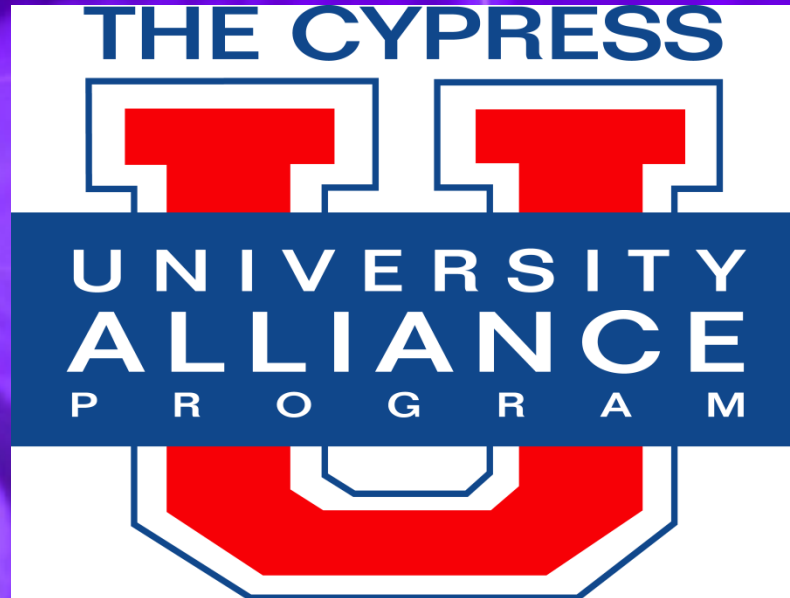


Cypress University Alliance



Patrick Kane

Director Cypress University Alliance

Affiliate Professor University of New Hampshire

pkx@cypress.com

January 5, 2015



UNIVERSITY of NEW HAMPSHIRE

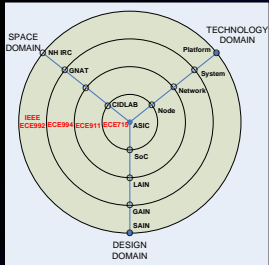
Cypress University Alliance Mission

Create strategic partnerships with key universities to enable professors and students to work with leading edge Cypress technology in the classroom, in the lab, and in research projects

Over 950 schools world-wide participating in the CUA program!



January 5, 2015



Disruptive Engineering Training and Education Based on the Internet of Things

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Stephanie Farrell, ASEE & Rowan University, USA

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Andrzej Rucinski, ISSIP & University of New Hampshire, USA

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Agenda

- **Engineering Education 20 Years After World Wide Web**
- **GNAT-X© AS AN INNOVATION PLATFORM FOR TRAINING AND EDUCATION**
- **WHAT'S NEW IN 2015?**
- **Contact**

Internet of Things (IoT)



A dynamic global network infrastructure with self configuring capabilities based on standard and interoperable communication protocols

Physical and virtual 'things' have identities, physical attributes, and virtual personalities and use intelligent interfaces

Seamlessly integrated into the information network

Internet of Things



Internet of Things (IOT) can be modeled as

$$\text{IOT} = \text{PHY} * (\text{P})\text{SOC} + \text{CLOUD}$$

where

IOT

– Internet of Things

PHY

- PHY level of the seven level network model OSI7

SOC

- Embedded Systems; ASSP; Field Programmable Gate Arrays; Programmable System on a Chip (PSoC) as

