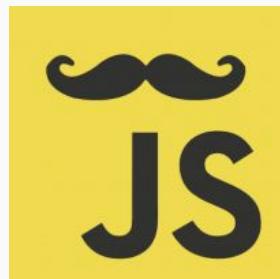


+



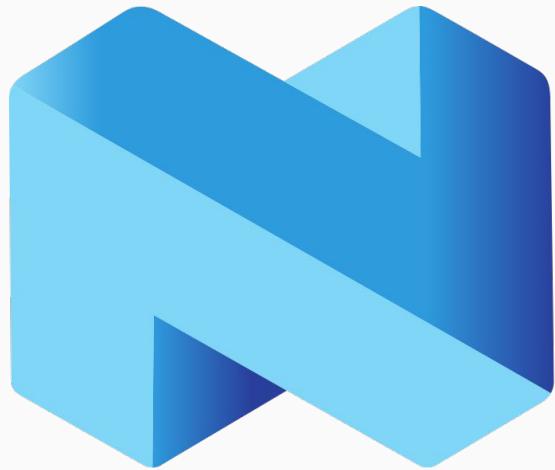
=



# Program

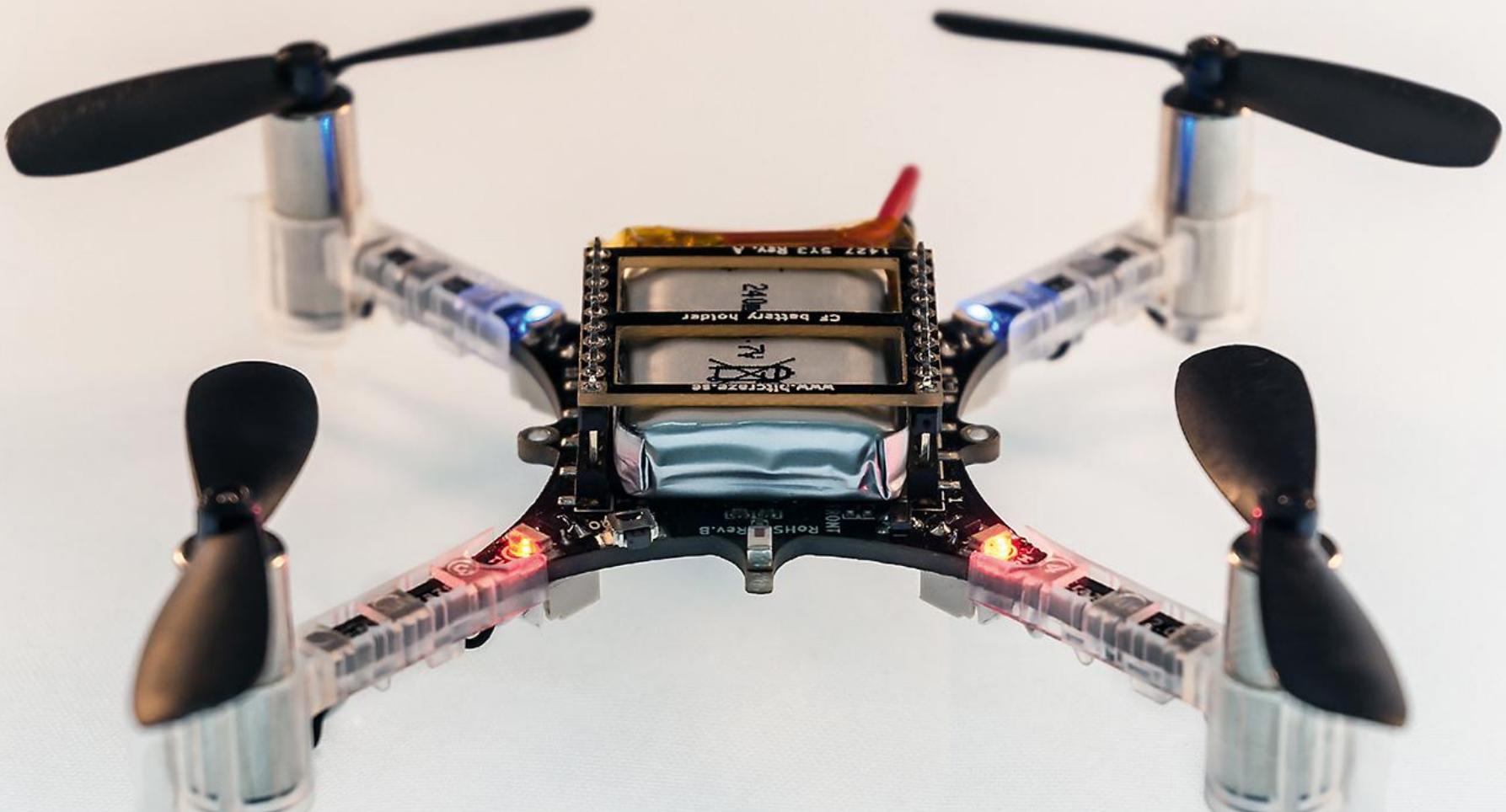
Physical Web Meetup

1. Nordic Semiconductor
2. Bluetooth Smart
3. Physical Web
4. Kode
5. Demonstrasjoner
6. Gjør det sjøl



**NORDIC**  
SEMICONDUCTOR



























