Automating Physical Interaction for IoT

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#EuroSTARConf

EuroSTAR Software Testing Conference

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Content

- Overview
- Challenges in testing IoT
- Automating physical interaction approaches
  - Simulators
  - Microcontrollers
  - Robots

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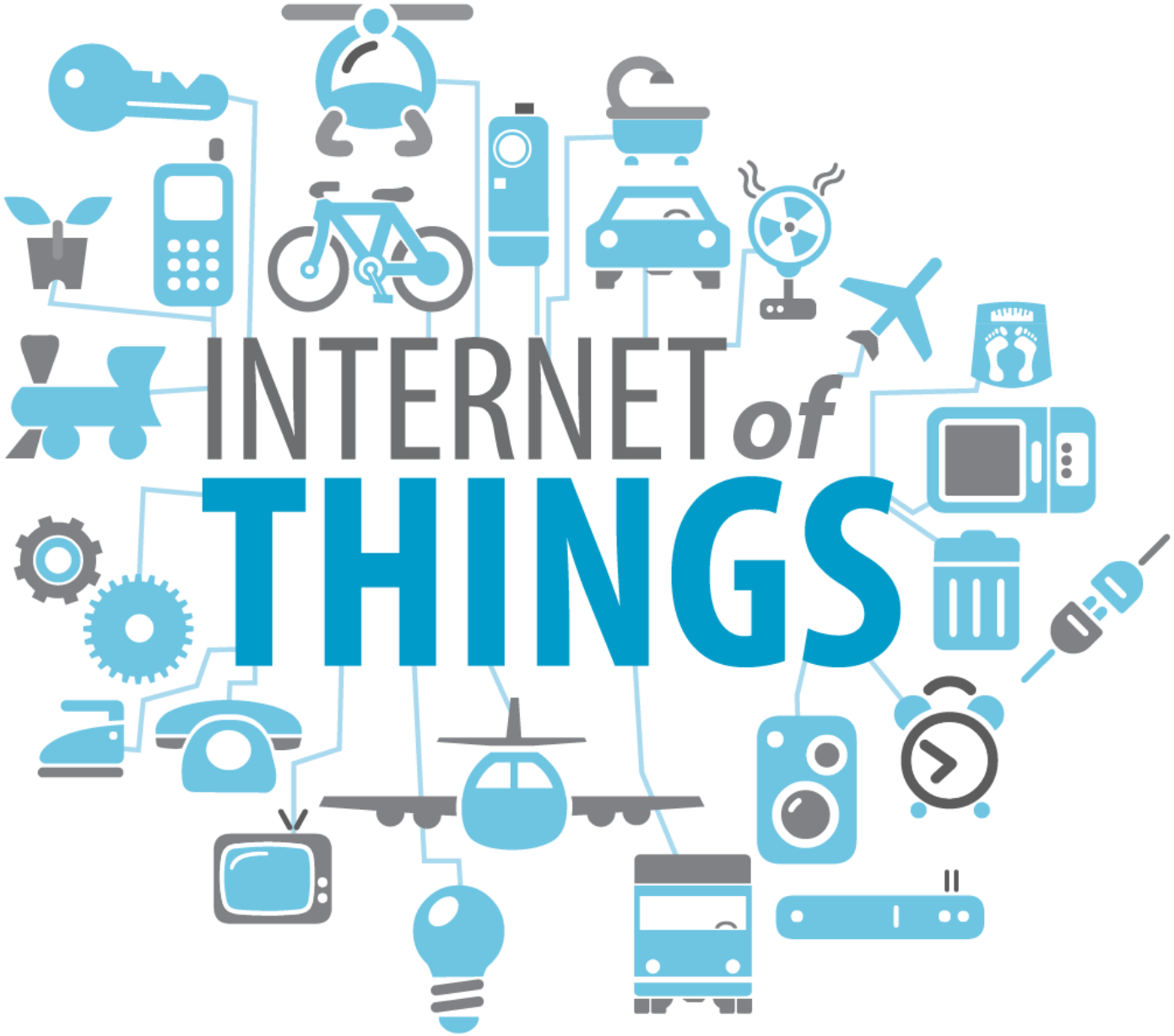

What we face?