examples of **disruptive microelectronics**

CLOUD

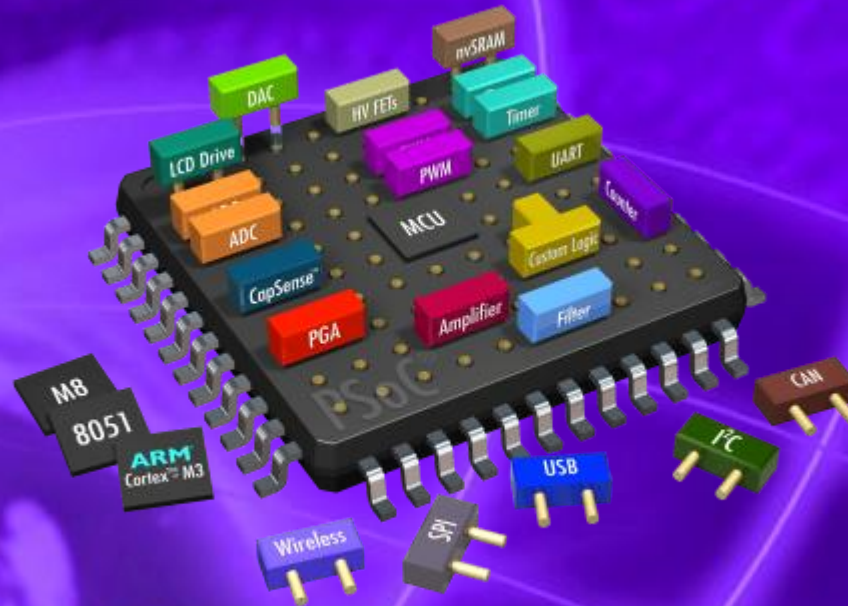
- Cloud

Disruptive Technologies



A **disruptive technology** or **disruptive innovation** is an innovation that helps create a new market and value network, and eventually goes on to disrupt an existing market and value network (over a few years or decades), displacing an earlier technology [Christensen, 1995]

PSoC - Future of Embedded Design



PSoC = Programmable System-on-Chip

PSoC is the world's only embedded SoC integrating high-performance analog and programmable logic, memory, and a microcontroller on a single chip

