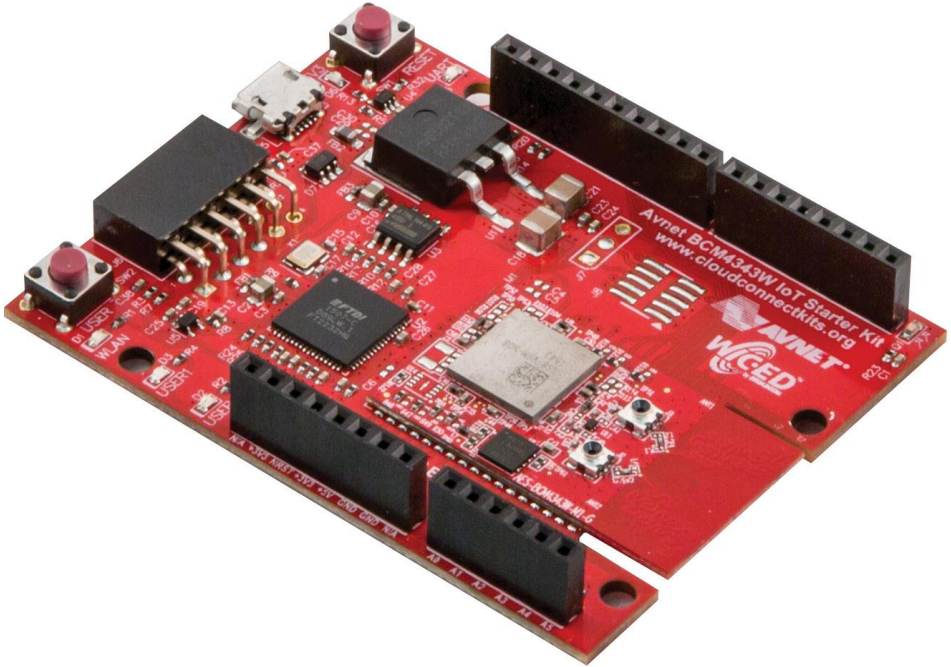


Avnet BCM4343W IoT Starter Kit

Tutorial - Part 2

v2.0 - Nov 29, 2016

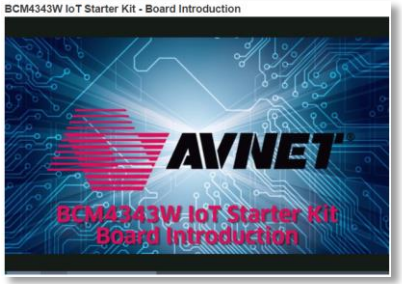
Accelerating Your Success™

Online Video Material

It is strongly recommended that you view the short technical videos available on the BCM4343W IoT Starter Kit webpage:

http://cloudconnectkits.org/product/avnet-bcm4343w-iot-starter-kit

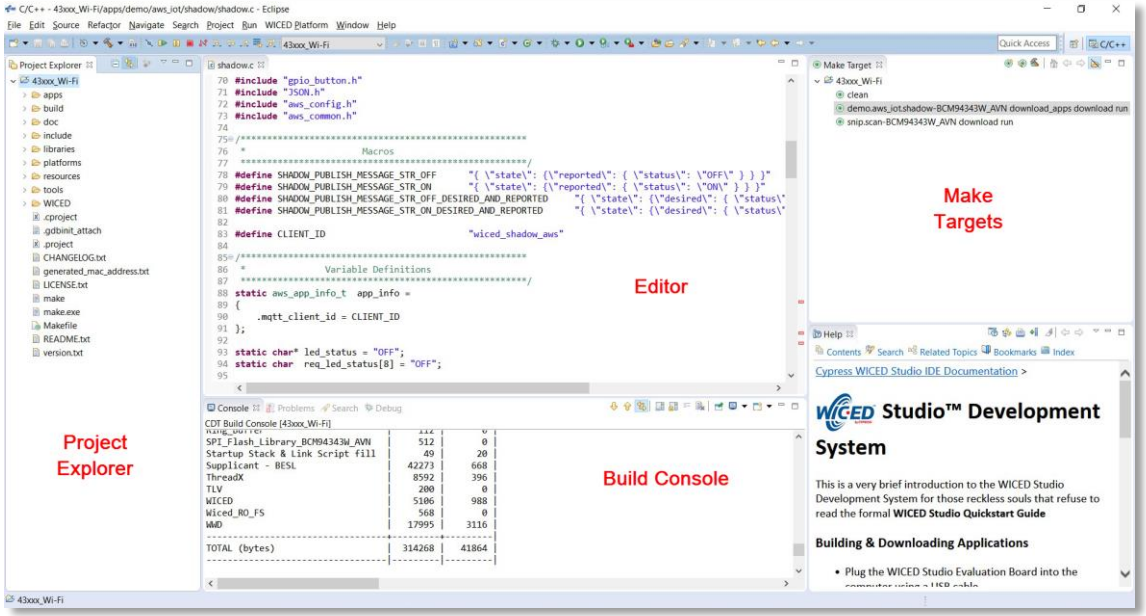
- **Part 1: BCM4343W IoT Starter Kit - Board Introduction**
- **Part 2: BCM4343W IoT Starter Kit - Amazon Web Services**
- **Part 3: BCM4343W IoT Starter Kit - IBM Bluemix Cloud Services**



