

IoT Workshop

Ablauf

17:00 Start

17:00 - 17:45 Uhr Einweisung Hardware und Node-Red Szenario

17:45 - 18:00 Uhr Einweisung SAP Cloud

18:00 - 19:30 Uhr Do It Yourself + Pizza

Gruppen

Gruppe Stuttgart -> Ziel Sensor bauen für das Stuttgart Büro => Christoph

Gruppe 1 Schwerin -> Ziel Sensor bauen (4 Personen) => Christoph

Gruppe 2 Schwerin -> Ziel Sensor bauen (4 Personen) => Christoph

Gruppe 3 Schwerin -> Ziel Node-Red ertüchtigen (3 Personen) => Christoph

Gruppe 4 Schwerin -> Ziel SAP Cloud ertüchtigen (4 Personen) => Niclas

Bei Fragen kommt gerne auf uns zu!

Definition

The Internet of things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure.

Vgl. https://en.wikipedia.org/wiki/Internet_of_things

Der Begriff wird für vieles verwendet was mit dem Internet verbunden wird: <https://www.expertenderit.de/blog/iot-definitionen-was-ist-eigentlich-das-internet-der-dinge>

Der Begriff ist nicht neu - erstes Auftreten 1999 - Ideen bereits in den 1980er Jahren.

Neu ist die Menge und Leichtigkeit mit der die Geräte verbunden werden können.

Der Begriff wird auch gerne für das Marketing verwendet um mit dem Internet verbundene Dienste zu bezeichnen.

Libelium Smart World

Air Pollution

Control of CO₂ emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection

Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing

Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care

Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care

Vital signs monitoring in high performance centers and fields.

Structural Health

Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Quality of Shipment Conditions

Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Smartphones Detection

Detect iPhone and Android devices and in general any device which works with WiFi or Bluetooth interfaces.

Perimeter Access Control

Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels

Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels

Measurement of the energy radiated by cell stations and WiFi routers.

Traffic Congestion

Monitoring of vehicles and pedestrian affluence to optimize driving and walking routes.

Smart Roads

Warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Smart Lighting

Intelligent and weather adaptive lighting in street lights.

Intelligent Shopping

Getting advices in the point of sale according to customer habits, preferences, presence of allergenic components for them or expiring dates.

Noise Urban Maps

Sound monitoring in bar areas and centric zones in real time.

Water Leakages

Detection of liquid presence outside tanks and pressure variations along pipes.

Vehicle Auto-diagnosis

Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

Item Location

Search of individual items in big surfaces like warehouses or harbours.

Waste Management

Detection of rubbish levels in containers to optimize the trash collection routes.

Smart Parking

Monitoring of parking spaces availability in the city.

Golf Courses

Selective irrigation in dry zones to reduce the water resources required in the green.

Water Quality

Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.

Internet of Things Landscape 2016

Applications (Verticals)

The figure displays a comprehensive list of 100 startups, organized into 10 categories, each represented by a colored box containing logos. The categories and their respective startups are as follows:

- Personal:** Apple Watch, Samsung Gear, Pebble, LG, Huawei, Fitbit, Jawbone, TomTom, Garmin, Microsoft Band, Fitbit, RunKeeper, LifeBeam, Athos, Lark, SenSara, WHOOP, Striv.
- Wearables:** (Logos for various wearable devices and brands).
- Fitness:** (Logos for fitness trackers and apps).
- Health:** (Logos for health monitoring and wellness startups).
- Entertainment:** (Logos for entertainment and media startups).
- Sports:** (Logos for sports-related startups).
- Home:** Nest, Lixif, Honeywell, Ecobee, Culltron, Orvibo, Level, Sonoff, Tado, Aqara, Hubitat, Insteon, Iris, Bosch, Vera, Predeo, Ninjablocks, Fluant, Nexia, Zonoff.
- Automation:** (Logos for home automation systems).
- Hubs:** (Logos for central home control hubs).
- Security:** August, Schlage, Kwikset, Dropcam, Canary, Vivint, Ring, Xovi, Latch, Evercam, Locktron, Seco, Scout24.
- Kitchen:** (Logos for smart kitchen appliances).
- Pets:** (Logos for pet-related startups).
- Garden:** (Logos for smart gardening tools).
- Trackers:** (Logos for asset and location tracking devices).
- Vehicles:** Inrix, Waze, Automatic, Stryte, Dash, Zeb, Navdy, AutoNavi, Vinli, Arity, OpenXC.
- Automobiles:** (Logos for automotive technology startups).
- Autonomous:** (Logos for self-driving car technology).
- UAVs:** DJI, SkyCatch, Skydio, Yuneec, Parrot, Airware, Lily, DroneDeploy, iXEO, DRL.
- Space:** (Logos for space exploration and satellite technology).
- Bicycles/Motorbikes:** (Logos for smart cycling and motorcycling equipment).
- Enterprise:** Stanley, Augmedix, Versus, Micio, Stetson, Sirona, Omnicore, Senoconics, Fiberoptic, Vivify, Airstrip, Bioica, Genesense, TeleTagging, Precision, PreScribe.
- Healthcare:** (Logos for medical technology startups).
- Retail:** Euclid, Gimbal, Puma, Nomi, Variable.
- Payments/Loyalty:** PayPal, Shopify, Square, Verifone, Paycom, Coin, Comstock, ShopKeep, Ciright, LevelUp, ETL.
- Smart Office:** LogiMeth, Crestion, Kisi, Robin, Xora, Everboard.
- Agriculture:** (Logos for smart farming technology).
- Infrastructure:** (Logos for infrastructure development and management).
- Industrial:** Caterpillar, Siemens, Bosch, Schneider, Iron, Enlighted, SeaCity, Trilliant, Enervox, EnerNOC, Liberty, JDS, Retnet, Genolux, e-on, LUCID, EnergyJenny, Powerhouse, Lucid, Aurore, Neptune, SunCity, Tenergy.
- Machines:** (Logos for industrial machinery and equipment).
- Energy:** (Logos for renewable energy and power management).
- Supply Chain:** (Logos for supply chain optimization and logistics).
- Robotics:** Amazon Robotics, ABB, Clearpath, KUKA, Empire, Liquid Robotics, OpenRV.
- Industrial Wearables:** (Logos for wearables used in industrial settings).
- Family:** (Logos for family-oriented technology products).
- Toys:** (Logos for smart toys and entertainment for children).
- Elderly:** (Logos for technology products designed for the elderly).
- Consumer Robotics:** (Logos for consumer-grade robots).

