Quick Start Guide
SWRU470–February 2017

SimpleLink™ Wi-Fi® CC3220 Out-of-Box Application

This quick start guide details the out-of-box experience for the CC3220 LaunchPad™ Development Kit from Texas Instruments™.

The CC3220 device is part of the SimpleLink™ microcontroller (MCU) platform which consists of Wi-Fi®, *Bluetooth*® low energy, Sub-1 GHz and host MCUs, which all share a common, easy-to-use development environment with a single core software development kit (SDK) and rich tool set. A one-time integration of the SimpleLink platform enables you to add any combination of the portfolio's devices into your design, allowing 100 percent code reuse when your design requirements change. For more information, visit www.ti.com/simplelink.

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Trademarks

1 Introduction

This quick start guide details the out-of-box (OOB) experience for the CC3220 LaunchPad Development Kit from Texas Instruments.

The focus is on using the SimpleLink Wi-Fi Starter Pro application (available both on iOS™ and Android™). It is also possible to run the demo using any browser. In the later method, web pages stored on the serial flash are loaded on the browser and provide the same functionality as the mobile application does. Working with the on-chip web pages is described in detail in the *SimpleLink™ Wi-Fi® CC3220 Out-of-Box Application Quick Start Guide*.

The following features are highlighted:

- Easy connection to the CC3220 LaunchPad using SimpleLink Wi-Fi Starter Pro application. Users can use AP provisioning or SmartConfig™ provisioning for fast connection. Once the device is provisioned and connected to an access point in station mode, the profile is stored on the local file system so that any reset to the CC3220 automatically makes it connect to the access point.
- Over-the-air update, demonstrating an update of a full image. OTA service enables in-system update of the MCU application, CC3220 firmware releases (also known as *Service Pack*) made available by Texas Instruments and other vendor files. Update procedure executed in a full system integrity fashion, that is, failure in upgrading any of the image components would lead to rolling back to the previous valid version.
- Easy access to the CC3220 device demonstrates configuring and reading onboard sensors.

This quick start guide is intended for basic level users who would like to experience the OOB image as is. This quick start guide also assumes that the OOB is already programmed on the CC3220 LaunchPad. If this is not the case, please see *SimpleLink™ Wi-Fi® CC3220 Out-of-Box Application User's Guide*. The guide is structured chronologically starting from required downloads and installations, then building the setup, and experiencing the demo.

2 Download and Installation

In an effort to make the out-of-box guide as self-contained as possible, all download and installation steps are described in detail here.

2.1 UniFlash

The UniFlash utility lets the developer download the application image, service pack, and other files on the serial flash of the CC3220 device. Follow these steps to install UniFlash.

1. Download UniFlash for CC3x20. If UniFlash is not available online, use the offline version (v4.x or later).
2. Run the installer by double clicking on it.
3. Read and accept the license agreement to proceed.
4. Choose the desired path to place the package (otherwise the default is chosen).
5. Proceed with the installation, and click the Finish button when done.

2.2 SimpleLink™ Wi-Fi® Starter Pro Mobile Application

This application can be downloaded and installed through the application store. It is available on both iOS™ and Android. Look for *SimpleLink Wi-Fi Starter Pro* (see Figure 1).

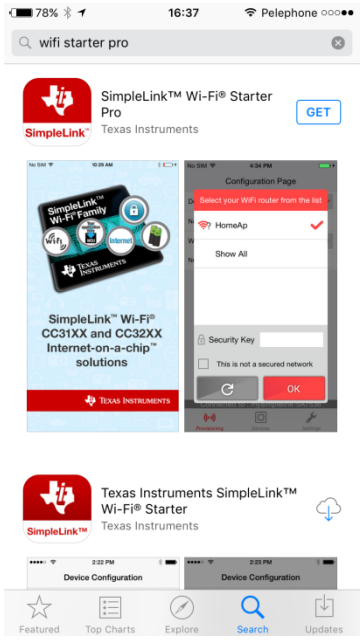

Figure 1. SimpleLink™ Wi-Fi Starter Pro

2.3 Serial Terminal

Many sample applications come with UART support for printing the debug information, or status of any operation. Some applications require user input through the UART, so TI advises installing a serial terminal application. Tera Term is used for demonstration here, but the Code Composer Terminal may also be used. Follow these steps to instal Tera Term:

1. Download Tera Term, and install as per the instructions.
2. Run the Tera Term application.

3. Select the Serial Port shown as XDS110 Class Application/User UART (see Figure 2).

   Be sure to install the XDS110 drivers for the PC to enumerate these ports for the serial terminal. Refer to Section 2.4 for installation of the XDS110 drivers.

