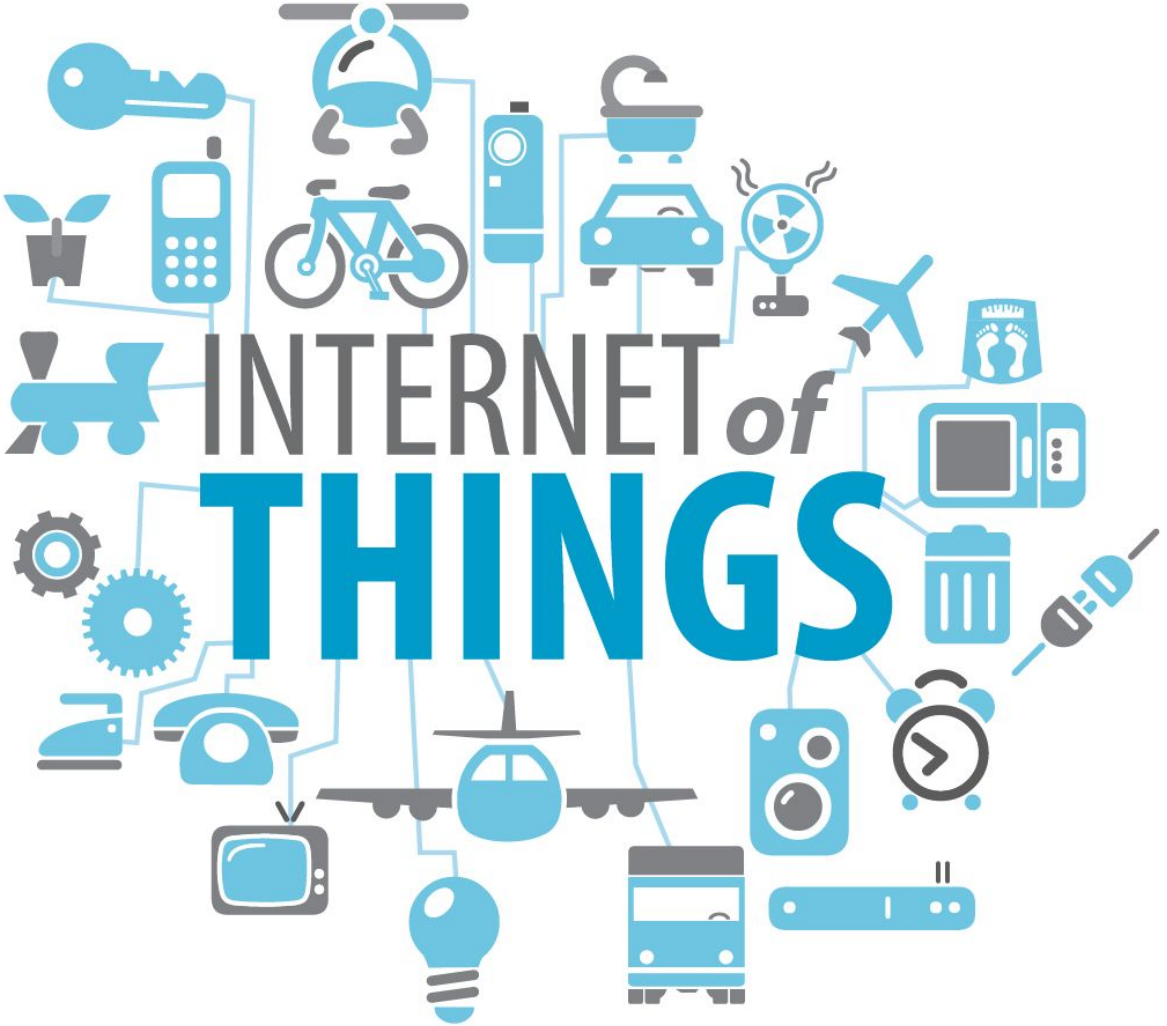
MQTT Device Description

Bachelor Thesis

Adrian Bärtschi, 01.02.2016

Inhalt

1. Einleitung
2. Problemstellung
3. Konzept
4. Umsetzung
5. Demo
6. Fazit


INTERNET of
THINGS

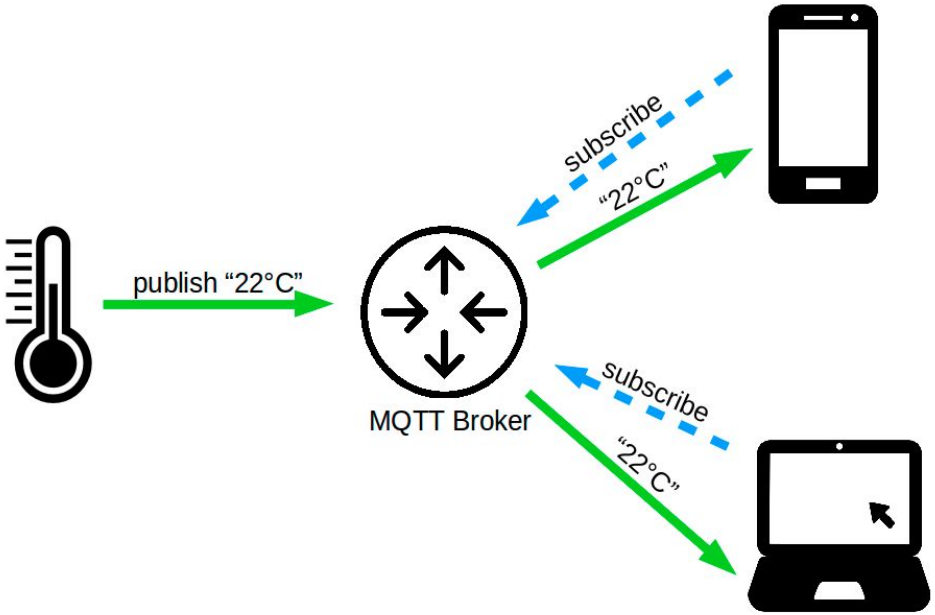
MQTT

Constrained Environment

Publish/Subscribe

Broker

Topics



Problem

- Welche Devices gibt es?
- Funktion?
- Interaktion?

Aufbau Topic Hierarchie

“home/livingroom/getTemp” ?

“home/temperatur/livingroom” ?

“home/sensor1/temp” ?

...

Problem

Aufbau Topic Hierarchie

Payload Encoding