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TRADITIONAL ELECTRONICS LAB

Large investment

Too expensive for at home learners to set up

Tools

- Oscilloscope

- Power Supply

- Digital Multimeter

- Logic Board

Components

- Resistors, Capacitors, Inductors, ICs

At Home Lab Using PSoC GNAT-X

Tools

- PC running Microsoft Windows
- PSoC 3/4/5 Kit
- CloudTree expansion boards

Result

- No high cost investment to student
- Full functioning home laboratory

PSoC® as an IoT node

Goals

- Use existing internet infrastructure

- Allow for high level of application configurability

Uses

- Creating large scale sensor networks

- Remote Data Collection

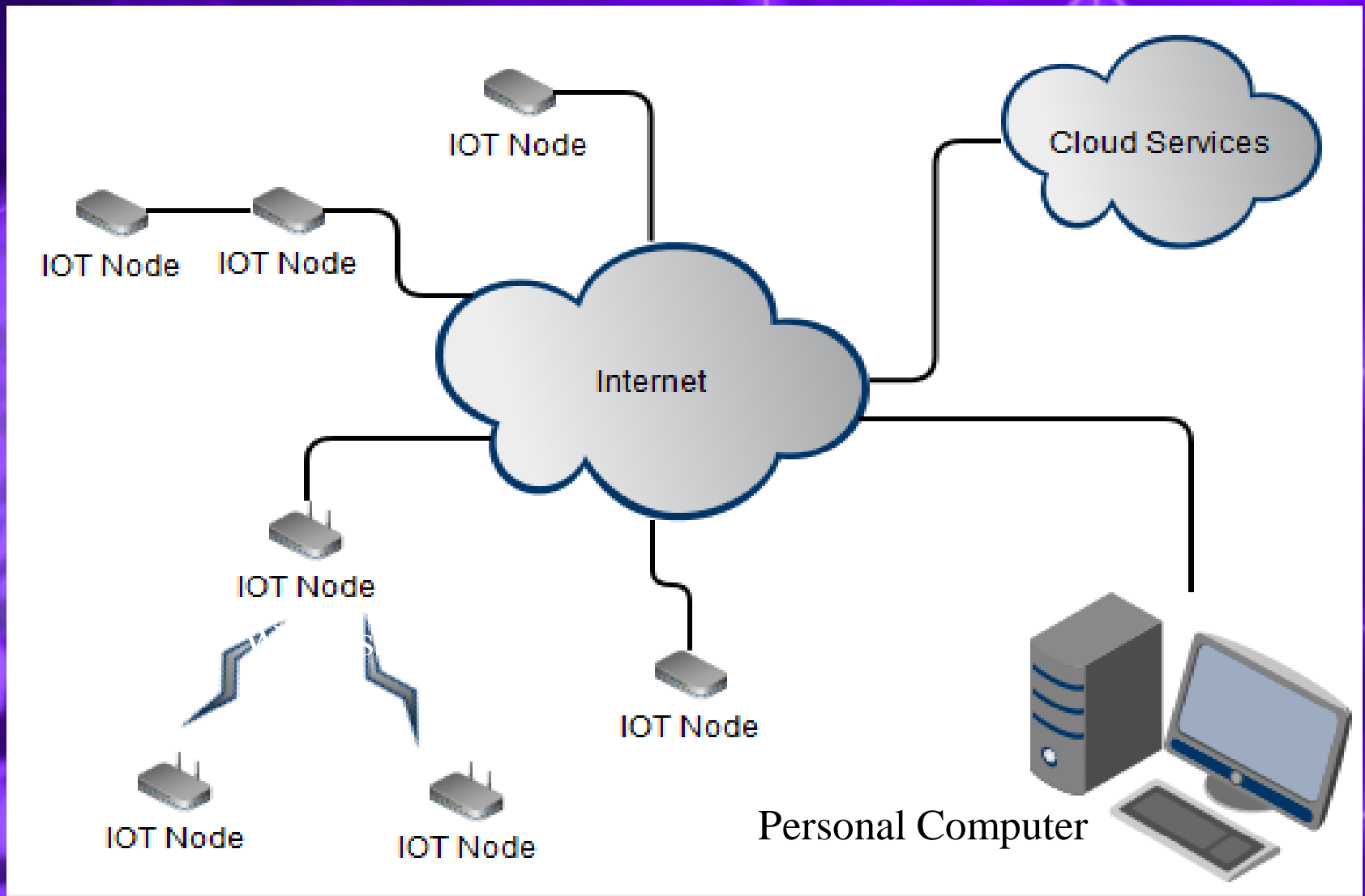
 - Weather Monitoring

- Data Publishing

 - Web based user interface

- Remote system control

IOT Example



Connections Circa 2012



Ethernet

WIZnet W5100

SPI interfaced Ethernet adapter

Wireless

XBee® Pro

900 MHz

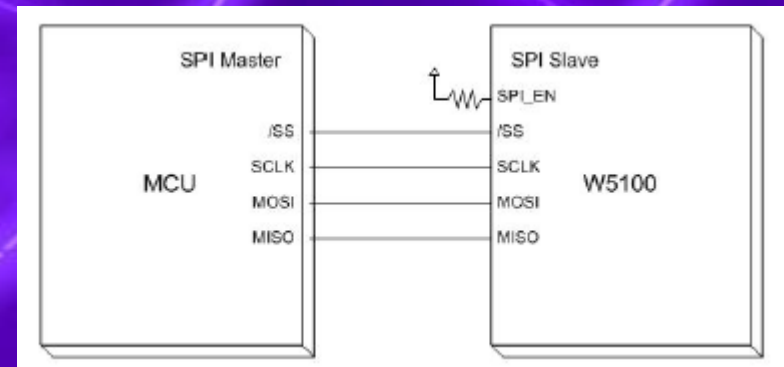
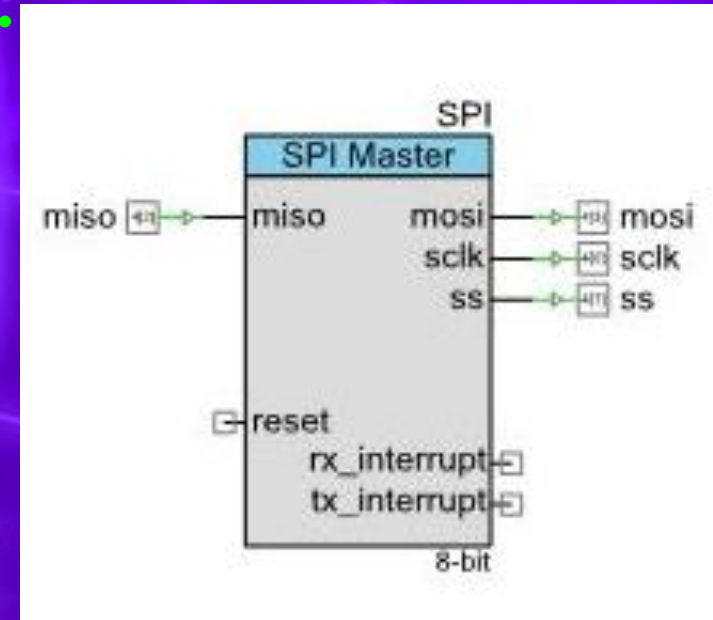
50mW

