Moving Renewable Energy Embedded Systems into the Cloud

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@MkHeck

Let’s talk about…

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- what is involved in an IoT project

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- what is involved in an IoT project
- how to approach one

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- what is involved in an IoT project
- how to approach one
- breaking it down

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- how to approach one
- breaking it down
- the code!

Let's talk about…

- what is involved in an IoT project
- how to approach one
- breaking it down
- the code!
- any questions?

What is involved?

What is involved?

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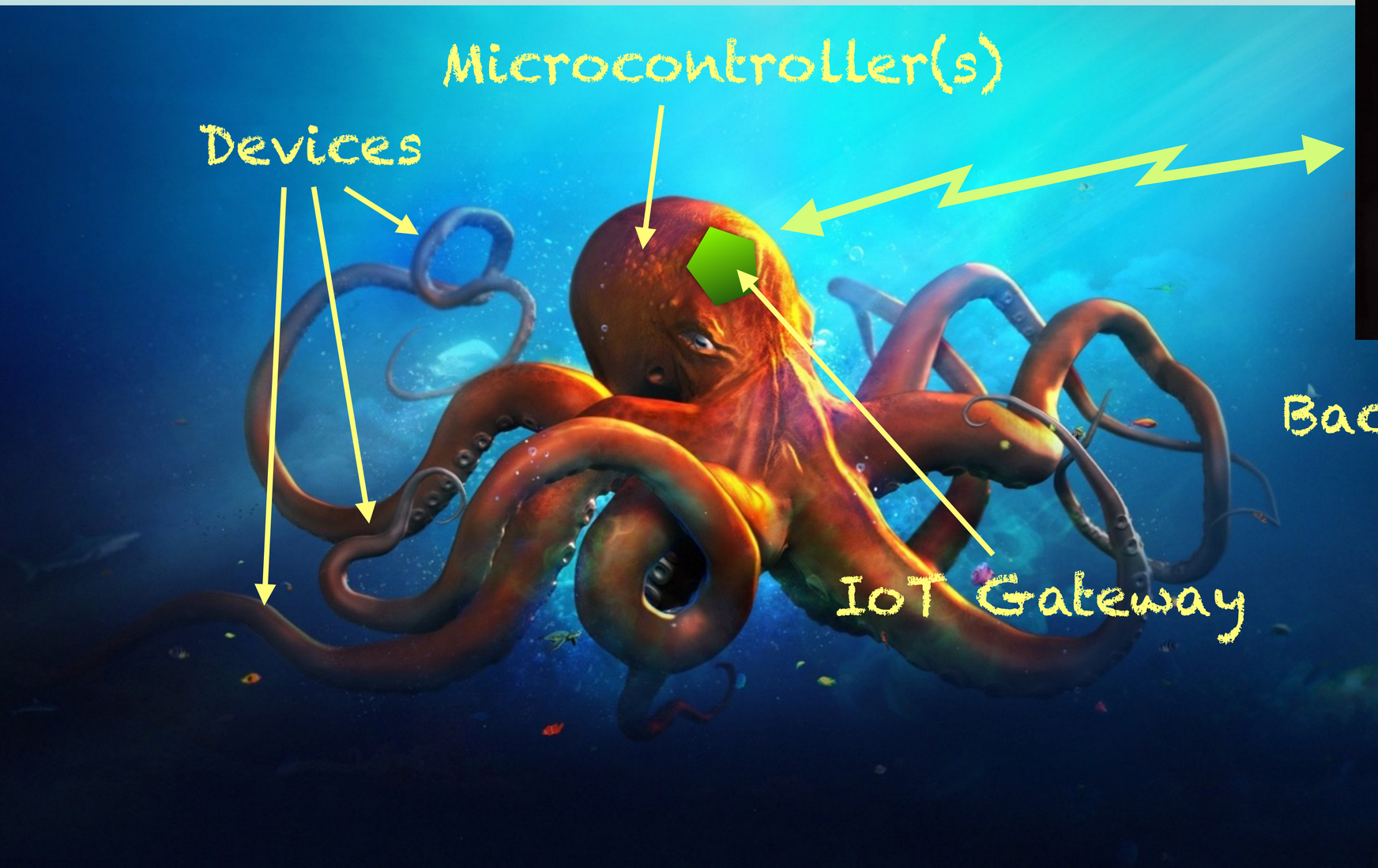
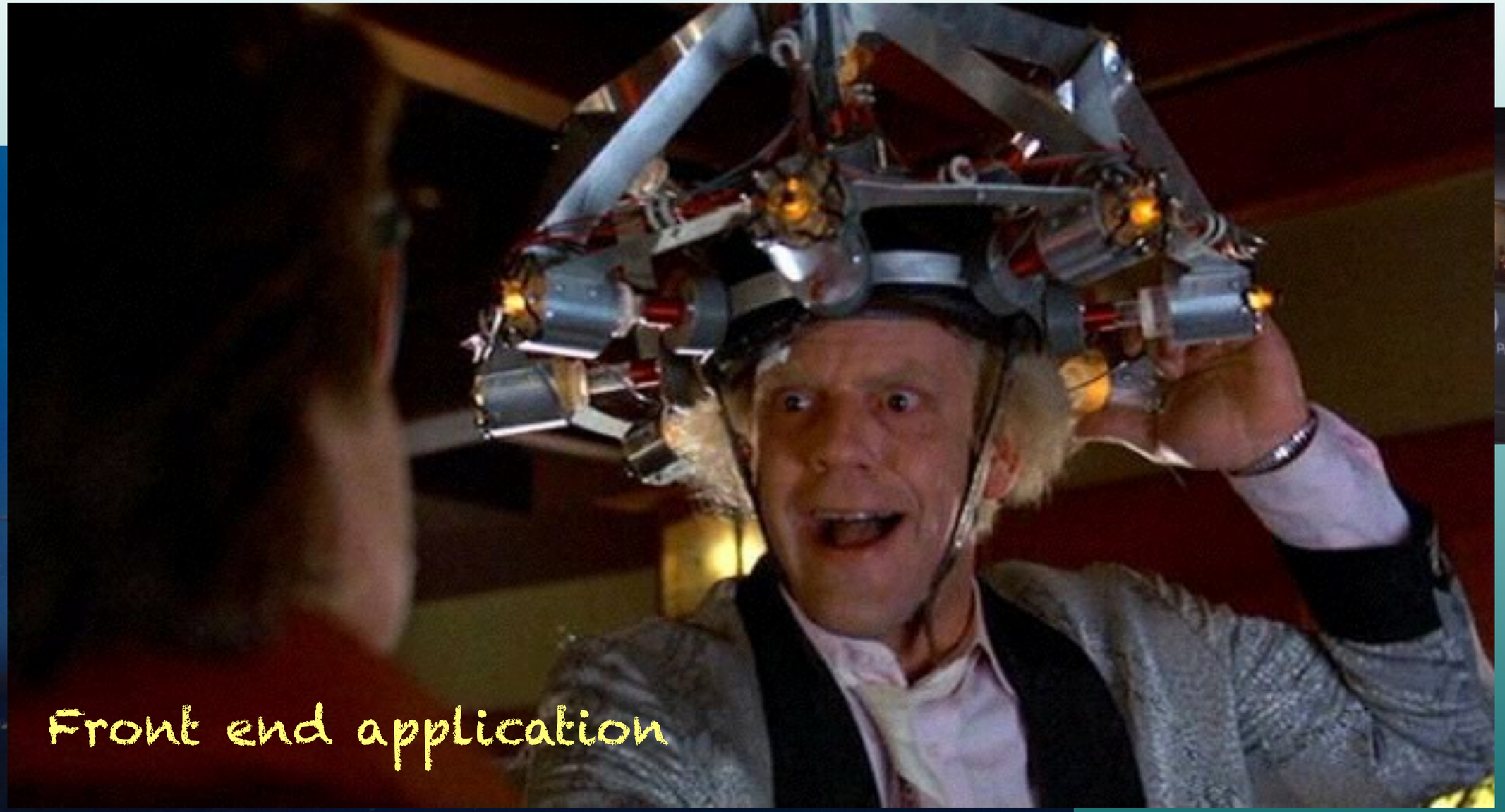
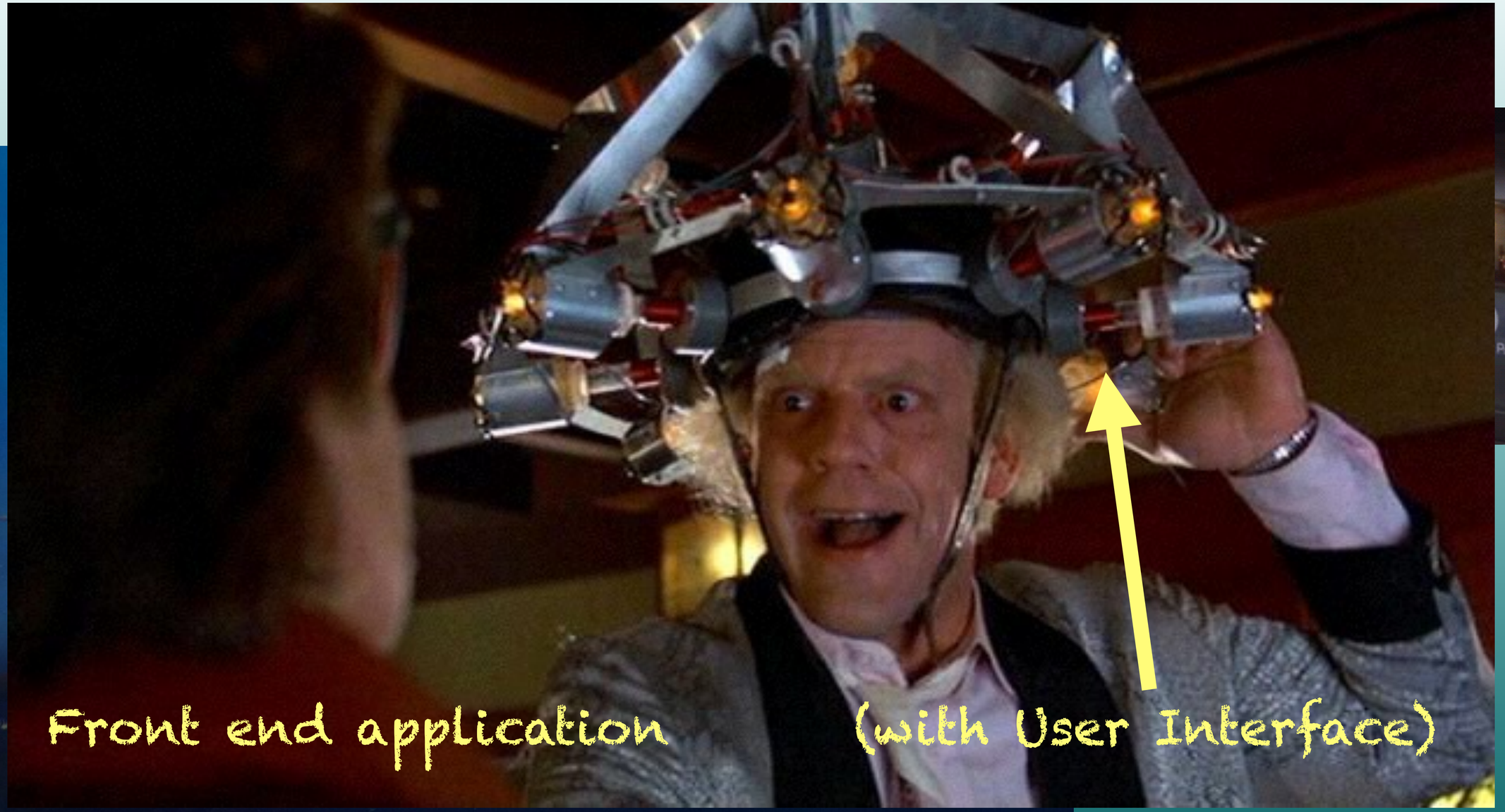
What is involved?



