Chapter 1: Tour of WICED Wi-Fi

Objective

After completing chapter 1 (this chapter) you will understand a top level view of all of the components of the WICED ecosystem including the chips, modules, software, documentation, support infrastructure and development kits. You will have WICED Studio installed and working on your computer and will understand how to program an existing project into a kit.

Time: 1 Hour

Fundamentals

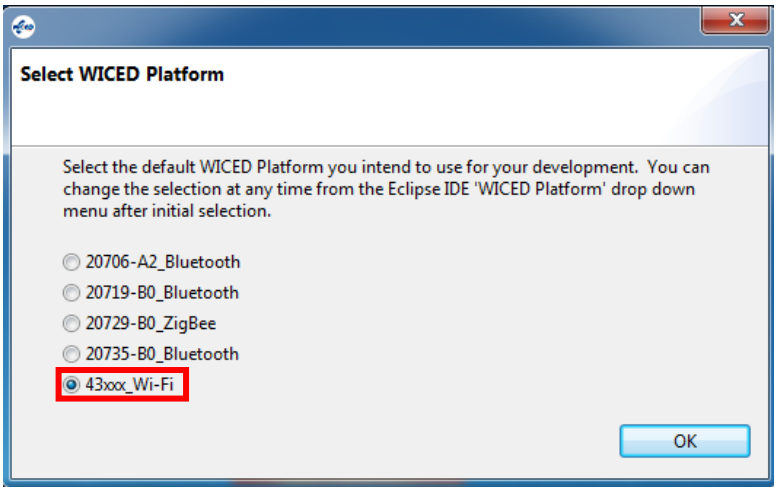
Tour of WICED Studio SDK

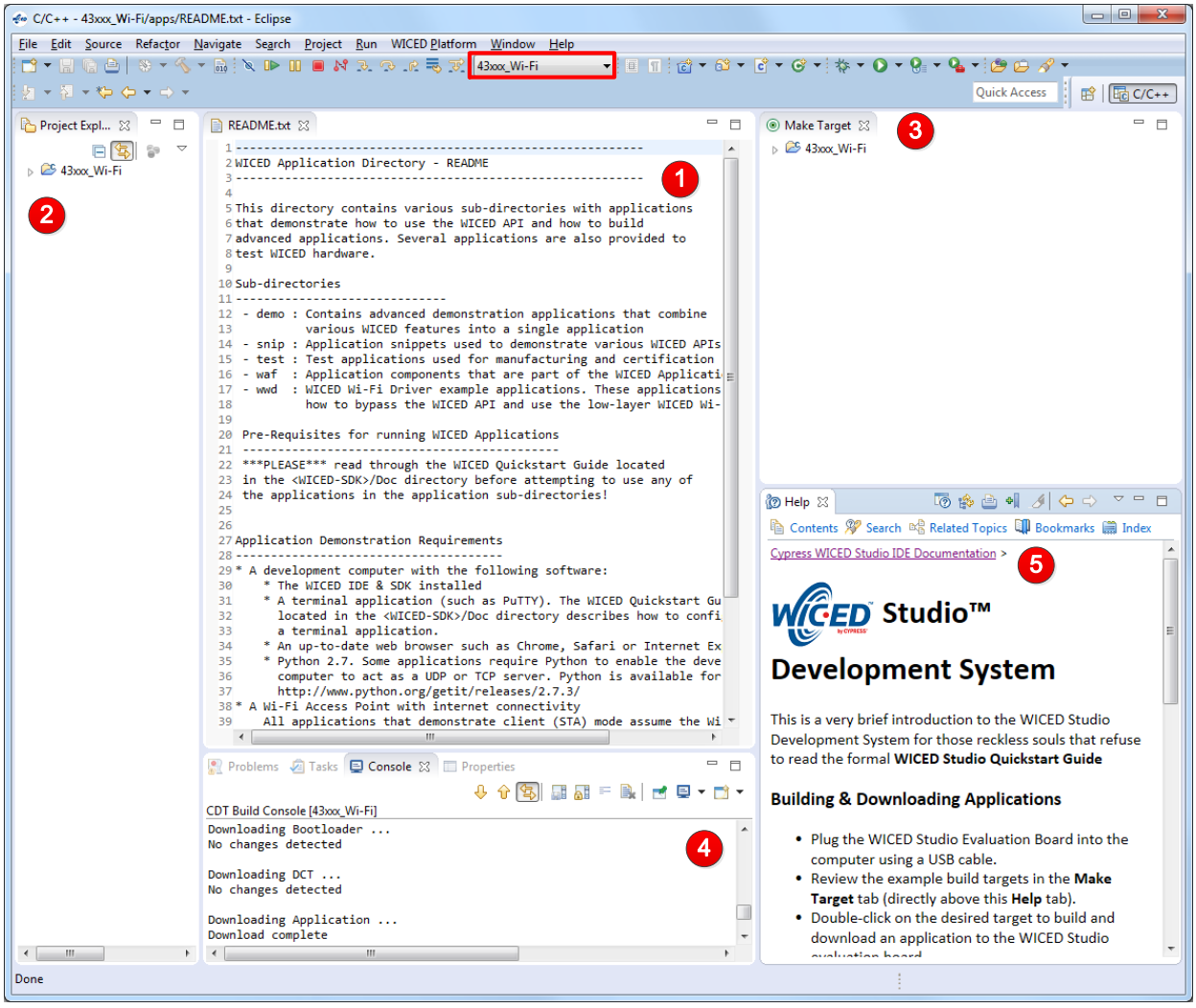
First Look

The WICED software tool is called "WICED Studio" and it is based on Eclipse.

WICED Studio is installed, by default, in *C:/Users/<UserName>/AppData/Local/WICED.* As a part of installing WICED Studio, an SDK workspace is created, by default, in *C:/Users/<UserName>/My Documents/WICED/WICED-Studio-<version>/43xxx_Wi-Fi*. The SDK Workspace is where you will create your projects. Note that a new set of SDK Workspace files is created for each version of WICED Studio that you install. If you install a newer version of WICED Studio, your projects from the previous version will still be available in the SDK Workspace location associated with that previous version of WICED Studio. You have to copy them over manually if you want to access them in the new version.

