DEFCON 31 SAO

- Market Research

- SWAP-CR

- Approach

Market Research

- Silly Add Ons (SAO) have been made for other conventions
  - #badgelife
  - Often use Light Emitting Diodes (LEDs) and Printed Circuit Boards (PCBs)
  - Most have 2*2 or 2*3 100 mil header to collect power from the host badge
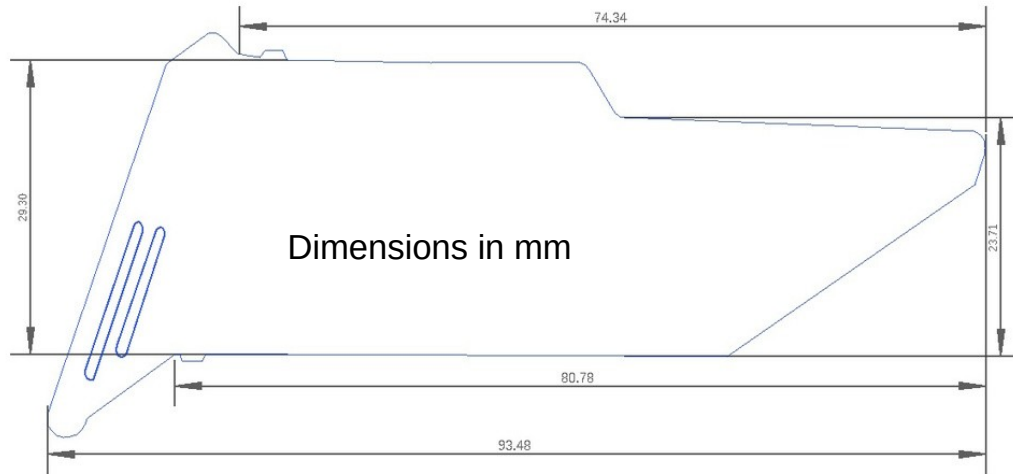
Market Research

- Specs posted May 17
  - https://media.defcon.org/DEF%20CON%2031/DEF%20CON%2031%20badge/
    - Svg board outline
    - Blender File shell
      - Cleaned up for 3D print here:
        - https://www.thingiverse.com/thing:6060558

- Limited time (June 9 as of writing) for designs to appear online
  - One example -->
    - https://www.reddit.com/r/Defcon/comments/13yoc96/my_final_proof_submitted_for_release_to_pressing/
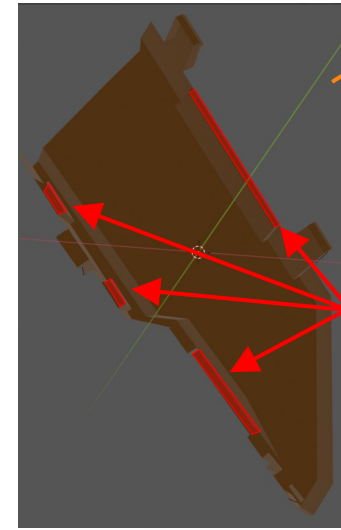
Size

- SAO slides into the (provided) clam shell case
- Dictated by SAO dimensions on 3 sides
  - Roughly 3.5" * 1"
  - Extensible in long dimension
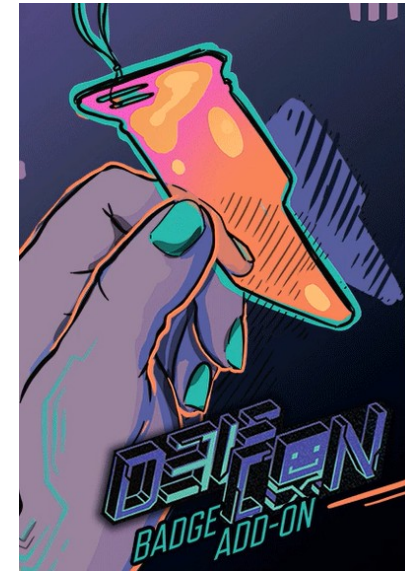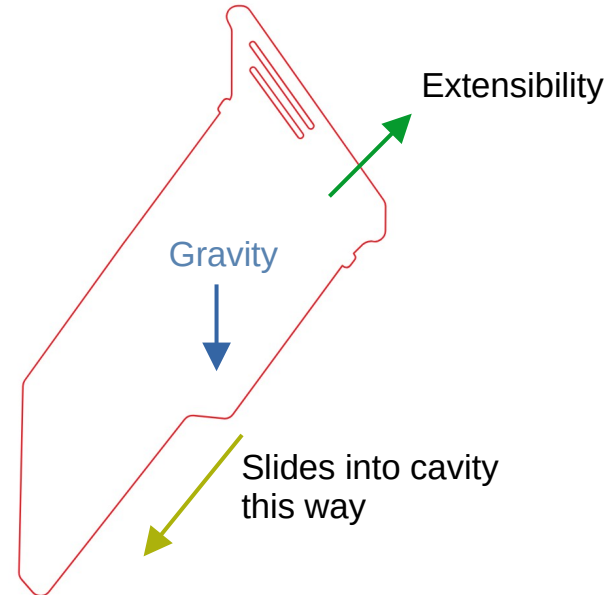- 3D complex geometry

