

# Agile Hardware Development

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# Agile Hardware Development

**if you can do Android, you can do hardware<sup>1</sup>**

**this presentation is open source: [github.com/falkorichter/presentations/blob/master/agile-hardware-development/hardware-development\\_droidcon2021.md](https://github.com/falkorichter/presentations/blob/master/agile-hardware-development/hardware-development_droidcon2021.md)**

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<sup>1</sup> Presentation made with [DecksetApp](#) 

# disclaimer:

All details about hardware in this presentation can be derived from the hardware itself and do not contain any internal company secrets. Additional information was derived from public documentation.

# Highlights in history of IOT from an Android perspective:

- IOIO ("JOJO") - **fail**
- Accessory Development Kit - **fail**
- Bluetooth (LE)<sup>4</sup> - ❤️❤️❤️
- USB(-C) - **fail/DJI**



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<sup>4</sup> Everything is better with(out) Bluetooth

# **connectivity**

**Bluetooth LE**

**Wifi**

**NFC**

**USB (see yesterdays Talk by  
Mario)**

# **agile Development**

| Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.

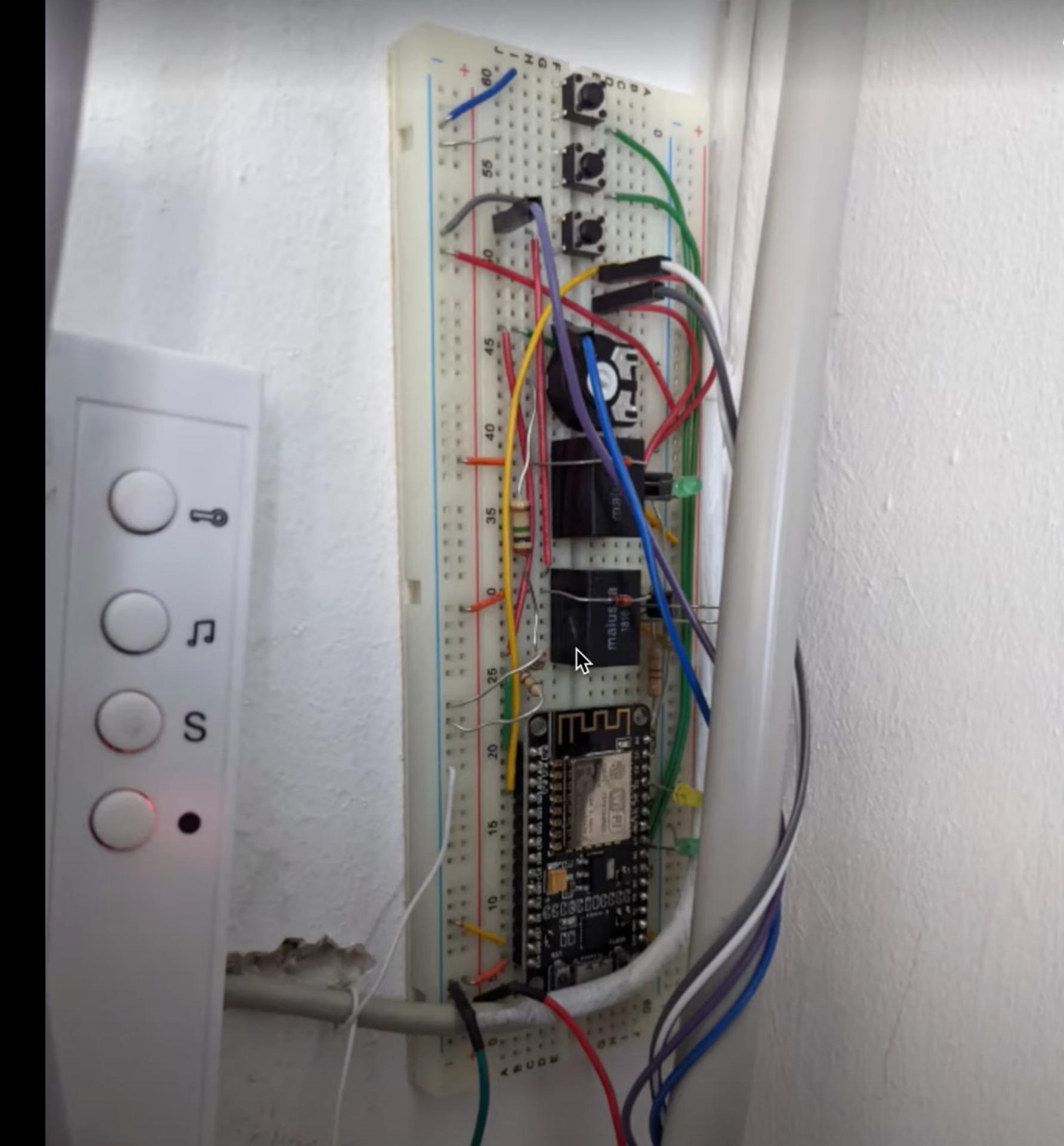
- Deliver working software frequently
- Responding to change
- Working software is the primary measure of progress
- Simplicity--the art of maximizing the amount of work not done--is essential.