Diversity in functionality

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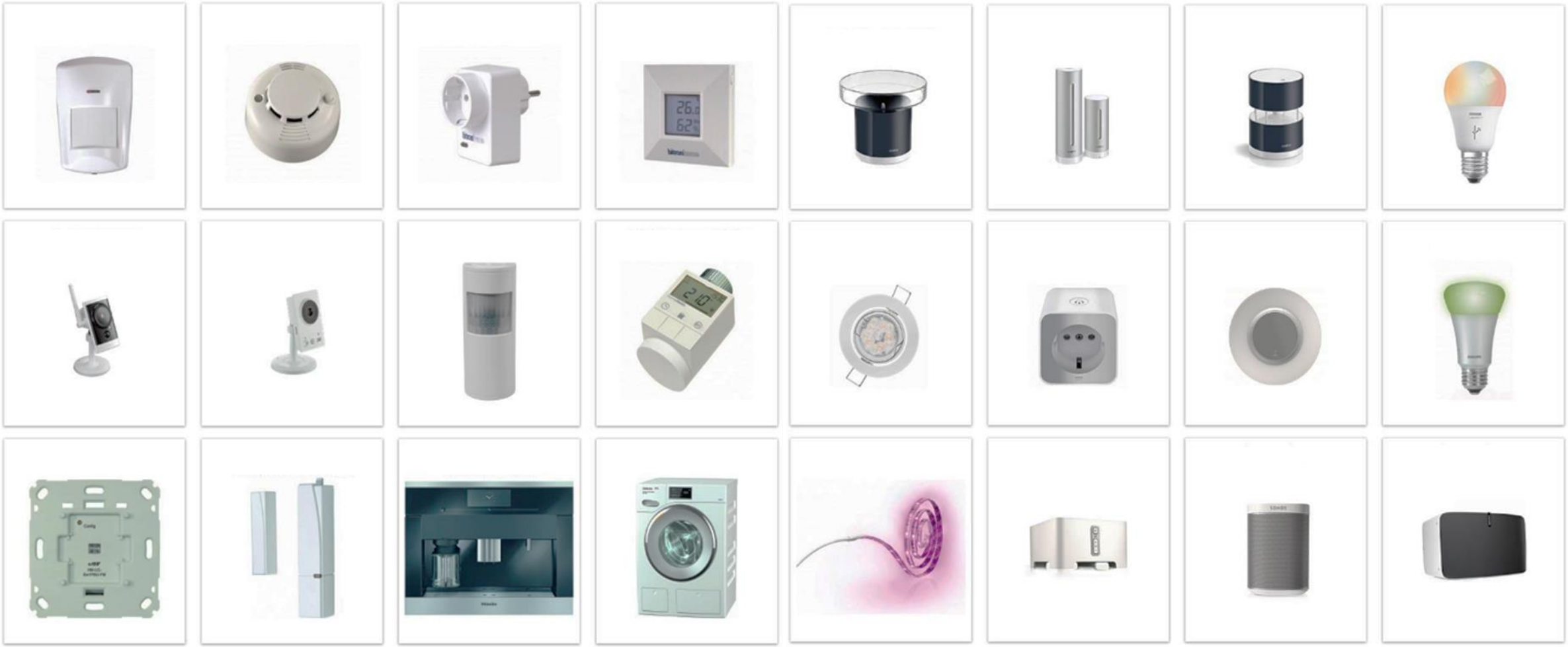
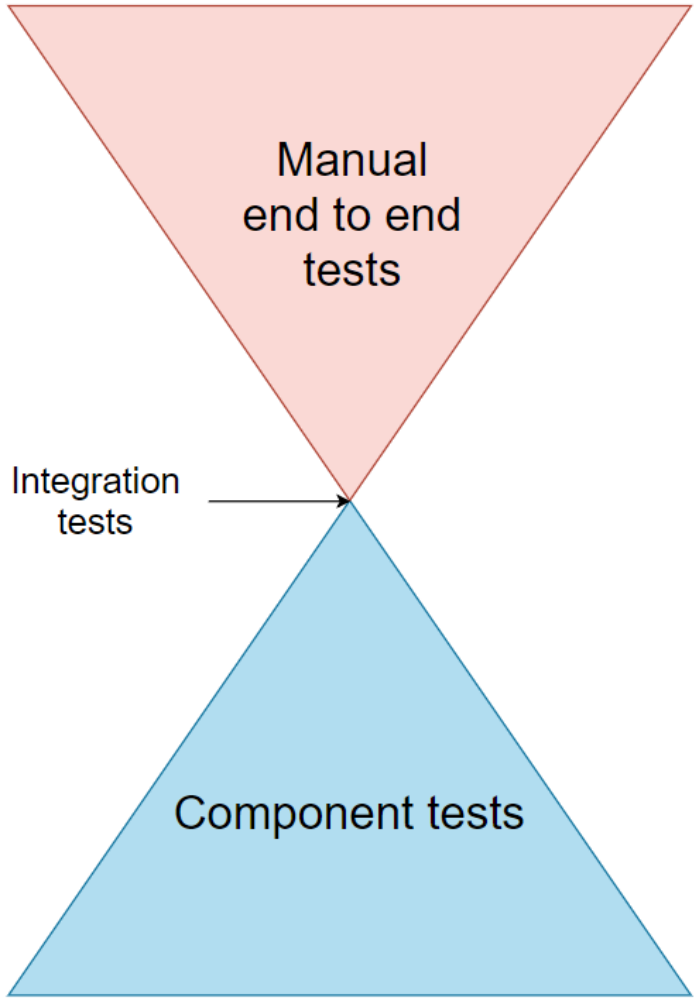


