

Form & Function Toolkit: printed electronics for unconventional interfaces



Bauhaus-Universität Weimar, Main Building

fingies

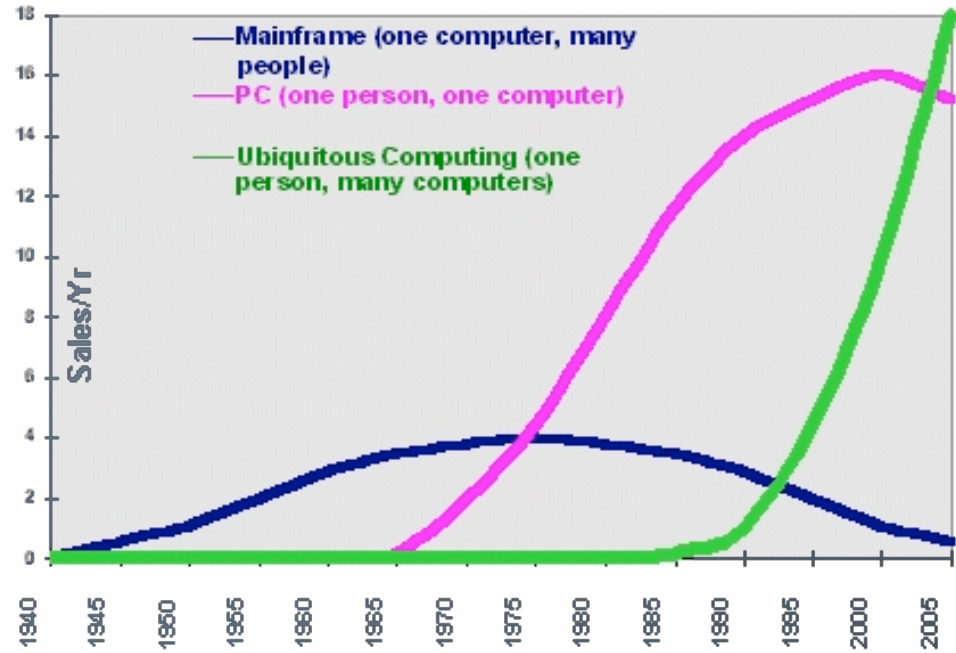
Introduction

Jens Geelhaar

Ubiquitous Computing



The Major Trends in Computing



Marc Weiser // Ubiquitous Computing

"The Computer for the Twenty-First Century," Scientific American, pp. 94–10,

Mobile Devices



25 years →



1983 // (DynaTAC 8000X)

The first commercially available
mobile phone (3.995\$)

Source: Wikipedia / Photo: Redrum0486

Location Based Services



 **DIGITAL
OSMANTINUM**

Funded by EU Interreg IIIB
project HERMES



T. Weiss, U. Straub, J. Geelhaar, 2004 :

Digital Osmantium, Location Based Museum Information

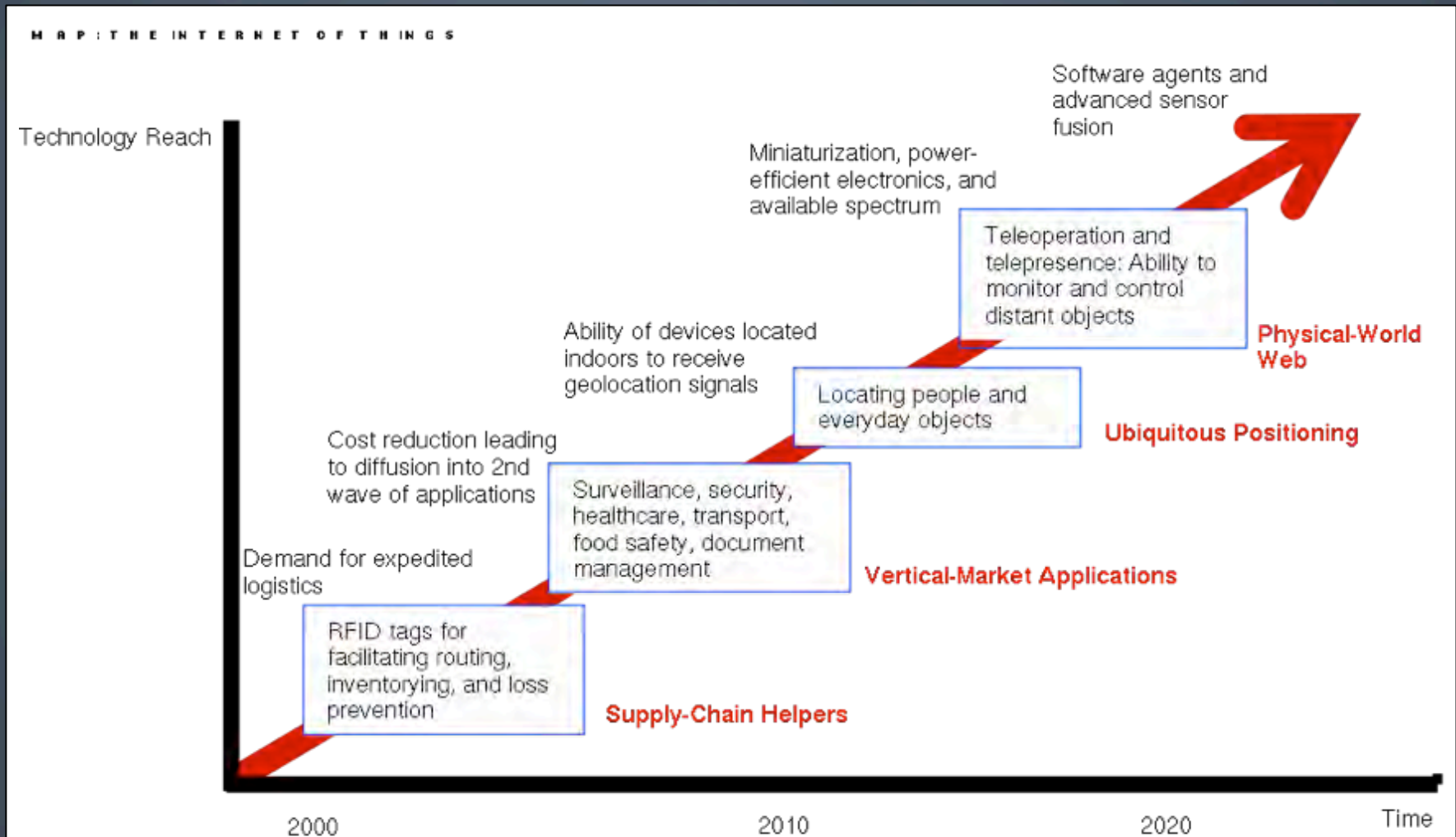
Tangible Interaction



Diplom Thesis // Lihs, M. 2009 :
WiiSpray, Digital Spraycan
<http://www.wiispray.com>



Internet of Things

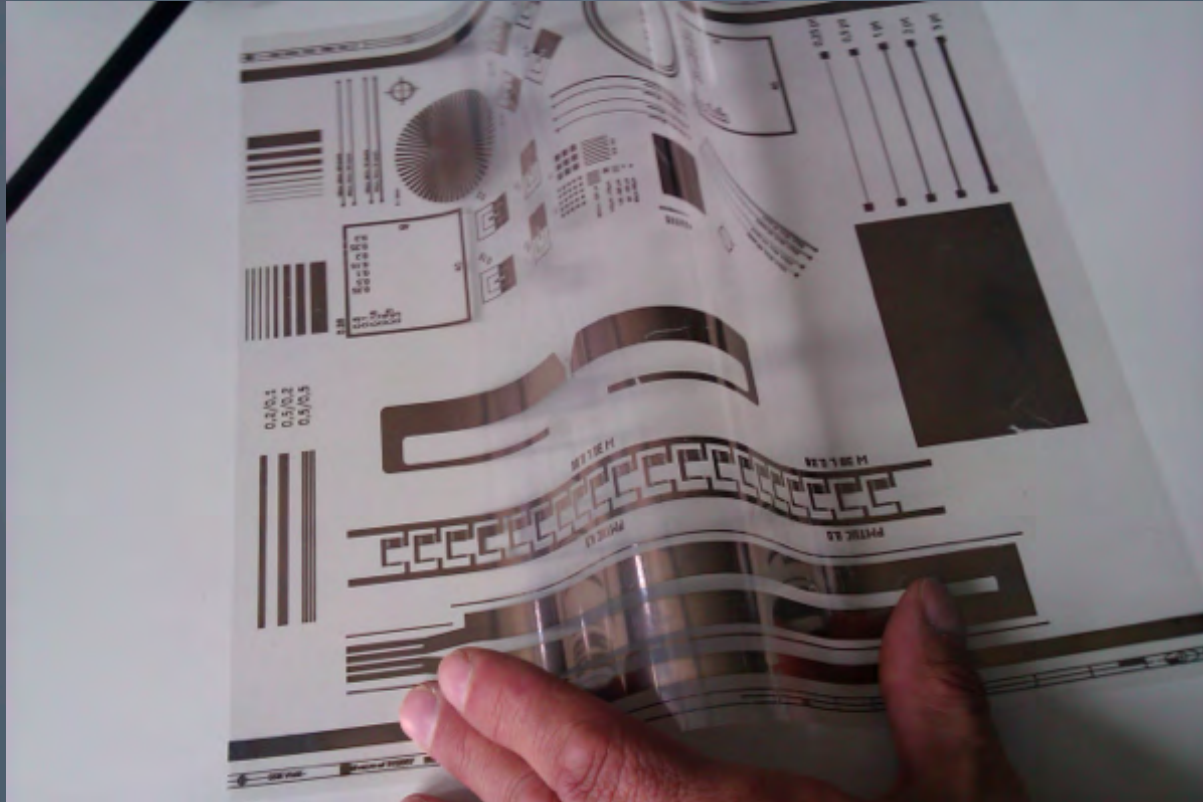


Internet of Things



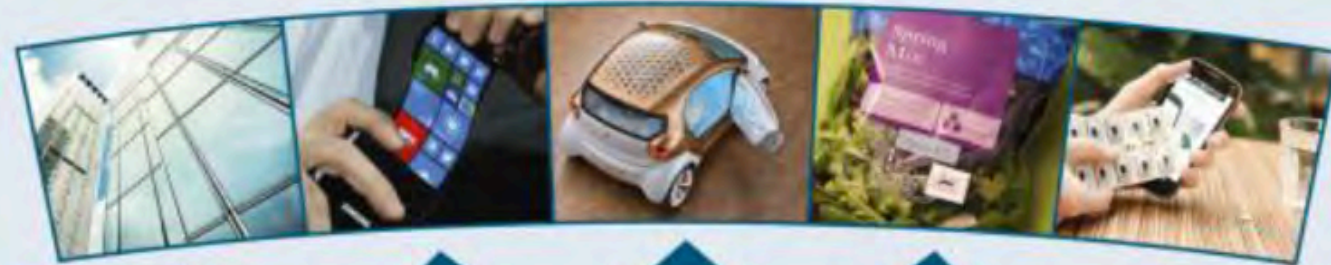
Master Thesis // Simon Tretter 2013 :
Open Medianode Infrastructure,
Solarpowered Open Source WLAN Network

Printed Electronics



Printed Electronics

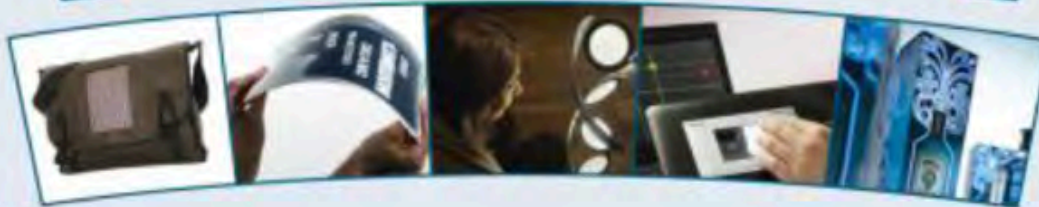
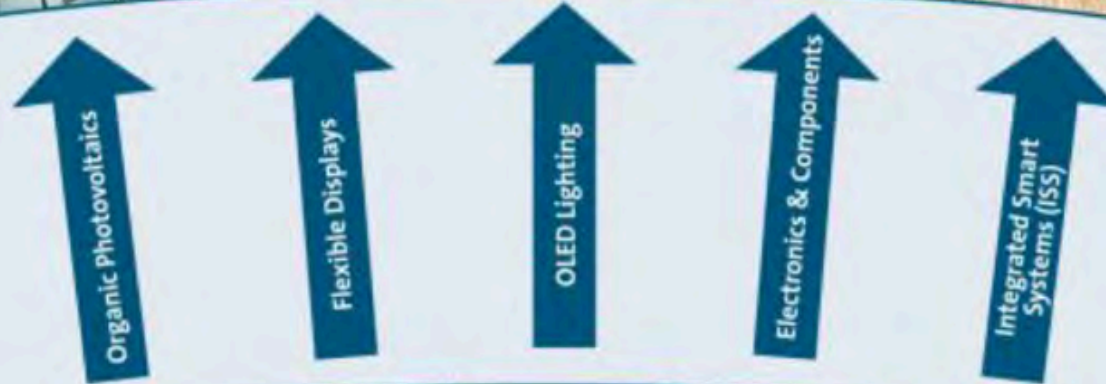
OE-A Roadmap for Organic and Printed Electronics Applications