Once installed, WICED Studio will show up in Windows under Start > All Programs > Cypress > WICED-Studio. The first time you open WICED Studio, you will be asked for which platform you want to use. We will use *43xxx_Wi-Fi* for this class, but if you used a different selection don't worry – you can change it easily from inside the tool using the dropdown menu.





The major windows are:

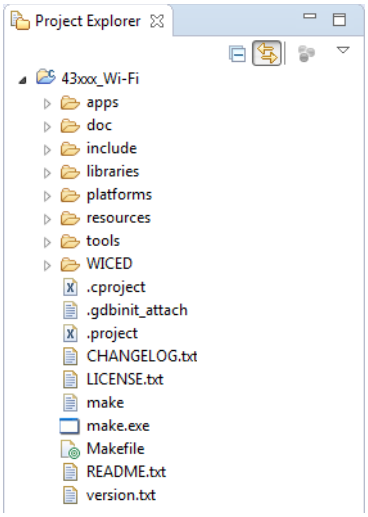
1. File Editor
2. Project Explorer
3. Make Target
4. Console
5. Help

If you close a window unintentionally, you can restore the original set of windows using the following procedure:

1. Select Window > Reset Perspective
    a. Note: the perspective shown is *C/C++*. You can open other perspectives by clicking the icon near the top right corner of the screen or by using Window > Open perspective.
2. Select Window > Show View > Make Target
3. Select Window > Show View > Other… > Help > Help
4. Drag window edges or window tabs around as desired.

Project Explorer

If you expand 43xxx_Wi-Fi from the Project Explorer window you will see the following:



Note: you can access these files using Windows Explorer in the SDK Workspace folder (see the First Look section above for this location).