Back end service


Front end application


Front end application
(with User Interface)

Bounded contexts

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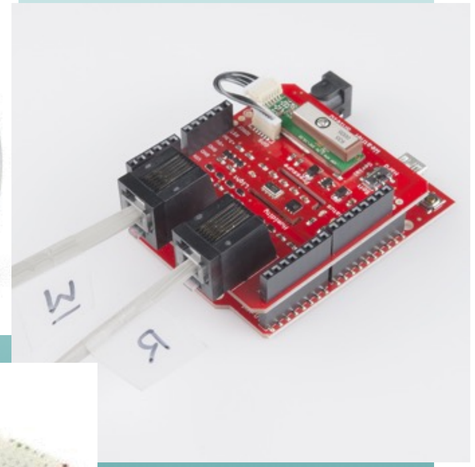
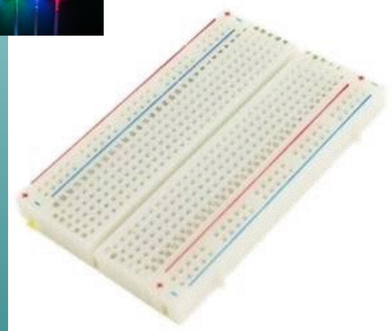
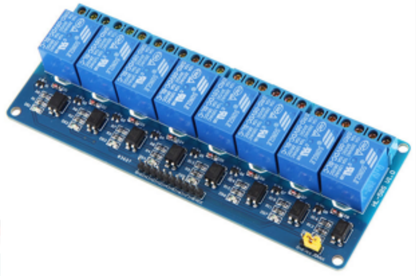
Physical devices

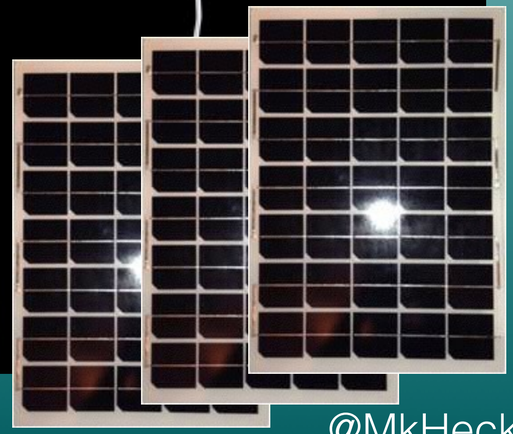











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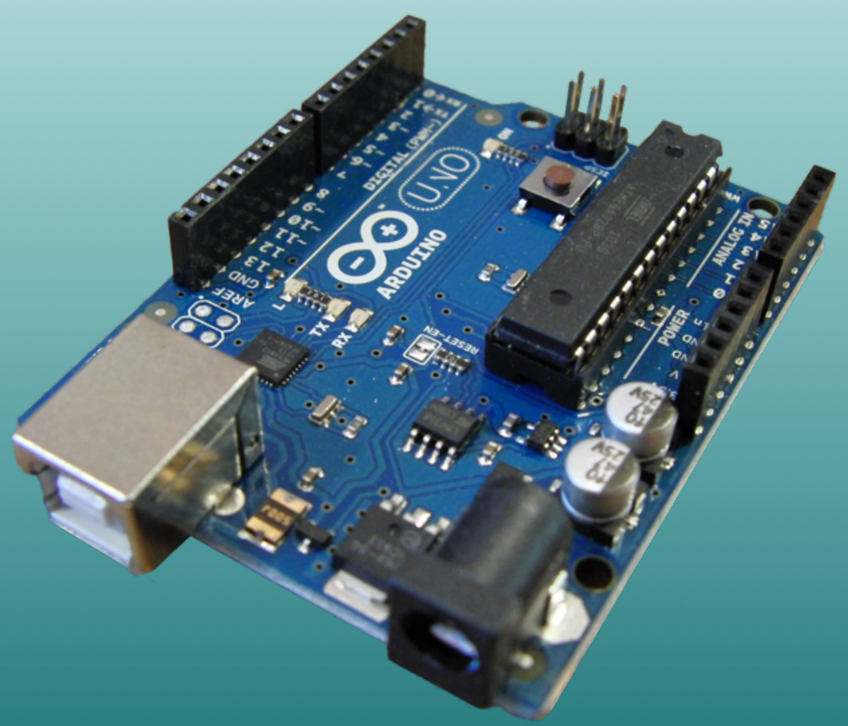
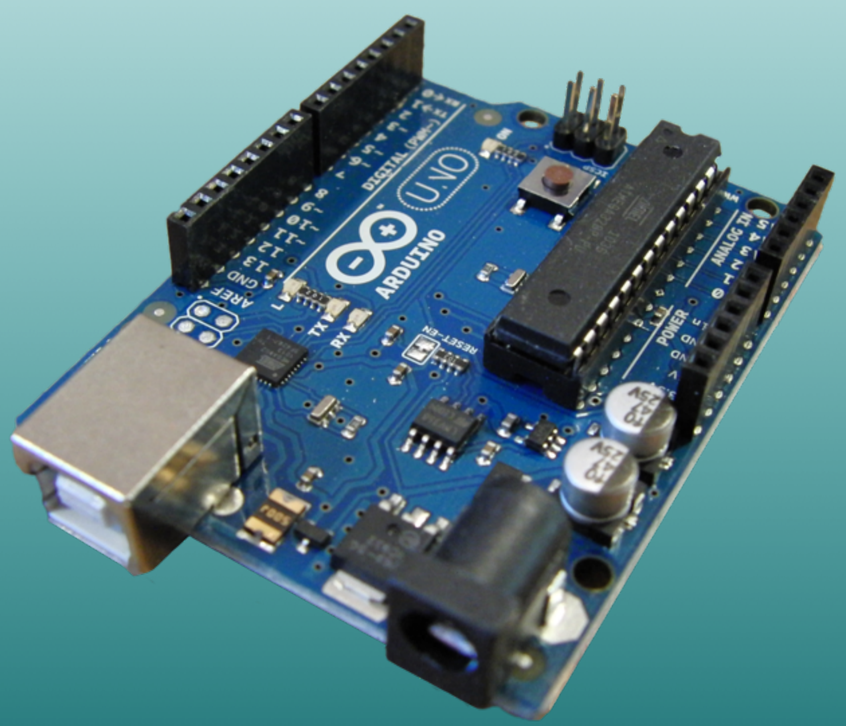
Microcontrollers