future



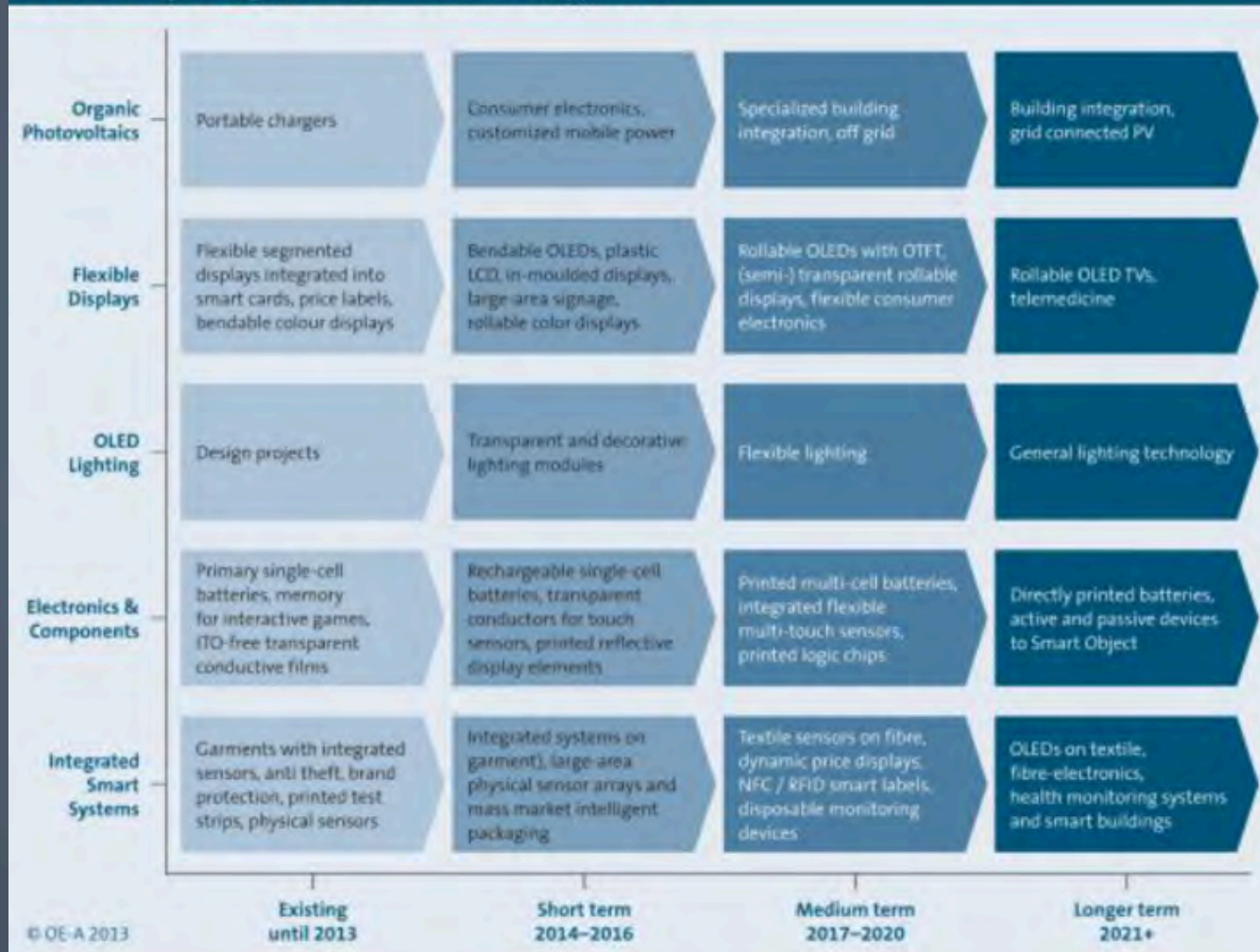
today



© OE-A 2013

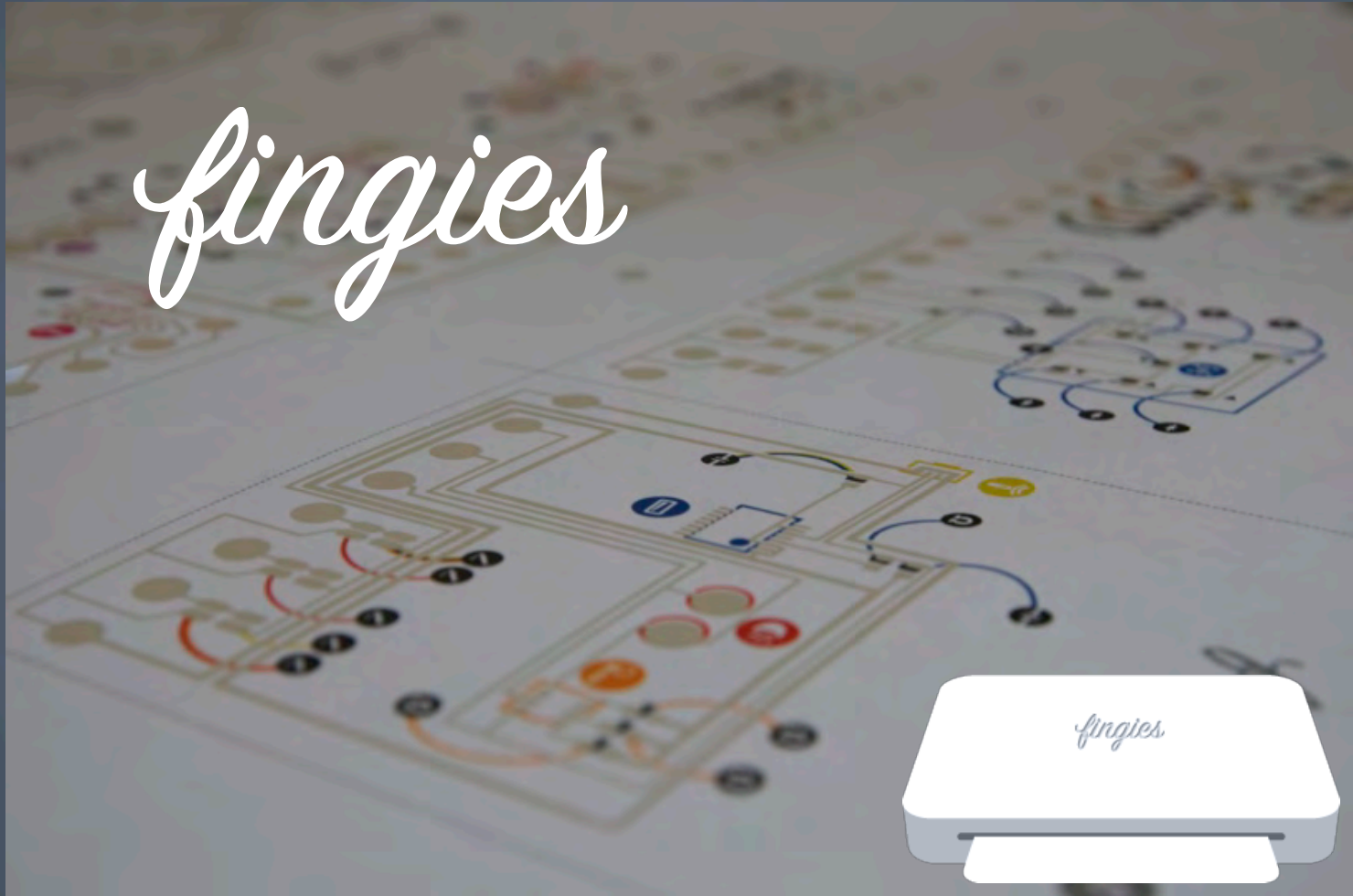
Printed Electronics

OE-A Roadmap for Organic and Printed Electronics Applications



Fingies Toolbox

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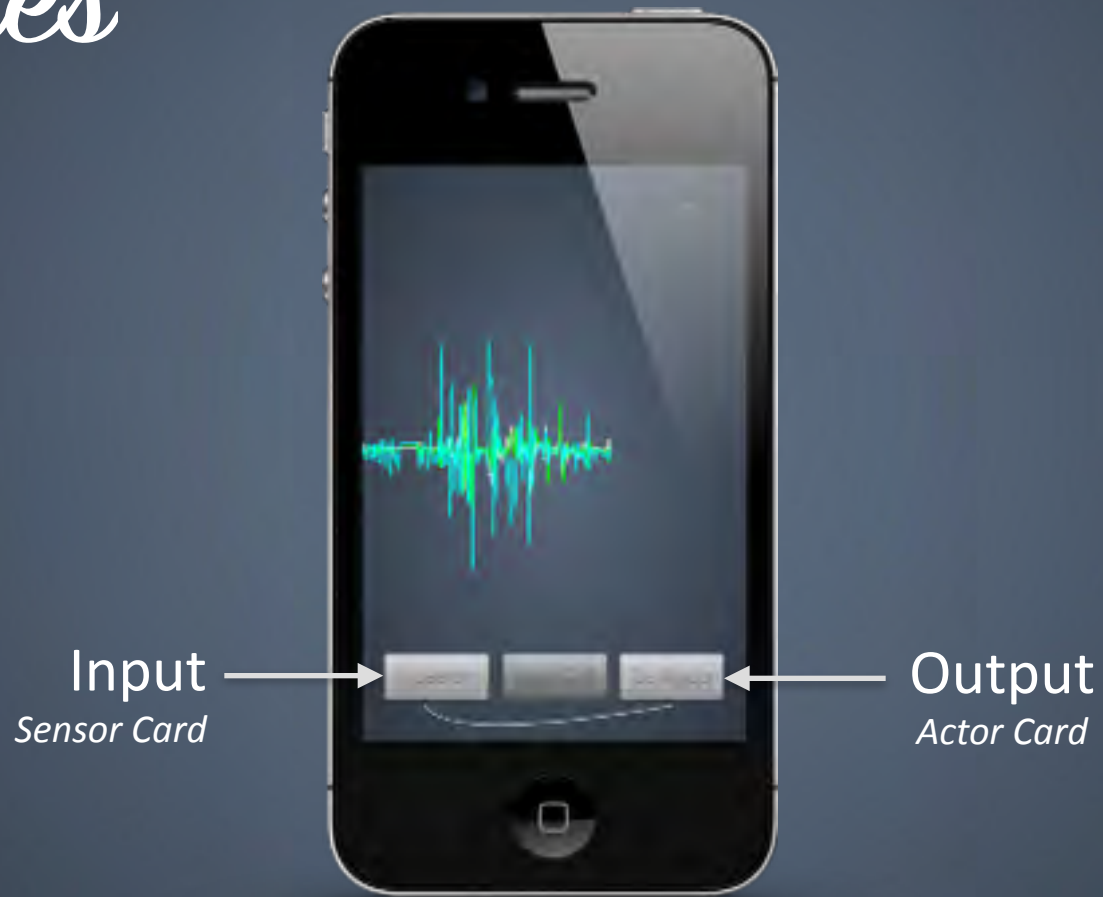
System Overview