Installation Items Required to Develop Embedded Firmware using WICED Studio

WICED Studio Development System Installation

- ***Tutorial Part 1*** procedure *must* have been completed for installation of Cypress **WICED Studio 4.x** development system plus USB drivers
- ***Tutorial Part 2*** describes additional steps required in setup of WICED SDK for software development targeting Avnet BCM4343W IoT Starter Kit



Critical Items Requiring Attention!

Three critical items *must* now be attended to before building projects in WICED Studio that target the BCM4343W IoT Starter Kit:

#1 Add **BCM4343W_AVN** Platform Files to WICED Studio

#2 Edit the **.mk** files in each demo project

#3 Add the compiler "**Make Targets**"

Additional Recommendations to Optimize Development

Additional AWS apps and fine-tuning the software development process:

#4 Add **additional AWS projects** to WICED Studio SDK for this IoT Kit

#5 **Bake-in** the AWS IoT settings and WiFi network settings

AVNET

Additional Download Links

Download + install **BCM4343W_AVN** platform files
https://github.com/CloudConnectKits/WICED-SDK-3.7.0-3_Platform_Files

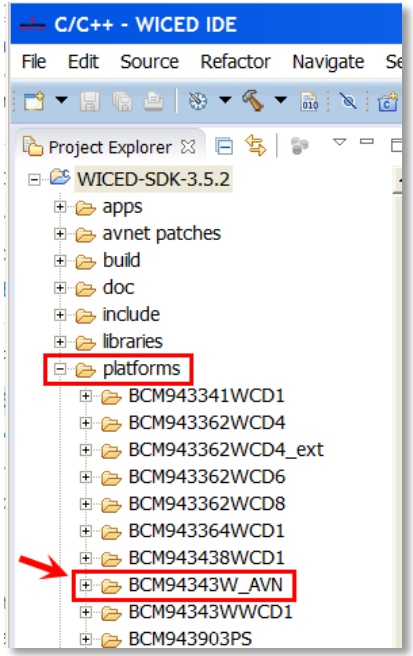
Download + install additional **Reference Designs**
http://cloudconnectkits.org/product/avnet-bcm4343w-iot-starter-kit

Platform Files Must be Added (BCM4343W_AVN)

#1

1) Download **BCM94343W_AVN.7z** platform files from the Avnet GitHub site
https://github.com/CloudConnectKits/WICED-SDK-3.7.0-3_Platform_Files

2) Extract this 7zip archive file to the …**\platforms** folder
(This will create the missing **BCM94343W_AVN** subfolder)



Edit the .mk File in each Demo Project

#2

All operations in WICED SDK rely heavily on custom **.mk** files

Cypress have elected to not include 3rd-party platforms within their application demo projects “make” files.

To correct this, each **.mk** file needs to be edited

- In the case of the **aws_iot\shadow** demo application:

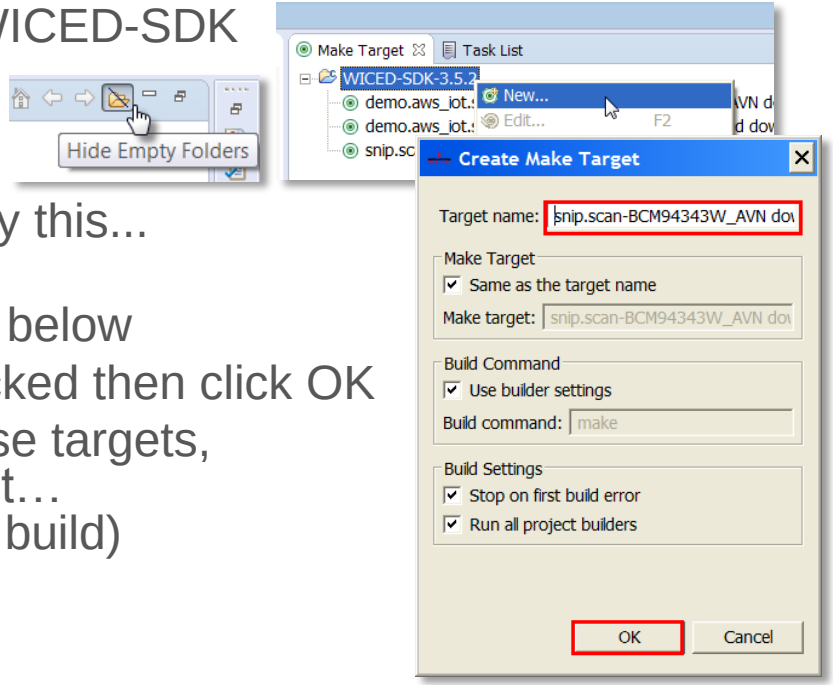
3) Go to the **apps\demo\aws_iot\shadow** directory and edit **shadow.mk** as highlighted below…

```
VALID_PLATFORMS := BCM943362WCD4 \
                   BCM943362WCD6 \
                   BCM943362WCD8 \
                   BCM943364WCD1 \
                   BCM94343WWCD1 \
                   BCM943438WCD1 \
                   BCM94343W_AVN
```

