

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:

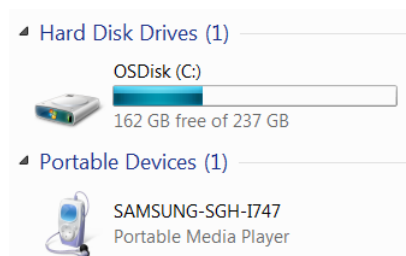
- Temperature sensor from ASF project “WINC1500 IoT Temperature Sensor Demo”
- Qtouch sensor from ASF project “WINC1500 IoT Qtouch Sensor Demo”

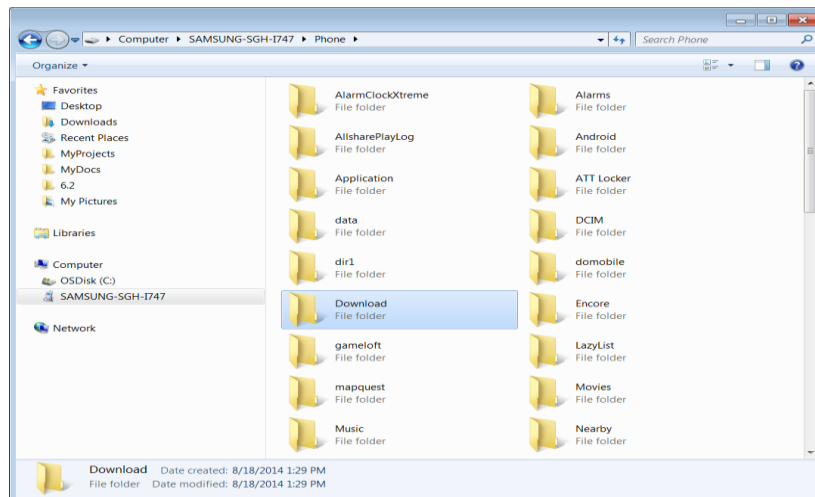
These are implemented in a very similar way and also use a similar communication protocol with the Android application. Both can work at the same time and report sensor information to the same “Atmel IoT Sensor” Android application.

1.2 Install Atmel IoT Sensor Android Application

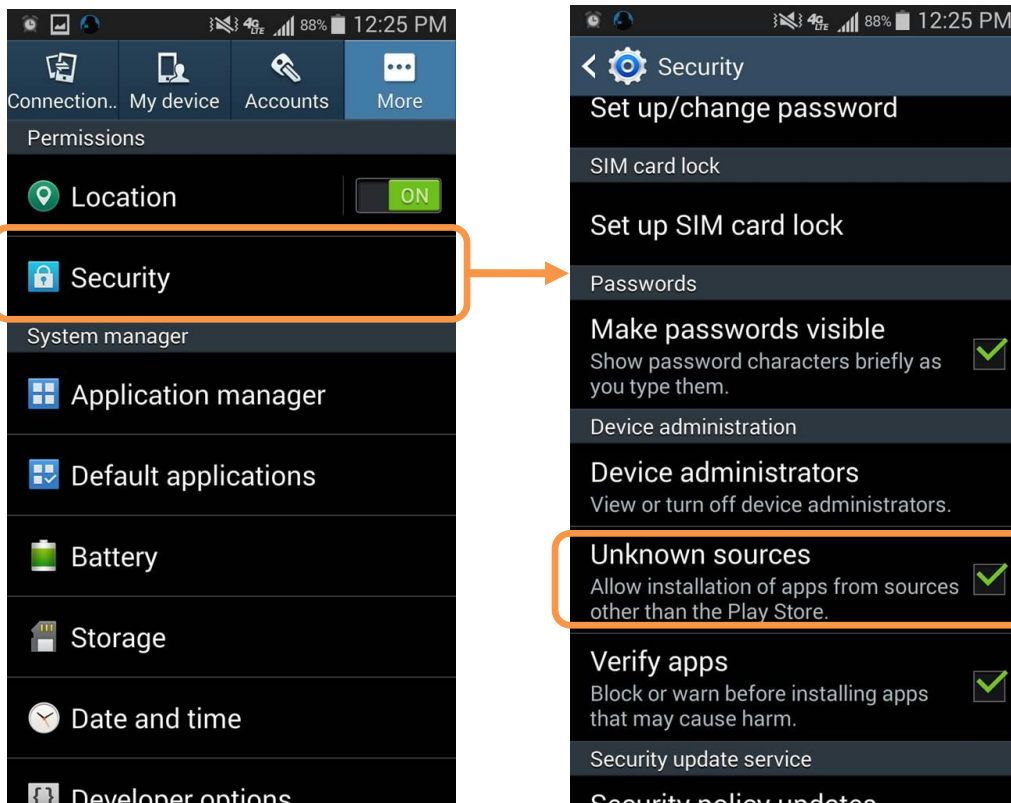
To Install the Atmel IoT Sensor APK located in the android_app folder of your ASF project just proceed as following:

- 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



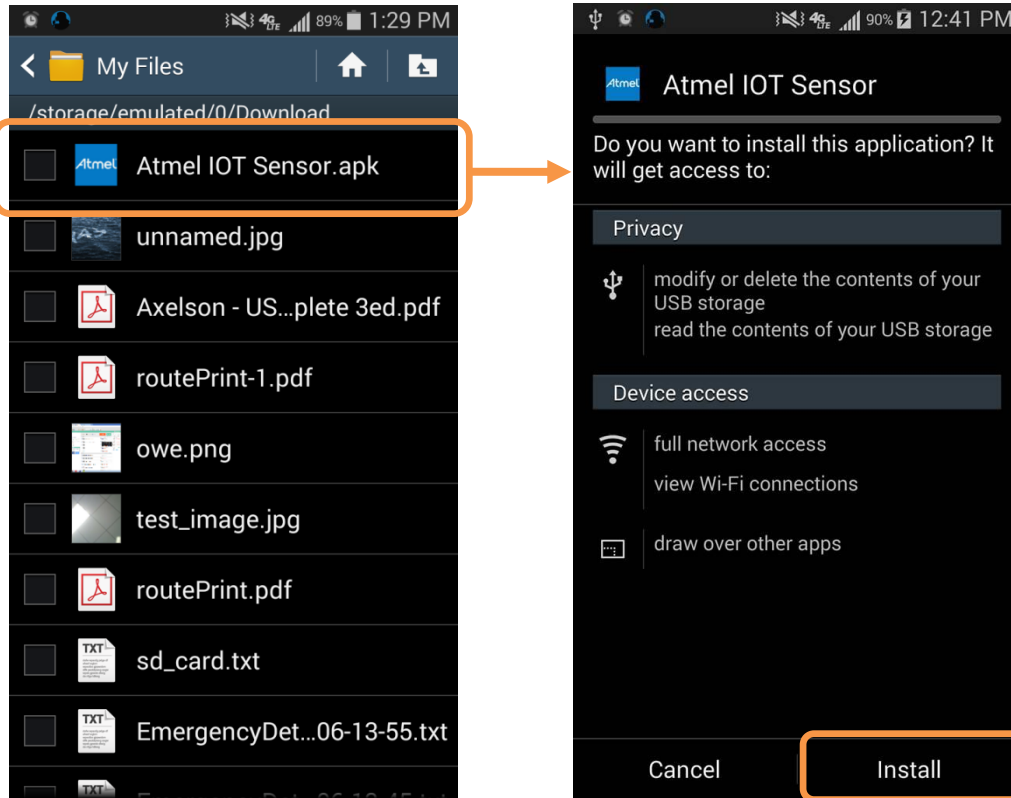


- Locate the “Download” folder, then simply drag and drop the provided “Atmel_IOT_Sensor_v2.10.18.apk” application
- Go to your Android phone settings and allow unknown application sources