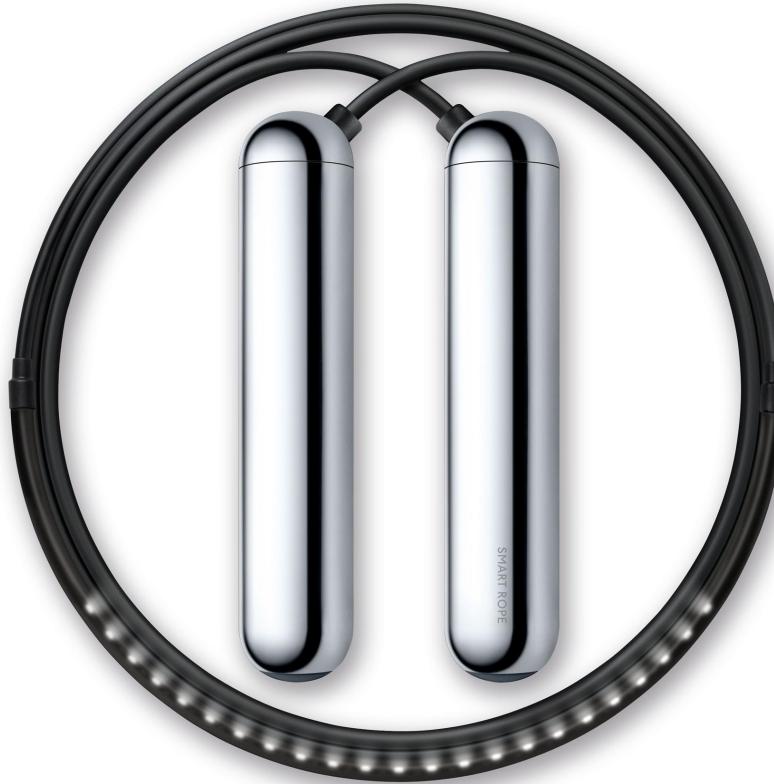


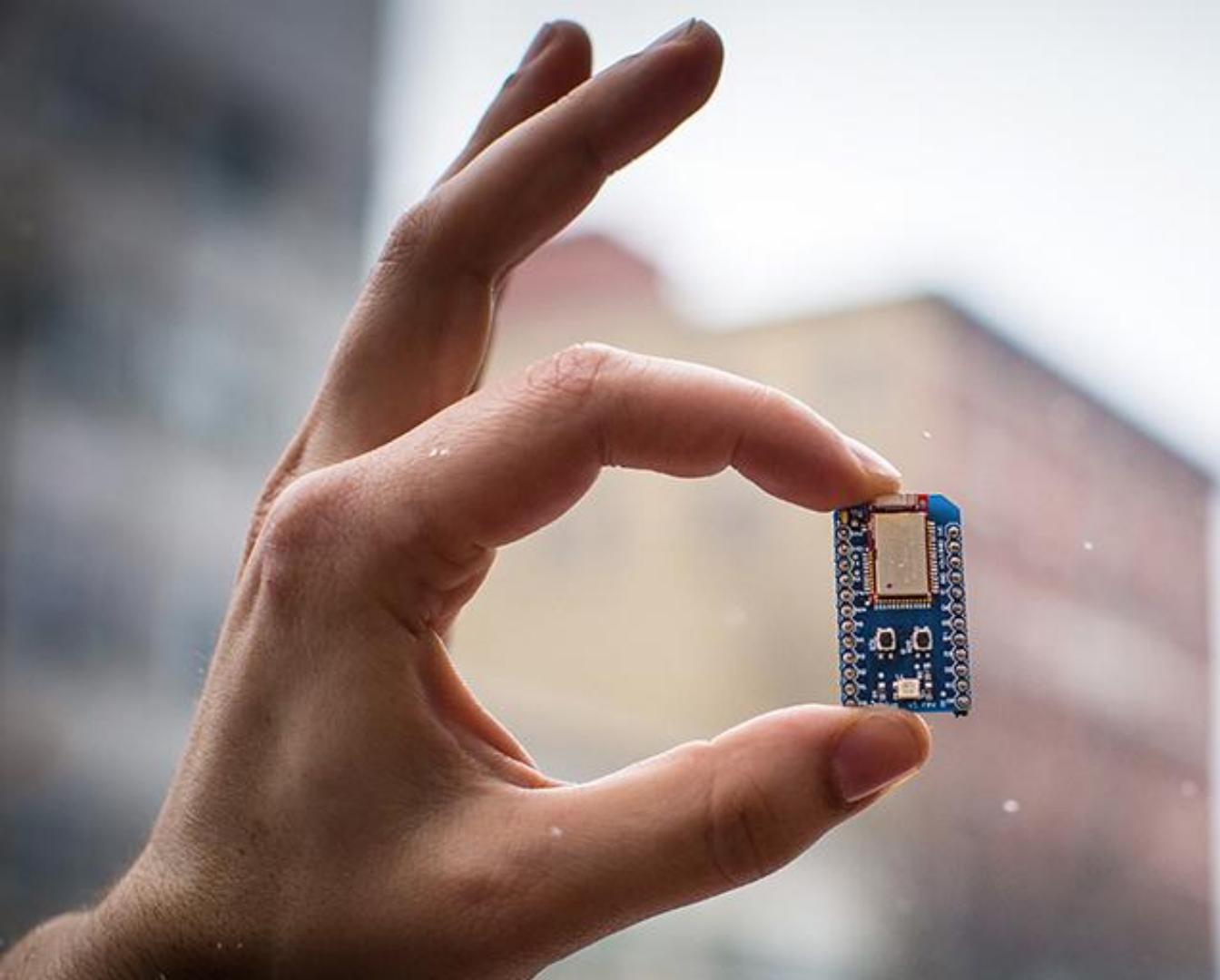




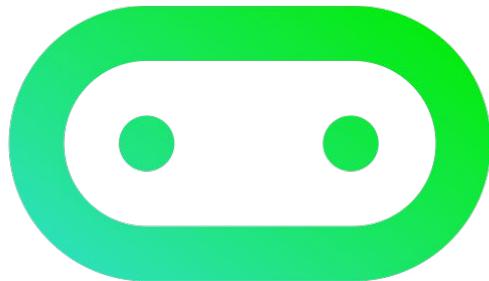




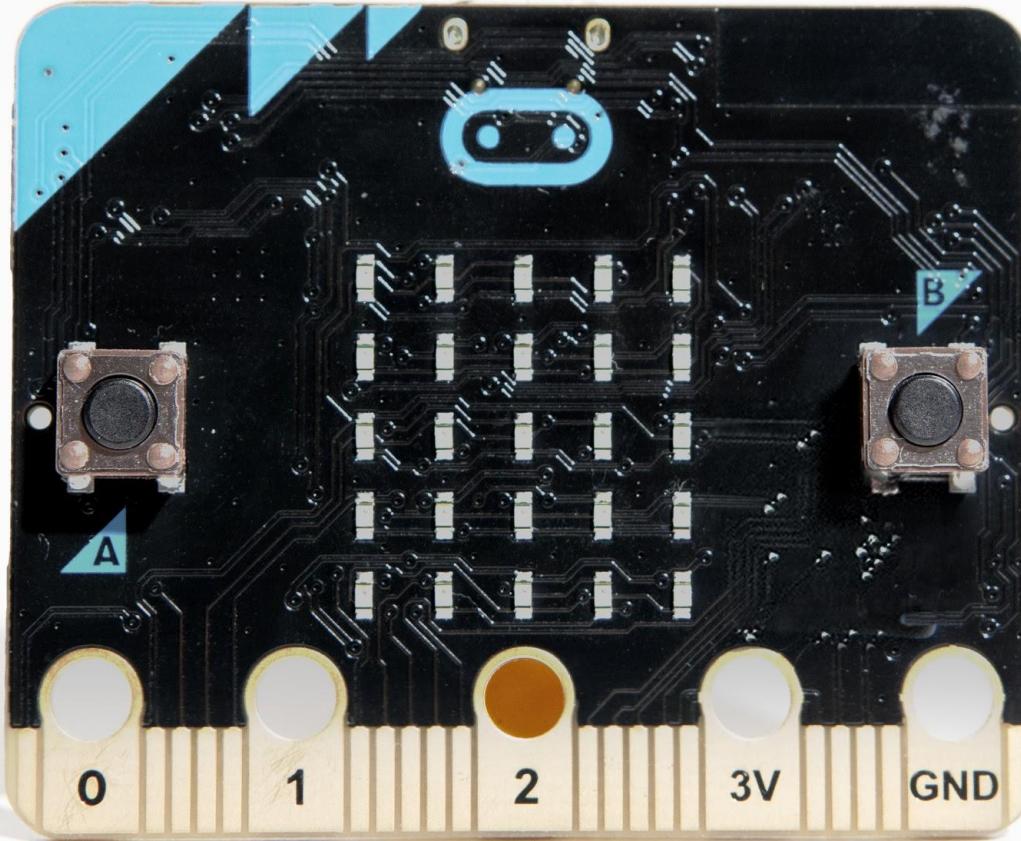


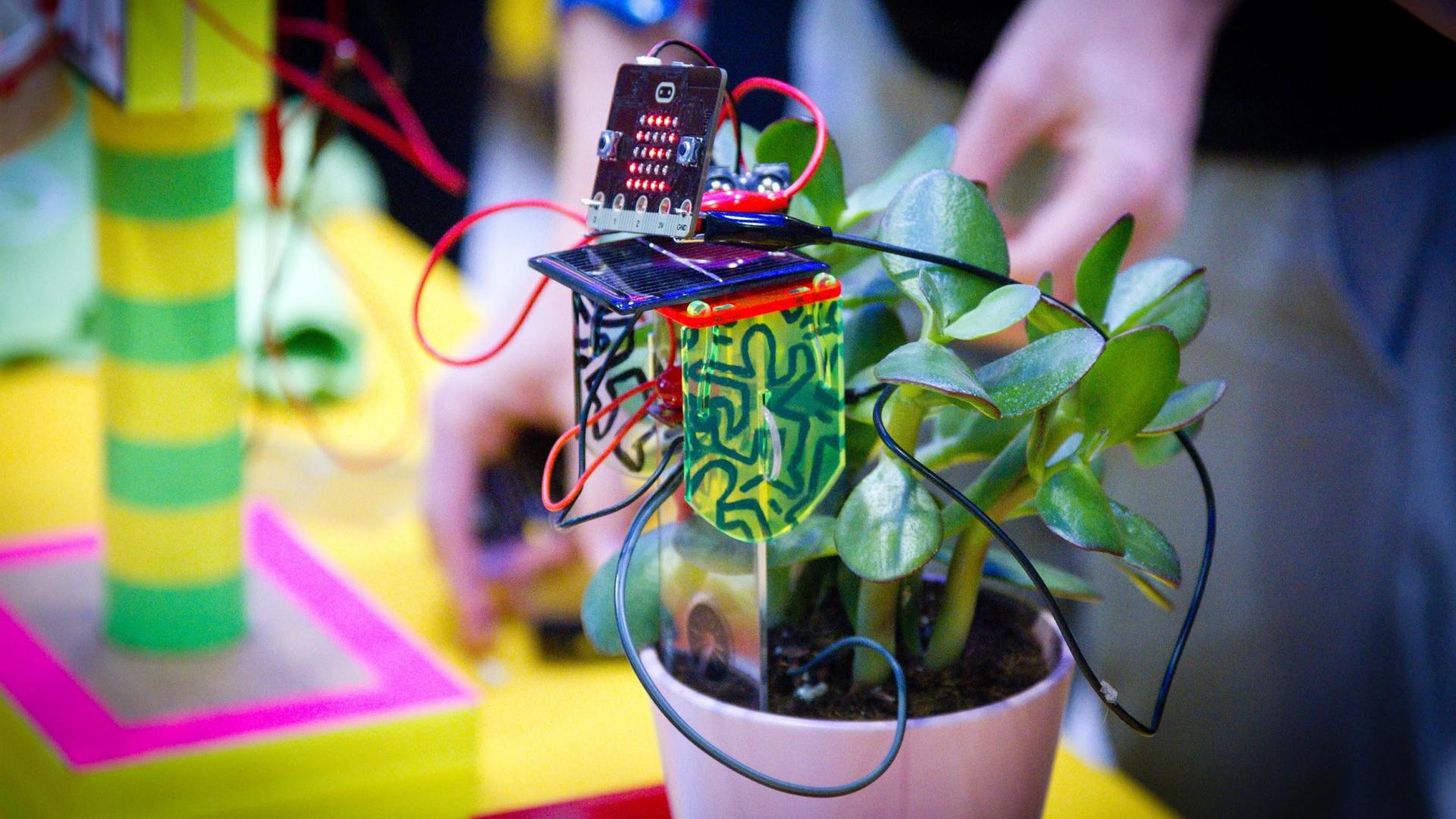


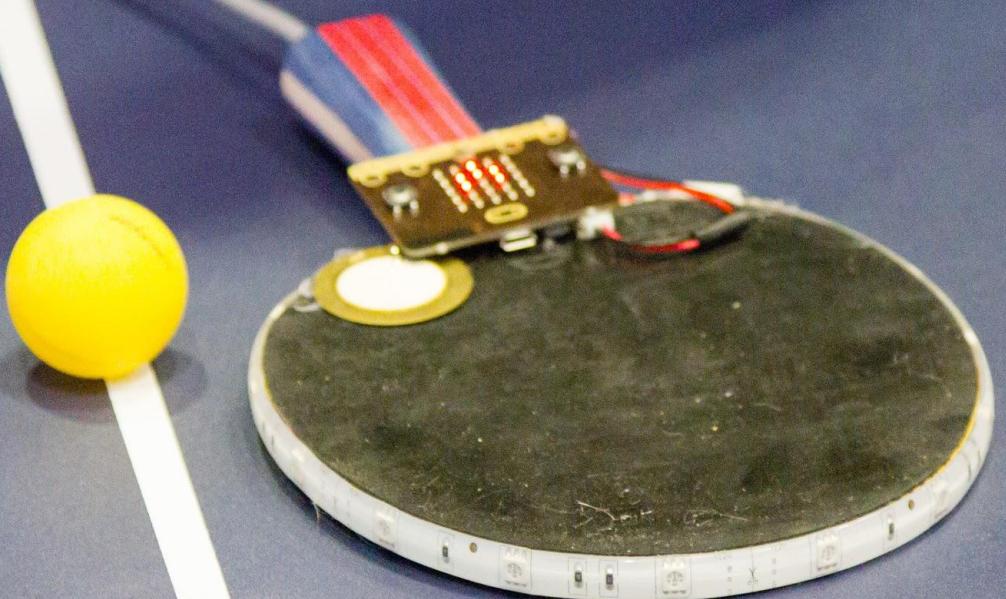
BBC



micro:bit