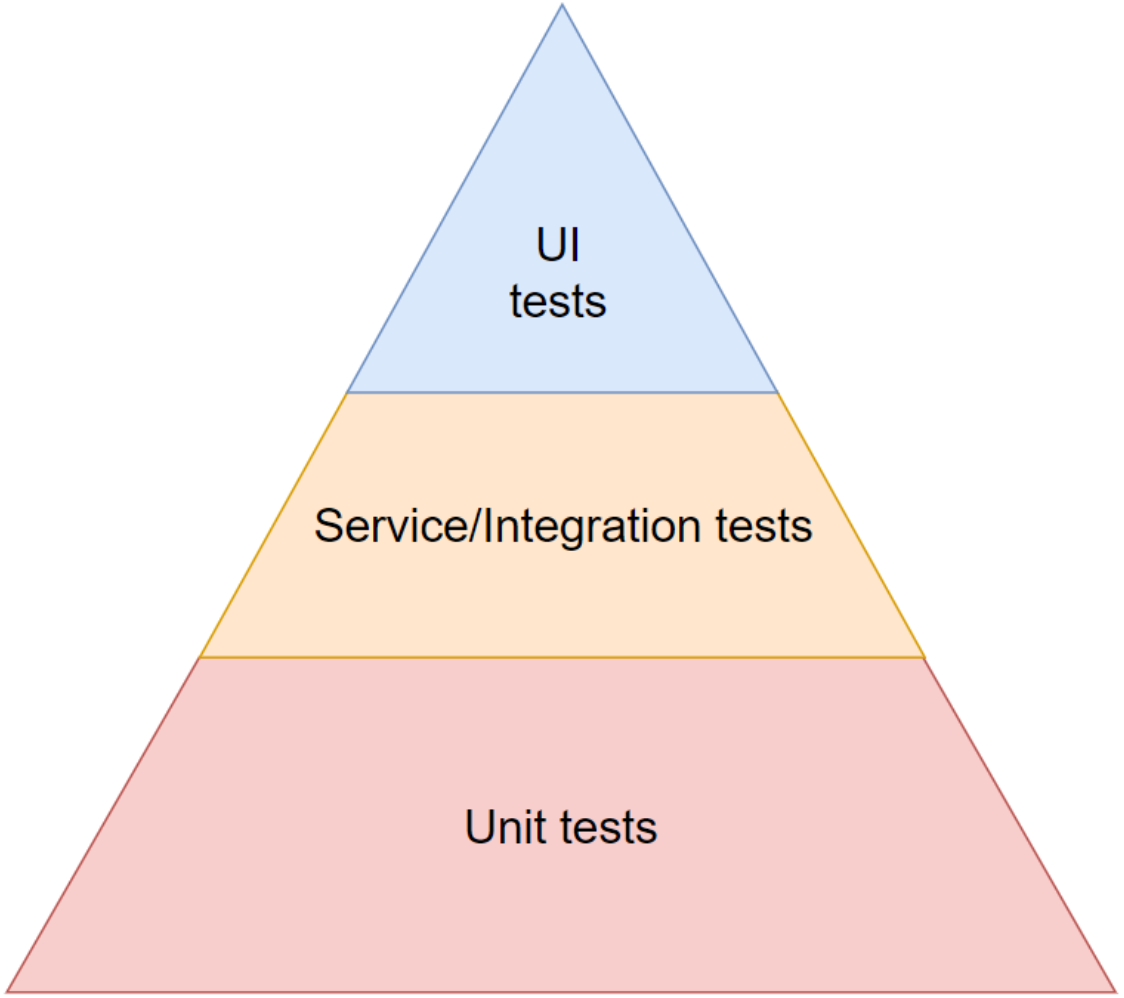
Complexity

Video presentation

Protocol Stack

Testing approach





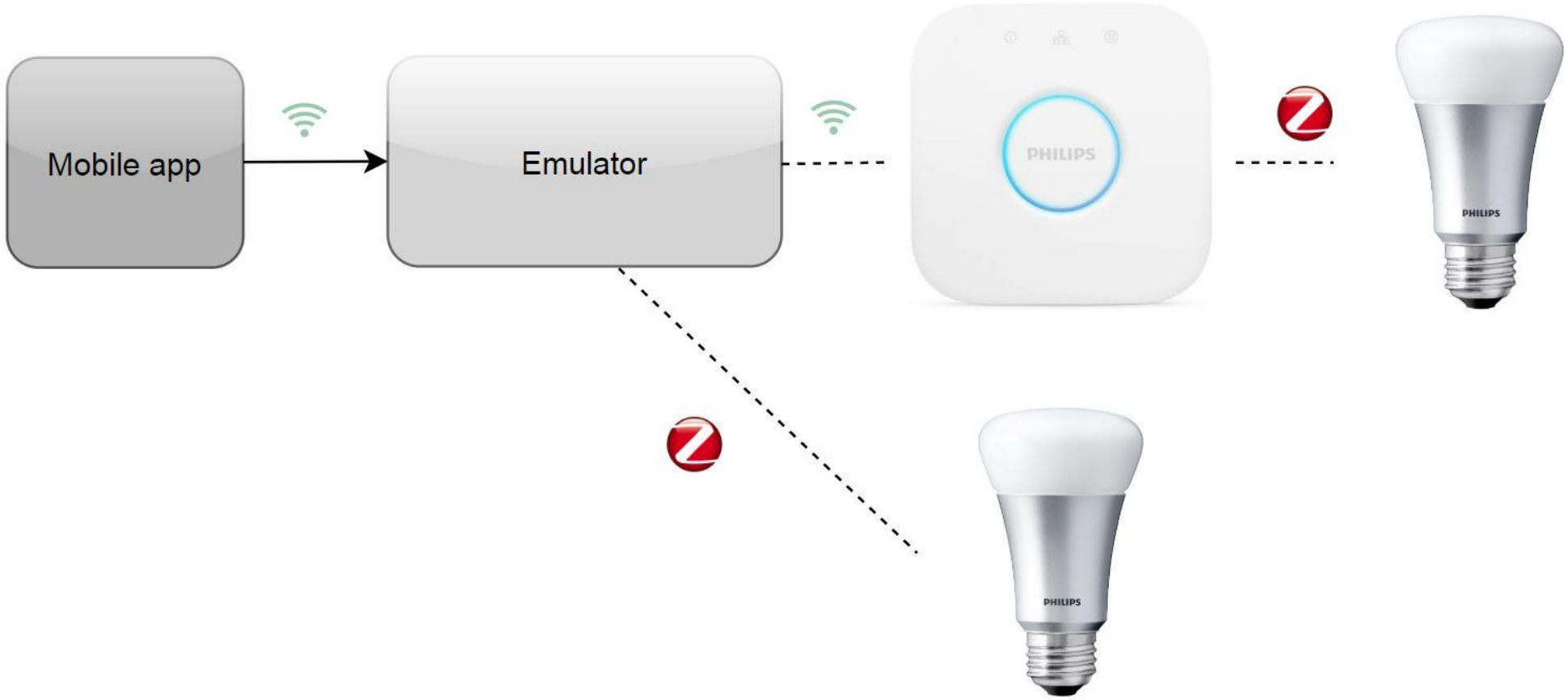
What are the options?