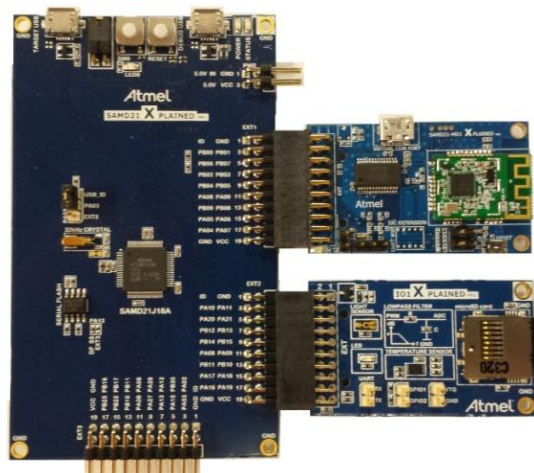
! **WARNING** It might be necessary to uncheck the “Verify apps” option if the application installation process stalls.

- 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

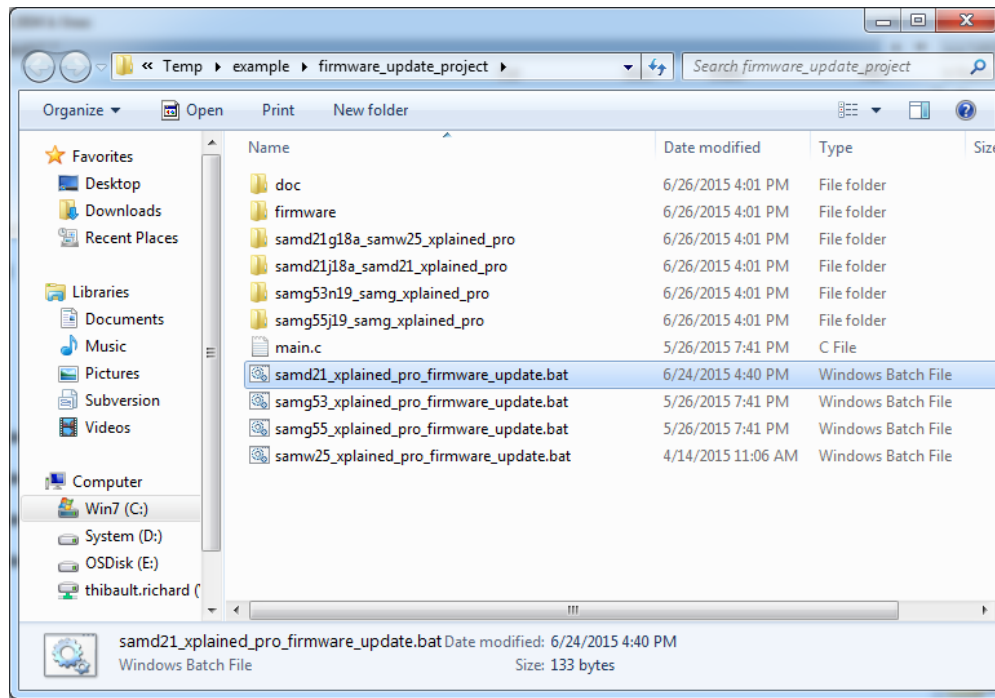
For temperature sensor, connect the WINC1500 Wi-Fi module on EXT1 and Atmel IO1 sensor on EXT2 as shown in the picture:



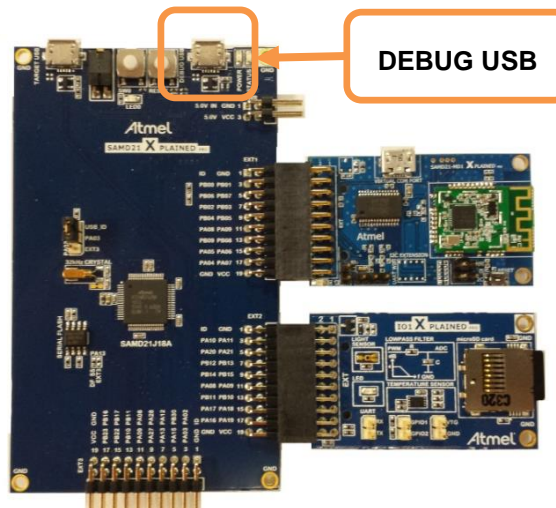
For Qtouch sensor, connect the WINC1500 Wi-Fi module on EXT3 and Qtouch mutual capacitance on EXT1 and EXT2.

