

Bakalářská práce

SENZORICKÉ ŘEŠENÍ CHYTRÉ DOMÁCNOSTI S AUTOMATICKOU DIAGNOSTIKOU KOMUNIKACE

Autor

Patrik NACHTMANN

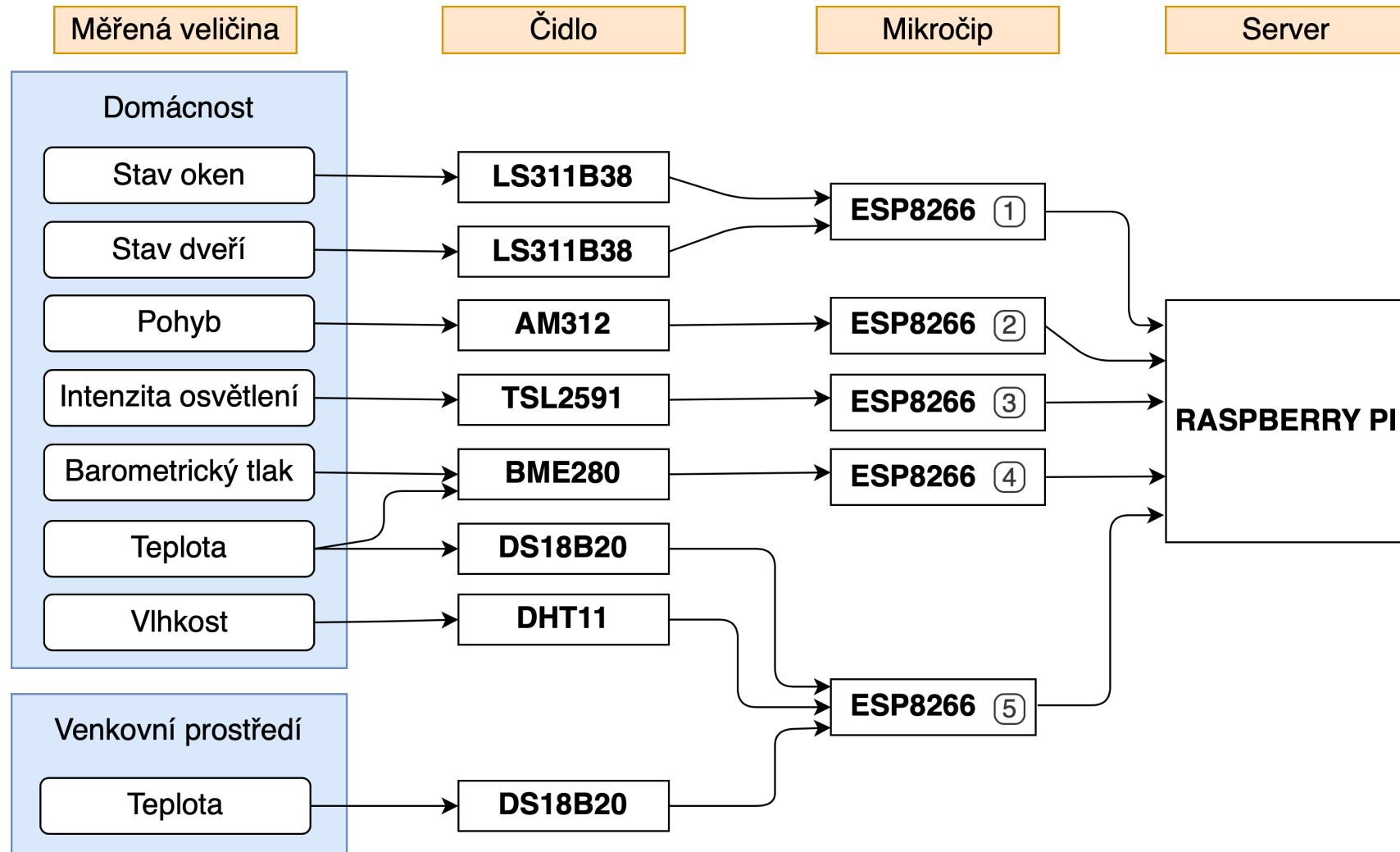
Vedoucí práce

Ing. Martin BULÍN, MSc.

