Make Every Device Connected

The SimpleLink Wi-Fi CC3200 LaunchPad

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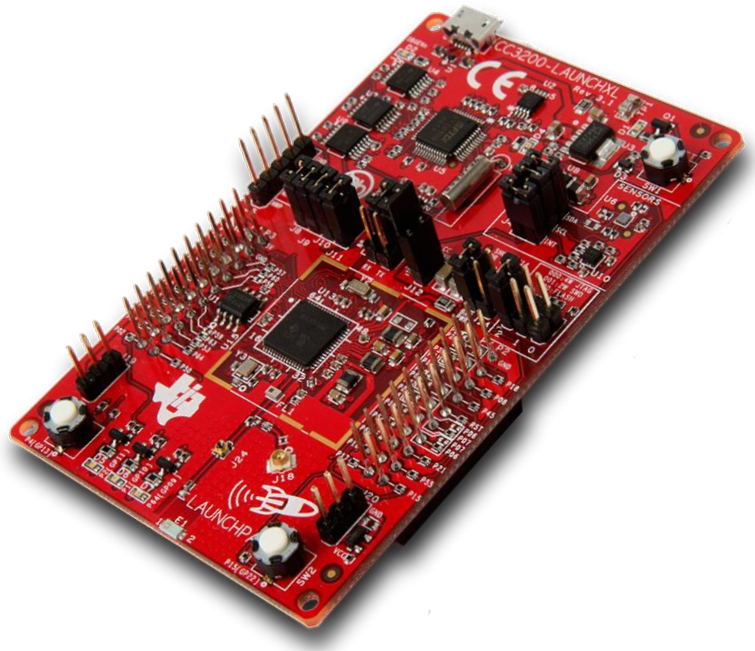
E2E MVP

TI E2E™ Community

engineer to engineer, solving problems

Agenda

- **Opportunity**
  - Growth
  - Device Diversification
- **Solution**
  - CC3200 LaunchPad
  - CC3200 Single-Chip Wireless MCU
- **Product Development Ecosystem**
  - BoosterPacks
  - Software Tools
  - Hardware Design Resources
  - Documentation
  - E2E Community
- **Product Examples**
  - Sensor and Control: Out Of Box
  - Internet of Things (IoT): Exosite
  - Home Automation: LightServer



The CC3200 LaunchPad

TI's SimpleLink Wi-Fi Family

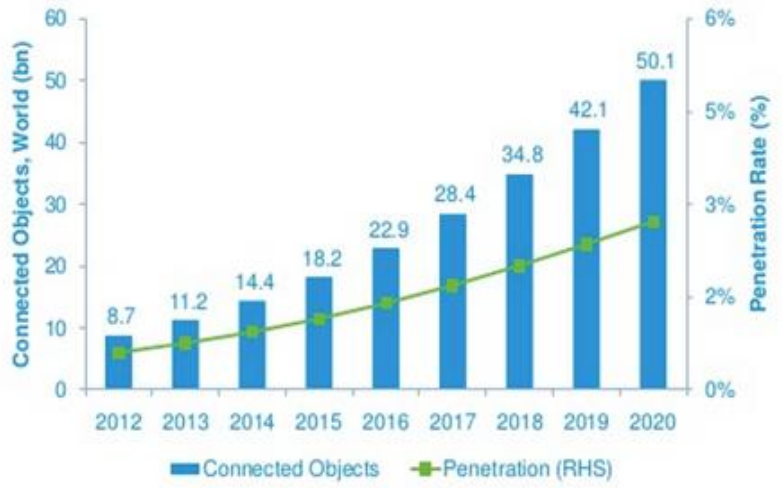
Opportunity

<u>Why</u> should you be interested in the CC3200 LaunchPad?

Growth

- Many devices previously not connected are expect become connected
- Growth will be rapid
- Wi-Fi likely to be the technology of choice for many devices
- Low cost devices require low cost solutions

Number of Connected Objects Expected to Reach 50bn by 2020



Penetration of connected objects in total 'things' expected to reach 2.7% in 2020 from 0.6% in 2012

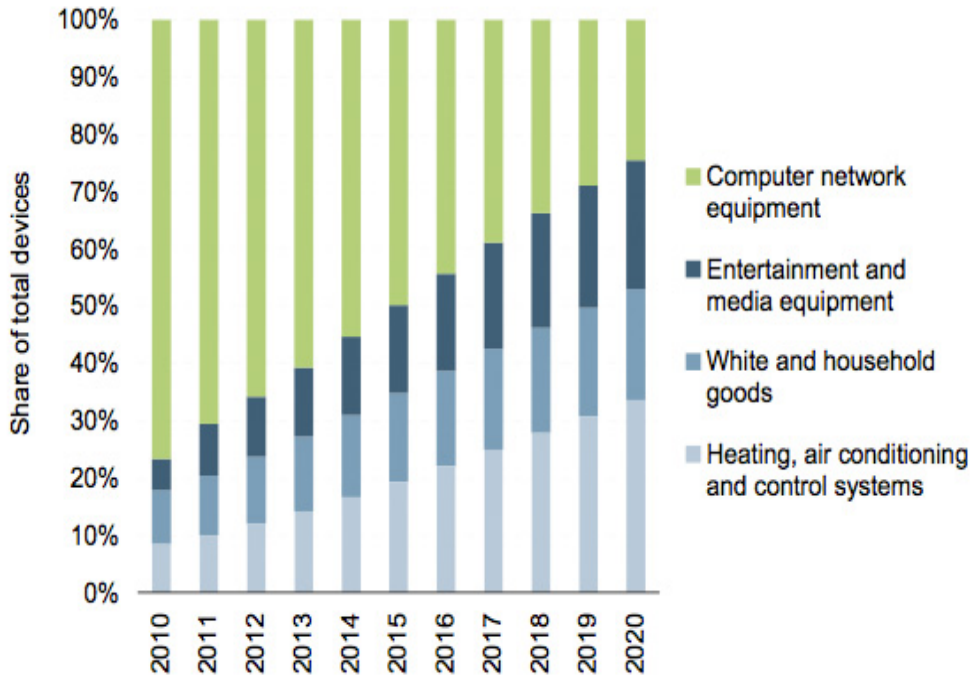
Source: CCS, 2013

Source: Cisco

Device Diversification

- The market share of connected devices will alter rapidly
- Many different types of devices will become connected
- Consumer household devices expected to lead growth
- All industries effected: Industrial, Automotive, Medical etc.