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:



- ```

C:\windows\system32\cmd.exe
34 2F 82 39 DF 40 23 AA F2 2D 9F F5 EC 10 21 AC
1F C9 D6 B8 7D 36 56 DB 7C BE 5D F2 1A E3 B1 C4
37 4B 21 80 D6 B9 EF 77 B9 24 54 14 3F 99 07 58

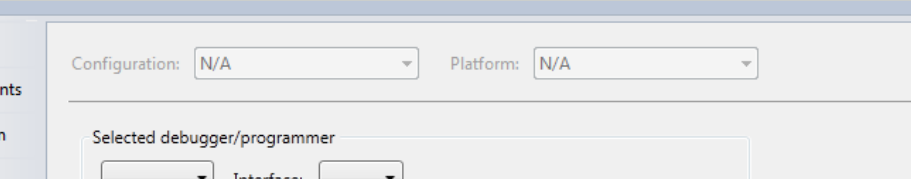
Donert erasing...
#Erase time = 0.063000 sec
>Start programming..
Done
#Programing time =0.093000 sec

>>This task finished after 1.78 sec
OK
#####
##
##
##
##
##
##
##
##
##
#####
Downloading ends sucessfully
Press any key to continue . . .

```

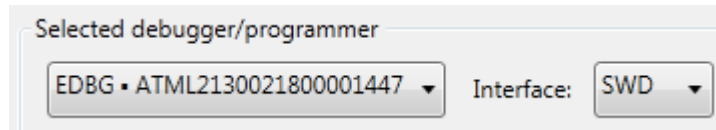
- Connect the SAM D21 Xplained Pro board to your PC using DEBUG USB connector.
- Program the application that was created as an example, as per section 2.2 by clicking on the Start



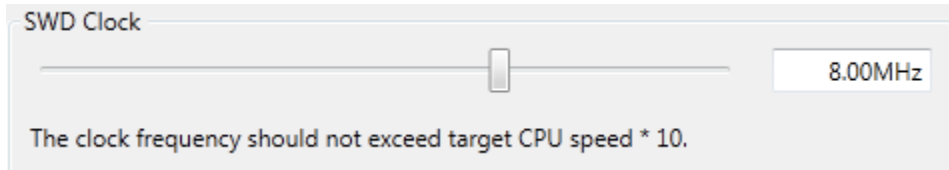
- 
- The screenshot shows the Atmel Studio IDE interface. On the left, a sidebar contains a menu with the following items: 'Build', 'Build Events', 'Toolchain', 'Device', 'Tool', and 'Advanced'. The 'Build' menu is currently selected. The main workspace area displays configuration options for a build. At the top, there are two dropdown menus: 'Configuration:' set to 'N/A' and 'Platform:' set to 'N/A'. Below these, there is a section for 'Selected debugger/programmer' with two dropdown menus: the first is empty and the second is labeled 'Interface:'. Underneath this is a 'Programming settings' section with a dropdown menu set to 'Erase entire chip'. At the bottom, there is a 'Debug settings' section with two checkboxes: 'Override Vector Table' (unchecked) and 'Cache all flash memory' (checked). A dialog box titled 'Atmel Studio' is overlaid on the main workspace. It contains an information icon (a blue circle with a white 'i') and the text: 'Skipping launch. User did not select debug tool, Select proper tool and interface.' At the bottom right of the dialog box is a 'Continue' button.