Software emulation

- Enables us to imitate or reproduce another system to perform an action (manual interaction with a device)
- Usually provided by the vendor or there are open source alternatives
- Suitable during application development and testing.

Software emulation

- Hue Emulator



Supported Operations

- /detect
- /set
- /get

Examples:

http://ip:port/set?light={ID}&on={true/false}

http://ip:port/set?light={ID}&bri={0-255}


```
{
        "state": {
                "on": false,
                "bri": 254,
                "alert": "none",
                "reachable": true
        },
        "swupdate": {
                "state": "noupdates",
                "lastinstall": "2017-12-13T01:59:13"
        },
        "type": "Dimmable light",
        "name": "Hue Light",
        "modelid": "LWB004",
        "manufacturername": "Philips",
        "productname": "Hue White",
        "uniqueid": "00:17:88:01:00:bd:c7:b9",
        "swversion": "1.15.0_r18729"
}
```

DEMO

Is there more?

Microcontroller platforms for communication with devices

- Provide a way to integrate sensors or controllers between your app and the physical device
- A system of building blocks
- Each module is pluggable and have intuitive API
- Can be used for devices that can be disassembled

Microcontroller platforms for communication with devices

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Microcontroller platforms for communication with devices

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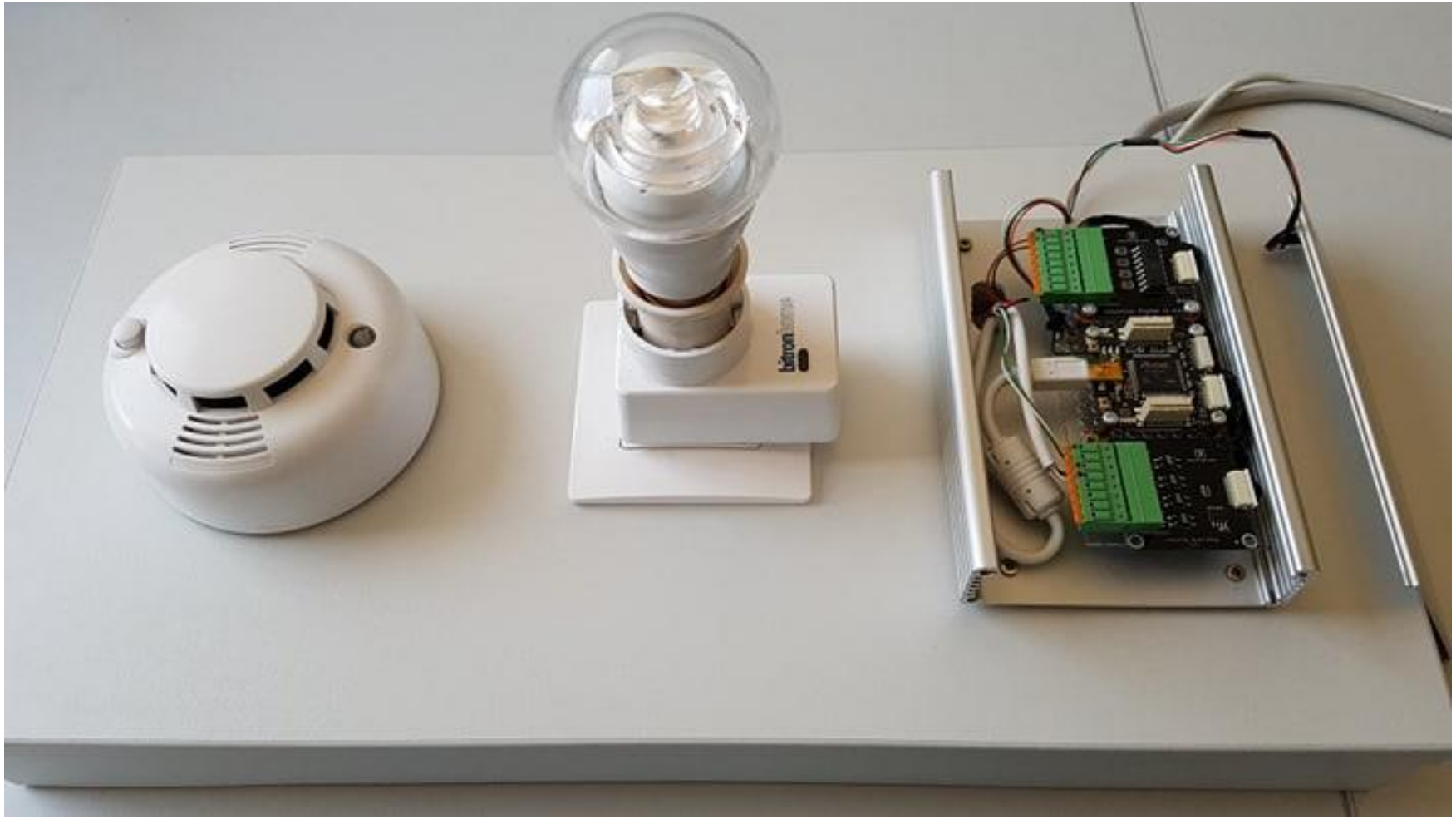
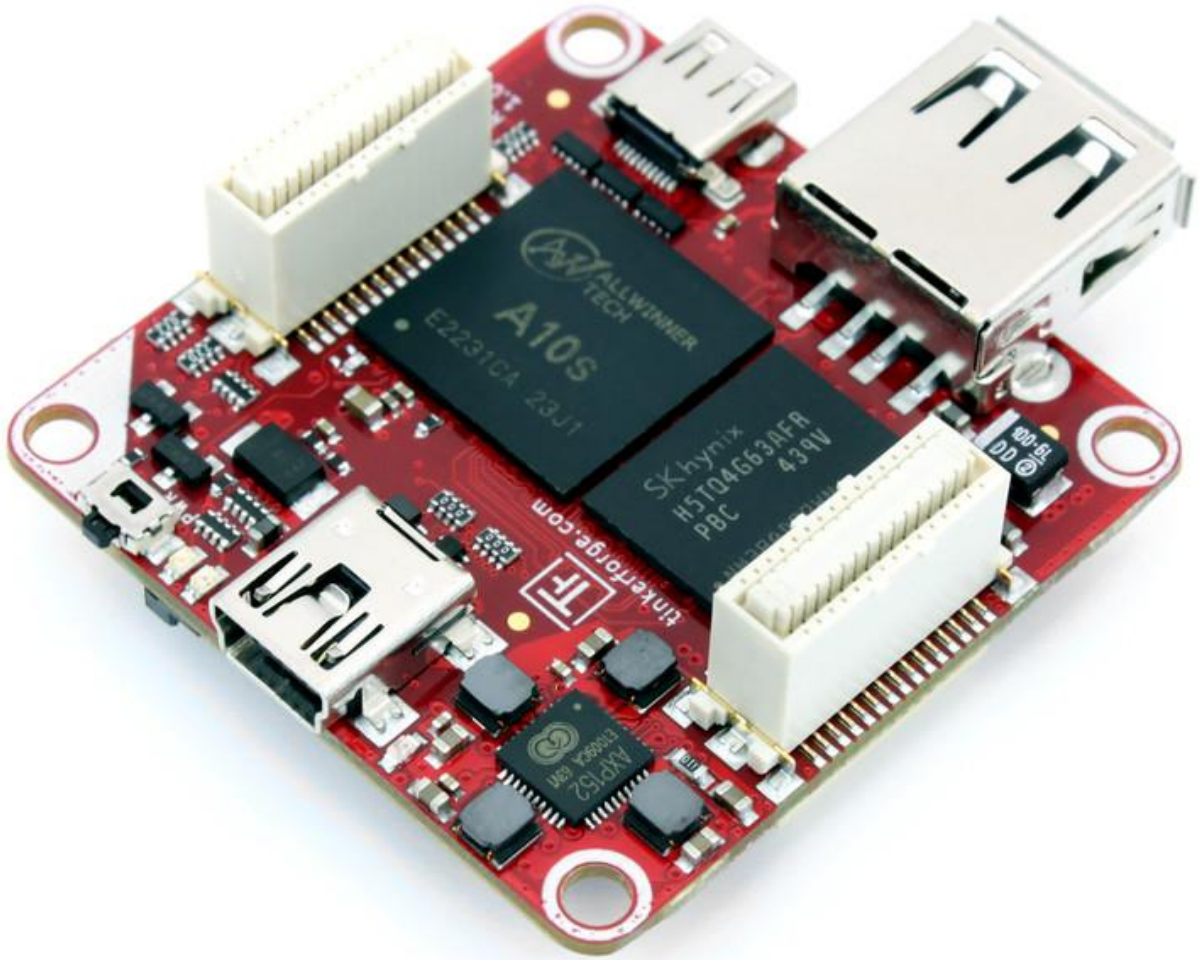