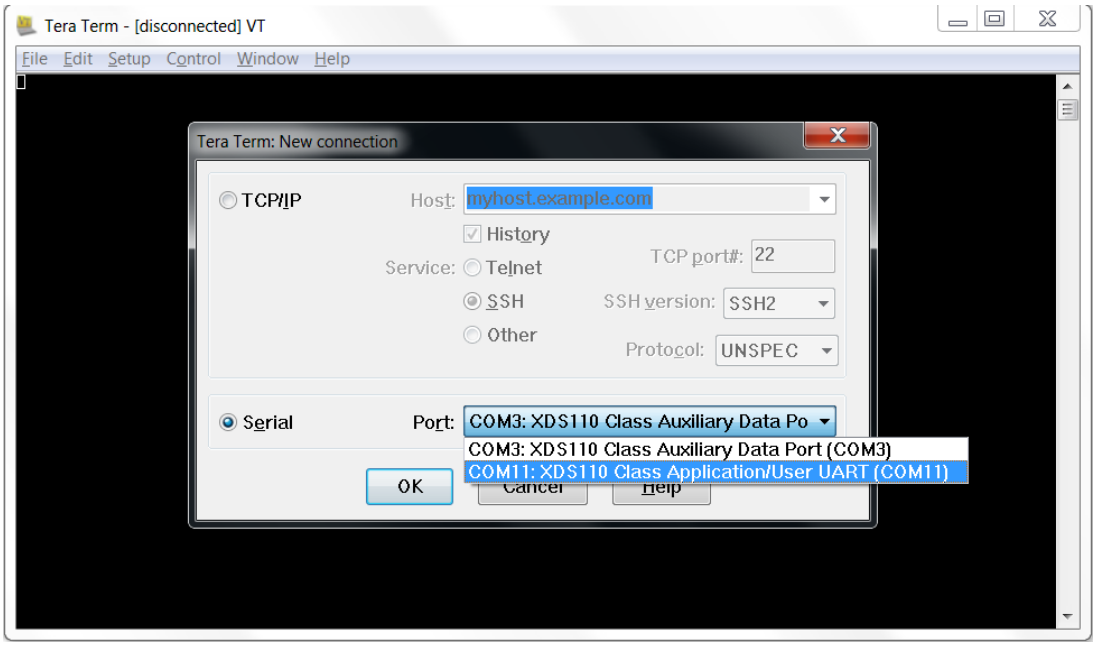

Figure 2. Tera Term New Connection Window

4. Go to Setup → Serial port (see Figure 3).

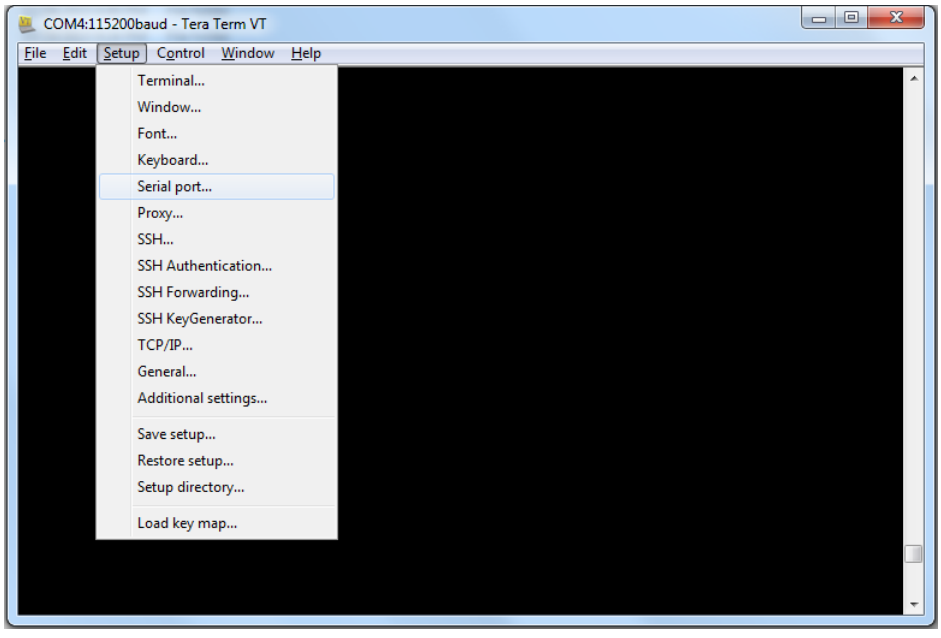

Figure 3. Tera Term Serial Port Tab

5. Configure the settings as per Figure 4.

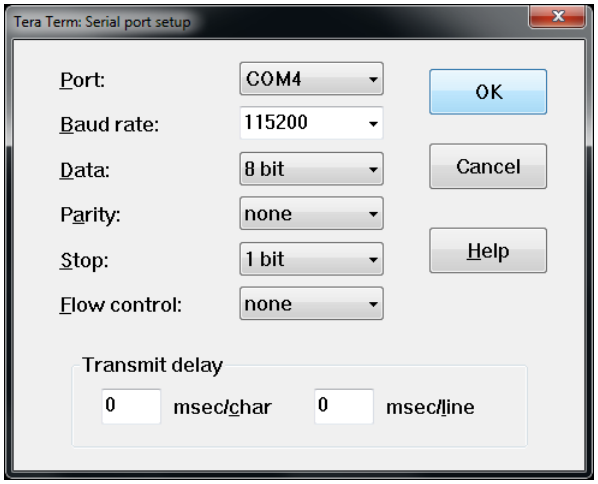

Figure 4. Tera Term Serial Port Settings

2.4 XDS110 Driver Installation

XDS110 drivers must be installed before using the debugger or image creator. The drivers also enumerate the serial terminal port, which can be used for printing the debug messages over the UART. The XDS drivers can be obtained through the XDS110 driver installation.