The README.txt file provides basic information about the SDK. This file is open by default in the editor window when the SDK is first opened. Other folders of interest in the Project Explorer are:

Apps

The *apps* folder is where all of the example projects reside as well as where you will put your own projects. The SDK Workspace includes a wealth of example projects. These are broken into categories by folder name. A few of the useful ones are:

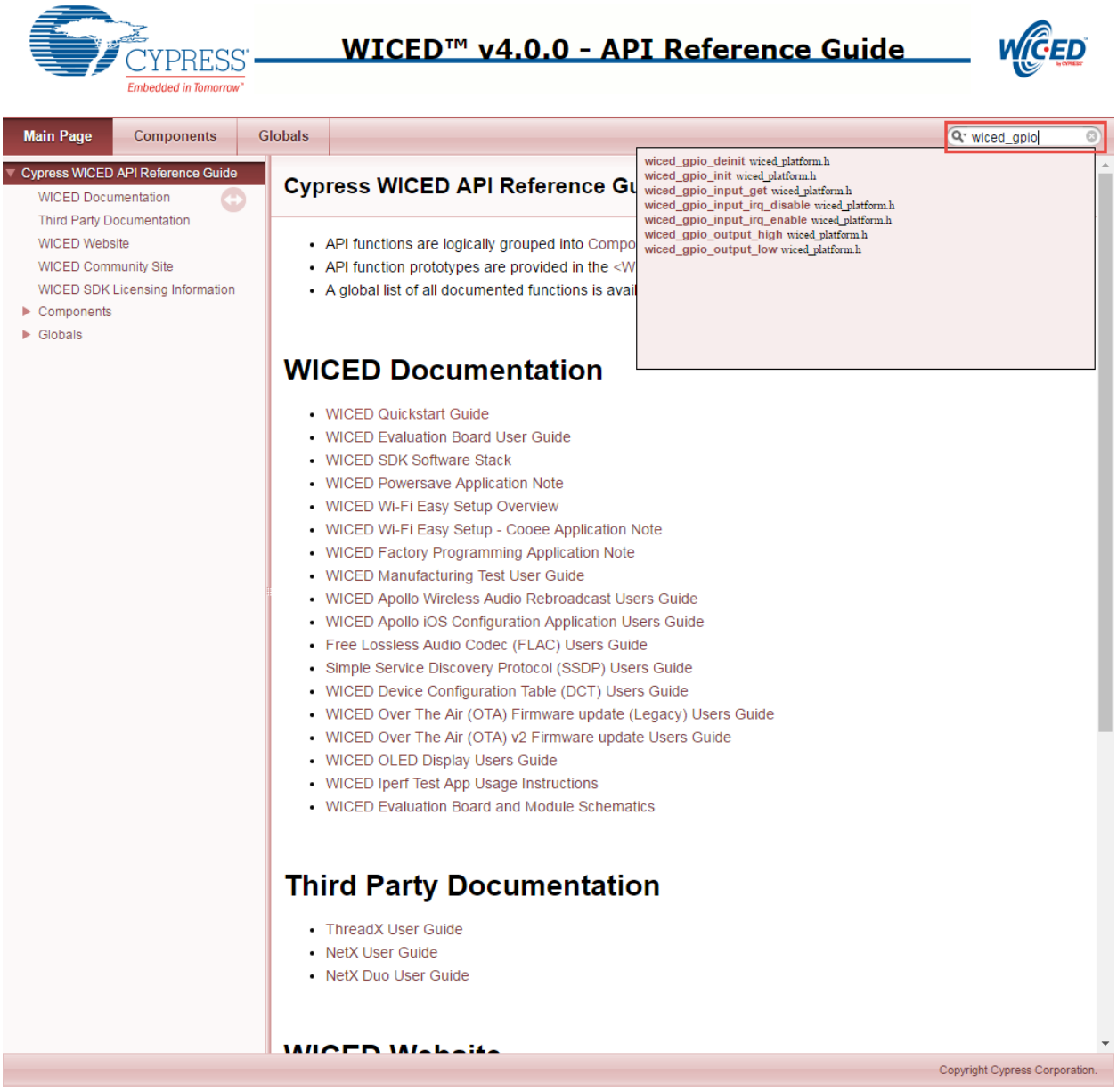
1. *snip*: These are short examples that typically demonstrate one feature. For example:
    a. *snip/gpio* demonstrates GPIO use by reading buttons and blinking LEDs.
    b. *snip/scan* scans for Wi-Fi access points every 5 seconds and displays the results to a terminal window.
2. *demo*: These are more complex and complete demonstrations. For example:
    a. *demo/temp_control* demonstrates an application for controlling and reporting temperatures.
    b. *demo/bt_smartbridge* demonstrates a Bluetooth to Wi-Fi bridge.
3. *test*: These are test and utility programs such as a console that allows you to scan for and connect to Wi-Fi access points. For example:
    a. *test/console* provides a console application on a terminal window. Type “help” in the console for a list of all supported commands.