Michael Markert

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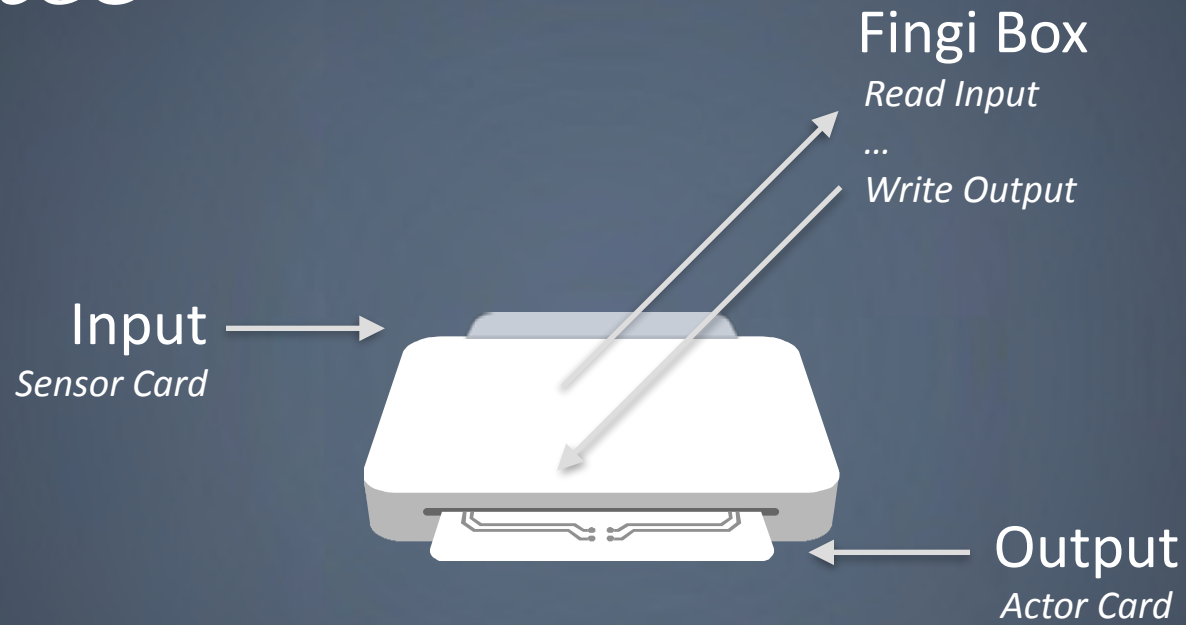
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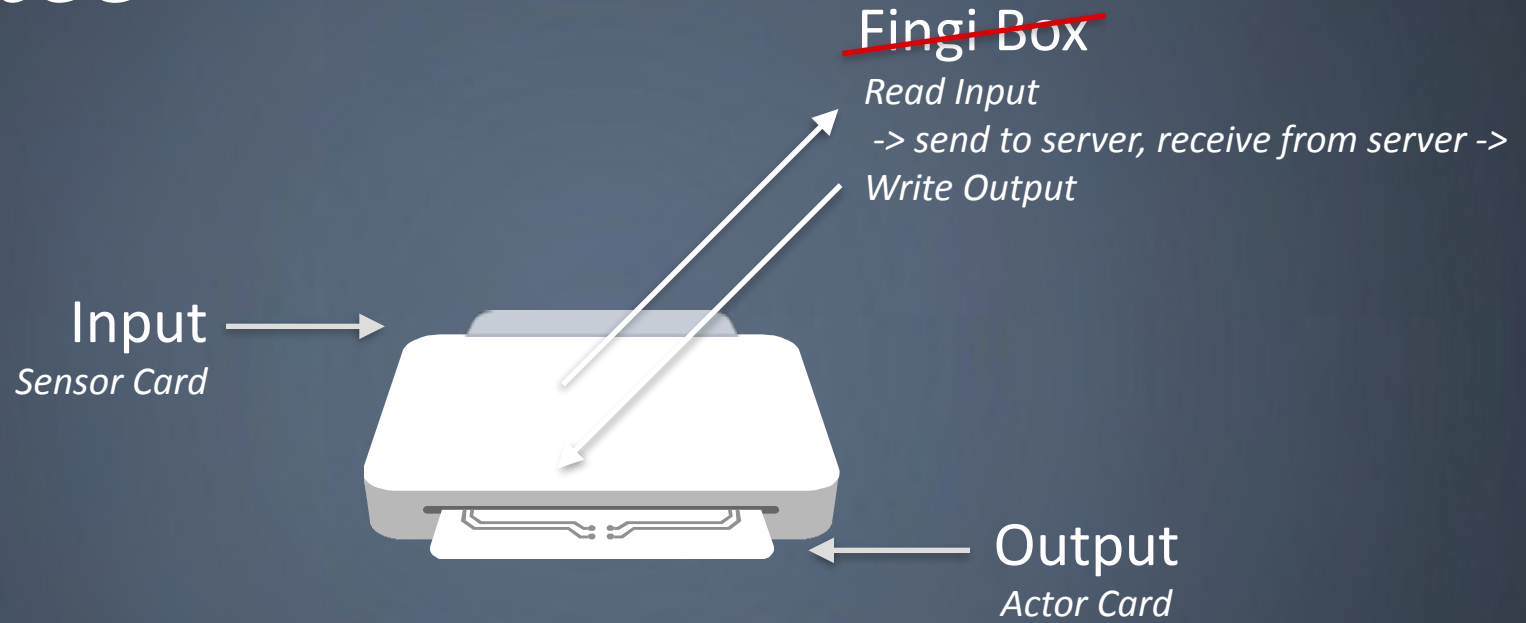
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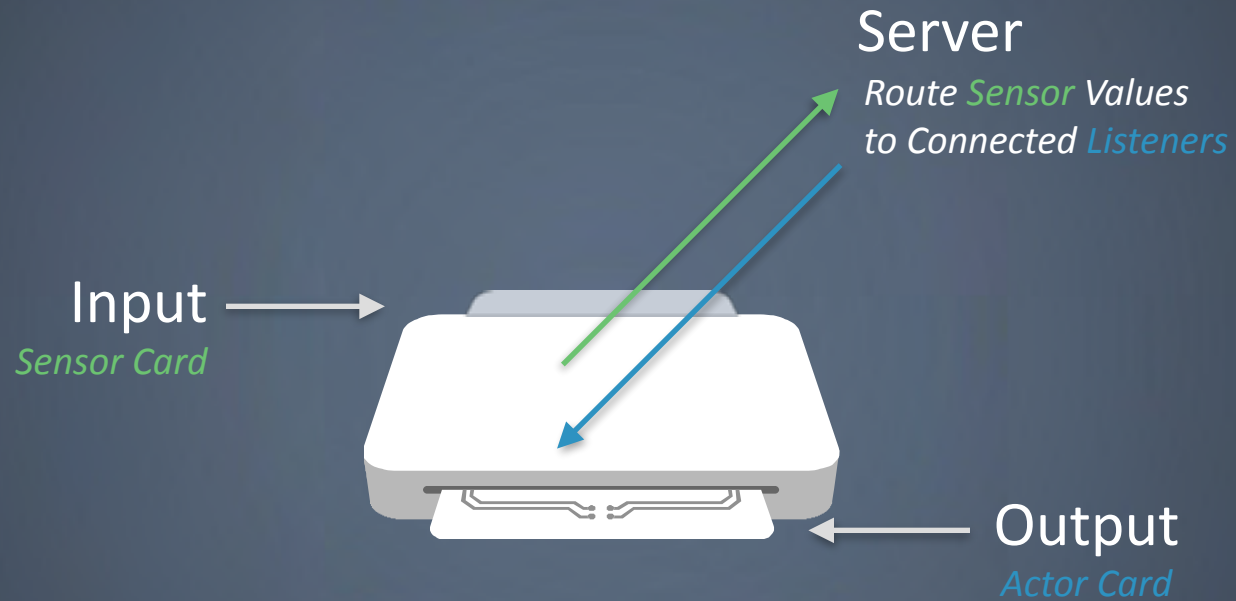
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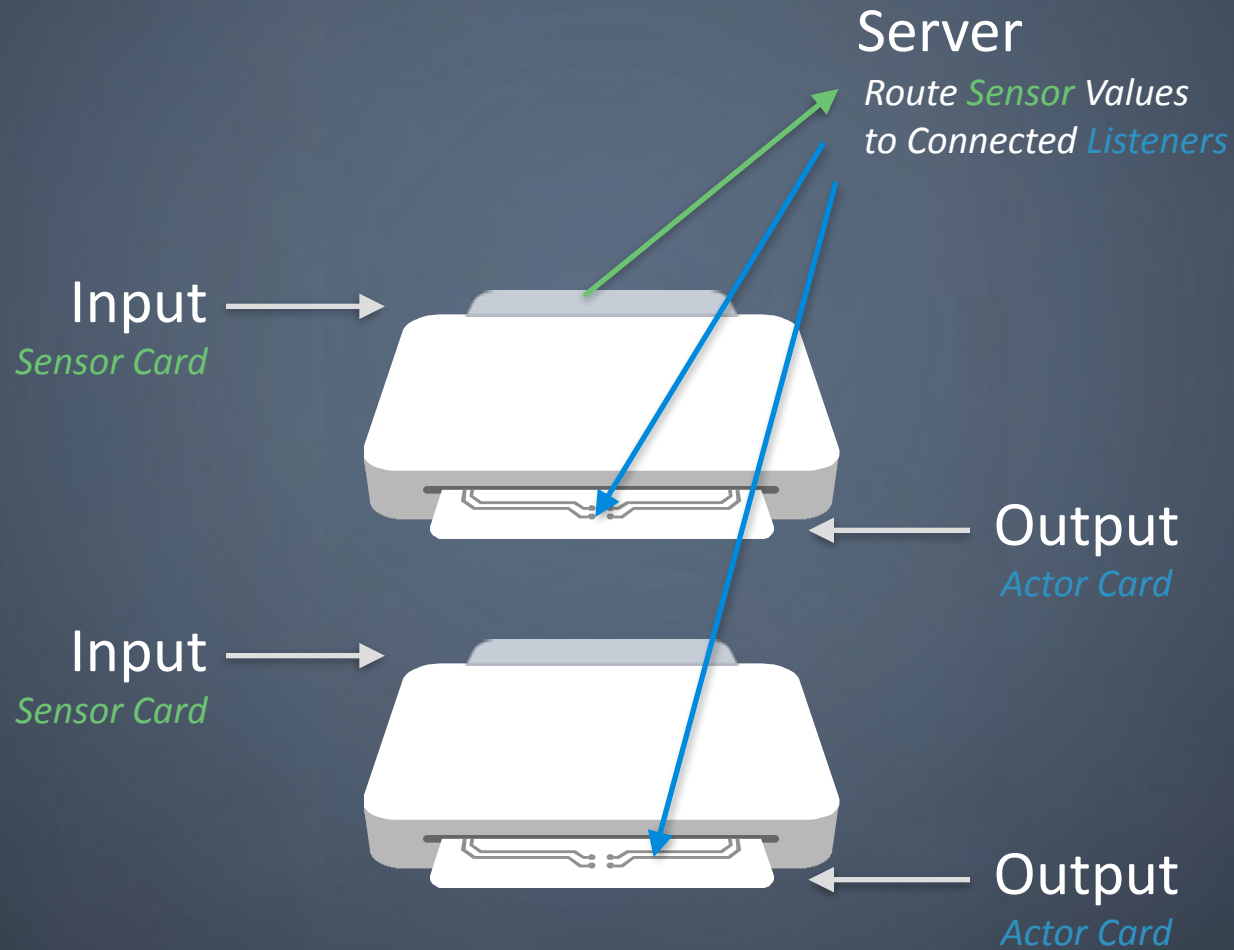
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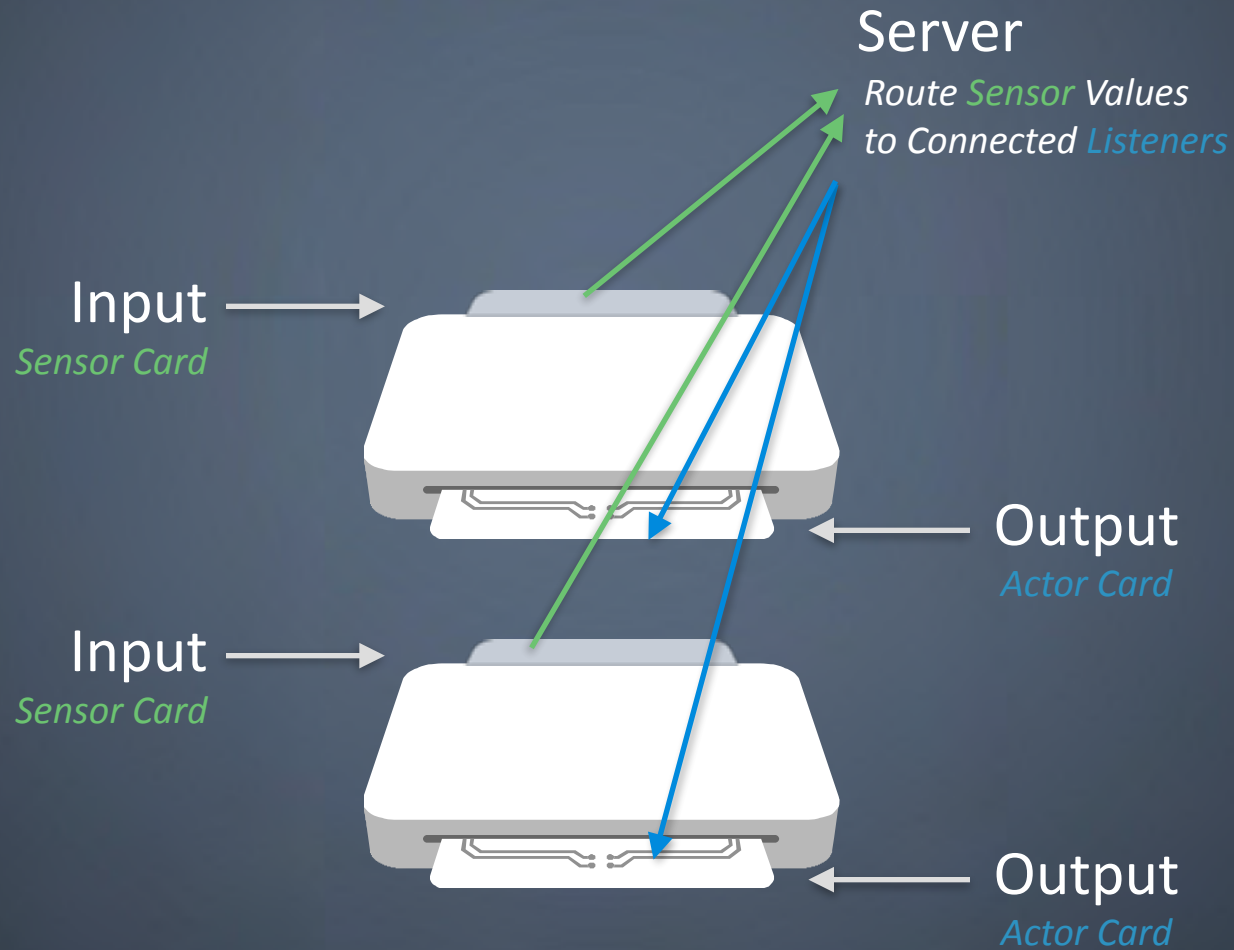
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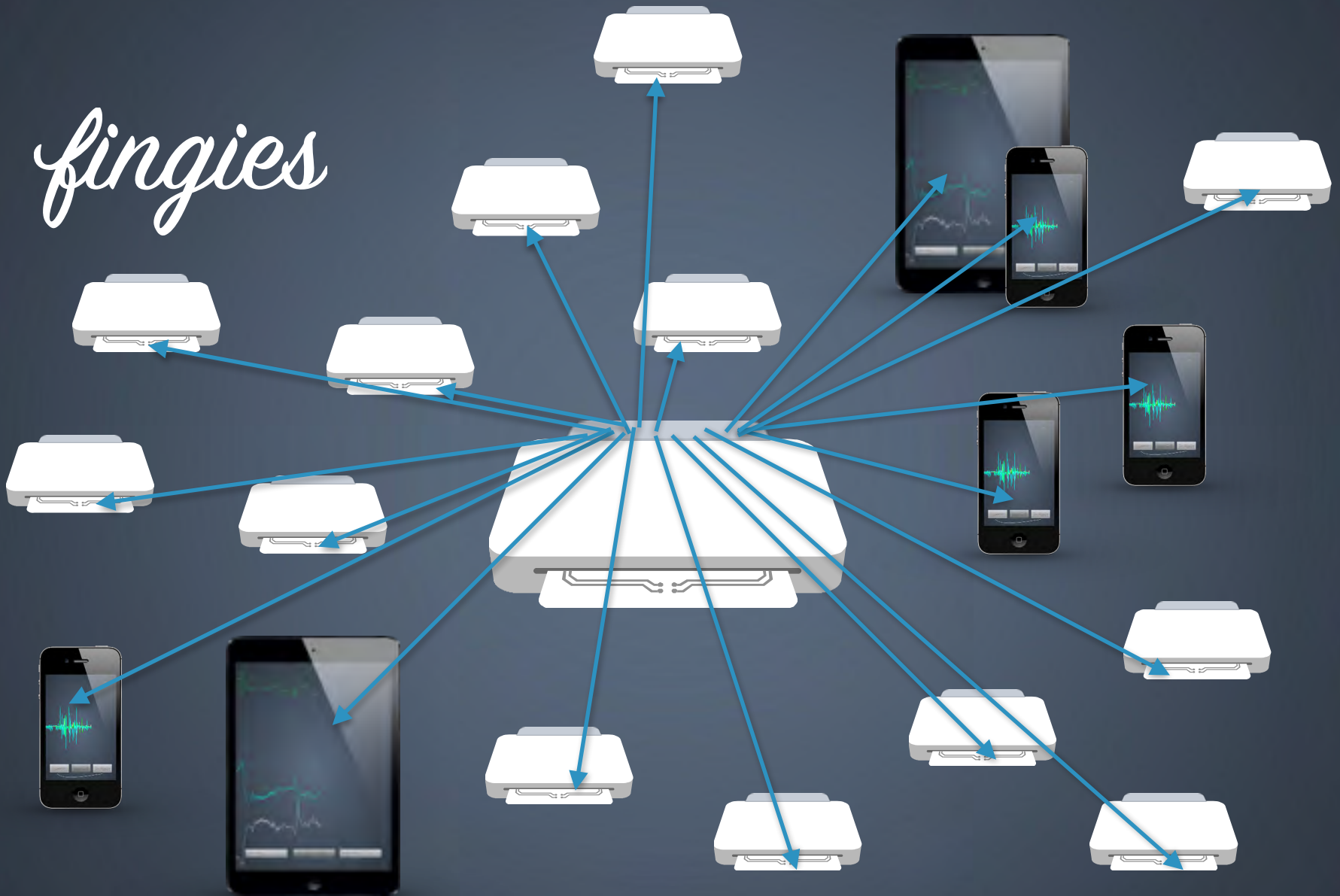
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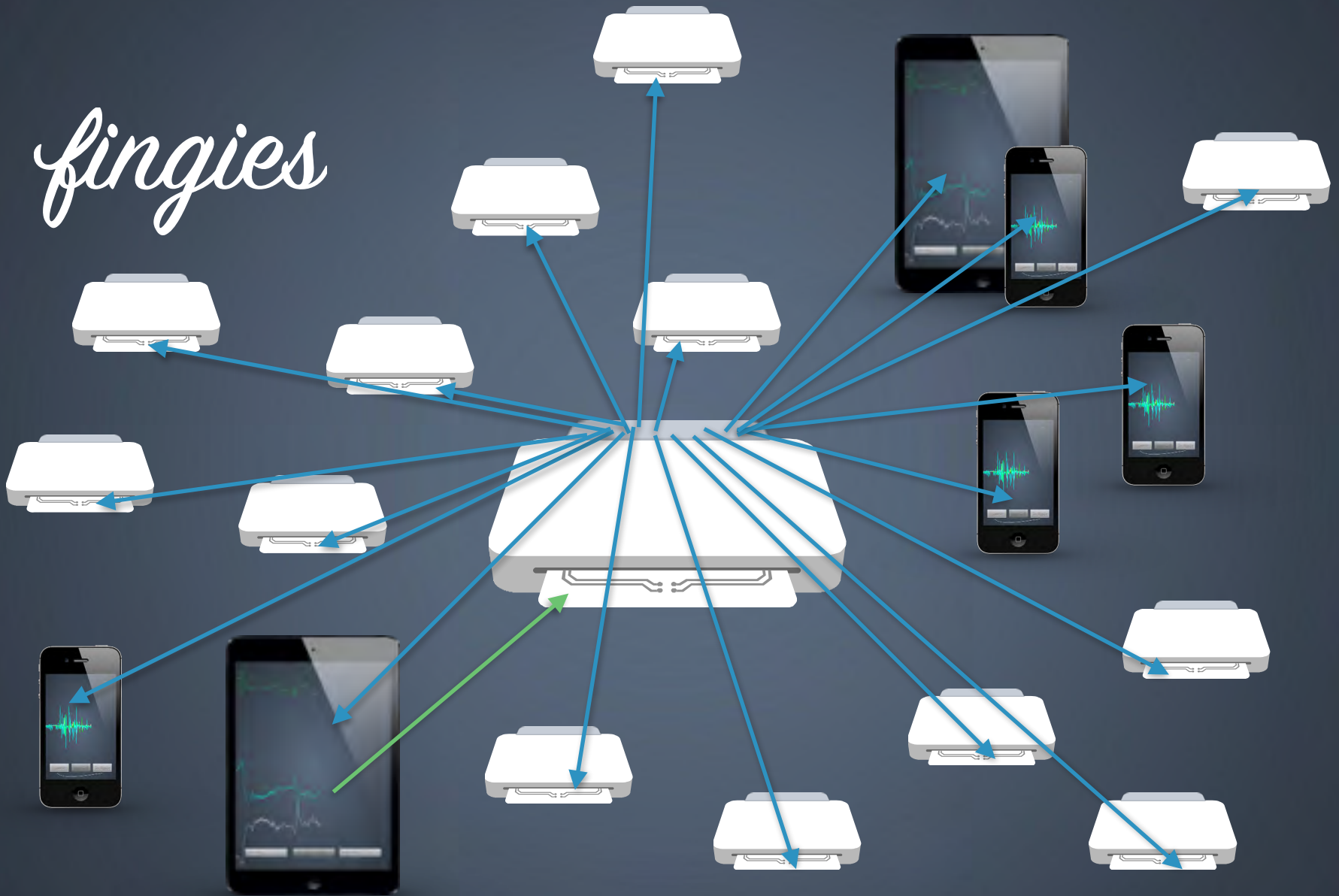
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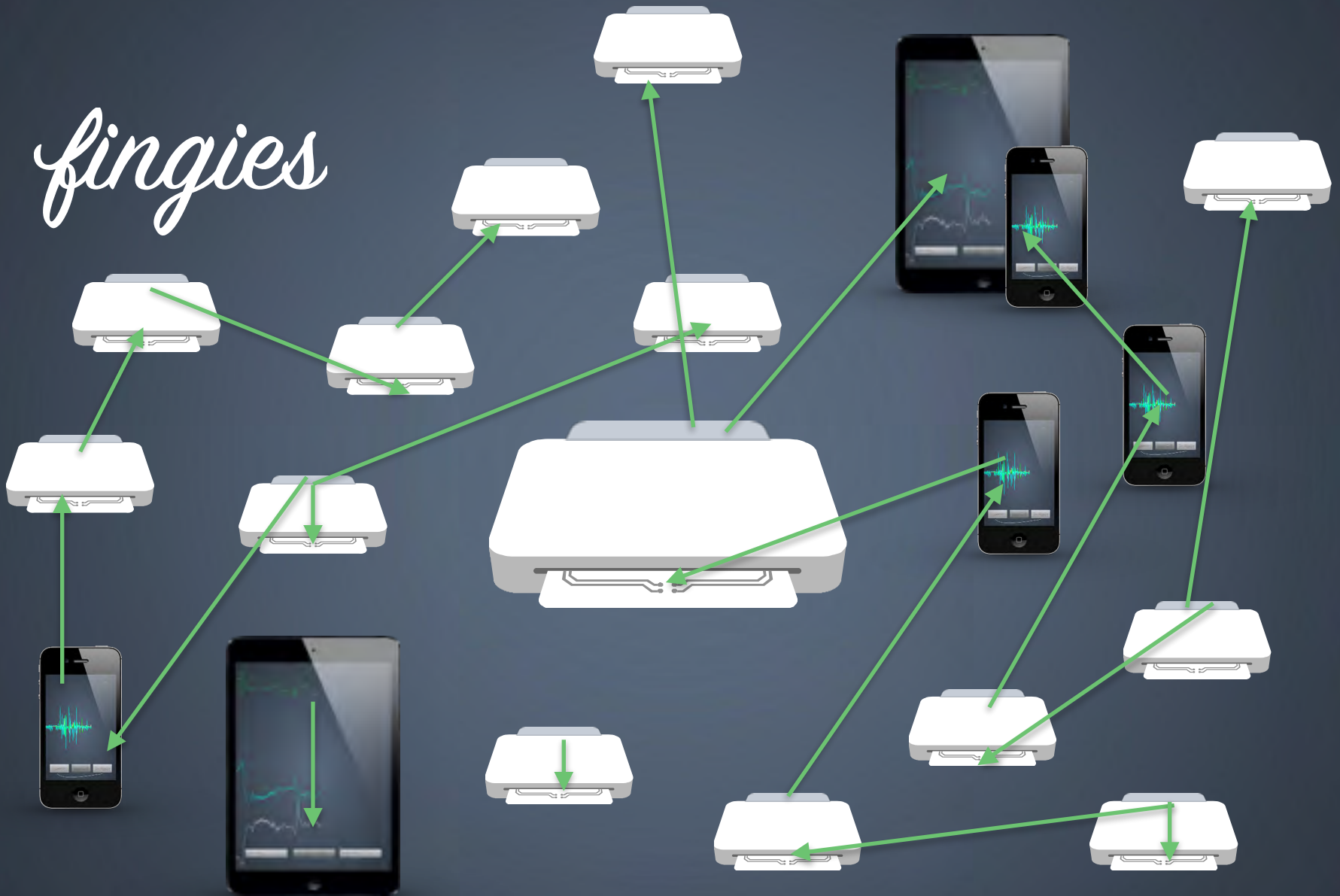
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Mobile Fingies

Michael Markert

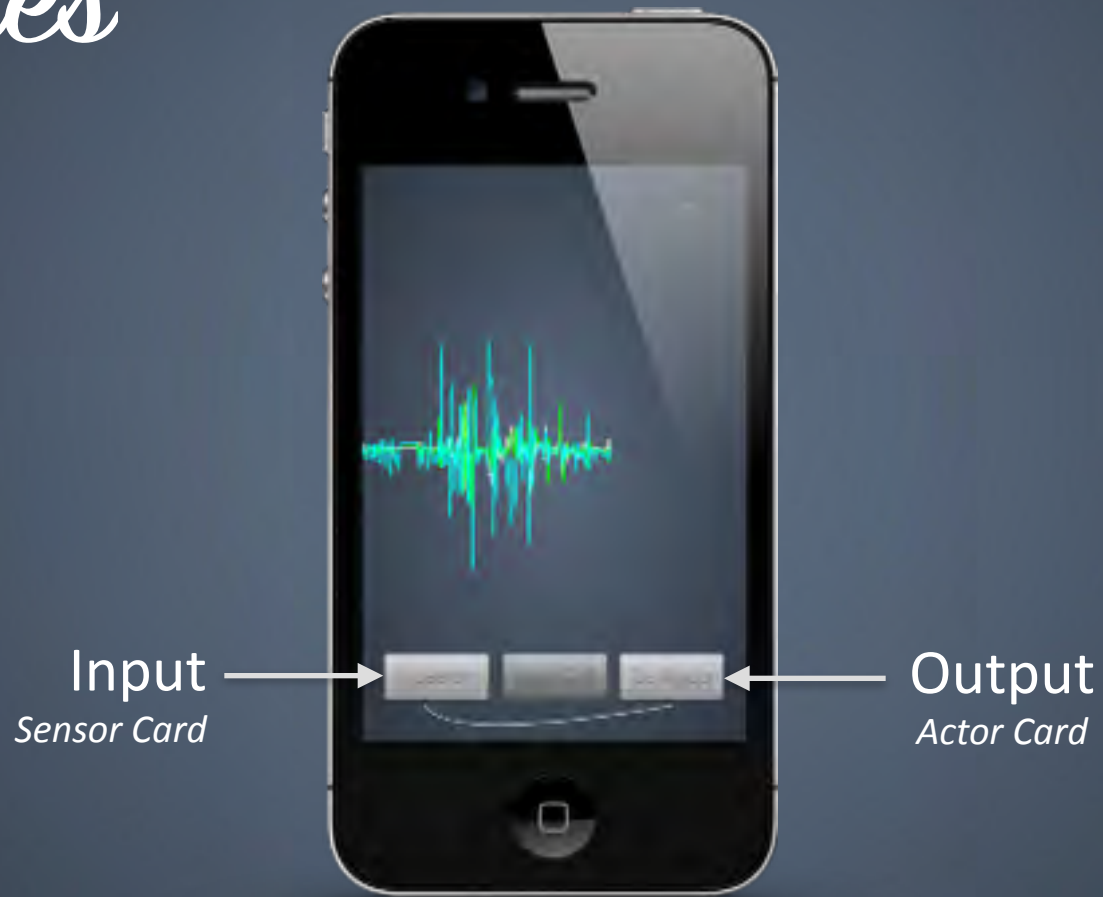
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Input
Sensor Card