```
02dc990 696c 6e65 2f74 716d 7474 3376 492f 714d

02dc9a0 7474 6341 6974 6e6f 694c 7473 6e65 7265

02dc9b0 632e 616c 7373 4b50 0201 0314 000a 0000

02dc9c0 0008 3920 4652 a66e b98c 1af9 0000 4b7a

02dca30 01be 0000 0034 0000 0000 0000 0000 0000

02dc990 696c 6e65 2f74 716d 7474 3376 492f 714d

02dc9a0 7474 6341 6974 6e6f 694c 7473 6e65 7265

02dc9b0 632e 616c 7373 4b50 0201 0314 000a 0000
```

Problem

Aufbau Topic Hierarchie

Payload Encoding

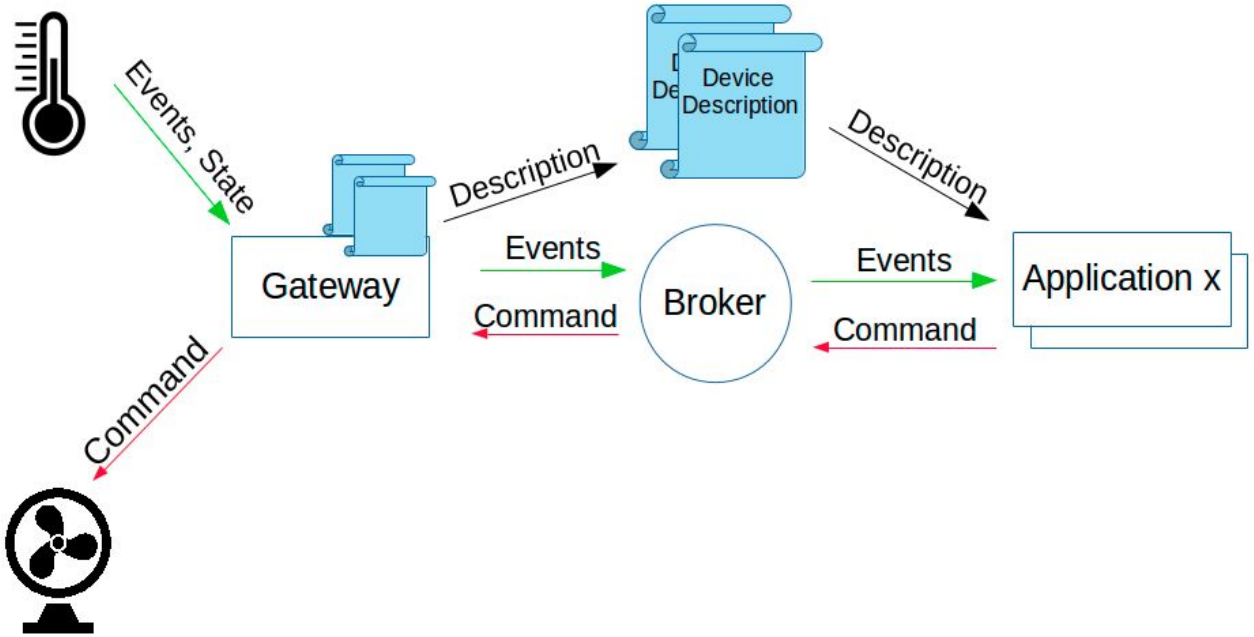
Message Interpretation

```
{
  “value”: 22.3
}
```

