WINC1500 Internet of Things Sensor Demo using SAM D21 Xplained Pro

Prerequisites

- **Hardware Prerequisites**
    - Atmel SAMD21 Xplained Pro Evaluation Kit
    - Atmel WINC1500 extension
    - Atmel IO1 extension
    - Atmel Qtouch mutual capacitance extension
    - USB Micro Cable (TypeA / MicroB)
    - Android device with OS version 4.3 or higher

- **Software Prerequisites**
    - Atmel Studio 6.2
    - Atmel Software Framework 3.25 (minimum)

Introduction

This document will explain how to use and program the Internet Of Things (IoT) sensor demo for the WINC1500 Wi-Fi module.

The following sensor demo will be described:

- Temperature sensor using IO1 extension.
- Qtouch sensor using Qtouch mutual capacitance extension.

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Icon Key Identifiers

Icons are used to identify different assignment sections and reduce complexity. These icons are:

INFO   Delivers contextual information about a specific topic

TIPS   Highlights useful tips and techniques

TO DO   Highlights objectives to be completed

RESULT   Highlights the expected result of an assignment step

WARNING   Indicates important information

EXECUTE   Highlights actions to be executed out of the target when necessary

1.   IoT Sensor Application

1.1   Overview

The purpose of this demo is to connect various kind of sensors to your home network using a Wi-Fi access point and remotely access the sensors information via an Android device.
A sensor typically implements a basic discovery system where UDP broadcast frames are sent each second to advertise the sensor presence on the network. The Android App can then detect such packet and communicate with the sensor to receive the sensor data stream.

This document will cover the following sensor:

- Temperature sensor from ASF project "WINC1500 IoT Temperature Sensor Demo"
- Qtouch sensor from ASF project "WINC1500 IoT Qtouch Sensor Demo"

These are implemented in a very similar way and also use a similar communication protocol with the Android application. Both can work at the same time and report sensor information to the same "Atmel IoT Sensor" Android application.

1.2   Install Atmel IoT Sensor Android Application

To Install the Atmel IoT Sensor APK located in the android_app folder of your ASF project just proceed as following:

- Connect your Android device to your Windows laptop
- Open the start menu and double click on "Computer"
- Your phone should be listed under the "Portable Devices" list
- Open, then browse the existing folders
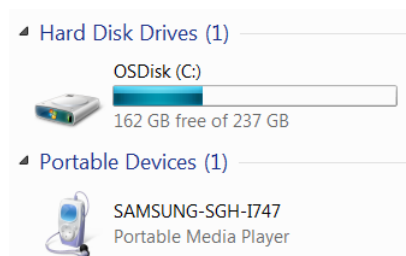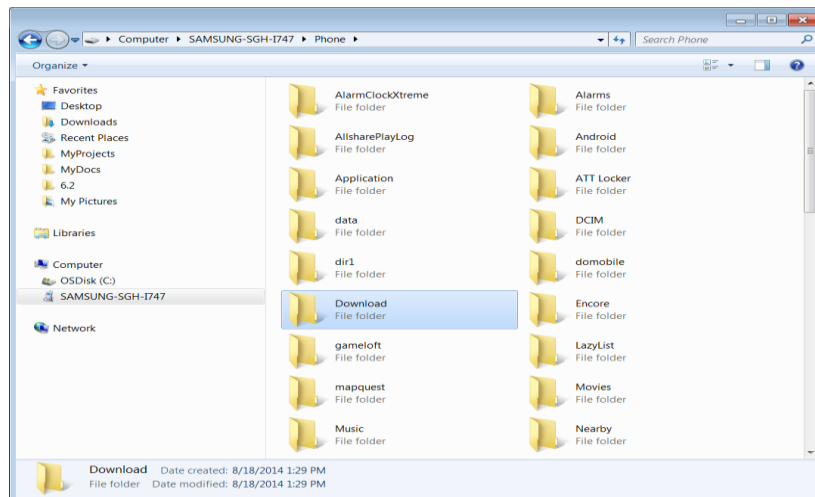
- Locate the "Download" folder, then simply drag and drop the provided "Atmel_IOT_Sensor_v2.10.18.apk" application
- Go to your Android phone settings and allow unknown application sources
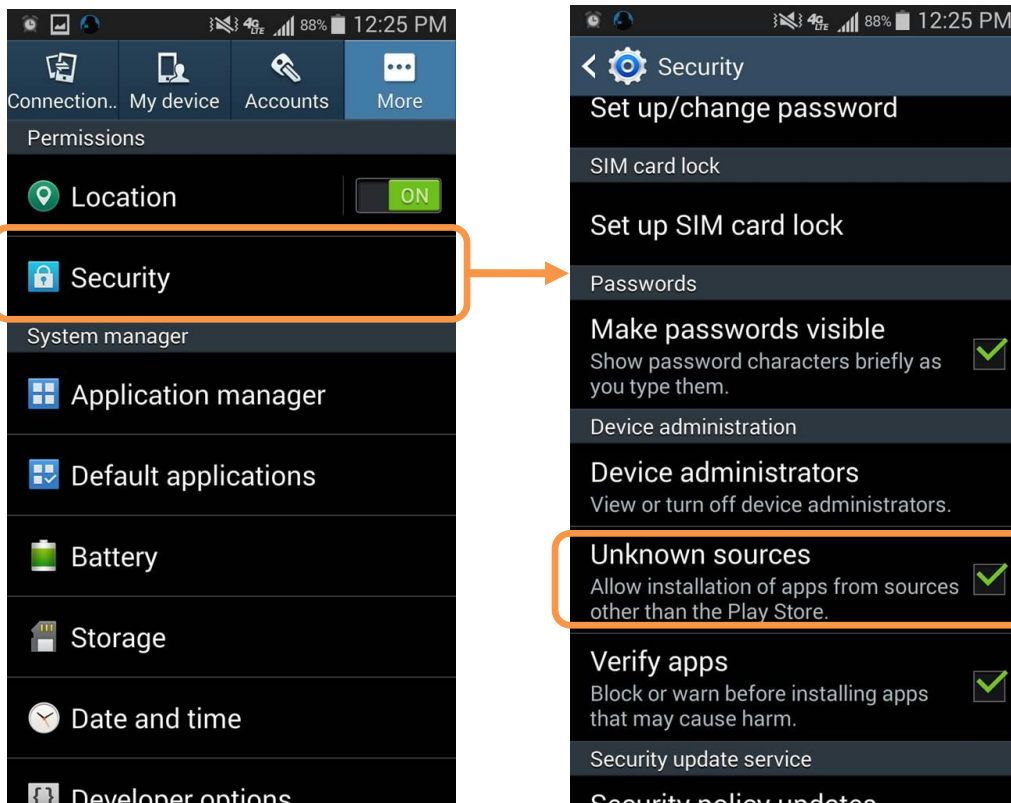

⚠ WARNING   It might be necessary to uncheck the "Verify apps" option if the application installation process stalls.