Dimensions in mm

74.34

29.30

23.71

80.78

93.48

Front shell cavity (atop PCB)

Rear shell cavity (behind PCB)

Clam Shell

5.03802 mm

Front/rear PCB Contact points

Extensibility

Gravity

Slides into cavity this way

DEFCON
BADGE ADD-ON

Weight

- Bulk (>50%) of weight will come from battery
  - 9 grams for 400 mAh (<0.02 lb)
  - http://www.ibt-power.com/Battery_packs/Li_Polymer/Lithium_polymer_cells.html
  - Assumed to be a non-issue
   - Expecting badge to weigh notably more than SAO

Power

- Cavity behind badge is roughly 5mm deep
  - Roughly 26.5 mm "wide" and 38m "tall"
  - LiPo battery naming is DDWWHH, in mm, where depth omits decimal place
    - ex. Common CR2032 dime cell is 20 mm diameter and 3.2 mm deep
    - LP452530, 420 mAh
      - https://www.lipobattery.us/lipo-battery-lp452530-3-7v-310mah-with-protection-circuit-and-wires-15mm/
  - LiPos charge at 0.5C: 0.5*capacity per hour: 200 mAh/hour
    - Most LiPos take 2 hours to charge fully, regardless of size
- 400 mAh/(10-hour day) = 40 mA continuous
  - LEDs draw 5-20 mA, so enough for 2 bright LEDs, or many dim ones

Cost

- Prototype
  - Qty 5: $
- Space
  - Qty 50: $
- Pony
  - Qty 300: $
  - Assuming sales (~$20) to 1% of DEFCON attendees
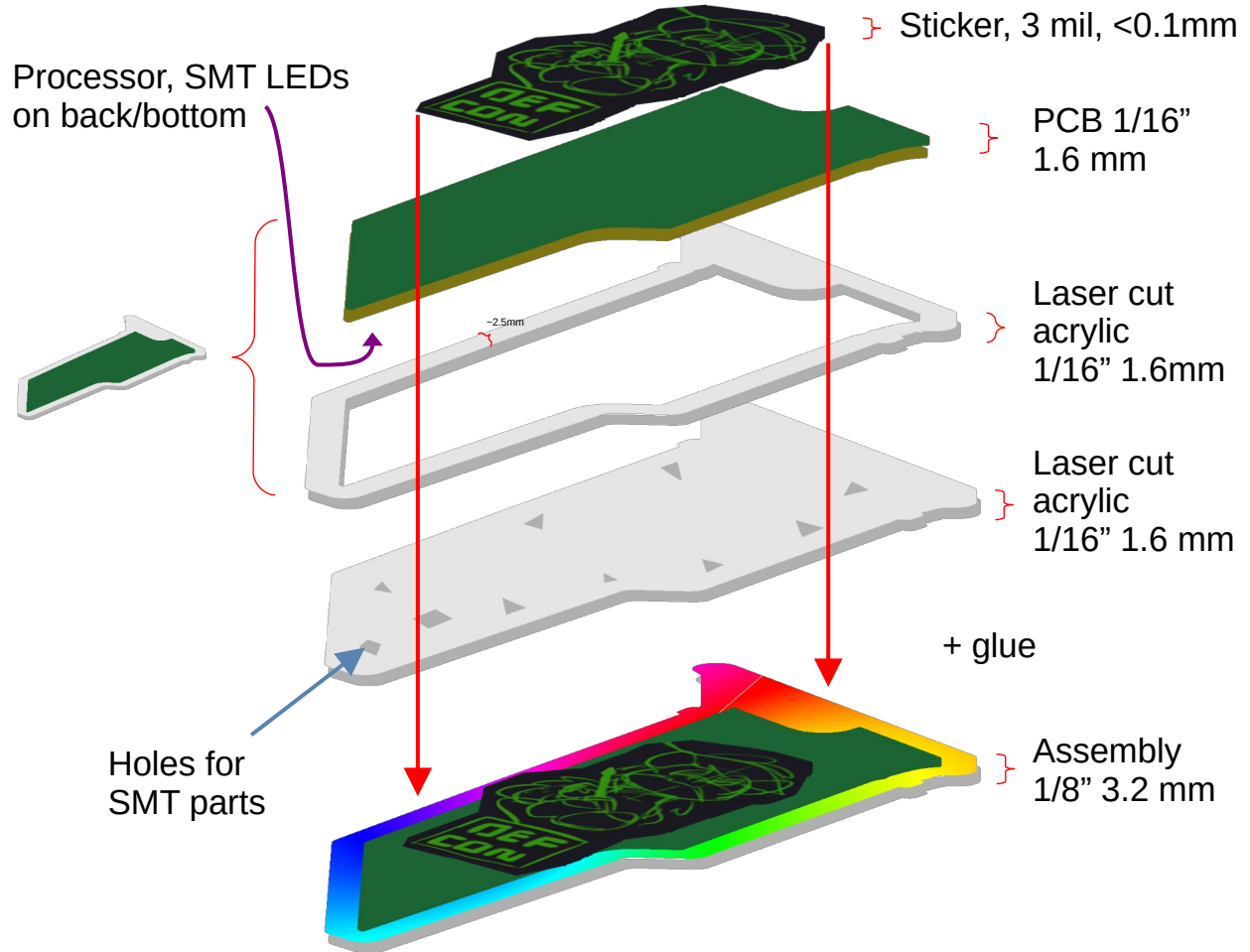- Sum
  - All: $
  - Per person: $