Microcontrollers

- Bricks

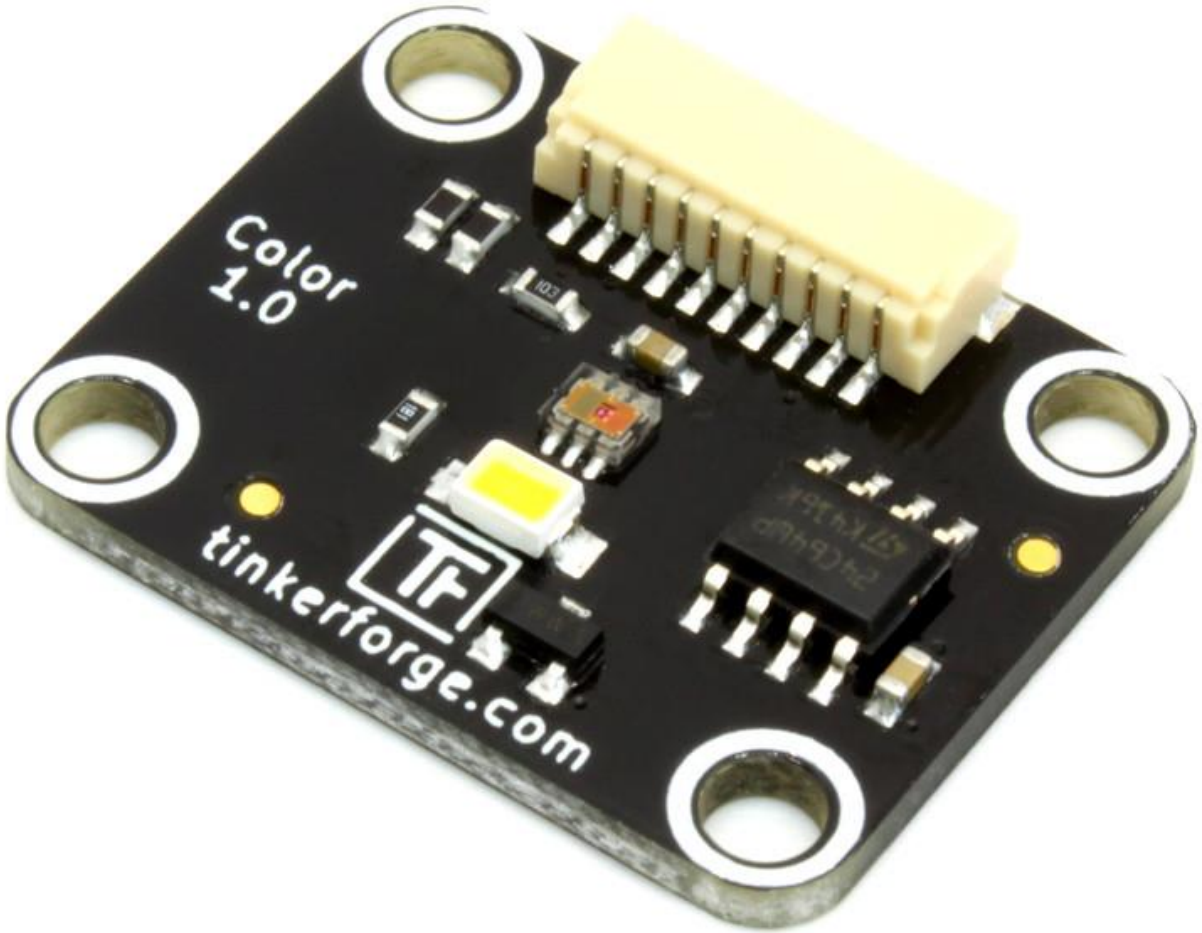
(stackable building blocks)



Microcontrollers

- Bricklets

(sensors and actuators)