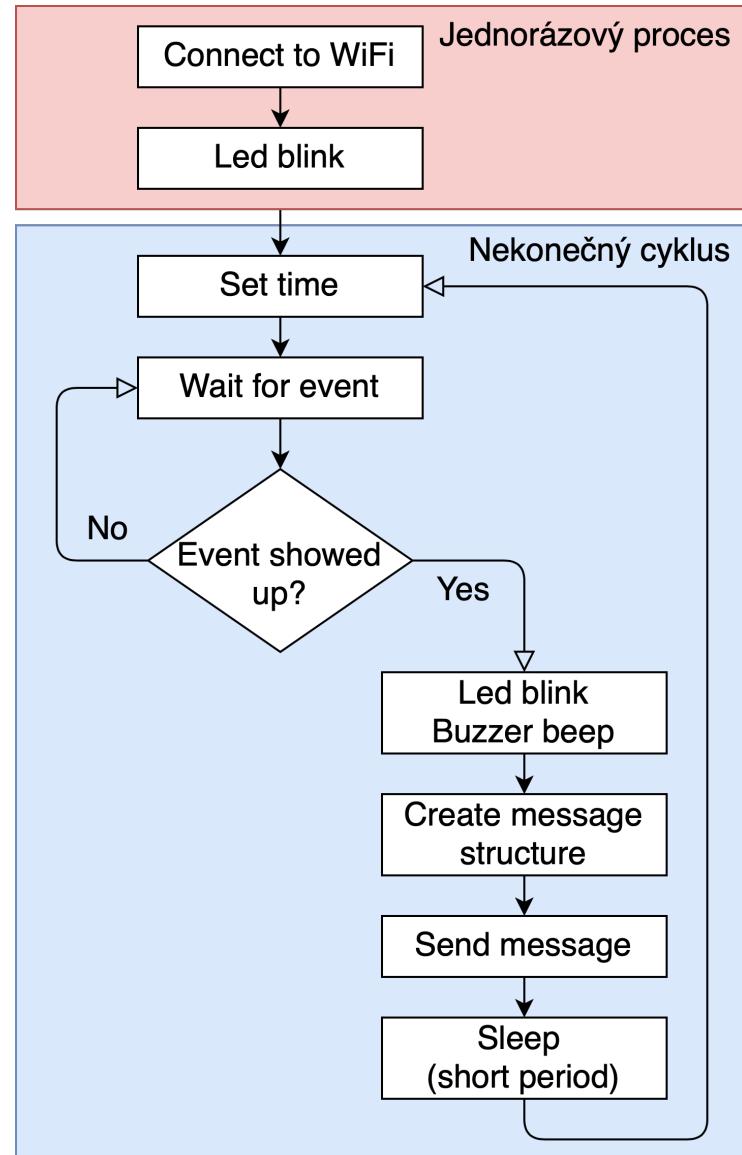
CÍLE PRÁCE

- 1** Otestovat a zkonstruovat vhodné senzory
- 2** Zajistit odesílání dat po síti a ukládání do databáze
- 3** Navrhnout systém automatické diagnostiky komunikace
- 4** Vytvořit interaktivní webové rozhraní

