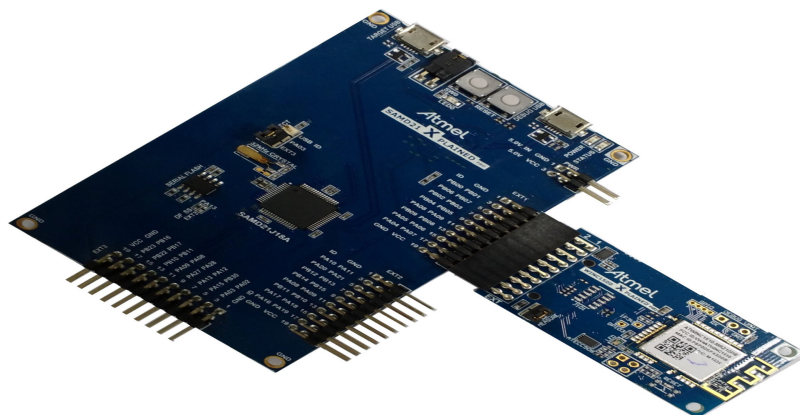

WINC Devices – Integrated Serial Flash Memory Download Procedure

Introduction

ATWINC1500/ATWINC3400 features an on-chip microcontroller and integrated SPI Flash memory for system firmware. The serial flash memory also stores the root certificate required for TLS/SSL connection and the gain table values used by transceiver. This application note explains in detail downloading procedure of firmware, certificate and gain values into WINC serial flash through different supported serial interfaces like SPI/UART. This document also covers some useful troubleshooting tips for downloading failures.



Features

- Firmware download procedure
- Root certificate download procedure
- Gain table values download procedure
- Modified provisioning webpage download
- Troubleshooting tips
- Common download procedure for WINC1500 and WINC3400

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1. Firmware Update Project

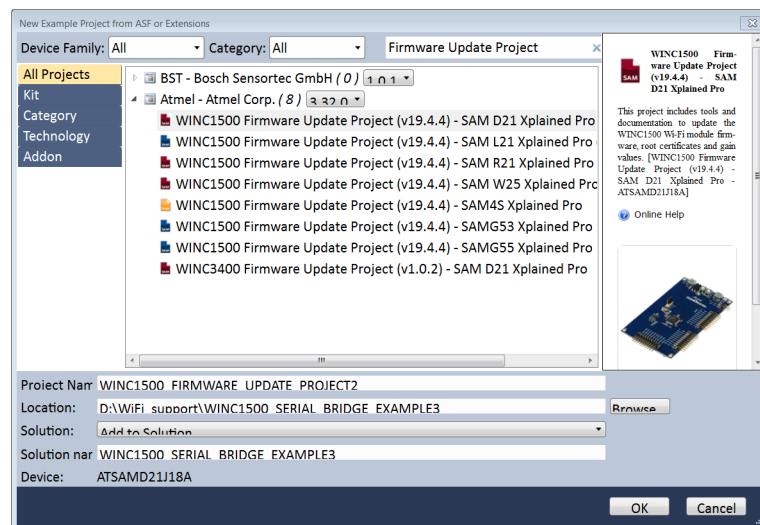
The WINC1500 or WINC3400 firmware update project can be retrieved through the Atmel Software Framework. The latest firmware update project contains the new firmware images as well as the batch script files used to download the firmware, certificate, provisioning webpage and gain values into Wi-Fi Network Controller (WINC) through SPI/UART.

1.1 Import Firmware Update Project

Pre-requisites: Install Atmel Studio Framework (ASF). The latest version of the Atmel Software Framework can be found on the [Atmel Gallery](#) or using Atmel Studio Extension manager.

1. Search for "Firmware Update Project" from the "New Example Project" of ASF menu in Atmel Studio.

Figure 1-1. Firmware Update Project in ASF

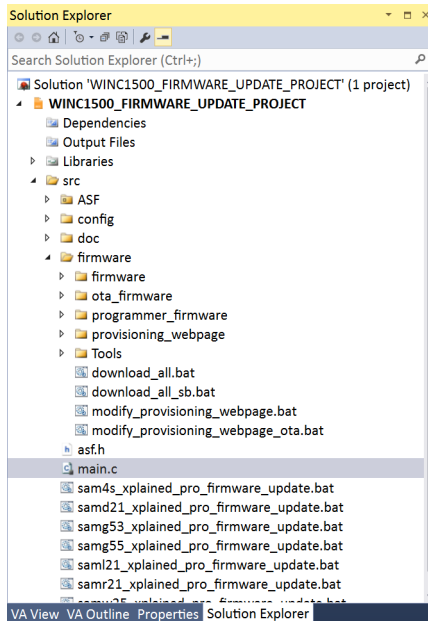


2. Select the appropriate "WINC Firmware Update Project (vxx.x.x)" project corresponding to the intended host MCU Xplained Pro board and then press OK button to import firmware update project and related documentation.

1.2 Project Overview

The firmware update project appears as a regular Atmel Studio ASF project.

Figure 1-2. Firmware Update Project Overview



/src/firmware folder – Contains the new WINC firmware as well as:

- The `download_all.bat` script - To download the WINC firmware/certificate/gain values.
- The `modify_provisioning_webpage.bat` - To update the WINC firmware image with a custom modified HTTP provisioning webpage.

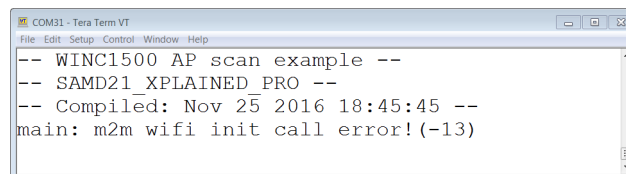
/src folder – Contains update scripts to download the WINC firmware, certificate and gain values at one shot using a serial bridge through host MCU Xplained Pro boards.

1.3 Firmware Version Mismatch Indication

When there is an update for the WINC, it usually combines the Wi-Fi software API for the host MCU and a binary firmware for the WINC. To ensure the compatibility between the Wi-Fi software API on the host MCU and the WINC, a major/minor version number is used and verified at the Wi-Fi driver init.