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Output
Actor Card



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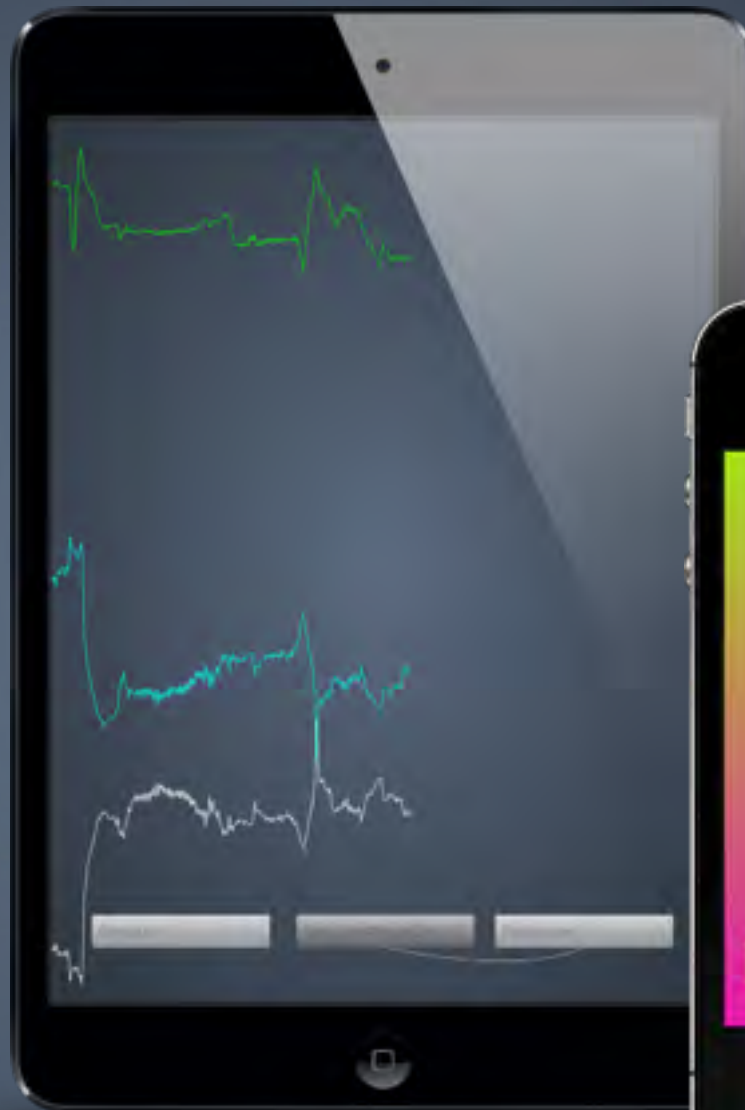
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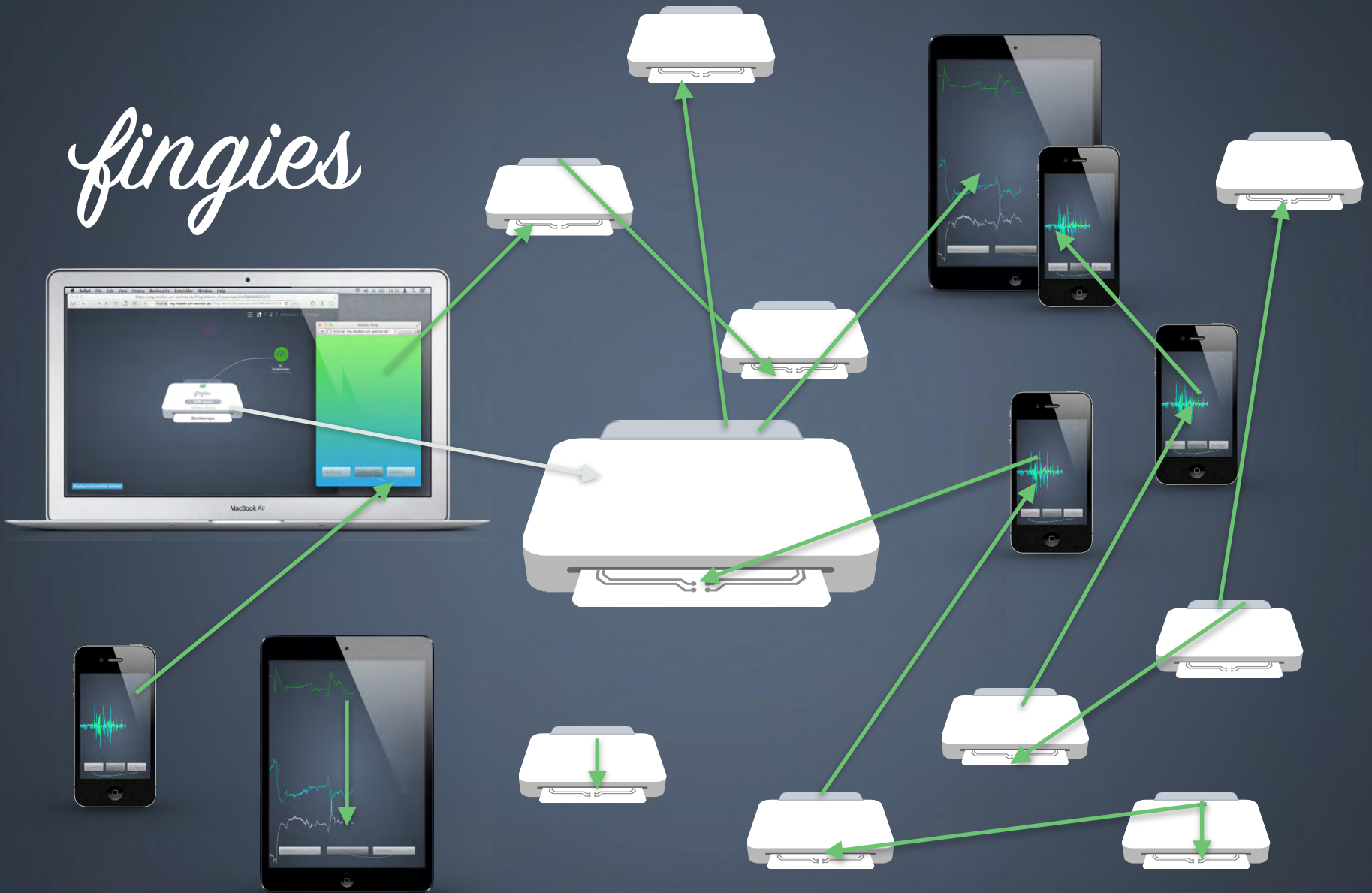
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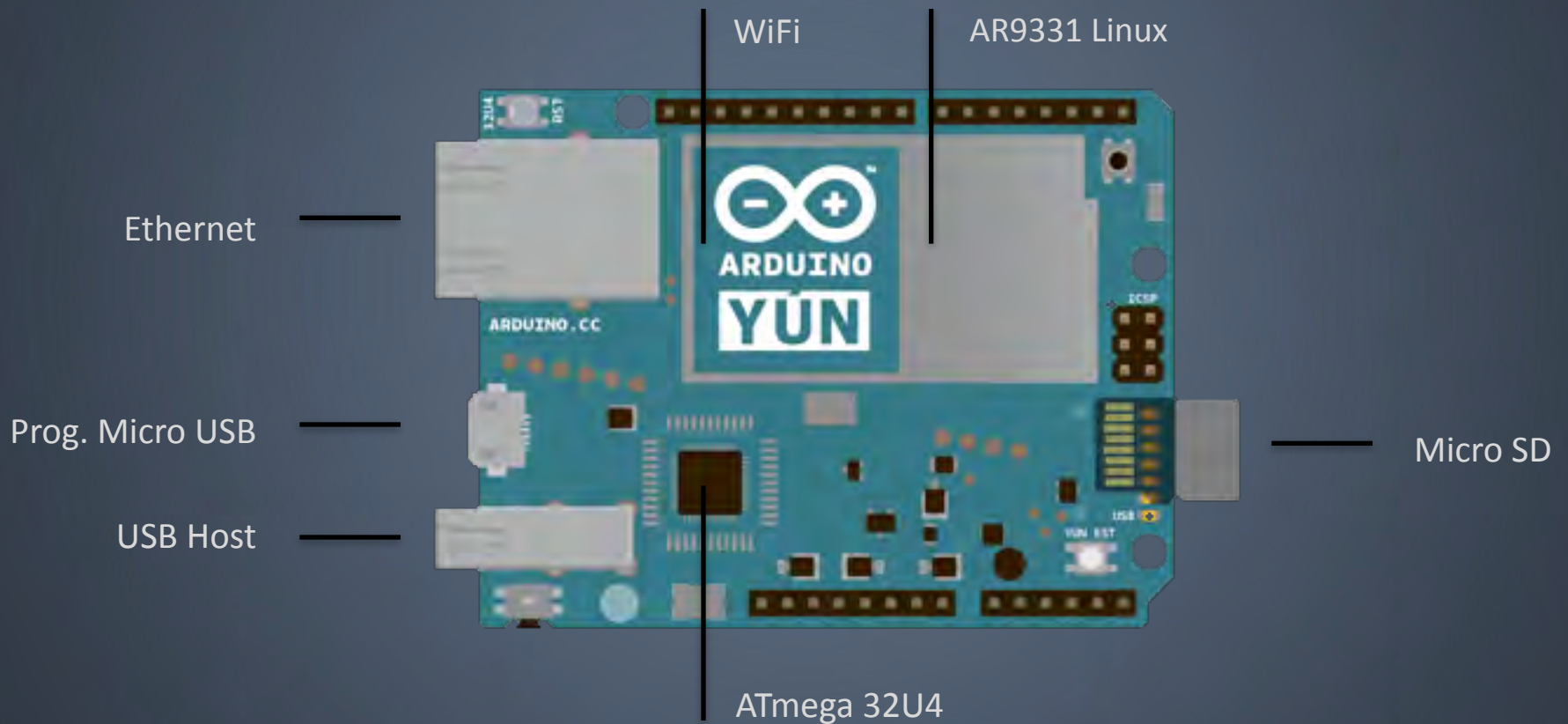
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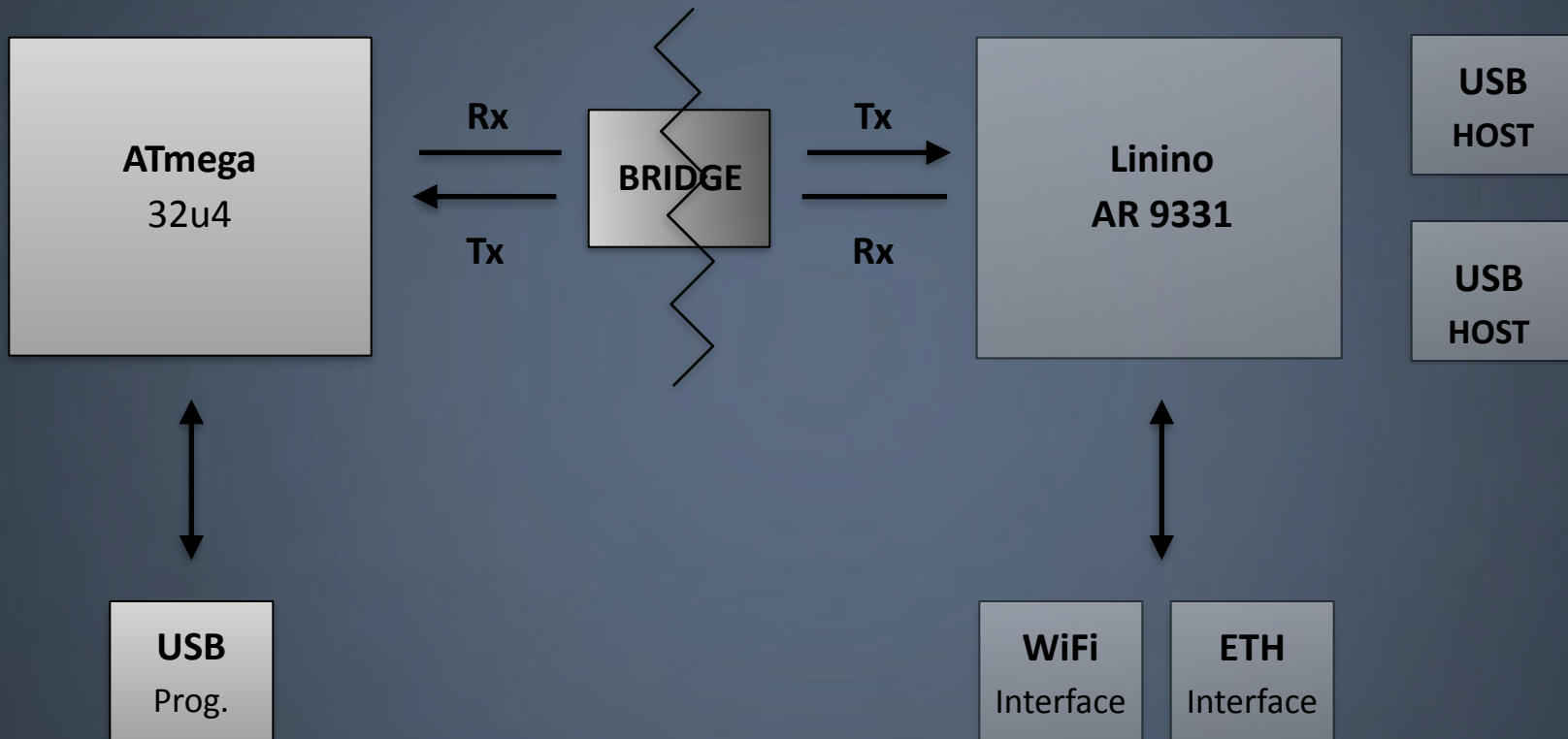
Fingies Hardware

AVR Arduino microcontroller, Linux microprocessor &
Fingies Shield

Arduino Yún



Internal-Serial-Bridge



Arduino Environment

Linux Environment

AVR Arduino Microcontroller

Microcontroller	ATmega32u4
Operating Voltage	5V
Input Voltage	5V
Digital I/O Pins	20
PWM Channels	7
Analog Input Channels	12
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (of which 4 KB used by bootloader)
SRAM	2.5 KB
EEPROM	1 KB
Clock Speed	16 MHz

Linux Microprocessor

Processor	Atheros AR9331
Architecture	MIPS @400MHz
Operating Voltage	3.3V
Ethernet	IEEE 802.3 10/100Mbit/s
WiFi	IEEE 802.11b/g/n
USB Type-A	2.0 Host/Device
Card Reader	Micro-SD only
RAM	64 MB DDR2
Flash Memory	16 MB