Platforms & Enablement (Horizontal)

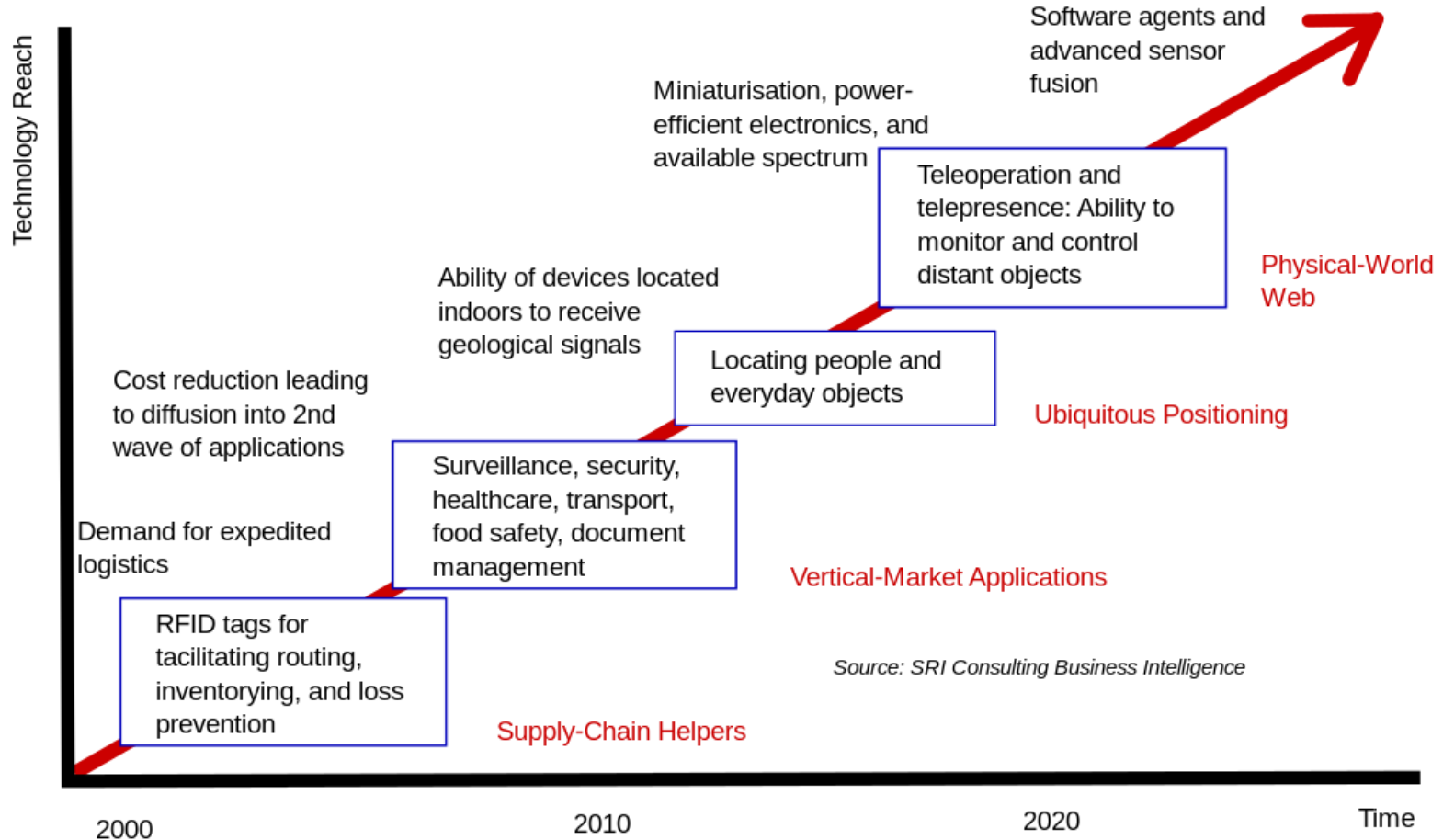
The diagram illustrates the interconnected ecosystem of the Metaverse, organized into 17 categories, each represented by a colored box containing logos of key players:

- Software:** xively, Axeda, Jasper, Lemnery, Ayla Networks, ThingWorx, Humana, seeeo, M2M, wot.io, covisint, AUTOGISK, SECURECONTROL, thingsquare, BSQUARE, PubNub, greenwave, M2M, WSilica, InnoPath, machineShop, C3IoT, arrayent.
- Platforms:** KEYWORD, EUROTECH, Predix, Telit.
- Full Stack:** Developer (resin.io, Particle, theThings.io, KONEKT, SensorCloud, NewAer), Analytics (splunk, sumologic, LOBEAM, KAAZING, Teroptio, UPTAKE, iotbeam), Sensor Networks (placemeter, SAFECASST, SST, MotionLoft).
- Connectivity:** SIGFOX, SIEMENS, FILAMENT, aeris, INGENU, VENIAM, KORE, intamac, skyroam, R KESSA, senet, oclify.
- Security:** Symantec, gemalto, Bastille, inside, MOCANA, NEURA, SHODAN, escrypt, SecurThings, CyberFlow, OWASP.
- Open Source:** KFO, ThingSpeak, IoT, webinars, openHAB, nimbits.
- Interfaces:** Virtual Reality (oculus, VIVE, PlayStation VR, Samsung Gear VR, OSVR, HTC VIVE), Augmented Reality (Microsoft HoloLens, magic leap, Meta, SONY, blippar, zSpace, VUZIX, EPSON, PARACOSM, heart), Other (amazon alexa, THALMIC, nod, EMOTIV, LEAP, SIXENSE, ivee, RYTHM, OTH, api.ai).
- 3D:** Printing / Scanning (Project Tango, intel, REALSENSE, stratasys, occipital, matterport, formlabs, DESKTOP METAL, Carbon, SelfFactory, shapeways, sculpteo, VOODOO), Content / Design (Sketchfab, Thingiverse, GRABCAD, AUTODESK, BODY LABS, FLOREO, DASSAULT SYSTEMES).

Building Blocks

Hardware Processors / Chips 			Software Cloud 			Connectivity Protocols 			Telecom 			Consultants / Services 			Partners Retail 			Incubators 		
Sensors 			Mobile OS Android 			M2M 			WiFi 			Alliances 			Funding 					
Parts / Kits 			Charging 			Relay 			Relay 			Relay 								

Technology roadmap: The Internet of Things



Beispiele für IoT Geräte

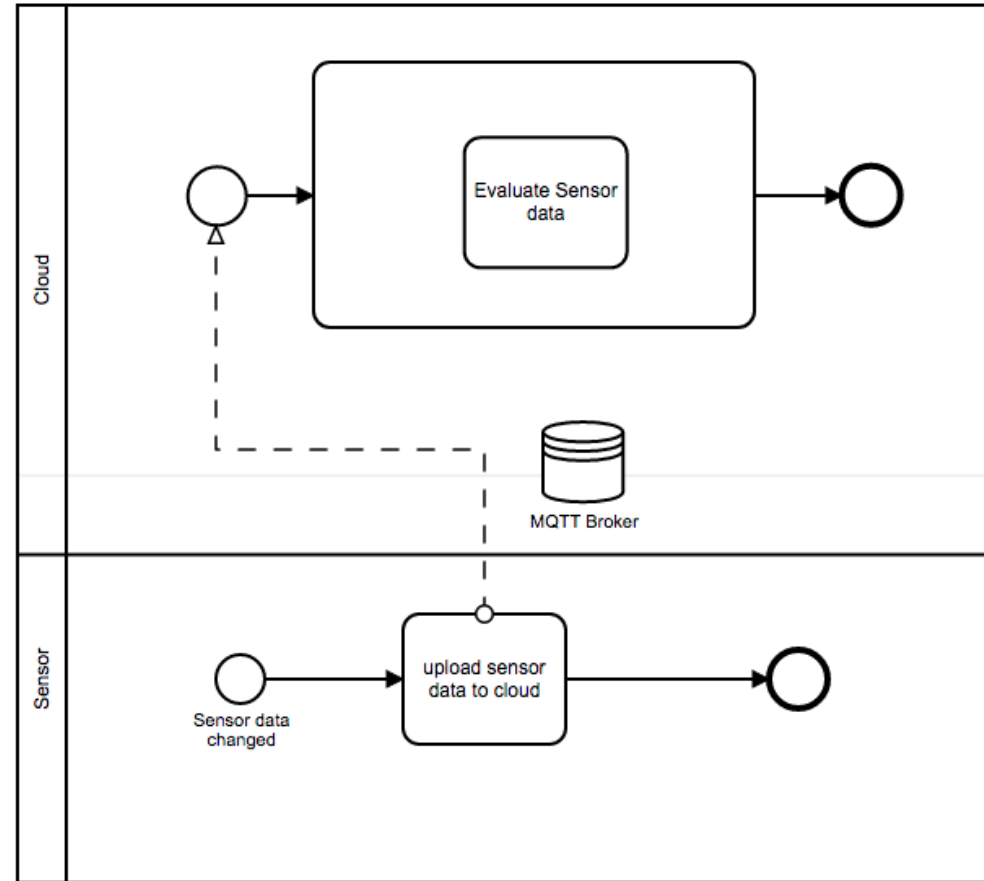
- Amazon Dashbutton zeitweise für 2 € mit WLAN / Bluetooth
- Super zum Steuern von einfachen Aktionen
- Nur für Prime Mitglieder :-)
- CCC Test und Debugging für Sicherheit bestanden