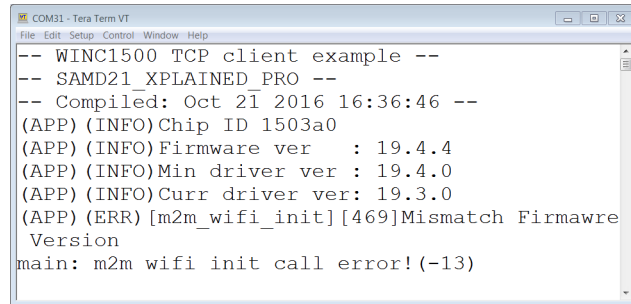
When a version mismatch is detected at startup, the Wi-Fi driver initialization fails and the `m2m_wifi_init()` function returns the following error code. The required baud rate configuration on terminal window is 115200 8-N-1-N.

Figure 1-3. Firmware Version Mismatch Error Code



Setting the `CONF_WIFI_DEBUG` to 1 in the `conf_winc.h` configuration file of the host application project will provide more information about the version mismatch error.

Figure 1-4. Firmware Version Mismatch Error



```
COM31 - Tera Term VT
File Edit Setup Control Window Help
-- WINC1500 TCP client example --
-- SAMD21_XPLAINED_PRO --
-- Compiled: Oct 21 2016 16:36:46 --
(APP) (INFO) Chip ID 1503a0
(APP) (INFO) Firmware ver : 19.4.4
(APP) (INFO) Min driver ver : 19.4.0
(APP) (INFO) Curr driver ver: 19.3.0
(APP) (ERR) [m2m_wifi_init][469]Mismatch Firmawre
Version
main: m2m wifi init call error!(-13)
```

In this scenario a firmware update with the appropriate firmware version number is expected. Each ASF release is tied to one particular WINC driver/firmware release.

1.4 Downloading Interfaces

The WINC serial flash download (WINC firmware, certificate, gain values) can be done by connecting a Windows computer to:

- Host MCU UART (typically the EDBG COM port when using an Xplained Pro board). The host MCU is connected to the WINC via SPI, thus host MCU UART acting as a serial bridge between Windows computer and WINC device.
- The WINC built-in UART.

2. Serial Flash Download via Serial Bridge

As the WINC device is connected to host MCU through SPI interface, upgrading the WINC serial flash via the host MCU would be an easier solution. Since, WINC provides transparent access to host MCU, the WINC serial flash can be read/written from host MCU. The host MCU can program the serial (SPI) flash without need for operational firmware in the WINC. The host MCU running the serial bridge firmware is connected between Windows computer and WINC SPI to download the firmware to WINC serial flash.

2.1 Serial Flash Download Using SAM Xplained Pro Board

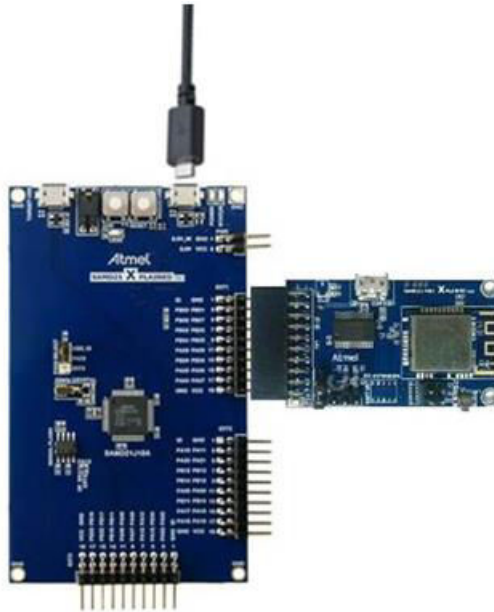
`/src/firmware/Tools/serial_bridge` shall contain the serial bridge binary images for few of SAM based host MCU's. This serial bridge firmware uses UART interface available on SAM Xplained Pro boards.

The batch script files available in `/src` folder contains the scripts to program the platform specific serial bridge binary image on the host MCU before it starts the WINC serial flash download. EDBG on SAM Xplained Pro board is used for programming serial bridge image. The script uses the Atmel Studio `atprogram.exe` commands for programming the host MCU via EDBG of SAM Xplained Pro boards.

2.1.1 Hardware Setup

The download procedure requires that WINC module to be attached on EXT1 of the SAM Xplained Pro kit. Plug a micro USB cable from Windows computer to the debug USB port of the Xplained Pro kit.

Figure 2-1. USB Connection With Xplained Pro Kit



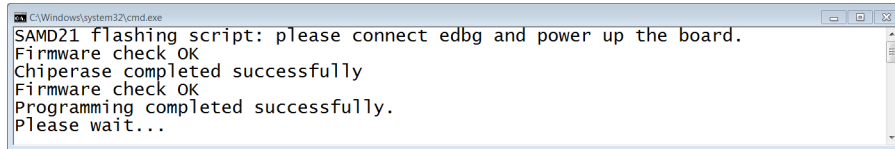
2.1.2 Batch Script

A list of batch (.bat) script files in the `/src` folder of "`WINCXXXX_FIRMWARE_UPDATE_PROJECT`" shall be used to trigger a WINC serial flash download.

1. Ensure that the SAM Xplained Pro board is connected to PC via debug USB port. The virtual EDBG COM port of the board is now listed in the device manager.
2. Run the `sam_xplained_pro_firmware_update.bat` script that corresponds to connected Xplained board.

3. The batch script will program a serial bridge binary on the host MCU to redirect firmware data from the computer (EDBG virtual COM port) to the WINC chip (via SPI). The serial bridge application also performs the WINC power up sequence, thus ensuring that the WINC bootloader is in the appropriate state to start a download.

