



CoreBluetooth for the Control Freak

CocoaConf Portland 2012

Tim Burks

(with lots of help from Scott Gustafson)



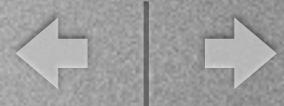
About us

Tim Burks

- Freelance iOS developer (part-time enterprise device management at MobileIron, full-time fun at Radtastical Inc)
- EE/Computer Engineer, formerly wrote CAD tools for microprocessors.

Scott Gustafson

- Freelance app development (Garlic Software LLC, eBay, RedLaser, Symantec)
- Hardware Hacker (Arduino, Bluetooth, RFID)



Why are we here?

Core Bluetooth + Bluetooth LE is
AMAZING



Bluetooth Low Energy

- Very high battery life, very low bandwidth
- Core Bluetooth: No MFI + easy API + background mode

Applications



BlueHR image source: wahofitness.com



Find my Car Smarter image source: www.imore.com



Bluetooth Bulb image source: bluetoothbulb.com



Casio G-Shock image source: www.wired.com





Apple Support for Bluetooth LE



image source: <http://www.bluetooth.com/pages/Bluetooth-Smart-Devices.aspx>



WWDC '12 Sessions

- 703 Core Bluetooth 101 (Brian Tucker)
- 705 Advanced Core Bluetooth (Joakim Linde, Khrob Edmonds)

<https://developer.apple.com/videos/wwdc/2012/>



Low Power

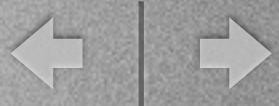


CR2032 battery

CR2032 image source: wikipedia.com

From Wikipedia, the free encyclopedia

A **CR2032 battery** is a standard lithium battery rated at 3.0 [volts](#), commonly used in computers as a [CMOS battery](#), some [scientific](#) and [graphing calculators](#), [scientific instruments](#), [watches](#), [clocks](#), [toys](#), [remote keyless systems](#) and small LED [flashlights](#).



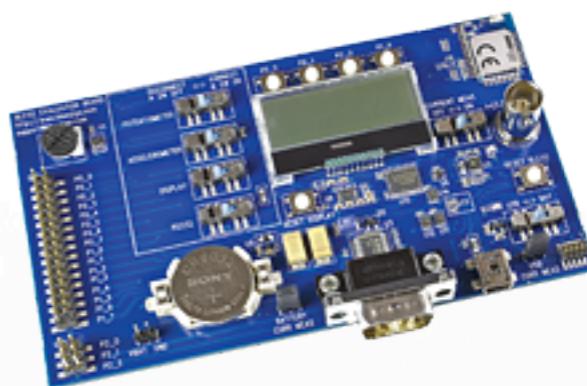
Apple Sample Code

- CoreBluetooth: Heart Rate Monitor (OS X)
- CoreBluetooth: Health Thermometer (OS X)
- CoreBluetooth: Temperature Sensor (iOS)

