U:Kit
open source software and hardware smoke detector

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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
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
### U:Kit PCB

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**Element** | **Specification**
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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
U:Kit PCB (2)

https://github.com/attachix/ukit-pcb
U:Kit PCB (3)

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• Tools
  ○ KiCAD - main tool
  ○ gerbv - for differences in Gerber files
  ○ ImageMagick - for differences in image files
  ○ diffpdf - for differences in PDF files
  ○ eepplot - 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/
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/
Goals and Completion Status

- Q: Is it 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