- Select EDBG and SWD (Serial Wire Debug) as Interface:



- Set SWD clock to 8 MHz to speed up programming:

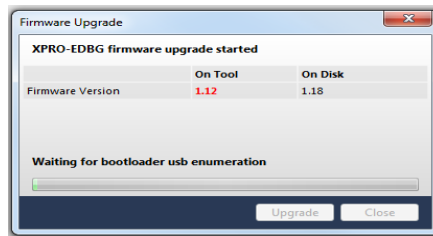


- Click again on the Start Debugging and Break icon:
- The application will be programmed in the SAM D21 embedded flash and breaks at main function.  
Click on Continue to execute the application:



#### INFO

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

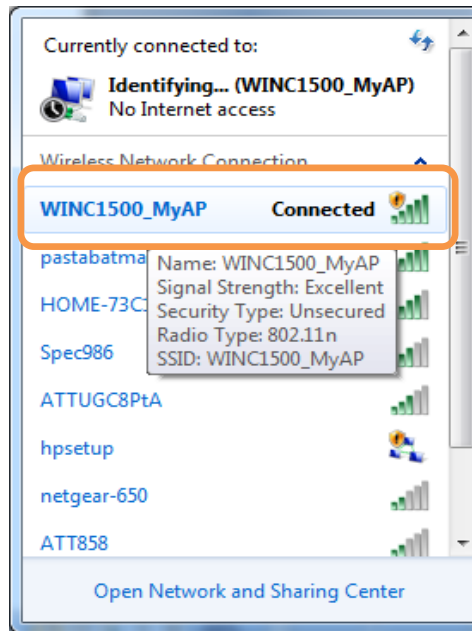


#### WARNING

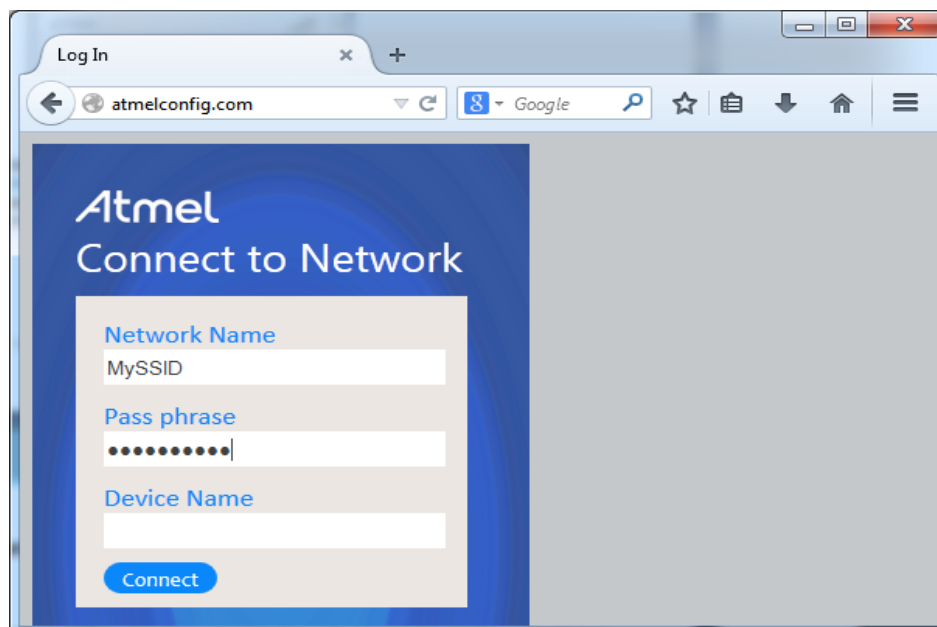
Upgrade operation may take a few minutes, please **wait** for the operation to complete.

