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

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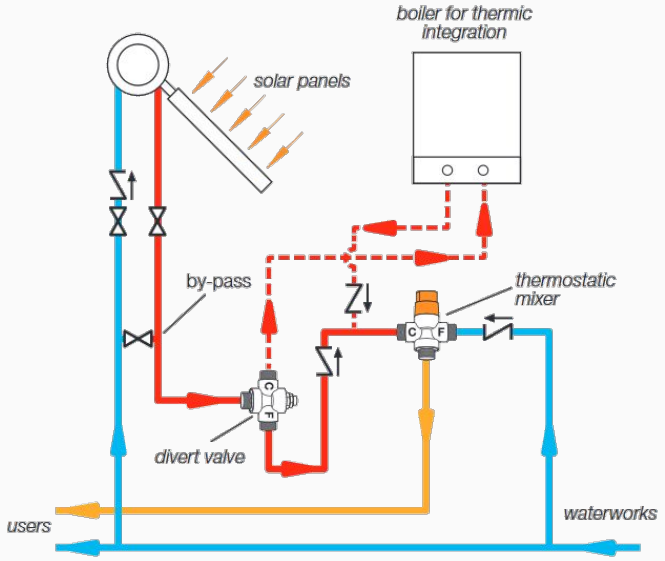
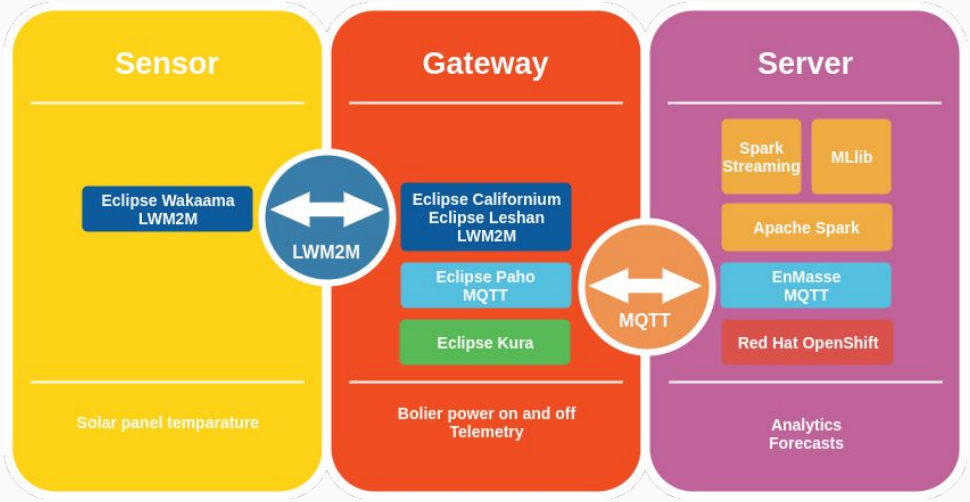
Solar water heating

- 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 ?

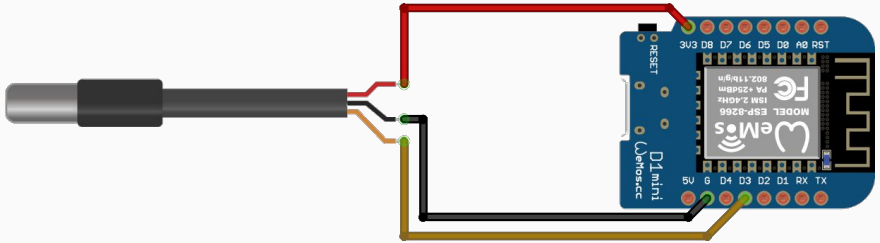
- A solution using …
  - … IoT technologies …
  - … AI technologies …
- to improve the efficiency
  - monitoring
  - forecasting



3rd place Open IoT Challenge 4.0!

