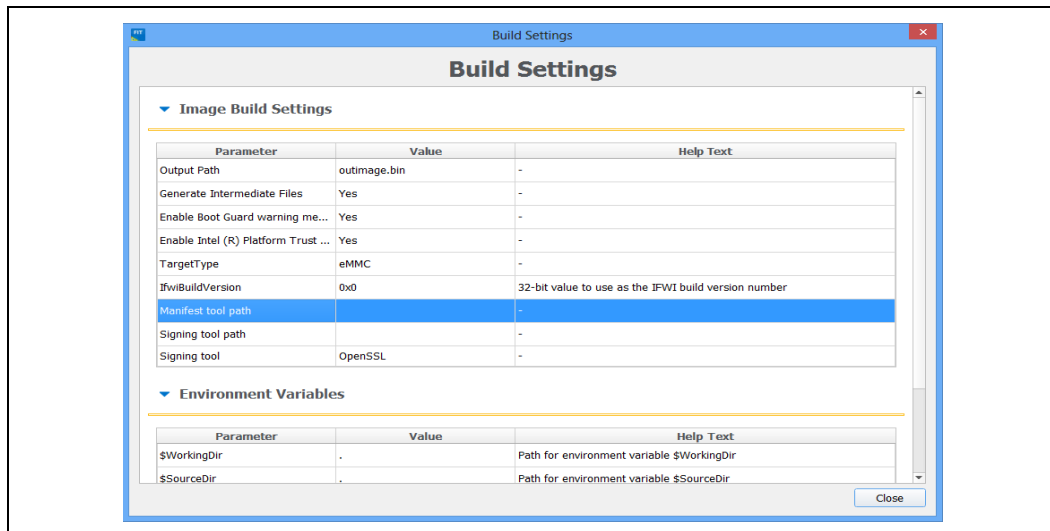
This part is optional as it is described in the TXE/IWFI Bring-up guide. The section is brought as reference only. If any inconsistency exists – the TXE bring up is the official source for data.

Configure FIT tool to be able to call Intel® MEU, use OpenSSL tool for SMIP signing.



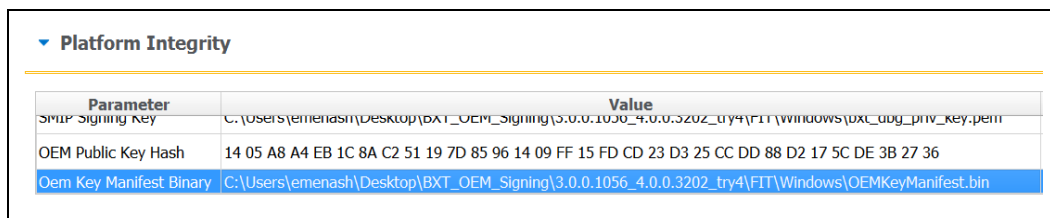
1. Go to the following screen in FIT and update the following:
 - Manifest tool path – MEU path
 - Signing tool path – OpenSSL path
 - Signing tool – OpenSSL

Figure 3-10: Build Setting Tab



2. Go to **Platform Protection tab > Platform Integrity > SMIP Signing Key >** <the key file that supposed to sign SMIP must be compatible to the key file entered into OEMKeyManifest.xml file>
3. Go to **Platform protection Tab > Platform Integrity > OEM Public Key Hash >** enter the **hash string** (actual numbers) generated from making hash of the above key file>
4. Go to **Platform protection Tab > Platform Integrity > OEM Public Key Hash > OEM Key Manifest Binary >** <enter the manifest bin file - **OEMKeyManifest.bin**>

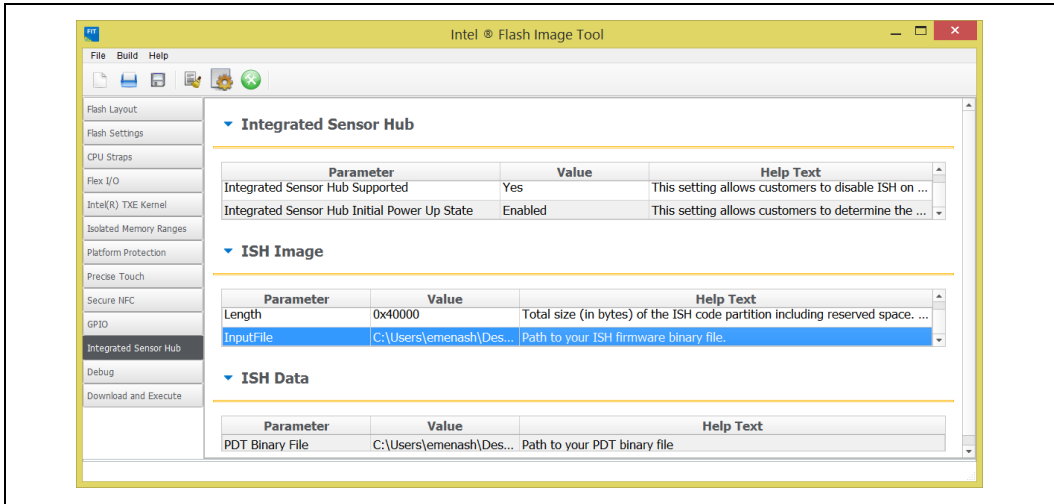
Figure 3-11: Platform Protection Tab



5. Go to **Integrated Sensor Hub Tab > ISH image Table >** <add the signed ISH fw image path>
6. Go to **Integrated Sensor Hub Tab > ISH Data >** <add the PDT file path>



Figure 3-12: ISH Tab



This concludes the ISH firmware signing flow.

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4 Modifying PDT

4.1 PDT Prerequisites

- Store the Intel® ISS default PDTs onto the system [Intel® ISS FW Kit]
- Install the PDT Editor tool to the system [Intel® ISS FW Kit]
- Modify the PDT to include third party micro drivers and algorithms [Optional if creating custom FW using the FDK]

Note: For more details, refer to PDT Editor User Guide. The user guide is located within the Intel® ISS FW kit, and the Intel® ISS FDK.

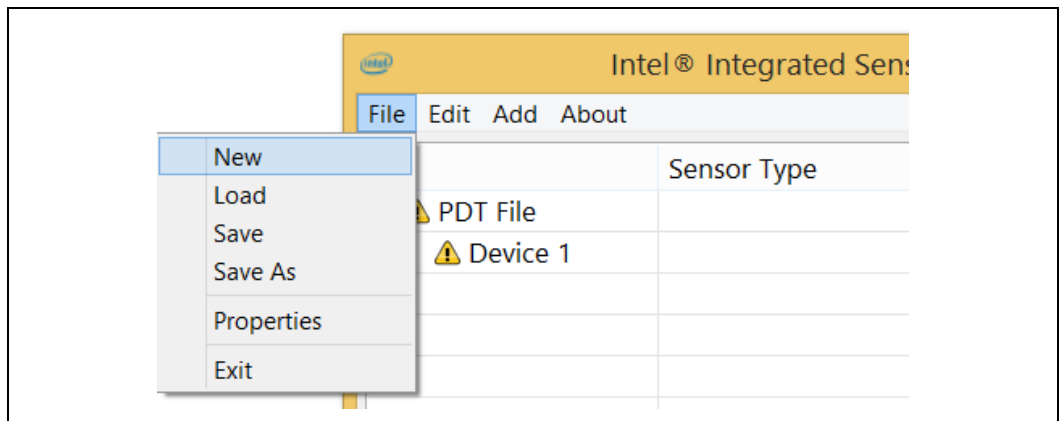
4.2 Expected Outcome

PDT Binary compatible with the sensor configuration of the SUT.