## 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.

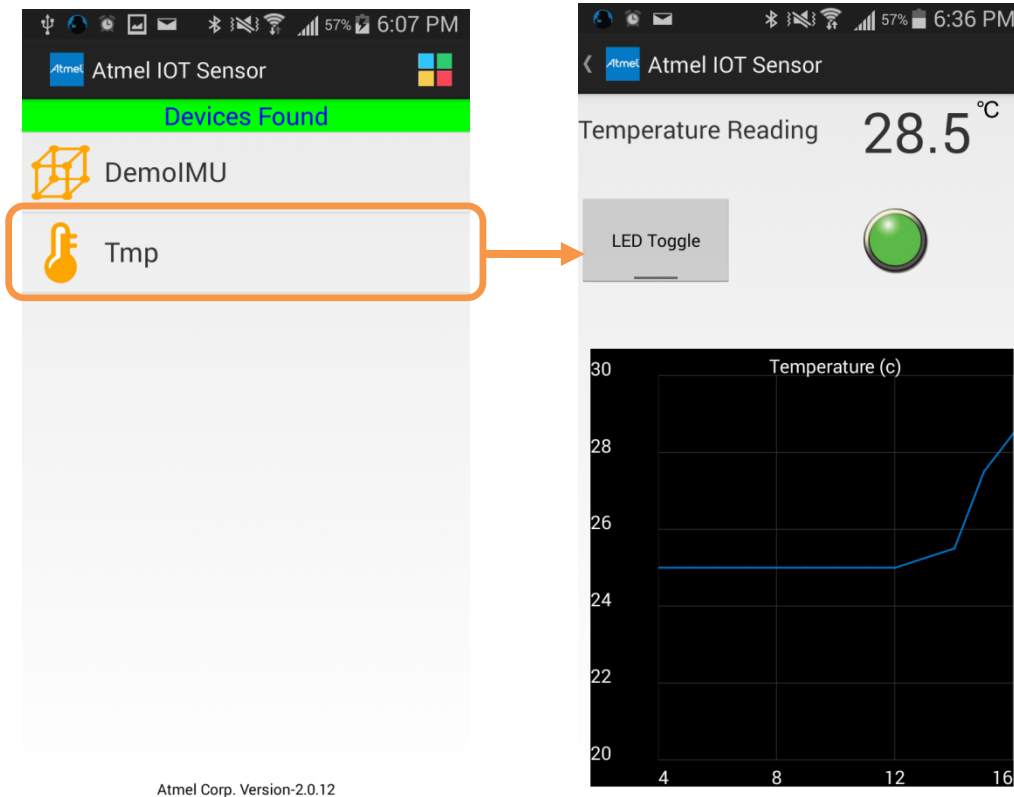


Once connected, just open your favorite web browser at the following address [atmelconfig.com](http://atmelconfig.com) (as defined in the `DEMO_WLAN_AP_DOMAIN_NAME` macro) and provide the required Network name and Passphrase of the wireless access point to connect to. Device name is optional. Hit connect 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.



