

Agile Hardware Development

Falko Richter | Android Dev Wayfair

Agile Hardware Development

**if you can do Android, you can do
hardware¹**

this presentation is open source: github.com/falkorichter/presentations

¹ Everything is better with(out) Bluetooth

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)¹ - ❤️❤️❤️
- USB-C - **fail/DJ!**



¹ 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 ✓

problems when iterating on hardware

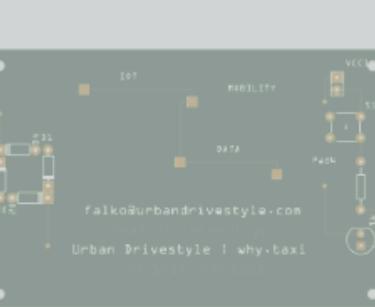
- knowledge (hardware)
- tools (electronics design, os)
- manufacturing (price + speed)

news

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

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



Product Detail	Product File	Price	Order Status	Operate
2019-07-10 jlp PCB  Order Number: Y1-2619181A €34.89 Product Details Build Time: 6 days PCB Batches 8534009000 Y1 50 €0.6979 €34.89	W20190710362057	Merchandise Total: €34.89 Shipping Charge: €21.48 Order Total: €56.37	Shipped Shipping Method: DHL Express Worldwide	Reorder Order Details Invoice
2019-04-18  PCB Prototype Order Number: Y1-2619181A 20 pcs €12.93 Product Details Build Time: 2-3 days	W20190418280979	Merchandise Total: €12.93 Shipping Charge: €0.00 Order Total: €12.93	Shipped Shipping Method: DHL Express Worldwide	Reorder Order Details Invoice

prototype manufacturing

order PCB

order parts

apply solder paste

hot air

repeat



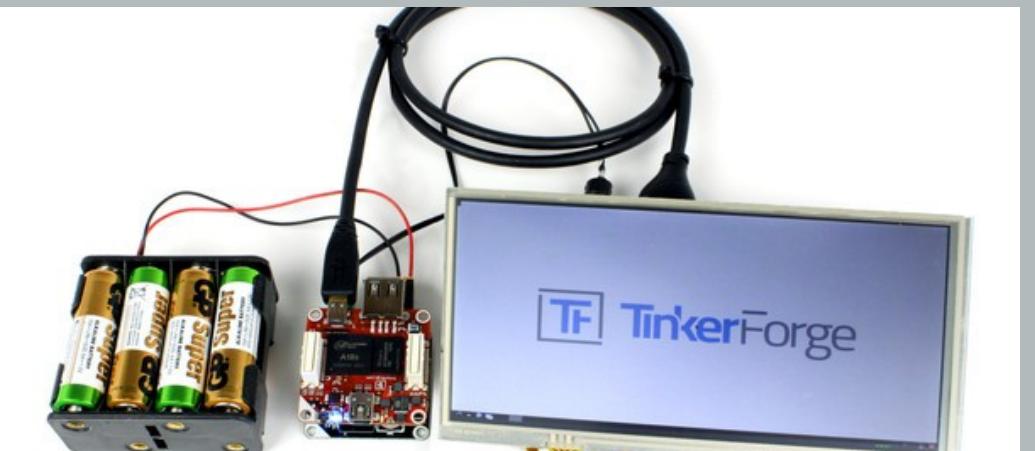
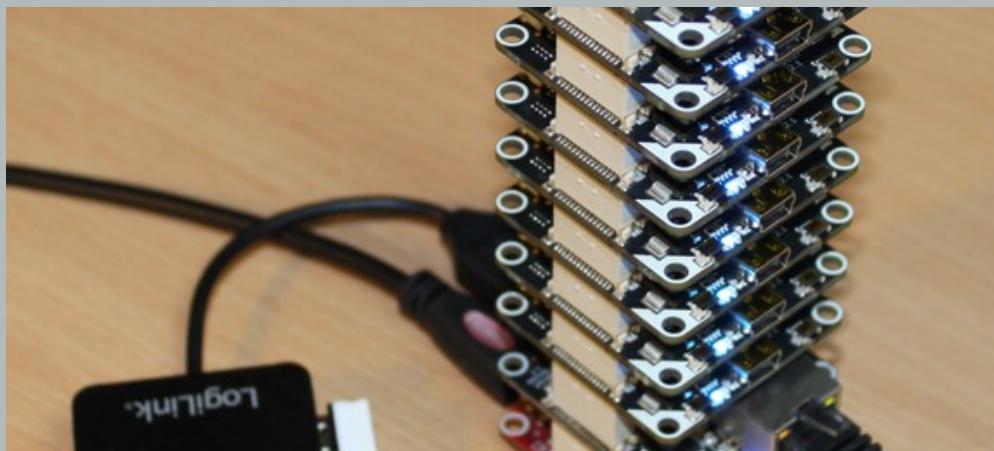
open source hardware for prototyping:

buy, connect, done

github.com/Tinkerforge

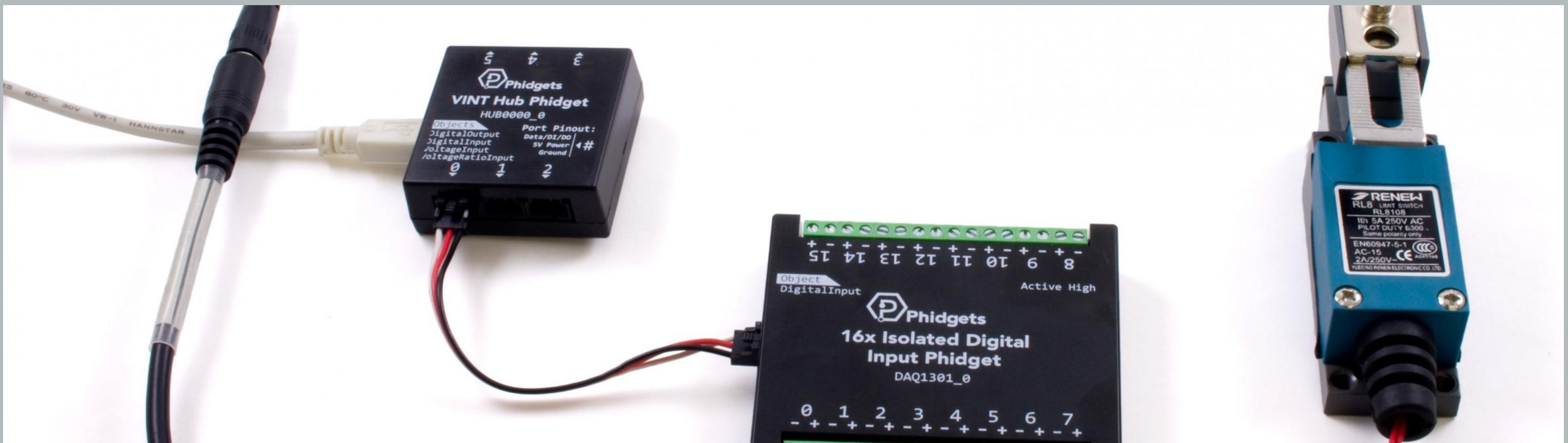
<show some hardware> how it works

-> 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
- CMIO board for prototyping or Raspberry Pi



by <http://www.embest-tech.com/>

CM4 even more projects
Slice - Compute Module-based media player

CMIO board for prototyping or Raspberry Pi



Search modules

COM Connectors

gumstix gepetto / modular.upverter.com

Raspberry Pi (11)
\$7.00 - 18.00

96Boards IoT Connector
\$15.50

\$17.00

96Boards IoT Connector
\$15.50



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

BeagleBone Black COM
\$15.00

96Boards IoT Connector
\$15.00

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:

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 Example
 - GATT Service Server Example Application
 - Immediate Alert Server Application
 - IPS Initiator Example
 - Nordic UART Service Client
 - Setup
 - Design overview
 - Testing
 - Experimental: BLE Pairing Using NFC - Central Role
 - Experimental: BLE Heart Rate Collector Example
 - Experimental: Object Transfer Service client Example
 - BLE Central & Peripheral
 - BLE Peripheral
 - BLE Secure DFU Bootloader
 - Experimental: IoT Examples
 - Cryptographic examples
 - DFU bootloader examples
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 - 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

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 protection³

stay < 48V, go to a lab

Certification

"spurious emissions"

pre-certification helps

case

cables + connectors (avoid, use
standards)

mass production



³ 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)