- Open your favorite file browser like "MyFiles" (available on Google market for free)
- Go to your "Downloads" folder
- Click on the Atmel IoT Sensor Application file (apk)
- Press the "Install" button
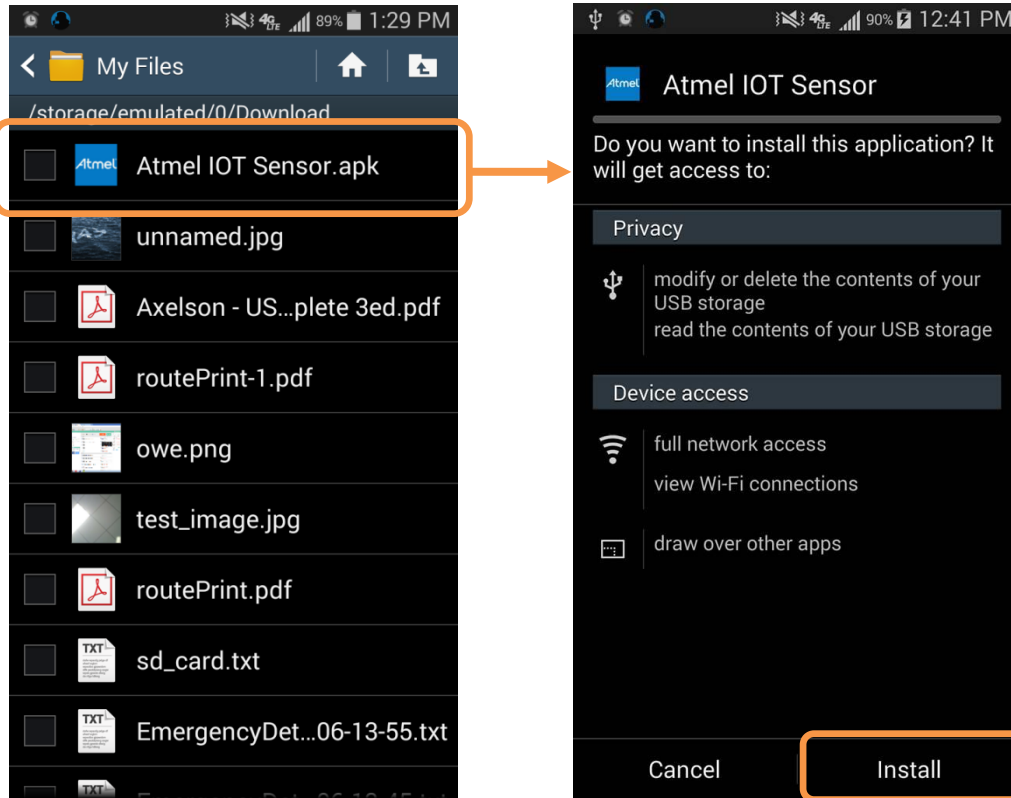
1.3   Setup your hardware

For temperature sensor, connect the WINC1500 Wi-Fi module on EXT1 and Atmel IO1 sensor on EXT2 as shown in the picture:
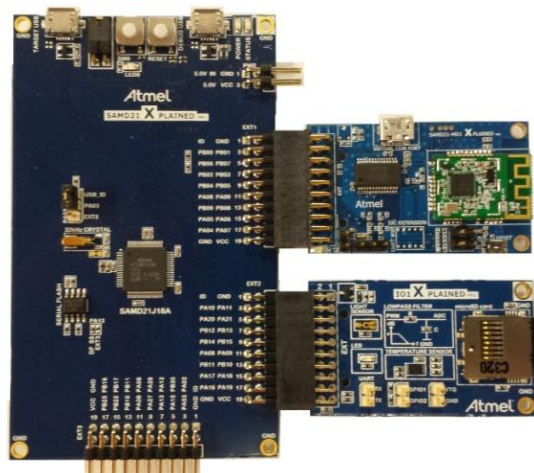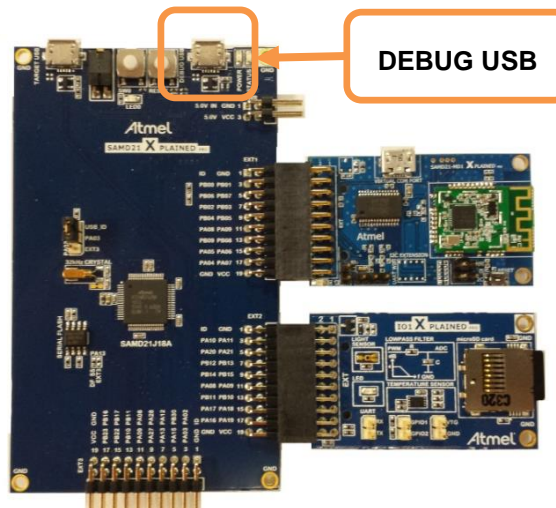
For Qtouch sensor, connect the WINC1500 Wi-Fi module on EXT3 and Qtouch mutual capacitance on EXT1 and EXT2.

1.4 Update WINC1500 firmware

- Using the *"New Example Project from ASF..."* menu in Atmel Studio, search for the "WINC1500 Firmware Update Project" and open the project