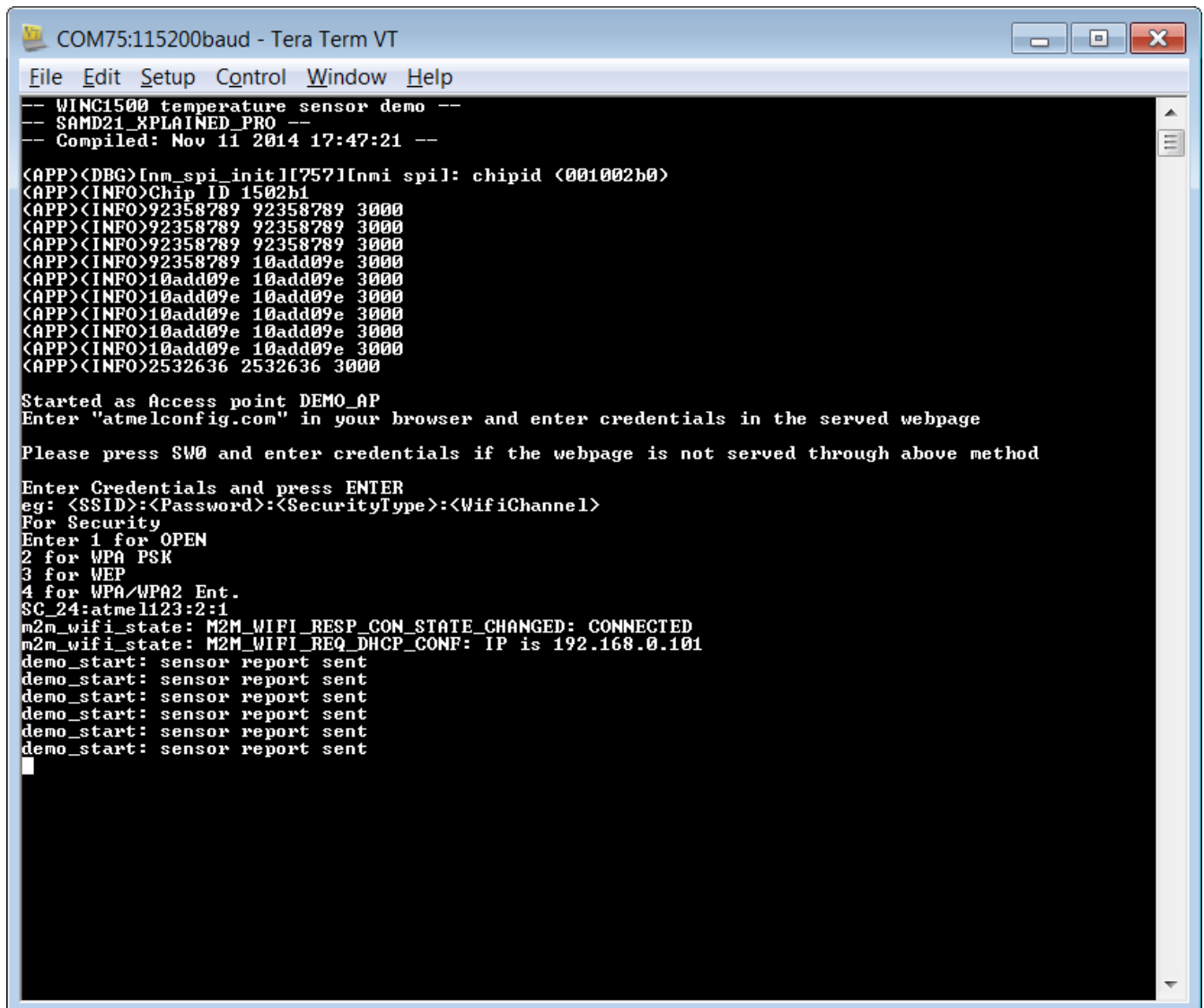
**WARNING** If your Android device is not connected to the same Access Point than your sensor then you will not be able see any device.