Was wollen wir machen

Sensordaten auslesen,
visualisieren und in die Cloud
schreiben.

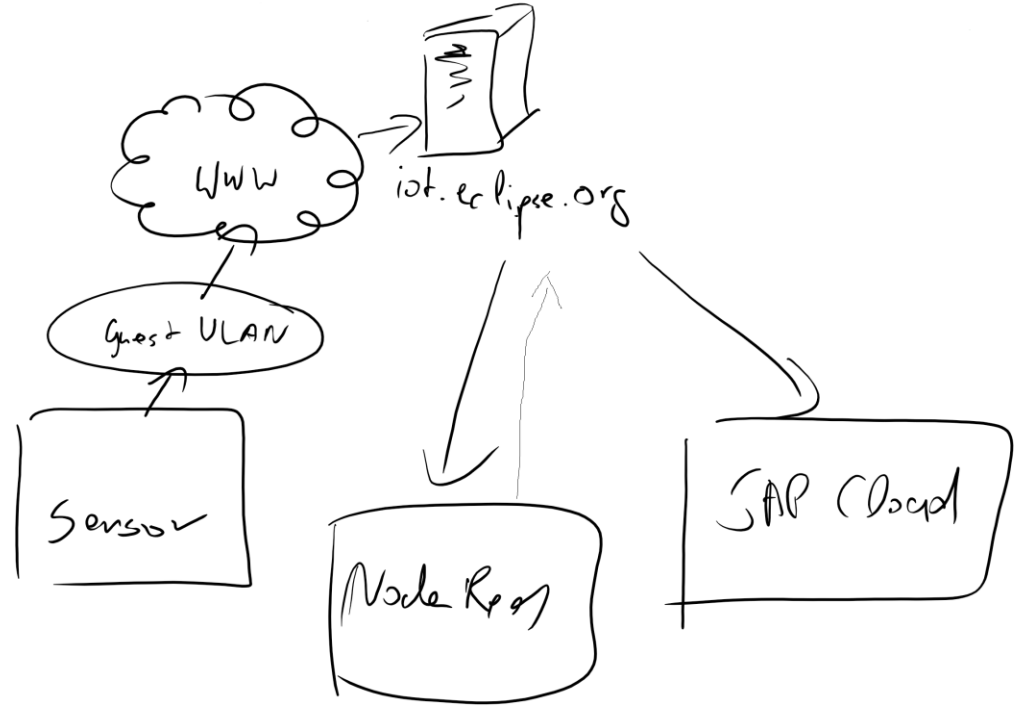
Sensordaten visualisieren.



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Sensordaten auslesen,
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Sensordaten visualisieren.



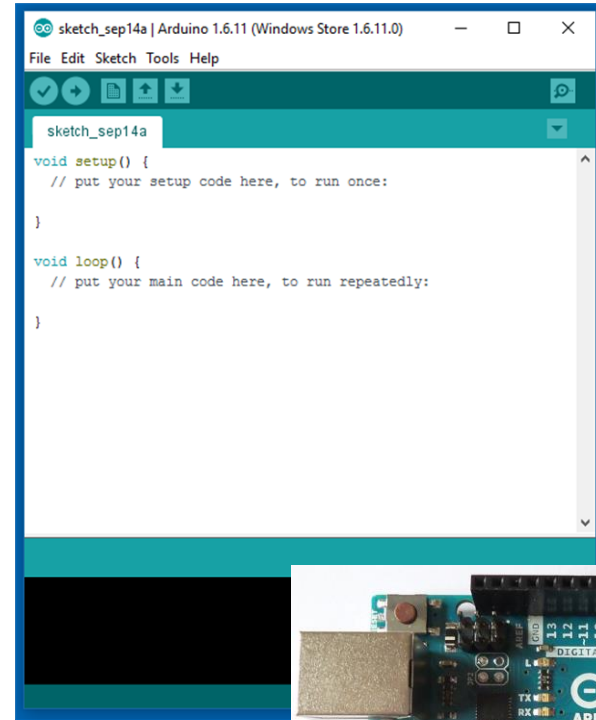
Grundlagen für Alle

Grundlagen Software

Arduino IDE - Entwicklungsumgebung für die Entwicklung von Programmen für Arduinos

