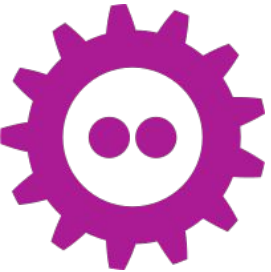
U:Kit
open source software and hardware smoke detector



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Slavey Karadzhov
slav@attachix.com

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Agenda

- Dream
- Team
- Creating U:Kit
  - a smart device that is open source software and open source hardware.
  - and created with/for open source tools
- And Open For Improvements

Dream

We wanted to build an IoT device that

- Improves the safety in our house
- Respects our freedom.
- Allows us legally to modify and extend it to our own needs
- Has the look and feeling of a finished device made with love.

Team

- Slavey Karadzhov - software engineer and long time open source enthusiast and supporter (Linux-BG.org)
- Cviatko Delchev - our hardware guy. Programming in Assembly for him is "high-level" programming.
- Ilian Milinov - our star designer. Actually a four star Red-Dot award winner.
- Pavel Ivanov - mechanical designer guy that made all those great 3D models




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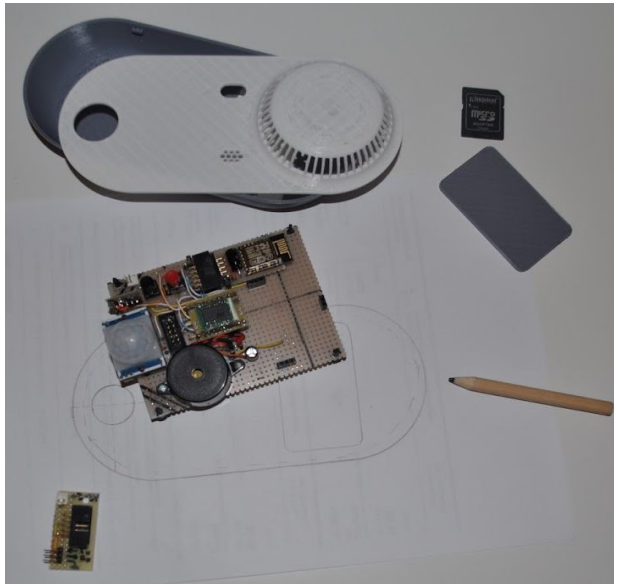
The Process of Creation



- Requires expertise in different knowledge areas
- Involves multiple steps and interaction between hardware, enclosure and software.
- Has initial requirements based on needs

Requirements

- To have motion and smoke detectors
- To have nice polished look (not just bunch of wires)
- To work on battery and last at least a year
- To be remotely upgradable.
- To be easy for open source/hardware enthusiast to improve it (extend it to their own needs)
  - U:Kit's source code, PCBs and enclosure to be open
  - U:Kit deliverables to be modifiable by open source software tools.
- ~~U:Kit to be created completely with open source software - impossible to force creative minds to use a software that is not their preferred choice.~~

U:Kit

- U:Kit is a sensor kit - improve the safety and security in your house
- U:Kit is easy to assemble from non-technical savvy people
- Works in different modes
  - Smoke Mode: (default) device can detect smoke and signal an alarm.
  - Alarm Mode: similar to the previous mode plus at the same time the device will detect motion.
  - Smart Alarm Mode: the device detects smoke or motion and informs you immediately via Internet
  - Smart Protection Mode: device detects smoke or motion and silently informs you about them via Internet.

https://github.com/attachix/ukit

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U:Kit PCB

Element	Specification
Buzzer	80 dB piezo buzzer.
Smoke Detector Chamber	Infrared Smoke Detector chamber with very low energy consumption.
Microcontrollers	• Attiny microcontroller with very low power consumption. This one will handle the main sensor logic and wake up the WIFI microcontroller to send messages. • ESP8266 microcontroller that is WIFI enabled and can execute more advanced programs in order to provide smart reaction and prediction to events. • Allegro microcontroller for the smoke detection processing
Programmable connectors	For both the attiny and ESP8266 microcontrollers
Motion detection	Based on the D2 chip.
Batteries	2 x 18650 3,7 V Li-Ion batteries.
Plastic Case	Unique plastic case designed especially for our sensor kit.

