Using I2C and SPI bus in Linux

Revision History

Revision	Date	Author	Changes
1.0	14h Jun 2016	G.G	First release
1.1	08h Dec 2016	M.M.	Add Apollo Lake support

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1. Introduction

The following guide is about the preliminary operations for enabling and testing I2C ad SPI interfaces.

This guide refers to the following Linux distribution:

- **Ubuntu 16.04** (tested with Bay Trail and Apollo Lake boards)

- **Ubuntu 17.10** (tested with Apollo Lake boards only)

This guide comes with two folders containing respectively the sources for the SPI module (spi-module) and the sources for the SPI tools for testing that peripheral (spi-tools)

2. BIOS Upgrade

The first step is upgrading the BIOS to the latest version available.

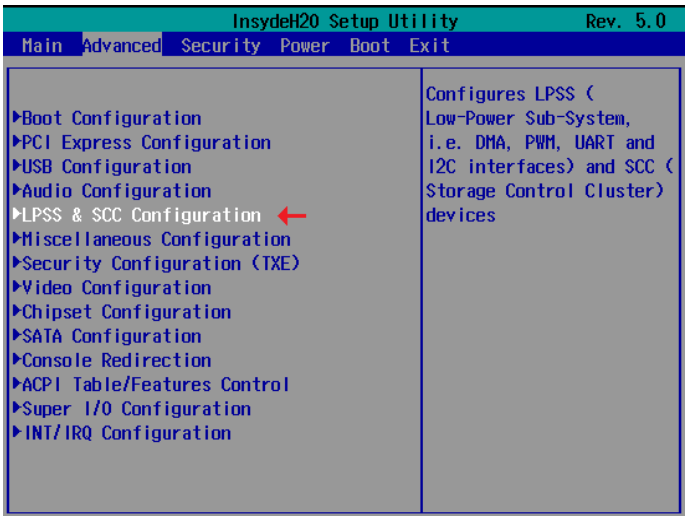
The latest BIOS release and the corresponding update tools can be downloaded from the Seco website www.seco.com on the product page of the board.

Please follow the instructions enclosed in the BIOS updater package for flashing the system EEPROM

3. BIOS Configuration

Bay Trail boards:

Power on the system and press the “Esc” key for enter in the BIOS menu and then enter in the BIOS Setup Utility.
Move to the “Advanced” section ad select **LPSS & SCC Configuration**



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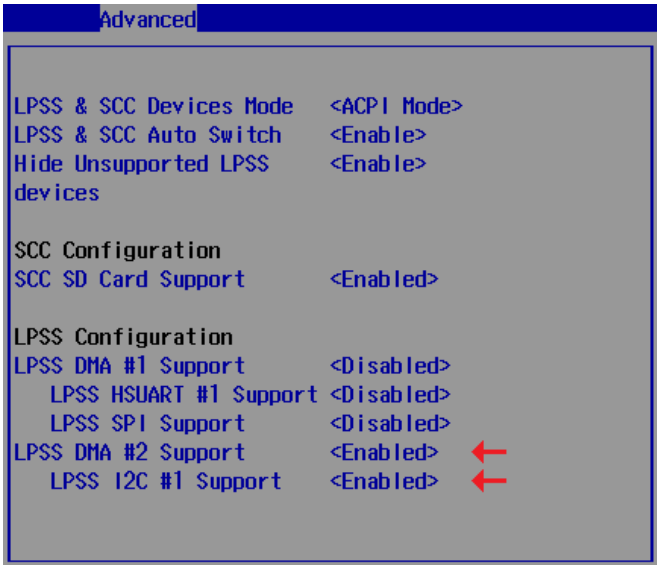
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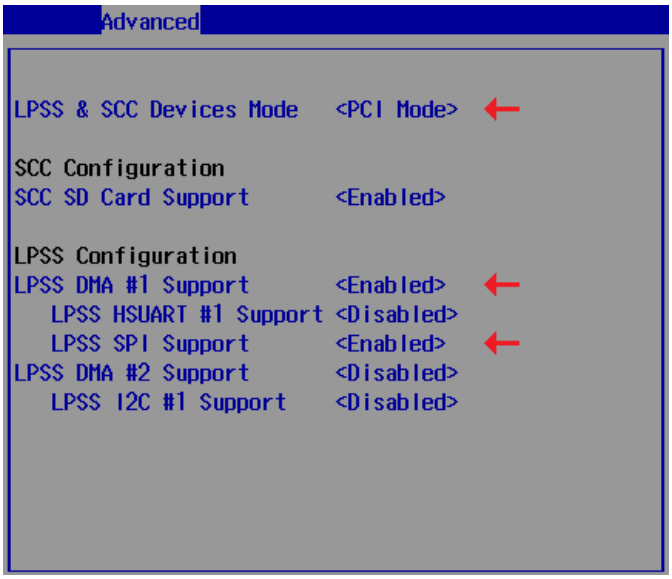
For enabling I2C:

- **LPSS DMA #2Support → Enabled**
- **LPSS I2CSupport → Enabled**



For enabling SPI:

- **LPSS & SCC Devices Mode → PCI Mode**
- **LPSS DMA #1Support → Enabled**
- **LPSS SPISupport → Enabled**



Apollo Lake boards:

Power on the system and press the “Esc” key for enter in the BIOS menu and then enter in the BIOS Setup Utility.

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Verify that:

I2C #0, I2C #2, SPI #0

items on **Chipste\South Cluster Configuration\LPSS Configuration** are set on **ACPI Mode** or **PCI Mode**.

4. Ubuntu preliminary operations

The I2C module is automatically loaded and no further operations are needed

The SPI module must be manually compiled and started
Enter in the SPI module folder (**spi-module**) and compile it
sudo make
Now load the module
sudo insmod low-speed-spidev.ko

NOTE: the SPI module must be loaded manually every time the system is started

5. I2C Testing

I2C can be tested using i2c-tools, downloadable from the repository
sudo apt-get install i2c-tools

This tool allows the following operations for testing the I2C interface

Scan for installed busses
i2cdetect -l

Check for devices connected to an I2C bus
sudo i2cdetect -y -r <BUSNUMBER>

Read data
sudo i2cget -y <BUSNUMBER> <CHIP_ADDR> [<DATA_ADDR> <ACCESS_MODE>]

Write data
sudo i2cset -y <BUSNUMBER> <CHIP_ADDR> <DATA_ADDR> <VALUE> [<ACCESS_MODE>]

Example:
i2cdetect -l return that the i2c bus is the number 8
i2cdetect -y -r 8 returns that in that bus a device with address 0×27 is connected
Is possible to access to that device for reading 1 byte of data starting by address 0
sudo i2cget -y 8 0×27 0 b
Is also possible to access to that device for writing a word of data at address 4
sudo i2cset -y 8 0×27 4 w

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6. SPI Testing

SPI can be tested using spi tools

Enter in the **spi-tools** folder, compile and install
sudo autoreconf -fim
sudo ./configure
sudo make
sudo make install

This tool allows the following operations for testing the SPI interface

Send data to SPI link
command_1 | spi-pipe -d /dev/spidev0.0

Read data from SPI link
spi-pipe -d /dev/spidev0.0 < /dev/zero | command_2

Send and receive data simultaneously
command_1 | spi-pipe -d /dev/spidev0.0 | command_2

NOTE: command_1 could be anything that generate data to be sent by SPI, while command_2 could be anything for processing data received from SPI

Example: loopback transmission
A simple test can be done connecting the SPI interface in loopback (MISO pin connected to MOSI pin)
Create with a hex editor a simple binary file and use this command for sending and receiving data simultaneously (must be root)
hexdump data.bin | spi-pipe -d /dev/spidev0.0

The test is passed if the content of the binary file is printed in the linux terminal

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