MQTT - offenes Nachrichtenprotokoll für Machine-to-Machine-Kommunikation (M2M). OASIS Standard.

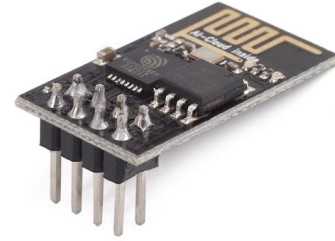
<https://docs.oasis-open.org/mqtt/mqtt/v3.1.1/os/mqtt-v3.1.1-os.html>



Grundlagen Hardware

NodeMCU / ESP8266 (2-3 €)

Wifi 32bit Microcontroller



Bosch BME280 (3 €)

Temperatur / Luftfeuchte / Luftdruck

-40...+85 °C, 0...100 % rel. humidity, 300...1100 hPa

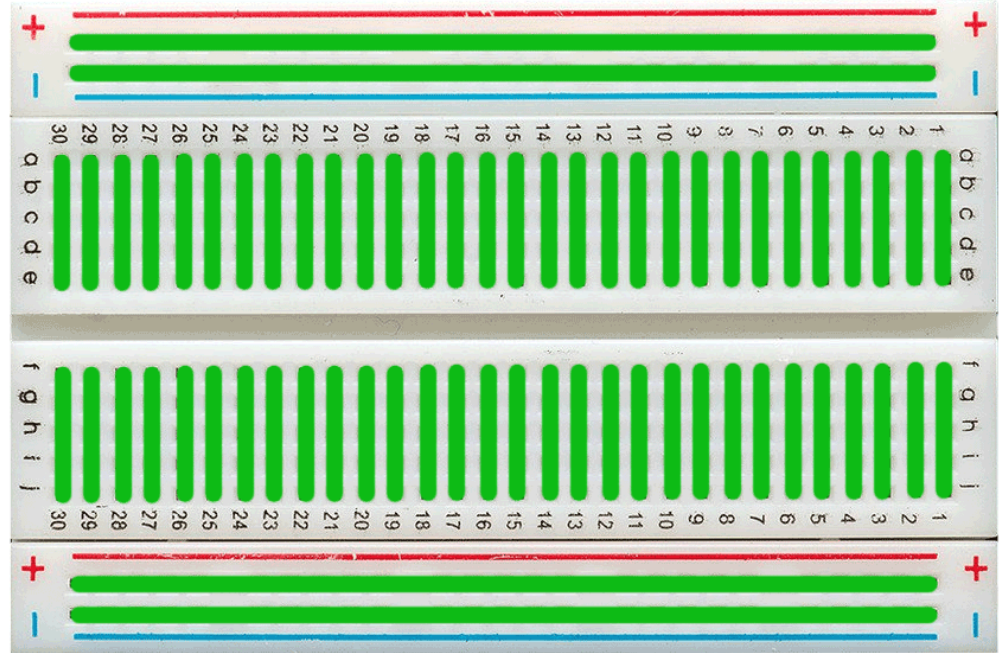
Grundlagen Hardware

NodeMCU / ESP8266 - 32bit Microcontroller mit Wifi

- Lua-basierte interaktive Programmierung (NodeMCU)
- Micropython (Pythonbasierte interaktive Programmierung)
- Arduino/C++ basierte Programmierung
- AT-Command für die Nutzung als Seriell-zu-WLAN-Schnittstelle
- ESP Easy zur Ansteuerung von Sensoren/Aktoren über Wlan
- ESP Basic