Figure 2-2. Serial Bridge Firmware Programming : Success

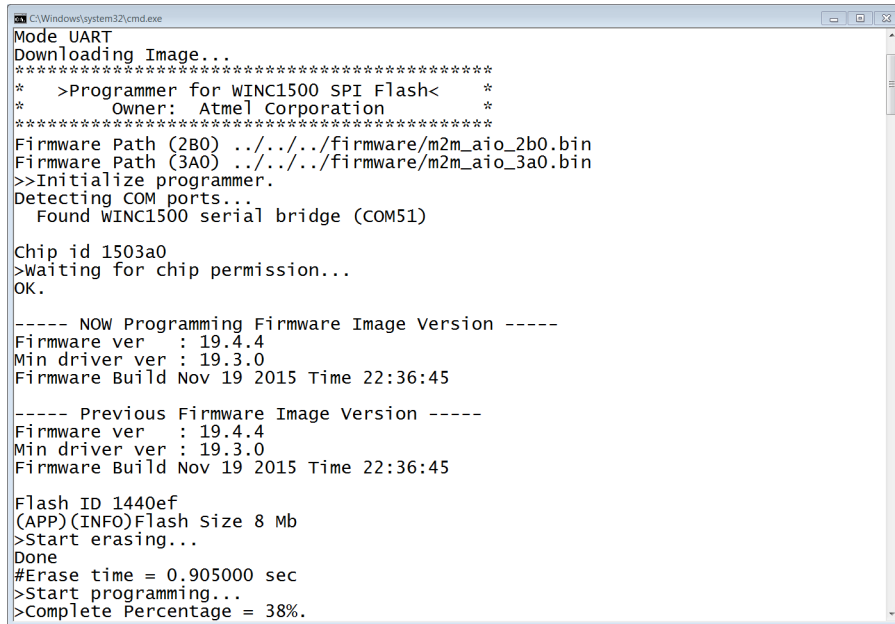


```

C:\Windows\system32\cmd.exe
SAMD21 flashing script: please connect edbg and power up the board.
Firmware check OK
Chip erase completed successfully
Firmware check OK
Programming completed successfully.
Please wait...
  
```

4. During the download process, the batch script will output the firmware version being programmed onto the WINC as well as the previously installed firmware version.

Figure 2-3. Displaying Firmware Version



```

C:\Windows\system32\cmd.exe
Mode UART
Downloading Image...
*****
* >Programmer for WINC1500 SPI Flash< *
* Owner: Atmel Corporation *
*****
Firmware Path (2B0) ../../firmware/m2m_aio_2b0.bin
Firmware Path (3A0) ../../firmware/m2m_aio_3a0.bin
>>Initialize programmer.
Detecting COM ports...
Found WINC1500 serial bridge (COM51)

Chip id 1503a0
>Waiting for chip permission...
OK.

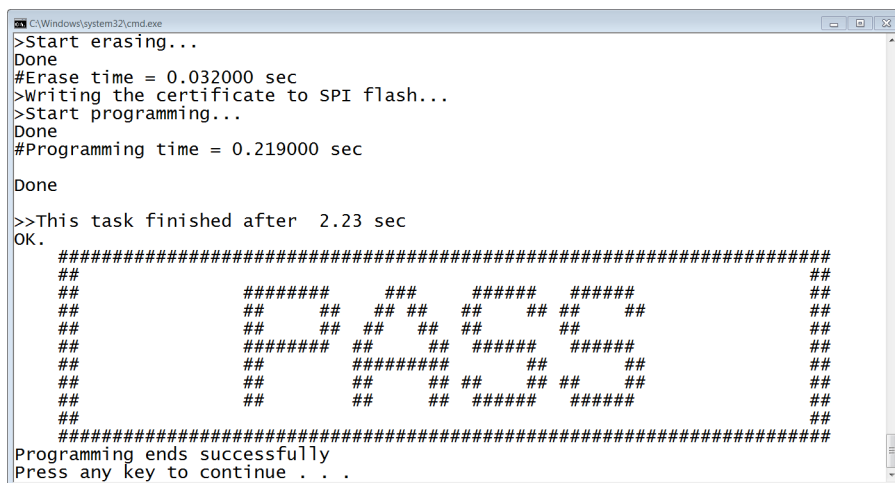
----- NOW Programming Firmware Image Version -----
Firmware ver : 19.4.4
Min driver ver : 19.3.0
Firmware Build Nov 19 2015 Time 22:36:45

----- Previous Firmware Image Version -----
Firmware ver : 19.4.4
Min driver ver : 19.3.0
Firmware Build Nov 19 2015 Time 22:36:45

Flash ID 1440ef
(APP)(INFO)Flash Size 8 Mb
>Start erasing...
Done
#Erase time = 0.905000 sec
>Start programming...
>Complete Percentage = 38%.
  
```

5. After several seconds the following message should appear, meaning that the WINC download procedure is complete.

Figure 2-4. WINC Serial Flash Download : Success



```

C:\Windows\system32\cmd.exe
>Start erasing...
Done
#Erase time = 0.032000 sec
>Writing the certificate to SPI flash...
>Start programming...
Done
#Programming time = 0.219000 sec
Done
>>This task finished after 2.23 sec
OK.
#####
##          #####      ##          #####      ##
##          ##  ##  ##  ##  ##  ##  ##
##          ##  ##  ##  ##  ##  ##
##          #####      ##          #####      ##
##          ##          #####      ##          ##
##          ##          ##  ##  ##  ##  ##
##          ##          ##  ##  ##  ##  ##
##          ##          ##          #####      ##
#####
Programming ends successfully
Press any key to continue . . .
  
```


Result: The WINC chip firmware, TLS/SSL root certificates and gain table have been successfully updated. Please refer to [Download Failure Troubleshooting](#) in case of failure.

Note: The serial flash download using EDBG virtual COM of SAM Xplained Pro on Virtual OS is not supported at present.