UART serial interface

WIZnet W5100

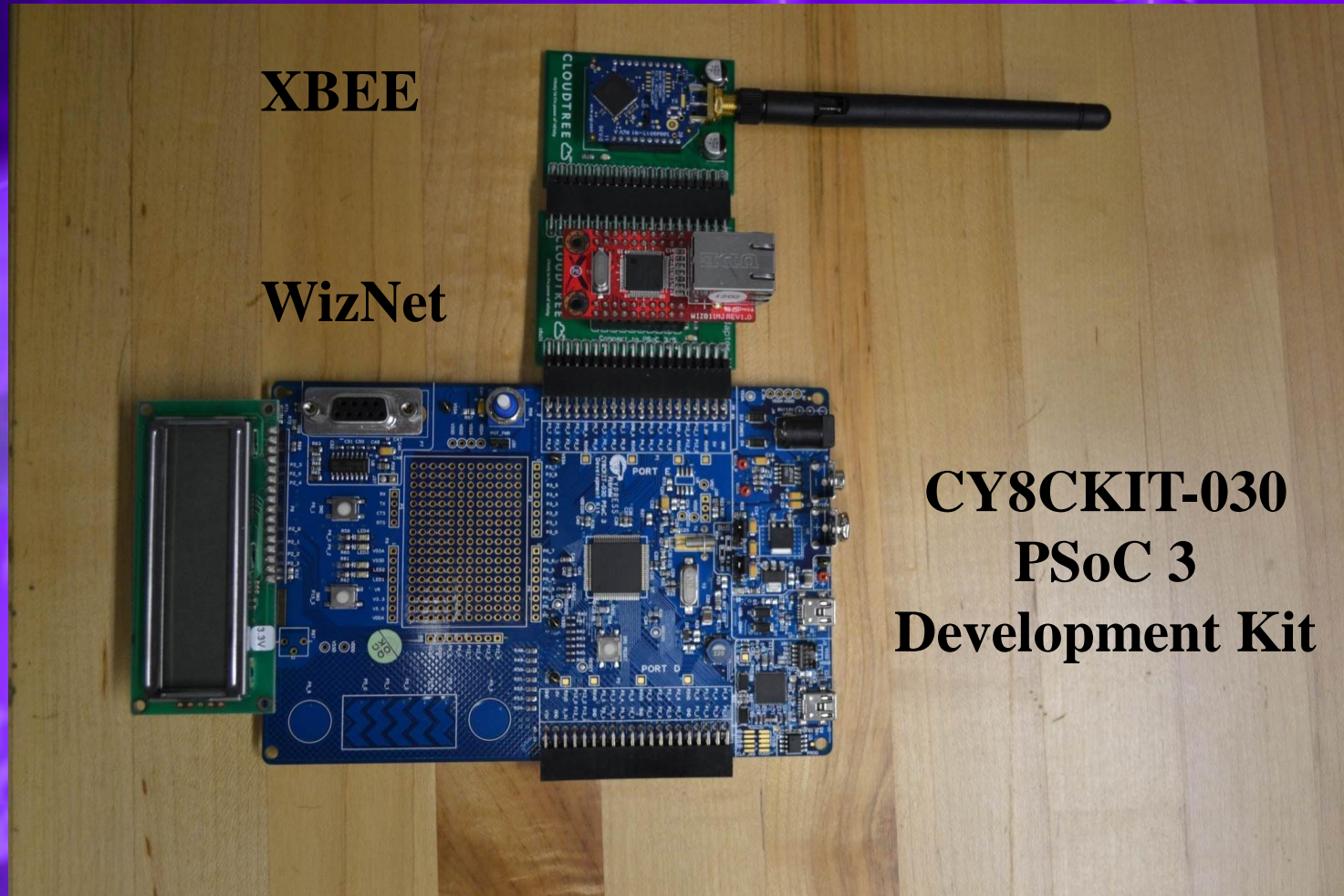
Connection between PSoC® and W5100 made through a SPI interface

PSoC® firmware modifies W5100 memory values to manipulate the W5100



SPI (Serial Peripheral Interface) Mode

PSoC GNAT-X System



XBEE

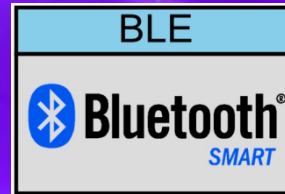
WizNet

**CY8CKIT-030
PSoC 3
Development Kit**

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What Has Changed Since 2012?