https://github.com/attachix/ukit-pcb

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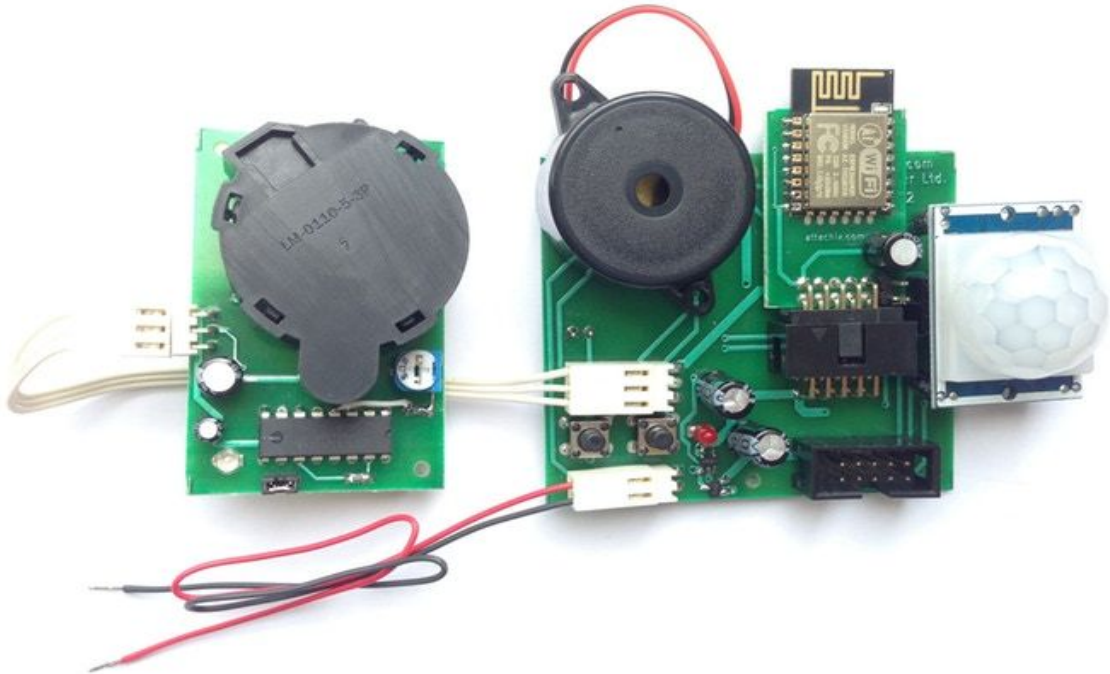
U:Kit PCB (2)



https://github.com/attachix/ukit-pcb

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U:Kit PCB (3)

- Tools
  - KiCAD - main tool
  - gerbv - for differences in Gerber files
  - ImageMagick - for differences in image files
  - diffpdf - for differences in PDF files
  - eeplot - for differences in Schema files.
  - See: https://github.com/attachix/ukit-pcb/tree/master/.tools

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U:Kit Enclosure

- Tools
  - FreeCAD (daily) + addons
  - KiCad-StepUP (for KiCAD) integration
    - Use stp files for bulky elements)
  - ExplodedAssembly
    - For nice animations
  - ~~3D diff~~