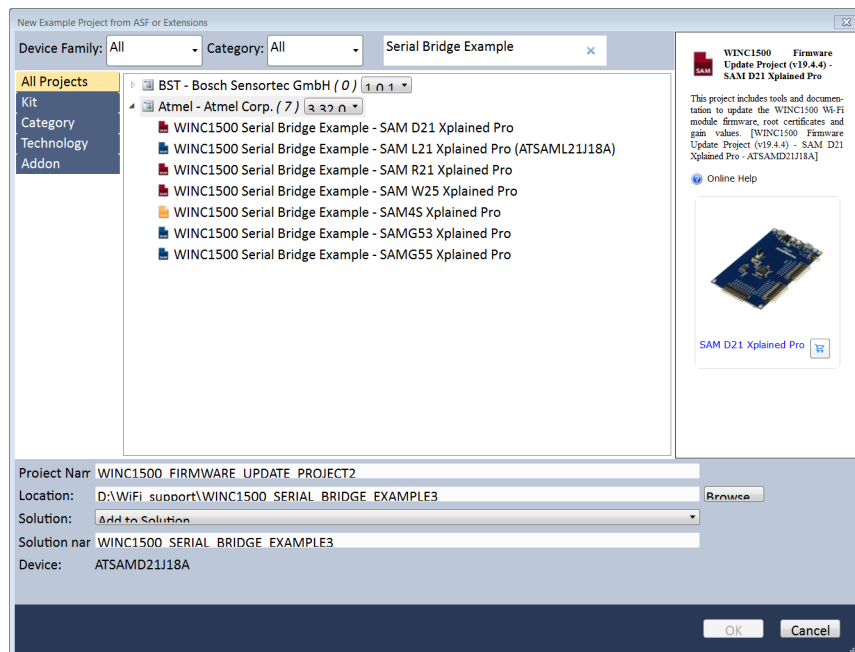
2.2 Serial Flash Download Using Custom Host MCU

The serial bridge example application is available in ASF for few of SAM based host MCU's.

Pre-requisites: Atmel Studio Framework (ASF) to be available in Atmel Studio

1. Search for "*Serial Bridge Example*" from the "*New Example Project*" of ASF menu in Atmel Studio. The search result lists the available Serial Bridge example projects for supported host MCU Xplained Pro board of WINC device.

Figure 2-5. Serial Bridge Example Projects in ASF



2. Select the appropriate "*WINC Serial Bridge Example*" project corresponding to the intended host MCU Xplained Pro board and then press OK button to import the project and related documentation.

Note: This project can be taken as base for implementing serial bridge for custom specific host MCU's. Porting of serial bridge firmware to custom host MCU is not the scope of this document.

2.2.1 Batch Script

`download_all.bat` shall be located in the `src/firmware` folder of the "*WINCXXX_FIRMWARE_UPDATE_PROJECT*" triggers the serial flash download.

1. Program the host MCU with the custom implemented serial bridge firmware.
2. Ensure that WINC device connected to host MCU is powered up and that the host UART is connected to PC.
3. In a Windows shell, run the command `download_all.bat UART` to start the download.
4. During the download process, the batch script will output the firmware version being programmed onto the WINC as well as the previously installed firmware version.

Figure 2-6. Displaying Firmware Version

```

C:\Windows\system32\cmd.exe
Mode UART
Downloading Image...
*****
* >Programmer for WINC1500 SPI Flash< *
* Owner: Atmel Corporation *
*****
Firmware Path (2B0) ../../../../firmware/m2m_aio_2b0.bin
Firmware Path (3A0) ../../../../firmware/m2m_aio_3a0.bin
>>Initialize programmer.
Detecting COM ports...
Found WINC1500 serial bridge (COM51)

Chip id 1503a0
>Waiting for chip permission...
OK.

----- NOW Programming Firmware Image Version -----
Firmware ver : 19.4.4
Min driver ver : 19.3.0
Firmware Build Nov 19 2015 Time 22:36:45

----- Previous Firmware Image Version -----
Firmware ver : 19.4.4
Min driver ver : 19.3.0
Firmware Build Nov 19 2015 Time 22:36:45

Flash ID 1440ef
(APP)(INFO)Flash Size 8 Mb
>Start erasing...
Done
#Erase time = 0.905000 sec
>Start programming...
>Complete Percentage = 38%.

```

5. After several seconds the following message should appear, meaning that the WINC device update procedure is complete/

Figure 2-7. WINC Serial Flash Download : Success

```

C:\Windows\system32\cmd.exe
>Start erasing...
Done
#Erase time = 0.032000 sec
>Writing the certificate to SPI flash...
>Start programming...
Done
#Programming time = 0.219000 sec

Done

>>This task finished after 2.23 sec
OK.
#####
##          #####      ##          #####      ##
##          ##  ##  ##  ##  ##  ##  ##  ##
##          ##  ##  ##  ##  ##  ##  ##  ##
##          #####      ##          #####      ##
##          ##          ##          ##          ##
##          ##          ##          ##          ##
##          ##          ##          ##          ##
##          #####      ##          #####      ##
#####
Programming ends successfully
Press any key to continue . . .

```

Result: The WINC chip firmware, TLS/SSL root certificates and gain table have been successfully updated. Please refer to [Download Failure Troubleshooting](#) in case of failure.

3. Serial Flash Download via Built-in UART

The serial flash download can be done using the built-in UART of WINC device. Prior to running any update script, ensure that the hardware is setup as required.

Note: WINC3400 does not support download through built-in UART at present.

3.1 Hardware Setup

3.1.1 Power On Sequence

To perform a serial flash download using the WINC built-in UART, it is mandatory that the WINC chip is in the right bootloader state. To do so, the host MCU must power up the WINC chip and then perform the reset sequence as defined in the [datasheet](#). This can be done very easily from the host MCU by calling the `m2m_bsp_init()` function.

```
int main(void)
{
    /* Initialize the board. */
    system_init();

    /* Initialize the BSP. */
    nm_bsp_init();

    while(1) {
    }
}
```

3.1.2 UART Pin assignment

Pin assignment of [WINC1500 module UART](#) are described in the following table. On ATWINC1500 Xplained Pro, TX and RX are available on through holes labeled “DEBUG_UART” for easy identification.

Table 3-1. UART Pin Mapping of WINC1500 Module

ATWINC1500 module pin name	ATWINC1500 Xplained Pro pin name	Function
J14	UART_TX	TXD
J19	UART_RXD	RXD

3.1.3 Hardware Connection

Depending on the WINC-Xpro board version, it may feature a micro USB plug which is connected to the WINC built-in UART via an FTDI module. In this case, the PC must have the latest FTDI driver installed to see the corresponding virtual serial COM port.

Figure 3-1. USB Connection With WINC Built-In UART



When micro USB plug is not present on WINC-Xpro board, RX, TX and GND UART signals available on [board](#) can be connected to PC using a third-party serial to USB converter.

3.2 Batch Script

`download_all.bat` batch script shall be located in the `src/firmware` folder of the "`WINCXXX_FIRMWARE_UPDATE_PROJECT`" triggers the download through built-in UART.