Konzept

- Device beschreibt eigene Funktionalität
- Lesbar für Mensch & Maschine
- Generischer Ansatz Device
- Hierarchische Gliederung Devices

Architektur



Inhalt Device Description

State

Events

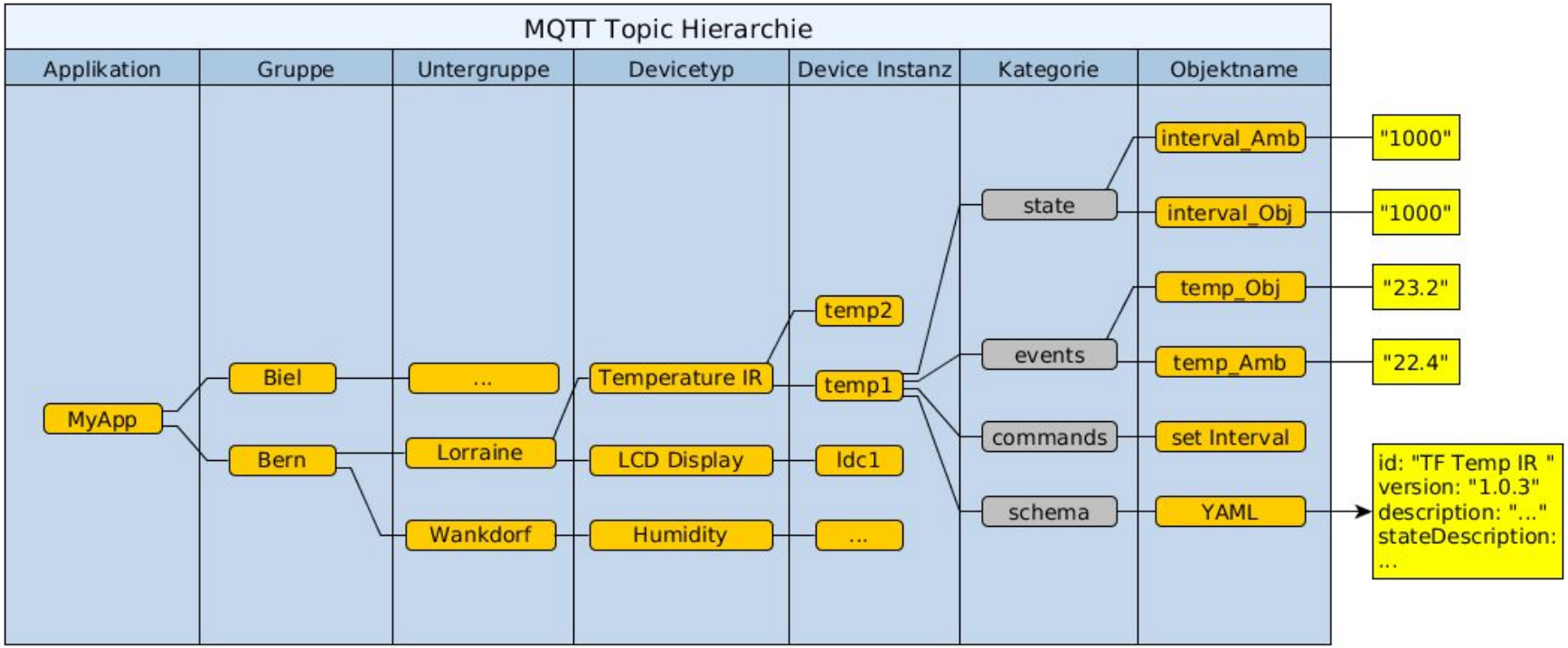
Commands

Format Device Description

UTF-8 / YAML (JSON)