Share of Internet Connectable Consumer Household Devices



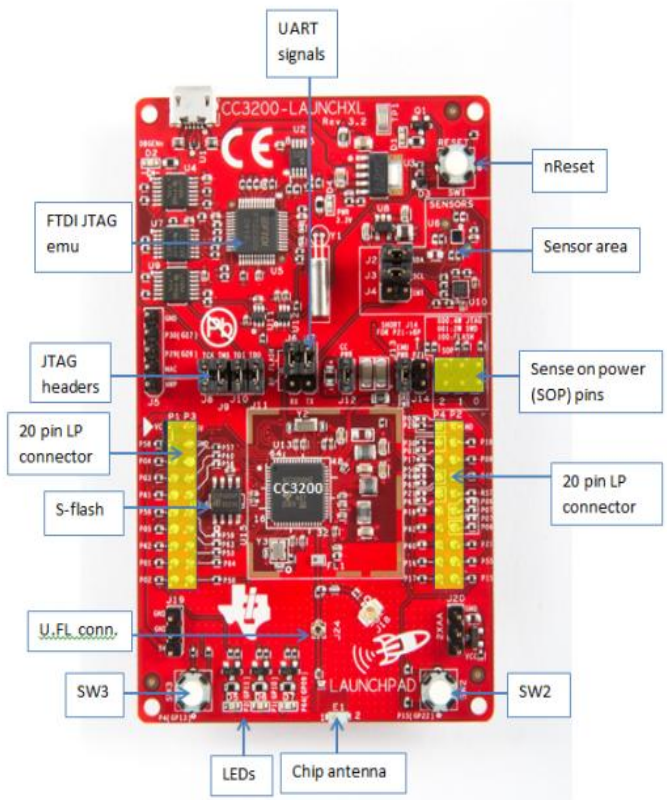
Source: Analysys Mason

Solution

What is the CC3200 LaunchPad?

CC3200 LaunchPad

- Wifi Development Board
- CC3200 Single Chip Wireless MCU
- 40-pin BoosterPack Headers
- Micro USB connector for power and debug
- FTDI based JTAG emulation with serial port for Flash programming
- 8mbit/1MB external serial flash
- Two buttons and three LEDs
- On-board accelerometer and temperature sensor
- On-board chip antenna and U.FL connector

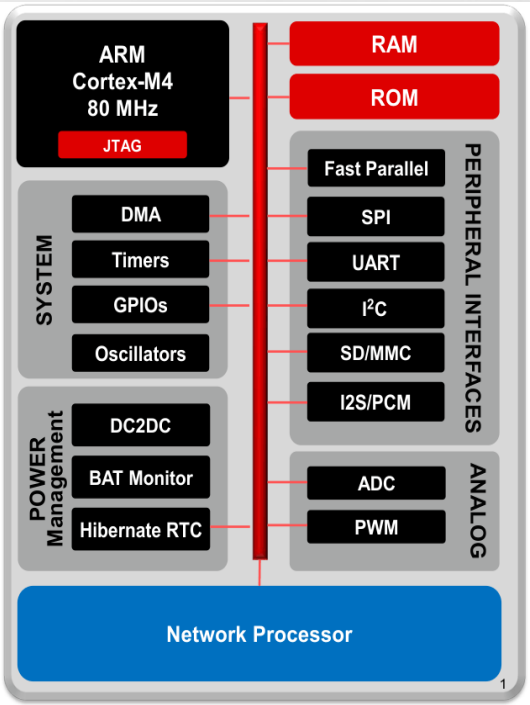


CC3200 Single-Chip Wireless MCU

Industry's first single-chip microcontroller with built-in Wi-Fi

- **Applications Microcontroller Subsystem**
  - ARM Cortex-M4 80Mhz Processor
- **Wi-Fi Network Processor Subsystem**
  - Dedicated ARM MCU - Completely Offloads Wi-Fi and Internet Protocols from the Application Microcontroller
- **Power-Management Subsystem**
  - Integrated DC-DC Supports a Wide Range of Supply Voltage
  - Advanced Low-Power Modes (2xAA Batteries for over a Year!)
- **Clock Source**
  - 40.0-MHz Crystal with Internal Oscillator
  - 32.768-kHz Crystal or External RTC Clock
- **CC3200 Module** (Available 3rd Quarter 2014)
  - An FFC certified module that includes serial flash and crystal/RTC

