

Internet of Things

die nächste
Industrielle Revolution?

ESP8266

System on a Chip by Espressif
Arduino-killer??

Adri Wischmann

- 51 Jahren jung, wohne in Emmen (halbwegs Bremen-Amsterdam)
- Deutsche Name aber seit 8 Generationen in Holland
- Elektronik und Informatik studiert (aber schon ein paar Jahre her!)
- Seit meinem 21sten eine Firma in Data-Analytics für Finanzwelt
- Seit 3 Jahren auch eine Firma in IoT
- Hobbys: meine "Arbeit", Tontaubenschossen, Fliegen

www.iotnederland.nl

Improving experiences, efficiency and effectiveness...
one interconnection at a time!
Providing an on-ramp to IoT,
trying to inspire users and manufacturers.

IoT “Internet der Dinge” ist nicht so ein guter Name...

Nicht alle IoT ist mit dem Internet verbunden!

Besser wäre vielleicht:

“Connected Devices”

Oder..

“Smart Devices”



OH YEAH
We are so smart

**Unsere Welt
ändert sich in den kommenden 5-7 Jahren EXPLOSIV!
(disruptiv)**

**Die Allgemeine Wirtschaft
stellt sich um von
bezahlen für Besitz auf.. bezahlen für Verwendung**

- Der Welt grösster Taxi-Firma besitzt keine Taxi's (Über)
- Der Welt grösster "Accommodation provider" besitzt keine Immobilie (AirBnB)
- Der Welt grösster Verkaufskanal besitzt keine Vorräte (Alibaba)
- Der Welt grösster Medienkanal generiert selber kein Inhalt (Facebook)
- Der Welt grösster "Film-Kanal" besitzt keine Kino's (Netflix)
- Usw...

Und... Internet und IoT machen es möglich!

IoT hat ein SEHR grosses Anwendungsbereich



Beispiel Smart Mobility



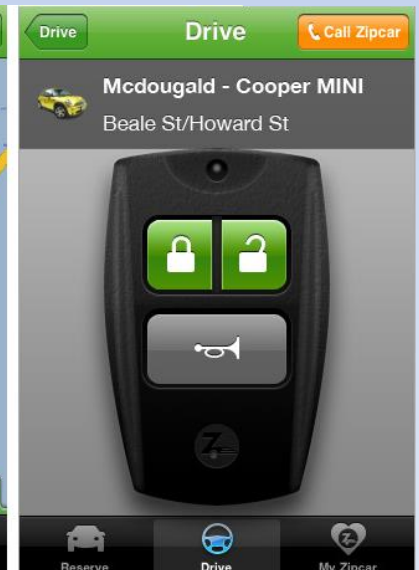
HAVING A SMART CAR

It doesn't make you smart

Beispiel Smart Mobility



Fully connected Schoolbusses



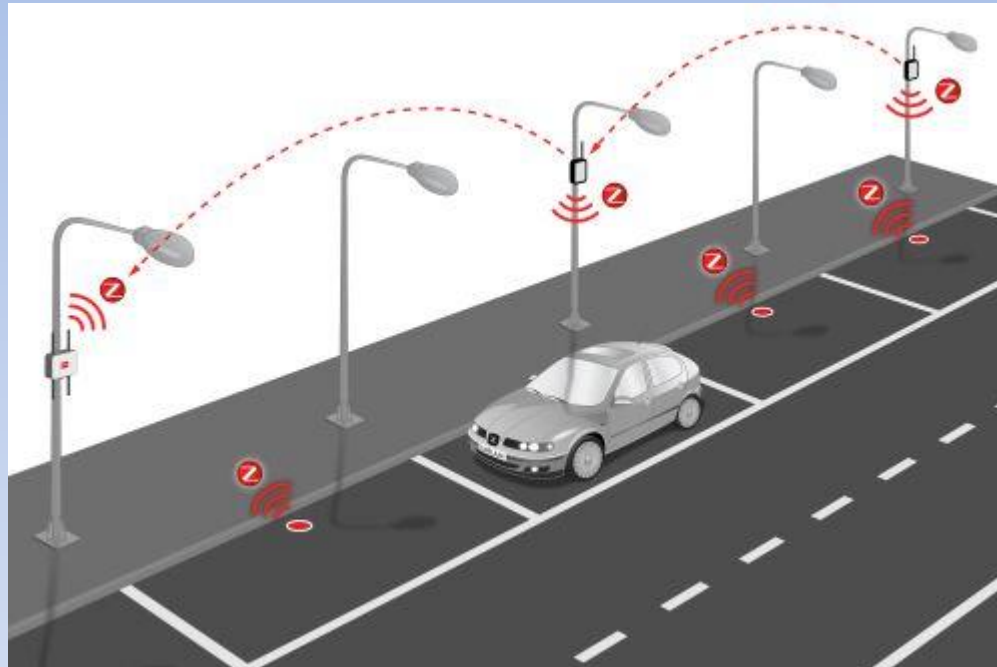
Beispiel Smart Car



Fully connected smart car..