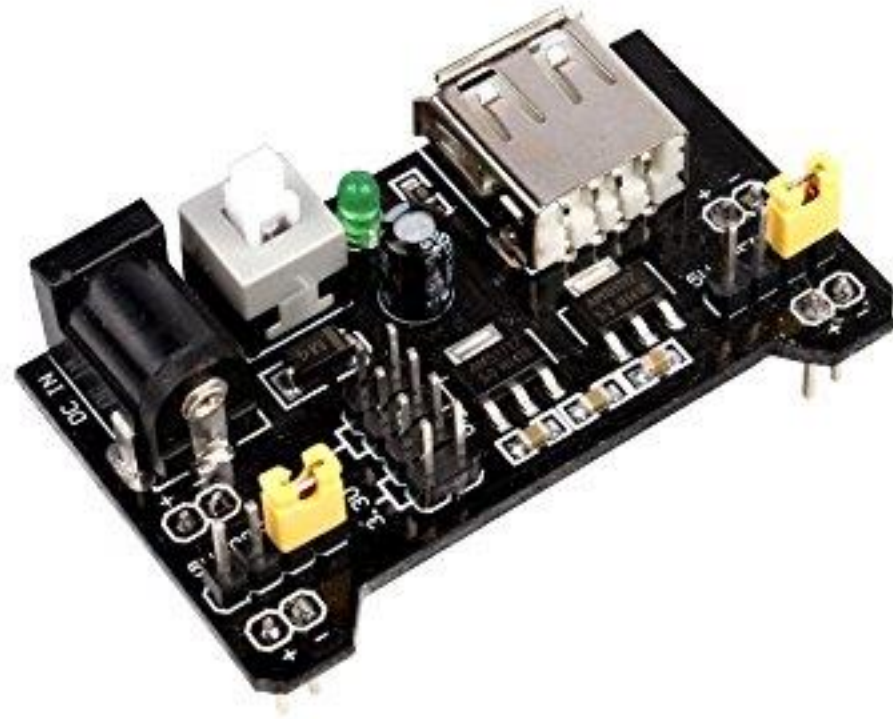
Breadboard - Steckbrett

- + - sind jeweils von links nach rechts verbunden
- das Steckfeld in der Mitte ist spaltenweise verbunden
- + - und 3,3Volt und 5 Volt nicht verwechseln



Stromversorgung

- bitte nur Arbeiten wenn Netzteil ausgezogen ist
- Wichtig, entweder Stromversorgung über das Netzteil oder über USB
- + - und 3,3Volt und 5 Volt nicht verwechseln
- ggf. gemeinsame Masseleitung verwenden



Grundlagen Netzwerkdienste

<http://iot.eclipse.org> bietet MQTT Server als Public Dienst an. Wir verwenden diesen hier als Datendrehscheibe.

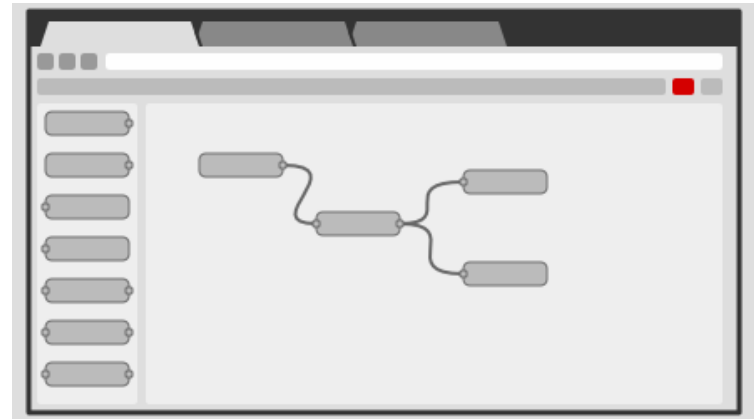
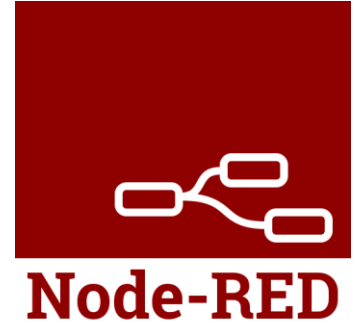
Achtung: Alle Daten sind öffentlich sichtbar!

Alternativ können die Geräte auch direkt HTTP uvm.

Node-Red

Node-Red

- Open-Source webbasierte Oberfläche um Flow-basierte Programmierung auszuführen
- Konzept aus den 70er Jahren von J. Paul Morrison
- Ursprünglich als IBM Projekt gestartet, jetzt von der JS Foundation verwaltet