Follow these steps for the installation:

1. Run the installer in Administrator mode, and click the Next button (Figure 5).

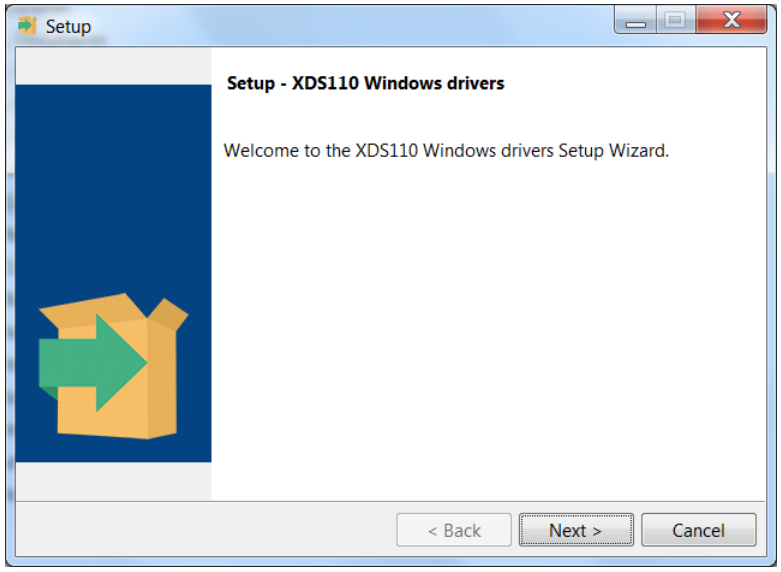

Figure 5. XDS110 Driver Setup Wizard

2. Read and accept the license agreement, and click the Next button (see Figure 6).

Figure 6. XDS110 Driver License Agreement

3. Specify the installation path (default is c:\ti\), and proceed with the installation (see Figure 7).

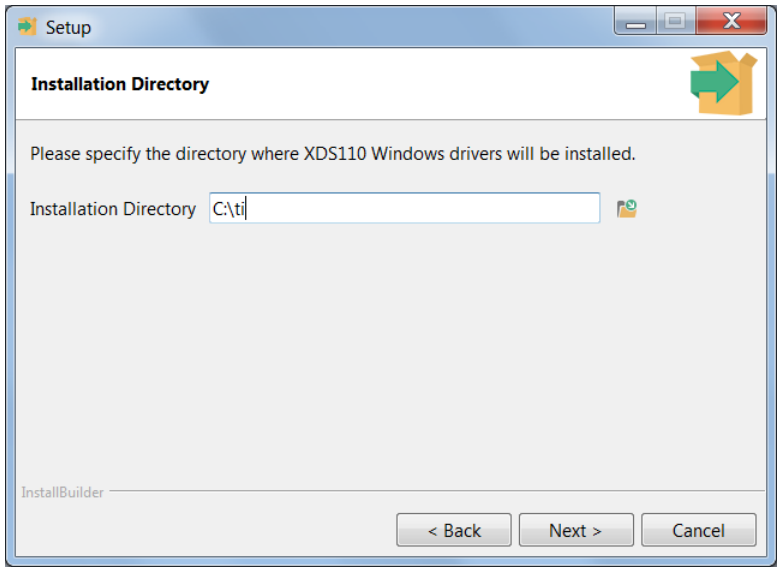

Figure 7. XDS110 Driver Installation Directory

4. Click the Finish button after the installation is done (Figure 8).

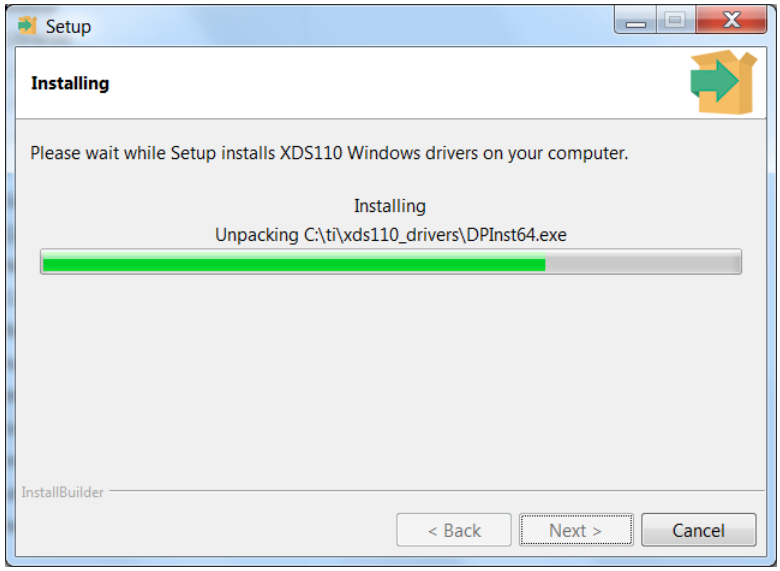

Figure 8. XDS110 Driver Installation Complete

3 Building the Setup

The following components are required:

- A CC3220 LaunchPad flashed with the out-of-box package with the jumpers set correctly. See Figure 9 for reference when powering from USB. J5 is not mandatory
- Micro USB cable
- Mobile or tablet with SimpleLink Wi-Fi Starter Pro application installed. An internet connection is required for the OTA procedure, because the software package is retrieved from the cloud.
- Local access point

To power up the CC3220 LaunchPad, connect it to the PC or to any USB power supply. The CC3220 LaunchPad out of the box should already contain the application, so there is no need to flash it; that is, flashing the OOB project paragraph is not required.