Available through the Xcode documentation window

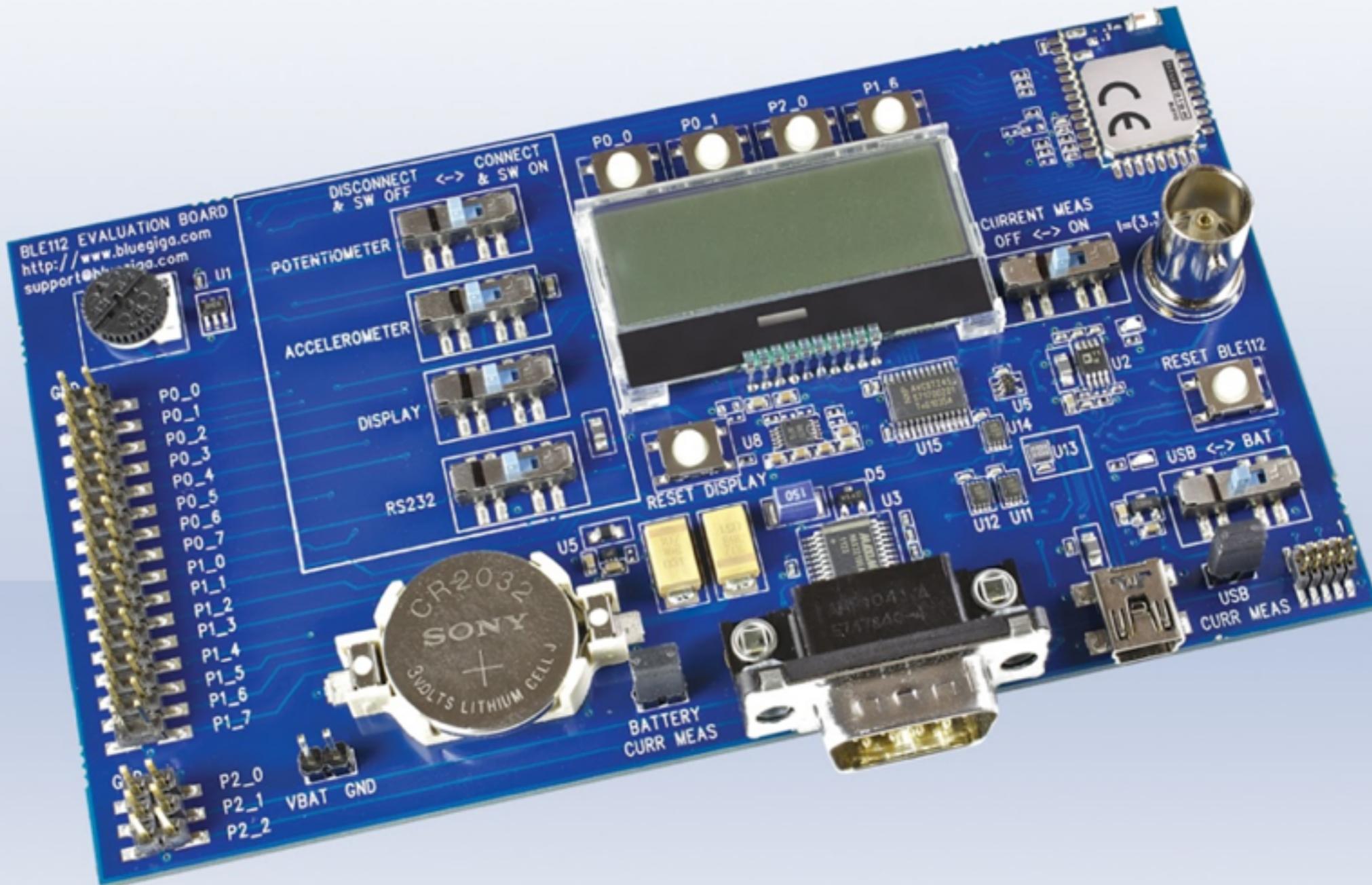


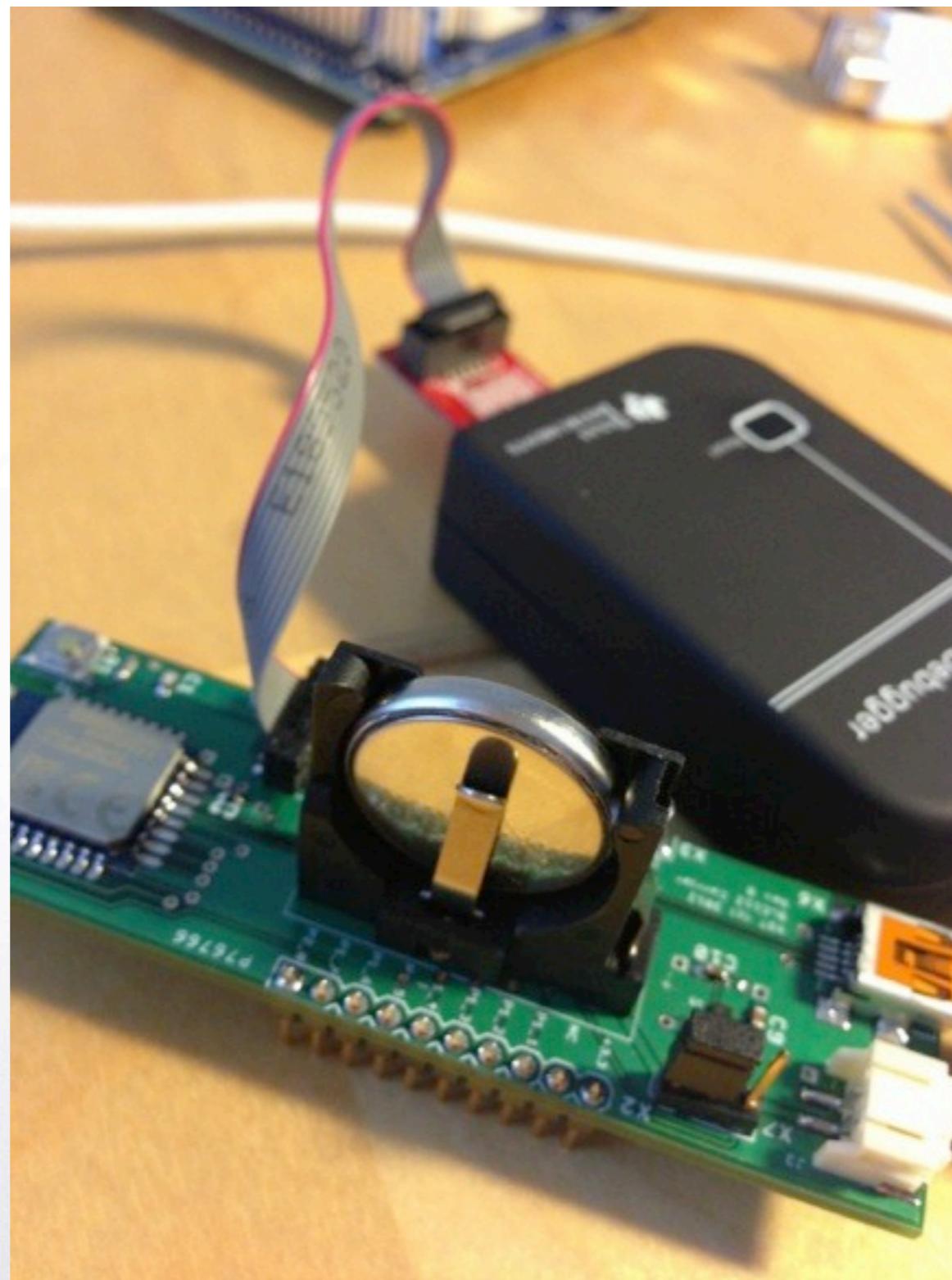
Bluegiga BLE I I2

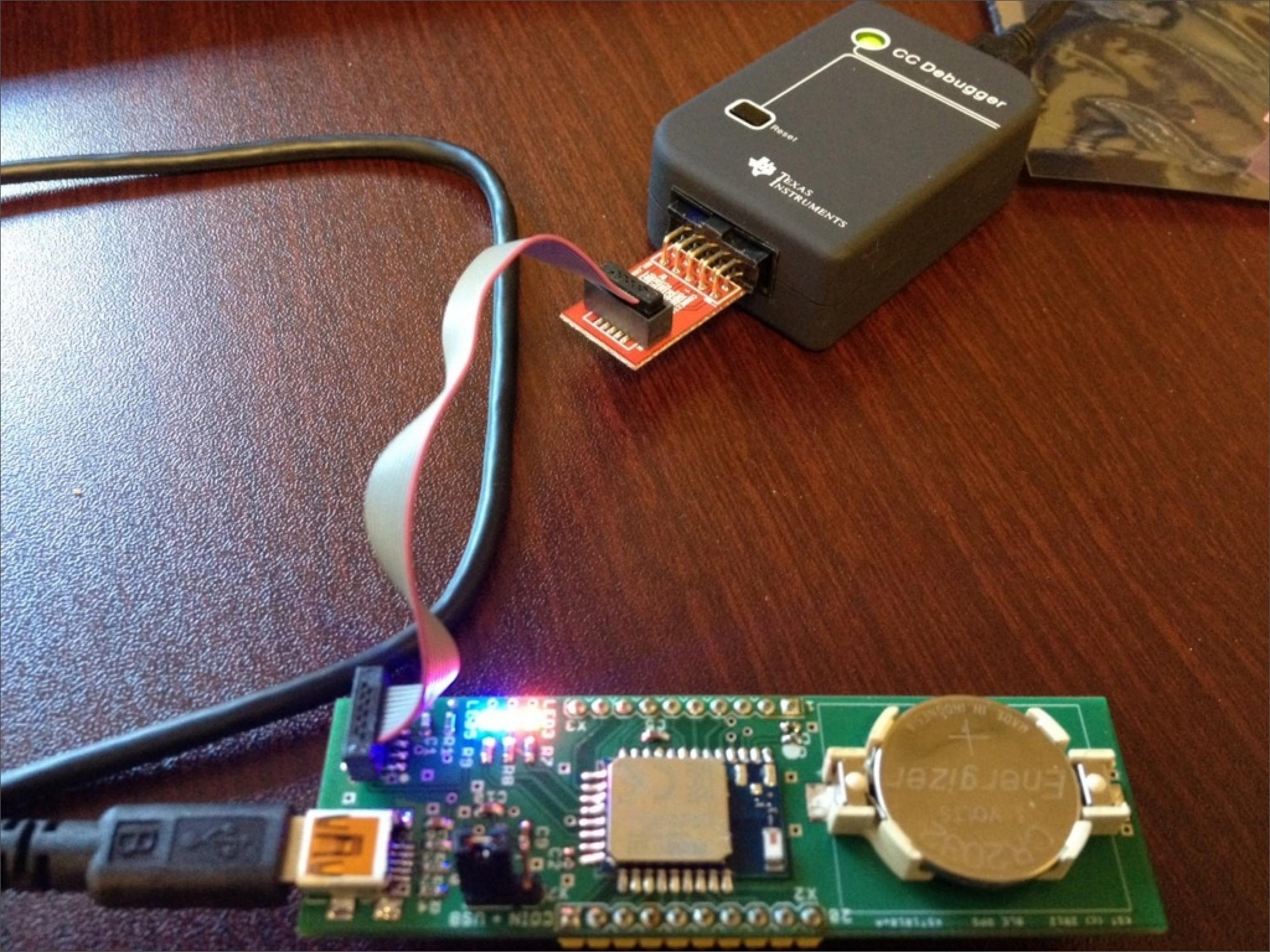


- Bluetooth 4.0 Single Mode Module
- Integrated radio, antenna, 8051 µC
- DKBLEI I2 development kit