4.3 Steps to Modify PDT

1. Run PDTEditor.jar
2. Load PDT.bin by clicking File > Load PDT File and select a pre made PDT.bin.

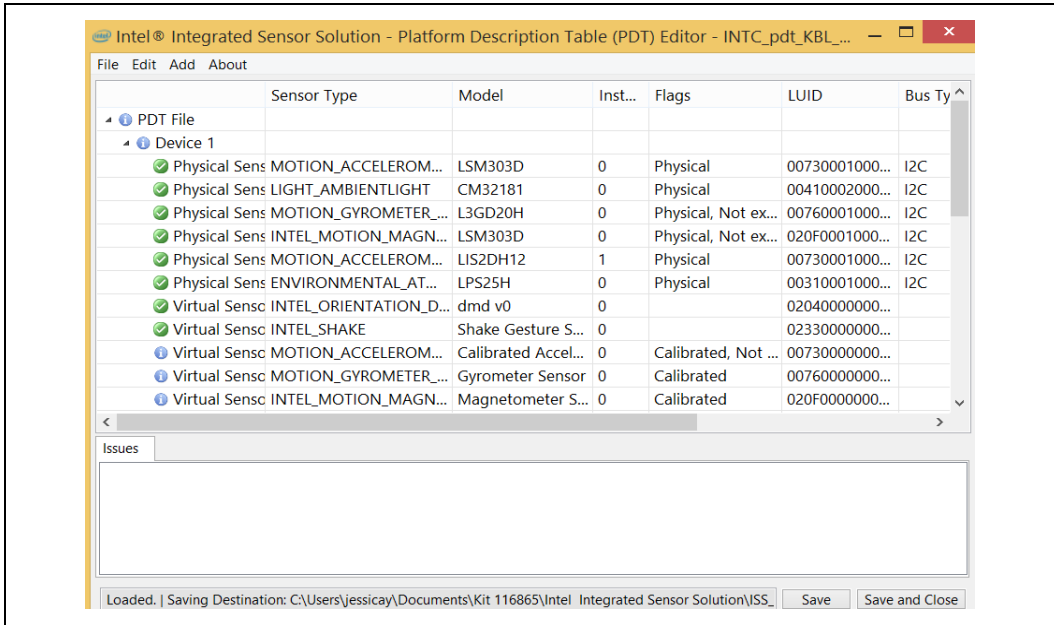
Figure 4-1: Loading PDT into PDT Editor



3. After the PDT is loaded, it will display the physical and virtual sensors (algorithms) included in the PDT.

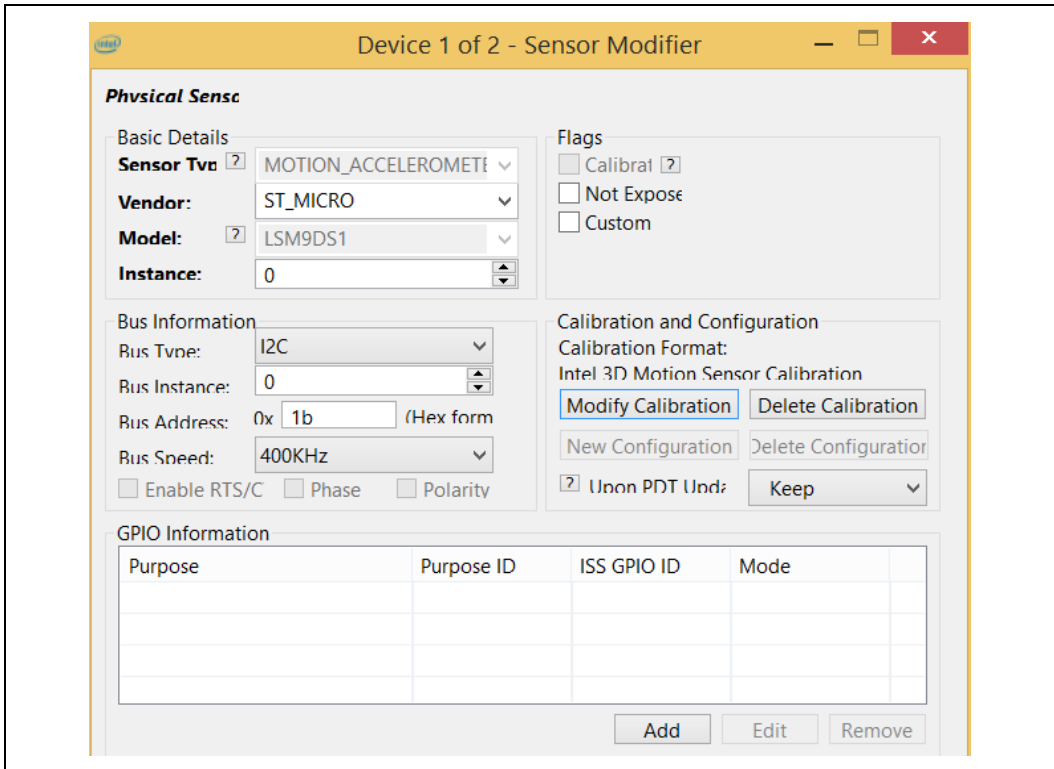


Figure 4-2: PDT Editor View after Loading Default PDT



4. To add a sensor, click **Add New Physical Sensor**. Then select **Sensor Type**, **Vendor**, and **Model** and so on in the drop-down box.

Figure 4-3: Add Sensor Micro Drivers



5. Double click each **Physical Sensor** that requires editing.

Figure 4-4: Physical Sensor Detailed view

The image shows a window titled "Device 1 of 2 - S" with a "Physical Sense" section. It contains two sub-sections: "Basic Details" and "Bus Information".

Basic Details:

- Sensor Type:** MOTION_ACCELEROMETER (dropdown)
- Vendor:** ST_MICRO (dropdown)
- Model:** LSM9DS1 (dropdown)
- Instance:** 0 (spinner)

Bus Information:

- Bus Type:** I2C (dropdown)
- Bus Instance:** 0 (spinner)
- Bus Address:** 0x 1b (Hex form)
- Bus Speed:** 400KHz (dropdown)
- ☐ Enable RTS/C
- ☐ Phase
- ☐ Polarity

6. Modify the sensor bus address (I2C address) if needed to avoid I2C conflicts.
7. Assign or change the GPIO address (Optional) assigned to the sensor.
 - a. Double click **GPIO** section of the physical sensor.
 - b. Edit the GPIO information in the **Interrupts Modifier** window.

Figure 4-5: GPIO Editor Window

GPIO Information				
Purpose	Purpose ID	ISS GPIO ID	Mode	
3	3	0	Active Low, O...	

8. Click **Save** the PDT as a PDT binary file.

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5 Adding Intel® ISS Components to Binary Image

5.1 Before Modifying PDT

- Create a binary image and XML configuration file that includes the BIOS, Intel® ME, and GBE region.
- Modify the Intel® ISS PDT to match the SUT sensor configuration

5.2 Expected Outcome

Binary image with Intel® ISS that can be flashed to the SUT

5.3 Steps to Add Intel® ISS Components to Binary Image

1. Open **Intel® Flash Image Tool** (Intel® FIT) and copy the files to the FIT folder:
 - a. Existing SPI flash image.
 - b. New Intel® ISS Code signed and compressed.
2. Run **FIT.exe** and drag the SPI flash image into the GUI.
3. Navigate and click **Integrated Sensor Hub**.
4. Click **ISH Image** and load the new Intel® ISS FW Code bin file.
5. Click **ISH Data** and load the PDT binary file.
6. Build image (Ctrl+B).
7. Expected result will be an SPI flash binary image created in the FIT folder including Intel® ISS FW components.



Figure 5-1: FIT Tool when Adding Intel® ISS FW Components

Input File	Location for the Intel® ISS FW binary. Provide the Intel® FIT tool with the location of the binary that should be added to the IUP within the Intel® ME region.	
Padding Percent	Percentage of extra space to be added to the IUP. <ul style="list-style-type: none">• If no value is set—the default IUP size is 256KB• If padding percentage entered– This will be the size of the padding added above the size of the Intel® ISS FW binary	
PDT Binary File	Location for the Intel® ISS PDT binary. Provide the Intel® FIT tool with the location of the binary that should be added to the IUP within the Intel® ME region.	

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6 Installing Intel® ISS Drivers

6.1 Obtaining Intel® ISS Drivers

The drivers may be obtained from the software zip file inside the ISH kit. They can be installed to a known location. The drivers included are:

For RS1:	Windows* 10
ISH HECI Driver	✓
ISH Bus Driver	✓
HID PCI Miniport Driver	✓

For previous RS1:	Windows* 10
ISH HECI Driver	✓
ISH Bus Driver	✓
HID PCI Miniport Driver	✓
AdvSensorHIDClassDriverV2	✓

Note: The (✓) means that the driver is required for the operating system version. Android* drivers are part of the Android* image.

Warning: Use the SW drivers and FW binary from the same FW kit.

6.2 Installing Intel® ISS Drivers – Windows*

There are two methods of installing the drivers on the machine:

- Manual installation
- Using a batch file

6.2.1 Exe File Installation

1. Run the SetupISS.exe file (from <unzipped folder>\ISH_SW\OS Components\Installer) with administrator privileges.
2. Once finished, it will show ISS stacks in Windows* Device Manager.