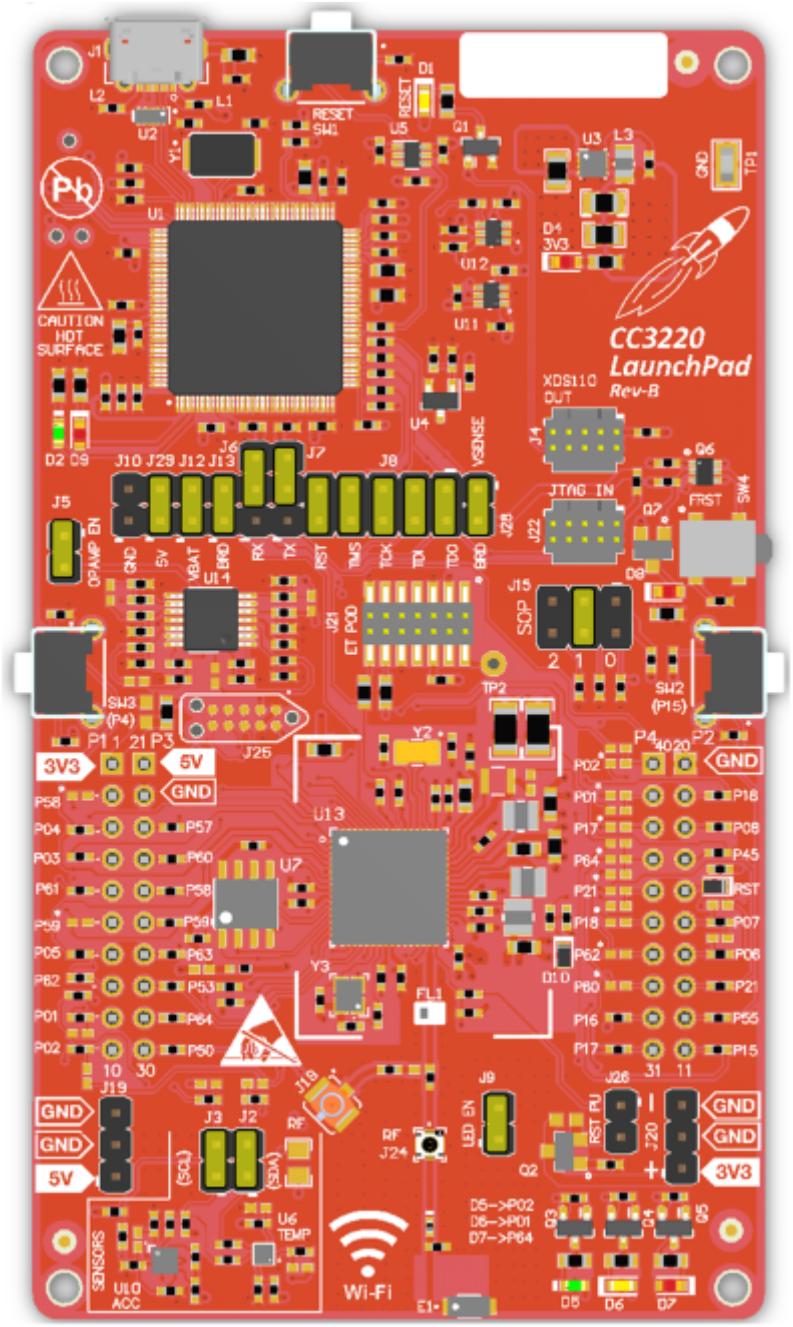

Figure 9. CC3220 Default Jumpers Settings

4 Getting Started With the Out-of-Box Demonstration

4.1 Returning to Factory Image

The out-of-box application enables users to go back to the factory image. Factory image means that the original image stored on the serial flash is extracted, erasing all content from the serial flash. This assumes that an out-of-box image resides on the serial flash; otherwise, users must reprogram the CC3220 using the UniFlash utility. Returning to the factory image is equivalent to reprogramming an image from scratch.

One scenario where users must return to the factory image is if a profile exists and must be replaced by another one.

Returning to the factory image is an embedded feature, and is not application-dependent.

The procedure is described in the *Restore to Factory by Using the SOP* section of the *SimpleLink™ Wi-Fi® and Internet of Things CC3120 and CC3220 Network Processor Programmer's Guide*.

The procedure is as follows:

1. Set the SOP to 011 (SOP2 = 0, SOP1 = 1, SOP0 = 1), and perform power on reset (POR). Device reset can be simply done by pressing SW1 Reset switch. See Figure 10 for reference of SOP jumpers.

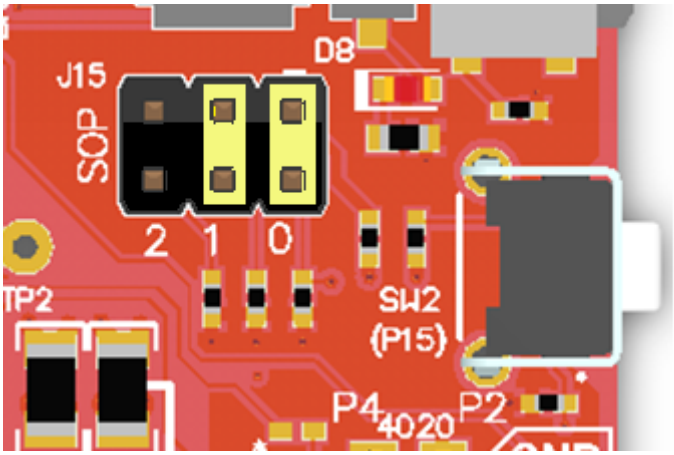

Figure 10. SOP Jumpers Configuration

2. The device is initiated in Restore to Factory phase, set the SOP jumpers to 000 (SOP2 = 0, SOP1 = 0, SOP0 = 0).
3. At this point, returning to the factory image occurs because the image is large, and the entire file system is recreated, which may take up to 1 minute to complete. Upon successful completion, the default OOB application executes.
   - The terminal message should instruct the user to perform POR.
   - Because the application is initiated, the red LED starts flashing once every second.
4. The OOB application requests the user perform POR. Manual reset is mandatory in this case.
5. The user performs POR and the default OOB application is executed.