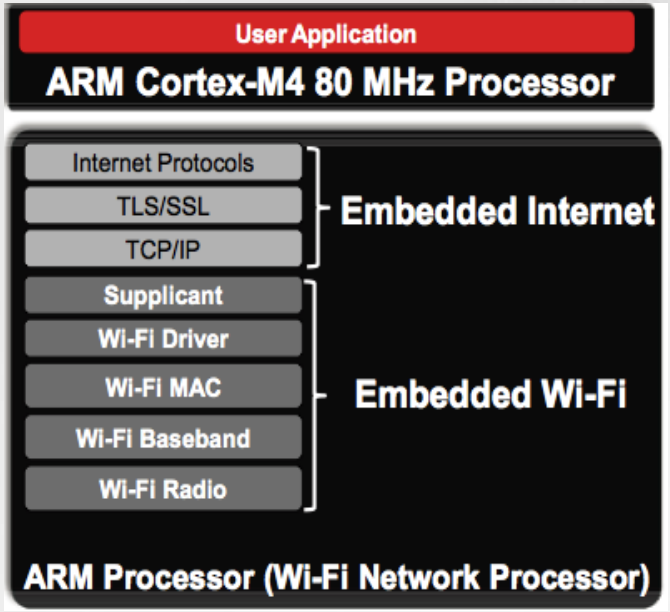
Applications Microcontroller Subsystem



Powerful ARM Cortex-M4 80Mhz Microcontroller

- 256KB RAM
- 32-Channel µDMA
- 8-Bit Parallel Camera Interface
- 1 McASP, 1 SD/MMC, 2 UART, 1 SPI, 1 I2C
- 4 General-Purpose Timers with 16-Bit PWM Mode
- 1 Watchdog Timer
- 4-Channel 12-Bit ADCs
- Up to 27 Individually Programmable Muxed GPIOs
- Hardware Crypto Engine AES, DES, 3DES, SHA2, MD5 CRC and Checksum

Wi-Fi Network Processor Subsystem



Dedicated ARM Cortex M3 Microcontroller
Completely Offloads Wi-Fi and Internet Protocols from the Application Microcontroller

- 802.11 b/g/n Radio, Baseband, MAC, Wi-Fi, Supplicant
- Station, AP, and Wi-Fi Direct® Modes
- Multiple provisioning methods including SmartConfig™, AP Mode and WPS
- Embedded TCP/IP Stack including mDNS
- Embedded BSD Sockets API
  - 8 Simultaneous TCP or UDP Sockets
  - 2 Simultaneous TLS and SSL Sockets
- Onboard HTTP web server for configuration and custom applications
- Powerful Crypto Engine with 256-Bit AES Encryption for TLS and SSL Connections
- WEP, WPA, WPA2 Personal and Enterprise Security

Product Development Ecosystem

How do you create products with the CC3200 LaunchPad?

Product Development Ecosystem

It all starts with the CC3200 LaunchPad

- **BoosterPacks**
- **Software Tools**
- **Hardware Design Resources**
- **Documentation**
- **E2E Community**

BoosterPacks

- BoosterPacks make it simple to develop a diversity of products
- They plug directly into the 40 pin headers available on the CC3200 LaunchPad
- BoosterPacks are available from Texas Instruments, third party vendors and community members
- BoosterPacks include displays, audio, storage, positioning, motor control, prototyping and many more

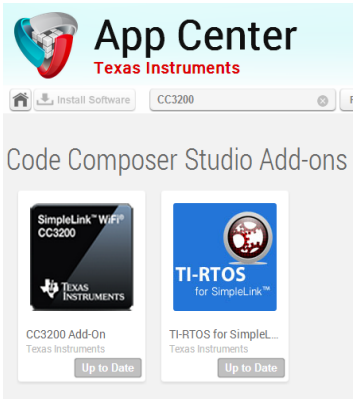
Camera BoosterPack

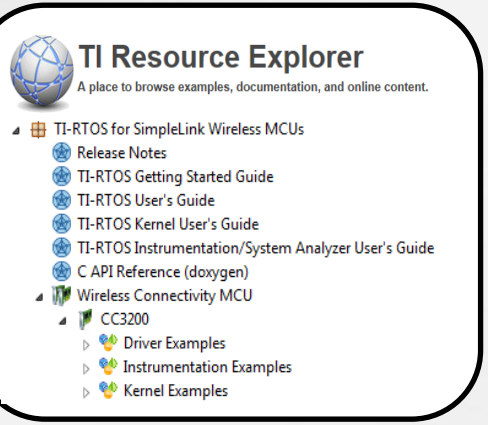
Audio Codec BoosterPack

Software Tools

- **Integrated Development Environments (IDEs) & Compilers**
  - Code Composure Studio v6
  - IAR Embedded Workbench and GCC
  - Energia and EmbedXcode – Based on Wiring and Arduino Frameworks
- **Operating Systems, SDK and Muxing Tool**
  - TI-RTOS and FreeRTOS
  - CC3200 Software Development Kit (SDK)
  - Pin Mux Utility for ARM Microprocessors
- **Application and Firmware Flashing**
  - UniFlash for CC3100/CC3200
- **Provisioning and Configuration**
  - SimpleLink iOS and Android Apps
  - Web based configuration
- **Testing**
  - SimpleLink Wi-Fi Radio Testing Tool
- **Trouble Shooting Tools**