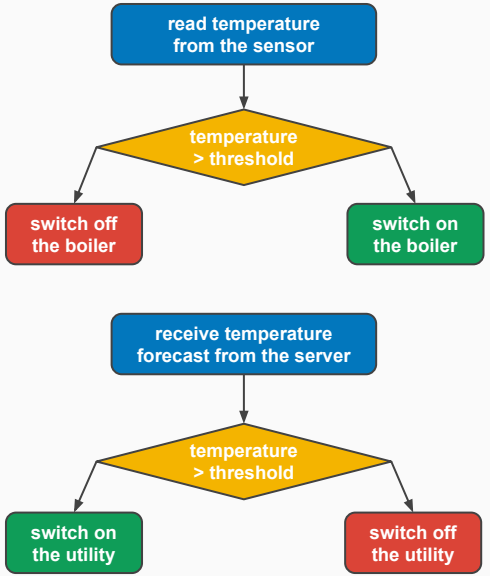
The sensor

- 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)



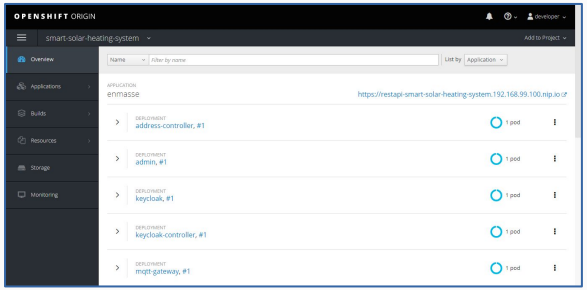
The gateway

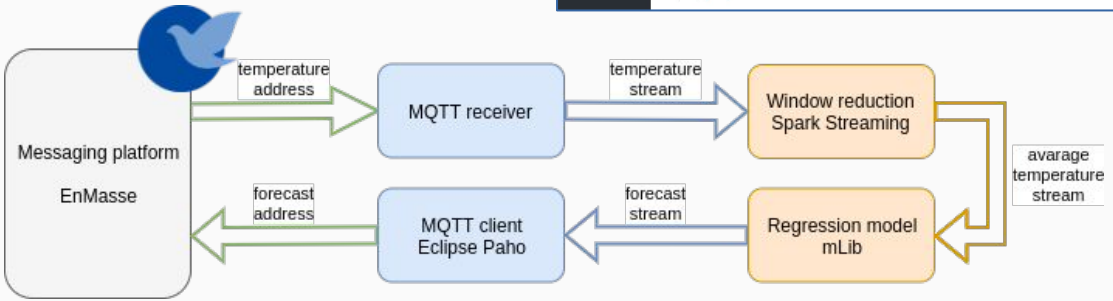
- Raspberry Pi with a relay board
- Build the IoT gateway using Eclipse Kura
- Communicate with sensor (via LWM2M) using …
  - Eclipse Leshan
  - Eclipse Californium
- Communicate with server (via MQTT) using …
  - Eclipse Paho



The server

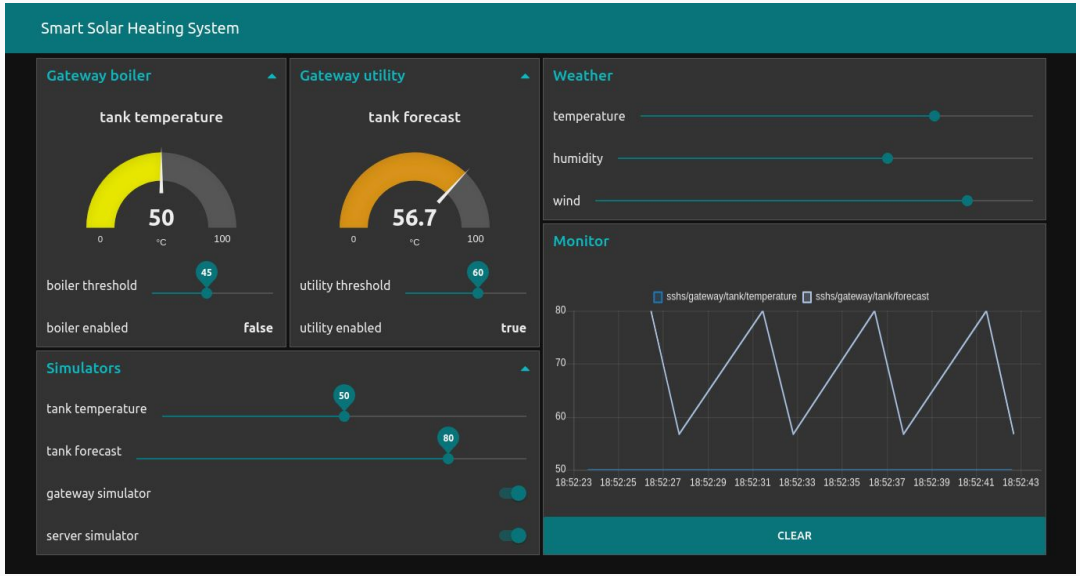
- OpenShift to deploy …
  - EnMasse …
  - Apache Spark …
- Spark Streaming
- MLlib





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/