Image source: bluegiga.com









TI CC Debugger

The DKBLEI112 can be programmed via USB using a built in DFU mode.

... but we're still working on that.

Until we get that, we program the board and any other BLEI112s with the TI CC Debugger.

<http://www.ti.com/tool/cc-debugger>



CC Debugger image source: ti.com



Meet the kubi | Revolve Robotics

revolverobotics.com/meet-the-kubi/ Reader



MEET THE KUBI PRODUCT JOIN US ABOUT CONTACT US

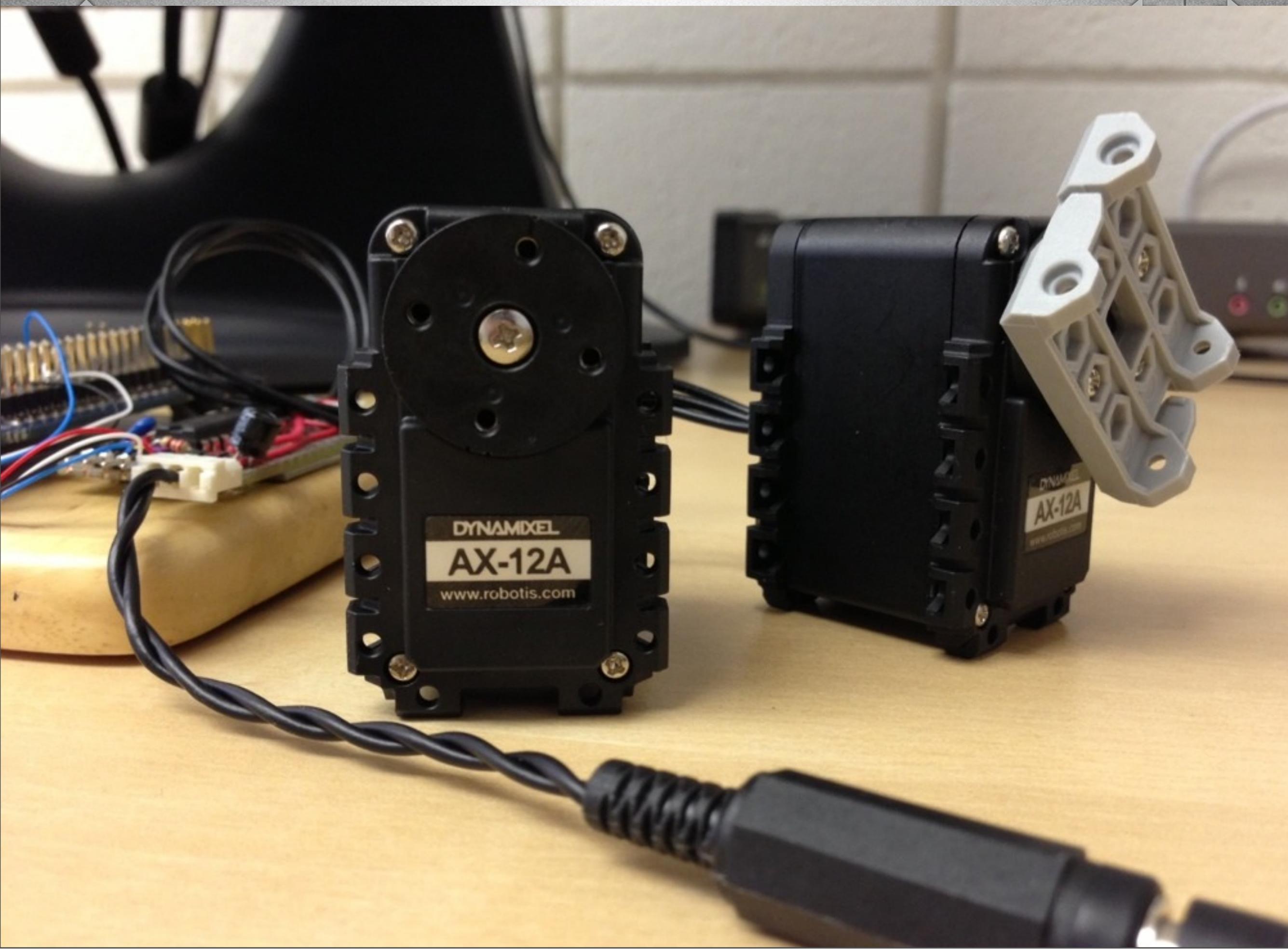
Meet **kubi**, the robotic stand that puts you in control Your iPad, evolved!