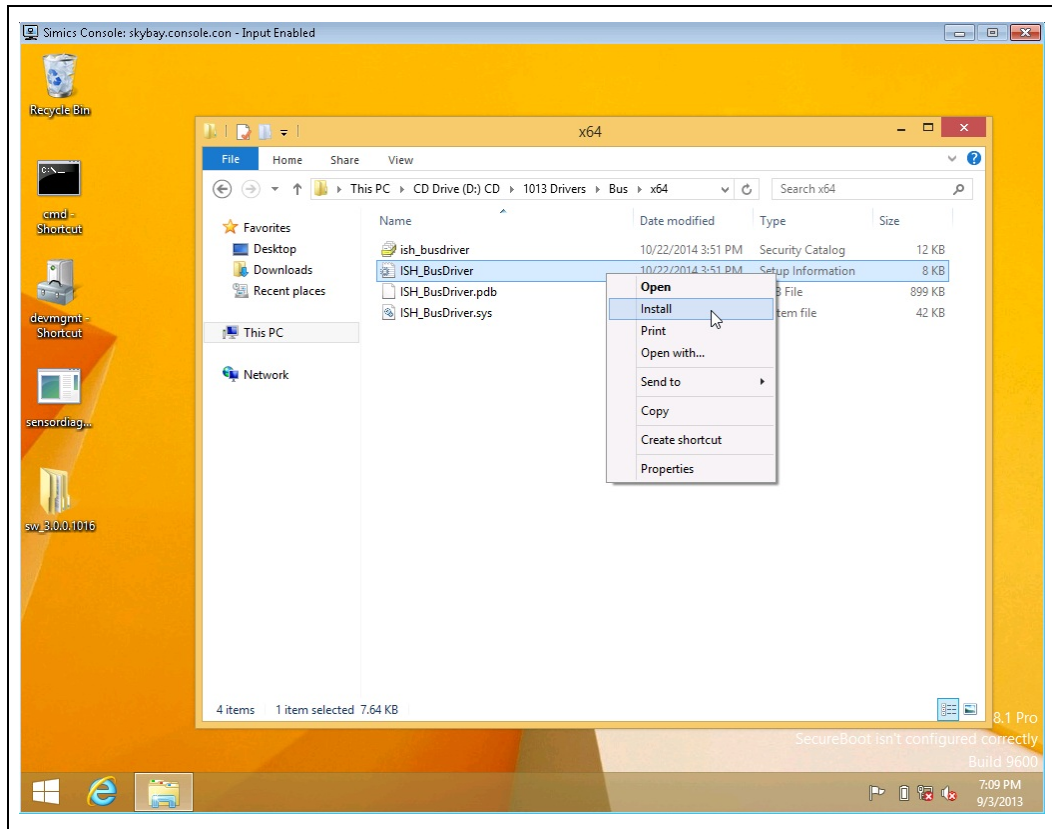
6.2.2 Manual Installation

For each one of the drivers in [Section 5.1](#), do the following:

1. Enter the driver folder (<unzipped folder>\drivers\<driver name>\<os version>\)
2. Right-click .inf file and choose install.



Figure 6-1: SW Driver Installation View



After installation of all drivers, it is recommended to restart the machine.

6.3 Uninstalling Intel® ISS Drivers

Uninstall old installer from Control Panel, then uninstall drivers from Windows* Device Manager with delete the driver software for this device selected manually with administrator privileges.

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7 Confirming Intel® ISS Status

7.1 Before Checking Intel® ISS Status

Complete the previous sections including the following:

1. Adding Intel® ISS FW components to the binary image
2. Writing the binary image to flash, and
3. Installing the Intel® ISS SW drivers.
4. Locate the **ISSUtil** tool located within the Intel® ISS tool kit.

7.2 Check Intel® ISS Status

1. Use the ISSU to check the FW status from the Windows* Desktop:
 - a. Open the command prompt as Administrator.
 - b. Run the following command: `ISSUtil.exe -INFO`
2. Verify that the tool returns to the following status:
 - Intel® ISS state
 - Intel® ISS Intel FW status
 - Intel® ISS Intel FW Version
 - PDT version
 - PDT Description
 - CSE FW version
 - Driver version
 - Intel® ISS Sensor Information

7.3 Check Sensor Information

1. Use the Intel® ISSU tool to check the FW status from the Windows* Desktop:
 - a. Open the command prompt as **Administrator**.
 - b. Run the following command: `ISSUtil.exe -INFO`
2. Verify that the tool returns the following information for each sensor:
 - Sensor LUID
 - Sensor Name
 - Vendor
 - Sensor Sub Type
 - Bus Type
 - Bus Address
 - Calibration Status



7.4 Check Intel® ISS FW Functional Test

Use the Intel® ISSU to check the FW functional status from the Windows Desktop:

1. Open the command prompt as **Administrator**
2. Run the following command: `ISSUtil.exe -Test <x> -Verbose:`
`<x>` can be one of the following:
 - 1 – Refers to sensor connectivity test
 - 2 – Refers to sensor calibration test
 - 3 – Refers to sensor BIST (Basic Internal Self Test)
3. Verify that the tool returns **Test pass for all sensors**.

Figure 7-1: Functional Test Results Displayed by ISSUtil Tool

```
Administrator: C:\Windows\system32\cmd.exe
D:\issutil training\13.6ISSU>ISSUtil.exe -bist
Intel Integrated Sensor Solution Util
Version: 1.0.0.2

Operation failed
Self Test:
Test Level: 3 (Sensors BIST)
Result: test failed for sensors:
Sensor LUID: 0073000100010002    Sensor Model: LSM303D    Result: err_code:7, connectivity failure
Sensor LUID: 0073000100010002    Sensor Model: LSM303D    Result: err_code:1, test failed
Sensor LUID: 0041000200010002    Sensor Model: CM32181    Result: err_code:7, connectivity failure
Sensor LUID: 020F000100010042    Sensor Model: LSM303D    Result: err_code:7, connectivity failure
Sensor LUID: 0204000000000000    Sensor Model: Dummy Intel    Result: err_code:4, missing mandatory re
porter
Sensor LUID: 0233000000000000    Sensor Model: Dummy Intel    Result: err_code:4, missing mandatory re
porter
Sensor LUID: 0073000000000041    Sensor Model: Dummy Intel    Result: err_code:4, missing mandatory re
porter
Sensor LUID: 0076000000000001    Sensor Model: Dummy Intel    Result: err_code:4, missing mandatory re
porter
Sensor LUID: 020F000000000001    Sensor Model: Dummy Intel    Result: err_code:4, missing mandatory re
porter
Sensor LUID: 0073000000000000    Sensor Model: Dummy Intel    Result: err_code:4, missing mandatory re
porter
Sensor LUID: 0241000000000000    Sensor Model: Dummy Intel    Result: err_code:4, missing mandatory re
porter
Sensor LUID: 0242000000000000    Sensor Model: Dummy Intel    Result: err_code:4, missing mandatory re
porter
Sensor LUID: 0201000000000000    Sensor Model: Dummy Intel    Result: err_code:4, missing mandatory re
```

Note: In this example, the tool runs without `-verbose` command.