Doc

The doc folder contains the documentation for the SDK Workspace. Of particular interest is the API.html file which documents all of the WICED API functions. It is usually easier to use that file if you open it in a

web browser of your choice rather than from inside WICED Studio. The first window you will see when you open the API.html file is shown below. You can enter search strings in the window as shown in the figure below. The list will filter dynamically as you type. For example, if you enter “wiced_gpio” you will see a list of all WICED APIs that are used for controlling IOs.

Note: sometimes the search feature stops working. If this happens, close the browser page and reopen it.



Platforms

The platforms folder contains information on different kits (i.e. hardware platforms). These files are necessary in order to program a given project into specific hardware. In our case, the kit we are using is called BCM943907AEVAL1F. That kit has a platform folder, but since we are also using a shield attached to it, we will use a custom set of platform files that also includes the peripherals on the shield. You will have to copy over the custom platform files before using the shield and kit (this will be the first exercise in Chapter 2). You can even create platform files for your own custom hardware that you design. We'll discuss the platforms folder in more detail in Chapter 2.

Libraries

The libraries folder contains various sets of library function files. For example, there are libraries for working with file systems (in the filesystems folder) and for using U8G graphics LCDs (in the graphics folder). We will discuss the libraries folder in more detail in Chapter 4.

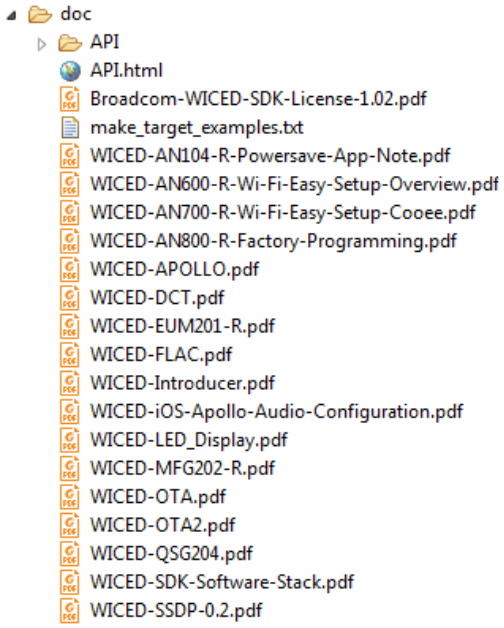
Resources

The resources folder is where you store files that are required by your application. For example, if your application contains a web server, the html files for the server would be in the resources folder under *apps/https_server*.

Tour of Documentation

In the SDK Workspace

As discussed previously, the doc folder in the SDK Workspace contains various documents. The most important of these is the API guide but the folder also contains other useful documents such as the QSG (Quick Start Guide), how to use DCT (Device Configuration Tables), FLAC (Free Lossless Audio Compression), and OTA (Over the Air) Updates. The list of files in the doc directory looks like this:



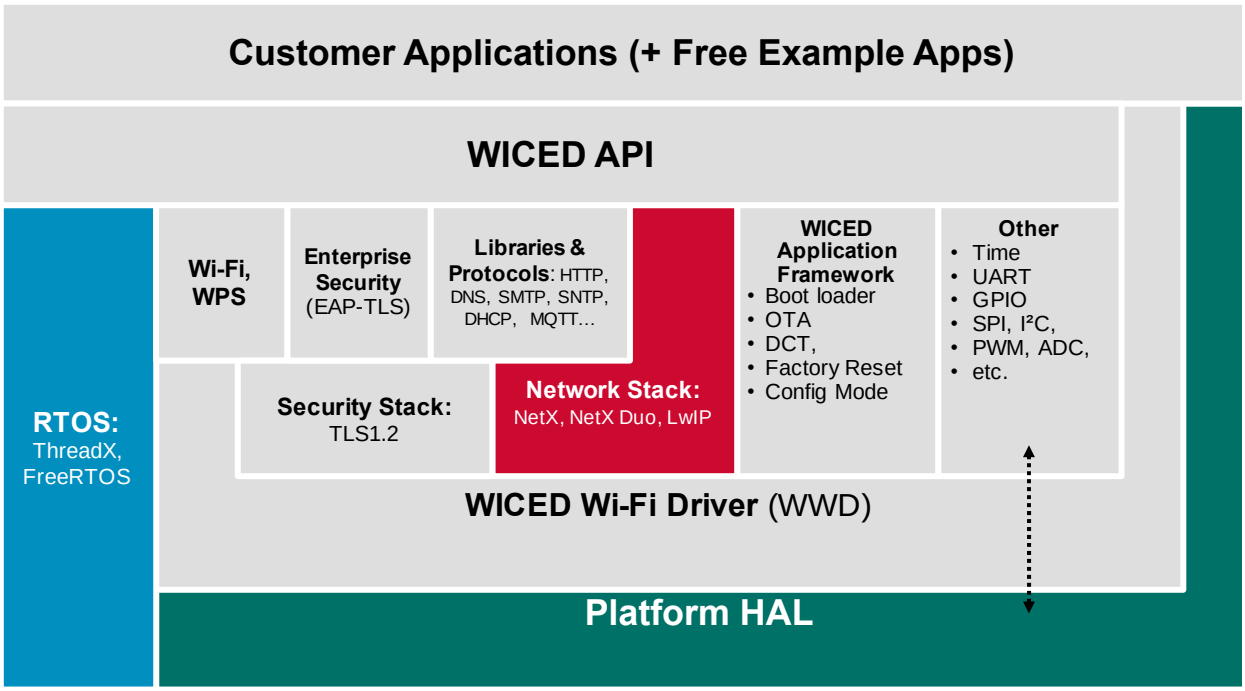
Each of the files in the doc folder can be accessed either from within the WICED Studio (the Project Explorer pane) or from Windows Explorer.

On the Web

Navigating to "www.cypress.com > Design Support > WICED IoT Community" will take you to the following site (the direct link is https://community.cypress.com/welcome):

Clicking on WICED Wi-Fi will take you to the community page as shown below. From this page, you can download the WICED Studio, purchase kits, search for answers, ask questions, etc.

Tour of WICED SDK Structure



Tour of Wi-Fi

IEEE Standard	Mbits/s	Freq GHz	# Chan	Chan Width MHz	MIMO	Comment
802.11	2	2.4	14	22	-	
802.11b	11	2.4	14	22	-	Same as 802.11 with new coding scheme
802.11a	54	5	22	20	-	New coding scheme OFDM + 5GHz
802.11g	54	2.4	14	22	-	New coding scheme OFDM
802.11n	600	2.4 5	14 22	20/40	4	MIMO=Multiple Antennas 4 streams of 150Mbits/s
802.11ac	3600	5	22 10 5 1	20 40 80 160	8	433Mbits/s per stream Beam forming directional

Tour of Chips

Device	Key Features	Notes
BCM43362	• Single band 2.4GHz • 1x1 11n • Modules paired w/ STM32F205 and STM32F411	Recommend new designs with 43364
BCM4390	• Single band 2.4GHz • 1x1 11n	Recommend new designs with BCM43903/7 Black Box Only
BCM43340	• Dual band combo 2.4GHz and 5GHz, 1x1 11n • BT4.1/BLE	Currently only production dual band combo in single chip for WICED RTOS SDK
BCM43364	• Single band 2.4GHz, 1x1 11n • Next Gen BCM43362	Lower power and cost compared to BCM43362
BCM4343W	• Single band combo 2.4GHz • BT4.1/BLE	Lower cost and power compared to BCM43340
BCM43903	• Single band 2.4GHz , 1x1 11n • SOC w/ ARM CR4 160Mhz • 1MB on chip RAM • Secure OTP and HW crypto engine	Lower cost solution for White Box High end Black Box features
BCM43907	• Dual band 2.4 and 5GHz, 1x1 11n • SOC w/ ARM CR4 320Mhz • 2MB on chip RAM • Secure OTP and HW crypto engine	Ideal solution for White Box Multiple low power modes