1. Ensure that the host MCU is powered up and that the WINC built-in UART is connected to PC via a serial to USB converter.
2. In a Windows shell, run the command `download_all.bat UART` to start the download.

Note: The gain setting values for SAMW25 module is different than the gain setting values of WINC1500 module. The above command downloads WINC1500 module gain values. The command for SAMW25 to incorporate the gain values of SAMW25 module:

`download_all.bat UART SAMW25`

3. During the download process, the batch script will output the firmware version being programmed onto the WINC as well as the previously installed firmware version.

Figure 3-2. Displaying Firmware Version

```

Administrator: C:\Windows\System32\cmd.exe - download_all.bat UART
Mode UART
Downloading Image...
*****
* >Programmer for WINC1500 SPI Flash< *
* Owner: Atmel Corporation *
*****
Firmware Path (2B0) ../../../../firmware/m2m_aio_2b0.bin
Firmware Path (3A0) ../../../../firmware/m2m_aio_3a0.bin
>>Initialize programmer.
Detecting COM ports...
Found built-in WINC1500 UART (COM54)

Chip id 1503a0
>Waiting for chip permission...
OK.

----- NOW Programming Firmware Image Version -----
Firmware ver : 19.4.4
Min driver ver : 19.3.0
Firmware Build Nov 19 2015 Time 22:36:45

----- Previous Firmware Image Version -----
Firmware ver : 19.5.2
Min driver ver : 19.3.0
Firmware Build Sep 1 2016 Time 14:14:33

Flash ID 1440ef
(APP)(INFO)Flash Size 8 Mb
>Start erasing...
Done
#Erase time = 0.905000 sec
>Start programming...
>Complete Percentage = 15%.

```

4. After several seconds the following message should appear, meaning that the WINC device download is complete.

Figure 3-3. WINC Serial Flash Download : Success

```

C:\Windows\system32\cmd.exe
>Start erasing...
Done
#Erase time = 0.032000 sec
>Writing the certificate to SPI flash...
>Start programming...
Done
#Programming time = 0.219000 sec

Done

>>This task finished after 2.23 sec
OK.
#####
##          #####      ##          #####      ##
##          ##  ##  ##  ##  ##  ##  ##  ##
##          ##  ##  ##  ##  ##  ##  ##
##          #####      ##          #####      ##
##          ##          ##          ##          ##
##          ##          ##          ##          ##
##          ##          ##          ##          ##
##          #####      ##          #####      ##
#####
Programming ends successfully
Press any key to continue . . .

```

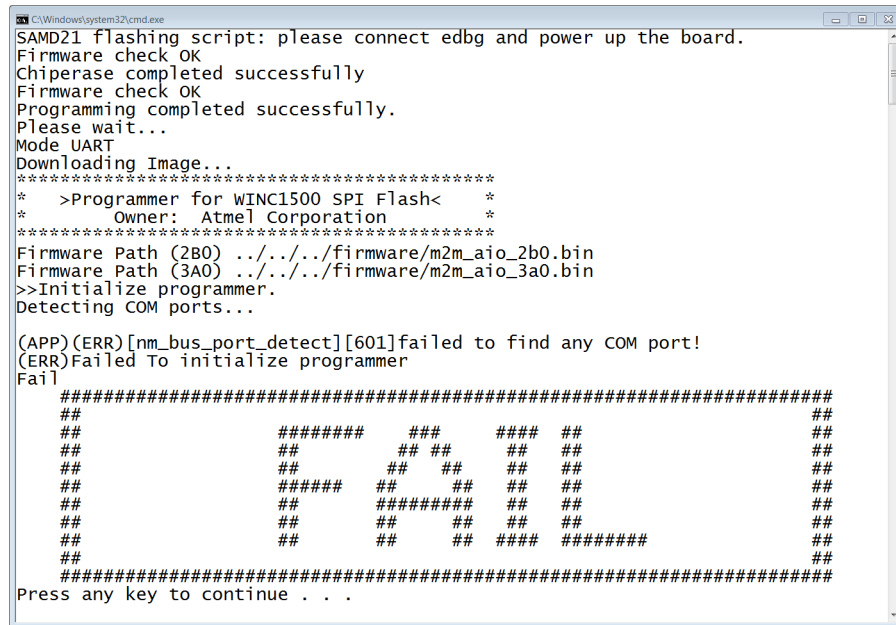
Result: The WINC chip firmware, TLS/SSL root certificates and gain table have been successfully updated. Please refer to [Download Failure Troubleshooting](#) in case of failure.

4. Download Failure Troubleshooting

Here are the troubleshooting tips for a specific error while downloading using batch script.

4.1 Failed To Find Any COM Port

Figure 4-1. Error : Failed To Find Any COM Port!



```

C:\Windows\system32\cmd.exe
SAMD21 flashing script: please connect edbg and power up the board.
Firmware check OK
Chiperase completed successfully
Firmware check OK
Programming completed successfully.
Please wait...
Mode UART
Downloading Image...
*****
* >Programmer for WINC1500 SPI Flash< *
* Owner: Atmel Corporation *
*****
Firmware Path (2B0) ../../../../firmware/m2m_aio_2b0.bin
Firmware Path (3A0) ../../../../firmware/m2m_aio_3a0.bin
>>Initialize programmer.
Detecting COM ports...

(APP)(ERR)[nm_bus_port_detect][601]failed to find any COM port!
(ERR)Failed to initialize programmer
Fail
#####
##          #####          ##          ##          ##          ##
##          ##          ##          ##          ##          ##
##          ##          ##          ##          ##          ##
##          #####          ##          ##          ##          ##
##          ##          #####          ##          ##          ##
##          ##          ##          ##          ##          ##
##          ##          ##          ##          ##          ##
##          #####          ##          ##          ##          ##
#####
Press any key to continue . . .
  
```

The image downloader tool used to perform a serial bridge or a built-in UART download will try to look for available COM ports using Windows API. It will then try to match each COM port name with “EDBG” string or a port number “COM” string. If one of the two conditions is true, the program will then try to send a 0x12 char on the UART line. The other side is then expected to answer 0x5A for a built-in UART update or 0x5B for a serial bridge update.