**iterate on hardware ?**

**iterate on software ✓**

# case study

- open taffeta
- pi + flutter app + esp32 on board
- explanation video in 
- looks harder than it is →
  - auth on phone -> ring door -> intercept signal (no ring) -> open door
- live at cwrkng
- done by Daniel from Finke Media  
contact him for Flutter ❤️



# problems when iterating on hardware

- knowledge (hardware)
- tools (electronics design, os)
- manufacturing (price + speed)

# news

Maker movement\* meets *Agile*  
*Craftsmanship* meets *Rapid electronic*  
*production* capabilities meets *China*

- [jlpcb](http://jlpcb.com) / [aisler.net](http://aisler.net)
- open (source) hardware
  - [tindie.com](http://tindie.com) - store for open hardware, [kicad](http://kicad.org)
- platforms
  - pi / ESP / NRF
- youtube



Product Detail	Product File	Price	Order Status	Operate
019-07-1 <b>jlp PCB</b>  Order Number: Y1-2619181A €34.89 <a href="#">Product Details</a> Build Time: 6 days PCB Batches	W20190710362057	Merchandise Total: €34.89 Shipping Charge: €21.48 Order Total: €56.37  v2(Reorder)_Y1 <a href="#">Production file</a>  <a href="#">Quality Complaint</a> <a href="#">Production Progress</a> 	Shipped Shipping Method: DHL Express Worldwide  <a href="#">Tracking</a>  <a href="#">Invoice</a>	<a href="#">Reorder</a> <a href="#">Order Details</a> <a href="#">Invoice</a>
019-04-18  PCB Prototype Order Number: Y1-2619181A 20 pcs    €12.93 <a href="#">Product Details</a> Build Time: 2-3 days  Gerber Viewer	W20190418280979	Merchandise Total: €12.93 Shipping Charge: €0.00 Order Total: €12.93  v2_Y1  <a href="#">Quality Complaint</a> <a href="#">Production Progress</a> 	Shipped Shipping Method: DHL Express Worldwide  <a href="#">Tracking</a>  <a href="#">Invoice</a>	<a href="#">Reorder</a> <a href="#">Order Details</a> <a href="#">Invoice</a>

# prototype manufacturing

order PCB  
order parts  
apply solder paste  
hot air  
repeat



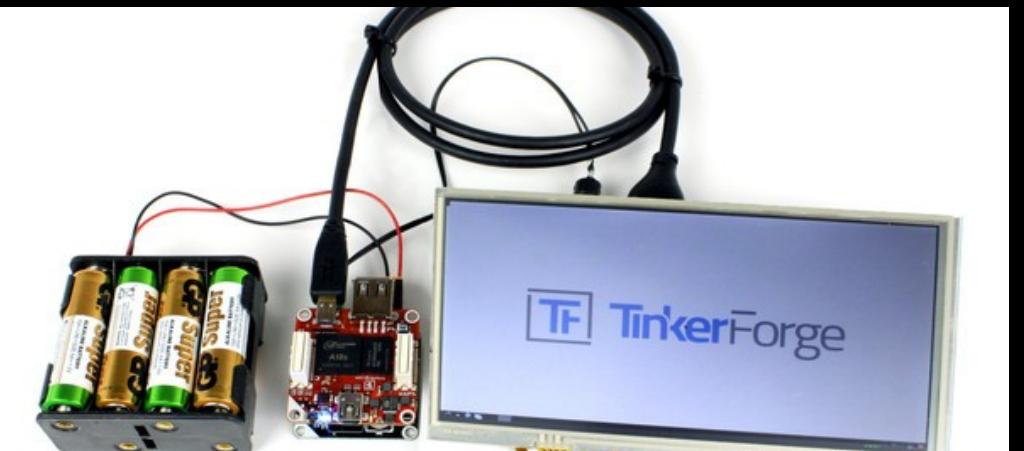
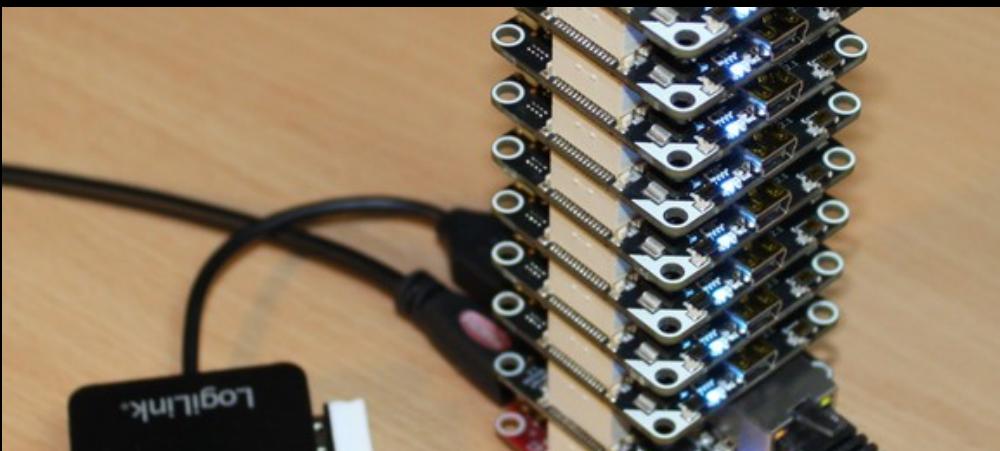
# open source hardware for prototyping:

buy, connect, done

[github.com/Tinkerforge](https://github.com/Tinkerforge)

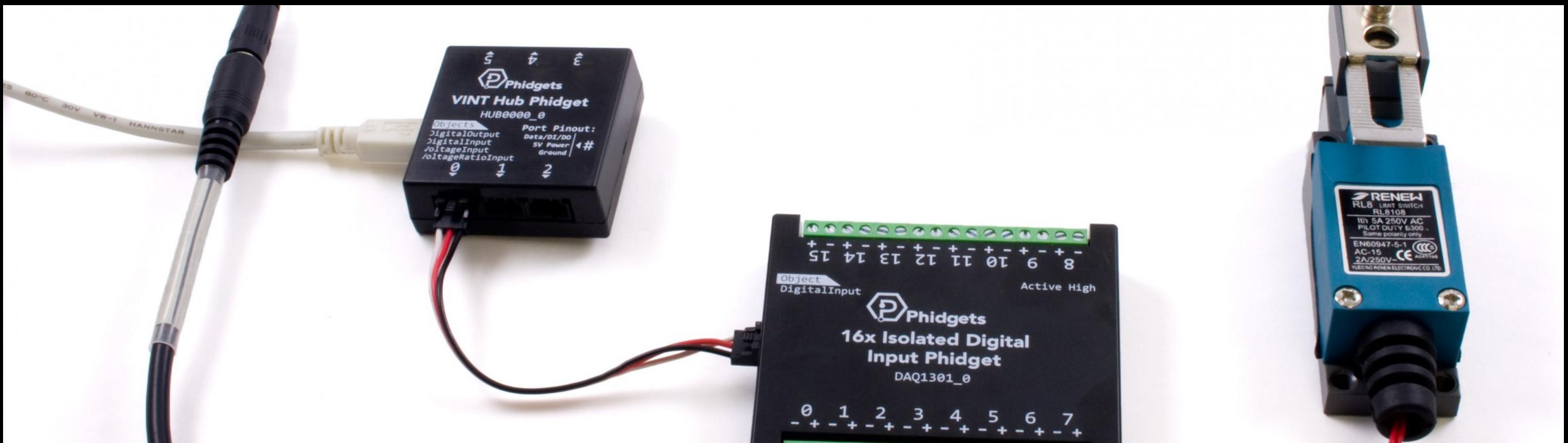
<show some hardware> how it works

-> Thermal camera Android code



# phidgets

Phidgets are programmable, modular USB devices, either sensors or controllers that you can connect together. Simply write code in your favorite language and solve real-world problems.