- Open the src folder of the firmware update project using Windows Explorer and locate file "samd21_xplained_pro_firmware_update.bat"
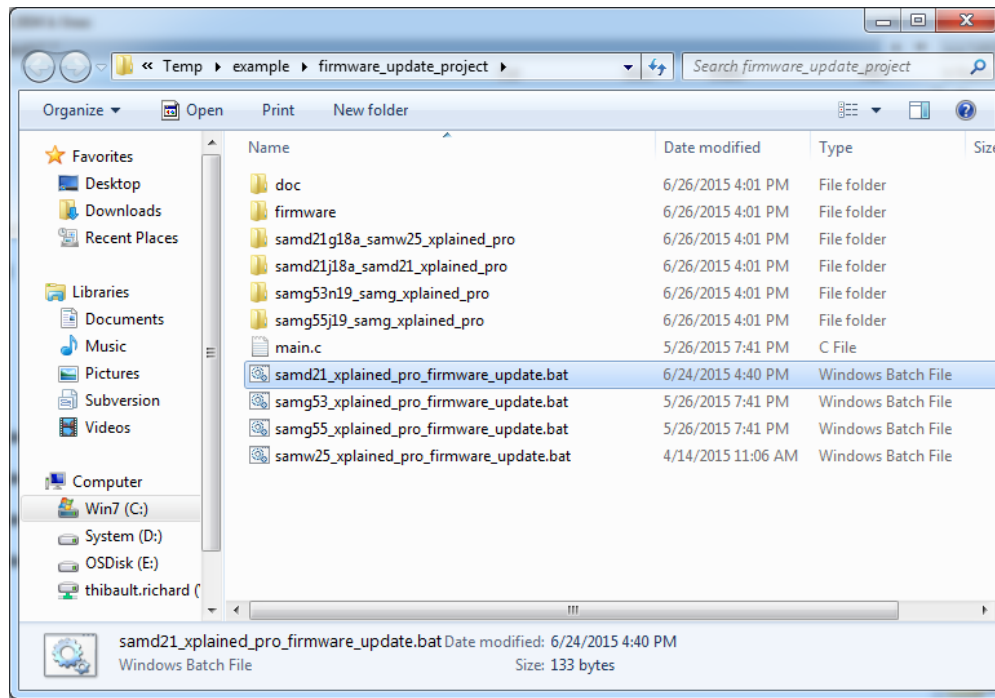
- Connect the SAMD21 debug USB to your PC with a USB cable:

DEBUG USB

- Run "samd21_xplained_pro_firmware_update.bat " script and wait for the update completion
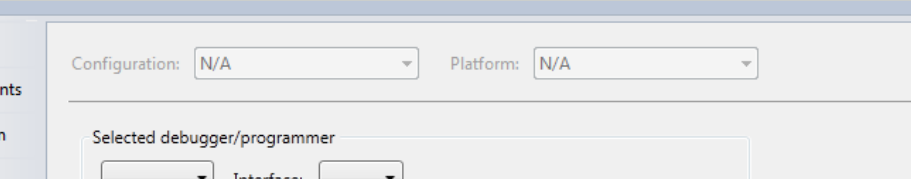
1.5   Program your SAMD21 Xplained Pro

- Connect the SAM D21 Xplained Pro board to your PC using DEBUG USB connector.
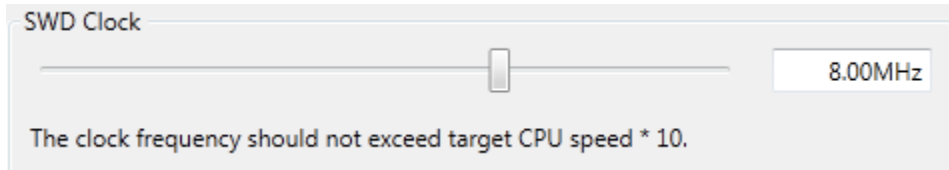- Program the application that was created as an example, as per section 2.2 by clicking on the Start Debugging and Break icon:

- You will be asked to select your debug tool:

- Select EDBG and SWD (Serial Wire Debug) as Interface:
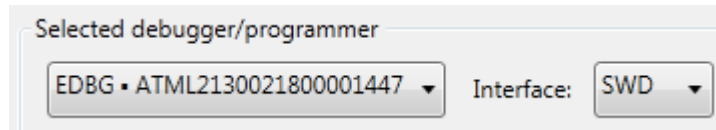
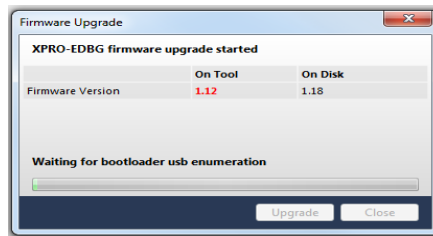- Set SWD clock to 8 MHz to speed up programming:

- Click again on the Start Debugging and Break icon:

- The application will be programmed in the SAM D21 embedded flash and breaks at main function. Click on Continue to execute the application:

 **INFO**   You may be asked to upgrade your EDBG firmware. If so, click on Upgrade:


 WARNING   Upgrade operation may take a few minutes, please <u>wait</u> for the operation to complete.