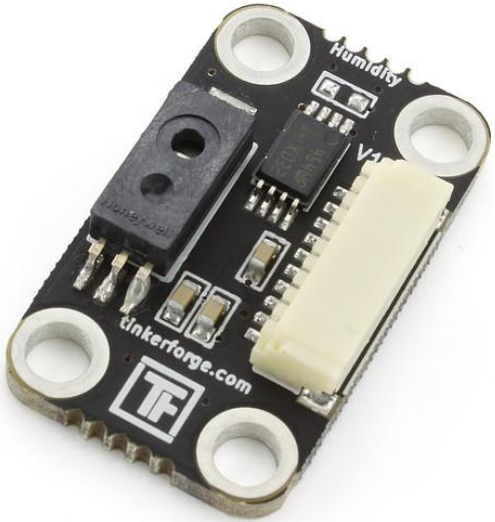
Wählbar / Erweiterbar

Topic Hierarchie

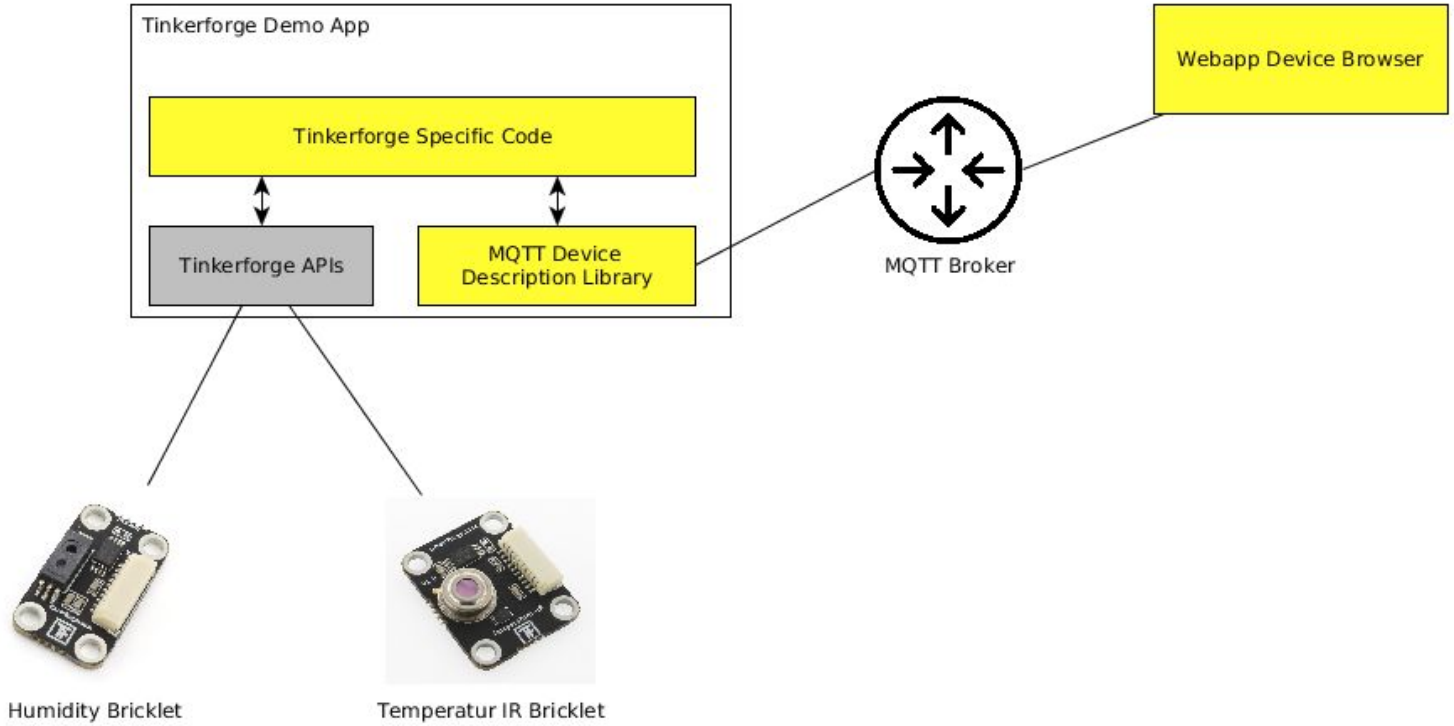


Device Description

```
id: "IoT-Humidity Sensor"
description: "The Humidity sensor can be used to measure relative humidity."
stateDescription:
  states:
  - name: "HumidityInterval"
              range:
              min: 0
              max: 9223372036854775807
              type: "Long"
              description: "Interval of the measurements in ms."
eventDescription:
  events:
  - name: "Humidity"
              range:
              min: 0.0
              max: 100.0
              type: "Double"
              description: "Relative Humidity in percent"
commandDescription:
  commands:
  - name: "SetInterval"
              linkedState: "HumidityInterval"
              description: "Set the measurement interval of the sensor, 0 disables the
measurements"
              parameter:
              Interval:
              min: 0
              max: 9223372036854775807
              type: "Long"
```



Umsetzung


Tinkerforge Demo App
Tinkerforge Specific Code
Tinkerforge APIs
MQTT Device Description Library
MQTT Broker
Webapp Device Browser
Humidity Bricklet
Temperatur IR Bricklet

MQTT Device Description Library

- Java Maven Modul
- Topic Hierarchie
- MQTT Message Handling
- Device Description

Tinkerforge Integration

- Verwendet entwickelte Library
- Humidity, Temperatur IR, Dual Button
- Einfache Integration weiterer Bausteine

Device Browser

- Webapplikation
- Anzeige Devices / Descriptions
- Interpretation / Interaktion

MQTT Device Description | Device Browser | Topic Tree

Application	Group	Subgroup	Device Type	Device ID
home	red-brick	tfstack2	Temperature IR Bricklet	qC1
home	red-brick	tfstack2	Humidity Bricklet	qSG

```
---
id: "IoT-Humidity Bricklet"
version: "0.0.1"