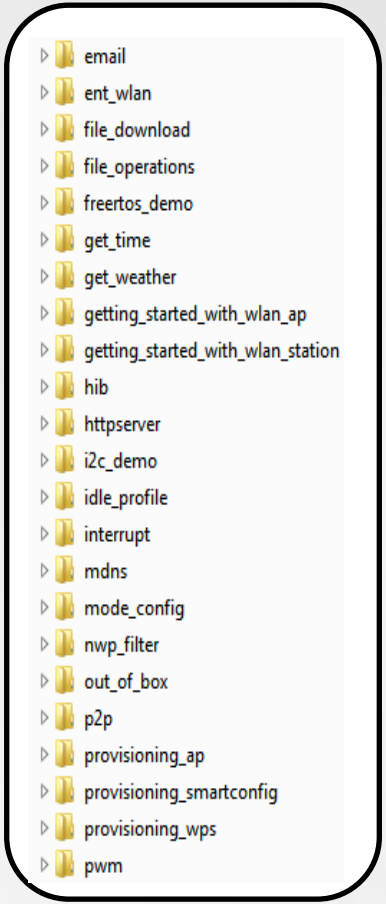
Code Composure Studio v6





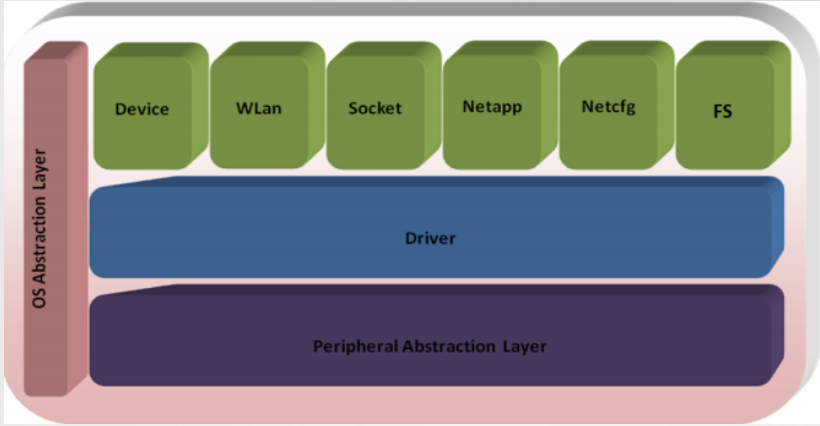
- **Completely Free**
  - Since v6 CCS is now free when developing on LaunchPads
  - Free for custom boards using the XDS100 Emulator
- **App Center**
  - Integrated libraries, resources and tools
- **TI-RTOS**
  - Resource Explorer provides many examples ready to install, great for starting development

CC3200 SDK



- Contains 52 ready to use example applications including detailed documentation on each
- Examples for CCS, IAR and GCC
- Each example has a ready compiled binary, which can be easily flashed to the CC3200, this includes the original Out Of Box example that the CC3200 comes preinstalled with.
- FTDI drivers so you can connect and debug the CC3200 (Will also install from the Microsoft online service automatically if you wish)
- Documentation includes getting started guides, programming guides, driver library information, hardware assembly and schematics.
- Comprehensive doxygen browser based SimpleLink Host Driver API documentation, which includes code samples
- Also includes the all important driver libraries and third party resources such as FreeRTOS and fatfs

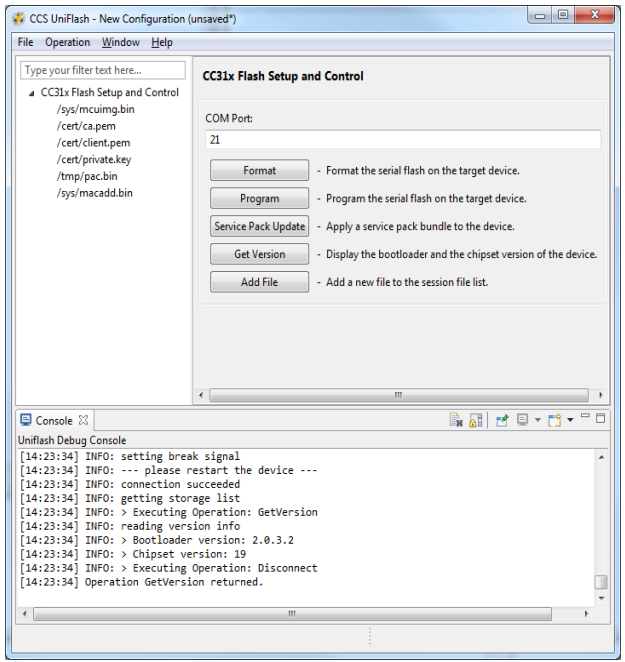
CC3200 SDK: SimpleLink API



TI SimpleLink Framework provides a wide set of capabilities ranging from basic device management through wireless network configuration, BSD socket services and more. These capabilities are segregated into individual modules. Each module represents different functionality capability of the SimpleLink Framework.

- **Device**
  - Initializes the host
  - Controls the communication with the Network Processor
- **Wlan**
  - Connection to the access point
  - Scan access points
  - Add/Remove access point profiles
  - WLAN Security
- **Socket**
  - UDP/TCP Client Socket
  - UDP/TCP Server Socket
  - UDP/TCP Rx/Tx
- **Netapp**
  - DNS Resolution
  - Ping remote device
  - Address Resolution Protocol
- **Netcfg**
  - IP/MAC address configuration
- **Fs**
  - File system Read/Write

UniFlash for CC3100/CC3200

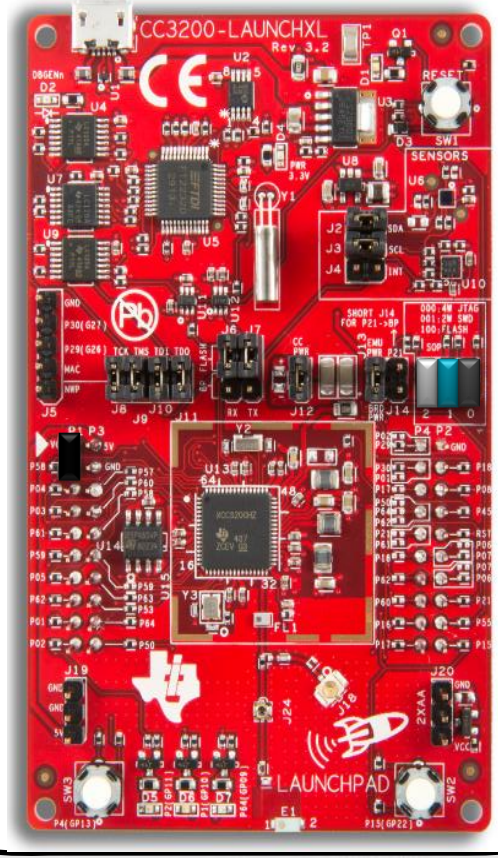


Console outputs information requesting input and debug information that can be used to solve problems