At this point, the device is returning to the factory image. Because the image is large and the entire file system is recreated, it may take up to a minute to complete. Upon successful completion, the default out-of-box application should execute.

4.2 Connecting to the CC3220

Connection to the CC3220 device can be applied either by provisioning it or by direct connection when the CC3220 is set as an access point.

Because this document describes provisioning only, access point mode is not described. Working with the CC3220 in access point mode is described in detail in the *CC3220 SimpleLink™ Wi-Fi® Out-of-Box User's Guide*.

Using *SimpleLink Wi-Fi Starter Pro*, the user can start AP or SmartConfig provisioning for a fast connection. During this procedure, the access point credentials are decoded by the CC3220, and a profile is stored on the serial flash for future connection.

By default, the out-of-box application starts in provisioning mode. It is reflected by a blinking red led (labeled D7) once every 2 seconds. Terminal can also be used for extra debug messages. A Waiting to be provisioned message appears when the device is ready to be provisioned.

The provisioning procedure for SmartConfig is described as follows.

1. Open the application and navigate to the Settings tab. Ensure the Enable Smart Config setting is set to ON (Smart Config is the preferred provisioning method, see Figure 11).

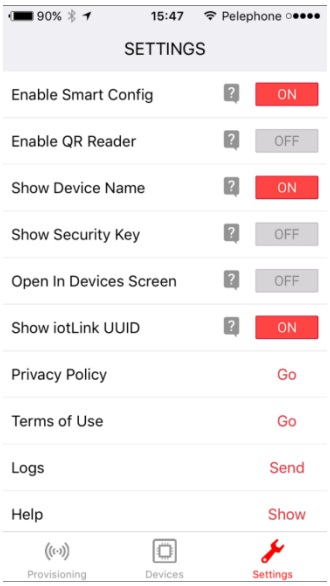

Figure 11. Wi-Fi Starter Settings Tab

2. Navigate to the provisioning tab to configure the AP credentials. Click on the START CONFIGURATION button to start the process (see Figure 12).

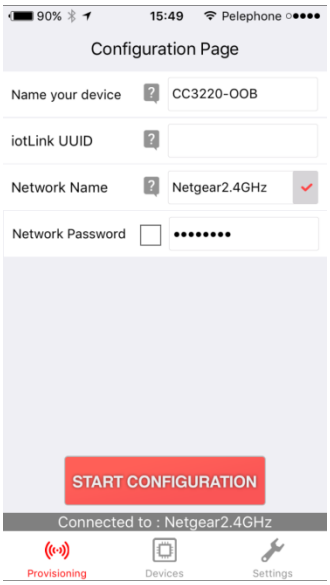

Figure 12. Wi-Fi Starter Provisioning Tab

3. Successful provisioning is indicated on the mobile application as shown in Figure 13, Figure 14, and Figure 15. On the LaunchPad, the red Led (D7) turns solid on.

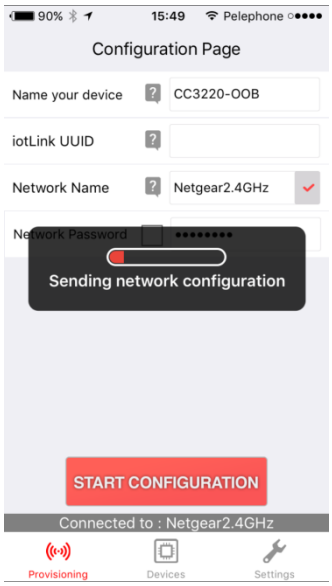

Figure 13. Wi-Fi Starter Provisioning Process (1/3)

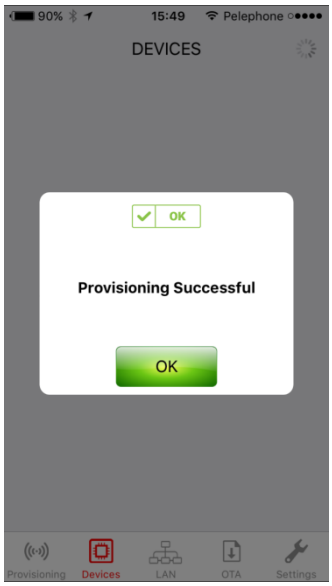

Figure 14. Wi-Fi Starter Provisioning Process (2/3)

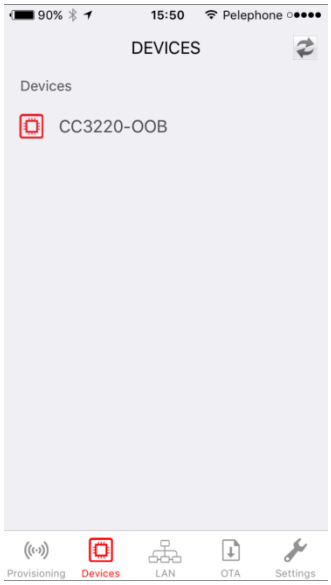

Figure 15. Wi-Fi Starter Provisioning Process (3/3)

Additional LAN and OTA tabs are applicable only to the OOB and automatically open after provisioning is successfully completed. If these tabs do not show up, navigate to the Devices tab and select the device by pressing and holding it.