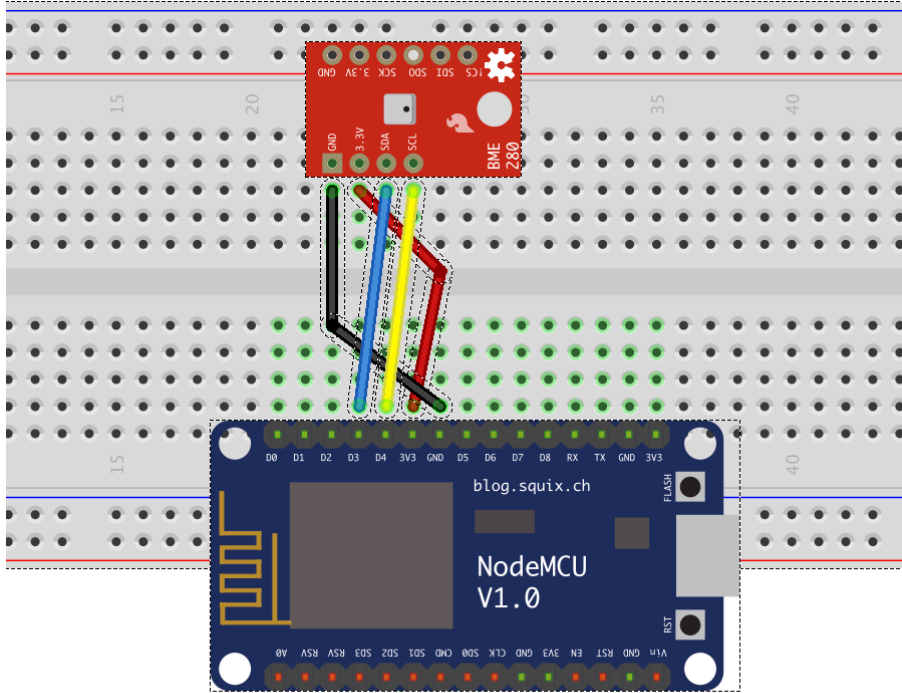
SAP Cloud

Gruppen: Sensor bauen

Ziel

- Sensor Daten in der Cloud per MQTT abliefern

Anleitung Verkabelung



- Rot - 3,3V -> VCC/VIN
- Schwarz - G -> GND = Masse
- Blau - D3 -> SDA
- Gelb - D4 -> SCL

Programmierung Wifi Verbindung herstellen

Programmierung Sensordaten lesen

Programmierung MQTT Verbindung herstellen

Programmierung Nachricht versenden

Stromversorgung anschliessen

- VIN und Masse (G) am NodeMCU wie folgt verbinden:
 - Power Supply -> NodeMCU
 - 5V + -> VIN
 - - -> G
- Passende Kabel gibt es bei Christoph

Gruppe Node-Red

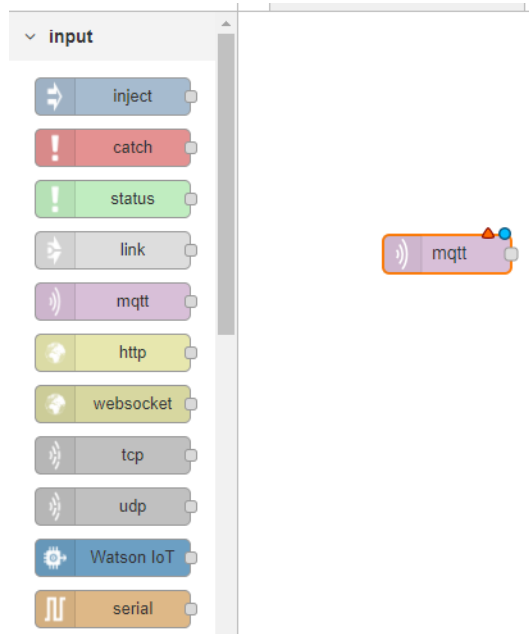
Ziele

- Sensordaten entgegen nehmen
- Sensordaten an SAP Cloud weiterleiten
- Sensordaten visualisieren

Programmierung Node-Red

- Starten über das Start Menü auf dem Raspberry
- Webbrowser öffnen und <http://localhost:1880> laden
- ein leere Flow ist bereits vorhanden

Programmierung Node-Red Daten von MQTT lesen



Programmierung Node-Red Daten von MQTT lesen

mqtt in > Add new mqtt-broker config node

Cancel Add

Connection

Security

Birth Message

Will Message

Server

iot.eclipse.org

Port

1883

☐ Enable secure (SSL/TLS) connection

Client ID

Leave blank for auto generated

Keep alive time (s)

60

☒ Use clean session

☒ Use legacy MQTT 3.1 support

Programmierung Node-Red Daten von MQTT lesen

Edit mqtt in node


Delete

Cancel

Done

▼ node properties

📍 Server

iot.eclipse.org:1883 ▼ 

📄 Topic

/t-h.de/sensor

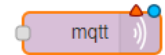
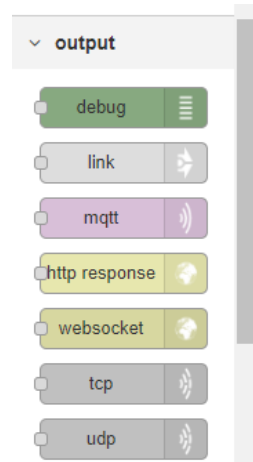
⚙️ QoS

2 ▼

🏷️ Name

Name

Programmierung Node-Red Daten nach MQTT publizieren



Programmierung Node-Red Daten nach MQTT publizieren

Edit mqtt out node

Delete

Cancel

Done

▼ node properties

🌐 Server

iot.eclipse.org:1883

✎

📄 Topic

to be filled in with SAP Team

🔊 QoS

▼

🔄 Retain

▼

🏷️ Name

Name

Tip: Leave topic, qos or retain blank if you want to set them via msg properties.

