Agenda

- About Me
- Silicon Labs
  - Who are we? What do we do?
- Applications Engineering
  - Functions
  - Skills needed
- IoT and Wireless Protocols
- **Demo:** Monitoring Soil Humidity with Bluetooth Smart
  - Younas Abdul Salam - Applications Engineer, Silicon Labs
About Me

- Grew up in US/MEX border (El Paso/Juarez)
- Undergraduate and graduate degrees in Electrical Engineering
- Applications engineer at Silicon Labs the last three years

- Dad of beautiful 10 year old girl
- Hobbies: Volleyball, guitar, cooking, exercising
- Happy and grateful with life!
How I Got Here

- “High school dropout” in MEX
- Apartment blackout → Electrical engineering major
- College, internships, student organizations
- Bad Economy → Graduate school

- Full fellowship → More graduate school
- Ph.D. in Analog/RF IC design
  - Research & teaching
  - NSF GK-12
- Job hunt → Interview → NCG applications engineer
Silicon Labs

- Global mixed-signal semiconductor company
  - Founded in 1996; public since 2000 (NASDAQ: SLAB)
  - >1,100 employees and 11 R&D locations worldwide

- Strong track record of innovation and differentiation
  - Operational excellence and conservative financial management drives high profitability
  - Fabless model with >6 billion devices shipped and >1,500 patents issued and pending
Our Product Portfolio

HIGH GROWTH

Internet of Things
MCU | Wireless | Sensors

Infrastructure
Timing | Isolation

Automotive | Consumer
Radio | Video

Voice and Data
Modems | SLICs | PoE

MATURE
Applications Engineering

- Provides engineering and technical support to internal and customer design teams for the development, deployment, and support of products

Functions based on product stage

**Under Development**
- Design/debug test boards
- Support design validation
- Set up testbench/equipment
- Collect/analyze test data
- Competitive analysis
- Promote customer needs

**Ready for Market Release**
- Develop product collateral
- Test automation scripting
- Support marketing team
- Support “alpha” customers
- Write user guides/app notes
- Become product expert

**In the Market**
- Customer tech support
- Evaluate returned products
- Promote upcoming products
- Assist customers with product development
- Provide on-site support
Requirements

- College degree in EE
- Broad set of technical skills
  - Knowledge of electronics, microcontrollers, circuit design, board layout, lab equipment, programming languages, data analysis, software development tools and environments, etc.
- Good soft skills
  - Communication, team work, adaptable to change, writing skills
- Hard work and commitment
- System-level thinking
Internet of Things (IoT)

- **Internet of Things**
  - MCU | Wireless | Sensors

- **Infrastructure**
  - Timing | Isolation

- **Automotive | Consumer**
  - Radio | Video

- **Voice and Data**
  - Modems | SLICs | PoE
What is IoT?

Web search result
- A proposed development of the Internet in which everyday objects have network connectivity, allowing them to send and receive data

Wikipedia
- A network of physical objects, devices, vehicles, buildings and other items which are embedded with electronics, software, sensors, and network connectivity to collect and exchange data between them
Leading providers of IoT devices rely on our solutions to deliver products that change lives and transform industries.

Wearables
Connected Home
Smart Buildings
Smart Metering
Smart Factories
Our Solutions for the Internet of Things

**Sense**
- Heart rate monitoring (HRM)
- IR, ambient and UV light
- Proximity & gesture detection
- Temperature & humidity

**Compute**
- 32-bit ARM Cortex-M cores
- 8-bit 8051 core
- Ultra-low energy
- High integration & functionality

**Connect**
- ZigBee/Thread SoCs and software
- Bluetooth and WiFi modules
- Blue Gecko solutions
- Sub-GHz transceivers and SoCs

**Tools**
- Simplicity Studio
- 8/32-bit IDE
- Starter & development kits
- Reference designs
Connectivity Options

**Big Pipe**
High data rate connection to the cloud
- Modules

**MESH**
Low data rate, low power connected things
- Wireless MCUs

**Point to Point**
Allows you to interface with individual devices
- Modules and SoCs
Bluetooth

A wireless communication technology

• Initially developed by Ericsson in 1994
• Named after 10th century Danish king “Harald Blåtand”
  Blåtand translates to “Bluetooth” in English
• Created to enable short-range radio links between mobile phones
• Standardized by the Bluetooth SIG (Special Interest Group)
Why is Bluetooth Popular?

- Made royalty-free to SIG members from the beginning
- Using unlicensed 2.4 GHz band has given it global reach
- Native support in mobile phone operating systems
- Popularity = higher device volumes = lower cost
About Bluetooth Low Energy (BLE)

- Intended for low power applications running from coin cell batteries
- Good for sending small amounts of data infrequently
  - No streaming – Data throughput not quite an important metric
- Facilitates multi-vendor interoperability and product development
  - Application development architecture and profiles are standardized
  - Profiles allow customizing “stack” for a particular application
Branding

- Technical name: Bluetooth Low Energy
- Marketing brand: Bluetooth Smart

Heart monitors, sensors, other low-power applications
PCs, tablets, smartphones (Communicate with Smart AND Classic)
Audio headsets, hands-free calling, file / video transfer
How is Bluetooth Smart Low Energy?

- Devices operate by constantly switching between active & sleep modes
  - Sleep most of the time
  - Variable connection interval (few ms to several s)
Demo: Monitoring Soil Humidity with Bluetooth Smart

Younas Abdul Salam
Applications Engineer, Silicon Labs
About Me

- Grew up in Pakistan. Moved to US after high school.
- Undergraduate degree in Electrical Engineering from Illinois
- Graduated May 2015 and joined Silicon Labs in June.

- Hobbies: Soccer, tennis
- Traveling
Demo Key Concepts

- Custom capacitive sensor
  - Sensor contains capacitor that gets charged and discharged rapidly
  - Counter measures how many times in given period
- When touched or in contact with water, sensor capacitance increases
  - Frequency of charges/discharges decreases

- Silicon Labs Bluetooth Module does all processing and communication
- Information transmitted out to Bluetooth devices
Recap
CAMPUS VISIT FOR TEACHERS - SUMMER 2016
Note: Register at http://austem.org/teacher-email-form/
Add “interested in STEM training” in the “Title” field of the form. Also include your title in that field.
Thank You!

www.silabs.com