4.3 Use the Mobile Application

One way to control the CC3220 running the out-of-box demo is by using *SimpleLink Wi-Fi Starter Pro*. This application can be downloaded and installed through the application stores. Look for *Wi-Fi Starter Pro*.

4.3.1 Connect to the CC3220

The application includes the following tabs: Provisioning, Devices, and Settings. Additional LAN and OTA tabs are applicable to out-of-box only, and are automatically opened after provisioning is successfully completed.

NOTE: If these tabs do not appear, navigate to the Devices tab and select the device by holding the button down.

If the device has never been provisioned, refer to Section 4.2. If the device has already been provisioned, it should automatically connect to an access point so that users can start playing with LAN and OTA demonstrations. If the access point credentials have not been provisioned by *SimpleLink Wi-Fi Starter Pro*, or if *SimpleLink Wi-Fi Starter Pro* was started while the device was already provisioned and connected to the access point, the user must bind the application to the desired device. In this case, navigate to the Devices tab and select the device by long-pressing it.

4.3.2 Local Network Demo

On this tab and screen, the user can control and get the state of the onboard sensors. These sensors include the red LED (D7) and the accelerometer. Device-specific information can also be fetched. The list of HTTP methods is described in Table 1.

Table 1. HTTP Server Methods

Service	Operation	Description
Device	Get	Fetches MAC address, IP address, and SSID of the access point the CC3220 server is connected to. If the CC3220 is in access point mode, the SSID is the name of the CC3220 device.
Light	Get/Post	Fetches and updates the state of the onboard red LED (labeled D7)
Sensor	Get	Fetches the value of X/Y/Z accelerometer axis
Ota	Put	Uploads the over-the-air image to the CC3220 web server
Ota	Get	Fetches the current over-the-air version

Figure 16 shows device information, status of the onboard red LED (D7), and periodic accelerometer readings of the CC3220 LaunchPad board.

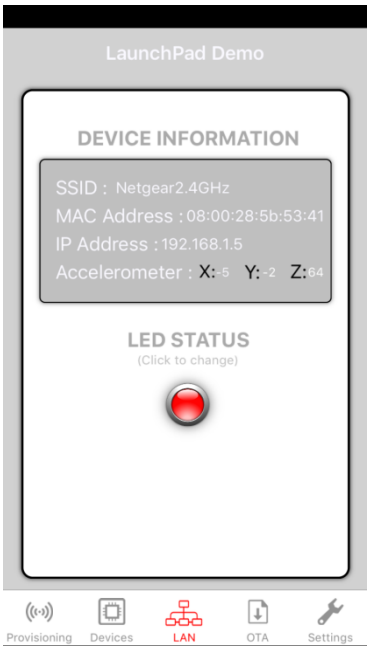

Figure 16. Mobile App LAN Tab

To change the state of the red LED (D7), tap on the LED icon.

To show board movement, move the CC3220 board. The update rate is once every second.

4.3.3 Over-the-Air Update

On this tab and screen, the user can see the current software version running on the CC3220 out-of-box application. Users can check for a new software version by clicking the Check for software update button. The application then connects to a cloud server where the software version is stored, and downloads it. Users may modify this link by long-tapping the download icon next to Check for software update label, and filling the new URL. The procedure is monitored by an upload progress bar, which gets feedback from the CC3220 device itself during the process.

The over-the-air update is adapted to the out-of-box application. If the user either programed other examples or modified the out-of-box application, they must program an official out-of-box again. Refer to .

The procedure is as follows:

1. Click the Check for software update button to test whether a new software version exists. As shown in Figure 17, Current software version shows that no version file exists on the device, and New software version shows that no file has been downloaded from a data store server. If the device is updated, an appropriate informative message pops up asking for the user to manually approve it if desired.

Figure 17. Mobile App OTA Tab

In Figure 18, clicking the Check for software update triggers a new software version download from a data store server, as indicated by New software version.

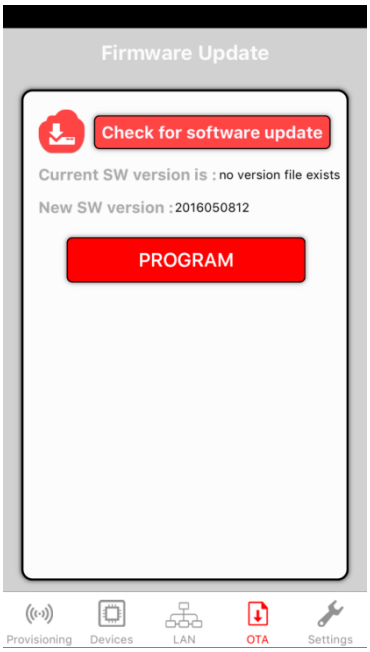

Figure 18. Mobile App Check for Software Update Completed

Alternatively, the user may modify this link by long-tapping the download icon next to the Check for software update label, and filling the new URL, as shown in Figure 19.