Tinkerforge project

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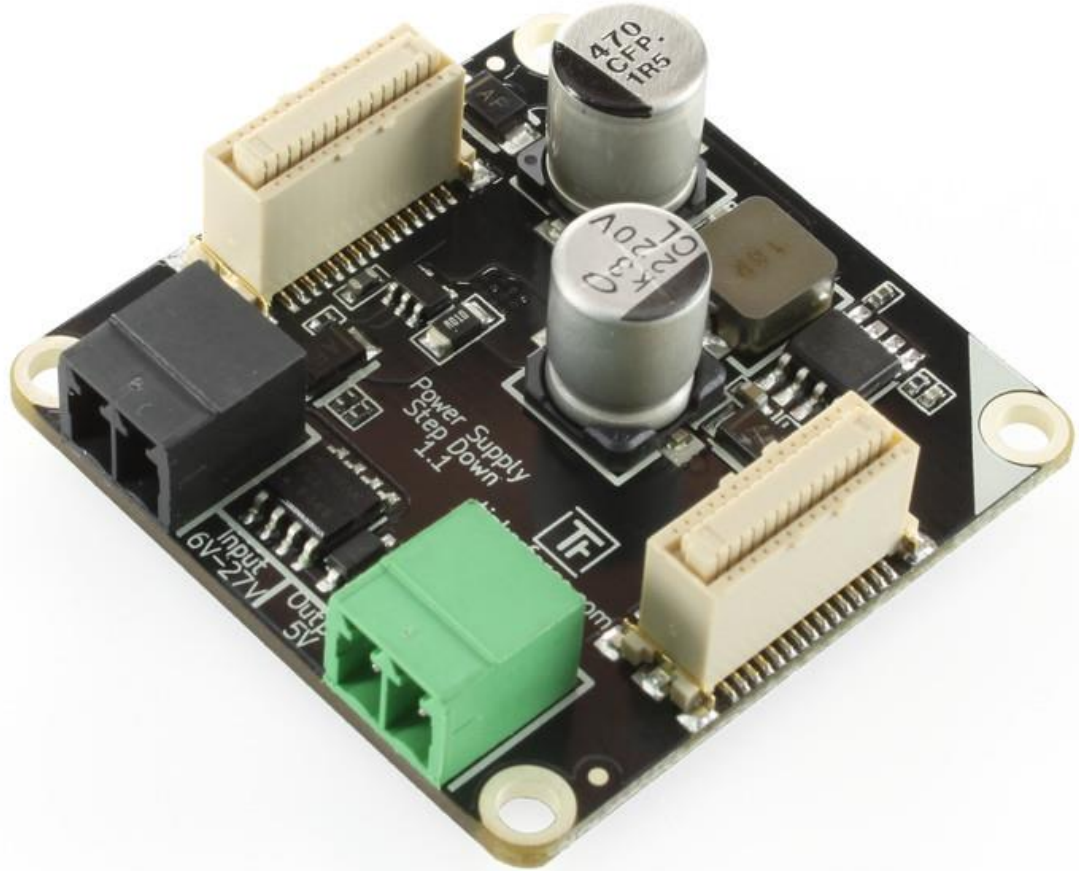
- Master extensions

(provide alternative communication channels)

Microcontrollers

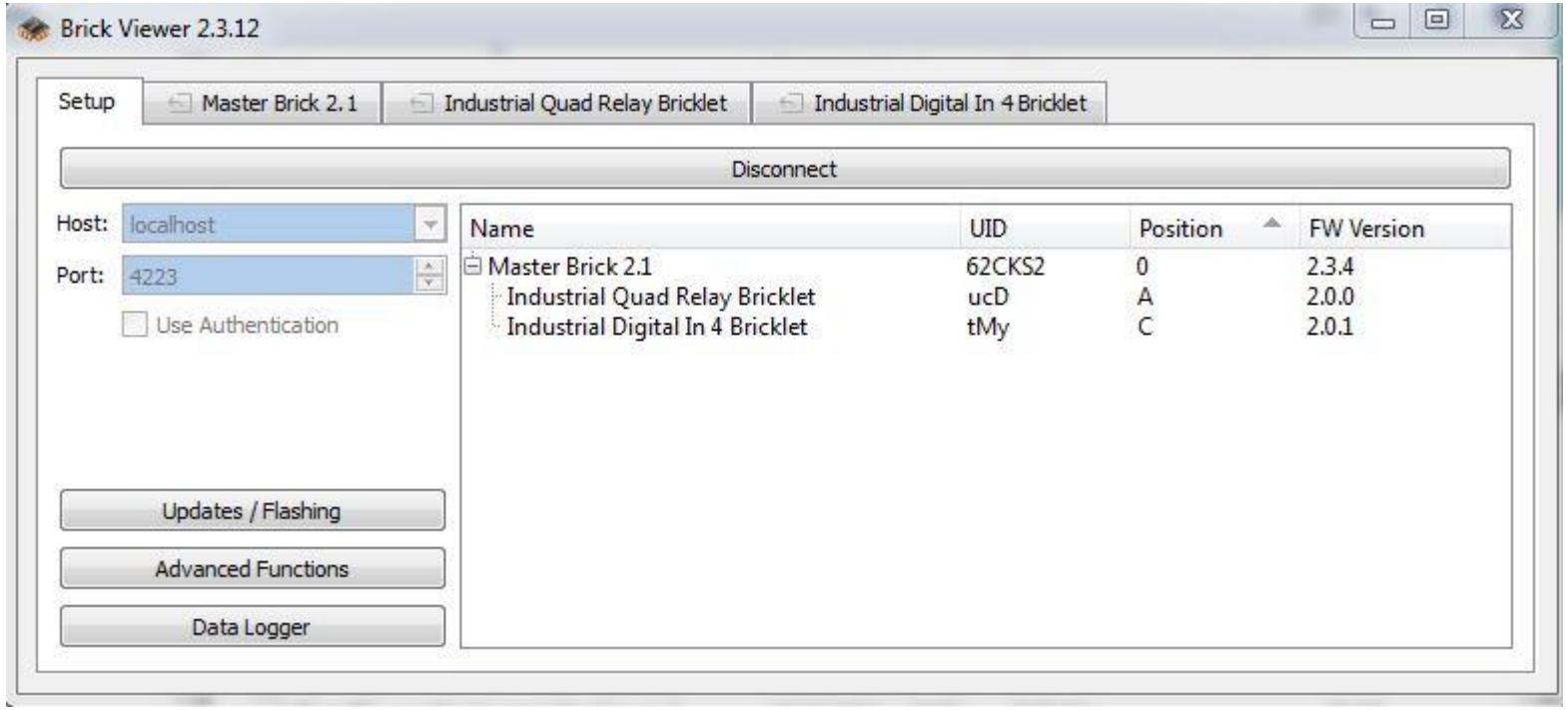
- Power supplies



Microcontrollers

Related software

- Brick daemon
- Brick viewer



Supports API bindings for different programming languages

Tinkerforge project - Operations

Switch (on/off smartplug)