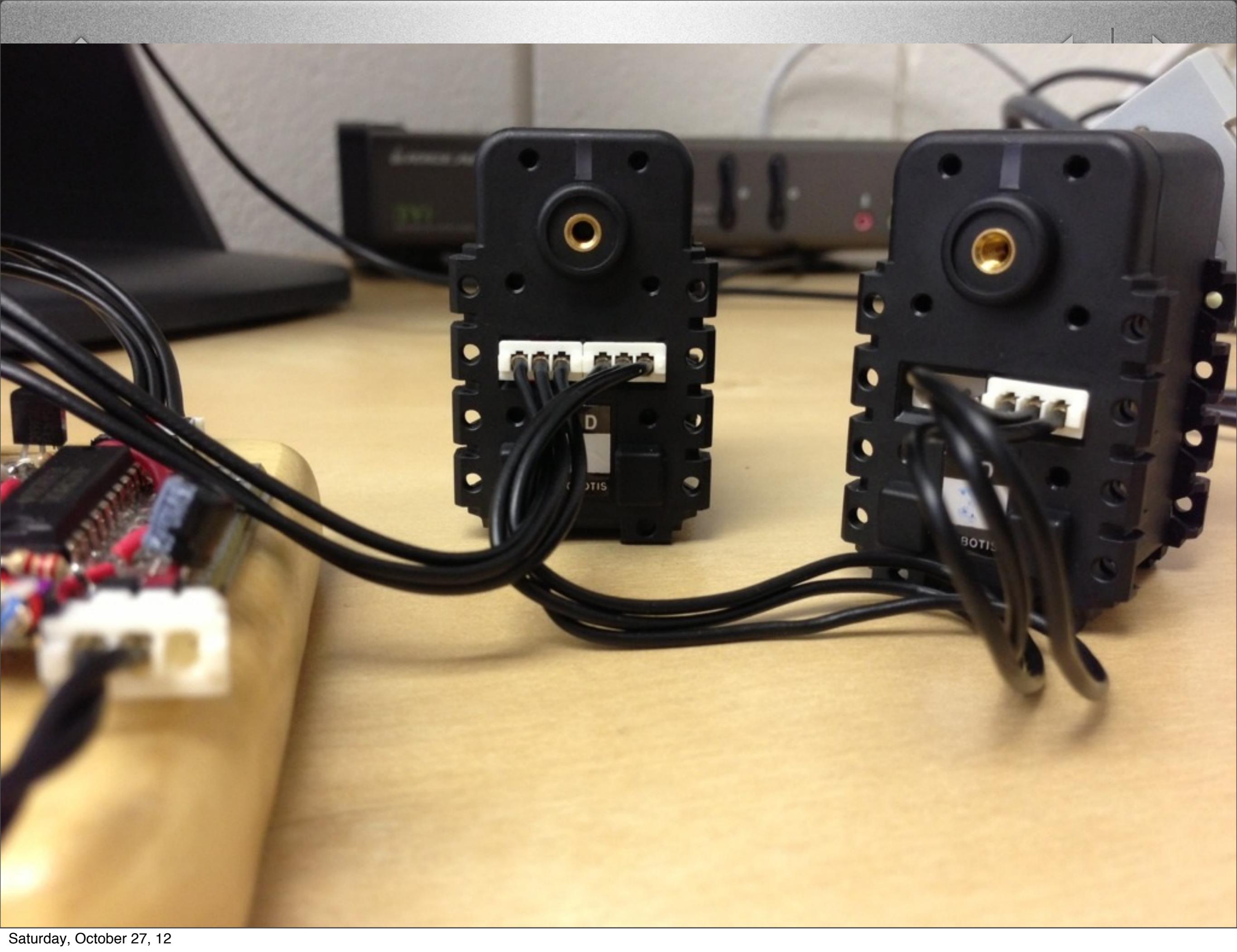


Follow the action with the kubi remote pan and tilt base, address individuals and interact with remote environments like never before



- 90° tilt, 180° pan motion range
- app controlled hardware with open API
- Bluetooth 4.0 (low energy) controlled
- tripod compatible
- collapses for travel







877.898.1005

Int: 630.437.5095

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Dynamixel Datasheet/
Comparison Guide**

main controller free to perform other functions.

[Downloads](#)**Dynamixel AX-12A Robot Actuator**

Item #: RO-902-0003-001

Availability: In Stock

Price: \$44.90

Quantity

	Unit Price	Pack Price
Bulk Pack (6)	\$37.42	\$224.50

For orders over 20 units please contact [sales](#)
or call 1-877-898-1005

The AX-12A servo actuator from Robotis is the most advanced actuator on the market in this price range and has become the defacto standard for the next generation of hobby robotics. The AX-12A robot servo has the ability to track its speed, temperature, shaft position, voltage, and load. As if this weren't enough, the control algorithm used to maintain shaft position on the ax-12 actuator can be adjusted individually for each servo, allowing you to control the speed and strength of the motor's response. All of the sensor management and position control is handled by the servo's built-in microcontroller. This distributed approach leaves your





Dynamixel Examples

- http://support.robotis.com/en/product/bioloid/premiumkit/download/bio_prm_advance_apps.htm