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8 Common Bring Up Issues and Troubleshooting Table

8.1 Common Bring Up Issues and Troubleshooting Table

Problem / Issue	Solution / Workaround
Intel® MEU tool fails to run	<p>Confirm that the MEU_Config and CodePartition files are present in the same folder of the Intel® MEU tool.</p> <p>Confirm that both files have been modified properly.</p> <p>NOTE: If it still failed, add option Verbose into end of command line and provide PDT image.</p>
ISSUtil test fails	<p>Review the PDT table added to the binary image:</p> <ul style="list-style-type: none"> • Re-confirm all I2C addresses for each sensor • Check that the sensors listed in the PDT table match those physically present on the system <p>NOTE: If it still failed, add option Verbose into end of command line and provide PDT image.</p>
The ISSUtil results show that the Intel® ISS is not enabled	<p>Check the BIOS to for a setting that has disabled the Intel® ISS</p>
The Intel® ISS is enabled but the sensors are not initialized. (That is ISSUtil BIST test fails)	<p>Check the system design to confirm that the I2C addresses of each sensor matches those that are programmed in the PDT (sensor configuration)</p> <p>If this is the problem – use the PDT Editor tool to edit the PDT and correct the problem.</p> <p>Add the updated PDT to the binary image and write this to the system.</p> <p>NOTE: If it still failed, add option Verbose into end of command line and provide PDT image.</p>



Common Bring Up Issues and Troubleshooting Table

<p>The ISSUtil "level 3" test for ISH returns a warning for one or more sensors. (that is test unsupported)</p>	<p>Included is a list of possible causes and resolutions for sensor failures listed by ISSUtil:</p> <ul style="list-style-type: none"> • Missing calibration – This failure is raised if the calibration values are set to their defaults (all 0's). This can be resolved by re-running the calibration for this sensor type. • Connectivity failure – This indicates that the FW was unable to reach the specific sensor listed. The root-cause can include (a) configuring the wrong I2C address or (b) a HW issue affecting the sensor or the I2C link. • Test unsupported – This may related to a to the sensor's built-in self-test. This warning will be raised if the sensor u-driver does not support a sensor self-test that can be called by ISSUtil. <p>NOTE: If it still failed, add option Verbose into end of command line and provide PDT image.</p>
<p>YB issue</p>	<p>Provide following information:</p> <ul style="list-style-type: none"> • ME/TXE/ISH/OS version • Failure rate/ reproduce way • PDT image • Version of drivers (HECI, BUS, MINIPORT, UMDf) • Event log, full ramdump, ISH.etl <p>NOTE: Instruction to get full ramdump</p>
<p>Sensor is not active or missing sensors</p>	<ul style="list-style-type: none"> • Make sure that udriver already includes theISH image • Make sensor already adds into PDT image and all configuration is correct(like i2c bus, i2c speed and so on) <p>help to get FW log by ISSTraceCollector/FTDI and get SelectedSensors.xml (workspace\ISS_Sample\settings\SelectedSensors.xml)</p>
<p>Function of PLM sensor does not work</p>	<ul style="list-style-type: none"> • Check data of AG. It means that data should be correct when ISH calculates hinge angle. • GPIO pins should be configured correctly in BIOS and PDT.If GPIO works, check EC part.
<p>Cannot build ISH project by FDK</p>	<ul style="list-style-type: none"> • 1. Use Troubleshooter to check what's software missing (Just click "fix it" if the PC does not have such of SW) • 2. Provide hole workspace folder
<p>Hall sensor does not work(Lid close detection sensor, tablet mode sensor...and so on)</p>	<ul style="list-style-type: none"> • Make sure GPIO pin already configured correctly in BIOS and in PDT • GPIO purpose should be 0 • Check signal of GPIO pin derectly

NOTES:

There are two ways to get full ramdump.

1. Get <<trace_enable_ISH.reg_>>
 - a. Enter **regedit**
 - b. Delete (if exists) the
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\WMI\AutoLogger\ISH folder
 - c. Run **attached trace_enable_ISH.reg** (remember to rename from trace_enable_ISH.reg_ to trace_enable_ISH.reg before execution)
 - d. Restart the platform



- e. Reproduce the issue again
- f. Create a dump by pressing **ctrl+scrlick** twice.
- g. Send the BSOD dump file to Intel (Make sure it is a completed dump).

To get BSOD, crash by pressing ctrl+scrlick, try to find and download a freeware tool **Notmyfault** from internet and run this tool to replace step6.

2. Get trace_enable_ISH.reg from COE team

Below is snippet of this reg script:

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\WMI\Autologger\ISH]

- a. "Start"=dword:00000001
- b. "Guid"="{A5371B2E-0B01-45F5-81B5-EFBC009B117C}"
- c. "FlushTimer"=dword:00000001
- d. "Status"=dword:00000000
- e. "LogFileMode"=dword:00088101
- f. "ClockType"=dword:00000002
- g. "FileName"="%SystemRoot%\System32\LogFiles\WMI\ISH.etl"
 - i. Double click to apply the reg file
 - ii. **Control Panel -> System -> System Properties -> Startup and recovery -> change to Complete memory dump**
 - iii. **Reboot**
 - iv. Do the **Test**.
 - v. When issue occurs, run the command prompt as admin. Navigate to the folder contained the tracelog64.exe tool and type: tracelog.exe -stop ISH
 - vi. Upload the following file to AE.

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9 Debug Prerequisites

9.1 Overview

This document describes the standard set of requirements for submitting issues to the Intel® Integrated Sensor Solution (Intel® ISS) Debug team. This facilitates debugging of submitted issues.

The target audience for this document includes OxMs, IHVs, Intel AEs and all those submitting issues to Intel.

9.2 Requirements and Log Requests

9.2.1 Mandatory Information for Sightings

For all newly reported issues, Intel requires the following information:

- **Detailed reproduction steps** - with actual and expected results. It is highly recommended to include supporting information such as screen shots, video and so on.
- **Full SPI flash dump after the failure** - The firmware contains different system configurations, such as ME information and critical logs, as well as Intel® ISS information and PDT.
- **PDT File** - In case full image cannot be provided, for review and faster reproduction.
- **OS version and build number, ISS FW and SW version** – Can be found in syscope log
- **Answers to the following questions:**
 - Can the issue be reproduced on an RVP?
 - Can the issue be reproduced on a simulator? (such as Simics)
 - Any other information that is relevant to the issue

9.2.2 Additional Information Requested

In addition to the above requirements and in order to speed up the debug process, Provide some of the following information as relevant to the case:

- **Intel® ISS FW Log** – Collect trace messages from firmware, it will help us to understand what the FW status is and history on what happened during the reproduction.

Note: Refer to [Section 2.1](#) Retrieving Intel® ISS FW Logs for more information

- **Customer system** - When submitting an issue that is replicated only on customer system, make sure to ship a system to Intel ASAP so the shipping does not delay the debugging process. For shipping information refer to [D Appendix IV Shipping system to Intel](#)
- **System Tools Logs** – Provides simple test to check whether the Intel® ME or Intel® TXE FW are alive. In case no Intel® SST log available, provide ISSUtil logs to put more light on systems status:

**For Intel® ME:**

```
MEInfoWin                                > meinfo.txt
MEInfoWin -fitver                        > fitver.txt
ISSU -BIST -verbose                      > issu.txt
```

For TXE:

```
TXEInfo                                > txeinfo.txt
TXEInfo -fitver                        > fitver.txt
ISSU -BIST -verbose                      > issu.txt
```

- **Customer BIOS** – Clean System BIOS image which never ran on a platform with relevant ISH FW version. BIOS version information and reference code version. It will help reproducing on customer's platform.
- **uDrivers and Algorithms Compiled files** – either *.o or *.a files of the uDrivers and algorithms included in the PDT (if they are not part of Intel's built-in code)
- **System scope log** – Run the System scope tool on the platform and save the log as txt.

For more information, refer to Syscope section in the Intel® Management Engine Compliance and Debug Kit

- **Intel® Trace Hub and Intel® Trace Tool (NPK)** – Closed chassis interface for tracing different platform components including Intel® CSE. For sensor hub bring-up issues, include STT log with CSE messages. For more information, refer to "Intel® Trace Hub and Direct Connect Interface Implementation Guide for Skylake Platform", CDI #548786.
- **Latest schematics, board files, system layout and relevant documentation** – When I2C logs should be extracted from a closed chassis platform, the schematics and layout are necessary to perform the rework. In addition, when a HW issue is suspected those documents are needed for isolating the issue.

9.2.3 Issue Specific Logs (as Applicable)

- **Simics/Emulauncher issues** – The Wind River Simics hardware simulator is included in the Intel® ISS FDK. It can simulate the full target system or only the firmware to create a shared platform for software development. For Simics/Emulauncher issues, include all the Simics logs. These are located at <FDK installation folder>\Tools\Emulauncher and are named as follows:
 - debug-log.txt
 - debug-log-console.txt
 - debug-log-ish-console.txt
- **Calibration and data error Issues** – The following logs need to be provided:
 - **Calibration Tool Logs** – Include all the files which were generated in the calibration tool folder after running calibration flow (before reproducing the issue).
 - **Sensor Records** – For calibration issues or problems with the sensors data include all relevant sensor records, including physical sensor, un-calibrated sensor, and calibrated sensor data of AGM and algorithm data. Do this as follows:
 1. Open the Intel® ISS Sensor Viewer.
 2. Click **Record**.
 3. Select sensors to record and click **Start Recording**.