# Ultra Low Power Wireless Chips

Spesialområde

# 700.000

Innebygde kretser produsert per dag

# En milliard+

Innebygde kretser solgt





# Internet of Things

Fokusområde

~400

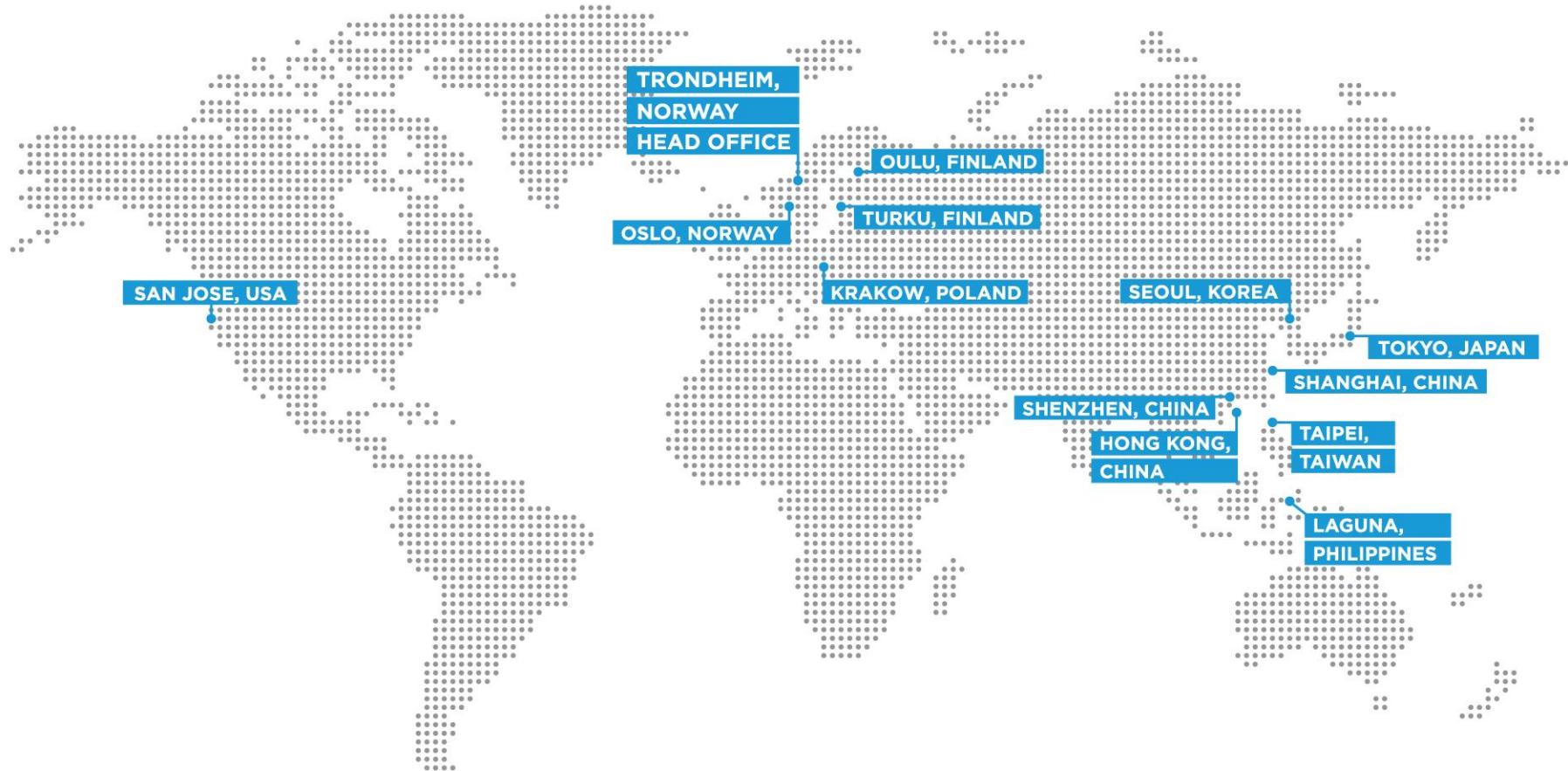
Ansatte

90%

Ingeniører

# 40+

Nasjonaliteter



# Nordic JS

Hvordan bruker vi JavaScript?