BLE I I2 in-depth

- Toolchain
- Data sheet
- Sample Projects
- Documentation

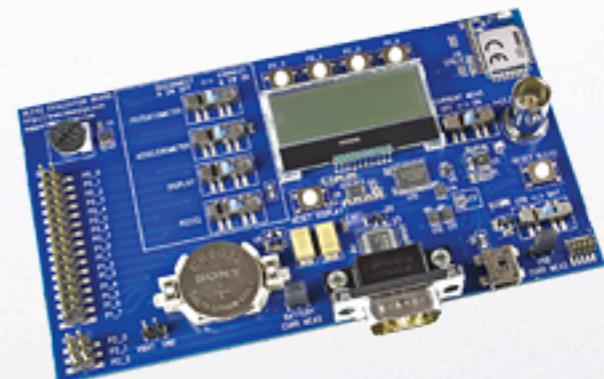
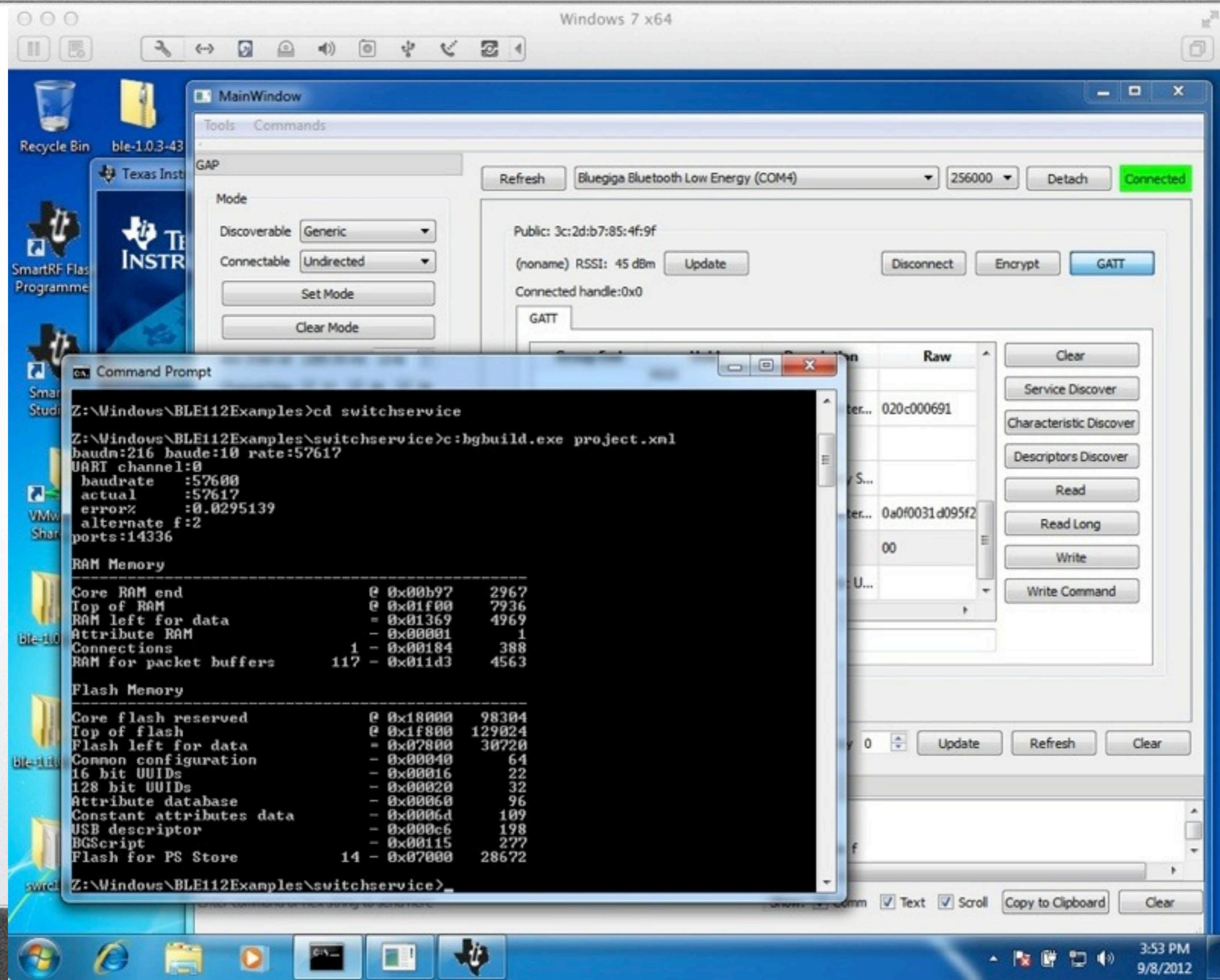
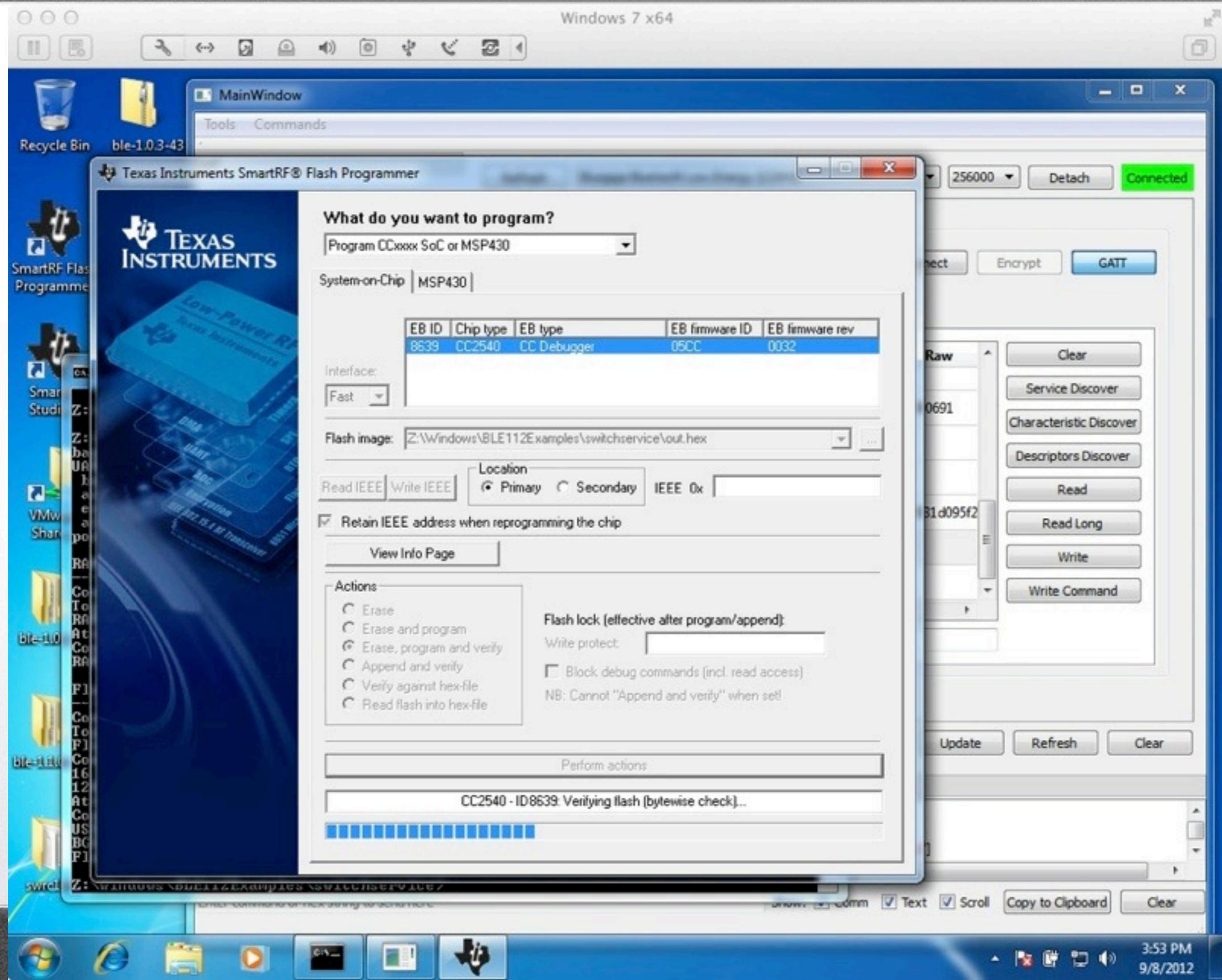