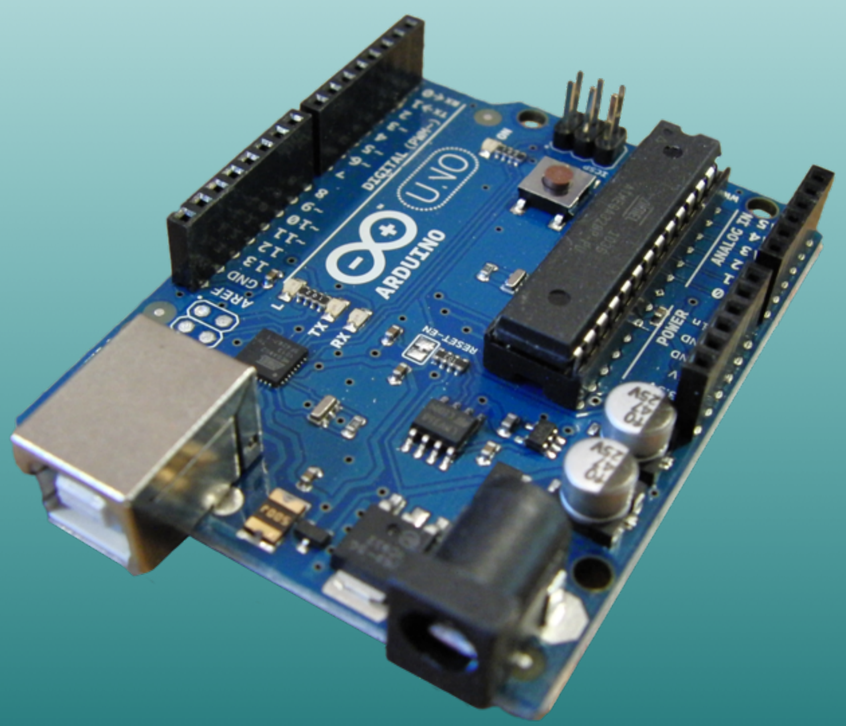


Microcontrollers



Open source

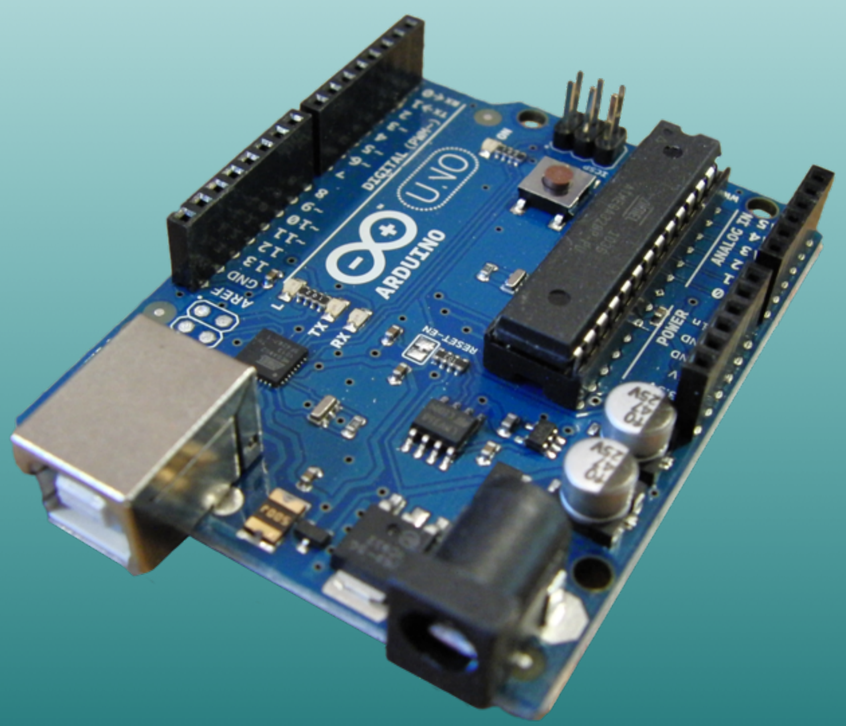
Microcontrollers



Open source

Add-ons

Microcontrollers

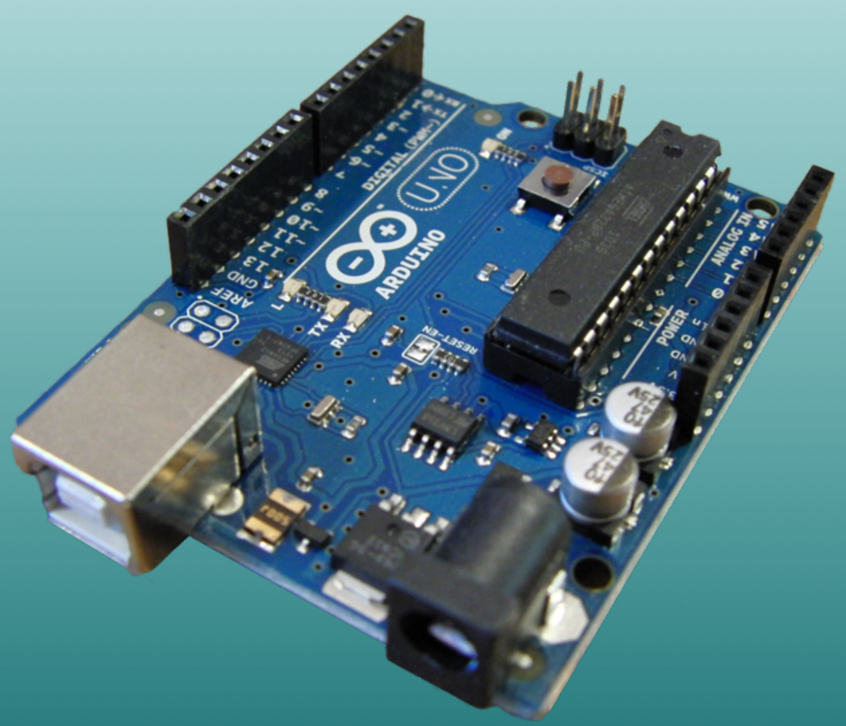


Open source

Add-ons

Programming language/environment

Microcontrollers



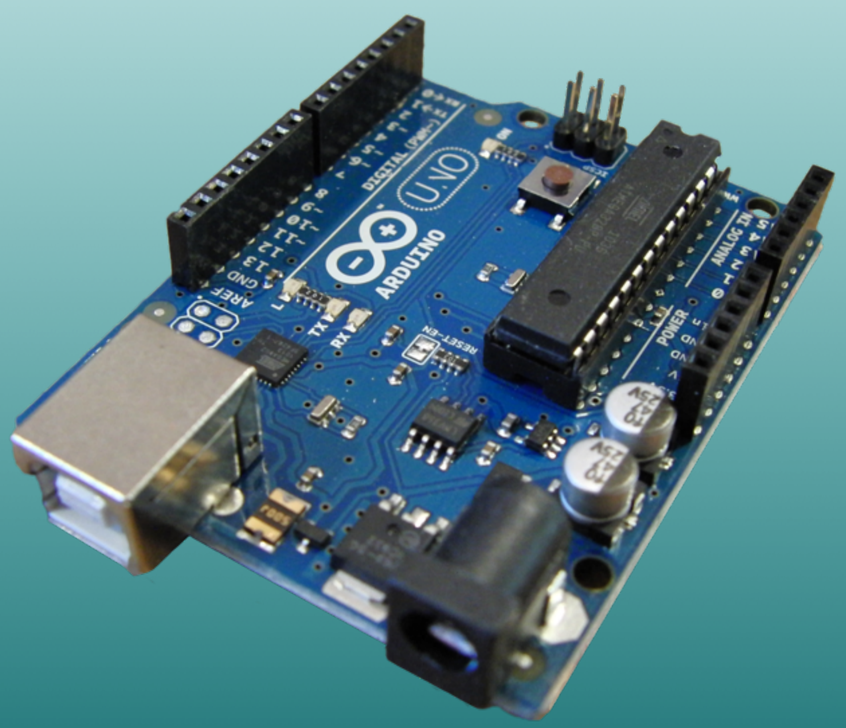
Open source

Add-ons