Fingies Shield



Micro USB

LiPo Charger

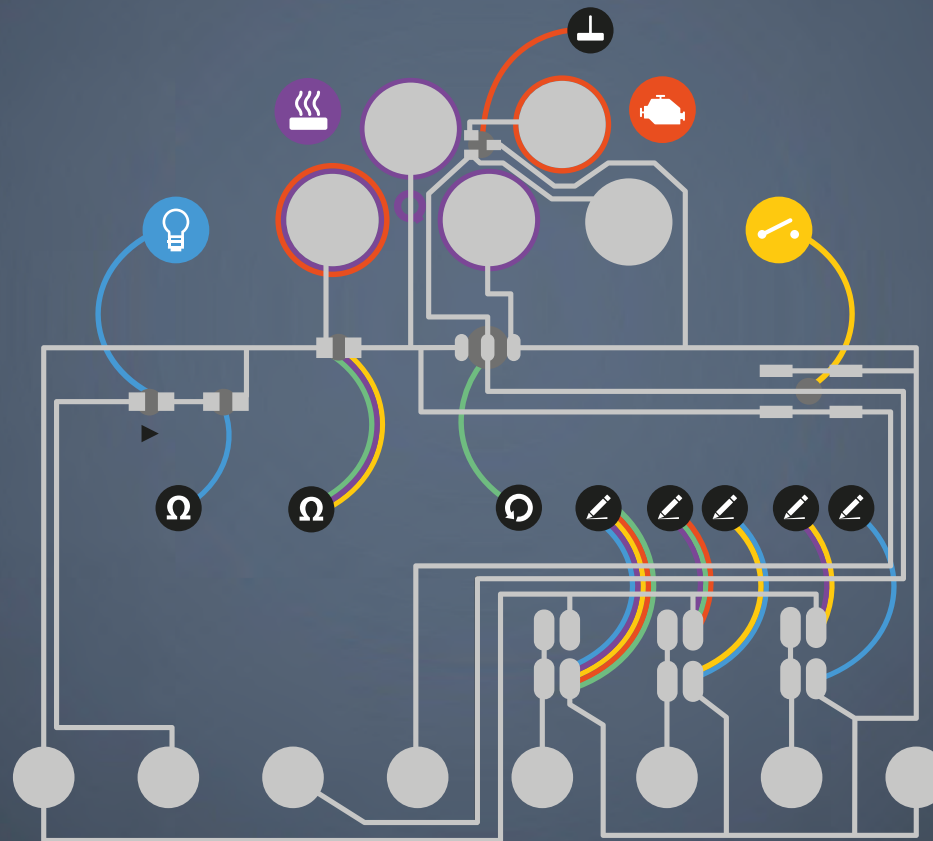
Power Button

Analog Switch

Battery

Magnetic Pins

Function Cards



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Fingies Configuration

Gabriel Rausch

Fingies Configuration

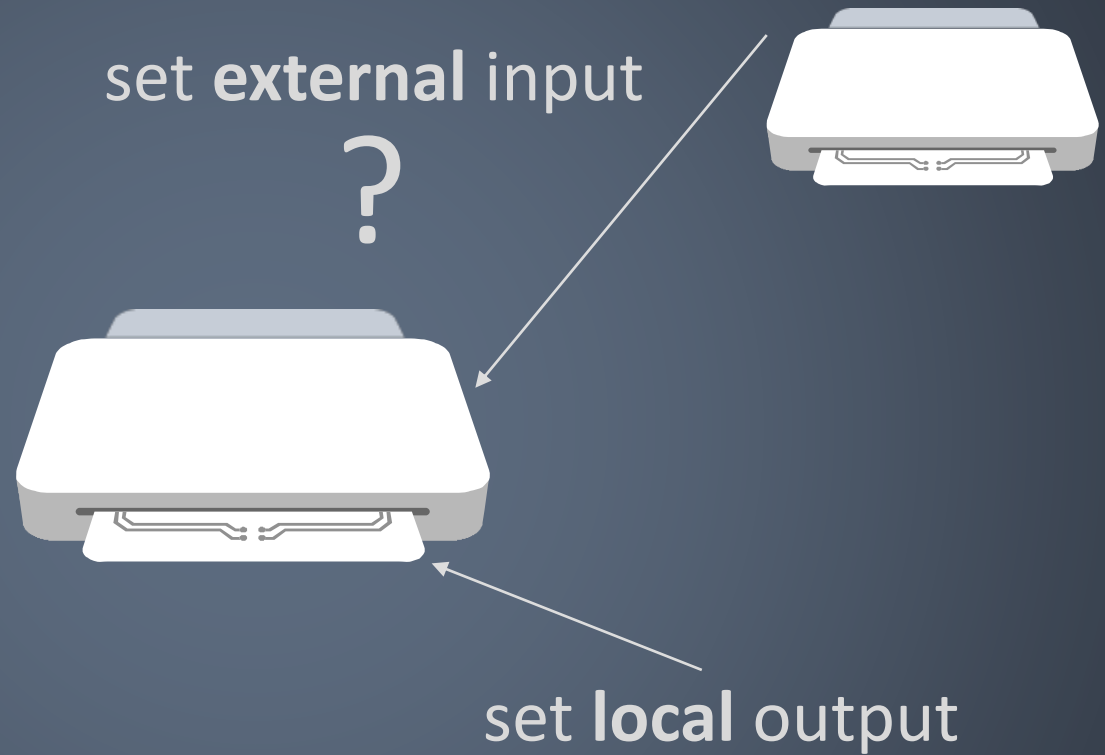
set **local** input



set **local** output



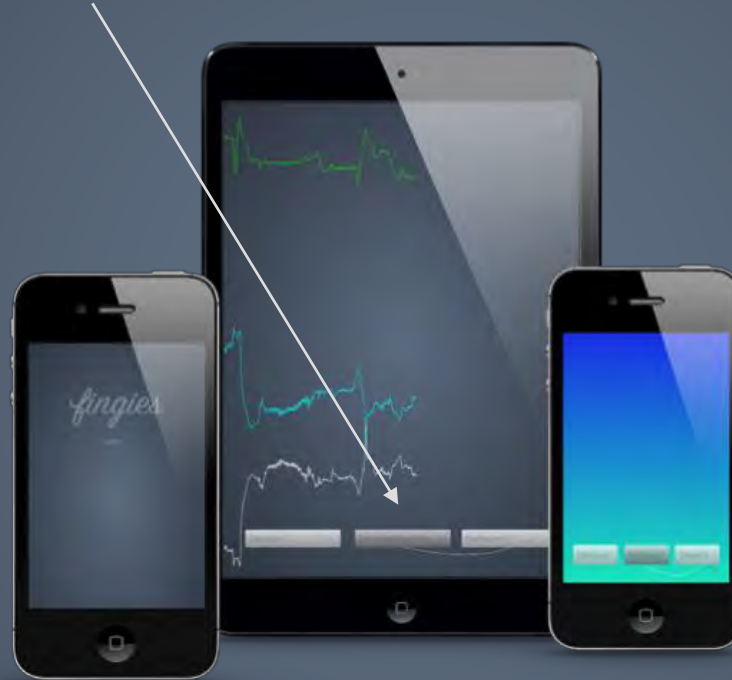
Fingies Configuration



Fingies Configuration

set **external** input

!



Fingies Configuration



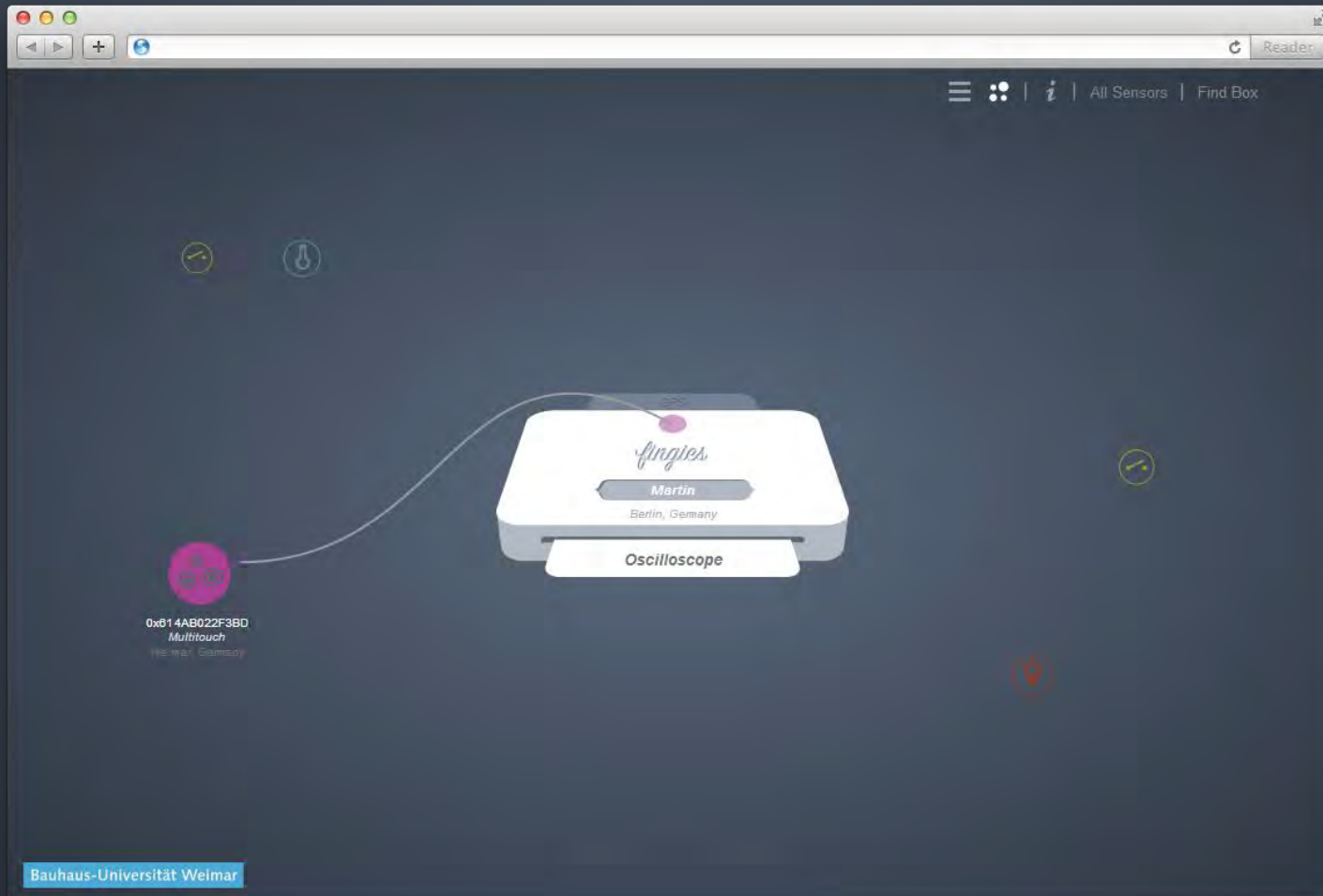
Configuration Tool



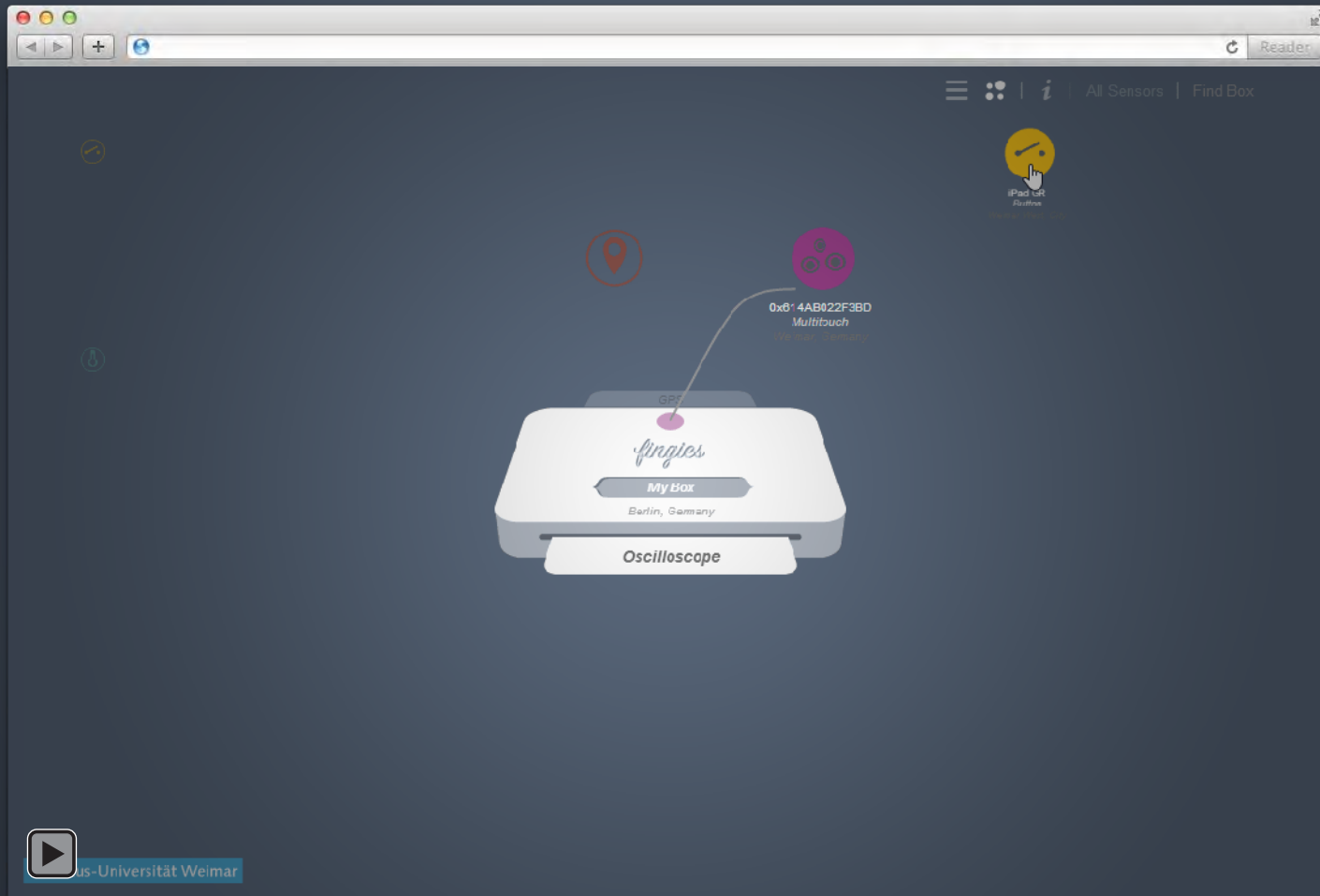
Fingies Configuration

Name	Reservation - MB	Limit - MB	Shares	Shares Value	% Shares	Worst Case Allo...	Type
h...	0	Unlimited	Normal	655360	3	26965	N/A
h...	0	Unlimited	Normal	655360	3	26965	N/A
cg...	0	Unlimited	Normal	327680	1	13484	N/A
cg...	0	Unlimited	Normal	327680	1	13484	N/A
cg...	0	Unlimited	Normal	327680	1	13483	N/A
h...	0	Unlimited	Normal	327680	1	13483	N/A
cg...	0	Unlimited	Normal	327680	1	13483	N/A
cg...	0	Unlimited	Normal	327680	1	13483	N/A
h...	0	Unlimited	Normal	327680	1	13483	N/A
cg...	0	Unlimited	Normal	327680	1	13483	N/A
cg...	0	Unlimited	Normal	327680	1	13483	N/A
cg...	0	Unlimited	Normal	327680	1	13483	N/A
cg...	0	Unlimited	Normal	327680	1	13483	N/A
cg...	0	Unlimited	Normal	327680	1	13483	N/A
cg...	0	Unlimited	Normal	163840	0	6743	N/A
cg...	0	Unlimited	Normal	163840	0	6743	N/A
h...	0	Unlimited	Normal	163840	0	6743	N/A
cg...	0	Unlimited	Normal	163840	0	6743	N/A
h...	0	Unlimited	Normal	163840	0	6743	N/A
h...	0	Unlimited	Normal	163840	0	6743	N/A
cg...	0	Unlimited	Normal	163840	0	6743	N/A
cg...	0	Unlimited	Normal	163840	0	6743	N/A
h...	0	Unlimited	Normal	163840	0	6743	N/A
cg...	0	Unlimited	Normal	163840	0	6743	N/A
cg...	0	Unlimited	Normal	163840	0	6743	N/A