# pc-ble-driver.js

NodeJS AddOn for the pc-ble-driver library

# nRF Connect

Electron | Node.js | Bootstrap | React | Reflux | sqlite3 | Winston ++

Yggdrasil

/dev/tty.usbmodem1421

Connection map Device details

**nRF51822** Central  
F3:96:00:48:1C:C4

**Nordic\_HRM** Peripheral  
C6:88:C5:B4:6C:23

- ▶ Generic Access
- ▶ Generic Attribute
- ▶ Heart Rate
- ▶ Battery Service
- ▶ Device Information

**IDTW218H** Peripheral  
E4:E4:6D:CB:7C:78

- ▶ Generic Access
- Generic Attribute
- ▶ 0x74E7FE00C6A411E2B7A90002A5D...
- ▶ Device Information
- ▶ Battery Service

**Discovered devices**

Start scan Clear

- sLTrhhUi2tWPZZG3xDVpGa16pV
- FE:3F:1B:5B:36:6B Connect
- IDTW218H
- E4:92:B5:93:49:77 Connect
- fA1
- C5:25:66:B5:D0:20 Connect
- Tx Power
- sLhQu5dgIePYqydRs6ssxV3qpV
- D6:6F:27:3F:F0:64 Connect
- Tx Power
- sLs82mTJ4pKxuLi/q0U1YvRKpV
- F0:DE:32:51:AD:C8 Connect
- sL78UZYTmDwcKLtO0Ej7DhKpV
- FE:B5:57:3D:EF:A7 Connect

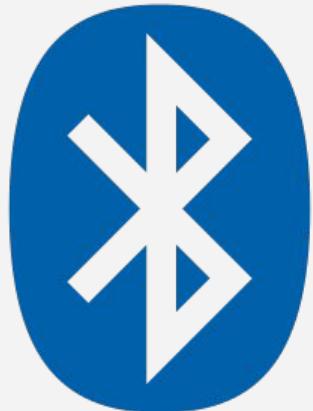
**Log**

22:27:46.2340	Starting scan...
22:27:51.5210	Initiated connection to C6:88:C5:B4:6C:23.
22:27:51.6020	Connected to peripheral C6:88:C5:B4:6C:23.
22:27:51.6030	Peripheral C6:88:C5:B4:6C:23 (handle #0) connected.
22:27:56.2490	Initiated connection to E4:E4:6D:CB:7C:78.
22:27:58.6030	Connected to peripheral E4:E4:6D:CB:7C:78.
22:27:58.6040	Peripheral E4:E4:6D:CB:7C:78 (handle #1) connected.

# Program

Physical Web Meetup

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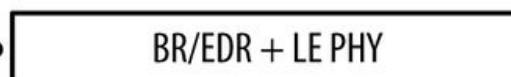
**Bluetooth®**  
**SMART**



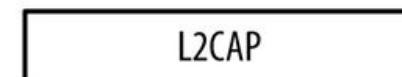
(classic or BR/EDR)



(dual mode or BR/EDR/LE)



(single mode or BLE)





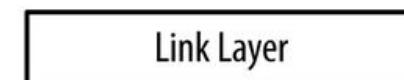
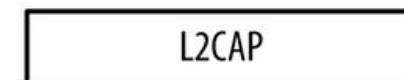
(classic or BR/EDR)

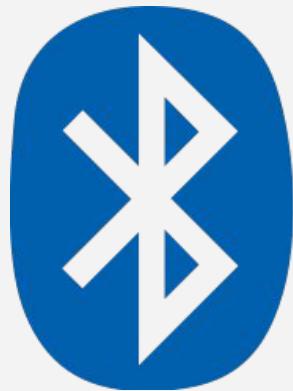


(dual mode or BR/EDR/LE)



(single mode or BLE)





**Bluetooth**<sup>TM</sup>

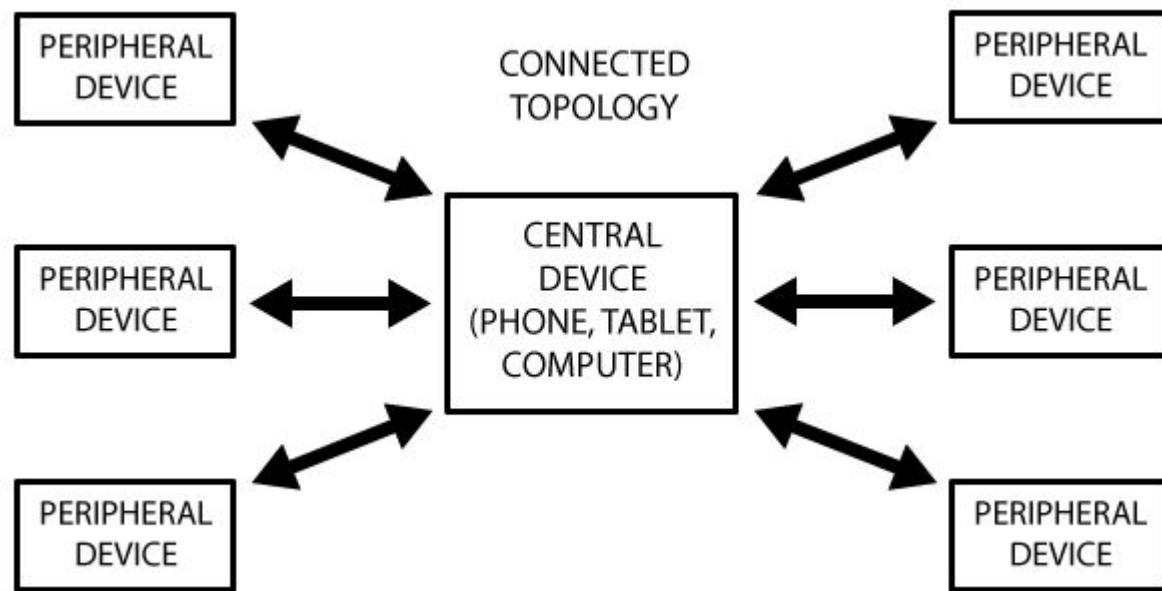
# Strømforbruk

Så lite som mulig



# Interoperabilitet

Mellom leverandør X, Y og Z



# GATT

Sørger for at alle snakker samme språk

## Heart Rate Service

	Handle	UUID	Permissions	Value
Service	0x0021	SERVICE	READ	HRS
Characteristic	0x0024	CHAR	READ	NOT 0x0027 HRM
	0x0027	HRM	NONE	bpm
Descriptor	0x0028	CCCD	READ/WRITE	0x0001
Characteristic	0x002A	CHAR	READ	RD 0x002C BSL
	0x002C	BSL	READ	finger

## Heart Rate Service



	Handle	UUID	Permissions	Value
Service	0x0021	SERVICE	READ	HRS
Characteristic	0x0024	CHAR	READ	NOT 0x0027 HRM
	0x0027	HRM	NONE	bpm
Descriptor	0x0028	CCCD	READ/WRITE	0x0001
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## Heart Rate Service



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## Heart Rate Service



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## Heart Rate Service



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	0x002C	BSL	READ	finger

# Program

Physical Web Meetup

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# Physical Web

Walk up and use anything



Spektrum

Sentrum

5 Dragvoll

ATB

372





# CINEMAS 16



Advance Ticket Pick Up  
www.fandango.com



Toys

Toys

Toys



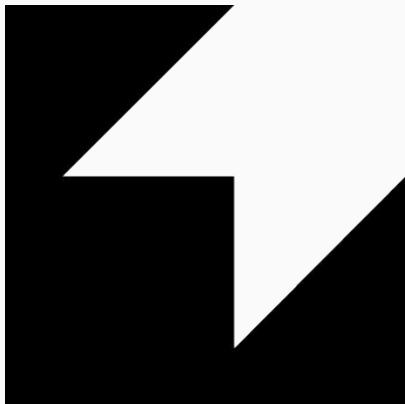
# Hundrevis av native Apps?