# pi compute module

- industrial raspberry as a module
- powerful, small, not cheap
- plug and play
  - develop software on prototype, swap into final hardware
- CM4 even more projects  
Slice - Compute Module-based media player
  - <http://www.tiveninjas.com/slice/>
  - <https://www.raspberrypi.org/blog/creating-and-kickstarting-slice-the-compute-module-based-media-player/>
- CMI0 board for prototyping or Raspberry Pi



Search modules

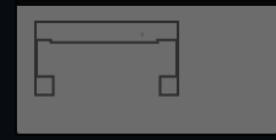
COM Connectors

# gumstix gepetto / modular.upverter.com

● <https://store.gumstix.com/products>

● <https://www.gumstix.com/raspberry-pi-family/>

<show some hardware> gepetto



Dave - DIVA 335x  
Connector  
\$11.00



Gumstix - Overo  
COM Connector  
\$7.60



Intel® Joule™  
Module  
\$35.00



MitySOM-335x  
(Critical Link)  
\$18.00



NVIDIA Jetson  
TX2 COM  
\$55.00



PICO-IMX6  
(TechNexion)  
\$15.00



Gumstix Raspberry Pi CM4 PoE Smart

3D Board View

Choose Power Source

0 mW

\$ 182.18

! Connections required

▶ Connectors (Signal) 1

▶ Lights and Switches 2

▶ COM Connectors 1

▶ Audio 1

▶ Network and Wireless 1

▶ Power 2

▶ Mechanical 5

▶ Converters 1

▶ Processors 1

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# NRF / serial over BTLE

Search the Infocenter:

[Go](#)

Scope: All topics

[Contents](#)

nordic semi conductos  
bluetooth  
many open source samples uart

OpenSK: rust anyone?

- Bluetooth low energy examples
  - BLE Central
    - + BLE Blinky Client Application Example
    - + BLE Heart Rate Collector Example
    - + BLE MultiLink Example
    - + BLE Running Speed and Cadence Collector Exam
    - + GATT Service Server Example Application
    - + Immediate Alert Service Application
    - + IPS Initiator Example
  - Nordic UART Service Client
    - + Setup
    - + Design Overview
    - + Testing
      - + Experimental: BLE Pairing Using NFC - Central Re
      - + Experimental: BLE Heart Rate Collector Example
      - + Experimental: Object Transfer Service client Exa
    - + BLE Central & Peripheral
    - + BLE Peripheral
    - + BLE Secure DFU Bootloader
    - + Experimental: IoT Examples
    - + Cryptographic examples
    - + DFU bootloader examples
    - + Direct Test Mode
    - + Hardware peripheral examples
    - + IEEE 802.15.4 examples
    - + NFC examples
    - + Nordic proprietary protocols
  - + User Guides
  - + API Reference
  - + Data Structures

Software Development Kit > Previous versions of nRF5 SDK > nRF5 SDK v15.3.0 > Examples > Bluetooth low energy examples > BLE Central

nRF5 SDK v15.3.0

[Copy URL](#)[Download offline documentation](#)

## Nordic UART Service Client

This example requires one of the following SoftDevices: S132, S140

**Important:** Before you run this example, make sure to [program the SoftDevice](#).

The Nordic UART Service (NUS) Client Application is an example that implements the Nordic UART Service Client over BLE. In the example, the development board serves as a GAP central and a GATT client.

The application scans peripheral devices and connects to a device that advertises with the NUS UUID in its advertisement report. After connecting, the application enables notifications on the device that delivers the Nordic UART Service.

### Note

This application will connect to only one device that delivers the NUS. If the application cannot find the NUS in the device discovery, it will not disconnect. This makes it possible to use more GATT clients at the same time.

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# the last mile

ESD protection<sup>3</sup>

stay < 48V, go to a lab

Certification

"spurious emissions"

pre-certification helps

case

cables + connectors (avoid, use  
standards)

mass production



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<sup>3</sup> electrostatic discharge protection

# nobody wants naked electronics:

- bopla
- apra plast
- takachi

<talk about embedded world 2018>

- 3D print, injection mold...

# sample platforms / talking points

- pi compute module cm4/cm4
- poe
- expandability (keypad, lockers)

# **where to go to:**

- embedded world
- electronica
- maker faires
- chaos congress/camp

# **sources for inspiration:**

- sparkfun
  - new products yt
- adafruit
  - new products yt
- Jeff Geerling (blog, [https://www.youtube.com/watch?v=DHwL1afSn8&list=PL2OBreMn7FqeHztTB3BCMGJ\\_dx1jEK3f](https://www.youtube.com/watch?v=DHwL1afSn8&list=PL2OBreMn7FqeHztTB3BCMGJ_dx1jEK3f))

**Thank you  
@volkersfreunde  
find me at the berlindroid booth  
Wayfair is looking for talented engineers  
open source your hardware**



# overflow

- Fab-Zugangssysteme
  - Telegram group
  - FabAccess/FabInfra