**SNAP Badge Design Notes:**

The SNAP Badge will be used at all three ESC shows in 2016. It may be provided to all “full conference” attendees, or there may be a narrower selection of users. Estimates are between 200 and 500 badges per show, so we anticipate building 1500 units.

The badge will function as a “cool techie perk” of the show. The company that puts on these shows is called UBM, and we are working with their Technical Program Director, Max Maxfield, to develop the interactive features of the badge.

**A few design goals:**

* Provide wireless networking for communication between badges and with a “conference mesh”
* Provide a “flashy” display, showing synchronized messages broadcast to all show attendees.
* Provide a DIP switch to indicate the wearer’s interests, also reflected on the display and used in “proximity” interaction between badge-holders.
  + Max identifies 6 interests: SW, HW, Analog, Digital, IoT, STEM
* Provide expansion capability (pads/headers) for hack-ability, so the badge can be used in a conference Hackathon and embedded in the user’s personal projects.
* Provide ability to program badge without additional hardware (except common USB cable)
* Provide an accelerometer so the badge can sleep when motionless, and also for interactive use in user-applications and games.
* Provide two (left/right) pushbuttons for general use in user-applications and games.
* Provide an ON/OFF switch, since not all scripts will sleep.
* Run for at least 10 hours on batteries, with default “conference” script.
  + Goal is sleep current < 10uA

**Design Choices:**

* Use SM220, to showcase our premiere module.
* Display is 8x8 LED array – provides cheap, large, bright, scrolling words and symbols.
* Micro USB connector for low-profile, cheap and ubiquitous connection to FTDI interface.
* 2x AAA batteries, holders on back of badge – compromise due to cost/complexity of LiPo rechargeable solution. Based on Defcon badge this is a reasonable approach.
* Expansion headers are Arduino shield format – match Pyduino pinouts for shield library compatibility (3.3V only).
  + In terms of 3.3V shield compatibility, matched Sparkfun’s “Arduino Pro Mini 3.3” board, which is also 3.3V only.
  + Deviated from Pyduino in SPI connections, since the SNAP Badge uses some pins for onboard peripherals we needed to “re-use” actual SPI pins for both ICSP connection and shield header. This matches Sparkfun Pro, but not Pyduino.
* All active parts operate down to 2.0v (battery pack exhaustion point) with the exception of the LED array driver chip, which is only guaranteed to run down to 2.7v. Because of this, we employ a boost circuit for just the LED array. To minimize sleep current, the boost circuit can be shut down completely by the SM220. The circuit also offers the potential to drive LEDs with higher Vf, such as white or blue LEDs by changing the feedback resistor-divider to achieve 5v boost. Since we are designing for red LEDs, we only boost to 3v to maximize current drive capability with stable regulation. This design will give consistent luminance as the batteries discharge completely.
* Accelerometer is chosen for high performance, low operating current and low cost. Also we have lots of experience with this device from our healthcare tag work.