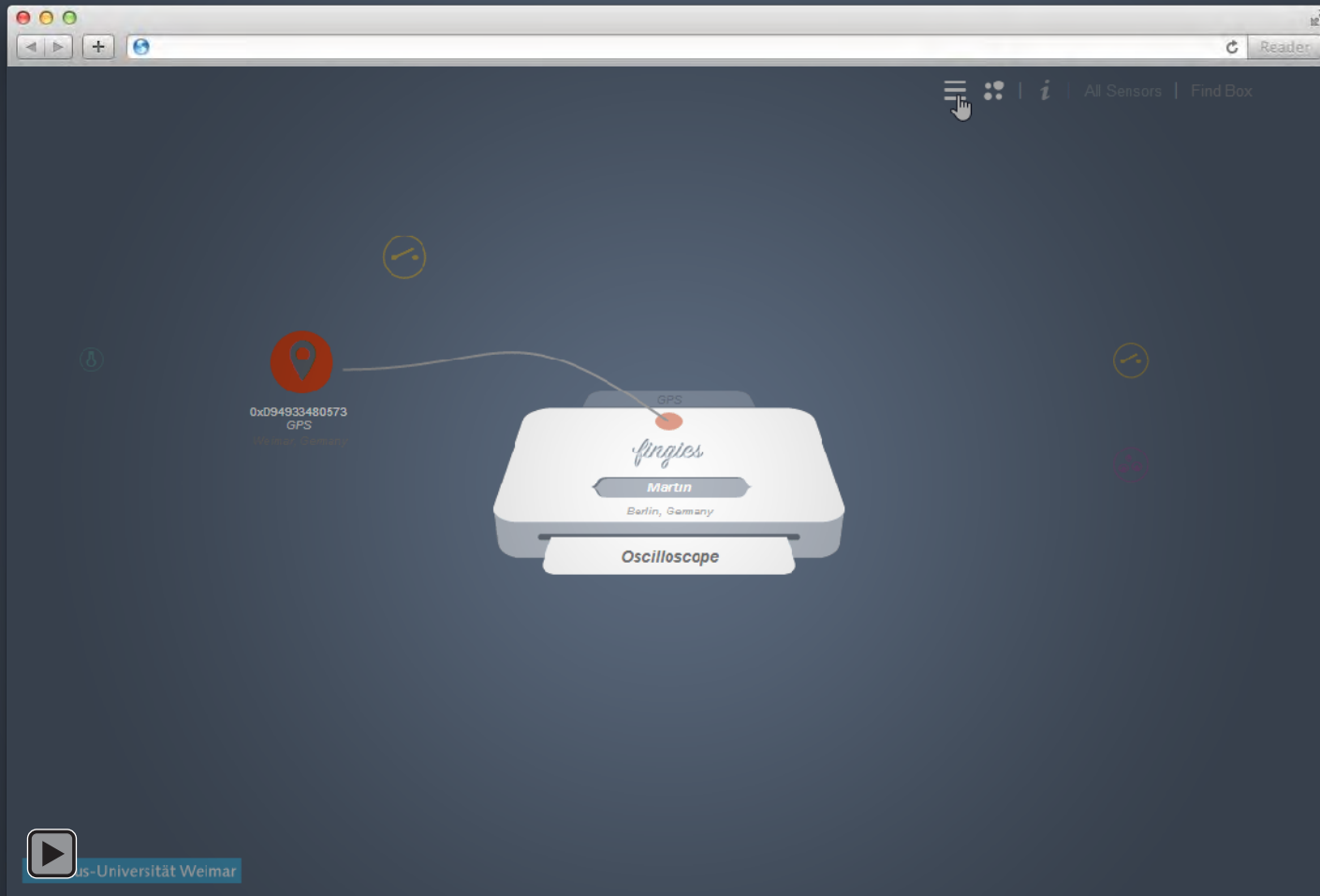
Fingies Configuration



Fingies Configuration



Fingies Configuration



Fingies Mobile App

<https://mg.medien.uni-weimar.de/Fingi/WebApp>

Fingies Configuration Tool

<https://mg.medien.uni-weimar.de/Fingi/Admin>

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Hardware Assembly

Fingies Casing

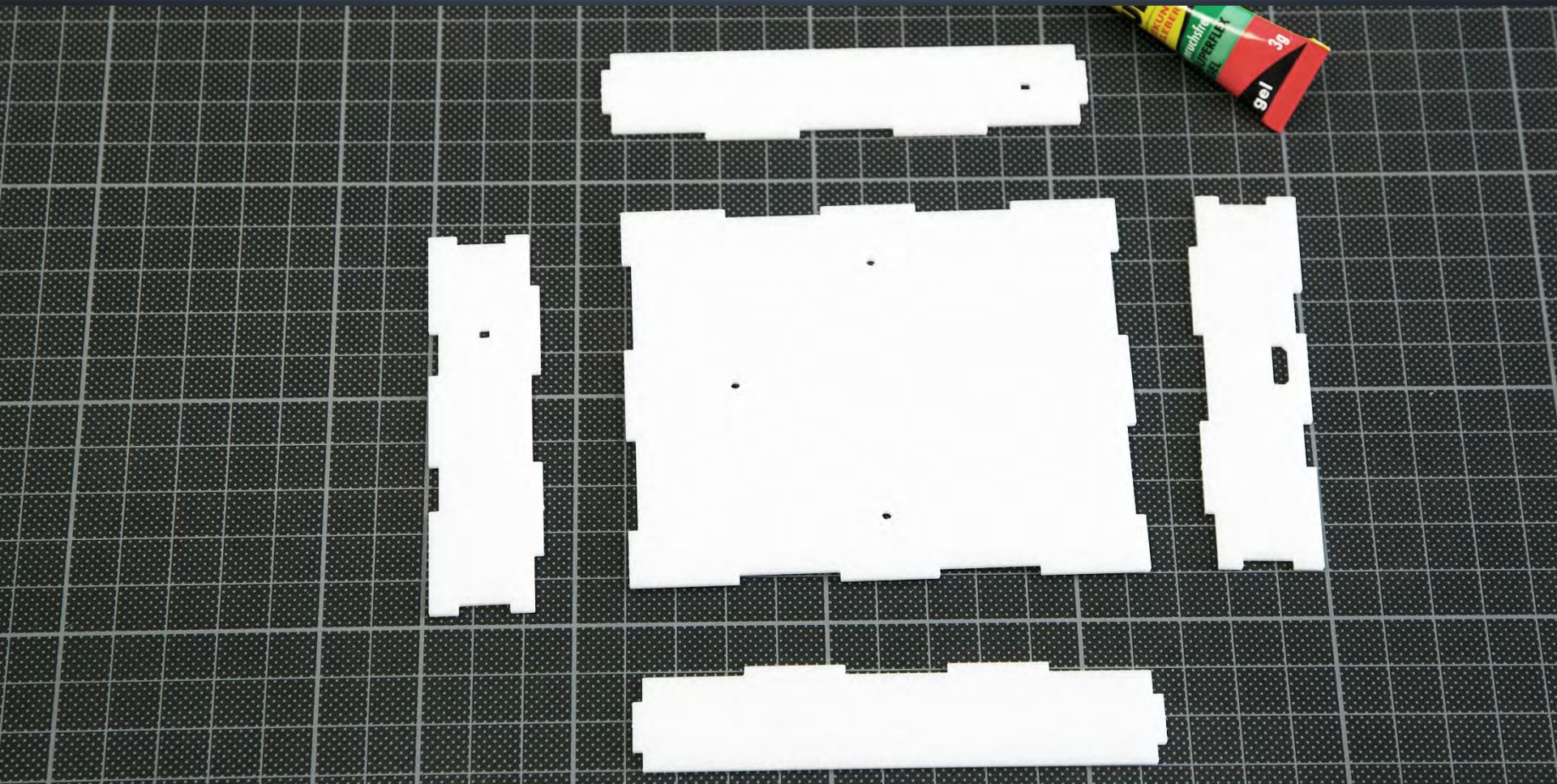
Step 1

Quarry out elements from the cutting die



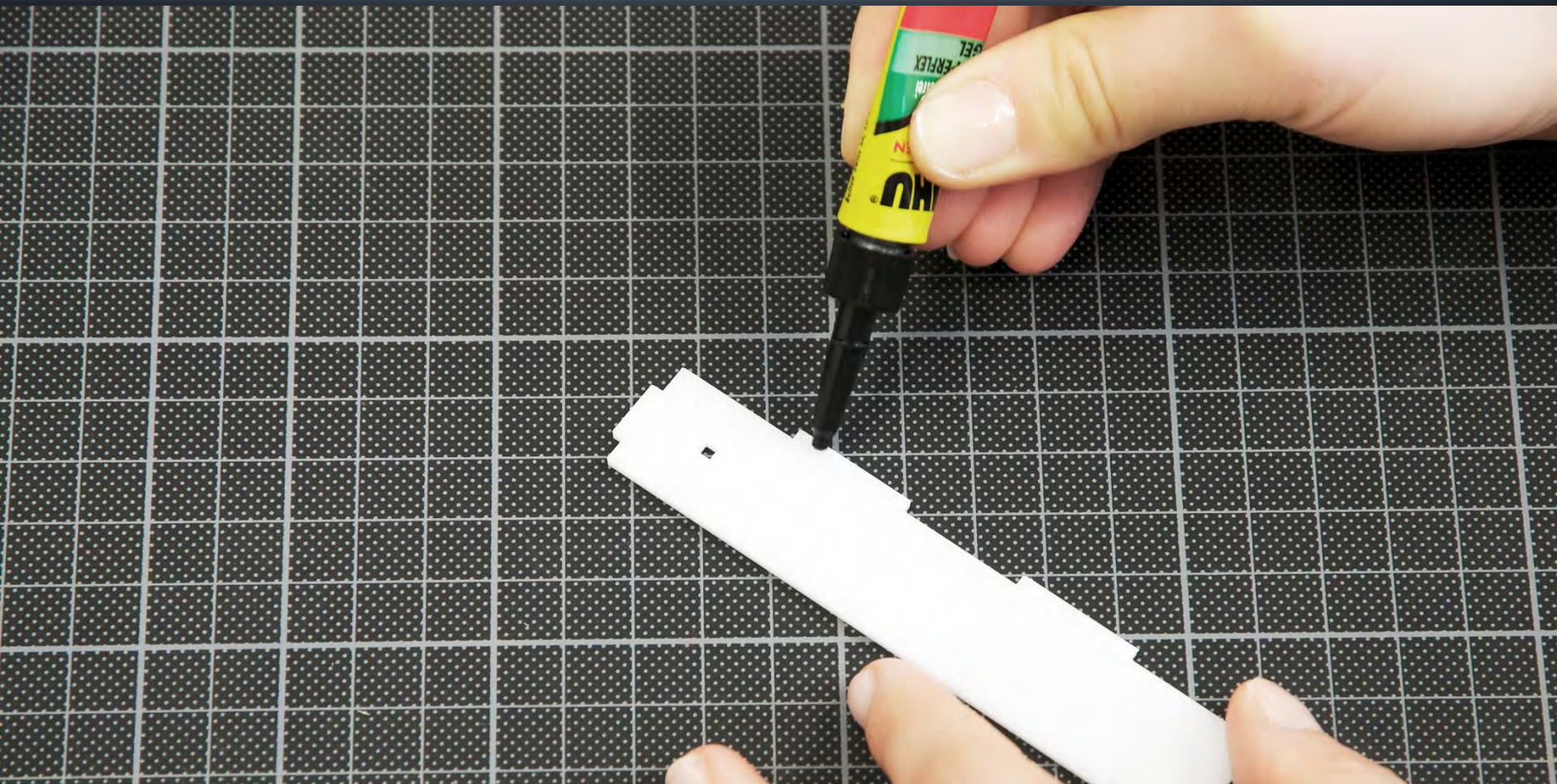
Step 2

Arrange reversed elements as seen in the picture



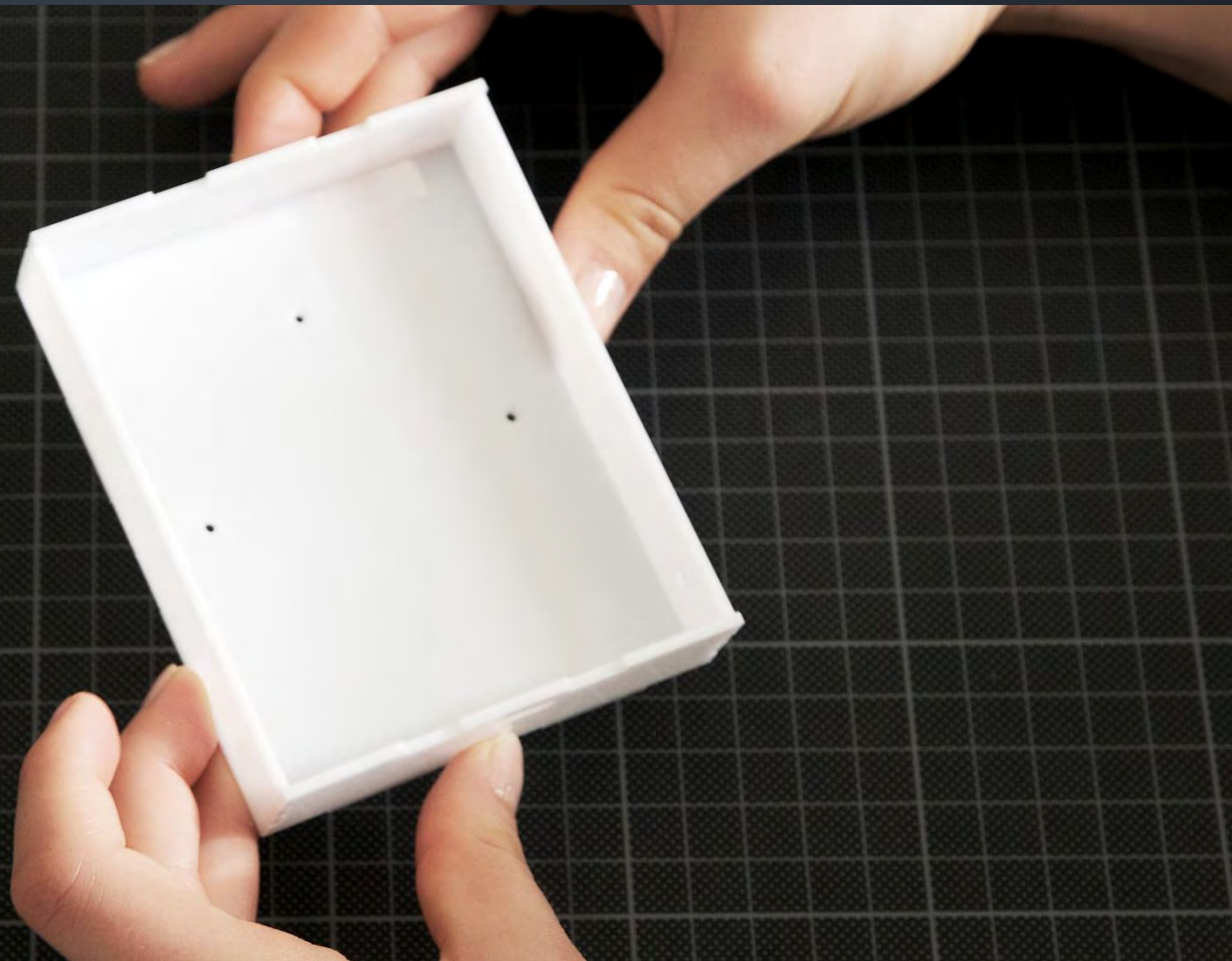
Step 3

Stick together base elements (glue only edges)