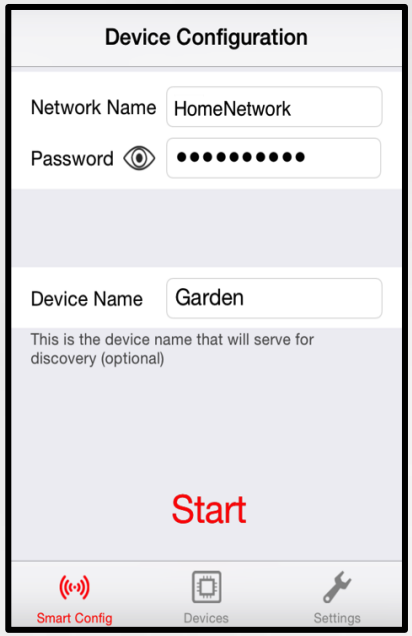
- Format the serial flash as a secure or non-secure file system
- Program an application binary or newly added files to the flash
- Install CC3200 firmware service pack updates
- Retrieve bootloader and chipset versions
- Add, erase or update files, which can include HTLM, images, text, new MAC address, security certificates etc.

UniFlash: Important Jumpers

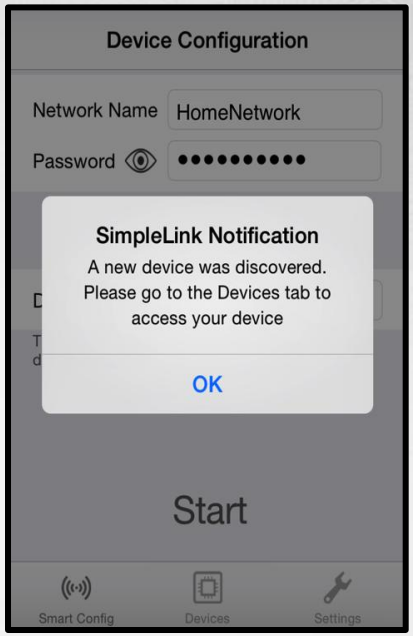
- **Sense On Power Jumpers**
  - SOP2: Serial Flash Programming
    - On when programming serial flash with UniFlash or debugging with IDE
    - Removed when running program that has been flashed to serial flash
  - SOP1: 2 Wire SWD Programming
  - SOP0: 4 Wire JTAG Programming
- **Force AP Mode Jumper**
  - For the out of the box example
  - Not required in custom applications, modes can be changed programmatically
- **More Jumper Configurations Details**
  - CC3200 LaunchPad Hardware Users Guide



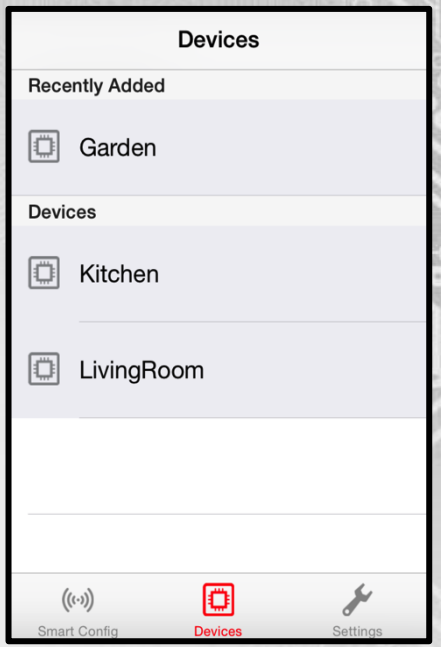
SimpleLink App



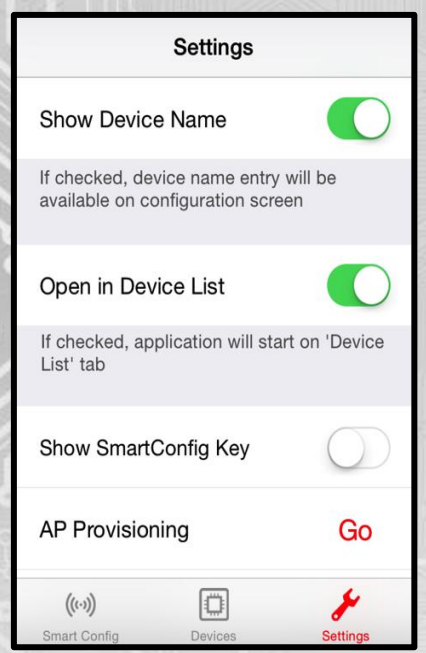
Smart Config provides an extremely simple way to add new devices to Wifi router. It is as simple as entering the password and an optional name and clicking Start.



Once the device is found an alert box is presented to notify the user. At this stage the device has now joined the Wifi router network



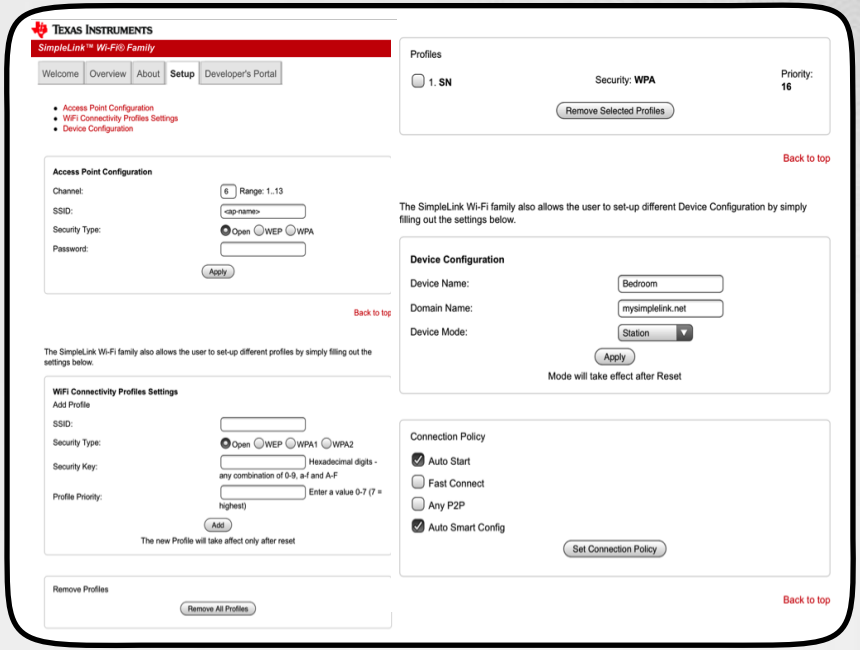
Devices advertise their presence through mDNS. Clicking on the name of the device will open the device's website, which will enable you to configure optional settings



Settings for the app can be changed as desired

SimpleLink features can be integrated into custom apps

Web Based Configuration



AP mode supports Open, WEP and WPA. Station mode supports Open, WEP, WPA and WPA2 security.