Programmierung Node-Red Daten nach MQTT publizieren


Edit function node

Delete


Cancel


Done

▼ node properties

 Name

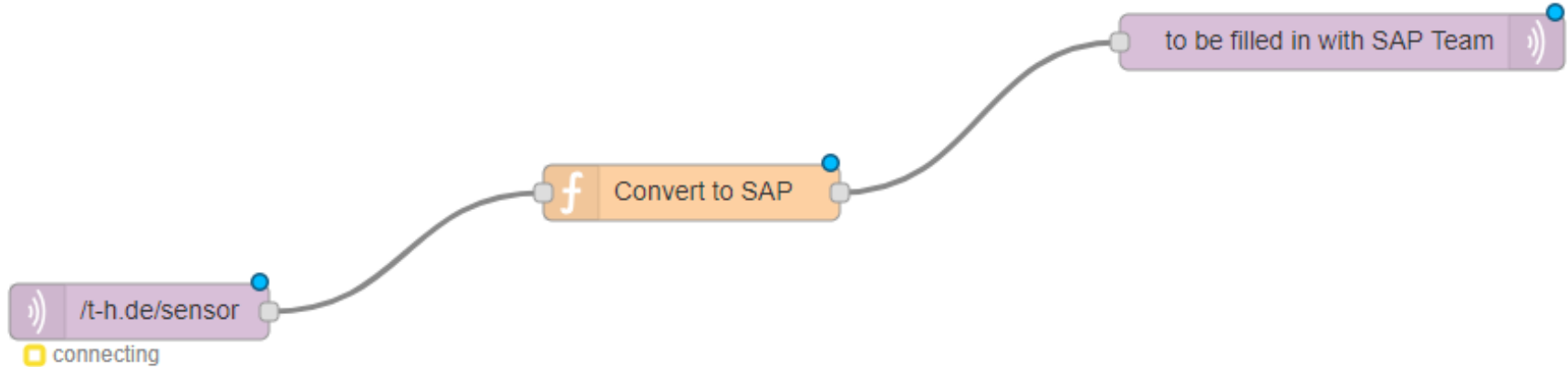
Convert to SAP

 ▼

 Function

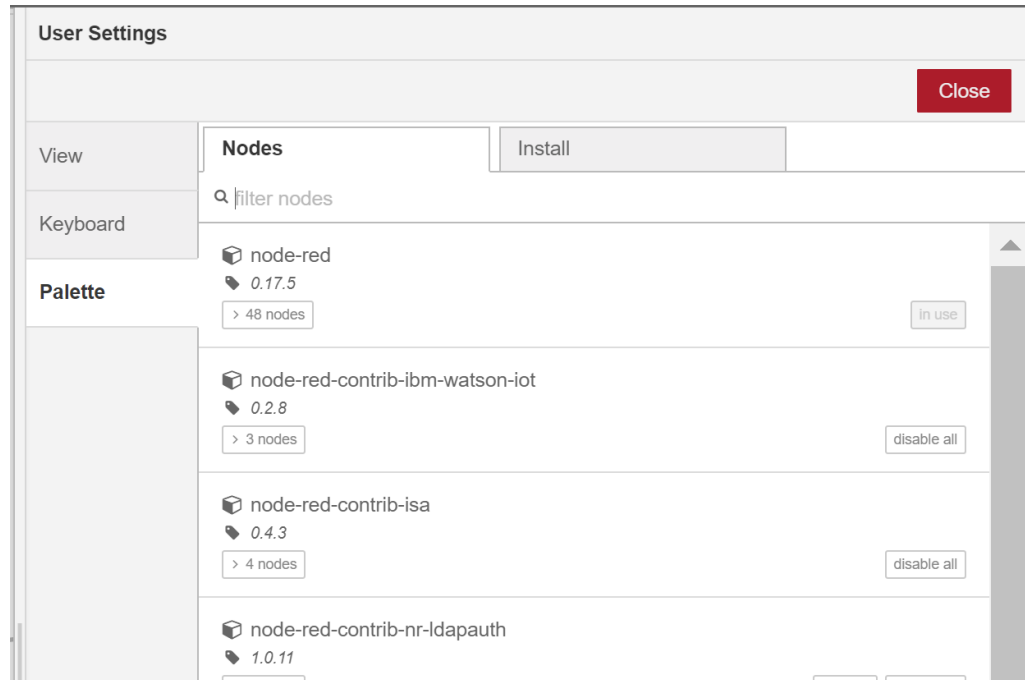
```
1  var newMsg={};
2
3  newMsg.tempC=msg.tempC;
4  newMsg.tempC=msg.humidity;
5  newMsg.pressure=msg.pressure;
6  return newMsg;
```

Programmierung Node-Red Daten nach MQTT publizieren



Programmierung Node-Red Daten visualisieren

- STRG-SHIFT-P drücken



Gruppe SAP Cloud