https://github.com/attachix/ukit-enclosure/

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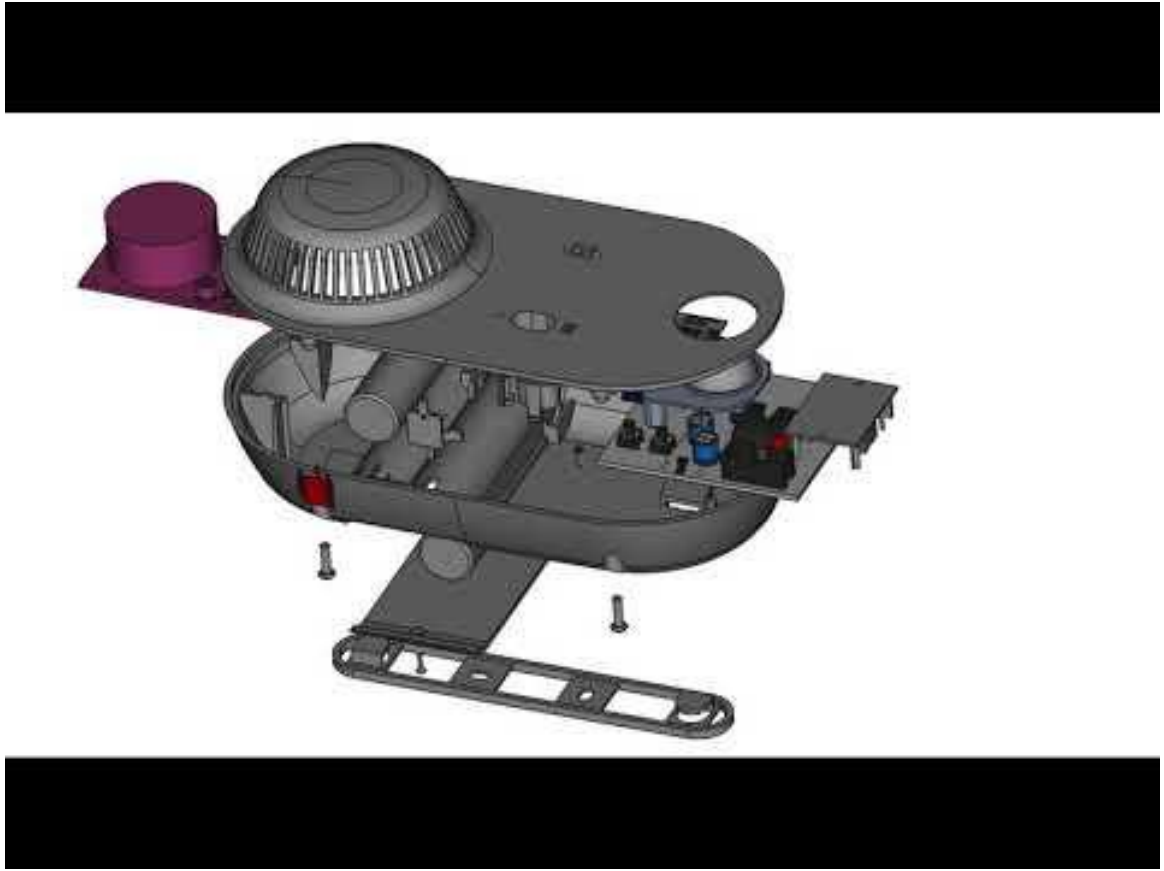
U:Kit Enclosure (2)



https://github.com/attachix/ukit-enclosure/

U:Kit Software

- ESP8266
  - Sming Framework for ESP8266 (Disclaimer - presenter is core contributor and release manager of Sming)
  - JerryScript for creating custom scenarios (IFTTT)
- Attiny1634
  - AVR Assembly for Attiny1634 (will need your help to convert it to GCC-AVR assembly or even C)
  - TSB Bootloader
- ~~Mobile app based on Ionic with AngularJS~~
- ~~And WebAPI service based on NodeJS~~

https://github.com/attachix/ukit-firmware/

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Goals and Completion Status

- Q: Is is possible to create open source and hardware smoke and motion detector: **Yes**
- Q: Was it easy: Definitely no but it is big fun
- Q: Are we finished: 80 % done and still 20 % more to go.
- Q: What is left
  - Documentation
  - HTML embedded website for initial wifi settings and mode changing
  - AVR assembly to GCC-AVR or GCC-C
  - Hardware
  - Decrease the price and size - with smaller and cheaper components

Goals and Completion Status (2)

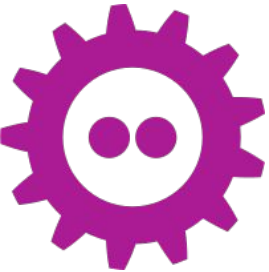
- Q: Can I help you guys: Ou YES! Just write to:

  slav@attachix.com

- Q: Are we ready for mass production: Maybe with an axe and a chisel

Thanks a lot!

- Questions?
- Contact: slav@attachix.com



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