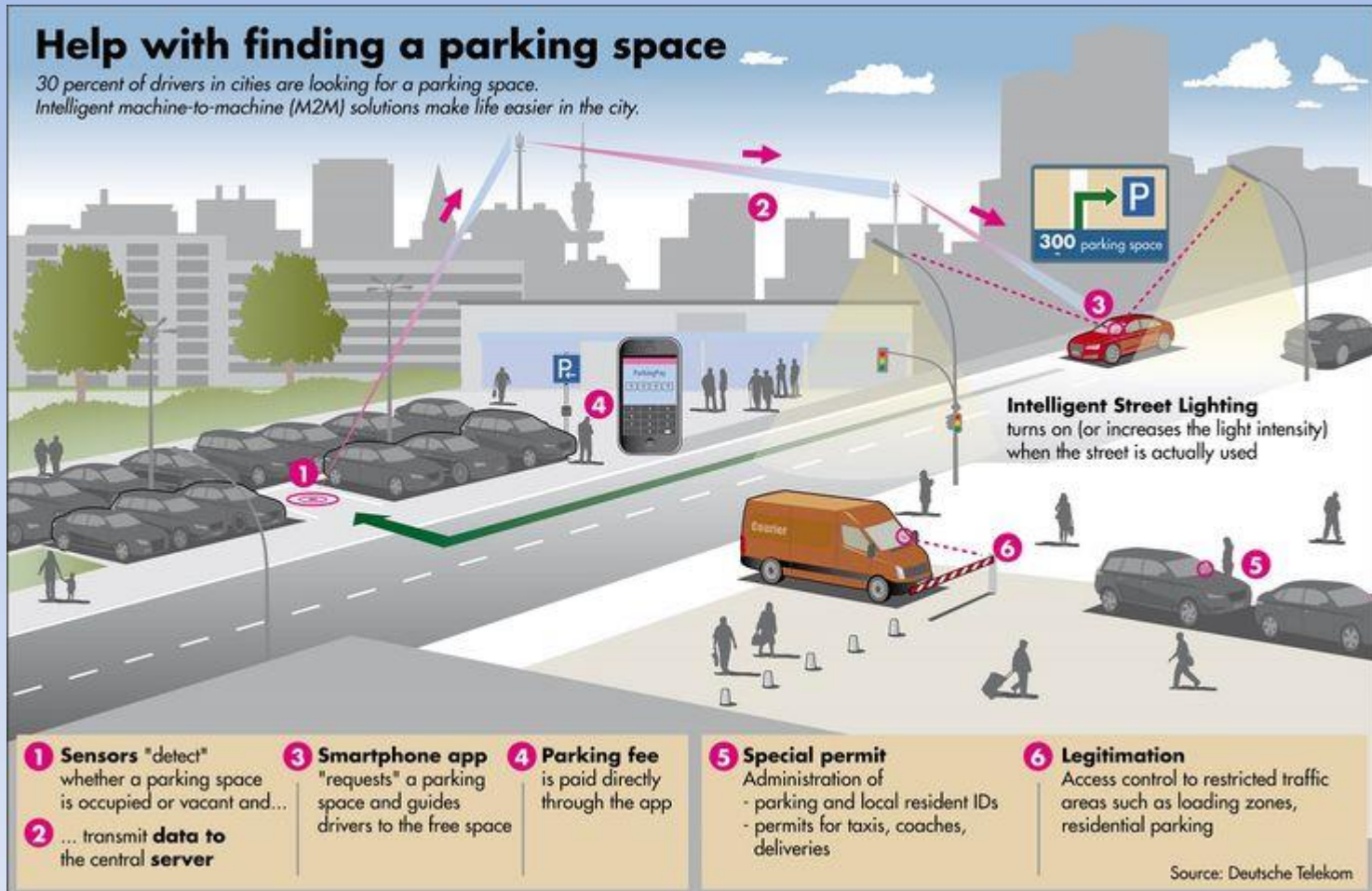
Beispiel Smart City: Smart-Parken



Beispiel Smart City: Smart-Parken

Help with finding a parking space

30 percent of drivers in cities are looking for a parking space.
Intelligent machine-to-machine (M2M) solutions make life easier in the city.



Beispiel Smart Home / Smart Retail

Autonomous Business

The Smart Store Cupboard



1 A smart cupboard is installed in the user's home and maintained by a supplier/operator.



2 User instructs cupboard to maintain levels of laundry soap, along with other items.



3 User takes laundry soap from cupboard, triggering the renewal process.



4 Cupboard broadcasts request for prices on laundry soap to ecosystem of suppliers.



5 Competing suppliers receive order and calculate product pricing according to supply chain / margin strategies (e.g. a discount to move stock).



6 Suppliers automatically select cheapest delivery option to customer's location from logistics partners, and offer final price.



7 Cupboard selects best offer and places order with winning supplier.



8 Item is delivered by autonomous vehicle or drone and received by cupboard.

Keep London Moving!!

Hey Mr. Boris : <https://www.youtube.com/watch?v=lpwboQxVJtg>

Smart City : <https://www.youtube.com/watch?v=z86TAFzwzi4>

Fake IoT...

IoT ist NICHT nur eine Fernbedienung übers Internet

Garagetür-öffner übers Internet

Leuchten ein- ausschalten..

Heizung ein- ausschalten..

Sicherheit... (keine Kleinigkeit!)

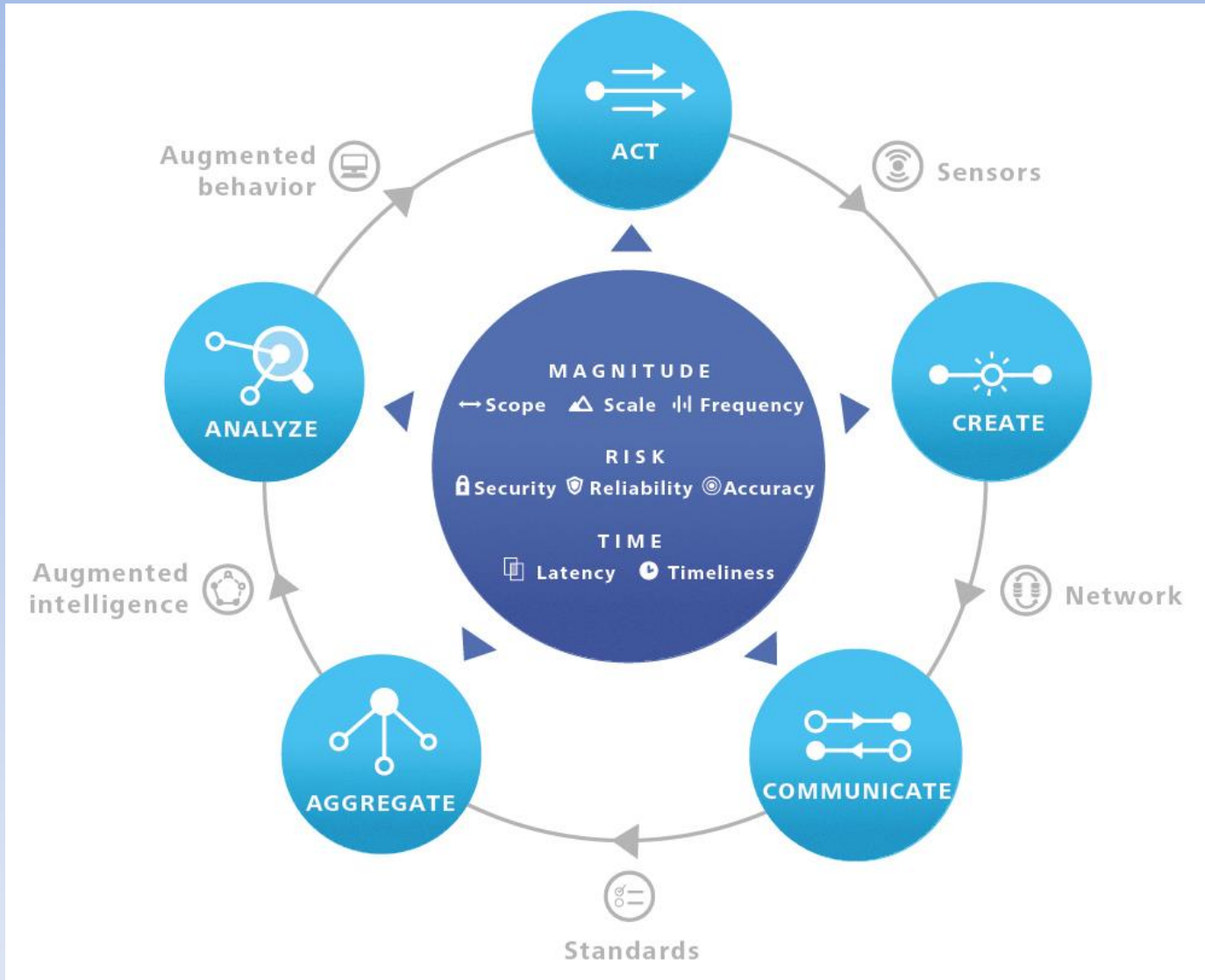
Früher hatten Menschen nur 2 Angriffs-Vektoren:

-Ihr Browser

-E-mail

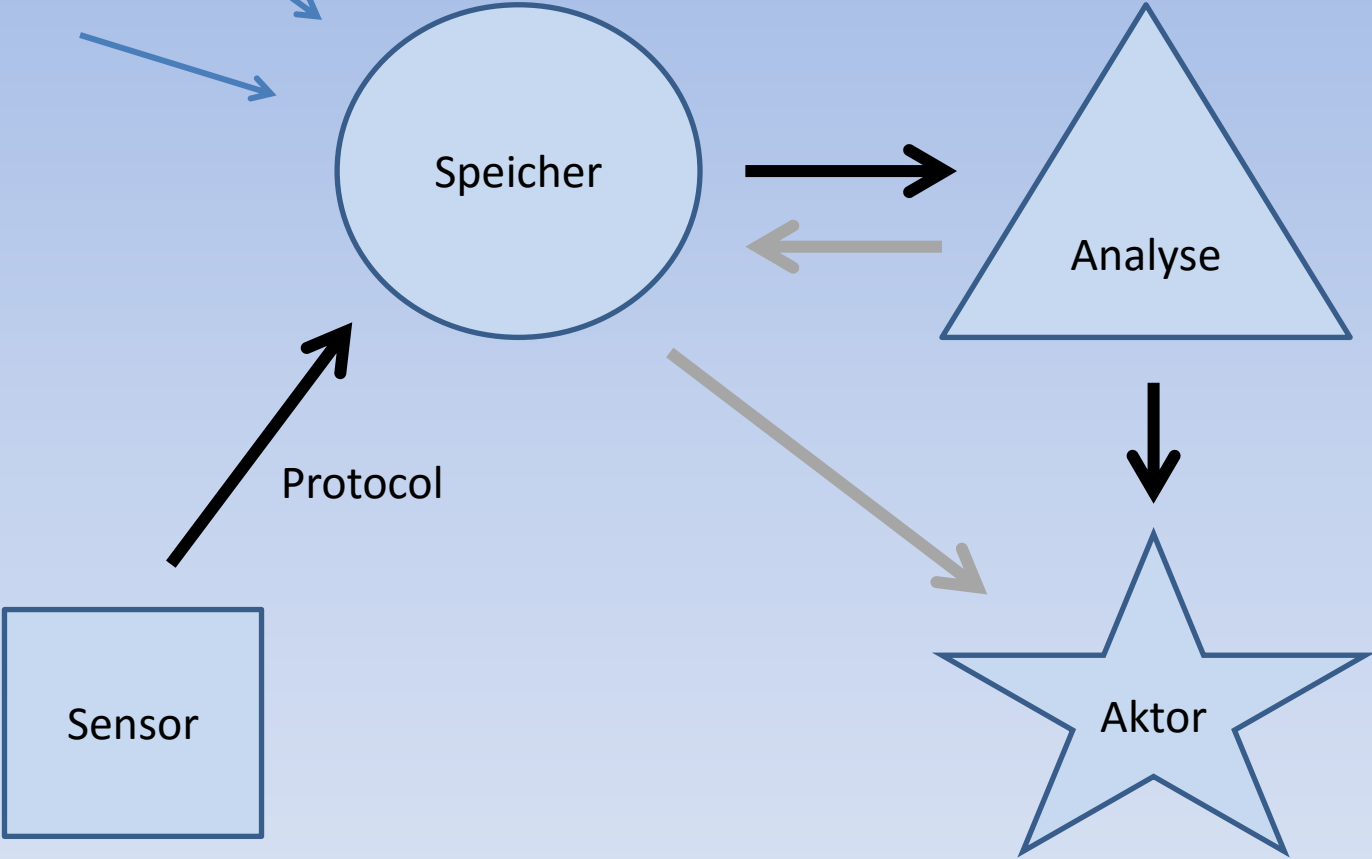
Aber wenn wir 50 Systeme um uns herum haben
die ALLE mit Internet verbunden sind...

IoT Informations-Kreis



IoT Architektur

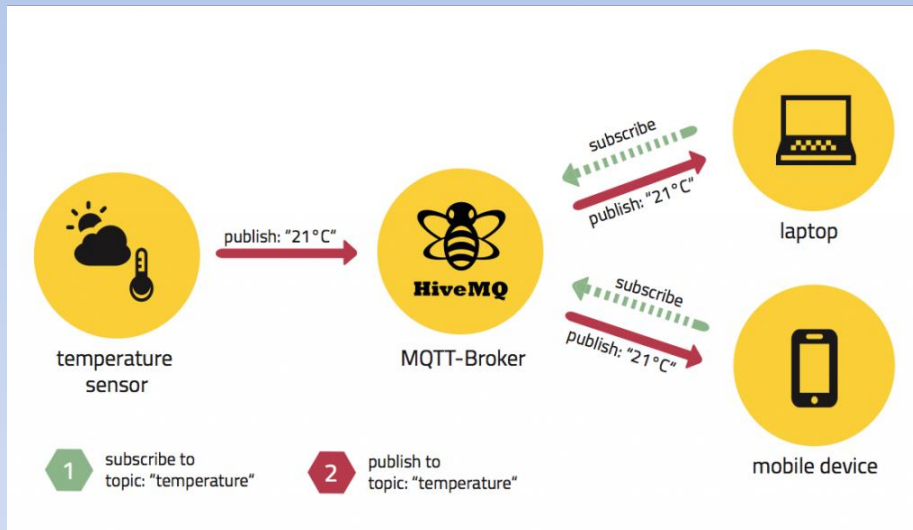
Sensoren,
Internet-Infos,
Smartphone,
Usw.





MQTT.ORG

Message Queue Telemetry Transport



Publish
Subscribe
Retain
LWT
QoS

Refcard : <https://dzone.com/refcardz/getting-started-with-mqtt>

HiveMQ : <http://www.hivemq.com/blog/mqtt-essentials-part-1-introducing-mqtt>

LoRaWan

Long Range Wide-Area Network

Router für IoT-Geräte (868Mhz)

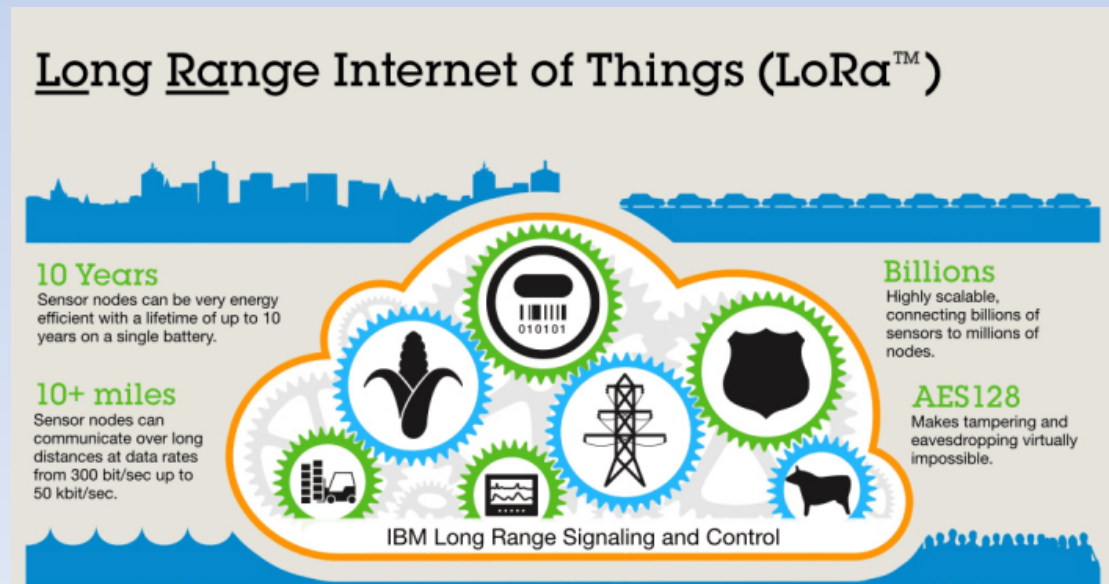
Kleine Nachrichten niedrige Geschwindigkeit

Bereich:

- Stadt ca. 1km

- Im Freien ca. 10-12km (Line-of-Sight)

<http://thethingsnetwork.org/>



Weshalb ist der Entwurf/Herstellung von ein IoT-Produkt so schwer?

Man muss Verstand haben von:

- Hardware (Sensoren-Technik)
- Embedded Software
- Comm. Protocolle
- Sicherheit
- Back-end-Design
- Databases
- Analytics
- Front-end Design (UI)
- User-Experience-Design
- Business-model

Internet of Things wird die Welt verändern!

Gut....

(jeder Mensch sein eigener Virtual Personal Assistant
- Keine Apps sondern “Smart Agents”)

und

Schlecht!!

(weniger Jobs...)