Stored Wi-Fi network profiles can be given different priority load orders

- **Manually Configure Network Setting**
  - Access point mode
  - Station mode
  - Manage station mode profiles
  - Device name including name advertised through mDNS
  - Connection Policies
- **Device About Information**
  - Firmware and hardware version details
  - MAC Address
  - AP channel and SSID details
- **Onboard HTTP Web Server**
  - Can be used for custom applications

Trouble Shooting Tools

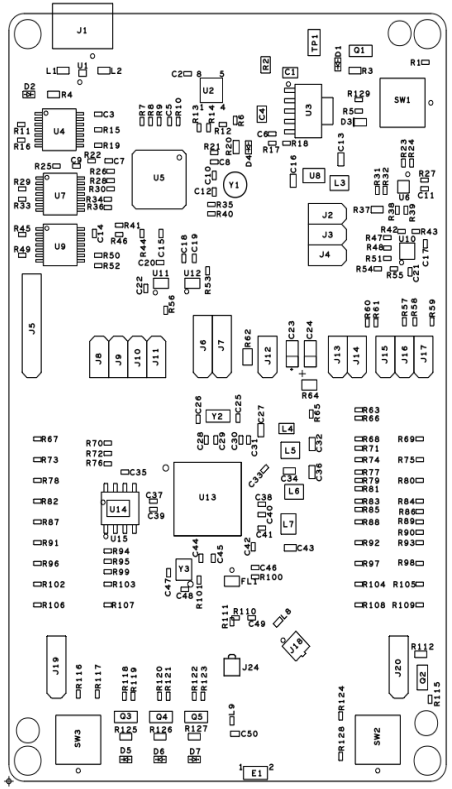




- **Windows**
  - UDP Test Tool – Tool for sending and receiving UDP packets
  - TCP Test Tool – Tool for sending and receiving TCP packets
  - SMTP Test Tool – Tool for testing SMTP connectivity
  - CoolTerm – Easy to use serial port terminal (Windows, Mac and Linux)
  - Network Monitor – Network packet sniffer
  - Wireshark – Network packet sniffer (Windows, Mac and Linux)
- **iOS**
  - Fing - Excellent utility to find out what is connected on your network
  - UDP Tools – Tool for sending and receiving UDP packets
  - Discovery - mDNS/Bonjour utility
  - mDNS Watch - mDNS/Bonjour utility
- **Android**
  - Fing - Excellent utility to find out what is connected on your network
  - UDP Sender/Receiver – Tool for sending and receiving UDP packets
  - Bonjour Browser - mDNS/Bonjour utility
  - ZeroConf Browser - mDNS/Bonjour utility

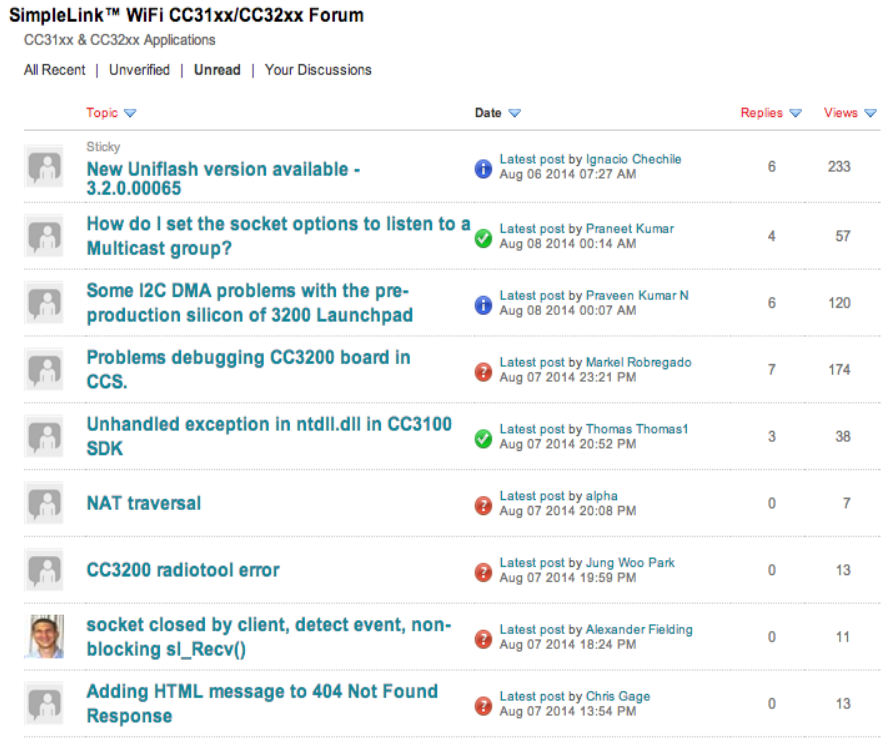
Hardware Design Resources

- **CC3200 LaunchPad Reference Design**
  - Used to check for consistency and accuracy of custom board designs
  - Includes reference schematics, bills of materials, as well as Gerber files
- **Hardware Design Review**
  - Ensures that custom board design follows the guidelines provided by TI
  - Hardware Design Review Process checklist
  - PCB Layout Guidelines