Tour of Modules

Americas and EMEA Key Module/VAR Partner Matrix

	Anaren	Laird	Inventek Systems	LANTRONIX	CEL	muRata
Target Volume	0-50K	0-50k	10k - 250k	10k -250K	50K – 100k+	100K +
Key Strengths	Ease of Use	Engineering Services	SW and HW compatibility	Industrial and Medical	Inudstry veteran, good sales team, Zigbee	Quality and selection
Selling Points	Start here ! Easty migration to lower cost BRCM module or CoB maintaining SW design	Full suite of services: Industrial design, app dev., system integration, RF testing, cloud	Ease of use and design migration: Pin for pin modules, serial WiFi interface	Fast time to market, Security, Reliability, Manageability	Support, passive component sales, price competitive, SPIL SIP resellers w/ support	High quality high volume large company with pedigree. Best selection of BRCM modules
Weakness	Design Flexibility	Cost	Scalability, EU support	New Product Intro	New to WiFi	SW support is weak Support for low volume
POS Tracking	Excellent	Good	Good	Good	TBD, comitted	Excellent
Market focus	Small commercial	Commercial	Commercial	Commercial	Lighting, and Commercial	Consumer
Products	BLE, WiFi (2H15)	WiFi Only	WiFi Only	WiFi Only	WiFi Combo	WiFi, BLE (2H16)
WICED Devices	20736/7	4390 (SPIL SIP based)	43362, 43340, 4390	43362	4343	43362, 43340, 4390. 43364, 4343W
Future WICED Products	43364, 4343W	4343W	43364, 43903	43907	20706, 20739	20736, 43907, 43455, 43012
Linux Device Support	None	4343W, 43353	43362, 43340	4339	None	43362, 43340, 43438, 4339, 4356
Bcm Exclusive	Yes	WiFi Only	Yes	Yes	WiFi	No

Asia Pacific Regional Module Partner Matrix

	muRata	USI (Realizing IDEAS Together)	SPIL	CC&C Technologies, Inc.	MXCHIP	Ambarella
Target Volume	Negotiable	Distribution	Distribution	25K+	100K+	250K+
Key Strengths	Quality and selection	Lower cost, broad distribution	ODM Model	Industrial and commercial	SW and selection	IP Camera Leader
Selling Points	High quality, leveraged line-card, broad selection of modules	Certified modules, Sister companies for complete ODM solution	High integration SIP, small footprint, pin and layout compatible, lowest cost STM MCU	Low cost, Realtek replacement	High quality, high volume, good SW support and sales channel, ease of use platform, good reputation in China.	SDK integration, global support and partnership, broad number of platforms at feature/price points
Weakness	Potential sales channel conflicts, typically requires third-party SW support	Limited SW and support resources	No SW support	Limited selections, No China support	Cost	Limited turnkey offerings
POS Tracking	Excellent	Good	Excellent	Good	Good	Depends on ODM
Market focus	Consumer, Automotive	Consumer	Distribution/OEM	Commercial	Consumer	Broad
Products	WiFi, Combo, BLE	WiFi, Combo, BT	WiFi, Combo, BLE	WiFi Combo, BT	WiFi, BLE (2H16)	WiFi Only and Combo
WICED Devices	43362, 43340, 4390. 43364, 4343x, 43907, 20736	43362, 43340, 4343x, 43907, 20702	43362, 4390, 43364, 4343W, 43907, 20736, 20706, 20707	43438, 20702, 20704	43362, 43340, 43438	None
Future WICED Products	20739, 43455, 43012	43364, 20707, 20739, 43455, 43012	20739, 43012		20736, 43364	4390x
Linux Device Support	43362, 43340, 43438, 4339, 4356, 43455, 43353, 89335	43362, 43340, 43438, 4339, 4356, 43455	43362, 43364, 4343W	43438	None	43362, 43340, 43364, 43143, 4343x
BCM Exclusive	IOT - Yes	Yes	Yes	BT - Yes	No, but preferred supplier	No, but first choice

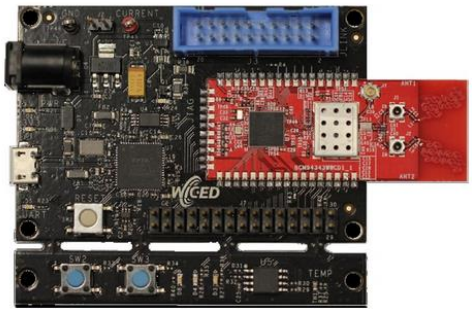
BROADCOM

Tour of Development Kits

Cypress BCM943907AEVAL1F

- Dual band 2.4 and 5GHz WiFi, 1x1 11n
- Ethernet
- SOC w/ ARM CR4 320Mhz
- 2MB on chip RAM
- Secure OTP and HW crypto engine
- USB JTAG Programmer/Debugger