1.6 Connect to your Access Point

After programming your board with demo application, they should boot up in Access Point (AP) mode and be listed on any Wi-Fi capable device as a Wi-Fi network with the same name as defined in the `DEMO_WLAN_AP_NAME` macro in demo.h file. Default value is "WINC1500_MyAP" for temperature sensor demo and "WINC1500_TOUCH_MyAP" for qtouch sensor demo. Simply connect to your WINC1500 module Access Point from any device to provision your sensor so it can connect to your home network.
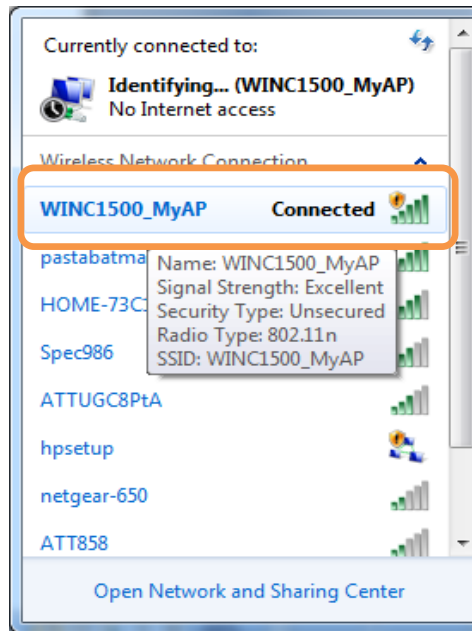

Once connected, just open your favorite web browser at the following address atmelconfig.com (as defined in the `DEMO_WLAN_AP_DOMAIN_NAME` macro) and provide the required Network name and Passphrase of the wireless access point to connect to. Device name is optional. Hit connect to finish.
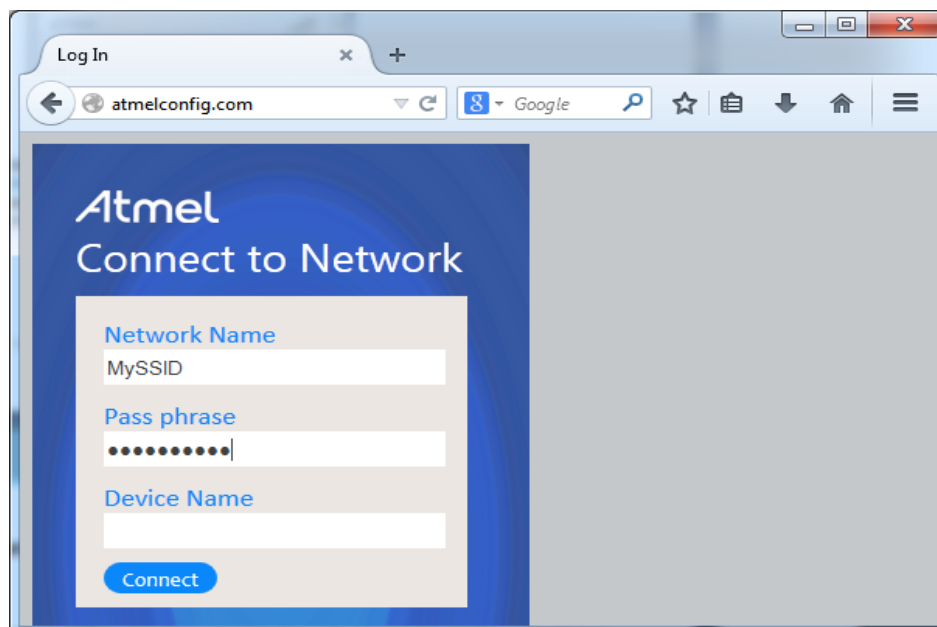
1.7   Run Atmel Iot Sensor Application