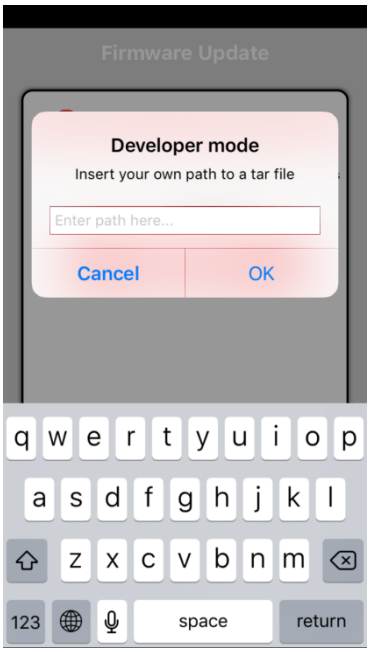

Figure 19. Mobile App Private OTA Repository

2. If a new software version has been downloaded, start the software update by clicking the Program button, as shown in Figure 20 and Figure 21.

Figure 20. Mobile App OTA Started

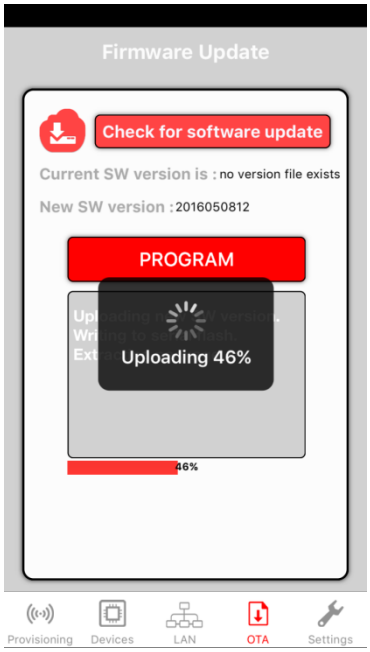

Figure 21. Mobile App OTA in Progress

An upload progress bar should appear with the following messages:

- Download started
  - Uploading new software version
  - Extracting archive file
  - Writing to serial flash
- Download done
  - Rebooting…
  - Testing new software version
- Verdict
  - When successful → “Done”
  - When failed → “OTA Update failed”

After a successful update, the new version should appear under the New software version section, as shown in Figure 22. An Upload finished! message appears on the bottom of the screen, and the screen is enabled again.

Figure 22. Mobile App OTA Done

Table 2 lists some abnormal behaviors of the over-the-air procedure.

Table 2. OTA Abnormal Behavior From Mobile App

Behavior	Cause	Solution
Progress bar does not start	Client is not able to open connection to the CC3220 report server	Usually, it is harmless. Users should probe the red LED (D7), terminal messages, and the mobile application for more information. After a successful process, the red LED (D7) should stop its rapid blinking, turn solid momentarily, and follow local network connection procedure, as described under Red LED legend. Terminal messages should indicate a successful OTA update process, as described under Terminal messages. The mobile application should show no error message, and the current software version field should be updated to the new version. The user can then navigate to the Demo tab and continue with the demonstration.
Progress bar is stuck	Client is not able to communicate with the report server, or some error occurred during the process	If the client is not able to communicate, the over-the-air procedure may still finish successfully. In this case, the same applies as for when the progress bar does not start (follow the above item on this table). If errors occur, the red LED (D7) should stop its rapid blinking and turn solid off. Users can restart OTA.

4.3.4 Local OTA When CC3220 is in Access Point Mode

When the CC3220 device is set in access point mode, the mobile application can communicate to it as if both were connected though a local access point. The only use case that requires clarification is the over-the-air feature, because the image for updates resides on a cloud server and, as the mobile application is connected to the CC3220, it cannot fetch and download the image.

Follow the steps below to upgrade the image:

1. Set the CC3220 LaunchPad as an access point.
2. Go to Wireless Settings, locate the SSID of the CC3220 LaunchPad, and connect to it (it should start with a mysimplelink prefix). At this point, the terminal should display a printout stating a device has been connected.
3. Open *SimpleLink Wi-Fi Starter Pro* and navigate to the Devices tab. The connected CC3220 with the MAC address as a prefix on the list should be displayed.
4. Long-press the icon until a pop up message with the IP address, LAN, and OTA tabs appears.
5. Return to Wireless Settings, and connect to an access point with an internet connection.
6. Return to *SimpleLink Wi-Fi Starter Pro* and navigate to the OTA tab. Click the Check for software update, and the image should be downloaded.
7. Go to Wireless Settings, locate the SSID of the CC3220 LaunchPad, and connect to it.
8. Return to *SimpleLink Wi-Fi Starter Pro* and navigate to the OTA tab. The version can now be upgraded.

5 Troubleshooting

5.1 Red LED Legend

This section lists all the state options of the red LED (D7). Red LED (D7) indication helps the user to both understand the application flow and debug cases where the application does not behave as expected. Only the red LED (D7) is used for status indication, and as such, similar indications may be applied in more than one occasion. To distinguish similar indications, be aware of the executed procedure.

Table 3 lists all options.