Add Compiler “Make Targets”

#3

4) To Create a Make Target, R-click on the WICED-SDK folder shown in your Make Target panel, then select New…
5) If the WICED-SDK folder not shown, then click on *Hide Empty Folders* icon to display this...
6) In the Make Target form that appears, cut+paste the applicable item from the list below
7) In the displayed form, keep all boxes checked then click OK
8) To launch the build process for one of these targets, double-click on the applicable Make Target… (eg. use **snip.scan** as this the quickest to build)



Example Make Targets

snip.**scan**-BCM94343W_AVN download run
demo.aws_iot.**shadow**-BCM94343W_AVN download download_apps run
demo.aws_iot.**shadow_light_sense**-BCM94343W_AVN download download_apps run
demo.aws_iot.**bt_smartbridge**-BCM94343W_AVN-ThreadX-NetX download download_apps run

Add AWS Projects for this IoT Kit to WICED Studio

#4

9) Add additional AWS demo projects for BCM4343W IoT Starter Kit to your WICED Studio installation

eg. the following projects

- **shadow_light_sense** (enhanced version of shadow application)
- **bt_smartbridge** (updated BLE + WiFi + AWS application)

Bake-in the WLAN and AWS Settings (optional)

#5

- Rather than repeatedly needing to program **Thing Name**, **Certificates** and **WiFi** settings into flash memory via SoftAP mode's **config webpage** each time an application is rebuilt, it is possible to **"bake-in"** these settings…
- Convenient for development, this is done by **re-naming** and **copying** your downloaded certificate files into:
  - **…\resources\apps\aws_iot**

  and then making edits to 4 source files:
  - project **.mk** file (in your project folder)
  - **aws_common.c**
  - **aws_config_dct.h**
  - **wifi_config_dct.h**

SoftAP mode Config Settings Webpage

Bake-in the Certificate & Private Key…

#5

Procedure:

10) Rename the downloaded private key file to: **privkey.cer**

11) Rename the downloaded certificate key file to: **client.cer**

12) Copy these two files to: **…\resources\apps\aws_iot**

13) Ensure the **.mk** file in your project folder has the following resources defined (eg. **shadow.mk**) :

```
$(NAME)_RESOURCES := apps/aws_iot/rootca.cer \
                     apps/aws_iot/client.cer \
                     apps/aws_iot/privkey.cer
```

Change the Source of Security Certificates

#5

14) In **aws_common.c** - Add the following lines in the section titled:

/* Read security parameters from DCT */:

// Add these two lines to load certificates from local folder:

```
resource_get_readonly_buffer( &resources_apps_DIR_aws_iot_DIR_privkey_cer, 0,
MQTT_MAX_RESOURCE_SIZE, &size_out, (const void **) &security.key);

resource_get_readonly_buffer( &resources_apps_DIR_aws_iot_DIR_client_cer, 0,
MQTT_MAX_RESOURCE_SIZE, &size_out, (const void **) &security.cert);
```

15) In **aws_common.c** - comment-out the DCT loading of security certs:

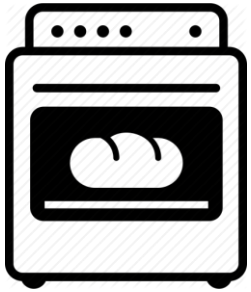
```
// Comment-out these 2 lines if certificates from local folder:
//  security.cert = dct_security->certificate;
//  security.key = dct_security->private_key;
```

Bake-in the Thing Name & WiFi Settings

#5

16) Append the following to the end of **aws_config_dct.c** :

```
// Allow WLAN and AWS config to be loaded from local folder:
DEFINE_APP_DCT(aws_config_dct_t)
{
  .is_configured = WICED_TRUE,
  .thing_name = "sk_0001" // define your thing name here
};                        // use last 4 digits of kit S/N
```



