

Smart solar water heating

IoT and AI to improve the efficiency of passive solar water heating systems

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Who am I ?

Senior Software Engineer @ Red Hat

Artificial Intelligence enthusiastic

Cheap connected devices hacker

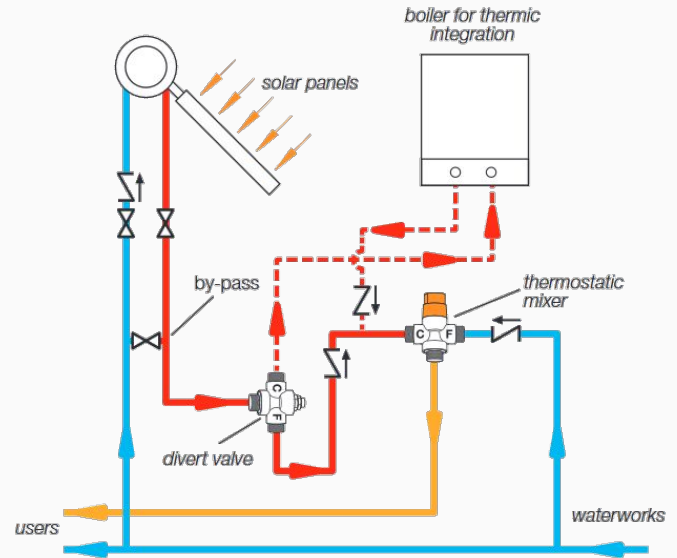
Proud father of three wonderful children

 @bruscinodf



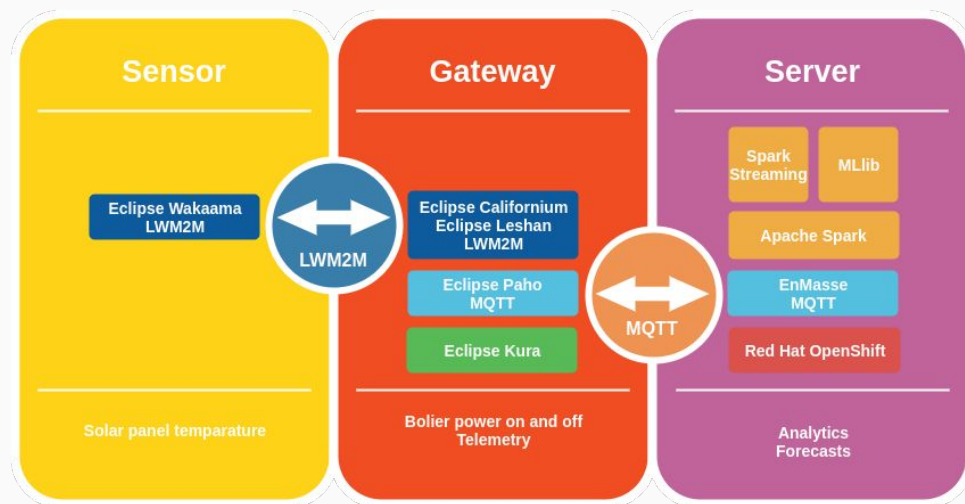
Solar water heating

- Heat water using solar energy
- Solar panels convert sunlights
- Storage tanks keep hot water
- Active vs passive systems
- Two factors reduce efficiency ...
 - Boiler distance
 - Thermal dispersion



What is smart solar water heating ?

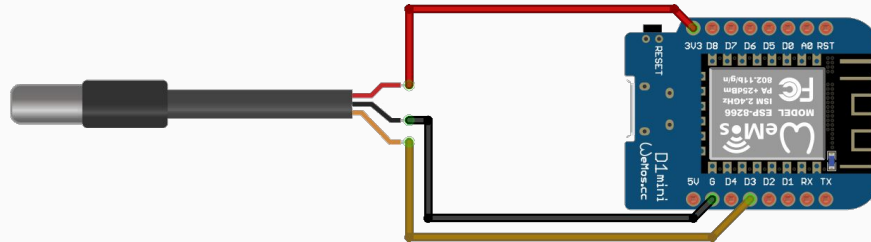
- A solution using ...
 - ... IoT technologies ...
 - ... AI technologies ...
- to improve the efficiency
 - monitoring
 - forecasting



3rd place Open IoT Challenge 4.0!

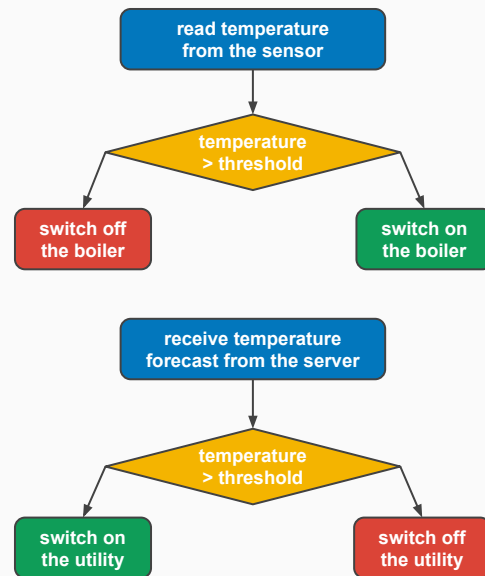
The sensor

- ESP8266 board with DS18B20 probe
- SDK Arduino core for ESP8266 by PlatformIO
- LWM2M for communication using Eclipse Wakaama
- The temperature is exposed by the object 3300 (generic sensor)