Image source: bluegiga.com

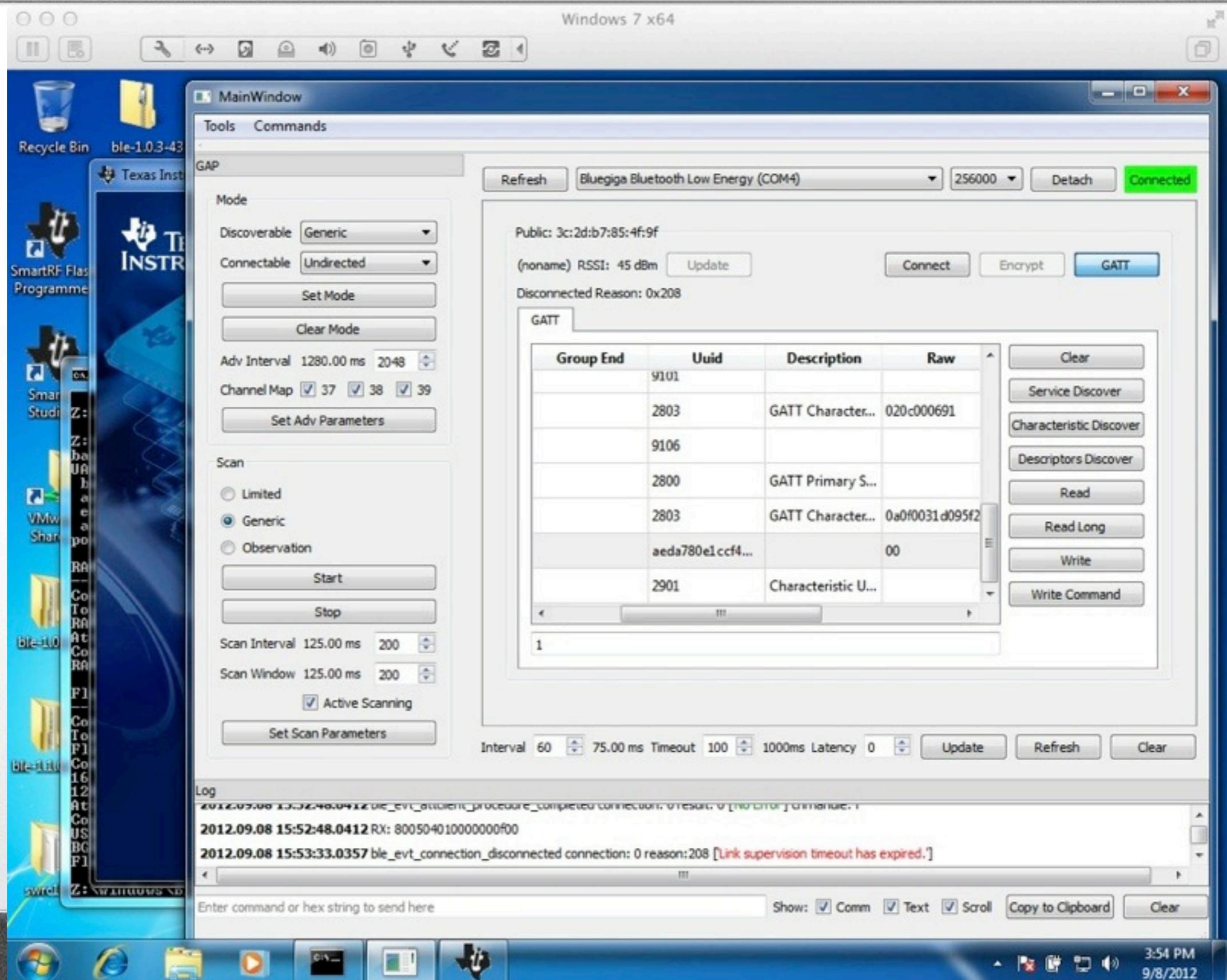
Windows Tools: bgbuild



Windows Tools: SmartRF Flash Programmer



Windows Tools: blegui2





```
Flash Memory
Core flash reserved          0 0x18000  98304
Top of flash                 0 0x1f800  129024
Flash left for data          = 0x07800  30720
Common configuration          - 0x00040   64
                               - 0x0001c   28
                               - 0x00020   32
Attribute database            - 0x00078   120
Constant attributes data     - 0x00065   101
USB descriptor                - 0x000c6   198
BGScript                      - 0x000a8   168
Flash for PS Store           14 - 0x07000  28672
[nonergodicity:Windows/example/hello] tim% cc-tool -e -w out.hex
  Programmer: CC Debugger
  Target: CC2540
  Erasing flash...
  Erasing complete
  Writing file ... (127 kB)
  Writing complete (9. s)
[nonergodicity:Windows/example/hello] tim% e
```

Hello, Macintosh





```
% bgbuild project.xml
tag name: 0x1013005aa
tag name: 0x1013005aa
tag name: 0x1013005aa
tag name: 0x1013005aa
baudm:216 baude:10 rate:57617
UART channel:0
    baudrate :57600
    actual    :57617
    error%    :0.0295139
    alternate f:2
ports:14336
tag name: 0x10100b46a
tag name: 0x10100b46a
```

RAM Memory

Core RAM end	@ 0x00000	0
Top of RAM	@ 0x01f00	7936
RAM left for data	= 0x01f00	7936
Attribute RAM	- 0x00001	1
Connections	1 - 0x00185	389
RAM for packet buffers	193 - 0x01d67	7527

Flash Memory

Core flash reserved	@ 0x18000	98304
Top of flash	@ 0x1f800	129024
Flash left for data	= 0x07800	30720
Common configuration	- 0x00040	64
16 bit UUIDs	- 0x00016	22
128 bit UUIDs	- 0x00020	32
Attribute database	- 0x00060	96
Constant attributes data	- 0x0006d	109
USB descriptor	- 0x000c6	198
BGScript	- 0x00115	277
Flash for PS Store	14 - 0x07000	28672
% ls -s out.hex		
704 out.hex		



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by g-stark

Support for Texas Instruments CC Debugger in Linux

8 Recommendations

4 Downloads (This Week)

Last Update: 2012-09-25

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cc-tool-0.20.tgz

[Browse All Files](#)

Description

cc-tool provides support for Texas Instruments CC Debugger for Linux OS in order to program 8051-based System-On-Chip devices: CC2540 CC253x CC243x CC251x CC111x

[cc-tool Web Site >](#)

Categories

License

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SOURCES.HP ProLiant ML350p Gen8
Server

\$2159.99



cc-tool

<https://github.com/scott-42/cc-tool>

% cc-tool -e -w out.hex

% cc-tool --read-mac-address

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- Internet Songs
- prog_index
- prog_index-1

SEARCH: btleplorer

App Store > Utilities > KS Technologies

BTLEplorer

Description

BTLEplorer is a utility application designed for engineers to quickly discover, connect, and characterize their custom Bluetooth Smart accessories.

...More

KS Technologies Web Site > BTLEplorer Support >

What's New in Version 1.2

- This app is designed for both iPhone and iPad

Category: Utilities
Updated: Oct 19, 2012
Version: 1.2
Size: 0.4 MB
Language: English
Seller: KS Technologies
© KS Technologies, LLC 2012

Rated 4+

Requirements: Compatible with iPhone 3GS, iPhone 4, iPhone 4S, iPhone 5, iPod touch (3rd generation), iPod touch (4th generation), iPod touch (5th generation) and iPad. Requires iOS 5.1 or later.

Screenshots

iPhone iPad

The screenshots show the app's user interface. The first screenshot displays a list of peripherals with signal strengths: Bluegiga Heart Rate (-44 dBm), Scosche PROX (-78 dBm), Wahoo BlueSC v1.0 (-41 dBm), and KST ADC (-52 dBm). The second screenshot shows a detailed view of the Bluegiga Heart Rate service, listing Generic Access Service, Device Information Service, Heart Rate Service, and Private Service, along with their respective UUIDs and last advertisement times.

Peripheral	Service	UUID	Last Advert
Bluegiga Heart Rate	Generic Access Service	0x1800	12:31:18
Scosche PROX	Device Information Service	0x180A	12:31:18
Wahoo BlueSC v1.0	Heart Rate Service	0x180D	12:31:18
KST ADC	Private Service	Unknown (<e001>)	12:31:18

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- iTunes Match
- Purchased

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- Genius

PLAYLISTS

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- 90's Music
- Classical Music
- Music Videos
- My Top Rated
- Recently Added
- Recently Played
- Top 25 Most Played
- Internet Songs
- prog_index
- prog_index-1

App Store > Utilities > Michael Kroll

BLEExplr

Description

BLEExplr is an app to find, connect and browse Bluetooth Low Energy devices nearby. The simple app can be used to connect to a given BLE peripheral, browse through the services which are provided. Moreover the characteristics of a given service can be browsed. The current version of the App supports read, write, notify and indicate characteristics. One peripheral can be connected at the same time. If the app is... [...More](#)

[BLEExplr Support >](#)

What's New in Version 1.0.6

- Discovering connected devices on iOS6 is now supported.

iPhone Screenshots

Category: Utilities
Updated: Oct 15, 2012
Version: 1.0.6
Size: 4.3 MB
Language: English
Seller: Michael Kroll
© 2012 Dr. Michael Kroll

Downloaded

Rated 4+

Requirements: Compatible with iPhone 3GS, iPhone 4, iPhone 4S, iPhone 5, iPod touch (3rd generation), iPod touch (4th generation), iPod touch (5th generation) and iPad. Requires iOS 5.1 or later. This app is optimized for iPhone 5.