Cypress BCM94343WWCD1 EVB Evaluation and Development Kit

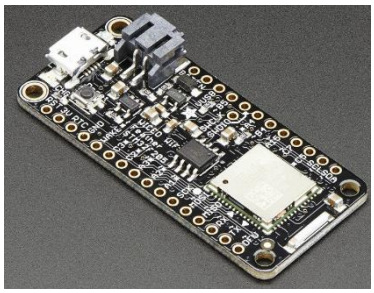


- Wi-Fi + BLE combo kit (BCM4343W)
- 512kB Flash, 128kB SRAM, 8Mb SPI Flash
- 2 User Buttons, 2 User LEDs
- Thermistor
- USB JTAG Programmer/Debugger

Avnet BCM4343W IoT Starter Kit

- Wi-Fi + BLE combo kit (BCM4343W)
- 512kB Flash, 128kB SRAM, 8Mb SPI Flash
- 1 User Button, 2 User LEDs
- Ambient Light Sensor
- Arduino Compatible Headers
- USB JTAG Programmer/Debugger

Adafruit Feather



- Wi-Fi kit (BCM43362)
- 128kB Flash, 16kB SRAM, 16Mb SPI Flash
- Programmable using Arduino IDE
- USB Bootloader

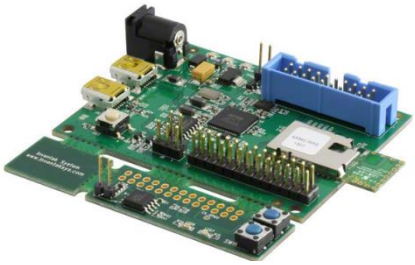
Electric Imp

- Wi-Fi kit (IMP003- BCM43362, IMP005 – BCM43907)
- Programmable using imp IDE

Inventek

ISM43362-M3G-EVB

- Wi-Fi Kit (BCM43362)
- 2 User Buttons, 2 User LEDs
- Thermistor
- USB JTAG Programmer/Debugger



ISM43340-M4G-EVB

- Wi-Fi & Bluetooth Combo Kit (BCM43340)
- 2 User Buttons, 2 User LEDs
- Thermistor
- USB JTAG Programmer/Debugger

ISMART Arduino Shield

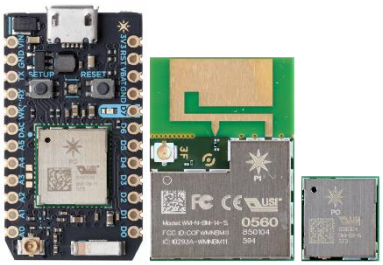
- Wi-Fi, Bluetooth, NFC Combo (BCM43362)
- Arduino stackable shield

ISM43340-L77-EVB

- Wi-Fi & Bluetooth Combo Kit (BCM43340)
- Wi-Fi over SDIO
- Bluetooth over UART
- Micro-SD Connector

Particle Photon

- Wi-Fi kit (BCM43362)
- 1MB Flash, 128kB SRAM



SparkFun with Particle Photon Module

- Wi-Fi kit (BCM43362)
- 1MB Flash, 128kB SRAM
- Arduino Compatible Headers

Exercise(s)

01 Create a forum account

1. Go to https://community.cypress.com/welcome
2. If you already have an account, click “Log in” from the top right corner of the page.
3. If you do not have an account, click “WICED Community” from the panel on the left and sign up for an account.
4. Once you are logged in, click the “WICED Wi-Fi” icon.
5. Click on the “Forums” button.
6. Browse the existing forum articles or search for a particular topic that interests you.

02 Open the documentation

1. Open the API.html document from the WICED Studio Project Explorer or using Windows Explorer in the SDK Workspace *doc* directory.

   Depending on your browser and security settings, you may need to allow ActiveX controls to get the page to display correctly.