ESP8266

System on a Chip



by Espressif



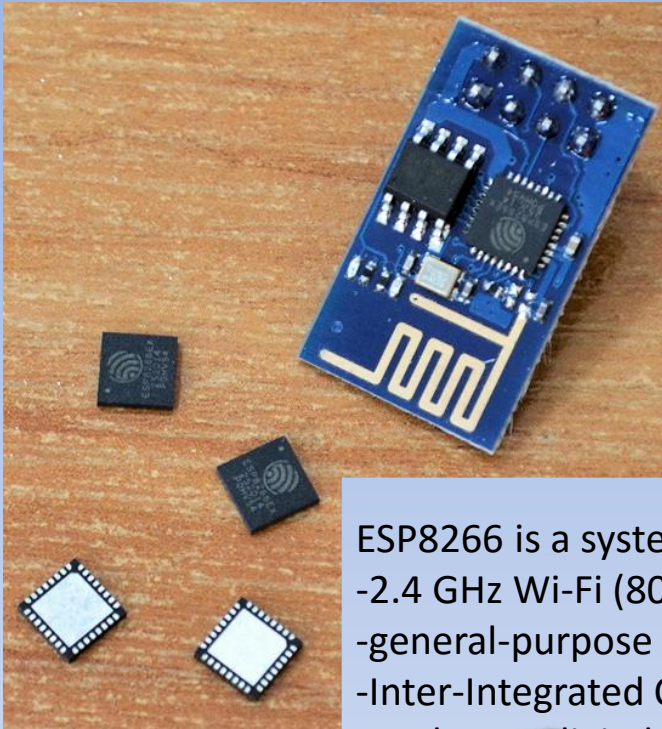
ESP8266

"Arduino-killer"??

System On a Chip
32-bit CPU
512Kb - 4Mb
Wi-Fi

Hackerspace Bremen

30.01.2016
11:00—17:00



ESP8266 is a system-on-a-chip (SoC) with capabilities for:

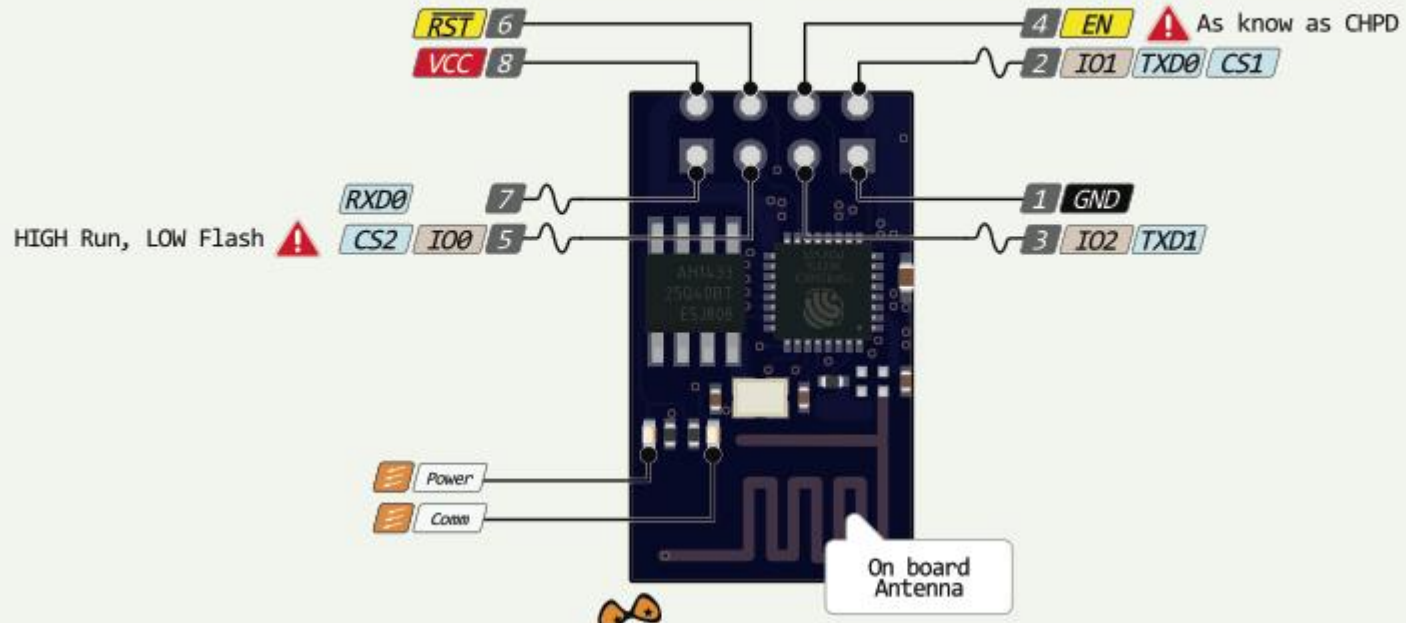
- 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2)
- general-purpose input/output (16 GPIO)
- Inter-Integrated Circuit (I²C)
- analog-to-digital conversion (10-bit ADC)
- Serial Peripheral Interface (SPI)
- I²S interfaces with DMA (sharing pins with GPIO)
- UART (on dedicated pins, plus a transmit-only UART can be enabled on GPIO2)
- pulse-width modulation (PWM)

It employs a 32-bit RISC CPU based on the Tensilica Xtensa LX106 running at 80 MHz or 160 MHz

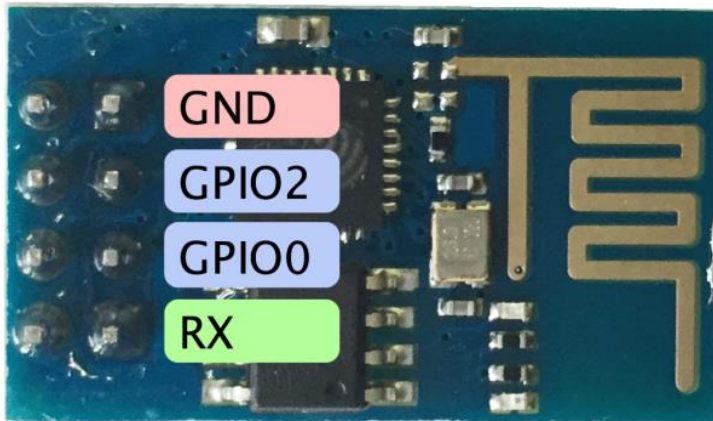
It has a 64 KB boot ROM, 64 KB instruction RAM and 96 KB data RAM. Further, the chip supports external SPI flash memory up to 4Mb.