The Failed to find any COM port error is expected when there are no response for the command.

How to fix it:

- Make sure WINC COM port is listed in the device manager.
- Make sure WINC COM port is not opened by any other application. For verification, try to open and close the COM port with a terminal application.
- Cheap USB cable (serial bridge) or cheap serial to USB converter (built-in UART) can introduce garbage on the UART line thus failing the detection of the WINC COM port. Try a different cable.
- When performing a built-in UART download, it is expected that the WINC bootloader is in a particular state that can only be achieved after doing a clean power up and reset sequence. Hence, before doing a download always ensure that a clean power up and reset sequence has been made.
- Make sure that no other extension board (ex: IO1...) is connected to the Xplained Pro board while performing the download.
- Make sure the project path is not exceeding Windows maximum 260 characters path length

4.2 Found More Than One Matching Tool

Figure 4-2. Error : Found More Than One Matching Tool

```

C:\Windows\system32\cmd.exe
SAMD21 flashing script: please connect edbg and power up the board.
[ERROR] Found more than one matching tool. Please specify serial number.
Fail
#####
##
##          #####   ##   ##   ##   ##   ##
##          ##   ##   ##   ##   ##   ##
##          ##   ##   ##   ##   ##   ##
##          #####   ##   ##   ##   ##
##          ##   ##   ##   ##   ##   ##
##          ##   ##   ##   ##   ##   ##
##          ##   ##   ##   ##   ##   ##
#####
Press any key to continue . . .

```

The Found more than one matching tool error could be observed when downloading using Xplained Pro board serial bridge with `sam_xplained_pro_firmware_update.bat` batch script. The image downloader tool will try to look for available COM ports and try to match each COM port name with “EDBG” string. This is to program the serial bridge binary image on the host MCU.

How to fix it:

- All the Xplained Pro boards are enumerated with “EDBG Virtual COM Port”. Make sure to connect one Xplained Pro board at a time on PC.

4.3 Listing More Than One COM Port

Figure 4-3. Listing More Than One COM Port

```

Administrator: C:\Windows\System32\cmd.exe - download_all.bat UART
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

D:\Projects\WINCSP430-firmware-upgrade-process\WINC1500_FIRMWARE_UPDATE_PROJECT_
demo\src\firmware>download_all.bat UART
Mode UART
Downloading Image...
*****
* >Programmer for WINC1500 SPI Flash< *
* Owner: Atmel Corporation *
*****
Firmware Path (2B0) .././../firmware/m2m_aio_2b0.bin
Firmware Path (3A0) .././../firmware/m2m_aio_3a0.bin
>>Initialize programmer.
Detecting COM ports...
Found WINC1500 serial bridge (COM51)
Found WINC1500 serial bridge (COM10)

Please enter COM port number to program:
51
Chip id 1503a0
>Waiting for chip permission...
OK.

----- NOW Programming Firmware Image Version -----
Firmware ver : 19.4.4
Min driver ver : 19.3.0
Firmware Build Nov 19 2015 Time 22:36:45

----- Previous Firmware Image Version -----
Firmware ver : 19.4.4
Min driver ver : 19.3.0
Firmware Build Nov 19 2015 Time 22:36:45

```

More than one COM port could be listed when downloading using `download_all.bat` where the host MCU already has the serial bridge firmware or download through built-in UART. The image downloader tool used to perform a serial bridge or a built-in UART download will try to look for available COM ports and try to match each COM port name with “EDBG” string or a port number “COM” string. If one of the two conditions is true, the program will then try to send a 0x12 char on each UART line. The

other side is then expected to answer 0x5A for a built-in UART update or 0x5B for a serial bridge update. If the expected response is received on all UART lines, the script will list all the detected COM ports.

How to fix it:

- Input COM port number of the intended device to be downloaded when Please enter COM port number to program: is displayed as shown in the above figures.
- Note that for each downloading option of WINC chip firmware, TLS/SSL root certificates, gain table the COM port number to be given. To avoid this, it is possible to force the image downloader tool to use a specific COM port number in the beginning. For example to use COM56, run the script like this: `download_all.bat UART 56`

4.4 Failed To Initialize Programmer: Invalid Chip ID

Figure 4-4. Error : Failed To Initialize Programmer - Invalid Chip ID

```

Administrator: C:\Windows\System32\cmd.exe - download_all.bat UART
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

D:\Projects\WINCSP430-firmware-upgrade-process\WINC1500_FIRMWARE_UPDATE_PROJECT_
demo\src\firmware>download_all.bat UART
Mode UART
Downloading Image...
*****
* >Programmer for WINC1500 SPI Flash< *
* Owner: Atmel Corporation *
*****
Firmware Path (2B0) ../../../../firmware/m2m_aio_2b0.bin
Firmware Path (3A0) ../../../../firmware/m2m_aio_3a0.bin
>>Initialize programmer.
Detecting COM ports...
Found WINC1500 serial bridge (COM51)

>>(ERR):Invalid chip ID = 0x00000000
>>(ERR):Connect NMC1500 Dx Fail
(ERR)Failed To initialize programmer
Fail
#####
##
##          #####      ##      ##      ##      ##
##          ##  ##      ##      ##      ##      ##
##          ##  ##      ##      ##      ##      ##
##          #####      ##      ##      ##      ##
##          ##  ##      ##      ##      ##      ##
##          ##  ##      ##      ##      ##      ##
##          ##  ##      ##      ##      ##      ##
#####
Press any key to continue . . .
  
```

The Failed to initialize programmer with Invalid chip ID error typically happens when there is garbage or noise on the UART line preventing from reading the correct chip ID value.

How to fix it:

- Try connecting the PC and the WINC with a different cable. A clean power up and reset sequence of the WINC is necessary to start over with the WINC bootloader in the appropriate state.