description: "The Humidity Bricklet can be used to measure
relative humidity. The\
  \ measured humidity can be read out directly in percent, no
conversions are necessary,\
  \ with configurable interval"
stateDescription:
  states:
  - name: "HumidityInterval"
    range:
      min: 0
      max: 9223372036854775807
      type: "Long"
    description: "Interval of the measurements in ms."
eventDescription:
  events:
  - name: "Humidity"
    range:
      min: 0.0
      max: 100.0
      type: "Double"
    description: "Relative Humidity in percent"
commandDescription:
  commands:
  - name: "SetInterval"
    linkedState: "HumidityInterval"
    description: "Set the measurement interval of the sensor,
0 disables the measurements"
    parameter:
      Interval:
        min: 0
        max: 9223372036854775807
        type: "Long"
complexTypes: []
```

Info

Id: IoT-Humidity Bricklet
Version: 0.0.1
Description: The Humidity Bricklet can be used to measure relative humidity. The measured humidity can be read out directly in percent, no conversions are necessary, with configurable interval

State

HumidityInterval
Interval of the measurements in ms.
Value:

- Type: Long
- Min: 0
- Max: 9223372036854776000

Topic	home/red-brick/tfstack2/Humidity Bricklet/qSG/state/HumidityInterval

Events

Humidity
Relative Humidity in percent
Value:

- Type: Double
- Min: 0
- Max: 100

Topic	home/red-brick/tfstack2/Humidity Bricklet/qSG/events/Humidity

Subscribe

Herausforderungen

- Generische Beschreibung Devices
  - Abbildung Datentyp Information
- Abwägen Einfachheit ⇔ Funktionalität

Demo

Ausblick

- Optimierungen Device Description
- Implementation an System in Praxis
- IPSO Smart Object Specification

Fazit

- Funktionierendes Konzept
- Prototyp erfolgreich
- Entwicklung Standards ungewiss

Vielen Dank