ESP-01

⚠ Absolute MAX per pin 12mA
recommended 6mA



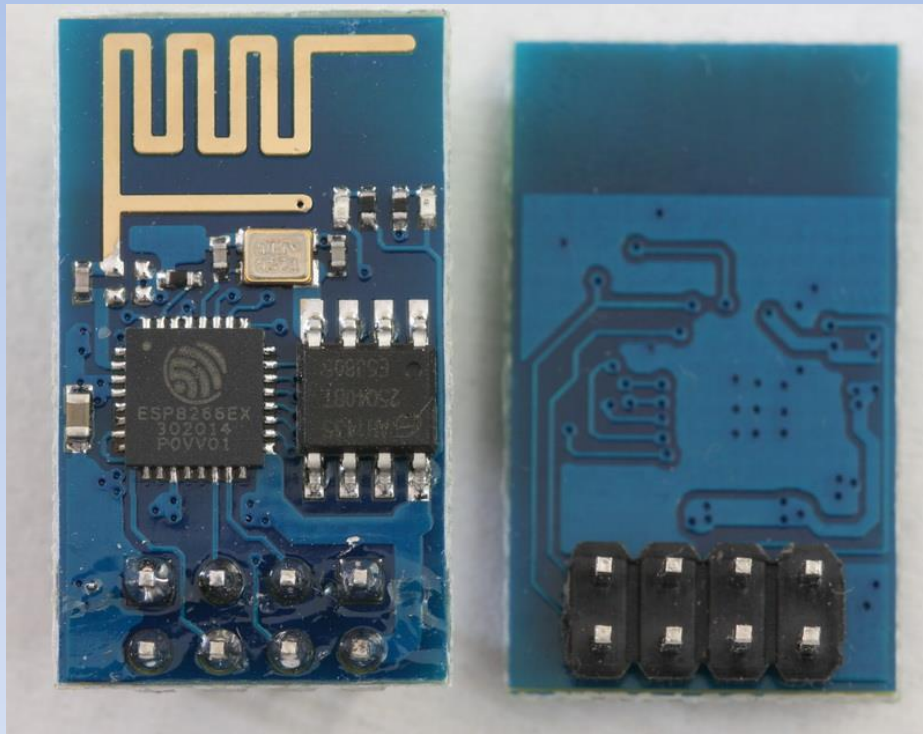
TX
CH_PD
RST
VCC



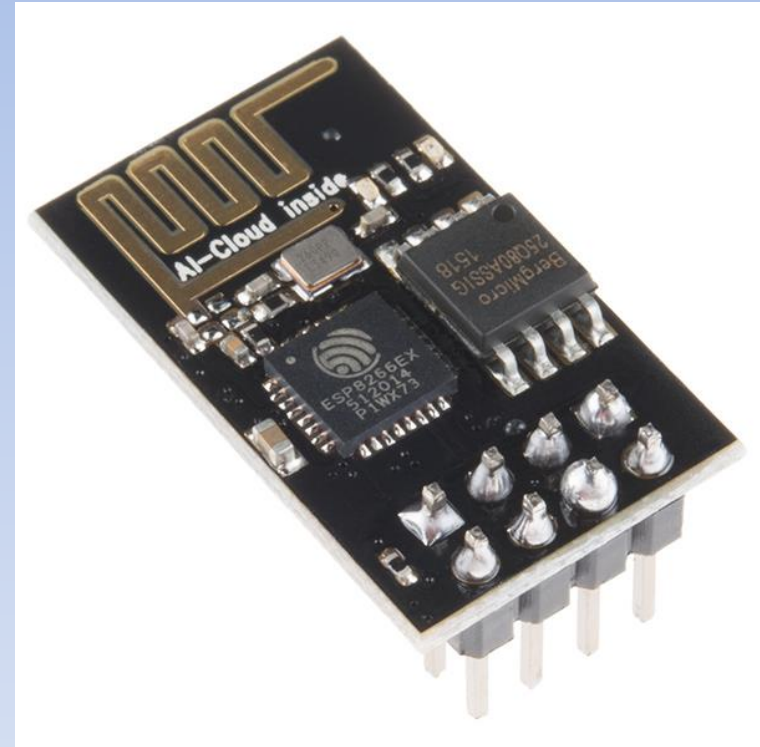
3,3 Volt !! !! !!

Keep the smoke in the Chip!

ESP8266 -01

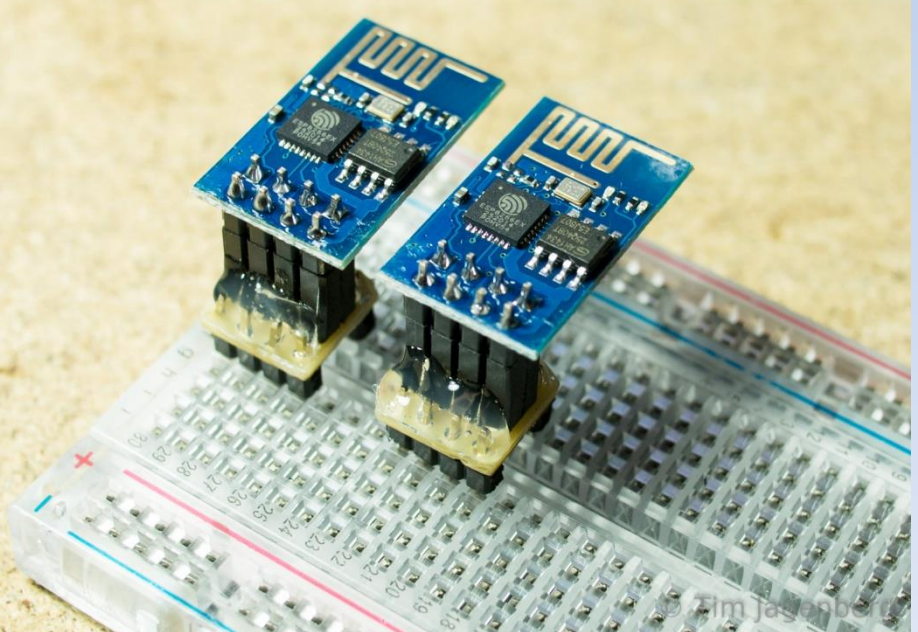
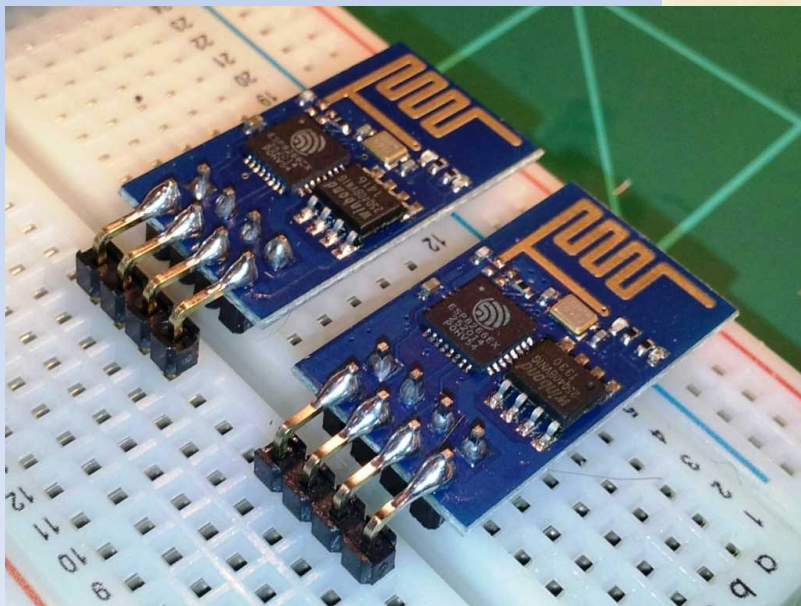
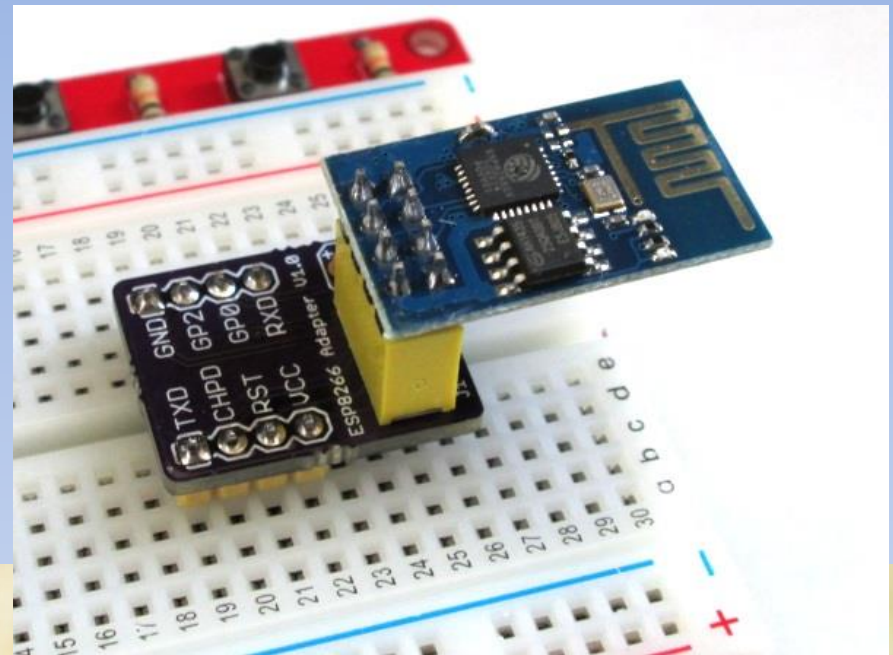