Neineinei

Web Apps når du trenger det.

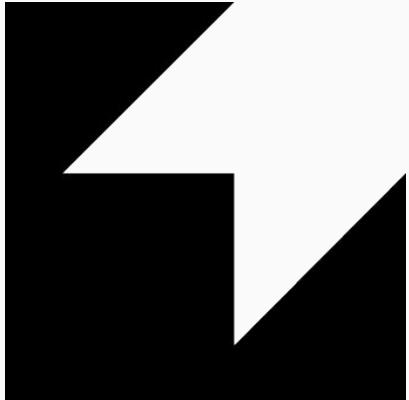
Jojojo

Eddystone URL



Web Bluetooth API





- Wireless QR code
- One of several Eddystone types
- Non-connectable
- Advertises URL up to 17 bytes
- Simple but powerful
- On all platforms via browser



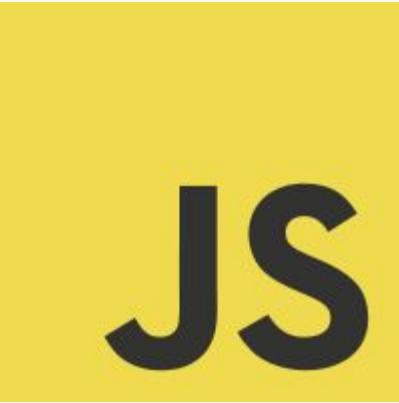
*https://www.getcandy.no*

*https://www.getcandy.no*

*https://www.getcandy.no*

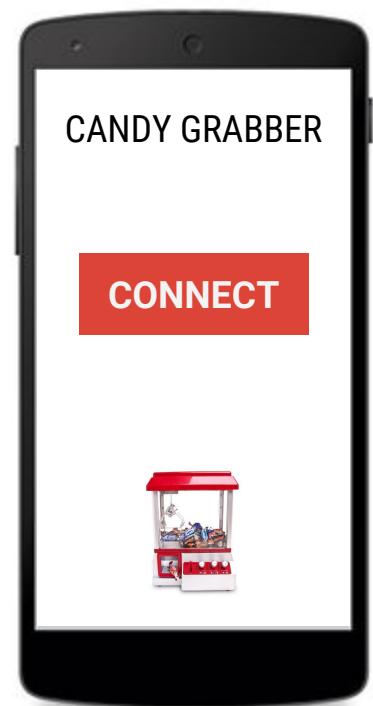


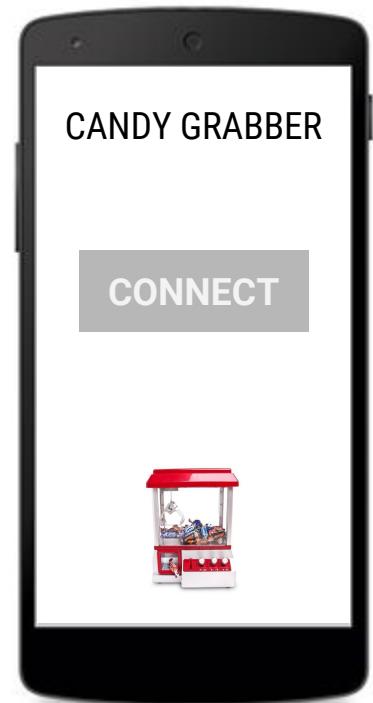


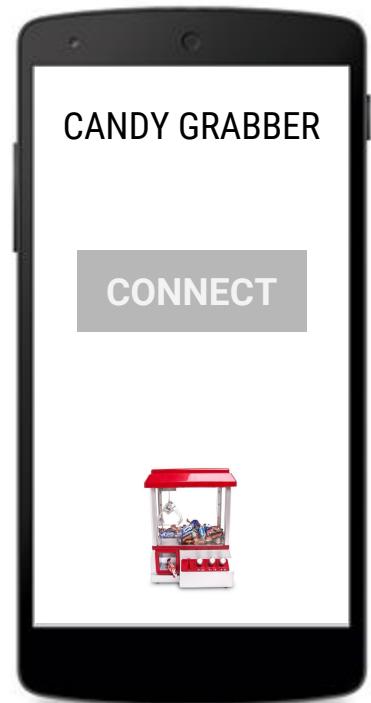


- Power of a native app
- A JavaScript library
- Websites talk with devices
- Implemented by browsers
- OS independent
- W3C Specification











Feature	Chrome OS	Android M	Mac OS X	Linux	Windows 8.1
Discovery	✓	✓	✓	50	50 (paired devices only)
Name or prefix	✓	✓	✓	50	50
Chooser UI	✓	✓	✓	50	50
GATT Server Connect	✓	✓	51	50	
Read Characteristic	✓	✓		50	
Write Characteristic	✓	✓		50	
Characteristic Properties	✓	✓		50	
GATT Notifications	✓	(start only)		50	
GATT Server Disconnect	50	50	51	50	
Get Characteristics List	50	50		50	
Device Disconnected Event					

# Program

Physical Web Meetup

1. ~~Nordic Semiconductor~~
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# UUID

128 bit Globally Unique Identifier

*If every human on Earth generated  
600.000.000 UUIDs there would only be  
a 50% probability of a duplicate.*

Ganske bra, altså.

# Write to characteristic

Code example

```
1 const SERVICE_UUID = 'a6c31337-6c07-453e-961a-d8a8a41bf368'  
2 const CHARACTERISTIC_UUID = 'a6c31338-6c07-453e-961a-d8a8a41bf368'  
3  
4 navigator.bluetooth.requestDevice({  
5     filters: [{ services: [SERVICE_UUID] }]  
6 })  
7 .then(device => device.connectGATT())  
8 .then(server => server.getPrimaryService(SERVICE_UUID))  
9 .then(service => service.getCharacteristic(CHARACTERISTIC_UUID))  
10 .then(characteristic => {  
11     var giveMeCandy = new Uint8Array([1, 0, 0, 0, 0, 0]);  
12     return characteristic.writeValue(giveMeCandy);  
13 })  
14 .catch(error => { console.log(error); });
```