Once your sensor Wi-Fi module is provisioned, you should connect your Android device to the same Access Point and open the Atmel IoT Sensor Application. If all the above steps go well, you should see your sensor listed on the Android application's main screen as shown below:
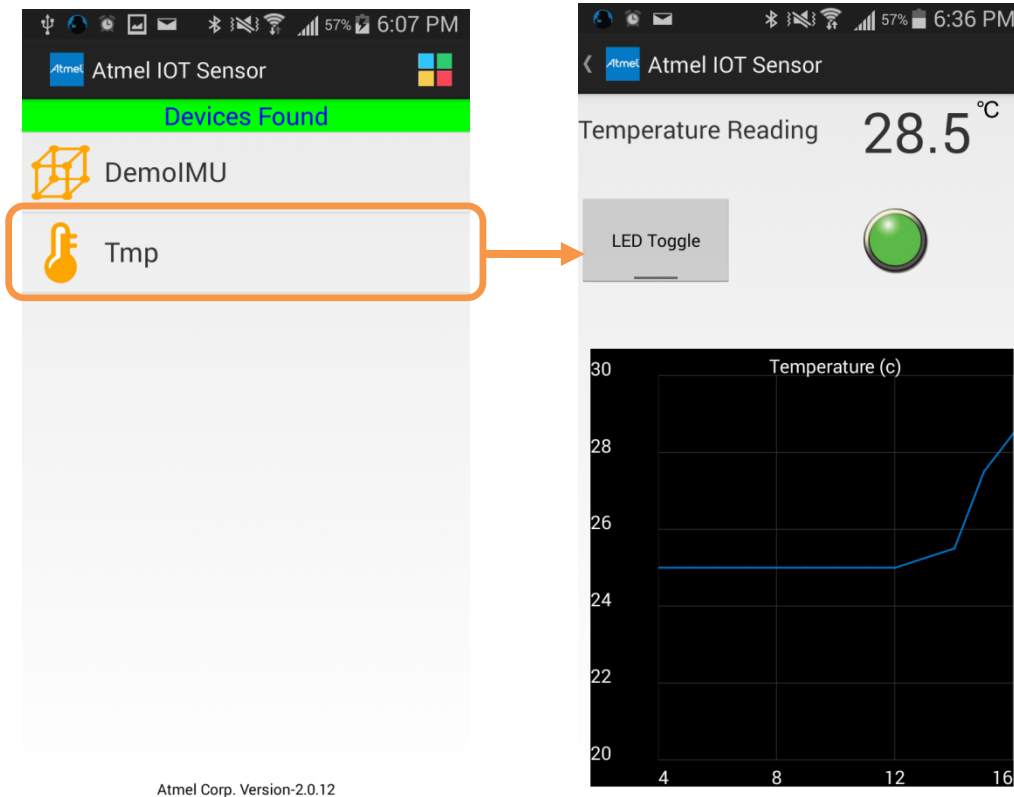
By tapping on the sensor's name, you should be able to access the real time data flow. In the case of a temperature sensor, you can see the real time temperature data in the graph. An "LED Toggle" button can be used to toggle the LED status. A green or red light next to the "LED Toggle" button also give the current status of the LED.
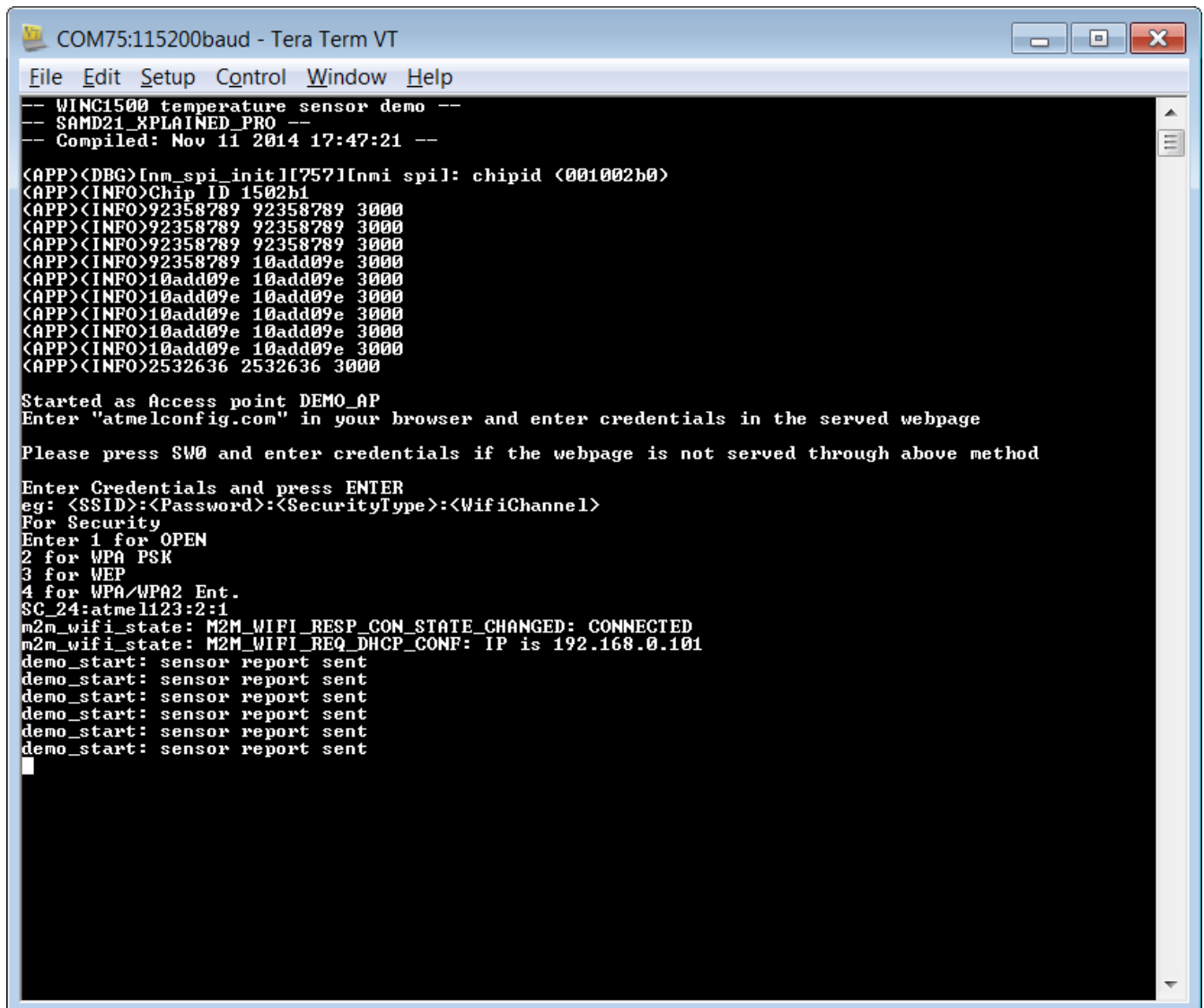
⚠️ **WARNING**   If your Android device is not connected to the same Access Point than your sensor then you will not be able see any device.

2. FAQs

To troubleshoot issues during demo, you need to open a serial console program like "Tera Term" or "Hyperterminal" on your laptop then finally open the EDBG DEBUG USB serial COM port (settings should be 115200 baud, 8 bit data, no parity, one stop bit and no flow control).

2.1 What if provisioning fails or "atmelconfig.com" does not work

If provisioning fails for some reason through the method described in this document, module can still be provisioned through the serial console by entering SSID, passphrase, security type and channel of the Access Point to connect to. To do so, just press SW0 button on the Xplained Pro board and the following prompt should appear:

If wrong credentials were entered "Unable to connect to AP, please check the credentials entered" will be displayed.

2.2 What if the sensor does not show up on the Android App

There could be multiple reasons for this, but if there is a problem on the SAMD21 or the sensors, these could be tracked down through serial debug messages. If the temperature demo is up and running, you should see messages indicating sensor report sent as shown below.

If the serial console displays these messages, yet none of the sensors were shown on the App's main screen, this could be network blocking broadcasts. In this case, you may have to check for your Access Point settings or simply try to configure your sensor to connect to another Access Point.

3. Revision History

Doc. Rev.	Date	Comments
XXXXXA	6/2015	Initial document release

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