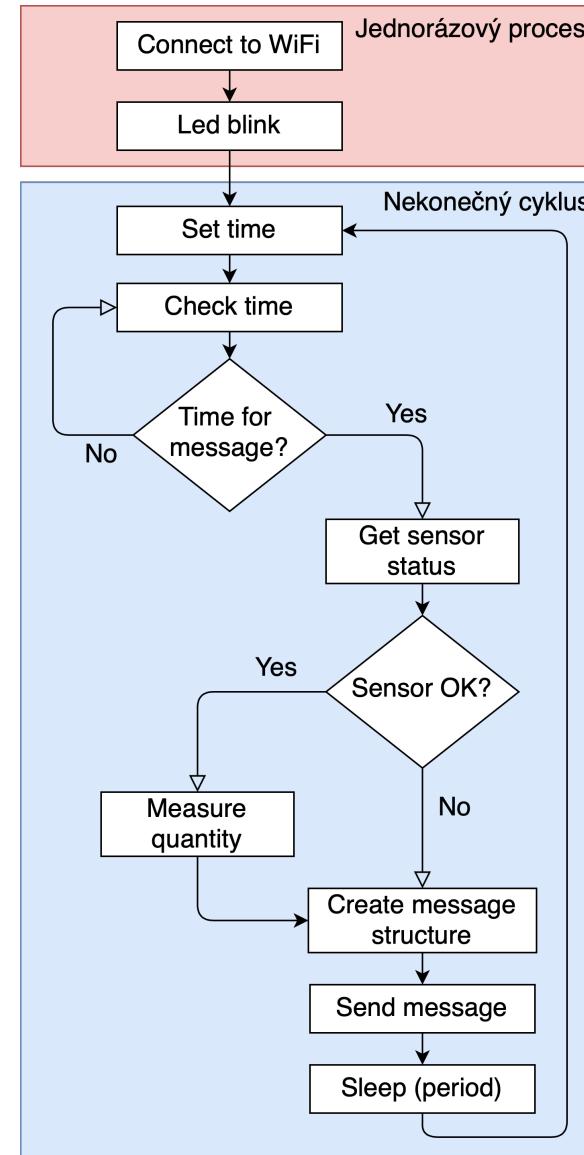
HARDWAROVÉ KOMPONENTY



NA ZÁKLADĚ VZNIKU UDÁLOSTI



PERIODICKÉ



SÍŤOVÁ KOMUNIKACE A DATABÁZE

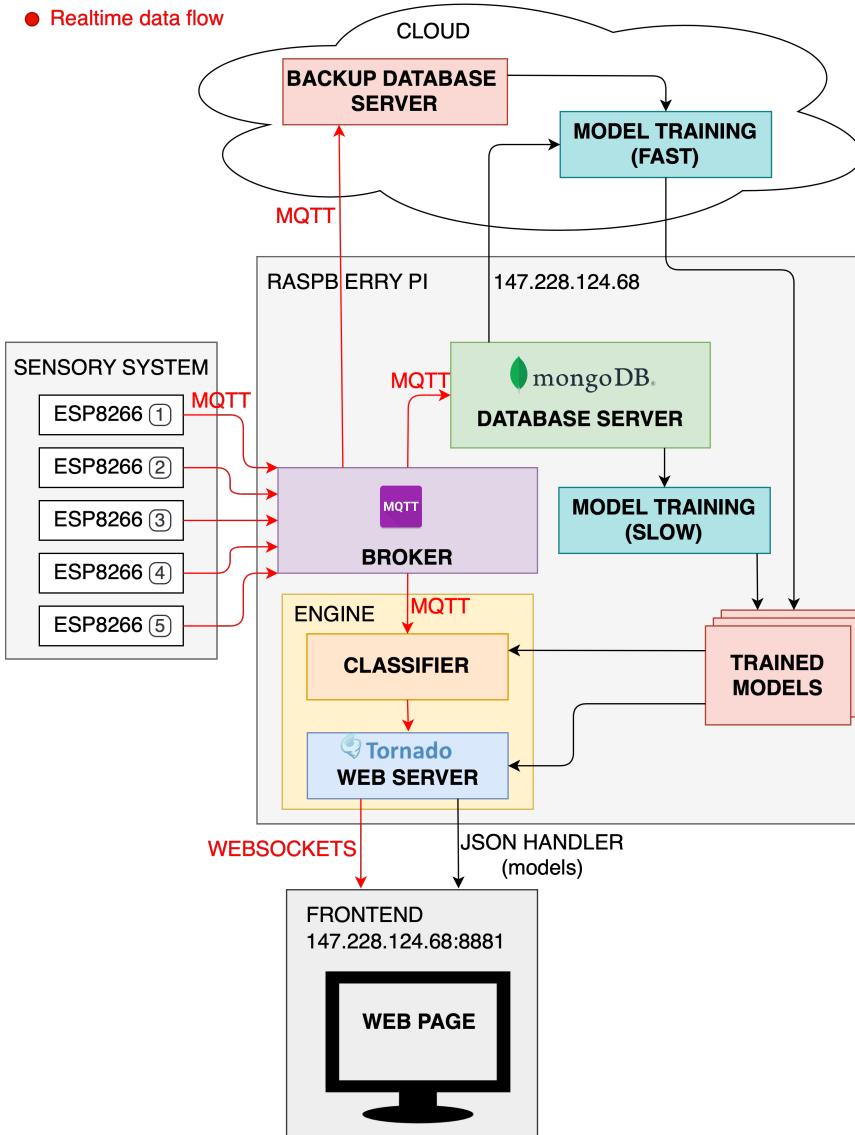
- Principy sítě IoT
- Protokol MQTT
- Websockets
- Databáze MongoDB
- Webserver Tornado

```
{ "sensor_id": "ds18b20_01",  
  "location": "room",  
  "owner": "pn",  
  "status": "ok",  
  "quantity": "temperature",  
  "timestamp": "2020-04-09 11:32:30",  
  "value": 24.08 }
```

```
smarthome/<location>/<quantity>
```