Alt 512k



Neu 1M

**NICHT
Breadboard-freundlich!**



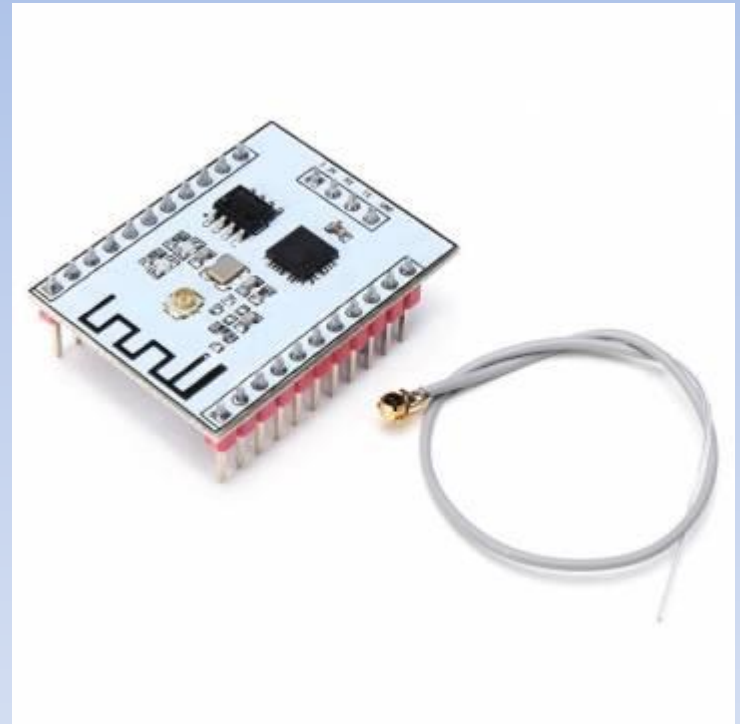
ESP-201

alle IO

ADC

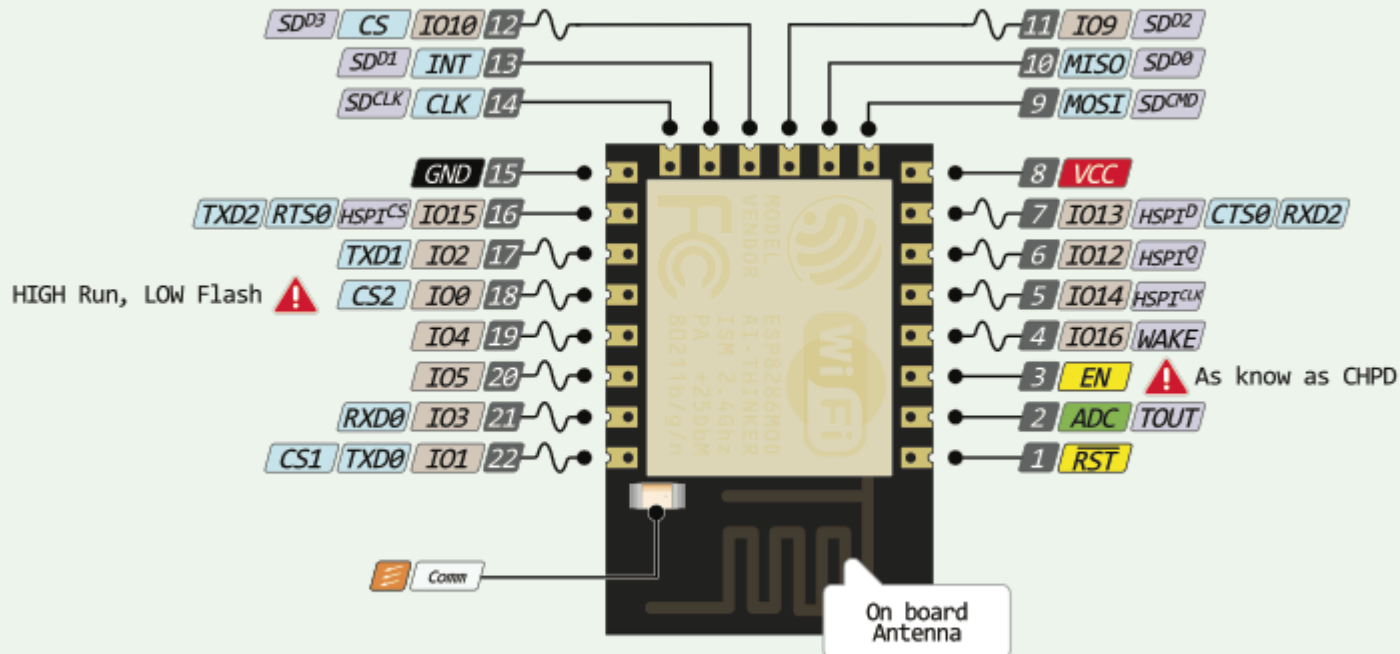
Externe Antenne

Aber nur 512k



ESP-12

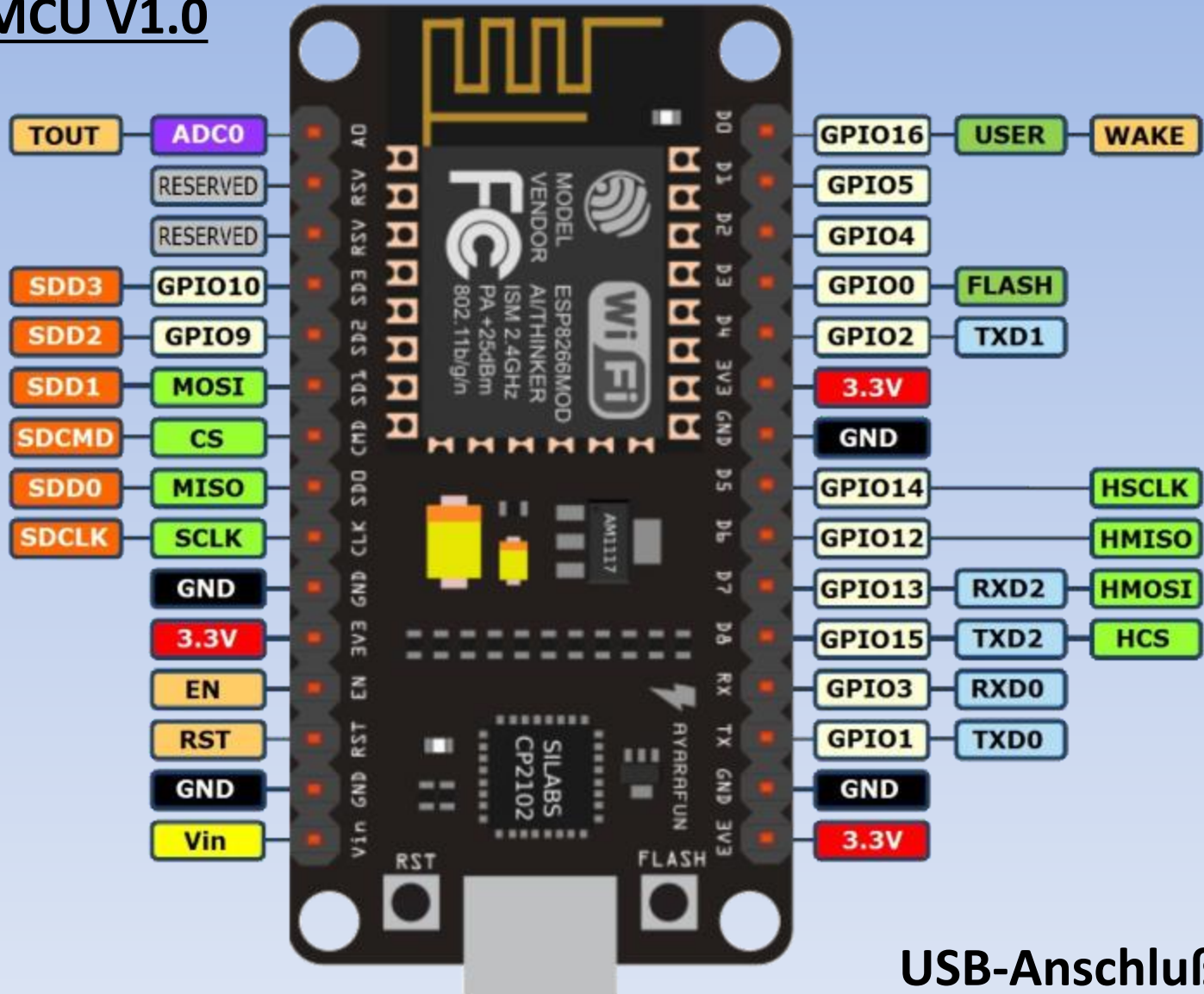
⚠ Absolute MAX per pin 12mA
recommended 6mA