# Read a characteristic

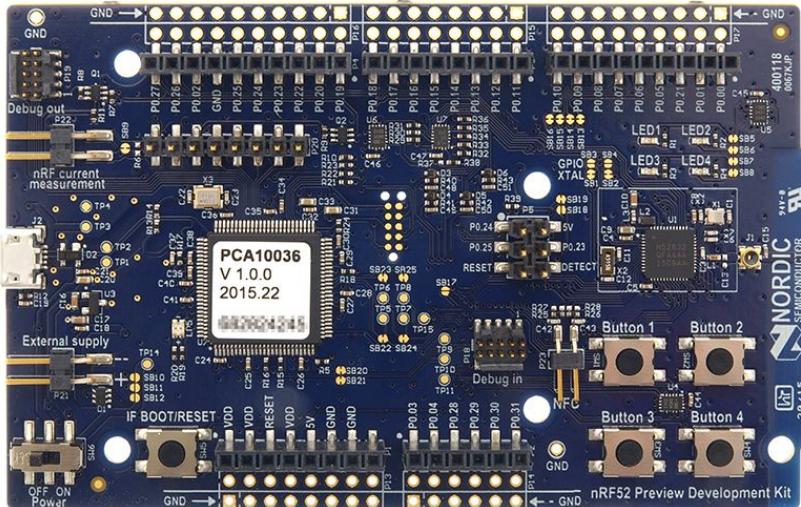
Code example

```
1 const SERVICE_UUID = 'a6c31337-6c07-453e-961a-d8a8a41bf368'  
2 const CHARACTERISTIC_UUID = 'a6c31338-6c07-453e-961a-d8a8a41bf368'  
3  
4 navigator.bluetooth.requestDevice({  
5     filters: [{ services: [SERVICE_UUID] }]  
6 })  
7 .then(device => device.connectGATT())  
8 .then(server => server.getPrimaryService(SERVICE_UUID))  
9 .then(service => service.getCharacteristic(CHARACTERISTIC_UUID))  
10 .then(characteristic => {  
11     return characteristic.readValue();  
12 })  
13 .then(value => {  
14     // In Chrome 50+, a DataView is returned instead of an ArrayBuffer.  
15     value = value.buffer ? value : new DataView(value);  
16     console.log('Battery percentage is ' + value.getInt8(0));  
17 })  
18 .catch(error => { console.log(error); });
```