## 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:



```
COM75:115200baud - Tera Term VT
File Edit Setup Control Window Help
-- WINC1500 temperature sensor demo --
-- SAMD21_XPLAINED_PRO --
-- Compiled: Nov 11 2014 17:47:21 --

<APP><DBG>[nm_spi_init][757][nm_spi: chipid (001002b0)
<APP><INFO>Chip ID 1502b1
<APP><INFO>92358789 92358789 3000
<APP><INFO>92358789 92358789 3000
<APP><INFO>92358789 92358789 3000
<APP><INFO>92358789 10add09e 3000
<APP><INFO>10add09e 10add09e 3000
<APP><INFO>10add09e 10add09e 3000
<APP><INFO>10add09e 10add09e 3000
<APP><INFO>10add09e 10add09e 3000
<APP><INFO>10add09e 10add09e 3000
<APP><INFO>2532636 2532636 3000

Started as Access point DEMO_AP
Enter "atmelconfig.com" in your browser and enter credentials in the served webpage

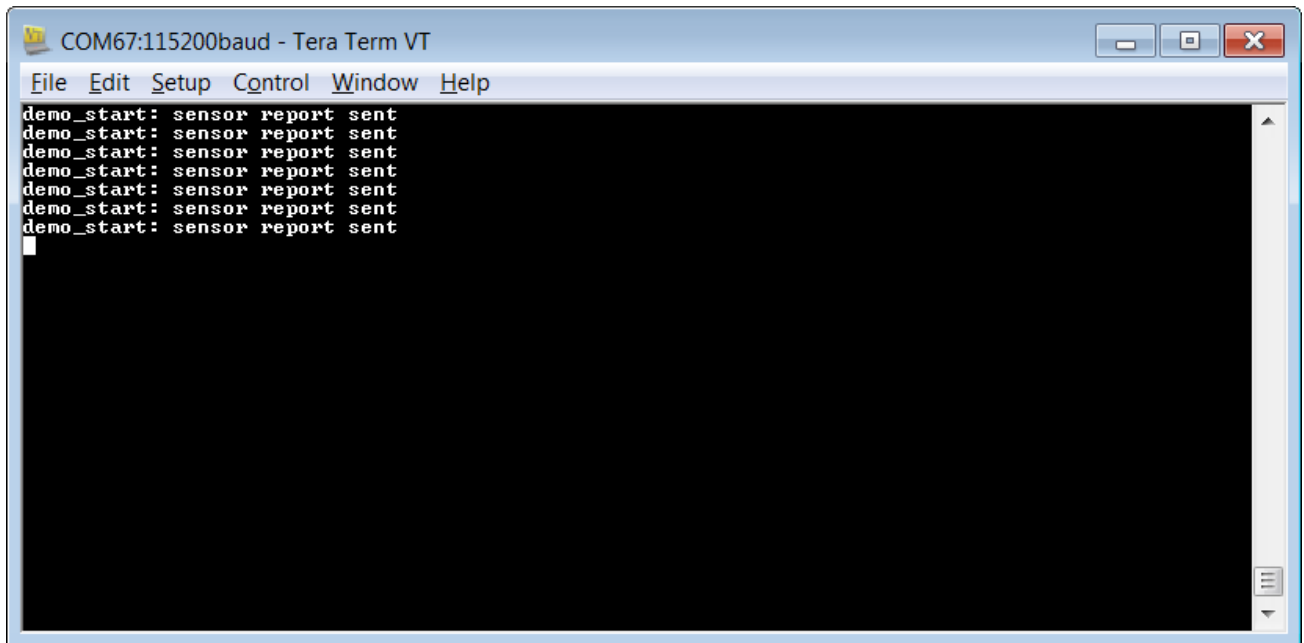
Please press SW0 and enter credentials if the webpage is not served through above method

Enter Credentials and press ENTER
eg: <SSID>:<Password>:<SecurityType>:<WifiChannel>
For Security
Enter 1 for OPEN
2 for WPA PSK
3 for WEP
4 for WPA/WPA2 Ent.
SC_24:atmel123:2:1
m2m_wifi_state: M2M_WIFI_RESP_CON_STATE_CHANGED: CONNECTED
m2m_wifi_state: M2M_WIFI_REQ_DHCP_CONF: IP is 192.168.0.101
demo_start: sensor report sent
demo_start: sensor report sent
demo_start: sensor report sent
demo_start: sensor report sent
demo_start: sensor report sent
demo_start: sensor report sent
```

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.

A screenshot of a Tera Term VT window titled "COM67:115200baud - Tera Term VT". The window has a menu bar with "File", "Edit", "Setup", "Control", "Window", and "Help". The main area is a black terminal with white text. It displays seven identical lines of the message "demo\_start: sensor report sent" stacked vertically. A white cursor is visible on the line following the last message. The window has standard Windows-style window controls (minimize, maximize, close) in the top right corner and a scrollbar on the right side.

```
COM67:115200baud - Tera Term VT
File Edit Setup Control Window Help
demo_start: sensor report sent
demo_start: sensor report sent
demo_start: sensor report sent
demo_start: sensor report sent
demo_start: sensor report sent
demo_start: sensor report sent
demo_start: sensor report sent
█
```

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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