17) Open your app's **wifi_config_dct.h** file and edit lines 38-43:

```
/* This is the default AP the device will connect to (as a client)*/
#define CLIENT_AP_SSID        "YOUR_AP_SSID"
#define CLIENT_AP_PASSPHRASE "YOUR_AP_PASSPHRASE"
```

18) Replace **SSID**, **PASSPHRASE** and **security details** with what required for your Wireless A/P (-ref. line 102-121 in .../WICED/WWD/include/**wwd_constants.h**)

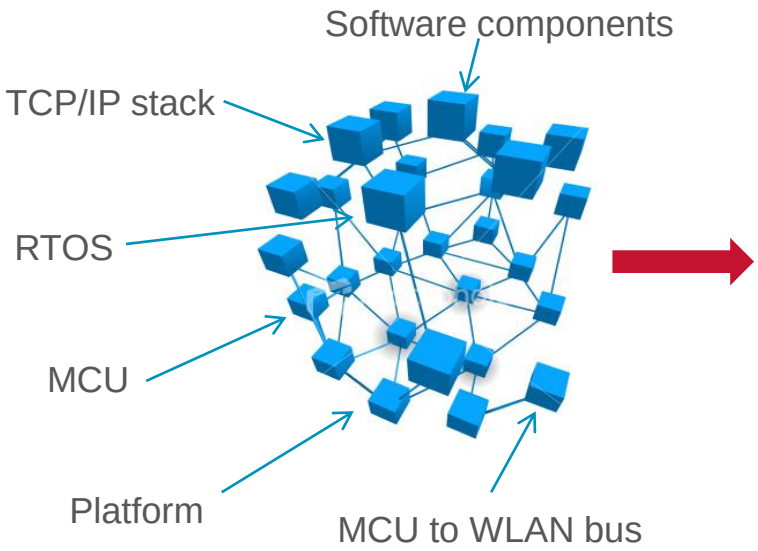
19) For apps that don't have a **wifi_config_dct.h** file, then edit instead the **default_wifi_config_dct.h** file (in the **/include** folder)

Overview of WICED Studio Software Development Kit

Cypress WICED SDK

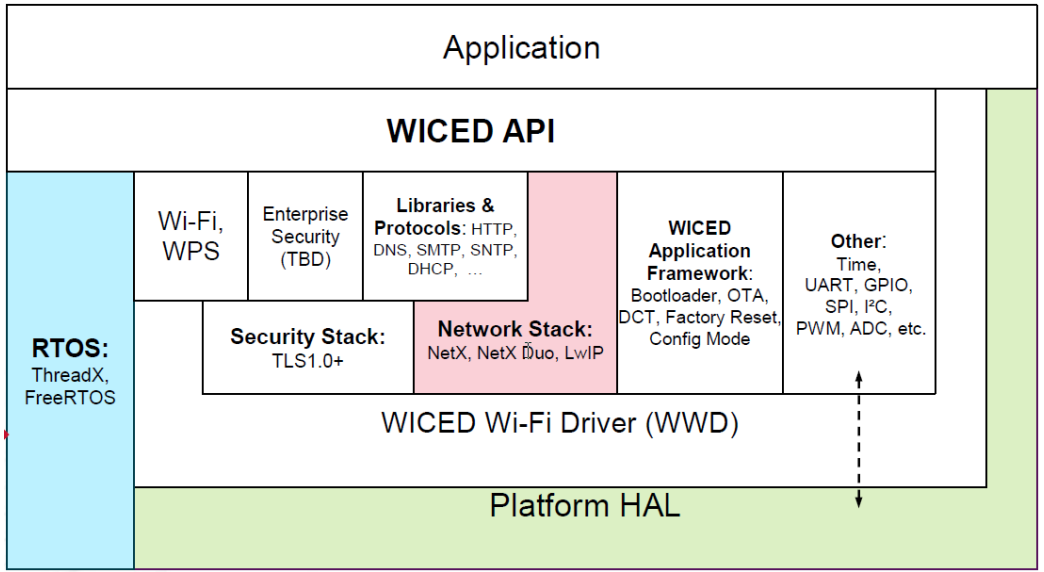
- **WiFi Development System**
  - Build system
  - Compiler and Tool chain
  - Programmer & Debugger
  - Integrated Development Environment
- **Software Stack**
  - Embedded WiFi Driver
  - RTOS / IP Network stacks
  - Embedded Security Libraries
  - Lots of Example Applications (ie. snips)
  - AWS SDK functionality now integrated
- **Hardware Platforms**
  - Evaluation Boards
  - Partner development platforms

Wireless **I**nternet **C**onnectivity for **E**mbedded **D**evices
Software **D**evelopment **K**it