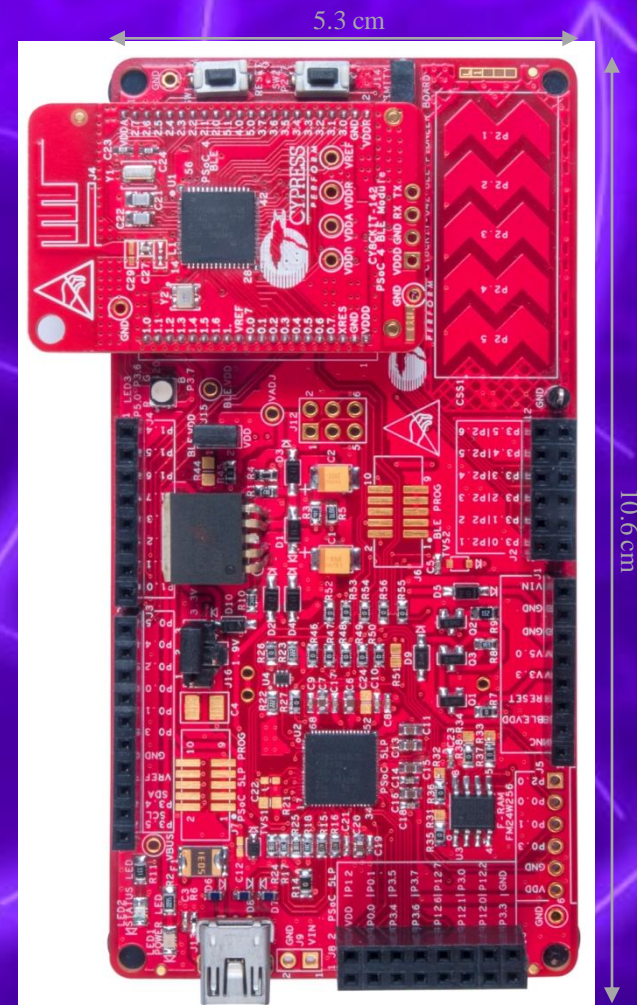


AD-HOC INTERNET OF THINGS NODES WITH PSOC 4 BLE

PSoC 4 Bluetooth Low Energy Kit

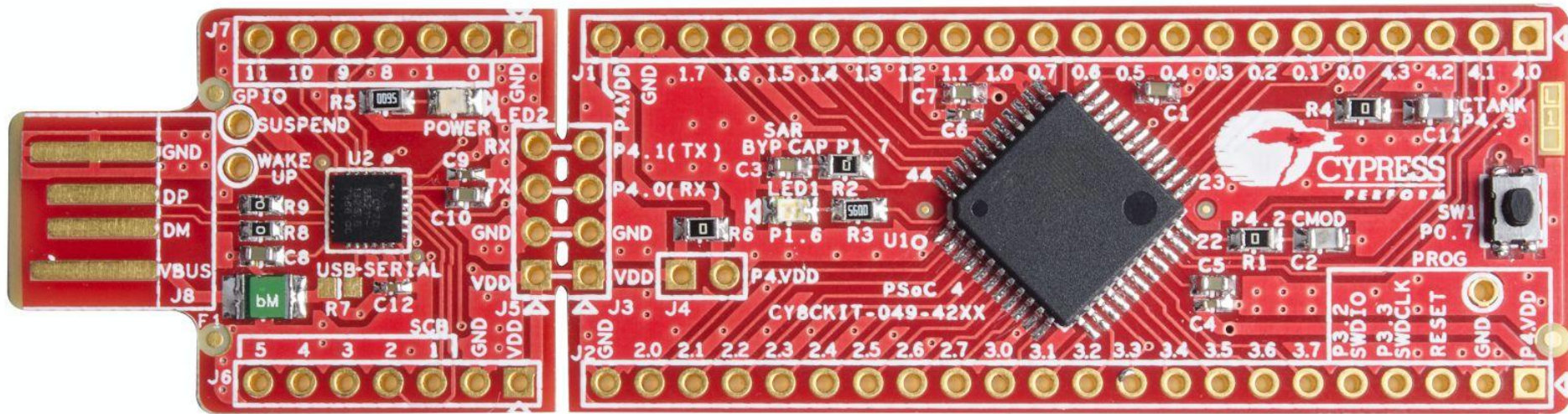
BLE Pioneer Kit (CY8CKIT-042-BLE)

- BLE Pioneer Kit provides simple, rapid development
 - Compatible form factor with Arduino® shields and Digilent® Pmod™ daughter cards
 - Includes two FCC-certified¹ BLE modules
 - PSoC 4 BLE module (also sold separately as CY8CKIT-141)
 - PRoC BLE module (also sold separately as CY5671)
 - Features onboard CapSense slider, RGB LED and push buttons
 - Provides direct access to all device GPIOs
 - Selectable voltage setting of 1.9 V, 3.3 V or 5 V
- BLE Pioneer Kit provides an advanced debug interface
 - Includes an on-board PSoC 5LP, factory-programmed as a programmer and debugger
 - Serial Wire Debug interface over USB
 - USB-to-serial interface



¹ A mark on electronic products manufactured or sold in the U.S. certifying that its electromagnetic interference is under limits defined by the Federal Communications Commission

PSoC 4 Stamp Board



The prototyping kits support PC connectivity through the Cypress USB-Serial controller. The devices can be programmed using the USB-Serial controller and the Bootloader Software Host tool. For more information please see the kit user guide for steps and examples.

PSoC 4

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Contacts

www.cypress.com/cua

Fig 4



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Thank You – Questions?