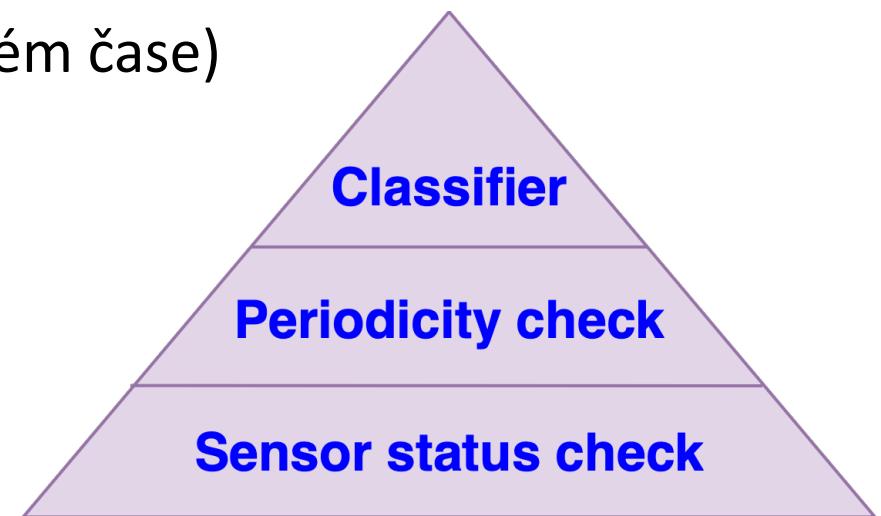
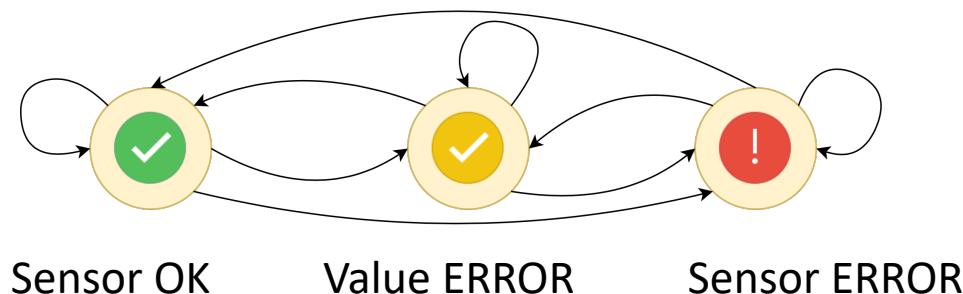
```
smarthome/room/temperature  
smarthome/outside/temperature  
smarthome/room/humidity  
smarthome/room/illuminance  
smarthome/room/pressure  
smarthome/room/motion  
smarthome/room/door_open  
smarthome/room/window_open
```