Eratta

- Note: Only the front side of the SAO will be visible
  - The rear will be obscured by a battery, electronics and the rear of the badge
- The long dimension does not align with gravity, the SAO hangs crooked
- DEFCON 31 badge is un-powered. SAOs need to provide their own power
- The nubs on either side of the PCB interlock with divets in the case.
  - Aside from gravity, this is the only mechanism preventing the SAO from jumping out of the badge
  - NOTE: The divets only extend for **3 mm** (measured from the front face) of the 4.8 mm SAO depth. Any design leveraging these slip fit points cannot be more than 3 mm thick here
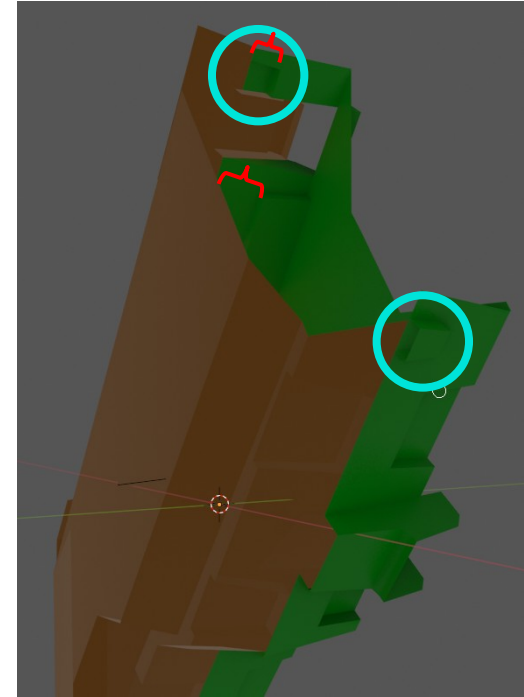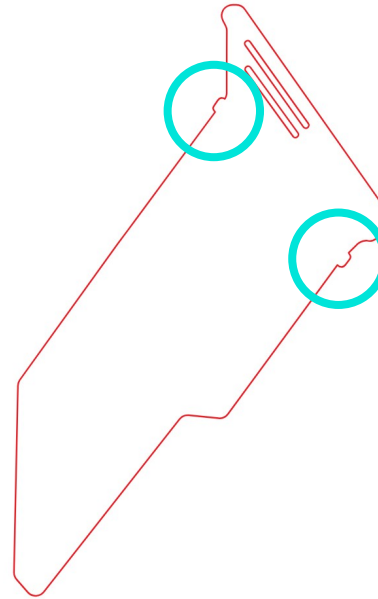
Approach: Depth/Stack-up

- 2-layer PCB
  - Copper traces on front & back

- Single-side SMT assembly
  - Surface Mount (SMT) parts only on back to save cost
  - Through-hole parts for front, battery, mic/speaker

Processor, SMT LEDs on back/bottom

Sticker, 3 mil, <0.1mm

PCB 1/16" 1.6 mm

~2.5mm

Laser cut acrylic 1/16" 1.6mm

Laser cut acrylic 1/16" 1.6 mm

+ glue

Holes for SMT parts

Assembly 1/8" 3.2 mm

Pony Art Canvas

Sales

- Each team member is given several badges in exchange for $TBR
  - 1x space badge
  - ~6x pony badges (~4x LED powered, ~2x un-powered acrylic)
    - The assumption being the team member will sell at least one before and after each event day (on average)