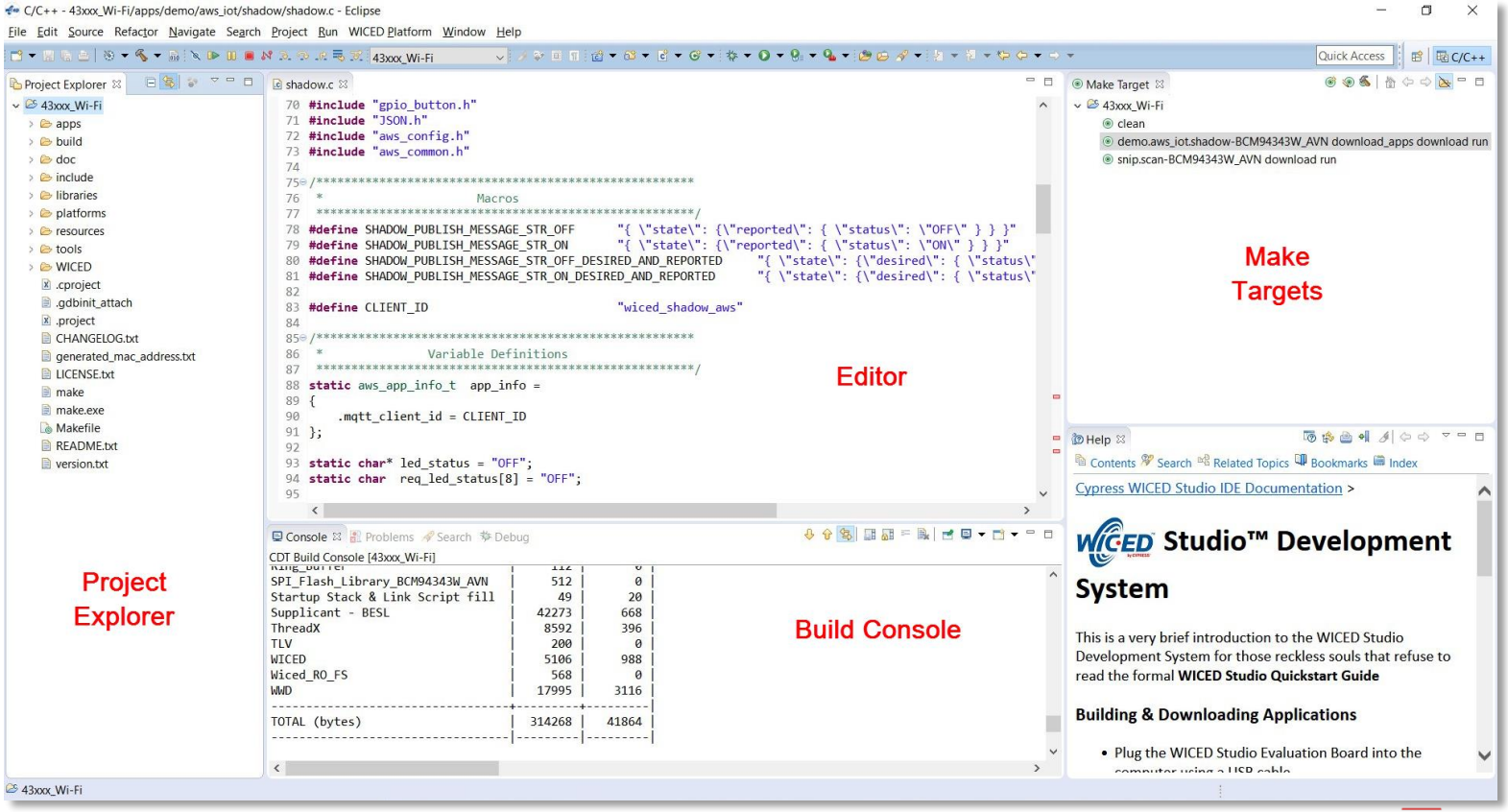


Cypress WICED SDK

- **Software Development Framework**
- **Sample Apps**
- **Libraries**
  - RTOS (ThreadX, FreeRTOS)
  - BRCM's Driver, WiFi and TCP/IP Stack & Profiles
  - Embeddable libraries
- **Open Source Dev. Tools**
  - Cygwin
  - GCC
  - Eclipse
- **Security Library**
  - Full security for SHTTP, OpenSSL, TLS