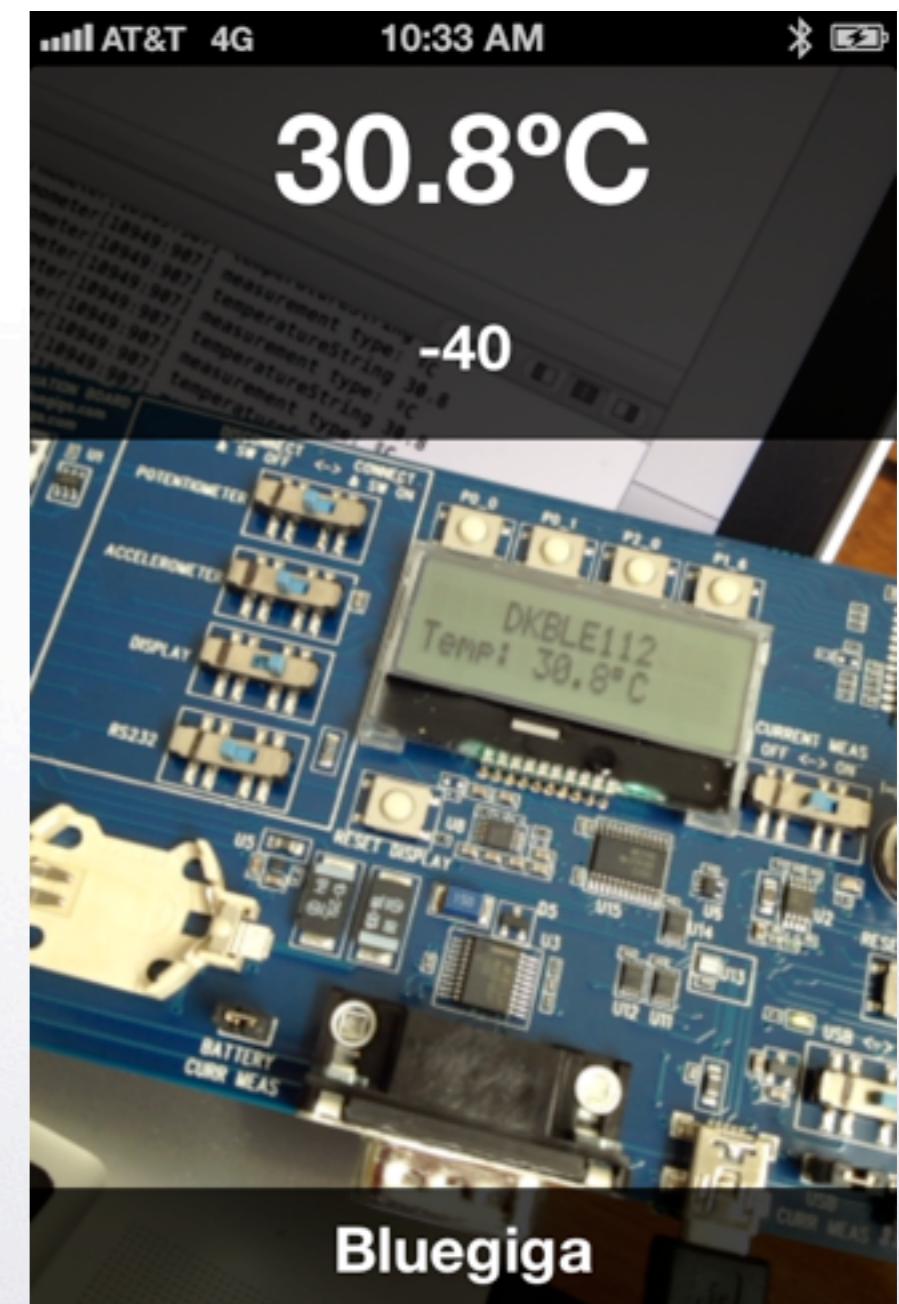
More iPhone Apps by Michael Kroll

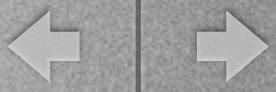
Search: blexplr



iOSHealthThermometer

- [http://github.com/timburks/
iOSHealthThermometer](http://github.com/timburks/iOSHealthThermometer)
- Demonstrates client implementation.
- Requires Bluetooth LE-capable iOS device and a compatible Bluetooth LE Thermometer
- Works with DKBLE112 running preloaded app.





Examples

<https://github.com/scott-42/BLE112Examples.git>



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PIR Sensor (Rev B)

The PIR (Passive Infra-Red) Sensor is a pyroelectric device that detects motion by measuring changes in the infrared (heat) levels emitted by surrounding objects. When motion is detected the PIR Sensor outputs a high signal on its output pin. This logic signal can be read by a microcontroller or used to drive an external load. Dual output modes and a sensible design that performs within stated datasheet specifications are a few reasons over 100,000 units are in use around the world.

NOTE: The product information found on this page currently pertains to Revision B of this product, which provides many updates and features from Revision A. Some of these include:

- Longer detection range, selectable by onboard jumper
- Wider supply voltage, from 3 to 6 VDC
- Higher output current provides for direct control of an external load
- Mounting holes included for permanent projects
- All parts SMT

 [View Larger Image](#)

Item code 555-28027

Stock **IN STOCK**

266

Price \$10.99

Starting from: 5 pieces \$10.44
 Starting from: 10 pieces \$9.89
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 Starting from: 50 pieces \$7.69
 Starting from: 250 pieces \$7.14

Features:

- Detect a person up to ~30 ft. away, or up to 15 ft. away in reduced sensitivity mode
- Jumper selects normal operation or reduced sensitivity
- Source current up to 12 mA @ 3 V, 23 mA @ 5 V
- Onboard LEDs light up the lens for fast visual feedback when movement is detected
- Mounting holes for 2-56 sized screws
- 3-pin SIP header ready for breadboard or through-hole projects
- Small size makes it easy to conceal
- Easy interface to any microcontroller

Application Ideas:

- Motion-activated nightlight
- Alarm systems
- Holiday animated props

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CBSample

- <http://github.com/timburks/CBSample>
- Demonstrates client and server implementations. Follows WWDC “Advanced Core Bluetooth” talk.
- Requires two Bluetooth LE-capable iOS devices.
- Subject to a few iOS6 bugs.



Thanks

@timburks @scottg0 @bluegiga

See us at <http://renaissance.io> for more.