Jeff Gough
Malte Heinzelmann
TROOPERS 19

How we made a badge BEFORE you showed up!

Agenda

- Whoami (Who are we)
- The goal(s)
- How to achieve the(se) goal(s)
- Lessons learned

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Jeff Gough

- @jeffmakes
- Electronic engineer
- Sleeps sometimes
- Has a burning hat
- Builds stuff
- Fixes hardware
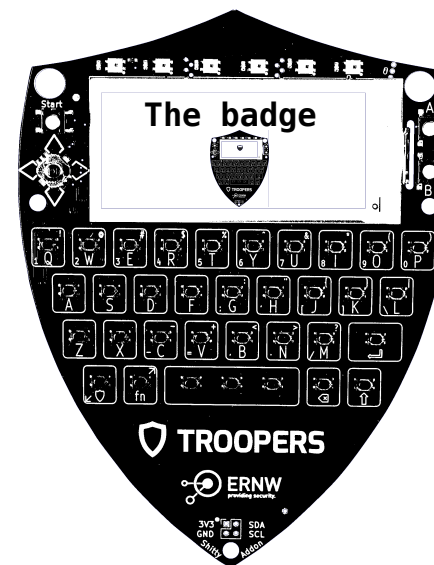 (he just f*cked up)

Malte Heinzelmann

- @hnzlmnn
- Computer Science student
- Sleeps even less
- Has no burning hat
- Builds ~~stuff~~ software
- Blames Jeff for f*cking up hardware he's supposed to build on

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The badge

- It works!
- It arrived before you did
- We didn't have to, but still did flash them again for some nostalgia and lulz

The goal(s)

- We wanted to have a badge that...
  - … works
  - … is fun to use
  - … shows your name!
  - … is interactive
  - … offers a playground for you
  - … shows the agendas
  - … can be used after Troopers

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How to achieve the(se) goal(s)

- ESP32
  - Many languages available
  - Easy to program
  - Affordable
  - Big community
- Micropython
  - Python is easy to write/learn
  - Rapid development/prototyping

How to achieve the(se) goal(s)

- ePaper display
  - Battery saving
  - High contrast for outdoor use
  - (-) Slow refresh rate
- Qwerty keyboard
  - Easy to type
  - (-) Slow refresh of display slows down input
  - Special characters available!

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How to achieve the(se) goal(s)

- **Accelerometer**
  - **Shake it**
  - **Count steps**
- **Shitty Addon Interface**
  - **#BadgeLife**
  - **Add some uniqueness**
  - **Solder your own FUCSS**
    - **Not the f*cked ones**

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Lessons learned (hardware-wise)

- Don't grill the SPI Flash by doubling up the supply voltage by using reserved pins for IO
  - 1.8 V != 3.3 V
  - R.I.P. rev1
- Don't use reserved pins again after realizing this mistake in rev1
- Input-only means NO output!
  - → Can't be used for I^2C

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Lessons learned (hardware-wise)

- **DON'T USE INPUT-ONLY PINS FOR OUTPUT AGAIN!!!**
  - **I personally think, Jeff did this on purpose to prevent me from building software while actually having working hardware to test on…**
- **Check Chinese part numbers**
  - **The WS2812 B-mini is actually just a SK6812**
  - **BTW, dont bake these LEDs too often, too hot… They will break!**

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Lessons learned (hardware-wise)

- Check your USB C connector footprints before ordering
- Don't try to fix everything on each prototype (just select enough to test all features)
- Check your solder paste stenciling quality before reflow
  - Don't be too lazy to stencil again

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Lessons learned (software-wise)

- Don't trust the documentation, trust the code
  - Micropython's documentation is incomplete, misleading and wrong
  - It's often easier and faster to check the C code than try to search for the correct documentation
- Implement OTA updates for the whole firmware, not just apps (makes re-flashing obsolete)

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Lessons learned (software-wise)

- Python is pretty slow compared to C
  - No sh*t Sherlock

- Overengineering is fun!

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Lessons learned (software-wise)

- **Use existing frameworks (https://badge.team)**
  - **Didn't know about when I started**
  - **Hard to switch after the provisioning server and apps are already finished ¯_(ツ)_/¯**
- **Don't implement everything from scratch especially if you don't need all features**
  - **Your badge actually supports rotations by 0, 90, 180 and 270 degrees but no* app uses it**

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Lessons learned (general)

- Don't run faster than your feet can carry you, else you will fall on your face and rip of shitty connectors
  - Cheers to Jeff's knee. Hope you recovered well!
- Working in different countries will increase latency for hardware changes massively
- Hardware design during Chinese New Year is HARD

Writing apps

- Check https://con.troopers.de/badge for instructions

- There will be a blog post on insinuator in the next couple of weeks with some more details and source code to explain the application framework in greater detail

I was promised secrets!

- Try these combinations throughout the badge apps
  ⌃ ⌃ ⌄ ⌄ ⟨ ⟩ ⟨ ⟩ B A

  ⟨ ⟩ ⟨ ⟩ B B Start

  🛡 (keep pressed) H N Z L M N N ↵

  Try his name in the agenda app------→

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Happy NahuelCon

@WeAreNahuel

SECURITY IS NOT A DREAM...