E2E Community

- The go to place for support and technical questions on the CC3200 LaunchPad
- Community members and TI engineers contribute to answering questions and solving problems
- Includes announcements about the latest updates and service packs
- Share knowledge, ideas and learn technical and trouble shooting skills



SimpleLink™ WiFi CC31xx/CC32xx Forum

CC31xx & CC32xx Applications

All Recent | Unverified | **Unread** | Your Discussions

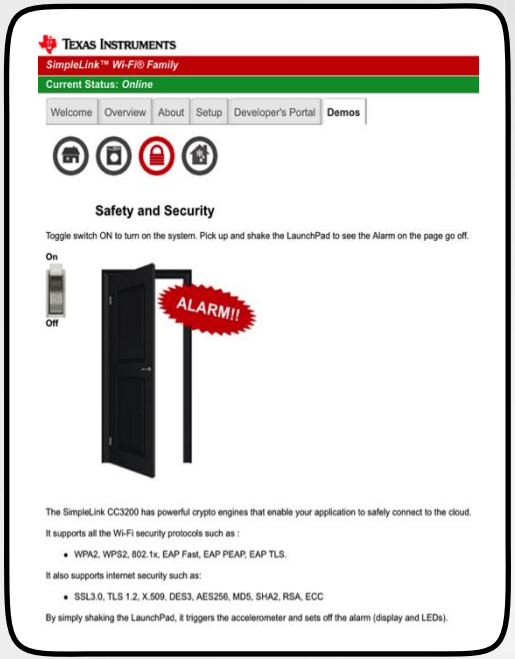
Topic	Date	Replies	Views
Sticky New Uniflash version available - 3.2.0.00065	Latest post by Ignacio Chechile Aug 06 2014 07:27 AM	6	233
How do I set the socket options to listen to a Multicast group?	Latest post by Praneet Kumar Aug 08 2014 00:14 AM	4	57
Some I2C DMA problems with the pre-production silicon of 3200 Launchpad	Latest post by Praveen Kumar N Aug 08 2014 00:07 AM	6	120
Problems debugging CC3200 board in CCS.	Latest post by Markel Robregado Aug 07 2014 23:21 PM	7	174
Unhandled exception in ntdll.dll in CC3100 SDK	Latest post by Thomas Thomas1 Aug 07 2014 20:52 PM	3	38
NAT traversal	Latest post by alpha Aug 07 2014 20:08 PM	0	7
CC3200 radiotool error	Latest post by Jung Woo Park Aug 07 2014 19:59 PM	0	13
socket closed by client, detect event, non-blocking sl_Recv()	Latest post by Alexander Fielding Aug 07 2014 18:24 PM	0	11
Adding HTML message to 404 Not Found Response	Latest post by Chris Gage Aug 07 2014 13:54 PM	0	13

Web Link http://e2e.ti.com/support/wireless_connectivity/f/968.aspx

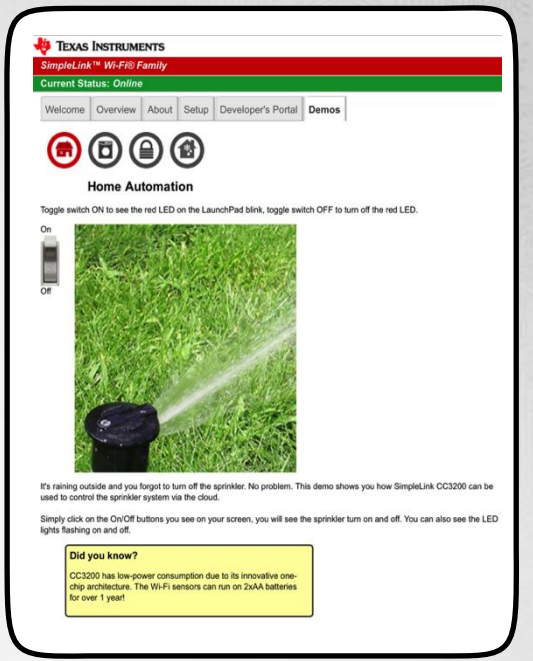
Product Examples

<u>What</u> kind of real world products can you develop with the CC3200 LaunchPad?

Sensor and Control Example: Out of Box



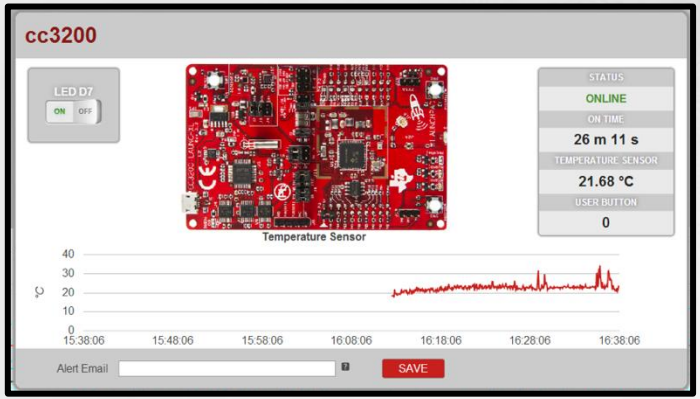
Sensor Example: Uses the accelerometer to display an alarm on the web page and flash LEDs



Control Example: Uses the web page to control LEDs and web page graphic

- Comes preloaded with the CC3200 LaunchPad
- The web application runs on top of the CC3200 onboard HTTP web server
- Source code can be found in the CC3200 SDK
- Application binary can also be found with the CC3200 SDK
- 4 different sensor and input demos which can be view at a TI video on YouTube
- For details get the QuickStart Guide

Internet of Things Example: Exosite



Displays temperature data that has been sent by the CC3200. Remote control an LED from the web page