HIGH Run, LOW Flash ⚠

- ⊘ When you use the sleep mode, I016 and RST should be connected and I016 will output LOW to reset the system at the time of wakeup.
- ⊘ On every boot/reset/wakeup I015 must keep LOW, I02 must keep HIGH.

NodeMCU V1.0



USB-Anschluß

NodeMCU



V1.0

V0.9

Versionen mit
CH340
D210
USB-drivers!!

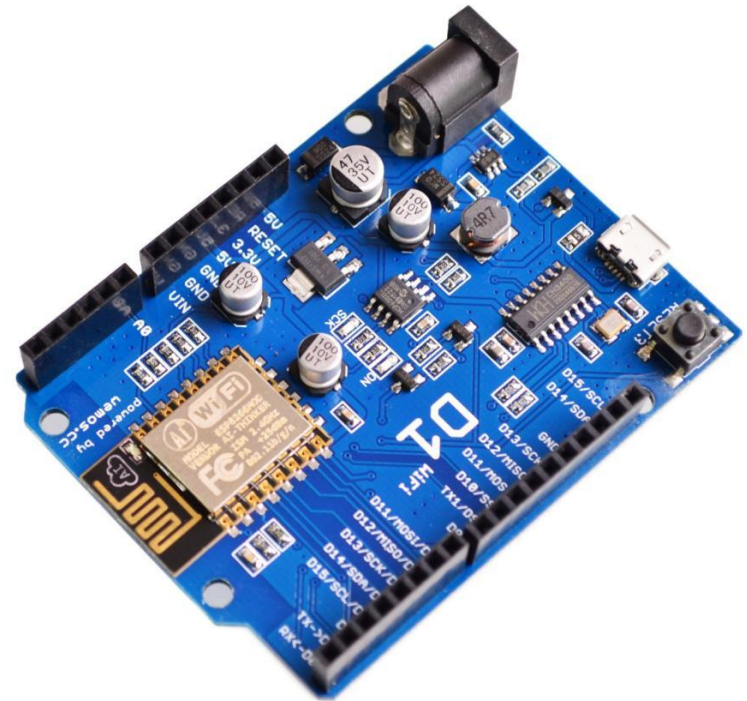
WeMos Development Boards



TOP



BOTTOM



Digital Humidity Temperatur Sensor 22

DHT22 pins	
1	VCC
2	DATA
3	NC
4	GND



Passiv Infra Rot sensor (Bewegungsmelder)



Normal 5Volt... funktioniert intern auf 3,3Volt....

http://www.electrodragon.com/w/index.php?title=HC-SR501_PIR_Motion_Sensor_%28Passive_Infrared_Sensor%29

Libraries

- Github
- Adafruit
- Esp8266.com

Standard kommt der ESP8266 mit “AT-commands”

Aber die Firmware-programmieren kann man in:

-C

-LUA

-Basic

-Javascript

-Lisp

-Micro-Python

ESP8266 Firmware mit Arduino IDE

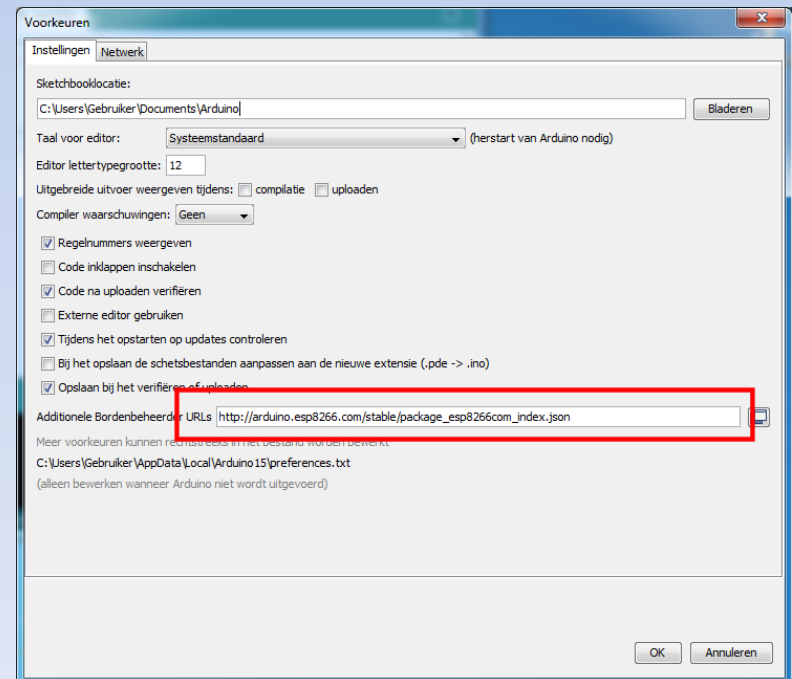
Install Arduino 1.6.5 from the [Arduino website](http://arduino.cc/).

Start Arduino and open Preferences window.

Enter `http://arduino.esp8266.com/stable/package_esp8266com_index.json` into *Additional Board Manager URLs* field.

You can add multiple URLs, separating them with commas.

Open Boards Manager from Tools > Board menu and install *esp8266* platform (and don't forget to select your ESP8266 board from Tools > Board menu after installation).