DATOVÉ TOKY

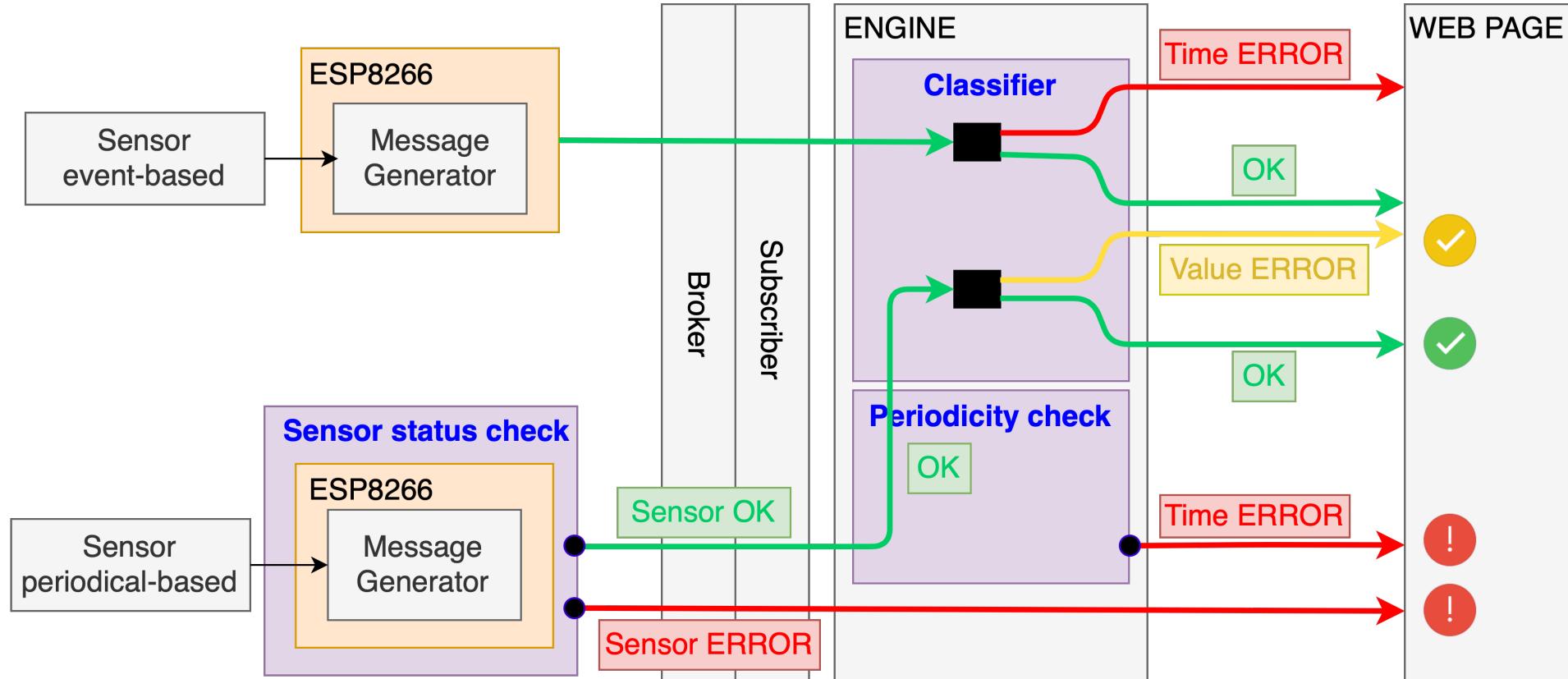


SYSTÉM DIAGNOSTIKY KOMUNIKACE

- Detekce chyb na úrovni ESP8266
- Kontrola periodicity příchozích zpráv na serveru
- Kontrola času a hodnot pomocí klasifikace
 - 1D: **[timestamp]** (kontrola času)