4.5 Failed To Initialize Programmer: Waiting For Chip Permission

Figure 4-5. Error : Failed To Initialize Programmer - Waiting For Chip Permission

```

Administrator: C:\Windows\System32\cmd.exe - download_all.bat UART
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

D:\Projects\WINCSP430-firmware-upgrade-process\WINC1500_FIRMWARE_UPDATE_PROJECT_
demo\src\firmware>download_all.bat UART
Mode UART
Downloading Image...
*****
* >Programmer for WINC1500 SPI Flash< *
* Owner: Atmel Corporation *
*****
Firmware Path (2B0) ../../firmware/m2m_aio_2b0.bin
Firmware Path (3A0) ../../firmware/m2m_aio_3a0.bin
>>Initialize programmer.
Detecting COM ports...
Found WINC1500 serial bridge (COM51)

Chip id 1503a0
>Waiting for chip permission...
(ERR)Failed To initialize programmer
Fail
#####
##                                     ##
##          #####          ##          ##          ##          ##          ##
##          ##          ##          ##          ##          ##          ##
##          ##          ##          ##          ##          ##          ##
##          #####          ##          ##          ##          ##          ##
##          ##          ##          ##          ##          ##          ##
##          ##          ##          ##          ##          ##          ##
##          ##          ##          ##          ##          ##          ##
##          #####          ##          ##          ##          ##          ##
#####
Press any key to continue . . .
  
```

After printing the correct chip ID of the WINC, the image downloader tool programs a small binary (programmer firmware) to assist with WINC flash programming. At this stage the image downloader will change the UART baud rate from 115200 to 500000 to speed up the actual transfer of the firmware image. Once the baud rate change is made, the chip permission is verified to ensure the UART connection is reliable. Failing at this stage means that the current setup does not support such a high baud rate.

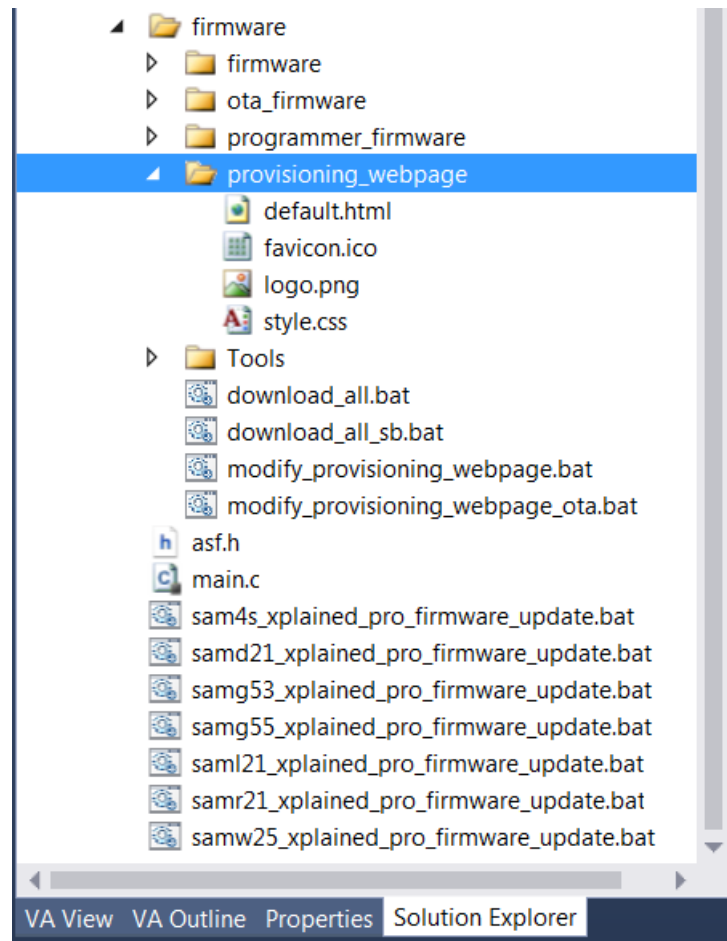
How to fix it:

- It is recommended to try connecting the PC and the WINC with a different cable. Also a clean power up and reset sequence of the WINC is necessary to start over with the WINC bootloader in the appropriate state.

5. Customized Provisioning Webpage Download

The WINC device features a provisioning webpage mode that can be used to enter user credentials to connect the WINC device to the desired Access Point. The HTTP server and the actual HTML provisioning webpage is embedded in the WINC firmware, hence it cannot be modified from the host MCU. The firmware update project includes the HTML code used by the WINC for HTTP provisioning and also the necessary scripts to generate a new WINC firmware image with the modified provisioning web page.

Figure 5-1. Provisioning Webpage Folder Structure



/src/firmware – Contains the script to generate an updated WINC firmware image:

- The `modify_provisioning_webpage.bat` script to generate a new WINC firmware image that includes the HTML code provided in the `/provisioning_webpage` folder.
- The `modify_provisioning_webpage_ota.bat` script to generate a new WINC firmware OTA image that includes the HTML code provided in the `/provisioning_webpage` folder.

/src/firmware/provisioning_webpage – Contains the WINC HTML code:

- *logo.png* - Logo image displayed at the top of the provisioning page.
- *favicon.ico* - Icon that appears inside the browser tab displaying WINC provisioning page.
- *default.html* - The default HTML file that appears in the browser when the user requests the WINC Home Page.

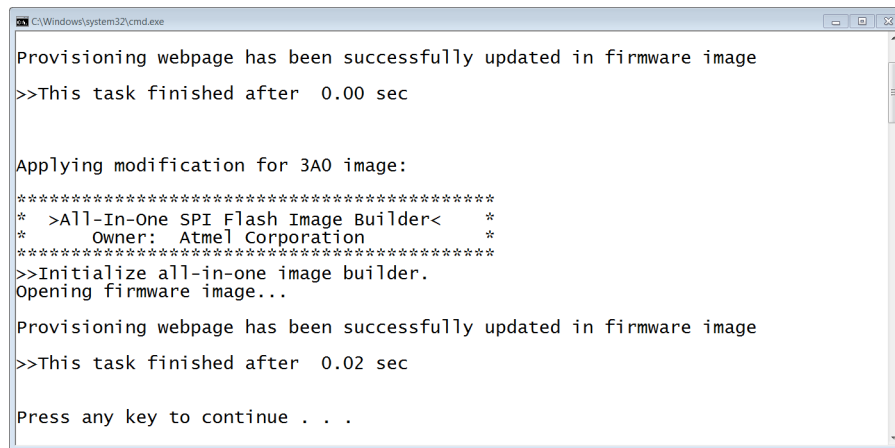
- *style.css* - Cascading Style Sheet (CSS) used for describing the look and formatting of the default.html contents.