4. To stop recording, click the red icon, enter a name for the record file, and click **Save**.

A message informs where the record is located. Click **Open Location** to access that folder.

- **SW Issues**

- **For any SW issue** – Include the Windows* Event Log and a screen capture of the device manager, for better understanding of OS status.

- **For Intel® ISS Drivers issues** - Include Intel® ISS trace prints.

- Refer to [Section 2.1](#) for more information.

- **For Blue-Screen errors** - Include the Kernel-Dump file.

- Refer to [Section 2.4](#) for more information.

- **Documentation issues** - For documentation issues, include document name, revision, and document ID. If possible, also include details (page, section, specific issue).

- **Intel® AWS Issues** - The Intel® Automated Workflow Suite is a tool used to perform Intel® ISS compliance testing. For any sighting reported with AWS, include AWS logs and any additional information (such as, do compliance test(s) pass when performed manually or in a different test environment or process). Enable Intel® AWS to include Intel® SST logs with Intel® AWS logs.

Note: Refer to Intel® AWS User Guide in the Intel® PETS release for more information.

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10 Retrieving Logs and Dump Files

10.1 Retrieving Intel® ISS FW Logs

FW logs are better being captured using FTDI (I2C) rather than HECI. Follow the steps below to retrieve ISS FW logs:

1. Modify trace configuration using **Trace Config Tool**:
 - a. Create an xml configuration file. Refer to [Appendix II – XML config file](#) for XML content.
 - b. Run the trace config tool (from the ISS FW kit) with the below command:
TraceConfigTool.exe setconfig <configFile> [volatile]
 - i. Volatile: if volatile, the configuration will not be saved in FW after reset ISS.
 - ii. TraceConfigTool can run and change configuration during the ISSTraceCollector is running, and change configuration meanwhile.
 - iii. ConfigFile = xml file that was created by the user.
 - iv. Configuration fields in the ConfigFile:
 - Trace interfaces: 1 or more from: HECI (bit 0), I2C (bit 1), LPK (bit 2).
 - I2C Bus.
 - I2C Address.
 - Host debug: (0=disable, 1=enable).
 - Trace mode: buffer disable (0), non-cyclic buffered mode (bit 1), cyclic buffered mode (bit 1+bit 2), block thread (bit 4- if msg queue is full, thread calling syslog() is blocked until queue can accept trace msg).
 - Buffer size: for buffered mode, by KB.
 - Lowest priority: 0=emergency, 1=alert, 2=critical, 3=error, 4=warning, 5=notice, 6=info, 7=debug.
 - Components Filter Mask: components to get traces from. Components xml file generated with the FW. 16 major components, that each one contains 16 sub components.



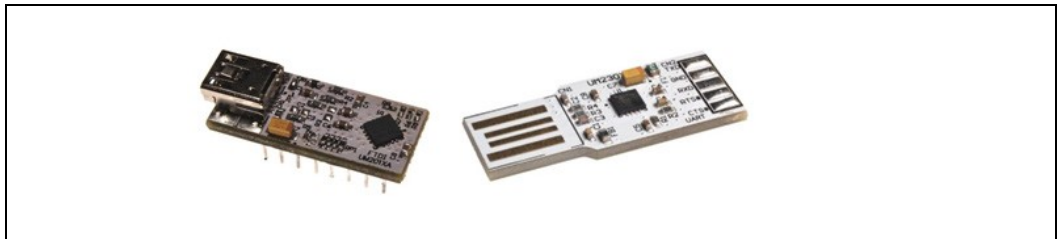
2. Collect logs with one of the below methods:
 - c. Collecting logs through FTDI (I2C) – Refer to below section
 - d. Collecting logs through HECI (using ISSTraceCollector tool from ISS kit) :
 - i. To be used on the system itself, able to retrieve information starting kernel phase only when buffer mode is disabled
 - Better to have buffer mode enabled in order to capture logs during boot time.
 - ii. ISH driver is required to be up and running for retrieving messages
 - iii. Run the following command "ISSTraceCollector.exe HECI continues TraceCatalog.xml TraceComponents.xml log.txt"
 - TraceCatalog.xml and TraceComponents.xml files should be found in the ISS kit

10.2 Collecting Logs through FTDI

Connecting FTDI:

1. Download and install the [FTDI driver](#) on console.
2. Connect the FTDI to the platform. Use either the UMFT201XA or UMFT201XB.

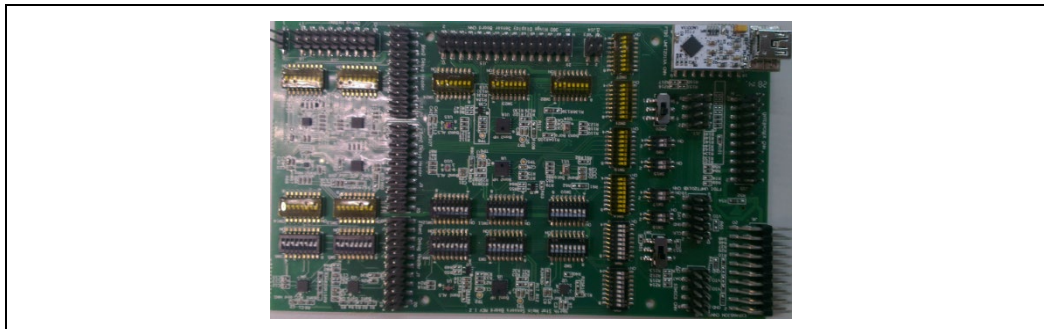
Figure 10-1: FTDI UMFT201XA vs UMFT201XB



The connection uses three wires (SDA, SCL and GRD) from the platform to the FTDI. This can be done manually or by dedicated connectors.

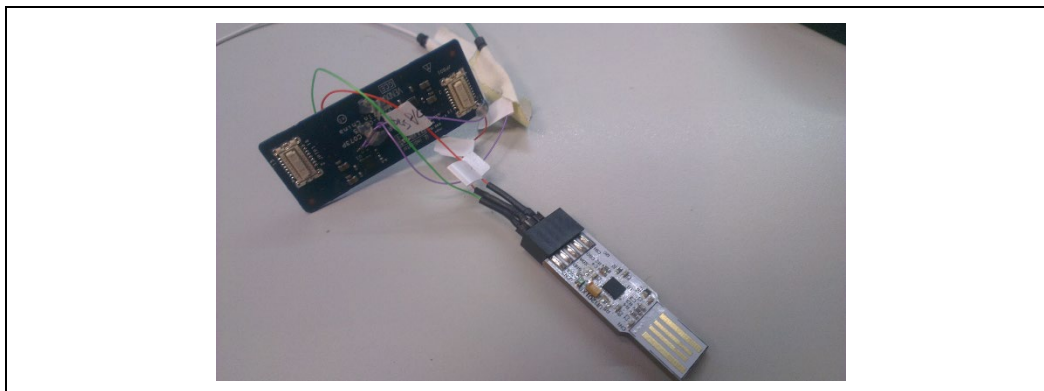
The following figure shows a connection via NS.

Figure 10-2: FTDI on NS



The following figure shows a manual connection.

Figure 10-3: FTDI Connected via Wires



3. Configure the FTDI (Refer to [Appendix III – FTDI configuration](#) for instructions.)
4. Run "ISSTraceCollector.exe I2C_COM <FTDI COM PORT #> TraceCatalog.xml TraceComponent.xml log.txt"
- < FTDI COM PORT # > is the FTDI port # which was determined in the previous bullet

10.3 Retrieving Intel® ISS Driver Logs

This procedure describes how to enable the logging mechanism to collect Intel® ISS driver logs.

1. Enable Intel® ISS logging in the Windows* registry as follows:
 - a. Create a new **Text file**, **Edit**, and **Copy** into the file the and contents refer to [Appendix I - Windows Registry Integrated Sensor Solution Logging](#).
 - b. **Save** the file with a .reg suffix
 - c. Run the file with **Administrator Privileges**.
 - d. **Restart** the system
2. Run the flow.
3. During reproduction, hold the Ctrl key and press the Scroll lock twice to initiate a BSOD



4. **Restart** the system and find the dump file
5. Create an etl file from the dump that was created (optional but can reduce download time, hence it is recommended)
 - a. Open the dump file using Windbg
 - b. Type in the command line:
`!wmitrace.logsave ISH c:\logs\badFlow.etl`
6. Upload the etl / dump file , together with the exact versions of the bus, HECI - ISH and miniport driver to the HSD
7. Verify the driver version as follows:
 - a. Open the Windows* Device Manager.
 - b. Click View→ Devices by Connection.
 - c. Double click all of the following:
 - i. Intel® Integrated Sensor Solution
 - ii. Integrated Sensor Solution Dynamic Bus Enumerator
 - iii. HID PCI Minidriver for Integrated Sensor Solution
 - iv. Advanced sensor collection
 - v. Advanced sensor collection V2
 - d. View the driver version in the Driver tab for each of the above items.