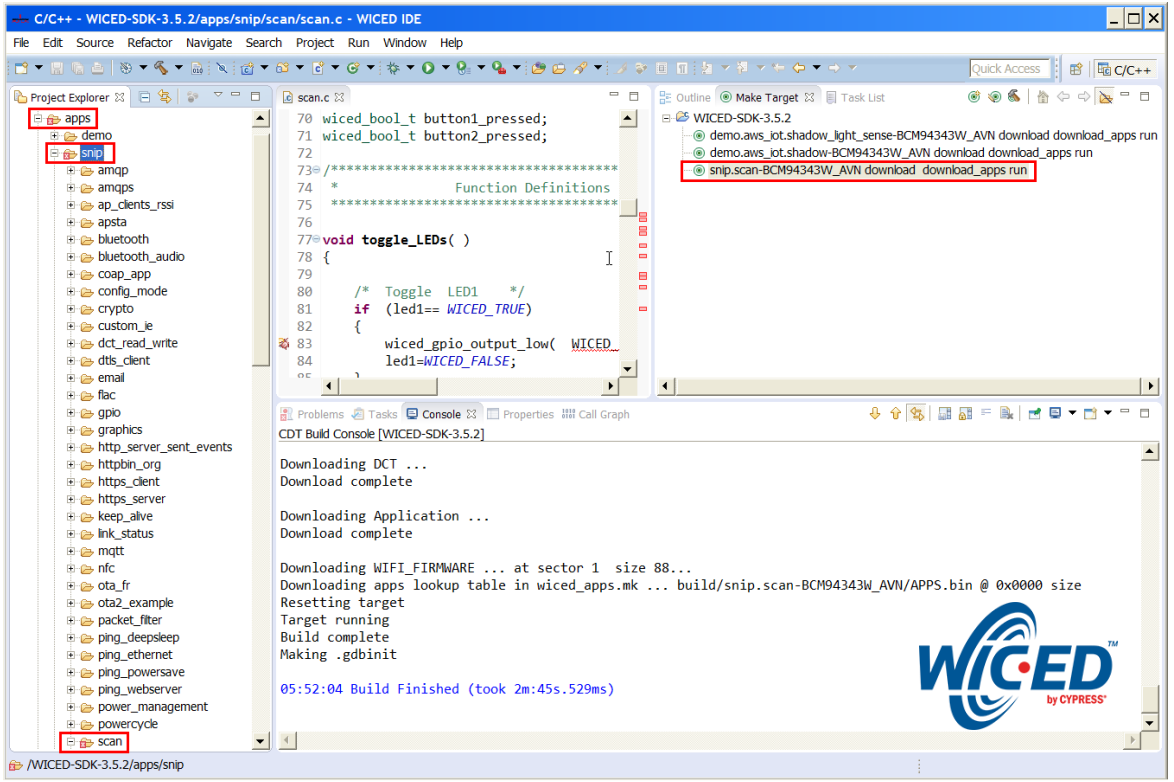
WICED SDK uses the Eclipse IDE



SDK and HW Verification using snip.scan

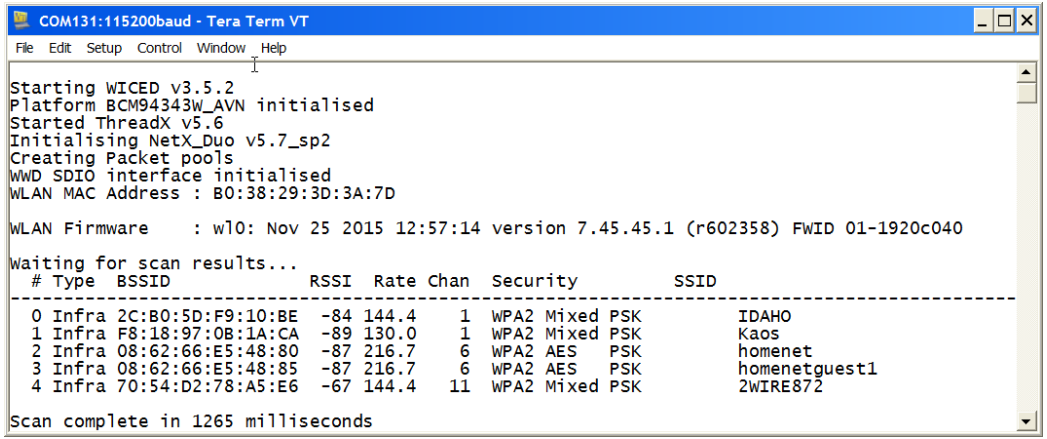
Why snip.scan? – SDK and HW Verification

It is recommended to start with one of simplest demos, that is quick to compile and provides feedback on the integrity of WICED SDK, the IoT Starter Kit and wireless module functionality…



Testing the snip.scan Application

- To launch the build process, double-click on the Make Target…
  snip.scan-BCM94343W_AVN download run
- Once the build has completed and the programming files downloaded,
  Press reset and view the serial console output in Tera Term…
- The app scans for local WiFi sources and reports their network info
- (An enhanced version of this app is also available that reports light levels from the onboard Ambient Light Sensor…)