5.1 Batch Script

The `modify_provisioning_webpage.bat` batch script shall be located in `src/firmware` folder of the "WINCXXXX_FIRMWARE_UPDATE_PROJECT". This script triggers the generation of new WINC firmware image that includes the HTML code provided in the `src/firmware/provisioning_webpage` folder.

1. Modify WINC HTML code in `/src/firmware/provisioning_webpage` folder as needed.
2. Run the `modify_provisioning_webpage.bat` script.
3. The generated new firmware image will overwrite the default firmware image located in the `src/firmware` folder. The following message should appear, meaning that the new WINC firmware is generated.

Figure 5-2. WINC Firmware Generated With Modified Provisioning Webpage



```

C:\Windows\system32\cmd.exe

Provisioning webpage has been successfully updated in firmware image
>>This task finished after 0.00 sec

Applying modification for 3A0 image:
*****
* >All-In-One SPI Flash Image Builder< *
* Owner: Atmel Corporation *
*****
>>Initialize all-in-one image builder.
Opening firmware image...

Provisioning webpage has been successfully updated in firmware image
>>This task finished after 0.02 sec

Press any key to continue . . .
  
```

4. Follow the steps mentioned in [Serial Flash Download via Serial Bridge](#) or [Serial Flash Download via Built-in UART](#) for specific interface to download the modified provisioning web page.

6. TLS/SSL Certificates Download

The WINC saves the TLS/SSL certificates inside the serial flash in 4K sector (the maximum size of all certificates in flash should be less than 4K). The serial flash download process explained in [Serial Flash Download via Built-in UART](#) downloads the TLS/SSL certificates also. But, it is also possible to download only the certificates without downloading the WINC chip firmware. The Wi-Fi Network Controller (WINC) Software Design Guide can be referred for generating the certificates. The following procedure explains downloading TLS/SSL certificates.

6.1 Batch Script

The `RootCertDownload.bat` batch script shall be located in `src/firmware/Tools/root_certificate_downloader/debug_uart` folder of the "`WINCXXX_FIRMWARE_UPDATE_PROJECT`". This script triggers the certificate download into WINC device.

1. Ensure that the host MCU is powered up as mentioned in Power On sequence and that the WINC built-in UART is connected to PC via a serial to USB converter. If the host MCU already running the serial bridge firmware, then it is possible to download the certificates through host MCU also.
2. Paste the certificates in `/src/firmware/Tools/root_certificate_downloader/crt` folder
3. Run `RootCertDownload.bat` to start the download.
4. After few seconds the following message should appear, meaning that the certificates are update procedure.

Figure 6-1. Root Certificates Download : Success

```

Administrator: Root Certificate Downloader - Atmel Corporation
Exponent
01 00 01
SIGNATURE
93 24 4A 30 5F 62 CF D8 1A 98 2F 3D EA DC 99 2D
BD 77 F6 A5 79 22 38 EC C4 A7 A0 78 12 AD 62 0E
45 70 64 C5 E7 97 66 2D 98 09 7E 5F AF D6 CC 28
65 F2 01 AA 08 1A 47 DE F9 F9 7C 92 5A 08 69 20
0D D9 3E 6D 6E 3C 0D 6E D8 E6 06 91 40 18 89 F8
C1 ED DF DB 41 AA E0 96 20 C9 CD 64 15 38 81 C9
94 EE A2 84 29 0B 13 6F 8E DB 0C DD 25 02 DB A4
8B 19 44 D2 41 7A 05 69 4A 58 4F 60 CA 7E 82 6A
0B 02 AA 25 17 39 B5 DB 7F E7 84 65 2A 95 8A BD
86 DE 5E 81 16 83 2D 10 CC DE FD A8 82 2A 6D 28
1F 0D 0B C4 E5 E7 1A 26 19 E1 F4 11 6F 10 B5 95
FC E7 42 05 32 DB CE 9D 51 5E 28 B6 9E 85 D3 5B
EF A5 7D 45 40 72 8E B7 0E 6B 0E 06 FB 33 35 48
71 B8 9D 27 8B C4 65 5F 0D 86 76 9C 44 7A F6 95
5C F6 5D 32 08 33 A4 54 B6 18 3F 68 5C F2 42 4A
85 38 54 83 5F D1 E8 2C F2 AC 11 D6 A8 ED 63 6A
**==**
>Root certificate verified OK.
>Start erasing...
Done
#Erase time = 0.031000 sec
>Writing the certificate to SPI flash...
>Start programming...
Done
#Programming time = 0.218000 sec
Done
>>This task finished after 3.00 sec
Press any key to continue . . .
  
```

Result: TLS/SSL root certificates are successfully updated.

7. Gain Values Download

Gain setting values, are those values used by RF with different rates to configure transmission power.

7.1 Modify Gain Values

.csv file in the `src/firmware/Tools/gain_builder/gain_sheets` folder holds the gain values. The following figure shows the template of .csv file. The .csv file must be sorted based on gain rates (Row) and for all channels (Coloumn).

Figure 7-1. Gain Sheet Template

ch	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1														
2														
5.5														
11														
6														
9														
12														
18														
24														
36														
48														
54														
mcs0														
mcs1														
mcs2														
mcs3														
mcs4														
mcs5														
mcs6														
mcs7														

Insert Your Values

7.2 Batch Script

The gain values are downloaded as part of the complete download process explained in previous sections. It is not possible to download the gain values alone. The modified gain values can be downloaded as below:

1. .csv file in the `src/firmware/Tools/gain_builder/gain_sheets` folder holds the gain values. The values can be changed in the default .csv file.
2. If the new gain values are available in different file with a different path, then open `download_all.bat` from `src/firmware` and update it with the new path and file like:
`GAIN_FILE=-hp ../gain_sheets/samd21_gain_setting_hp.csv → GAIN_FILE=-hp c:/gain_values.csv`
3. After modifying the gain values using either of above steps, follow the steps mentioned in [Serial Flash Download via Serial Bridge](#) or [Serial Flash Download via Built-in UART](#) to download the new gain values.

8. Document Revision History

Revision A (February 2017)

- Initial release.

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