Platformio

PlatformIO is an open source ecosystem for IoT development
Cross-platform code builder. Continuous and IDE integration.
Arduino and MBED compatible

Constant Library Management



Nicht vergessen:
Python 2.7
Notepad ++
Serial Terminal

(Github's) Atom-editor mit Platformio Package

Super editor

Direkt aus Atom Build und Upload

Sogar Over-The-Air

Nicht vergessen:

Clang

NodeMCU ESPlorer

The screenshot displays the NodeMCU ESPlorer v0.2.0-rc2 by 4ref0nt interface. The main window is divided into several sections:

- Code Editor:** Shows a Lua script named `pomp3.lua` with the following code:

```
111  
112 function showheartbeat()  
113   if heartUp then  
114     heartbeatValue = heartbeatValue + heartbeatInc  
115     if heartbeatValue > 1020 then  
116       heartbeatValue = 1020  
117       heartUp = false
```
- Terminal:** Displays the output of the program, including:

```
.....  
Got answer! AutoDetect firmware...  
Can't autodetect firmware, because proper answer not received.  
Communication with MCU...  
Got answer! AutoDetect firmware...  
Can't autodetect firmware, because proper answer not received.  
stdin:1: unexpected symbol near 'ú'  
>  
-----  
No files found.  
-----  
>  
Total : 3441461 bytes  
Used : 4769 bytes  
Remain: 3436692 bytes  
  
> =node.heap()  
21216  
> =node.info()  
0 9 5 1138503 1458400 4096 2 40000000  
> #HlzGàèL   XxIÃñihB    4xCÿ p    
  
NodeMCU 0.9.5 build 20150318 powered by Lua 5.1.4  
lua: cannot open init.lua  
>
```
- Configuration Window (Nodemcu Firmware Programmer):** Shows the COM port set to `COM10` and the `Flash(F)` button. It also displays `AP MAC Waiting MAC` and `STA MAC Waiting MAC`.
- Bottom Panel:** Contains buttons for `Save&Run`, `Save&Compile`, `Save&Compile&Run...`, `Save As init`, `Save&Compile All`, `View on ESP`, `Save&Compile`, `Save to ESP`, `Send to ESP`, `Run`, `Upload ...`, `Heap`, `Chip Info`, `Chip ID`, `Flash ID`, `Reset`, `Send`, `CR`, `LF`, and a `Donate` button.

In LUA sind Nummern von GPIO durcheinander!!! (check die Tabelle)

Viel einfache Beispiele:

http://www.electrodragon.com/w/ESP8266_NodeMCU_Lua

http://nodemcu.com/index_en.html

<https://learn.adafruit.com/adafruit-huzzah-esp8266-breakout/using-nodemcu-lua>

Custom Builds NodeMCU

<http://nodemcu-build.com/>

NodeMCU mit nur was man braucht
Mehr Speicherplatz..

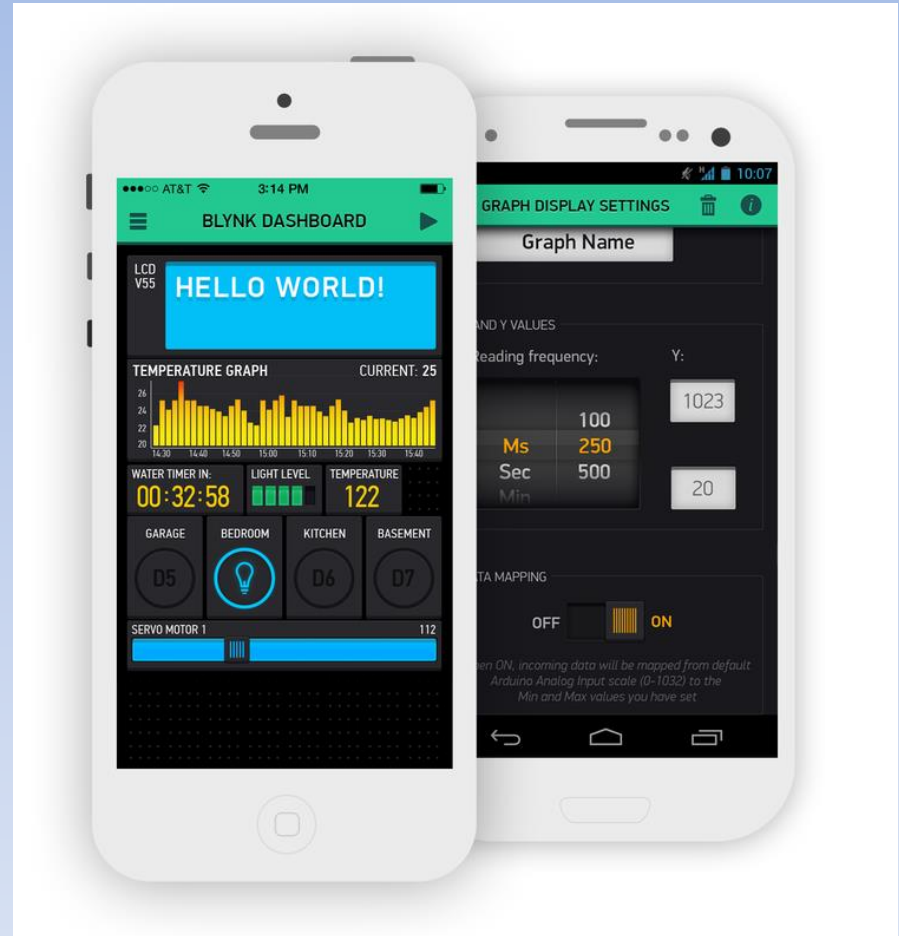
Blynk

<http://www.blynk.cc/>

GUI für IoT

Dashboard-app womit man
seinem ESP8266 steuern
kann.

Drag and Drop



What's next?

ESP32

<https://www.sparkfun.com/news/2017>

2 Prozessoren

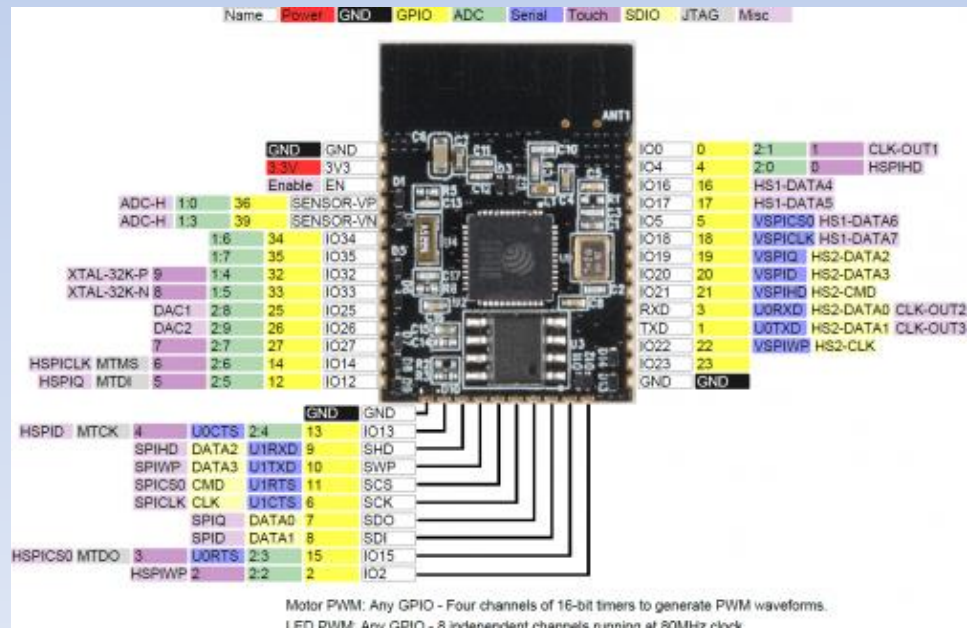
36 GPIO

-16 ADC + 2 DAC

-10 cap.sensing GPIO

-BLE+WiFi

-bis zu 64Mb Flash



Web-resources:

<http://www.esp8266.com/>

<http://blog.squix.ch/>

<http://tech.scargill.net/> und facebook “esp8266wifi”

https://www.youtube.com/channel/UCu7_D0o48KbfhpEohoP7YSQ/videos

Facebookgruppe “esp8266 deutschland”

Baoshi

<http://www.ba0sh1.com/>

<https://www.youtube.com/watch?v=fXs99u6AcWc>

Neil Kolban’s Buch (410 seiten!!)

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