Table 3. LED Indication Legend

Red LED Indication	Procedure	Interpretation
Blinking once in 2 seconds	Provisioning	The CC3220 is being provisioned.
Solid on	Provisioning	Connection to the access point is up.
Solid off	Provisioning	Connection to the access point is down.
Blinking once a second	Local network connection	For station mode, connection to the access point is in progress. For access point mode, initialization is in progress.
Solid on	Local network connection	For station mode, connection to the access point is up. For access point mode, initialization is done.
Solid off	Local network connection	Applies in station mode only. Connection to the access point is down.
Blinking 5 times a second	Over-the-air update	Over-the-air update of the CC3220 is in progress.
Solid on	Over-the-air update	Over-the-air update of the CC3220 succeeded.
Solid off	Over-the-air update	Over-the-air update of the CC3220 failed.

5.2 Terminal Messages

Terminal can also be used for debugging messages. The default configuration is 115200bps, 8 bits, no parity, and 1 stop bit. Most of the debug messages are self-explained.

For better tracking, each message is preceded with square parentheses that include the task and module generating the message.

Table 4 lists some common messages to help users track the application status.

Table 4. Terminal Messages

Message	Meaning
[Provisioning task] Provisioning Started. Waiting to be provisioned..!!	The CC3220 is in provisioning mode. The user should use *SimpleLink Wi-Fi Starter Pro* to provision the device.
[ProvisioningEvent] Connection to AP succeeded	During provisioning, the CC3220 managed to decode the access point credentials and connect to it successfully.
[ProvisioningEvent] Confirmation Success!	During provisioning, the CC3220 managed to feedback *SimpleLink Wi-Fi Starter Pro*.
[Provisioning task] Provisioning completed successfully..!	Provisioning process completed successfully
[ProvisioningEvent] Provisioning stopped	Provisioning is stopped. May indicate the following: • Successful provisioning • Inactivity timeout elapsed • Upon general error
[Provisioning task] committing new ota download...	Upon end of an OTA procedure, indicates a new software package is being committed.
[Provisioning task] commit succeeded	New OTA software package committed successfully.
[Provisioning task] Rollback error sl_FsCtl	New OTA software package failed its validation testing (connect to AP while in station mode or initialize while in access point mode), reverting to previous software package.

Table 4. Terminal Messages (continued)

Message	Meaning
[Provisioning task] failed to commit new download, reverting to previous copy by reseting the device	New OTA software package failed to commit, reverting to previous software package.
Return To Factory Image successful, Do a power cycle(POR) of the device using switch SW1-Reset	After a return-to-factory is triggered and the device is up, a manual reset is required from the user to complete the operation
Connection Success (feedback to Smartphone app failed)	During provisioning, the CC3220 connected to the access point successfully but failed to feedback *SimpleLink Wi-Fi Starter Pro*.
[Link local task] HTTP GET Request	Indicates client HTTP GET request. For details, refer to HTTP server methods.
[Link local task] characteristic is:	During HTTP request, indicates the relevant resource.
[Link local task] HTTP POST Request	Indicates client HTTP POST request. For details, refer to HTTP server methods.
[Link local task] value is:	During HTTP request, indicates the value of the resource.
[Link local task] HTTP PUT Request	Indicates client HTTP PUT request. For details, refer to HTTP server methods.
[Link local task] Received OTA filename	Archive filename received during over-the-air update. Filename and file size should follow.
[Link local task] OTA filename should be in *.tar format	Archive filename received during over-the-air update is not in tar format.
[Link local task] ota bundle version file does not exist	OTA version file does not exist on file system. This is informative, not an error.
[OtaArchive_CheckVersion] accept the new version	OTA version file does not exist on file system. New version is accepted. Version number should follow.
[OtaArchive_CheckVersion] newer version update	New OTA version is newer than the stored version.
[OtaArchive_CheckVersion] older version update	New OTA version is older than the stored version.
[OtaArchive_RunParseTar] Create/Open for write file	File is updated on file system during an over-the-air update. Filename should follow.
[OtaArchive_RunParseTar] Downloading File Completed	File has been downloaded and updated on file system successfully during an over-the-air update.
[ota report task] OTA progress	Progress bar in percentages during an over-the-air update.
[Link local task] sl_extLib_OtaRun: ---- Download file completed	Over-the-air procedure completed successfully.
[Link local task] sl_NetAppRecv error	Error in communication with client during an over-the-air update. Error code should follow.
[Link local task] OtaArchive error	Error in archive module during an over-the-air update. Error code should follow. For details, refer to OtaArchive.h header file.
[Control task] switching to AP mode	The CC3220 is switching to access point mode.
[Control task] device not started in AP role	Configuring the CC3220 as an access point failed.
[Control task] device started in AP role, rebooting device...	Switching to access point mode succeeded, rebooting application.
[Control task] device cannot start in AP mode, please reset the board	Switching to access point mode failed. Manual reset is required.
[ERROR] - FATAL ERROR	Fatal error occurred. Manual reset is required.

6 Limitations and Known Issues

- Up to20 non-default files can be updated during over-the-air updates. Default files include files that are non-secured, part of a bundle, failsafe, and with the size of the original file.
- Maximal file length inside tar archive is 100 bytes. It is the full path as appears in the tar file itself (including all directories from root). This is a limitation in the uncompressed tar format.
- Rarely, after provisioning is completed, the LAN and OTA tabs do not appear. If these tabs do not appear, navigate to the Devices tab and select the device by long-pressing it.
- Rarely, the progress bar does not start or starts but freezes in the middle, even if the over-the-air update procedure is successful. In these cases, the red LED (labeled D7) indication and terminal printouts show the true status of the procedure, and the Web client or mobile application should eventually indicate a successful process.

Revision History

Date	Revision	Notes
February 2017	SWRU470*	Initial release

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