- Press button
- Hold button
- Get button state

Fire Alarm

- Trigger alarm

Tinkerforge project - Example

Switch (on/off smartplug)

- Get connected devices

http://localhost:8020/devices/list

- Execute operation

http://localhost:8020/devices/90201025/holdButton?duration=15

Demo

What will the user do?

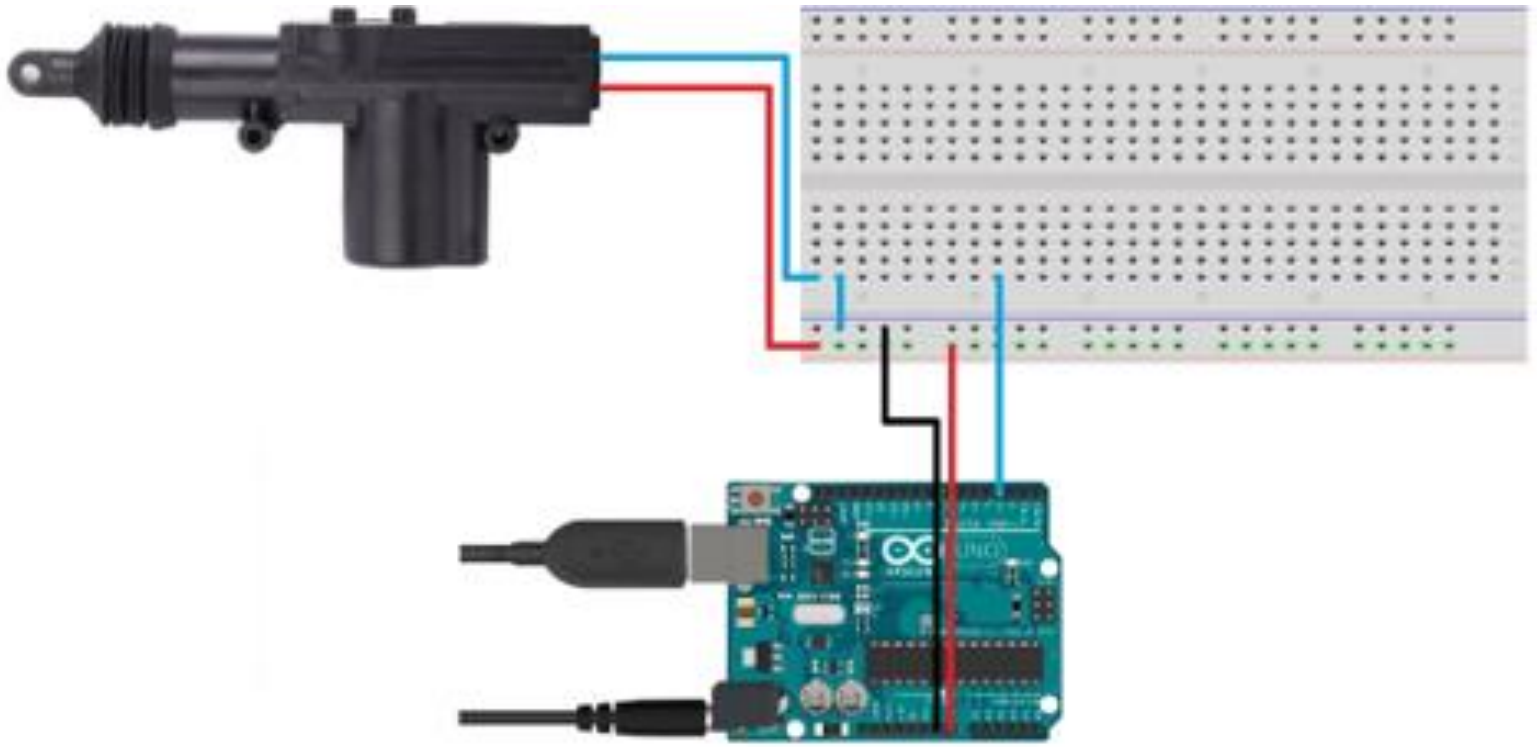
Manual interaction

- Hardware functionality is the focus
- Testing the mechanics of a device

“The real deal”

Arduino project – manual button pusher

- Arduino Uno R3
- 12V Car door lock actuator
- Push the button



Demo

Thoughts and comparison

- How much can be automated?
- Possibility for integration within the development and testing lifecycle
- Scalability of each solution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Thank You!

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