Note: In case BSOD is not functioning and flow does not include power transactions, collect SW logs manually:

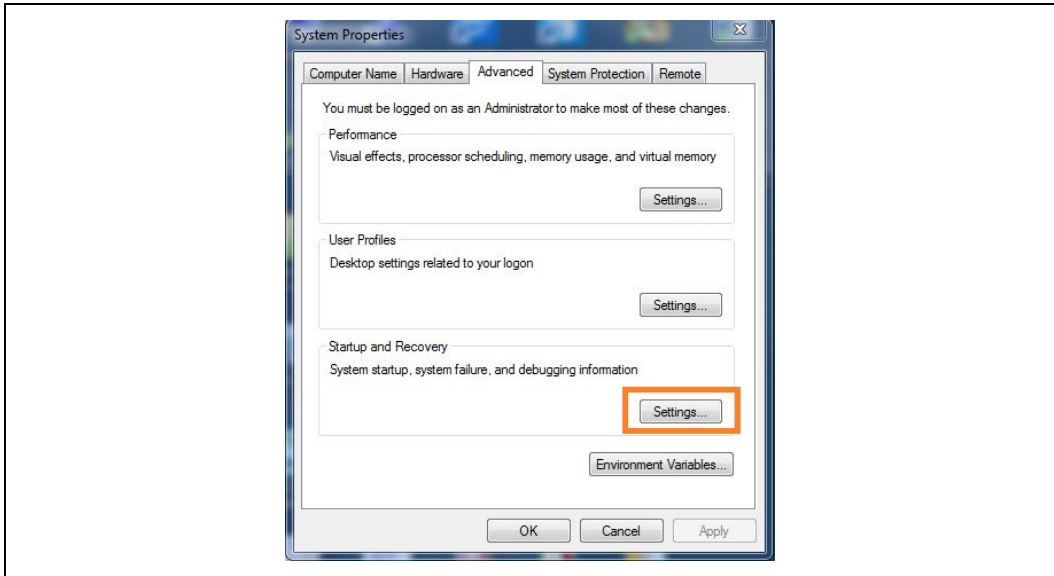
8. Save the Intel® ISS drivers log in a file as follows:
 - a. Create a new **Text file**, **Edit**, and **Copy** into this file the contents of [Appendix I - Windows Registry Integrated Sensor Solution Logging](#).
 - b. **Save** the file with a .reg suffix
 - c. Run the file with **Administrator Privileges**.
 - d. **Restart** the system
 - e. Obtain the Tracelog tool from [WDK](#).
 - f. Open a command prompt with administrator privileges.
 - g. The logging process has been running since driver startup. To stop it, type: **tracelog.exe -stop ISH**. A log file is created and saved in %SystemRoot%\System32\LogFiles\WMI\ISH.etl where %SystemRoot% is the folder where system32 folder is located (usually C:\Windows).

10.4 Locating Windows Dump File

1. Right-click Computer, select **Properties**, and click **Advanced System Settings**.
2. In **Startup and Recovery**, click **Settings**.

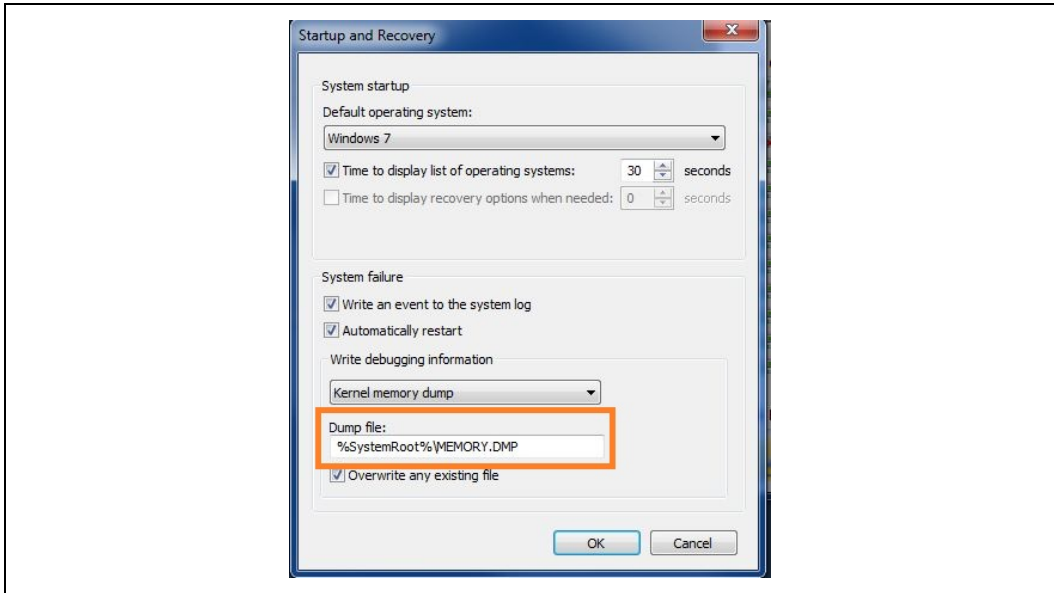


Figure 10-4: Startup and Recovery



3. Note the location of the Dump file as displayed in the **Dump File** field.

Figure 10-5: Dump File Location



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11 Reference Documents

Document or Tool	Location
Intel® Management Engine Compliance and Debug Kit (includes Intel® PETS)	VIP
Intel® System Scope Tool (Intel® SST)	VIP Being posted with Intel® ME Compliance and Debug Kit and as a separate kit
Sky Lake U and Y Platform Design Guide	(# 543016) Chapter 31.3.2 – “Sensors Debug Hooks” Chapter 44 – “Platform Debug and Test Hooks”
Kaby Lake Platform Design Guide	(#561150) Chapter 30.3.2 – “Sensors Debug Hooks” Chapter 43 – “Platform Debug and Test Hooks”
Broxton Platform Design Guide	#(551546) Chapter 7.6.2 – “Sensors Debug Hooks”
Apollo Lake and Gemini Lake Platforms Intel Integrated Sensor Solution Design Guide	(# 557503) Chapter 3.2 – “Sensors Debug Hooks”
Cherry Trail T3 Platform Design Guide	(# 540558) Chapter 6.3 – “SoC Debug Port (XDP) Design Guidelines”
Intel® Trace Hub and Direct Connect Interface Implementation Guide for Sky Lake Platform	(# 548786)



12 ISH Components FW Update

After CNL, ISH partial update is supported.

The document is created to define the flow of ISH FW/PDT update through ME BIOS.

12.1 Update ISH FW in the Field Flow

Calling FwUpdatePartialBuffer() API via FWUpdateLib to update ISH.

For more details, refer to system tool guide from Intel® ME kit.

12.2 Update PDT in the Field Flow (RS Only)

PDT is protected when ME is locked, the PDT UNLOCK is needed. It is one time effective.

Here are the steps to implement PDT image update in BIOS code:

- Enabling HECI interface in BIOS code.

Note: For more details, refer to CH3.4.7 of Sending Receiving Intel® Management Engine Interface (Intel® MEI) Messages from ME BIOS specification.

Platform	Document ID
CML	608436
CNL/WHL/CFL	572579
ICL	574509
TGL	612229

- Sending PDT_UNLOCK command (MKHI messages) before End-Of-Post.

For more details, refer to CH25.6 PDT Unlock Data Message from Platform PCH BIOS specification.

Platform	Document ID
CNL/CML-H	570374
ICL	574625
TGL	613495

- Entering EFI shell without configuration reset if needed.
- Calling FwuSetIshConfig() API via FWUpdateLib to update PDT image.

For more details, refer to system tool guide from ME kit. For this step, ME mode cannot be in normal mode and be not after End-Of-Post.



Note: In development stage, customers could run the following commands to validate quickly. However, be aware that FWUpdate.efi is not validated. Suggested that customers port reference code into BIOS.