Displays the location of the CC3200 LaunchPad based on IP information

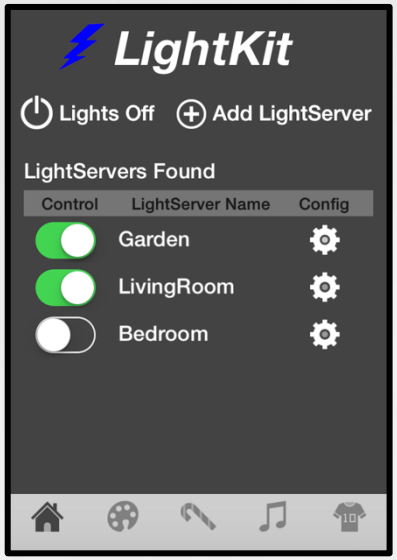
Displays accelerometer data that has been sent to the Exosite Cloud service

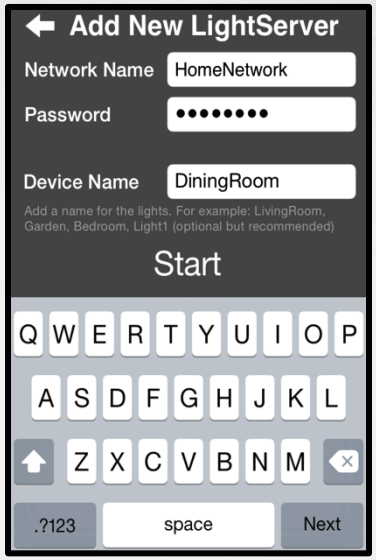
- **Cloud Based IoT**
  - Uses Cloud services to control the CC3200 from a remote location
  - Uses Cloud services to collect sensor and location data from the CC3200 from a remote location
- **Installation and Configuration**
  - Will need to flash the CC3200 LaunchPad with the binary available on the Exosite site
  - Alternatively the source code for the CC3200 LaunchPad application is available on github
  - You will need to visit the Exosite site and sign up, at which stage you can add a new device
  - The Exosite Cloud service uses the CC3200 MAC address as an identifier, you will need to provide this when adding a new device

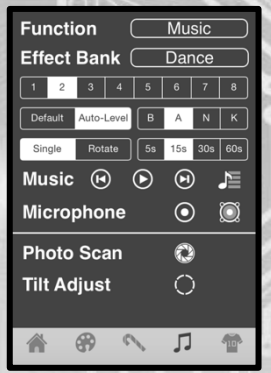
Home Automation Example: LightServer

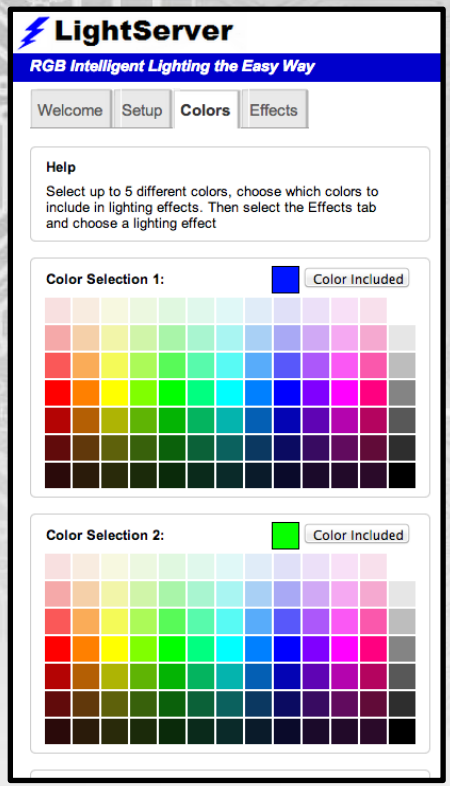
LightServer is a hardware device that connects to RGB Intelligent lighting and has SimpleLink Wi-Fi (including a web server that provides browser based control)

LightKit is an App that controls RGB Intelligent lighting via Wi-Fi. It uses SimpleLink to find existing LightServers and to add new LightServers to a Wi-Fi Router network









App automatically finds and lists all available LightServers. Control of lights can be selected individually or grouped

When a new LightServer needs to be added. This can be easily achieved through the integrated Smart Config feature

Lights can now be controlled in many different ways, color wheel, candy cane, music, special events and more

Resources

- **Software**
  - Code Composure Studio v6
  - UniFlash for CC3100/CC3200
  - Energia
  - EmbedXcode
  - CC3200 Software Development Kit (SDK)
  - Pin Mux Utility for ARM Microprocessors
  - SimpleLink/SmartConfig iOS an Android Source Code
  - SimpleLink/SmartConfig iOS iTunes Store
  - SimpleLink/SmartConfig Google Play
  - SimpleLink Wi-Fi Radio Testing Tool
- **Hardware**
  - CC3200 LaunchPad Reference Design
  - CC3200 Hardware Design Review Process sheet
  - CC3100 and CC3200 PCB Layout Guidelines
- **Marketing**
  - Meet the new Internet: Embedded Wifi for IoT (YouTube)

- **Documentation and Learning**
  - CC31XX/CC32XX Wiki
  - CC3100/CC3200 Overview Training by Jon Beall (YouTube)
  - CC3200 LaunchPad Hardware User Guide
  - CC3200 Data Sheet
  - CC3200 Technical Reference Manual
  - CC3200 Single Chip Wireless MCU Programmers Guide
  - CC3200 SimpleLink API Programmers Guide
  - CC3200 Peripheral Driver Library User's Guide
  - UniFlash Quick Start Guide
  - UniFlash Full Documentation
- **Product Example Links**
  - CC3200 LaunchPad Out of Box Experience (YouTube)
  - Exosite Quick Start Guide
  - Exosite Source Code (GitHub)
  - LightServer and LightKit Demos (Vimeo)