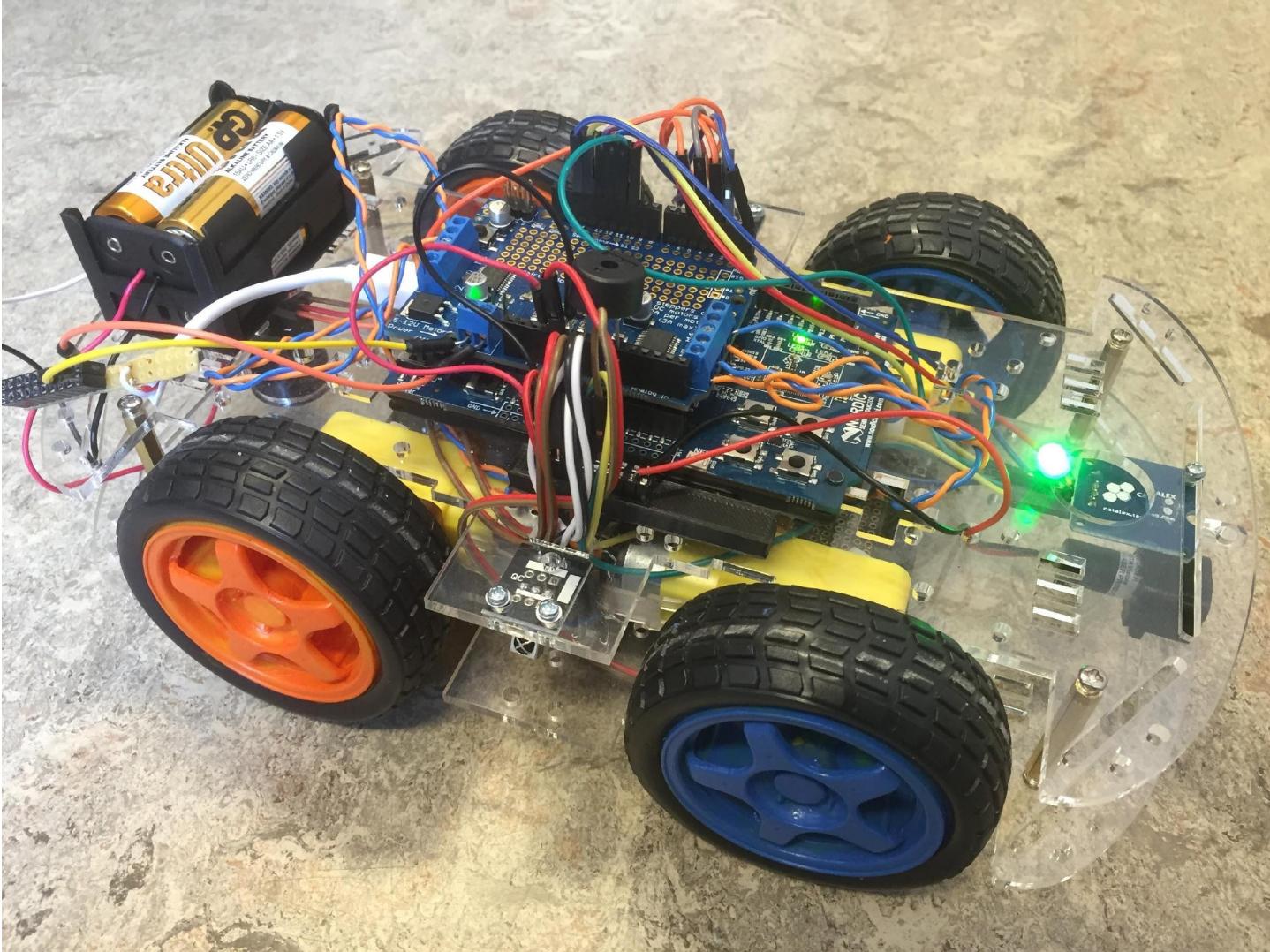
# Physical Web RC Car



# nRF 52 Development Kit







# Physical Web Car



Start

Physical Web

NORDIC  
SEMICONDUCTOR

NTNU

<https://jtgguggedal.github.io>

Connection status



Singleplayer



Create Game



Join Game



Settings



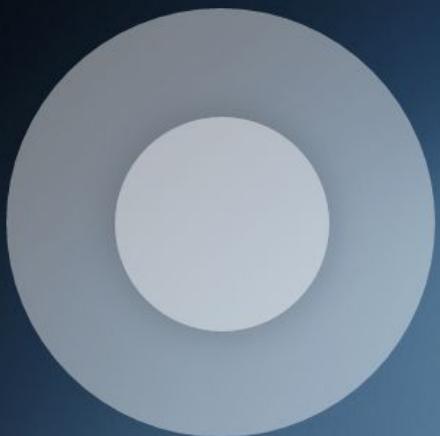
Reconnect

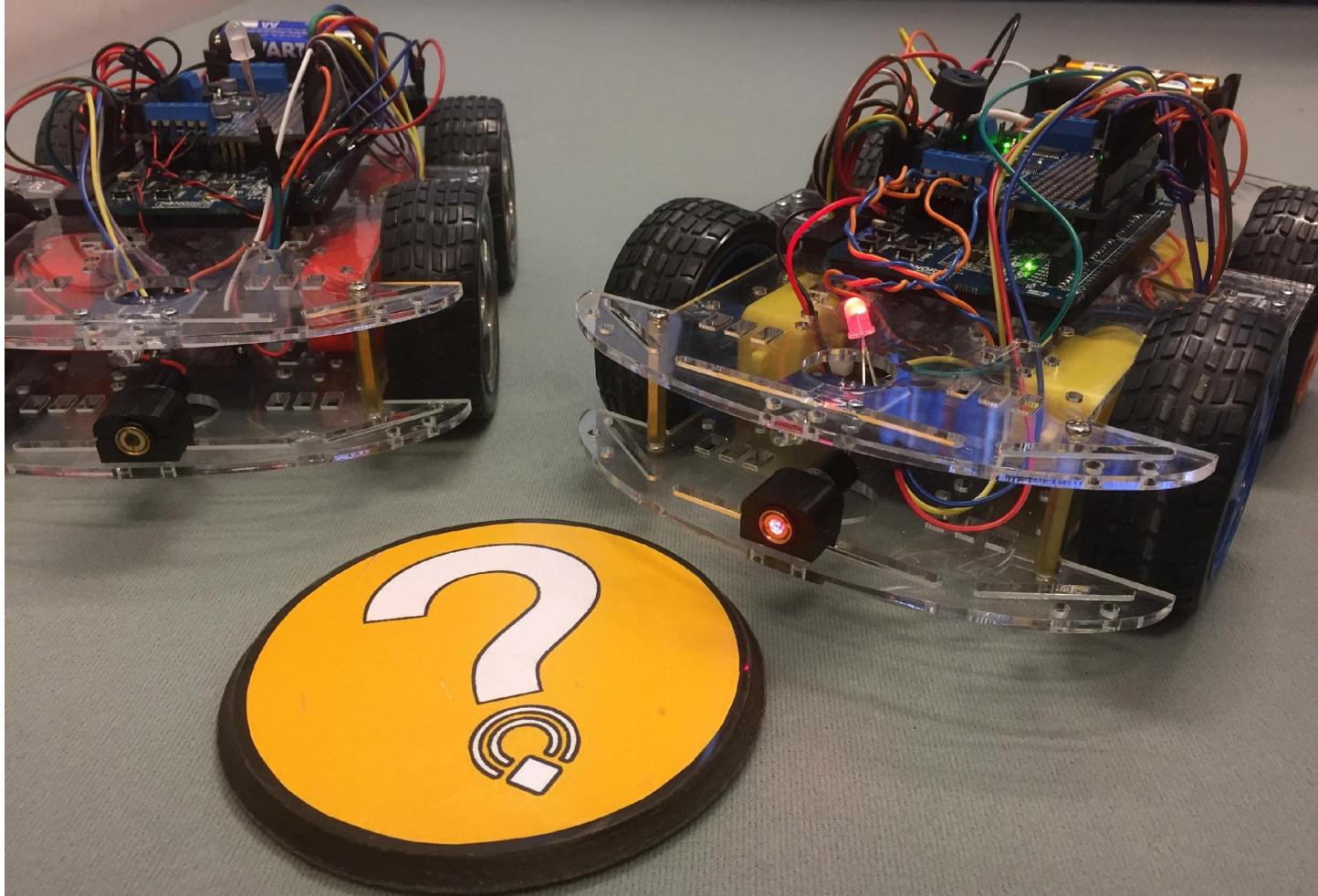


Home

Exit fullscreen

Connection status

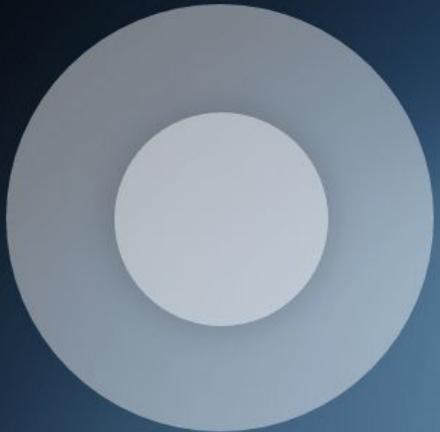




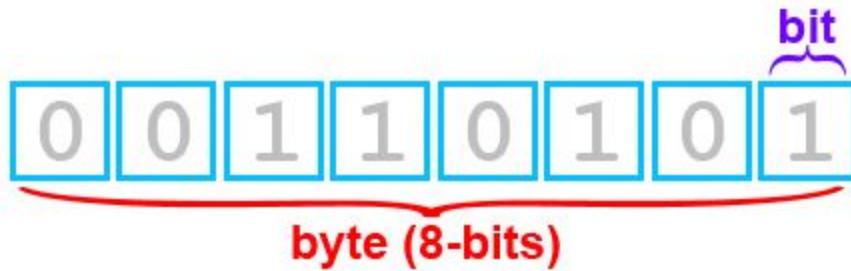
Exit fullscreen

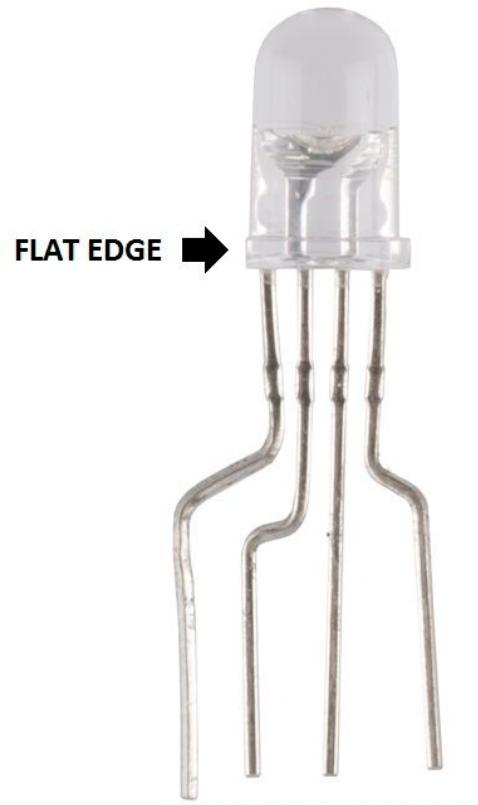
Connection status

♥ 6

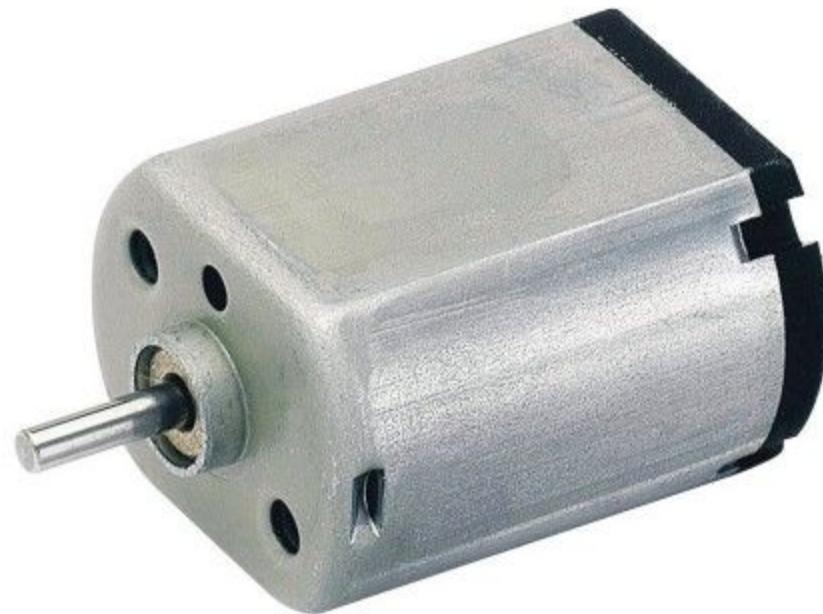


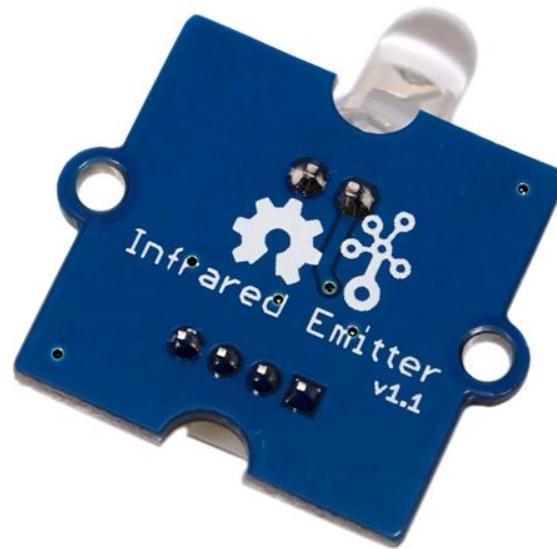
**20 bytes**

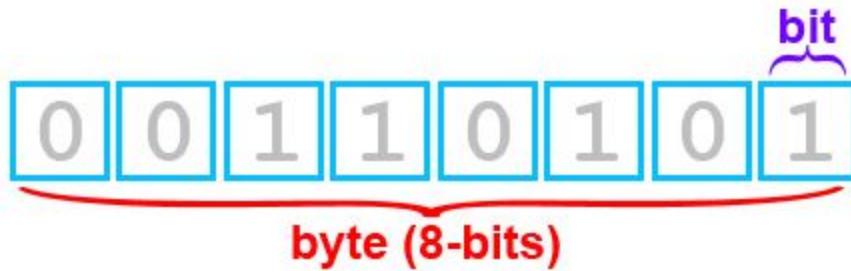


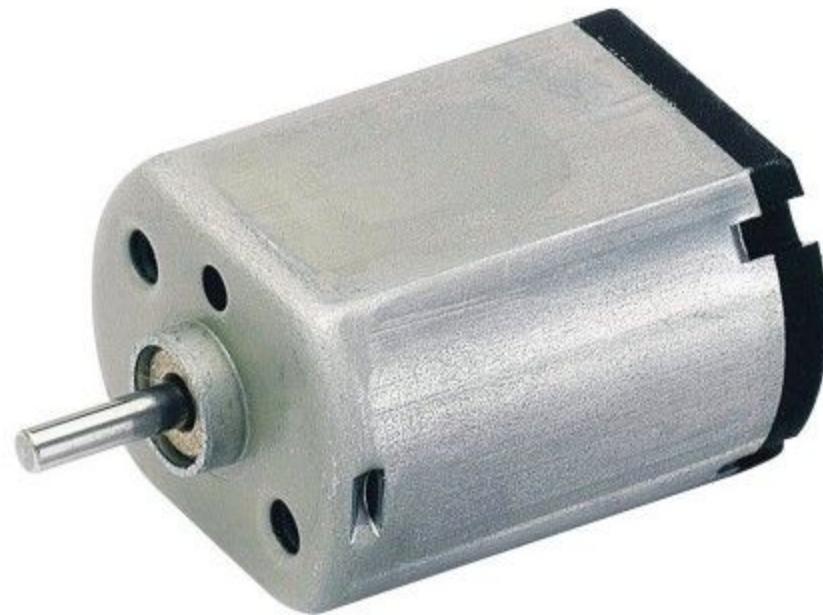


**RED GND GREEN BLUE**











```
1 var characteristicData = new Uint8Array(20);
2 var bitMask = [128, 64, 32, 16, 8, 4, 2, 1];
3
4 function setBit(byteOffset, bitOffset, value) {
5     if(bitOffset == 'b') {
6         characteristicData[byteOffset] = value;
7     } else {
8         if(characteristicData[byteOffset] & bitMask[bitOffset]) {
9             if(value == 0) {
10                 characteristicData[byteOffset] -= bitMask[bitOffset];
11             }
12         } else {
13             if (value == 1) {
14                 characteristicData[byteOffset] += bitMask[bitOffset];
15             }
16         }