Notes on the AWS IoT Applications

- The AWS apps have relatively large memory footprints, so take longer to build and also require the use of off-chip SFLASH memory
- The **download_apps** parameter forces build + programming of some files to external SFLASH (ie. the WiFi device firmware and/or additional application binaries, eg. for OTA)
- In the case of **Shadow**, two files are programmed to SPI SFLASH:
  binaries/4343WA1.bin - the actual radio firmware
  aws/APPS.bin - header file pointing to SFLASH locations where the binaries are stored (the radio firmware is the only item in this case)

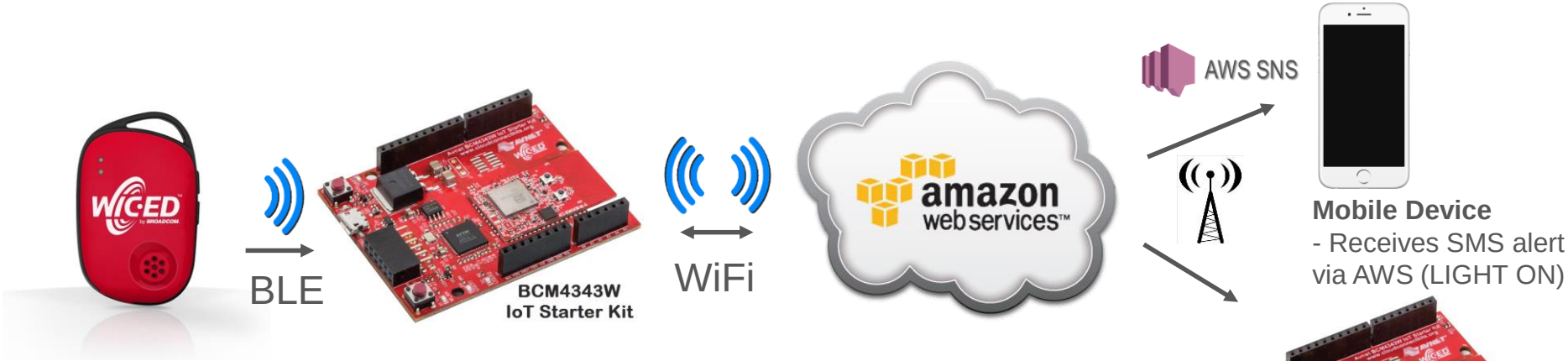
Advanced AWS IoT Demo: BT_Smartbridge

What is bt_smartbridge and why should you care?

- The out-of-box AWS **shadow** application is useful for testing MQTT over WiFi communication with the AWS IoT service but many developers will be looking for more complex “system-level” demos, to jump-start development of their end-application…

- The AWS **bt_smartbridge** application shows:
  - the versatility of the BCM4343W “combo” device
  - concurrent WiFi and BLE, sharing same antennas
  - communication with a popular BLE sensor hub
  - HTTP webserver
  - MQTT Publisher to AWS IoT topics

bt_smartbridge: BLE Sensor-to-Cloud Connectivity



Cypress WICED Sense
- BCM20737S BLE Module
- STMicro LIS3DH Accelerometer

Avnet BCM4343W IoT Module
- Receives BLE Notifications from BCM20737S
- Monitors Accelerometer Values for Movement
- Publishes “LIGHT ON” to AWS if sensor aligned vertically
- Publishes “LIGHT OFF” to AWS when sensor aligned horizontally

AWS IoT:
- Stores “LIGHT ON” and “LIGHT OFF” Messages in Device Shadow
- Pushes “LIGHT ON” Messages to mobile device via AWS SNS service

Mobile Device
- Receives SMS alert via AWS (LIGHT ON)

Avnet BCM4343W Module
- Subscribes to AWS IoT Device Shadow;
LED Indicates the state of LIGHT ON, LIGHT OFF

Advanced Watson IoT Bluemix Demo: BLE2Bluemix

What is BLE2Bluemix?

- BLE2Bluemix is an advanced app that is built with **ZentriOS SDK**
- This application shows:
  - the versatility of the BCM4343W “combo” device
  - concurrent WiFi and BLE, sharing same antennas
  - monitoring of multiple sensors on WICED SENSE2 tag
  - MQTT Publish to the Cloud via Watson IoT broker

Cypress WICED Sense2 BLE Tag

Cypress WICED SMART BLE SoC plus four STMicro sensors and a coin-cell battery

- **BCM20737L** BLE SoC
- **L5M6D3** Gyro and Accelerometer
- **LIS3MDLTR** eCompass
- **LPS25HBTR** Pressure sensor
- **HTS221** Humidity and Temperature sensor