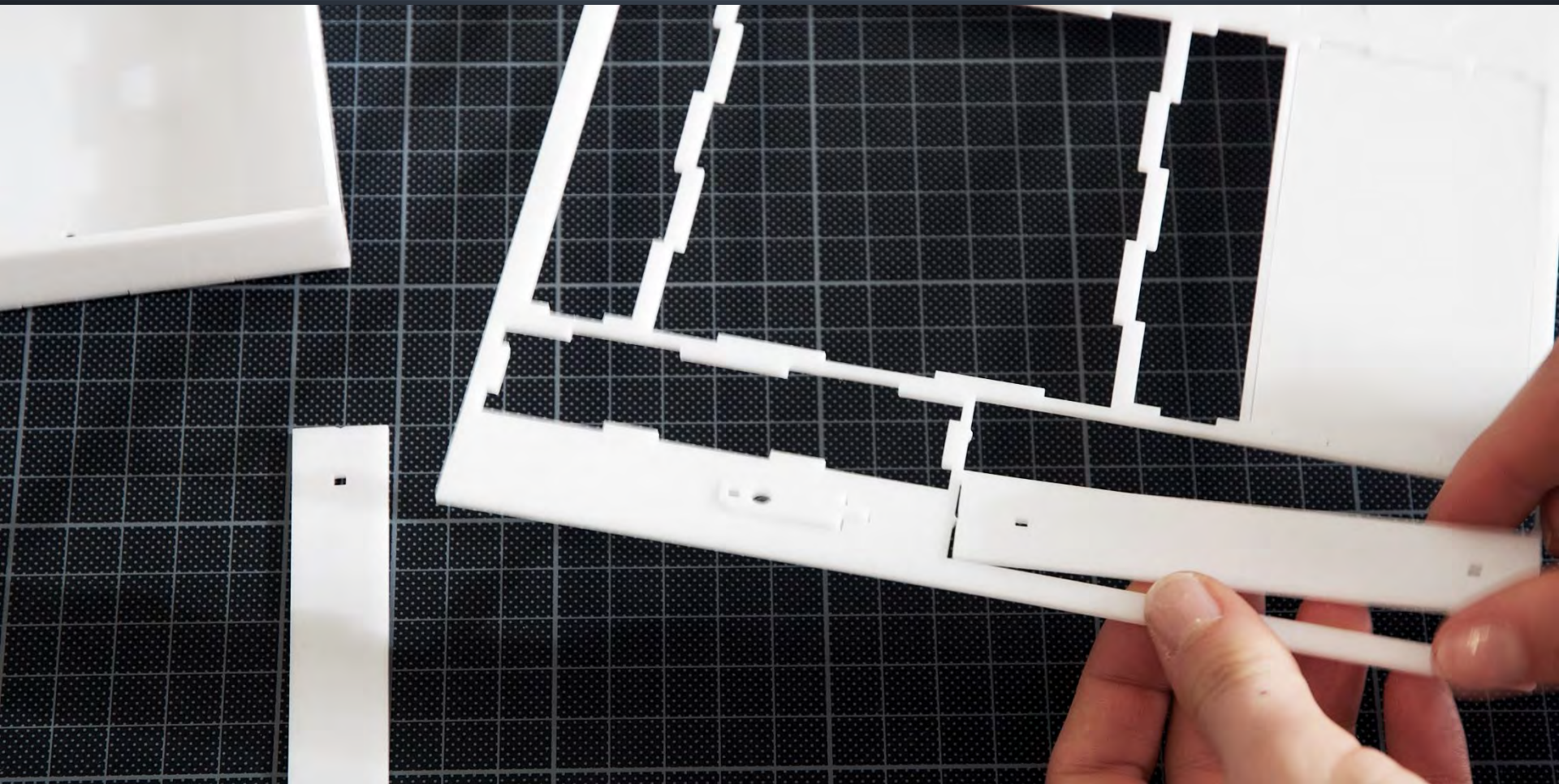
Step 4

Apply pressure to ensure stability



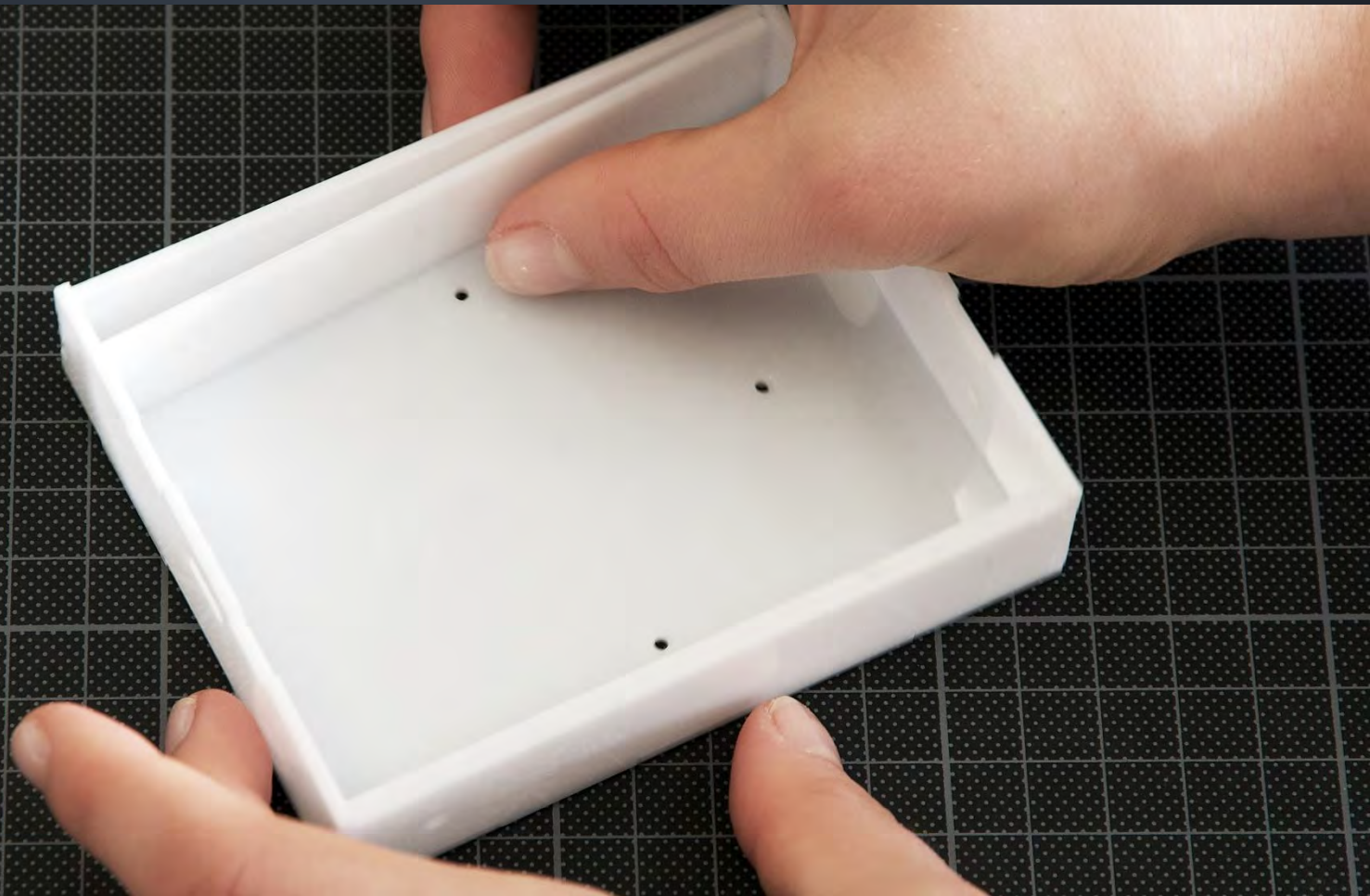
Step 5

Quarry out two border elements



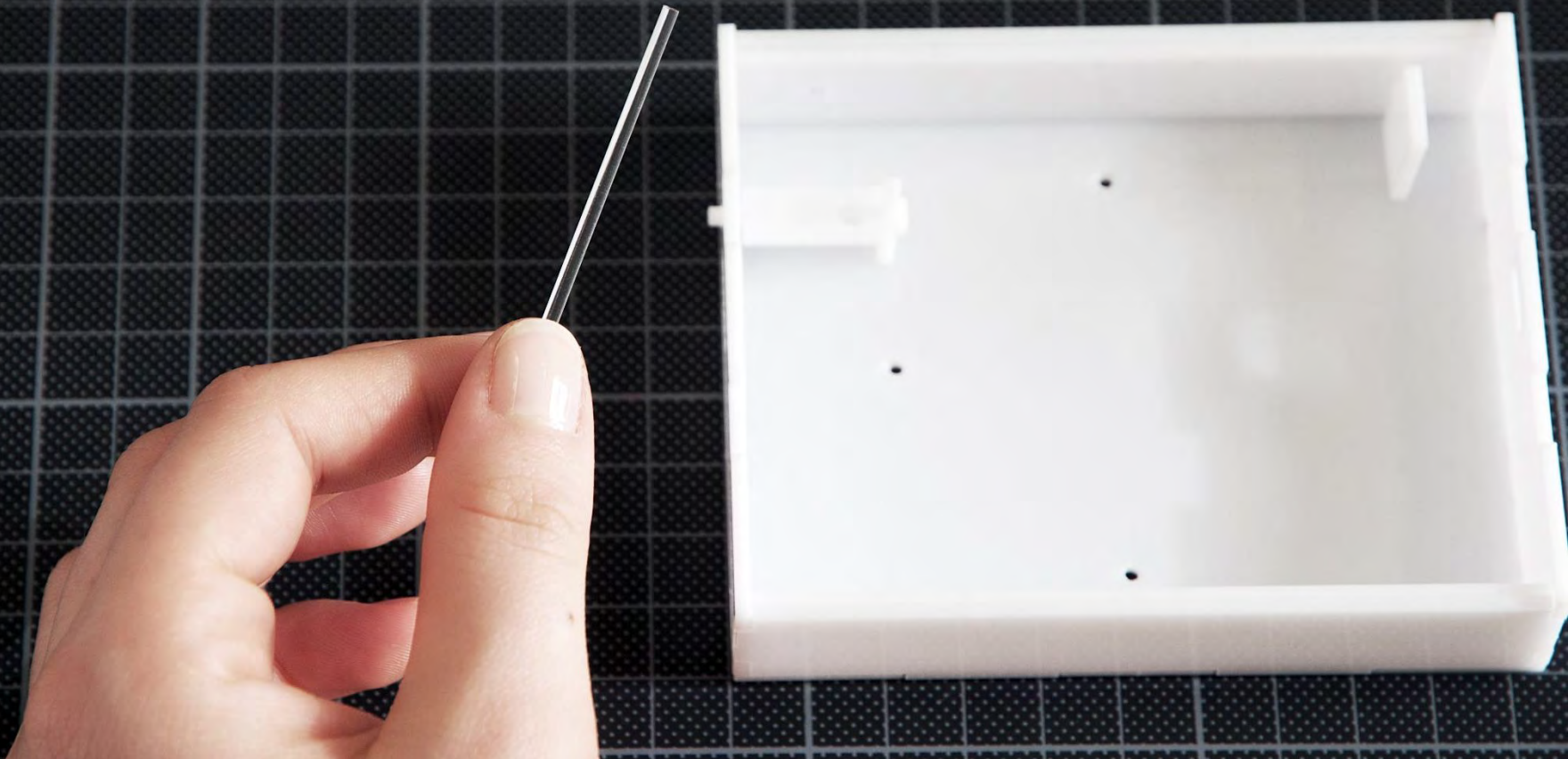
Step 6

Stick them into base cover



Step 7

Prepare light pillars



Step 8

Cut into three pieces: 1.6mm | 1.7mm | 1.7mm



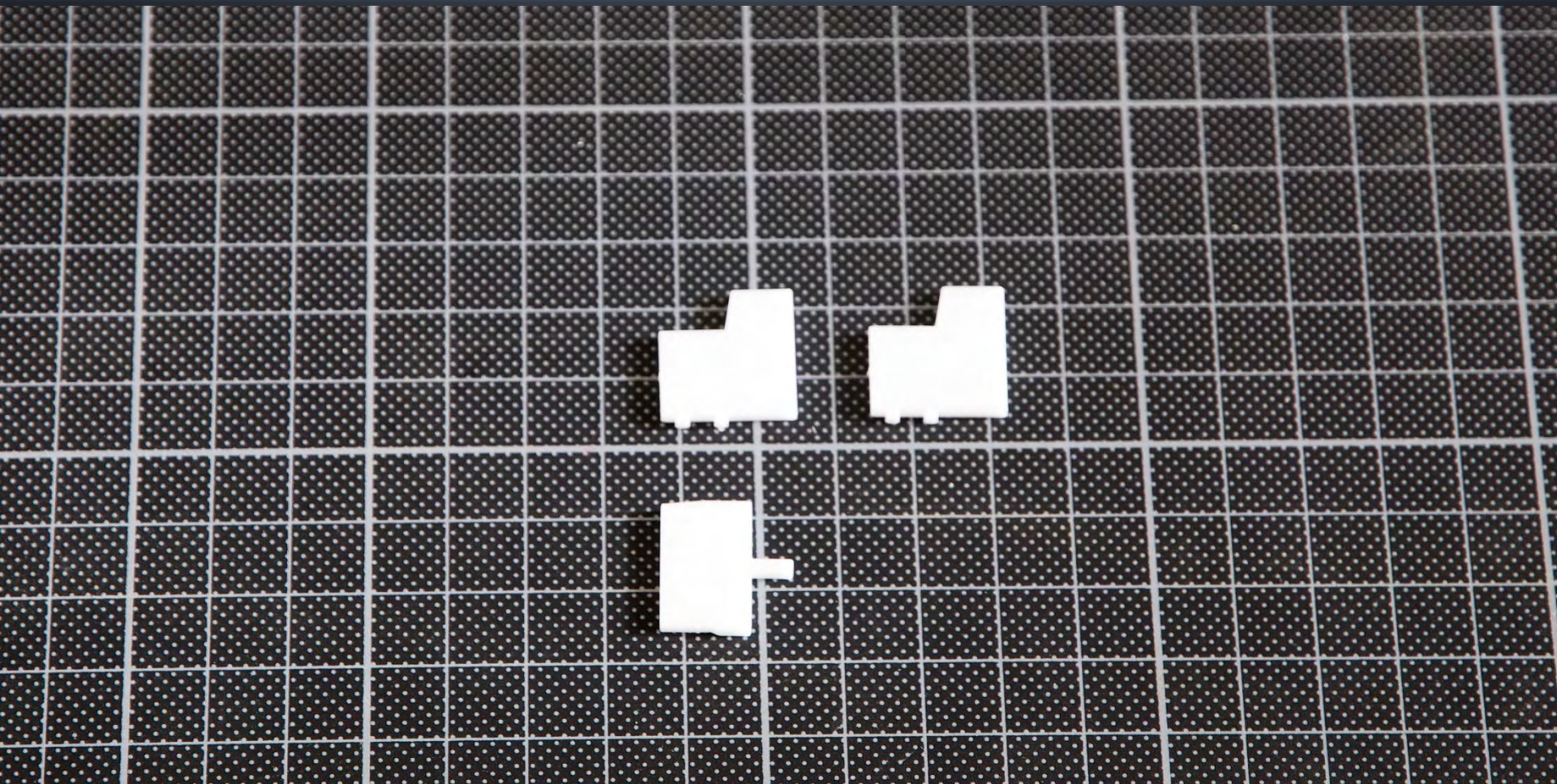
Step 9

Insert shortest light pillar



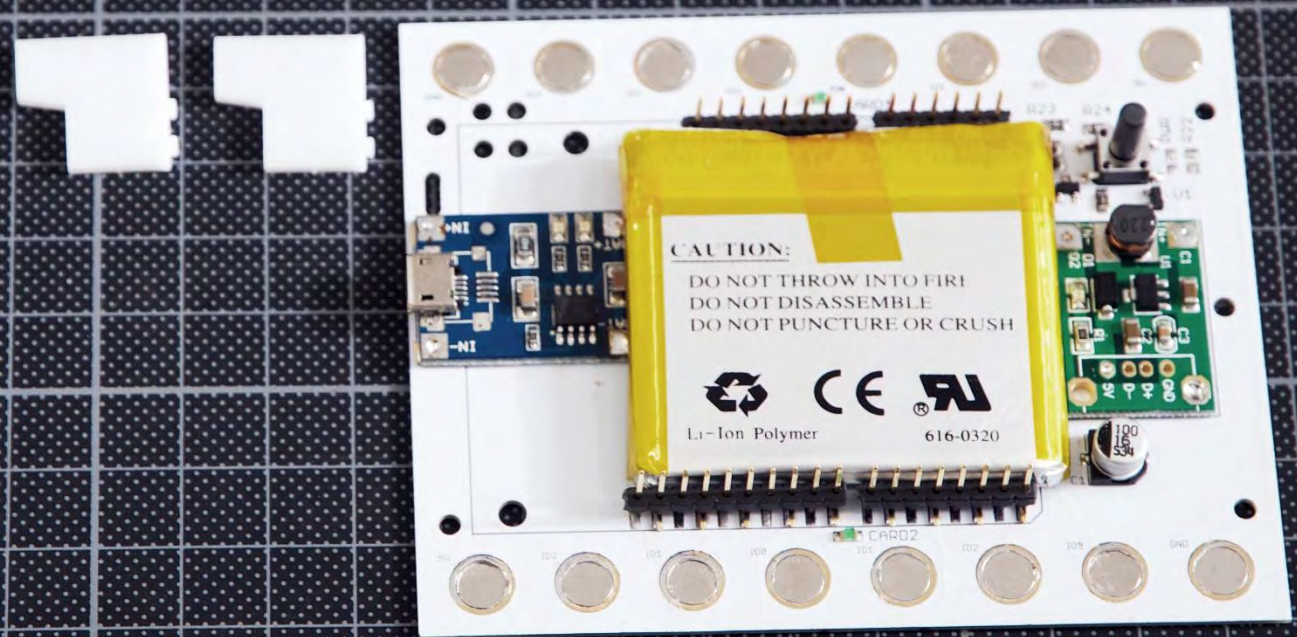
Step 10

Quarry out these elements



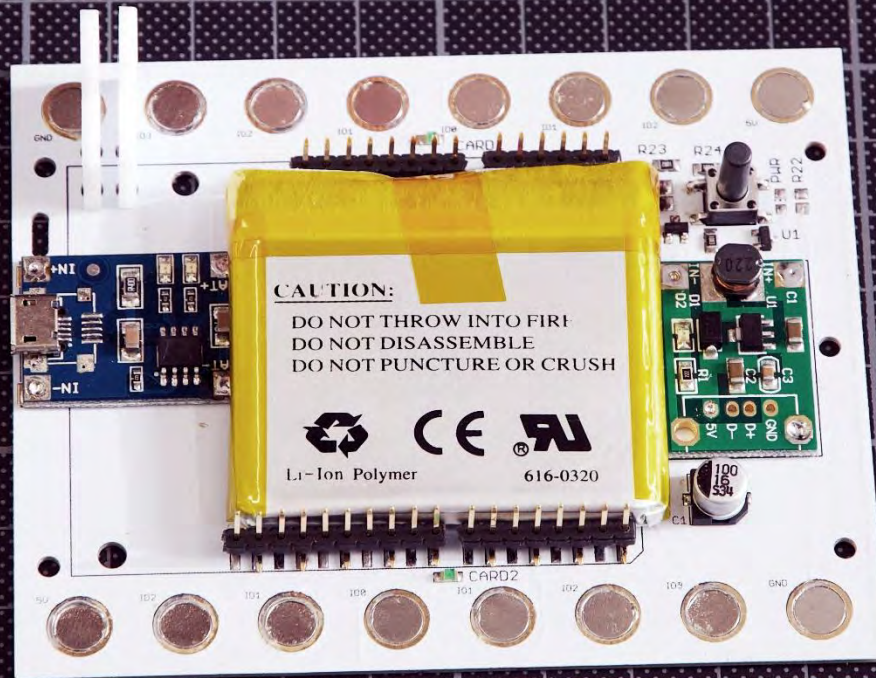
Step 11

Fetch your board for the next step