17     }
18 }
```

`characteristicData[14]`

$$\begin{array}{r} 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \quad 128 \\ + \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \quad 16 \\ \hline = \ 1 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \quad 144 \end{array}$$

**Resultat:** motor 1 og motor 4 roterer framover, motor 2 og motor 3 roterer bakover

bitMask[2]	0 0 1 0 0 0 0 0	32
testVariable	<b>&amp;</b> 0 1 1 0 0 1 0 0	100
	<hr/>	
	= 0 0 1 0 0 0 0 0	32

**Resultat:** bit i posisjon 2 er satt høy

Exit fullscreen

Connection status

# XWPEQ

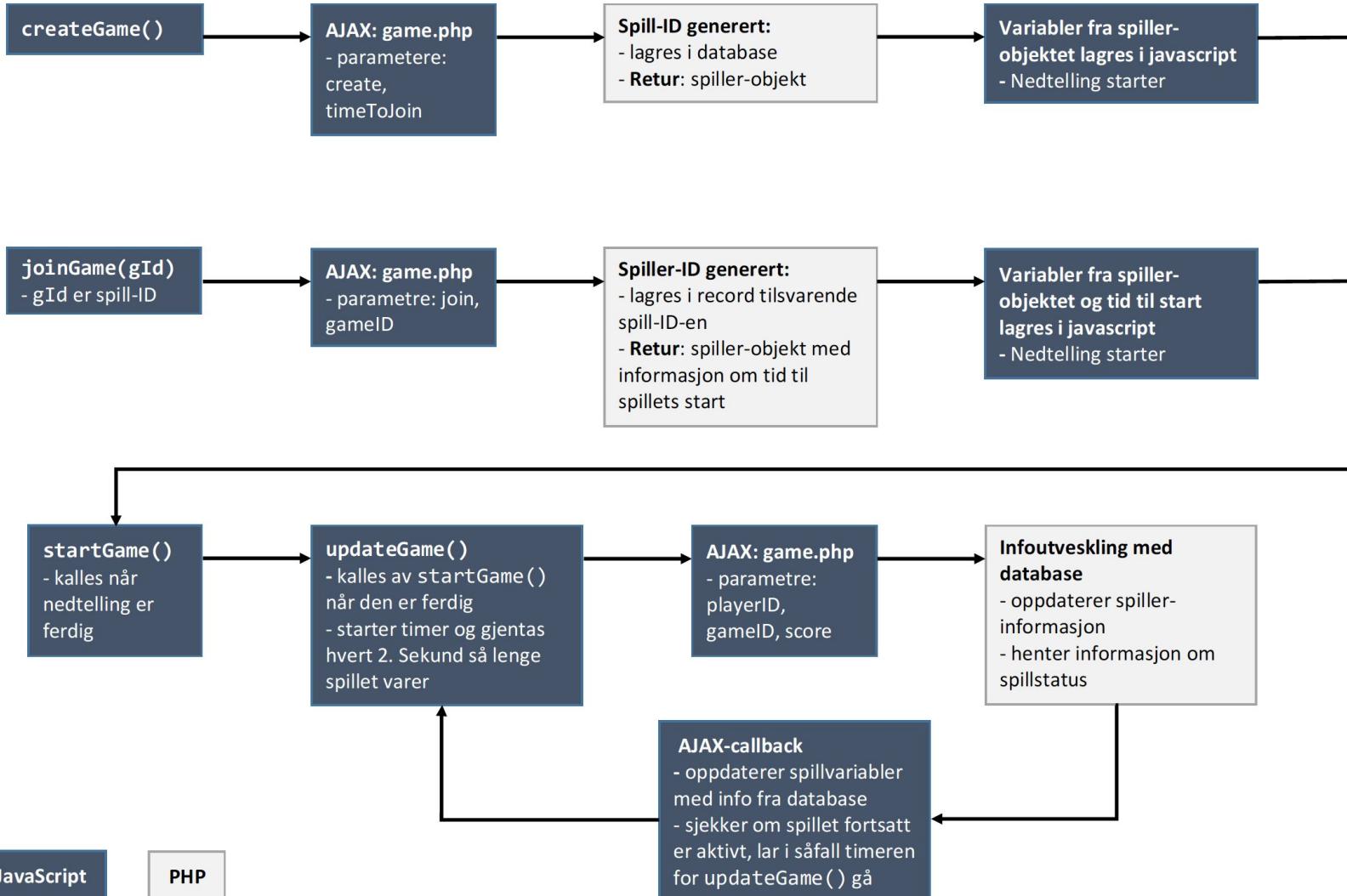
Game starts in 15

Connection status

## GAME ID

Join

Return





# Program

Physical Web Meetup

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# Program

Physical Web Meetup

1. ~~Nordic Semiconductor~~
2. ~~Bluetooth Smart~~
3. ~~Physical Web~~
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## **Bachelor RC Cars**

[github.com/web-bluetooth/rc-car-game](https://github.com/web-bluetooth/rc-car-game)

## **BartJS Motor Shield Challenge**

[github.com/hmhalvorsen/hmhalvorsen.github.io](https://github.com/hmhalvorsen/hmhalvorsen.github.io)

## **Blinky**

[ketile.github.io/physical-web/nRF-Blinky/](https://ketile.github.io/physical-web/nRF-Blinky/)

## **Candy Grabber**

[ketile.github.io/index\\_grabber.html](https://ketile.github.io/index_grabber.html)