CYPRESS
Embedded in Tomorrow™

Bluetooth® SMART

Sense Tag

iPhone App UI

AVNET

BLE2Bluemix: BLE Sensor-to-Cloud Connectivity

Streams Sense2 BLE tag measurements via Avnet module (in role of a gateway) to MQTT-based Watson IoT interface to IBM's Bluemix Cloud services

Cypress WICED Sense2 BLE Tag
- BCM20737S BLE Module
- LIS3DH Accelerometer, etc

Avnet BCM4343W Module
- Receives BLE Notifications from BCM20737S
- Publishes sensor measurements to Watson IoT

IBM Watson IoT / Bluemix
- QuickStart chart display of all sensor measurements
- Optional Node-RED flow design using data from the Sense2 Tag to trigger other Bluemix services

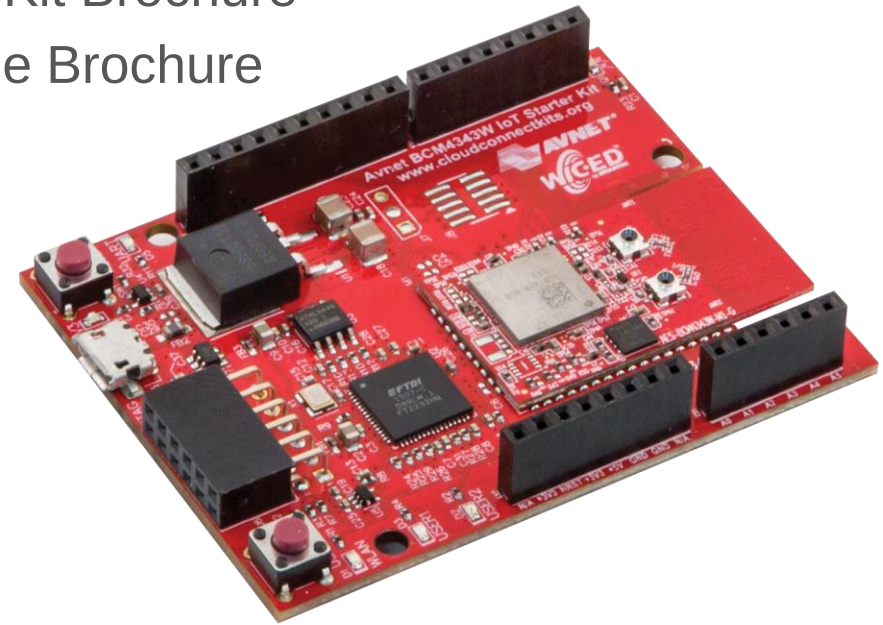
Reference Docs and Additional Info

Reference Docs and Additional Info

Documentation located under the **LEARN MORE** link at:

www.cloudconnectkits.org

- Avnet BCM4343W IoT Starter Kit Brochure
- Avnet BCM4343W SoC Module Brochure
- Quick Start Card
- Getting Started Guide
- Hardware User Guide
- Schematics
- Bill Of Materials
- PCB Layout (Gerber files)
- Mechanical Drawing



Where to go for Support?

Avnet CloudConnectKits User Forum
http://cloudconnectkits.org/forum

Avnet Documentation and GitHub Websites
http://cloudconnectkits.org/product/avnet-bcm4343w-iot-starter-kit
https://github.com/CloudConnectKits

Cypress WICED WiFi Forum
https://community.cypress.com/community/wiced-wifi/wiced-wifi-forums

AWS Getting Started Website
http://aws.amazon.com/iot/getting-started

AWS IoT and Other Discussion Forums
https://forums.aws.amazon.com/forum.jspa?forumID=210
https://forums.aws.amazon.com


Thank
You
Vinaka
köszönöm
Kiitos
Maake
Asante
Shukria
Dhanyavadagalu
감사합니다
Dankscheen
спасибо
Kam Sah Hammida
ارکش
Manana
Dankon
Terima Kasih
Matondo
Dank Je
Mauruuru
Biyan
Diolch i Chi
Taiku
Blagodaram
Ngiyabonga
Dziekuje
Chokrane
Tack
Grazie
Juspaxar
Arigato
Mochchakkeram
Gracias
Khap
Paldies
Tingki
நன்றி
धन्यवाद
cảm ơn bạn
Bedankt
Dakujem
Grazas
Gratias Tibi
Ua Tsaug Rau Koj
Di Ou Mèsi
Kia Ora
Obrigado
Děkuji
Nirringrazzjak
Kop Khun
ありがとう
Suksama
Nuwun
Hvala
Matur
Rahmat
谢谢
хвала
Welalin
Djiere Dieuf
Misaotra
Danke
Merci
Salamat
Go Raibh Maith Agat
Tuke
Najis
Eskerrik Asko
ขอขอบคุณคุณ

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