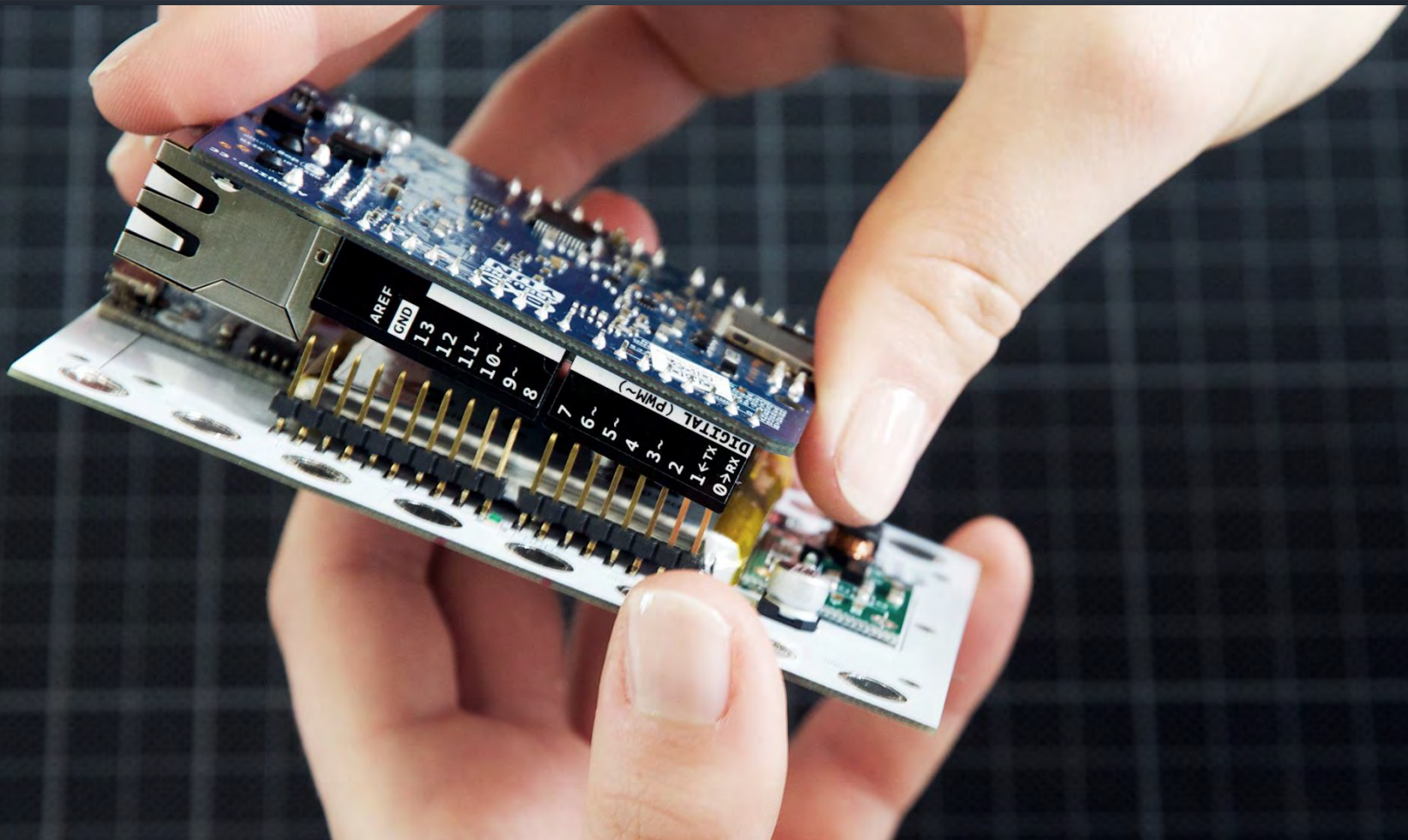
Step 12

Stick two board parts into board



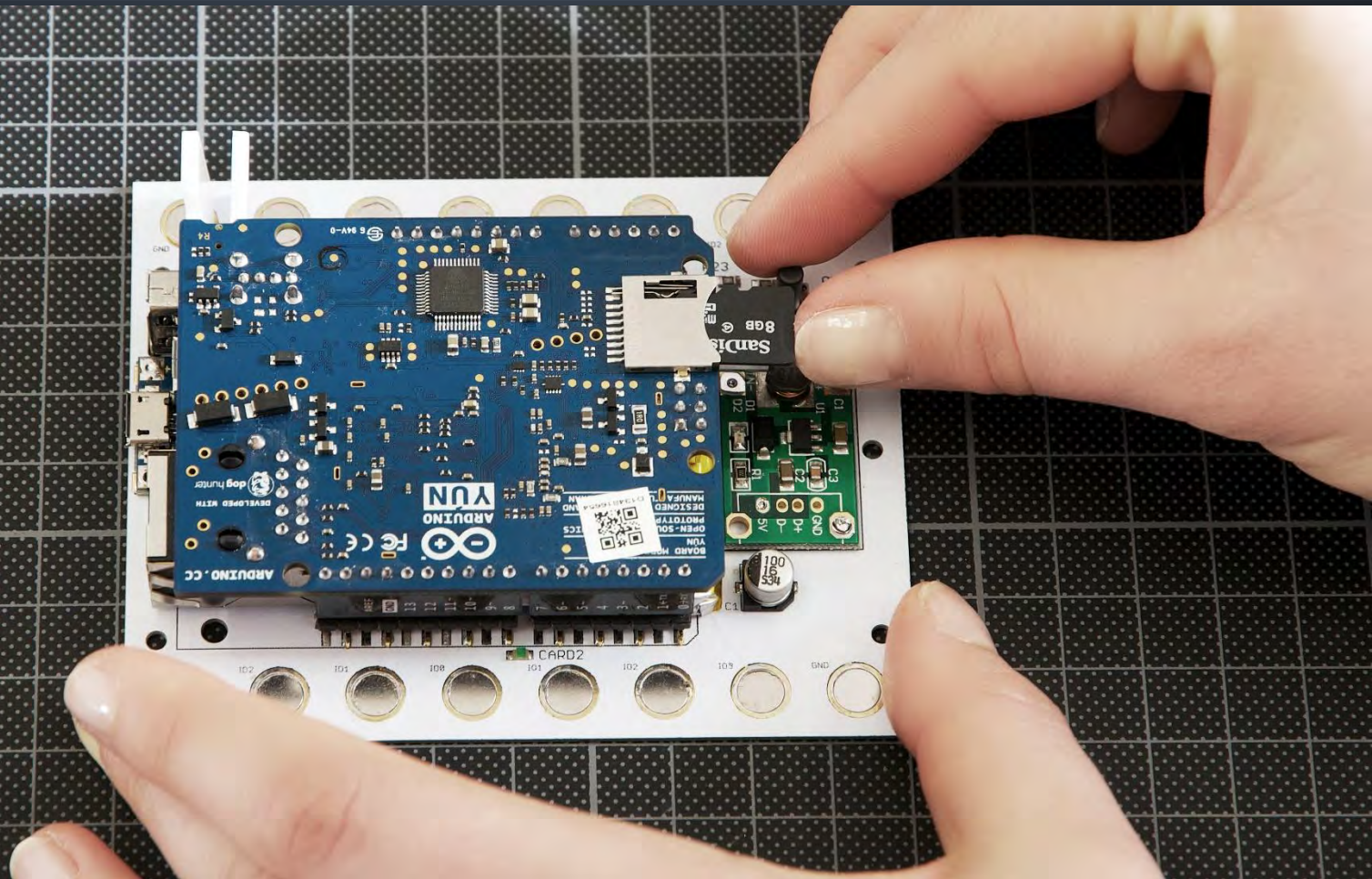
Step 13

Plug Arduino on the pins



Step 14

Insert microSD card



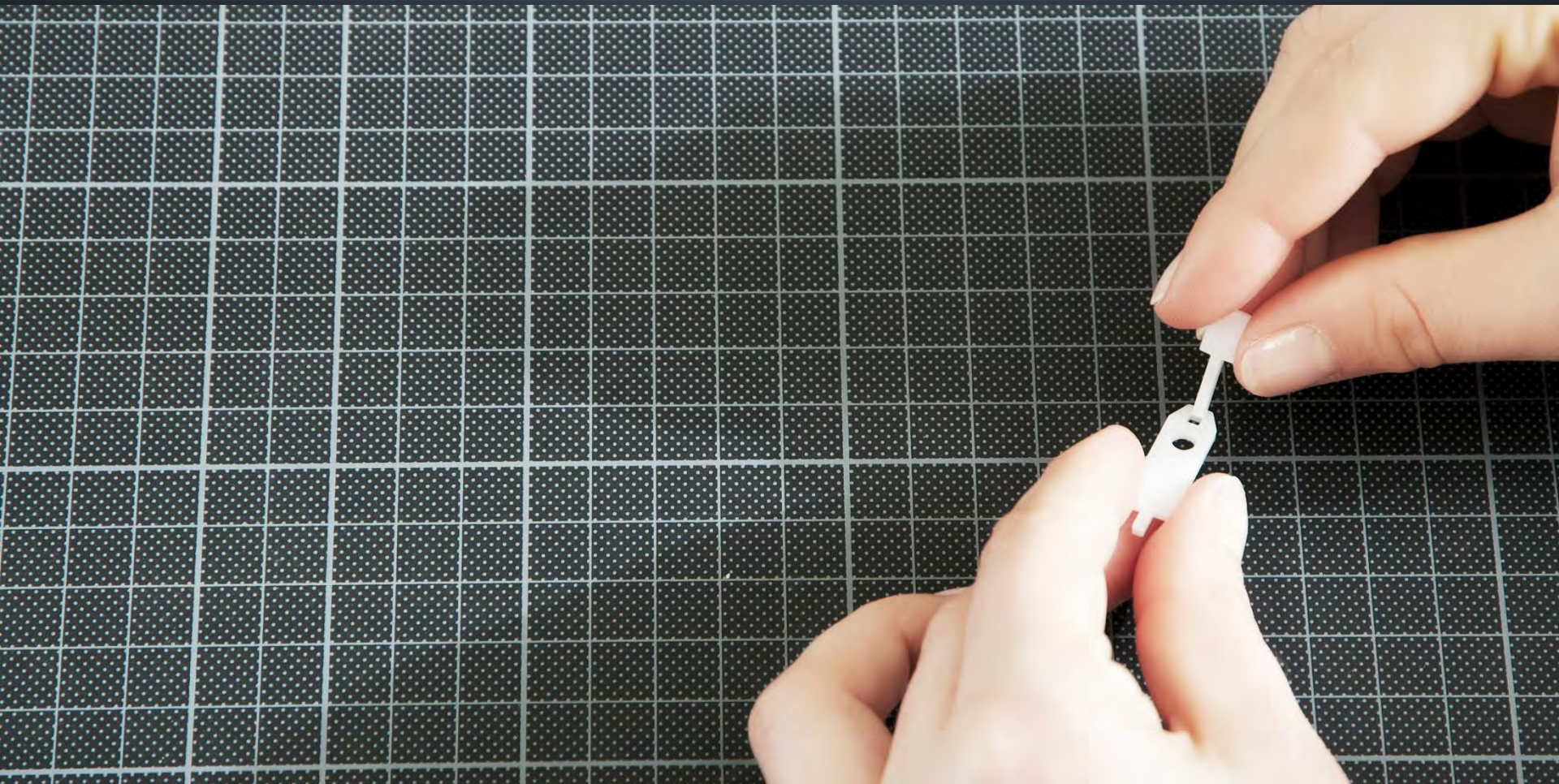
Step 15

Put wifi-reset button into the box



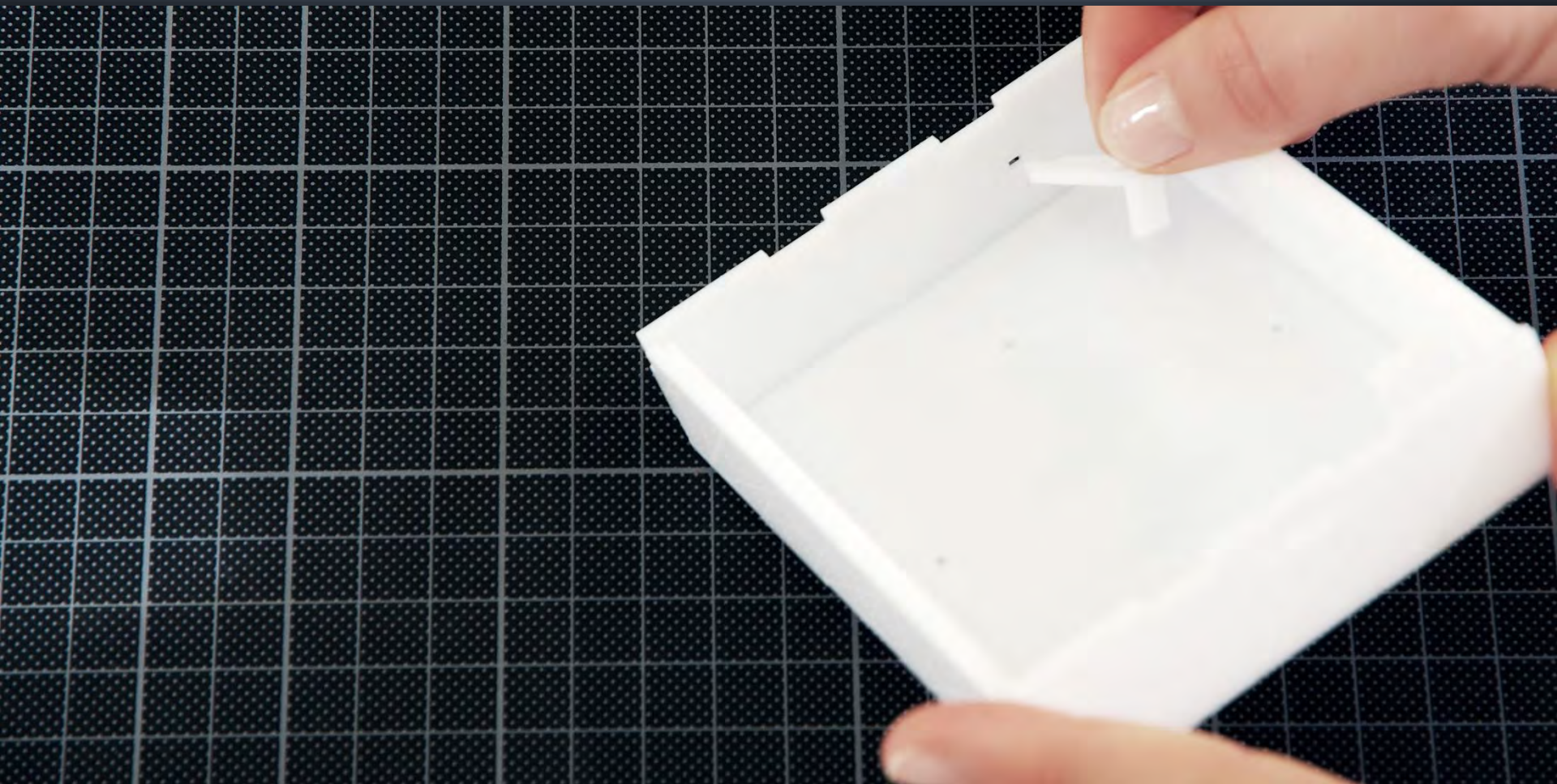
Step 16

Assemble power button from these two elements



Step 17

Put power button into the box



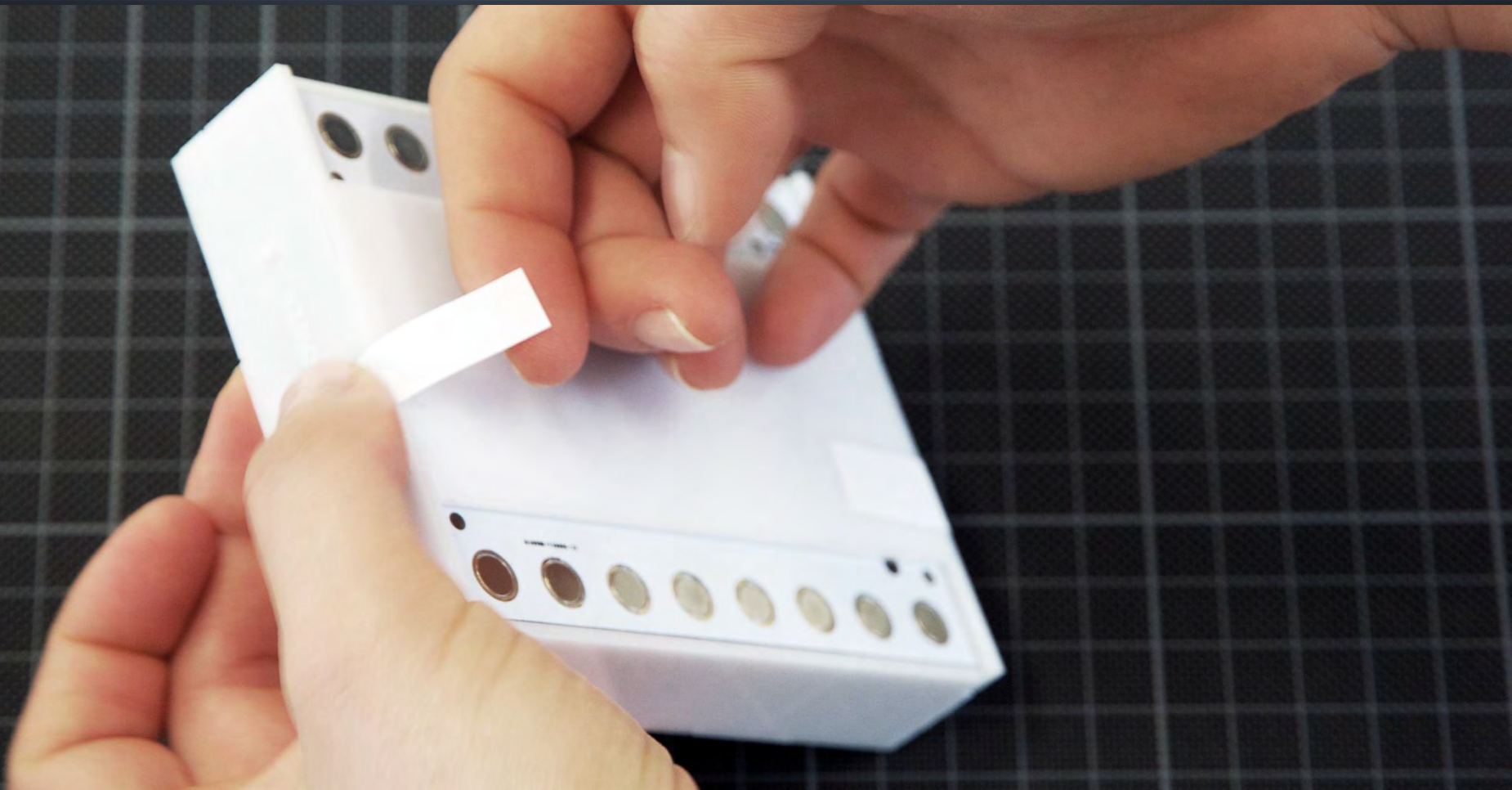
Step 18

Press the buttons firmly to the sides



Step 20

Close and tape the bottom cover



Step 21
Switch on