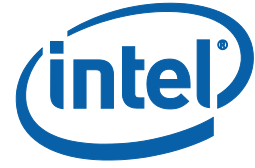
ISH FW:

- a. FWupdate – FWUpdLcl.efi -F <image.bin> -PARTID ISHC
- b. FWUpdate(RS version) - fwupdate.efi -i <image.bin>

ISH PDT:

- a. FWUpdate(RS version) - fwupdate.efi /d <image.bin>

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Appendix A Windows* Registry Integrated Sensor Solution Logging

Windows* Registry Editor Version 5.00

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\WMI\AutoLogger\ISH]
"Start"=dword:00000001
"Guid"="{A5371B2E-0B01-45F5-81B5-EFBC009B117C}"
"FlushTimer"=dword:00000001
"Status"=dword:00000000
"LogFileMode"=dword:00008400
"ClockType"=dword:00000001
"BufferSize"=dword:00000400
"MinimumBuffers"=dword:00000040
"MaxFileSize"=dword:00000002
"MaximumBuffers"=dword:00000040
```

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\WMI\AutoLogger\ISH\{2432b9fb-2987-4602-af88-b237175db491}]
"Enabled"=dword:00000001
"EnableFlags"=dword:ffffff
"EnableLevel"=dword:00000005
"LoggerName"="ISH"
"Status"=dword:00000000
```

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\WMI\AutoLogger\ISH\{739119E6-5336-4582-880D-041989565D5F}]
"Enabled"=dword:00000001
"EnableFlags"=dword:ffffff
"EnableLevel"=dword:00000005
"LoggerName"="ISH"
"Status"=dword:00000000
```

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\WMI\AutoLogger\ISH\{D23A0C5A-D307-4f0e-AE8E-E2A355AD5DAC}]
"Enabled"=dword:00000001
"EnableFlags"=dword:ffffff
"EnableLevel"=dword:00000005
"LoggerName"="ISH"
"Status"=dword:00000000
```

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\WMI\Autologger\ISH\{06C6C767-2179-40E1-8D39-9CD55AC6ABF8}]
"Enabled"=dword:00000001
"EnableFlags"=dword:ffffff
"EnableLevel"=dword:00000005
"LoggerName"="ISH"
"Status"=dword:00000000
```



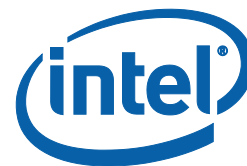
```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\WMI\Autologger\
ISH\{3804C675-7658-4B7E-AD5A-86E21631B7CD}]
"Enabled"=dword:00000001
"EnableFlags"=dword:ffffffff
"EnableLevel"=dword:00000005
"LoggerName"="ISH"
"Status"=dword:00000000
```

```
[HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows
NT\CurrentVersion\WUDF]
"LogEnable"=dword:00000001
"LogKd"=dword:00000001
```

```
[HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\i8042prt\Param
eters]
"CrashOnCtrlScroll"=dword:00000001
```

```
[HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\kbdhid\Paramet
ers]
"CrashOnCtrlScroll"=dword:00000001
```

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Appendix B XML config File

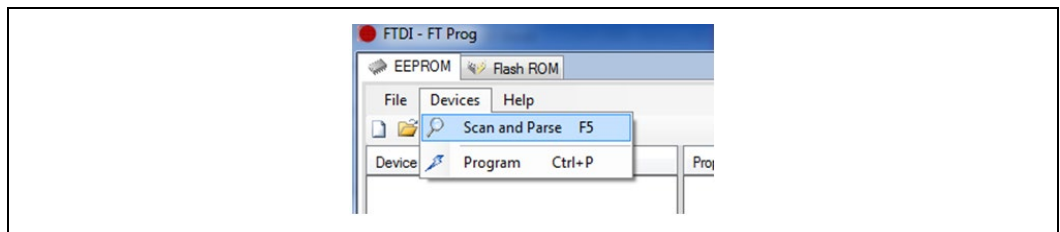
```
<?xml version="1.0" encoding="UTF-8"?>  
  