 - 2D: **[timestamp, value]** (kontrola hodnot v daném čase)

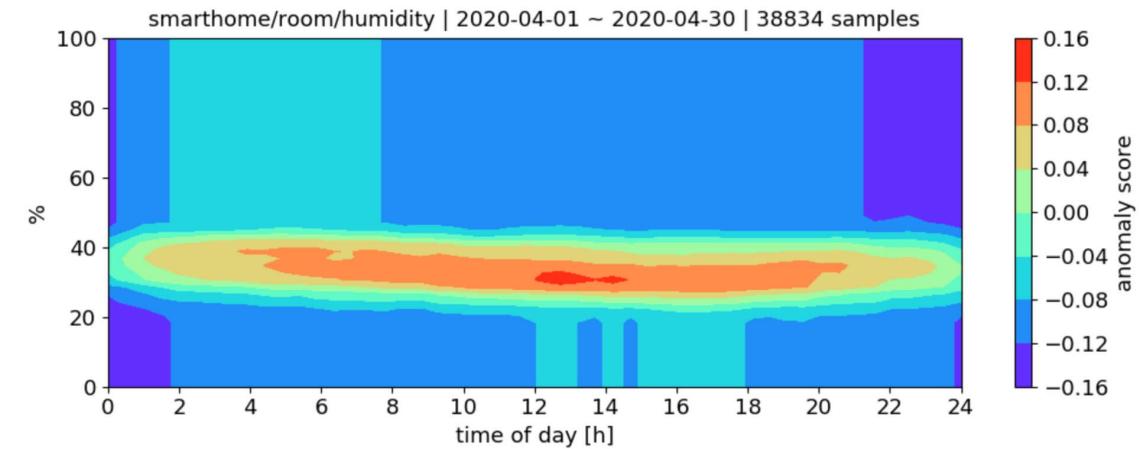
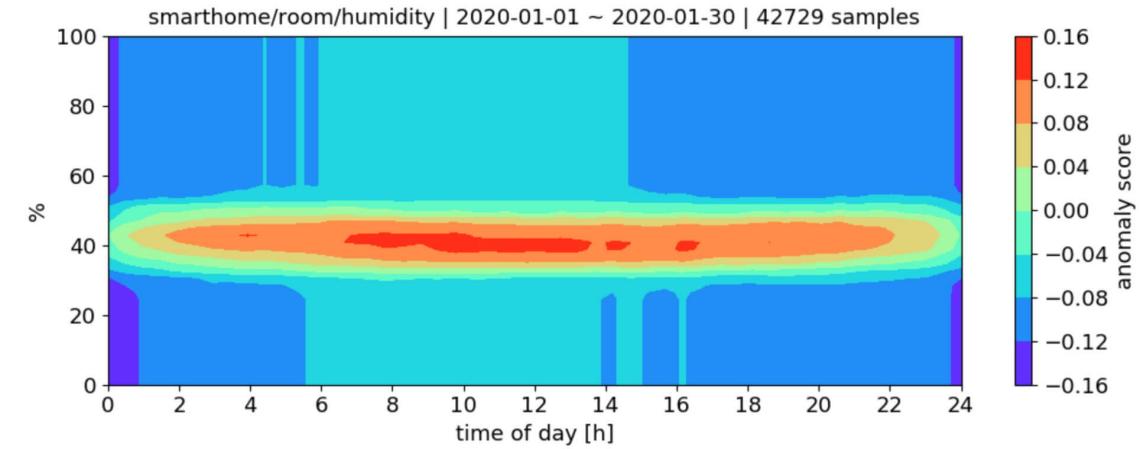
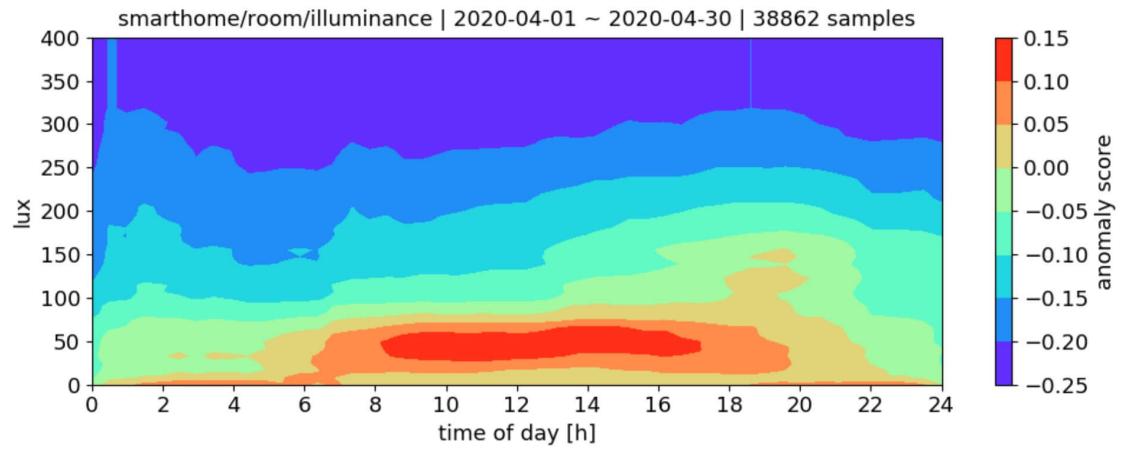
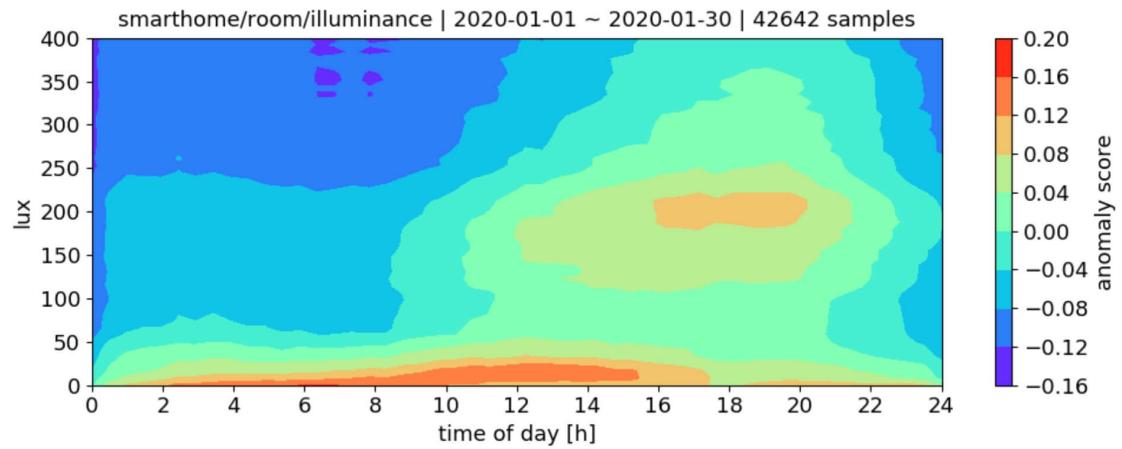