Programming language/environment

Available in various configurations

Microcontrollers



Open source

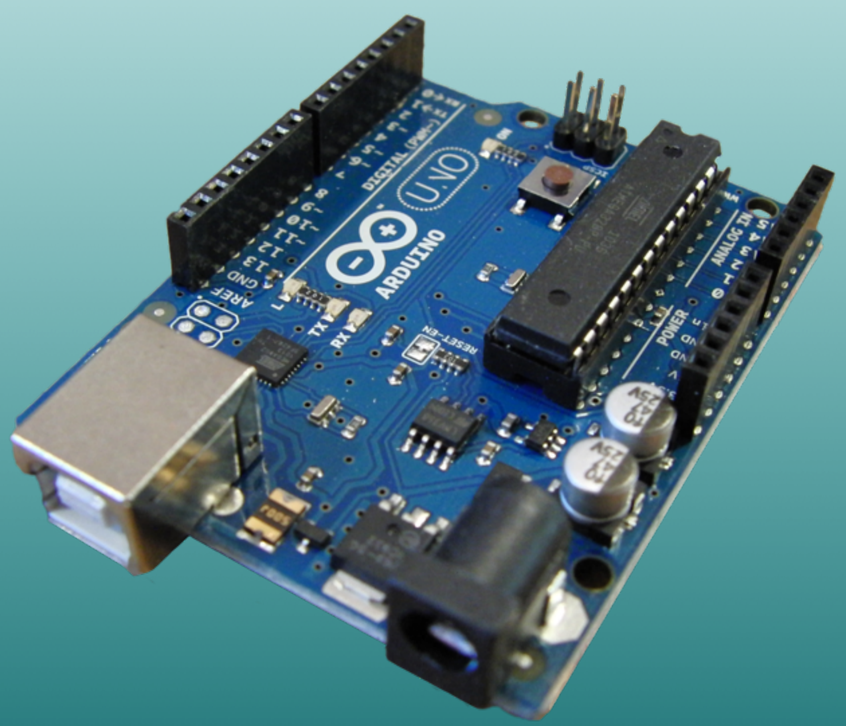
Add-ons

Programming language/environment

Available in various configurations

Durable & reliable

Microcontrollers



Open source

Add-ons

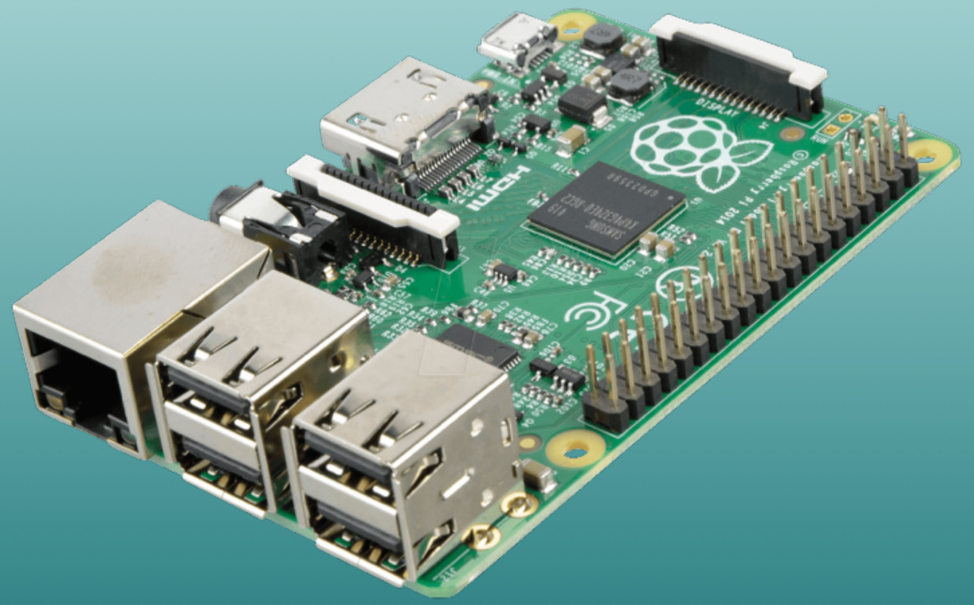
Programming language/environment