<myConfiguration>  
    <TraceInterfacesMask>1</TraceInterfacesMask>  
    <TraceModeMask>0</TraceModeMask>  
    <BufferSize>0</BufferSize>  
    <I2CBUS>0</I2CBUS>  
    <I2CAddress>0x5e</I2CAddress>  
    <HostDebugEnabled>0</HostDebugEnabled>  
    <LowestPriority>6</LowestPriority>  
    <CompFilterMask>ffff01ff00000000000000000000000000000000000000000000  
000000000000</CompFilterMask>  
</myConfiguration>
```

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Appendix C FTDI Configuration

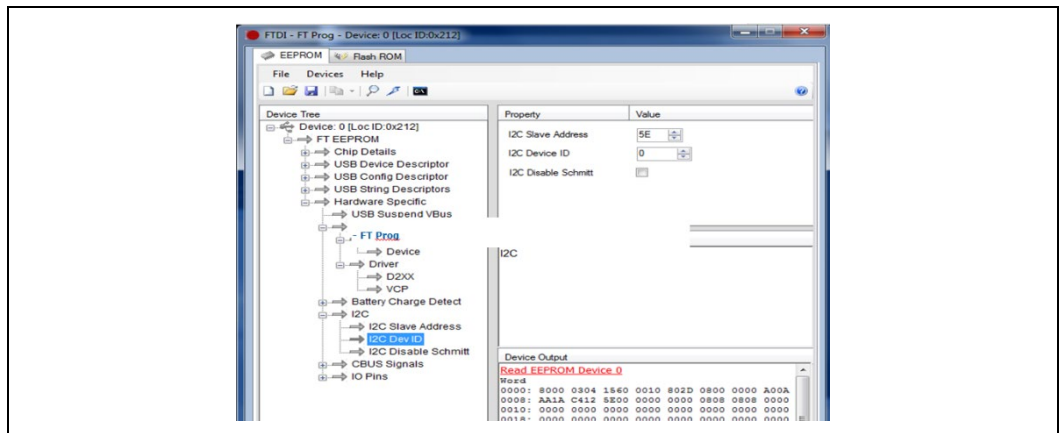
1. Download the FTDI software [FT_prog](#) to configure FTDI with FT PROG.
2. Configure the FTDI connector (this only needs to be done once):
3. From EEPROM -> Devices, click **Scan and Parse**. It may take a while until the device is exposed.

Figure 11-1: FT Prog Scan and Parse



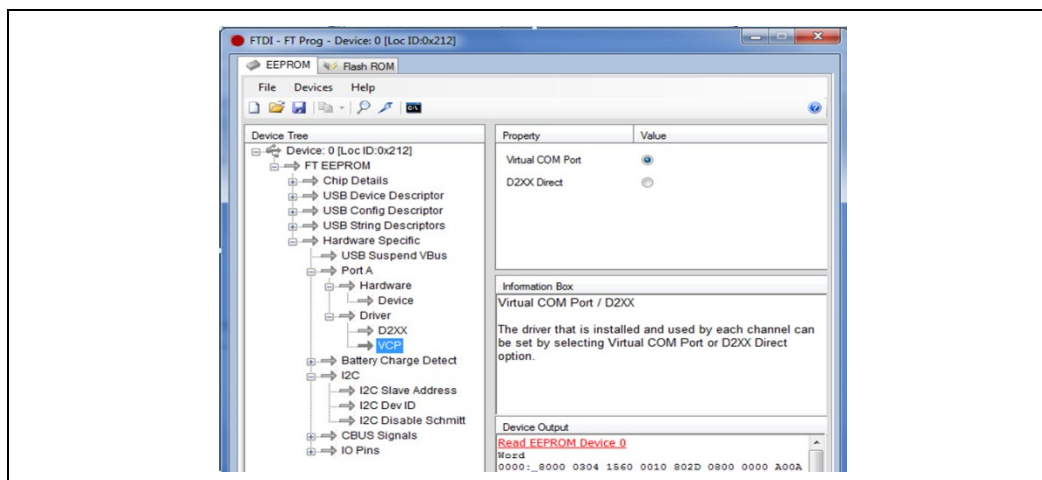
In Hardware Specific > I2C > I2C Dev ID, make sure the I2C Slave Address is set to 0x5E.

Figure 11-2: FT Prog I2C Configuration



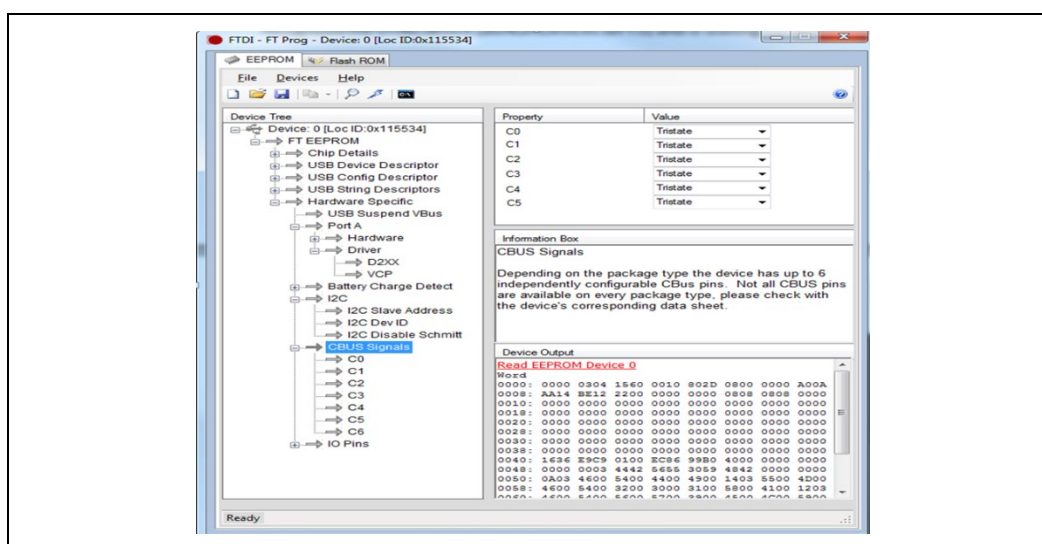
4. In Hardware Specific > Port A > Driver > VCP verify that Virtual COM Port is selected.

Figure 11-3: FT Prog Virtual COM Port



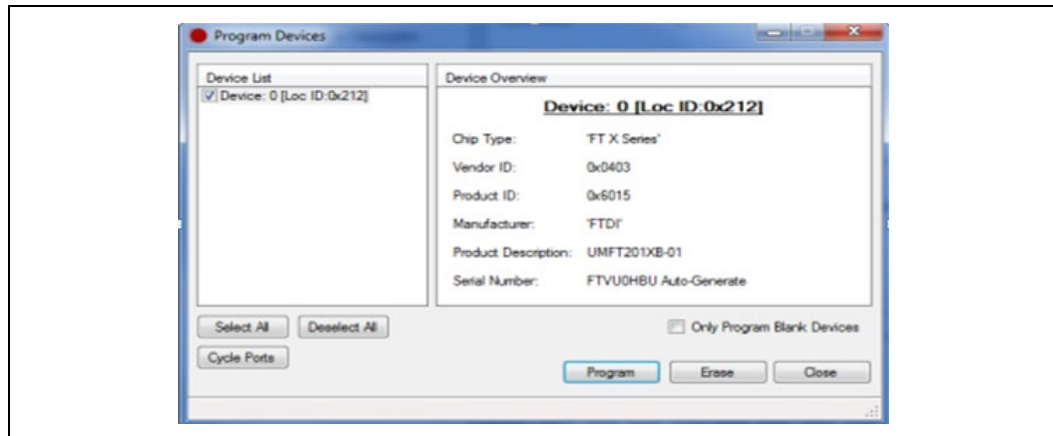
5. In Hardware Specific > CBUS Signals, change all the signals to Tristate.

Figure 11-4: FT Prog CBUS Signals



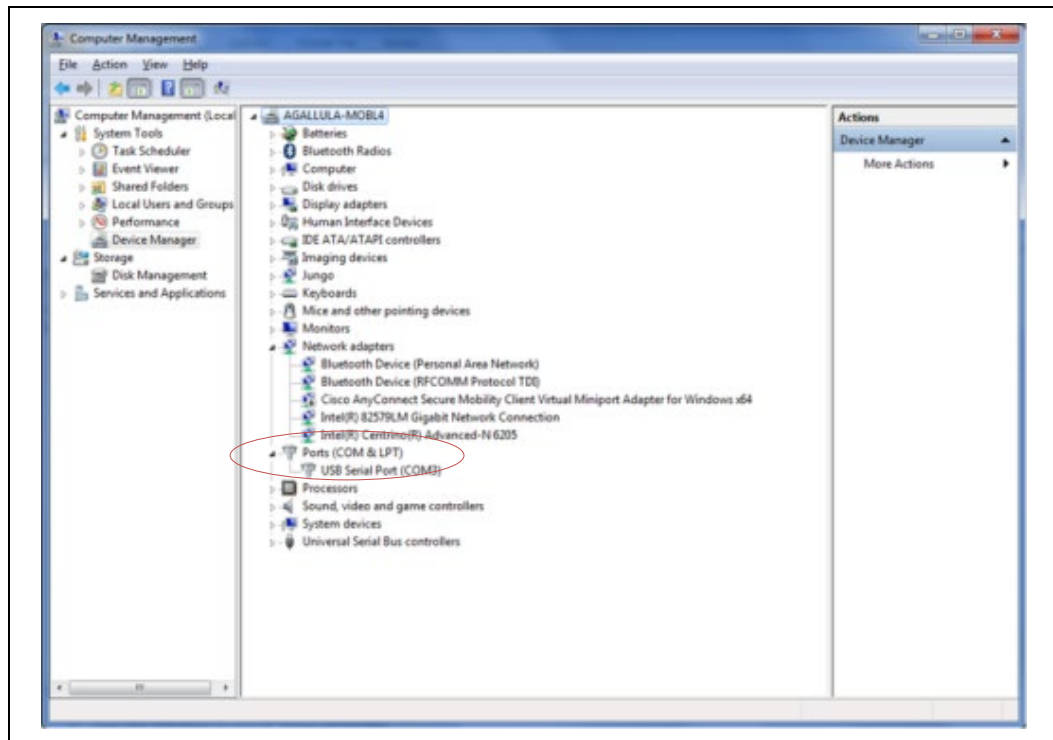
6. Program the device under Devices > Program and click **Program**.

Figure 11-5: FT Prog Program Devices



7. Find the FTDI COM PORT # under Computer > Manage > Device Manager > Ports > USB Serial Port (in the following example, the COM number is 3).

Figure 11-6: FTDI COM Port



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Appendix D Shipping System to Intel

When sending a system to Intel, ensure the following information is available:

Pre-shipping form – Ensure to fill the pre shipping form (Refer below) and send it to the system receiver (recommended before shipping) to speed up the delivery.

NOTES:

1. If there is no wireless card, there should be a written declaration with the confirmation. Note that this is preferred method to send platforms to Israel.
2. In case there is a wireless card included, the card's details must be shared as well in the pre-shipping form.
3. Note that a system will be released from Israel customs minimum 10 business days after sharing this information.
4. For more information, contact customer enablement.

Rework – Ensure to solder relevant connectors if they have foot print, or to put the relevant reworks if they do not have:

- **JTAG Connector Reworks** – For source code debugging and HW register reading, refer to Debug Port Design Guide to design and rework PCH XDP 60-pin or CMC port. For more details, refer to Skylake U and Y Platform Design Guide ([#543016](#)), chapter 44 – “Platform Debug and Test Hooks” or Cherry Trail T3 Platform Design Guide ([#540558](#)), chapter 6.3 – “SoC Debug Port (XDP) Design Guidelines”.
- Intel® ISS Debug Connector Rework – for connecting to the ISH I2C buses and ISH GPIOs, refer to debug connector and rework I2C buses (0 and 1), VIO and relevant GPIOs. For more details, refer to Platform Design Guide.
- SPI socket – This is very helpful during debugging, as well as for recovering a system.



Pre Shipping Form			
Category	Question	Answer	Notes
General	Who is the end recipient of the platform (make sure to add him in the CC)		
	Platform type (Exempl, Skylake)		
	Code name of the platform (Model)		
	Battery Working Hours – if more than 40 WH it should be shipped separately)		
Wi-Fi	Model name		
	Brand name		
	Bands		
	SKU		
Bluetooth	Model name		
	Brand name		
	Bands		
	SKU		
CPU/PCH	CPU Step		
	PCH Step		
	QDF		
	Production /Pre-Production		
Shipping	Including which Shipping Method used (Intel shipping, FedEx, DHL)		
	Send the Shipping memo number and tracking number if available		
	Is this shipment above \$1000? if yes include commercial invoice (Israel only)		

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