SYSTÉM DIAGNOSTIKY KOMUNIKACE

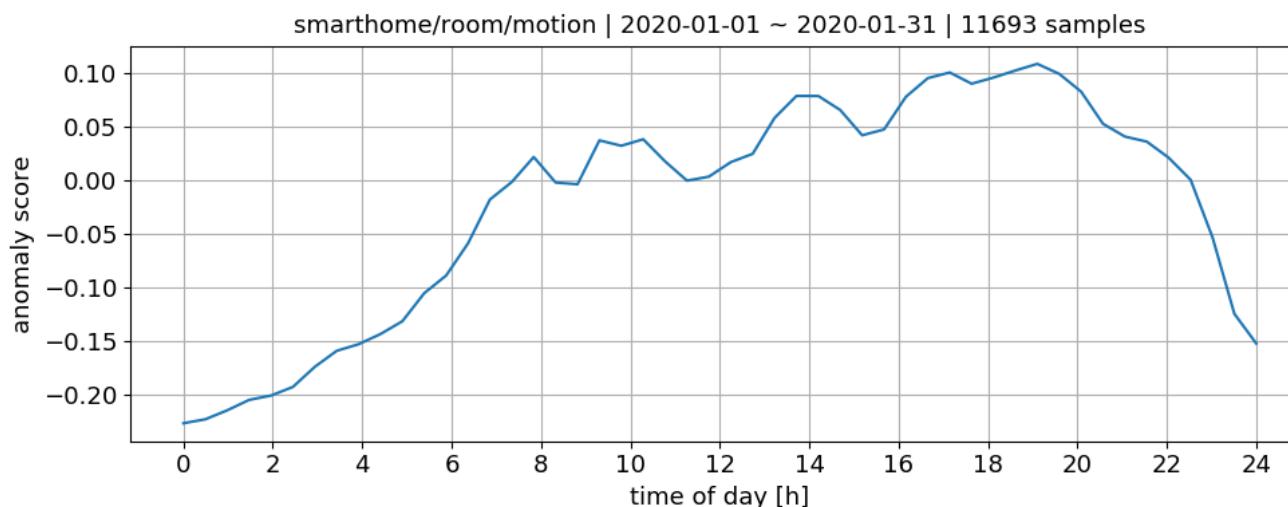
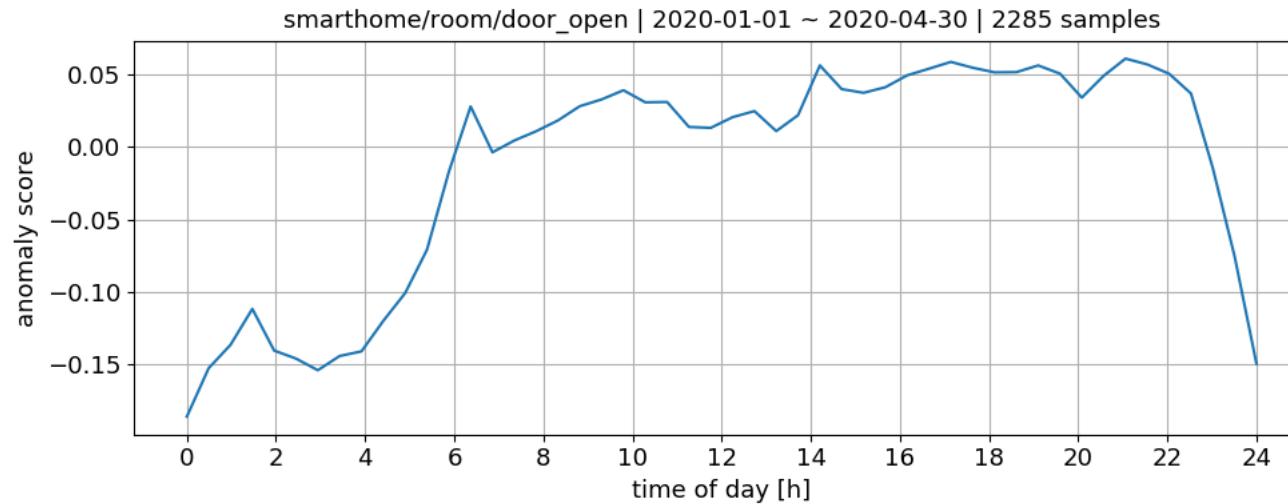


- Status generation
- Status modification (overwrite)

KLASIFIKACE HODNOT V DANÉM ČASE



KLASIFIKACE ČASU NEPERIODICKÝCH ZPRÁV



WEBOVÁ VIZUALIZACE

The screenshot shows a dark-themed web application interface with a header bar containing icons and the URL "Nezabezpečeno — 147.228.124.68". Below the header is a navigation bar with three tabs: "OVERVIEW", "ANALYTICS", and "ABOUT". The main content area displays the following data in a grid:

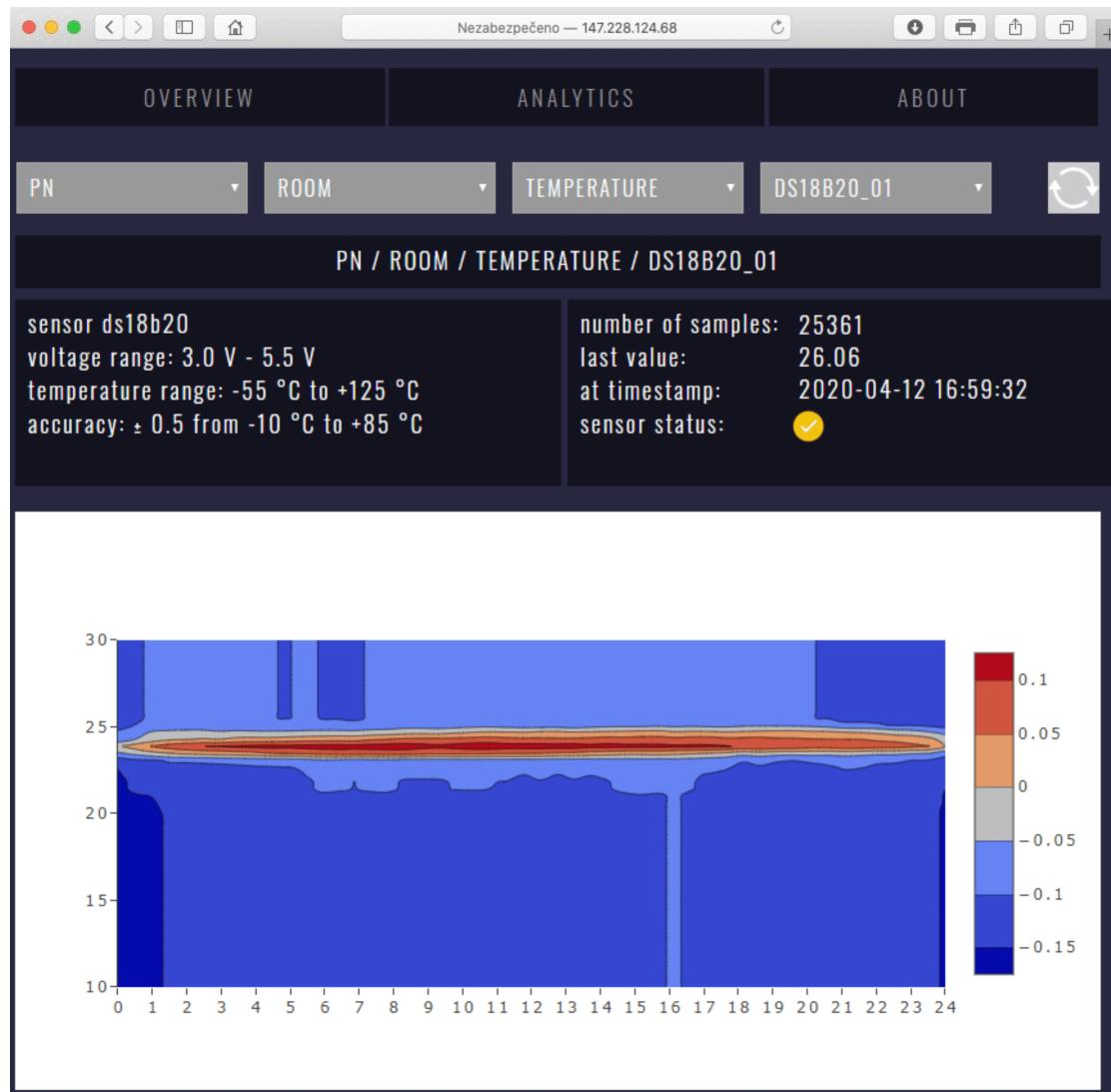
INSIDE TEMPERATURE	OUTSIDE TEMPERATURE
26 °C	18.62 °C
INSIDE HUMIDITY	INSIDE ILLUMINANCE
27 %	156 lux
INSIDE PRESSURE	LAST MOTION IN ROOM
968.72 hPa	2020-02-21 00:00:00
DOOR STATUS	WINDOW STATUS
OPEN	OPEN

Each data cell includes a small circular icon with a checkmark or exclamation mark in the top right corner.

Sensor ERROR



WEBOVÁ VIZUALIZACE



OVERVIEW ANALYTICS ABOUT

SMART HOME SENSORY SYSTEM WITH AN AUTOMATIC COMMUNICATION DIAGNOSTICS

This project is a bachelor work at Faculty of Applied Sciences, Department of Cybernetics at University of West Bohemia.

Aim of this student work is to design and built several smart home Wi-Fi sensors, programm the communication between individual sensors and broker via MQTT standard and design an automatic communication diagnostic system in order to catch anomaly and possible failure of the sensors.

These sensors are based on ESP8266 platform and the data transfer is performed wireless over Wi-Fi.

- ✓ When everything works fine. Both ESP8266 and sensor is **OK**, data transfer is **OK**. Range of measured value is in the predicted area - Classification is **1**.
- ✓ When almost everything works fine. Data transfer is **OK** but the value is not as expected. This can be caused by the lack of trained data or the sensor might be down. Range of measured value is **not** in the predicted area - Classification is **-1**.
- ! When some **error** occurred. ESP8266 did not send data several times or the sensor is broken. This can be cause by no internet connection or broken sensor.

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OF APPLIED SCIENCES
UNIVERSITY
OF WEST BOHEMIA**

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2020

SENZORICKÉ ŘEŠENÍ CHYTRÉ DOMÁCNOSTI S AUTOMATICKOU DIAGNOSTIKOU KOMUNIKACE

- ✓ Zkonstruovat senzory pro chytrou domácnost
 - ✓ Zajistit síťovou komunikaci a ukládání dat do databáze
 - ✓ Implementovat systém detekce chyb a jiných anomalií
 - ✓ Vytvořit interaktivní webové rozhraní
-
- + Přidání dalších senzorů a aktuátorů
 - + Automatické přetrénování modelů

Autor

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Vedoucí práce

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