Available in various configurations

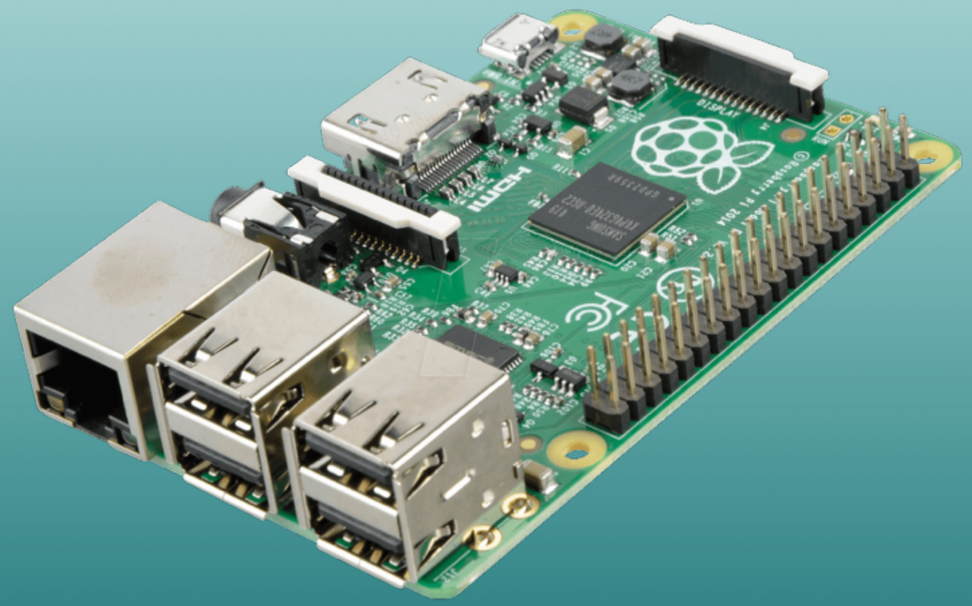
Durable & reliable

Low power requirements

IoT Gateway

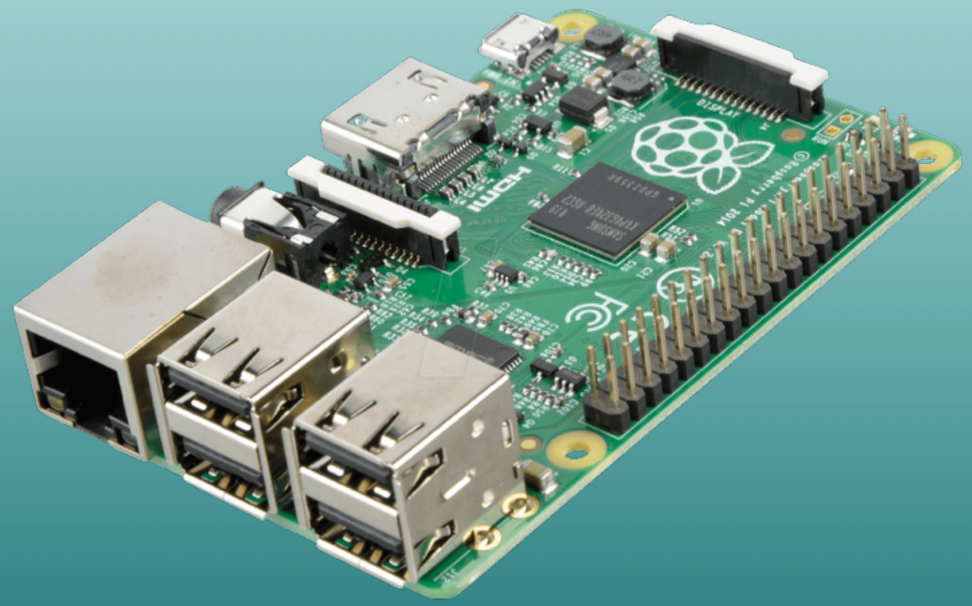


IoT Gateway



Same criteria plus:

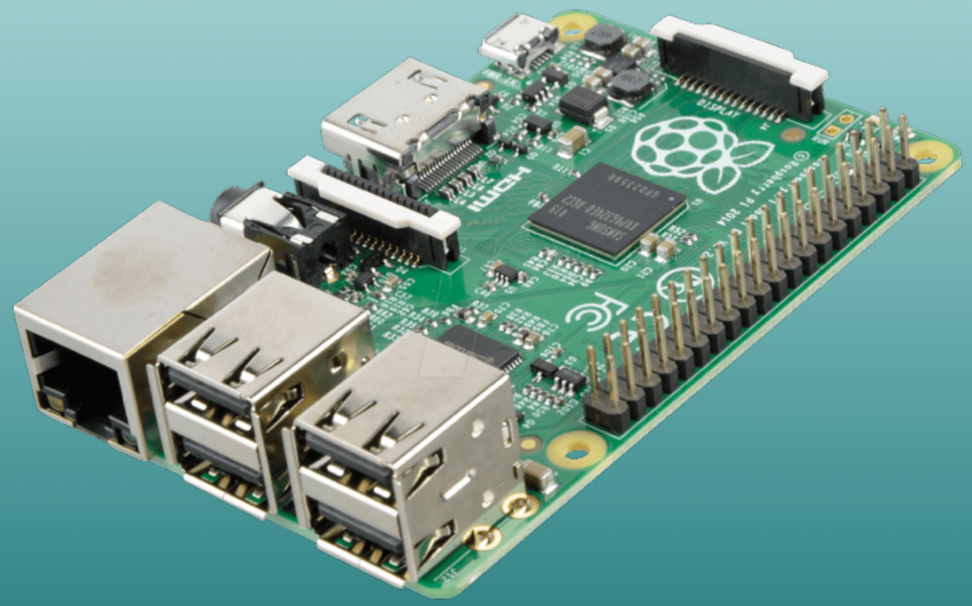
IoT Gateway



Same criteria plus:

Linux OS

IoT Gateway

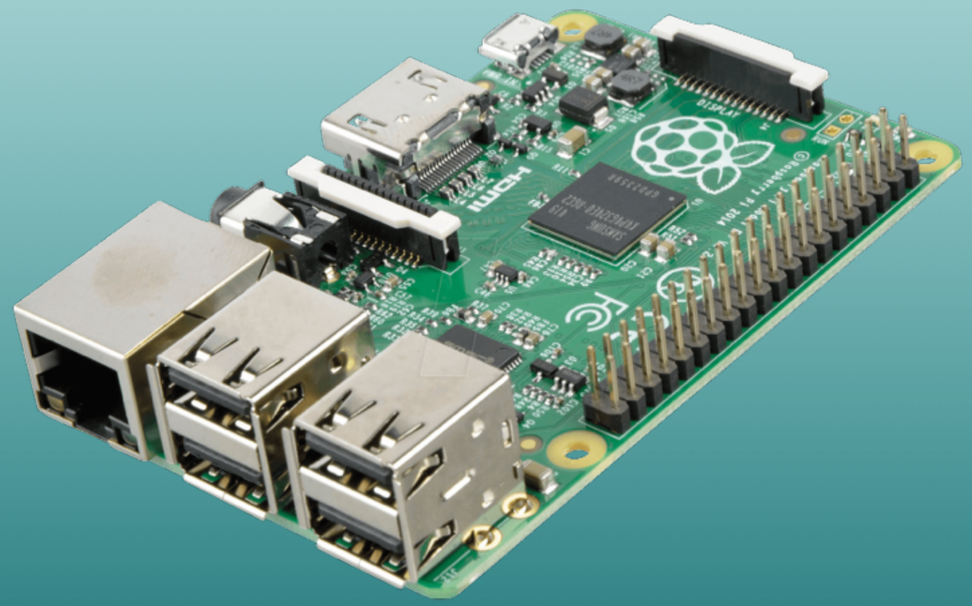


Same criteria plus:

Linux OS

All major programming languages

IoT Gateway



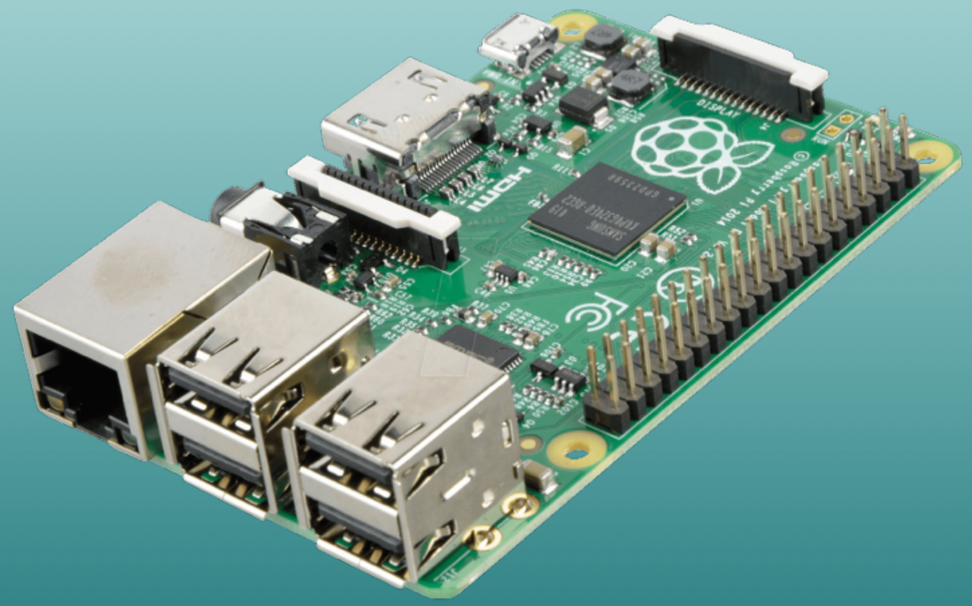
Same criteria plus:

Linux OS

All major programming languages

Communication/protocol options

IoT Gateway



Same criteria plus:

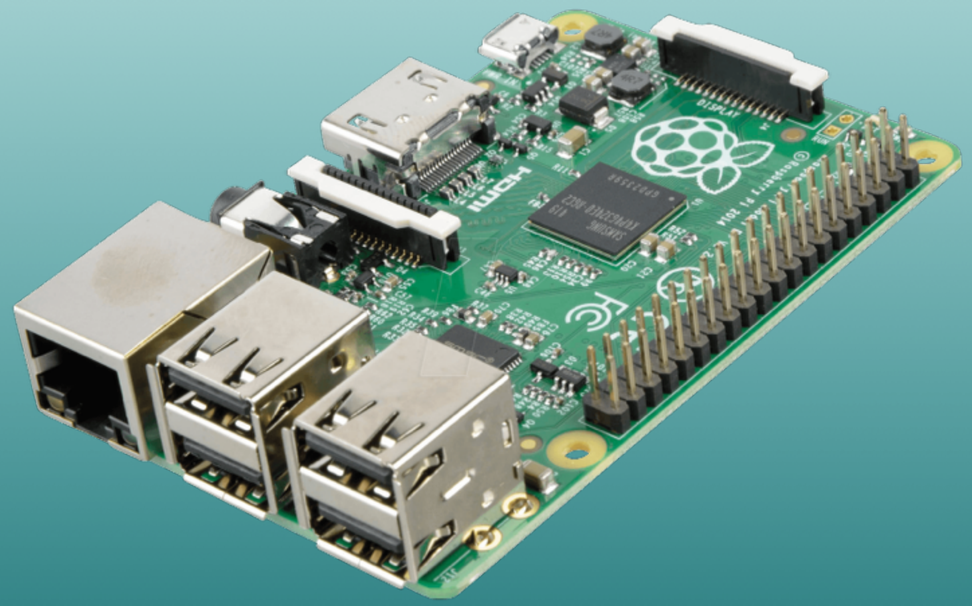
Linux OS

All major programming languages

Communication/protocol options

Remotely & securely accessible

IoT Gateway



Same criteria plus:

Linux OS

All major programming languages

Communication/protocol options

Remotely & securely accessible

Inexpensive add-ons

Back end service

Back end service

Communication, Query, Storage

Back end service

Communication, Query, Storage

Open source development platform

Back end service

Communication, Query, Storage

Open source development platform

Versatile, open source cloud

Back end service

Communication, Query, Storage

Open source development platform

Versatile, open source cloud

Velocity

Back end service

Communication, Query, Storage

Open source development platform

Versatile, open source cloud

Velocity

Portability

Back end service

Communication, Query, Storage

Open source development platform

Versatile, open source cloud

Velocity

Portability

SIMPLICITY

Back end service

Communication, Query, Storage

Open source development platform

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Velocity

Portability

SIMPLICITY

Spring Boot + Cloud Foundry

Front end application

Front end application

Available anywhere

Front end application

Available anywhere

Runs on every client

Front end application

Available anywhere

Runs on every client

Library/framework support

Front end application

Available anywhere

Runs on every client

Library/framework support

Versatile, open source cloud

Front end application

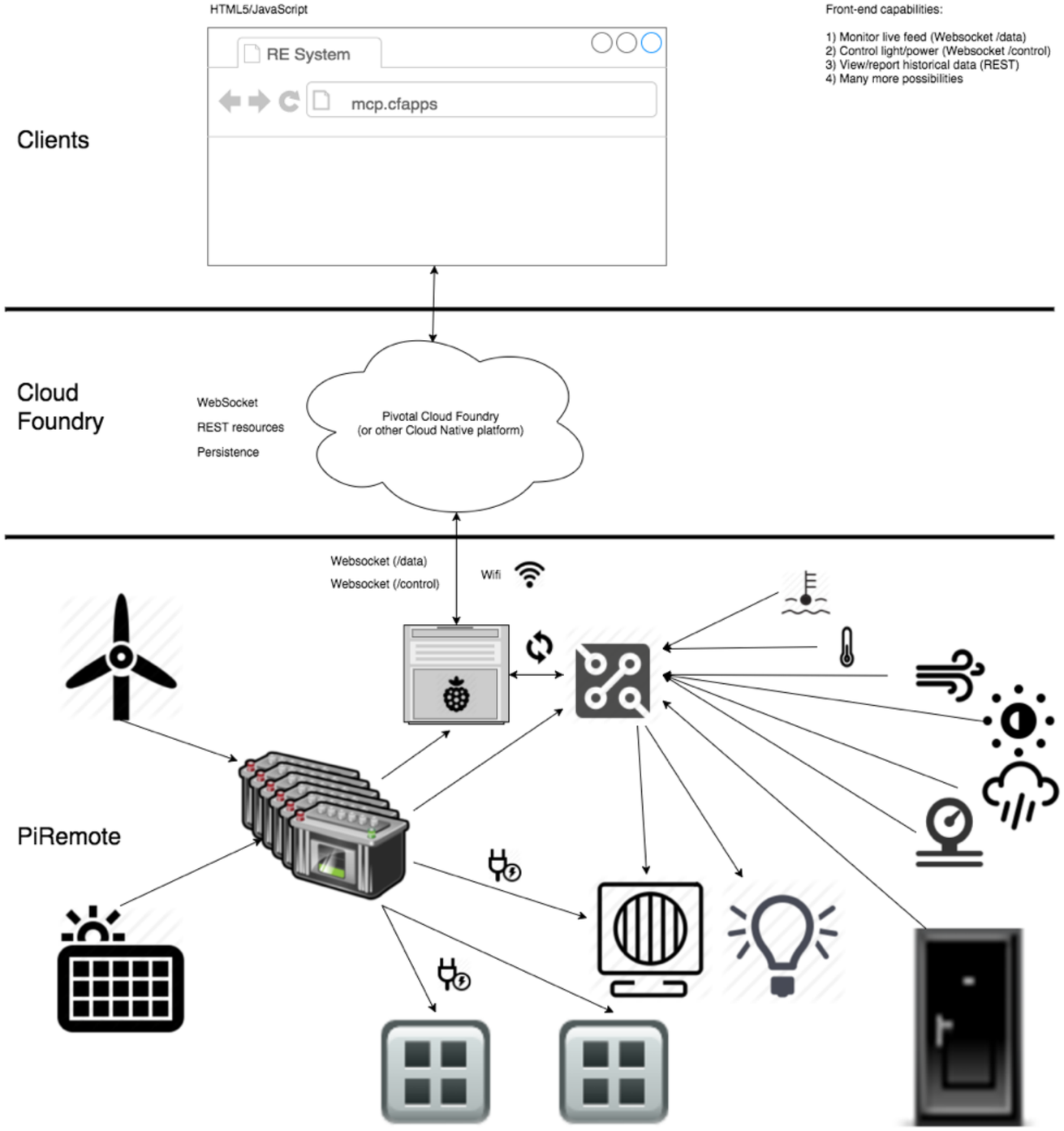
Available anywhere

Runs on every client

Library/framework support

Versatile, open source cloud

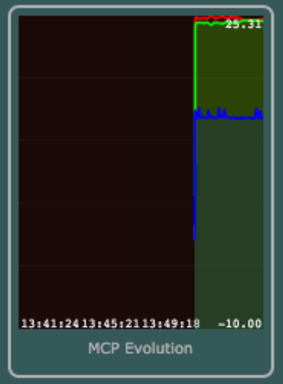
HTML + CSS + JS + Cloud Foundry


HTML5/JavaScript
RE System
mcp.cfapps
Front-end capabilities:
1) Monitor live feed (Websocket /data)
2) Control light/power (Websocket /control)
3) View/report historical data (REST)
4) Many more possibilities
Clients
Cloud Foundry
WebSocket
REST resources
Persistence
Pivotal Cloud Foundry
(or other Cloud Native platform)
Websocket (/data)
Websocket (/control)
Wifi
PiRemote

Power Monitoring & Management in the Cloud

Temperature: 24.6 (-15, °C, 45)
Humidity: 25.0 (0, %, 100)
Voltage: 13.8 (11, v DC, 16)
Lumens: 0.21 (0, w, 4)
Wind Speed: 2.92 (0, mph, 100)
Wind Direction: 248
Hourly Rainfall: 0.0 (0, in, 10)
Atmospheric Pressure: 101060 (90000, Pa, 110000)

Mode: A
Power: 0
Status Lamp: 1
Windows: 0
Interior Light: 0



MCP Evolution

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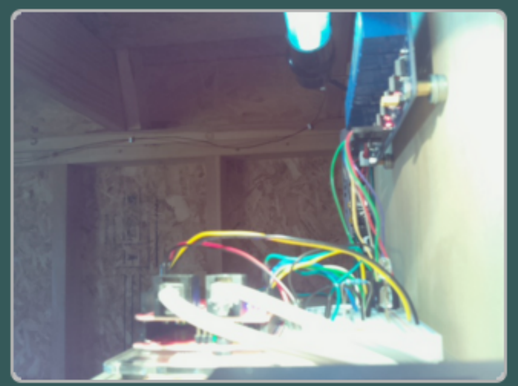
Power Monitoring & Management in the Cloud

Temperature: 24.8 (-15, °C, 45)
Humidity: 24.7 (0, %, 100)
Voltage: 13.8 (11, v DC, 16)
Lumens: 3.10 (0, w, 4)
Wind Speed: 0.00 (0, mph, 100)
Wind Direction: 315
Hourly Rainfall: 0.0 (0, in, 10)
Atmospheric Pressure: 100997 (90000, Pa, 110000)

Mode: M
Power: 1
Status Lamp: 0
Windows: 0
Interior Light: 1



MCP Evolution

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Thank You for Participating!

- Helpful Links
  - 12 Factor apps: 12factor.net
  - Spring Initializr: start.spring.io
  - Cloud Foundry: cloudfoundry.org
  - Pivotal Web Services: run.pivotal.io
  - Code for this session: https://github.com/hecklerm

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Keep the discussion going on Twitter!

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