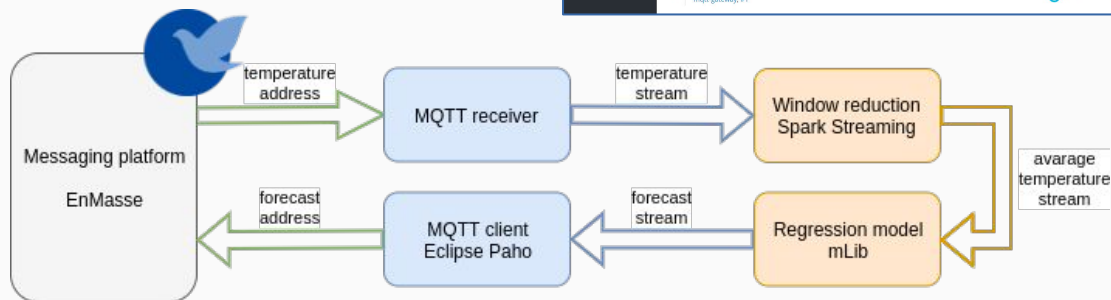
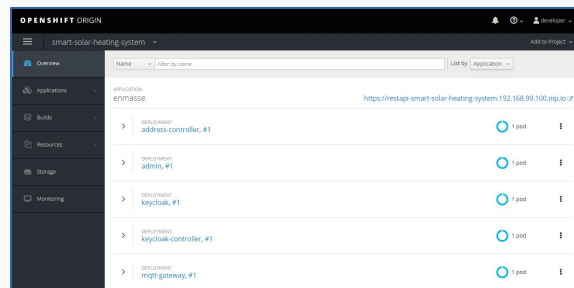
The gateway

- Raspberry Pi with a relay board
- Build the IoT gateway using Eclipse Kura
- Communicate with sensor (via LWM2M) using ...
 - Eclipse Leshan
 - Eclipse Californium
- Communicate with server (via MQTT) using ...
 - Eclipse Paho



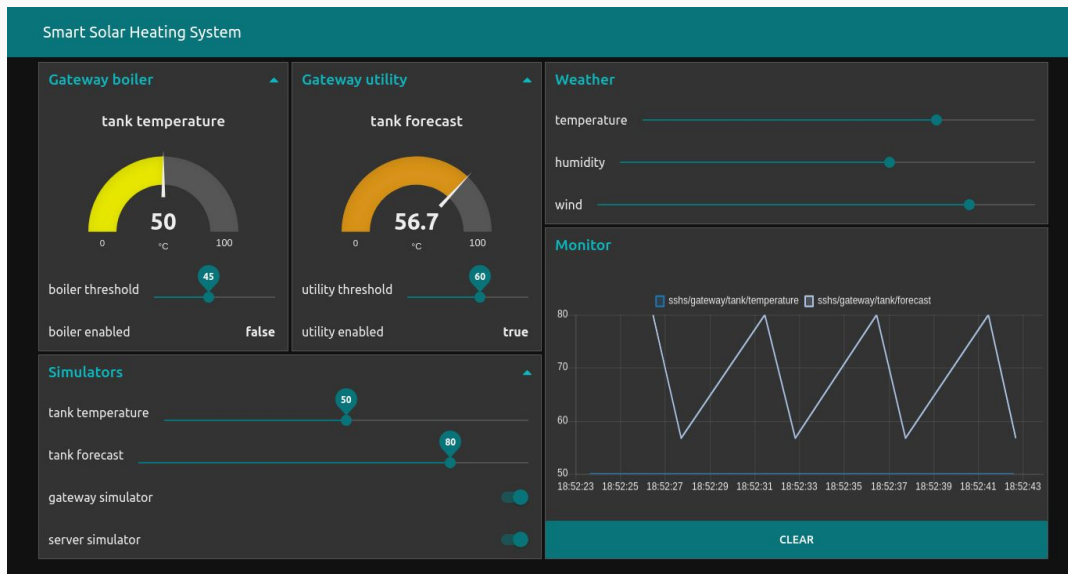
The server

- OpenShift to deploy ...
 - EnMasse ...
 - Apache Spark ...
- Spark Streaming
- MLlib



The dashboard

- Node-RED for wiring ...
 - hardware devices
 - online services
 - APIs
- node-red-dashboard
 - gateway
 - weather
 - monitor
 - simulators



Conclusions

- This is a proof of concept.
- To do ...
 - Allow multiple gateways
 - Improve forecasts
 - Add web api
 - Add mobile app
- Questions?



Resources

Smart solar heating system

<https://github.com/brusdev/smart-solar-heating-system>

- Eclipse Wakaama : <https://www.eclipse.org/wakaama/>
- Eclipse Kura : <https://www.eclipse.org/kura/>
- Eclipse Paho : <https://www.eclipse.org/paho/>
- Eclipse Leshan : <https://www.eclipse.org/leshan/>
- OpenShift Origin : <https://www.openshift.org/>
- EnMasse : <http://enmasse.io/>
- Apache Spark : <https://spark.apache.org/>