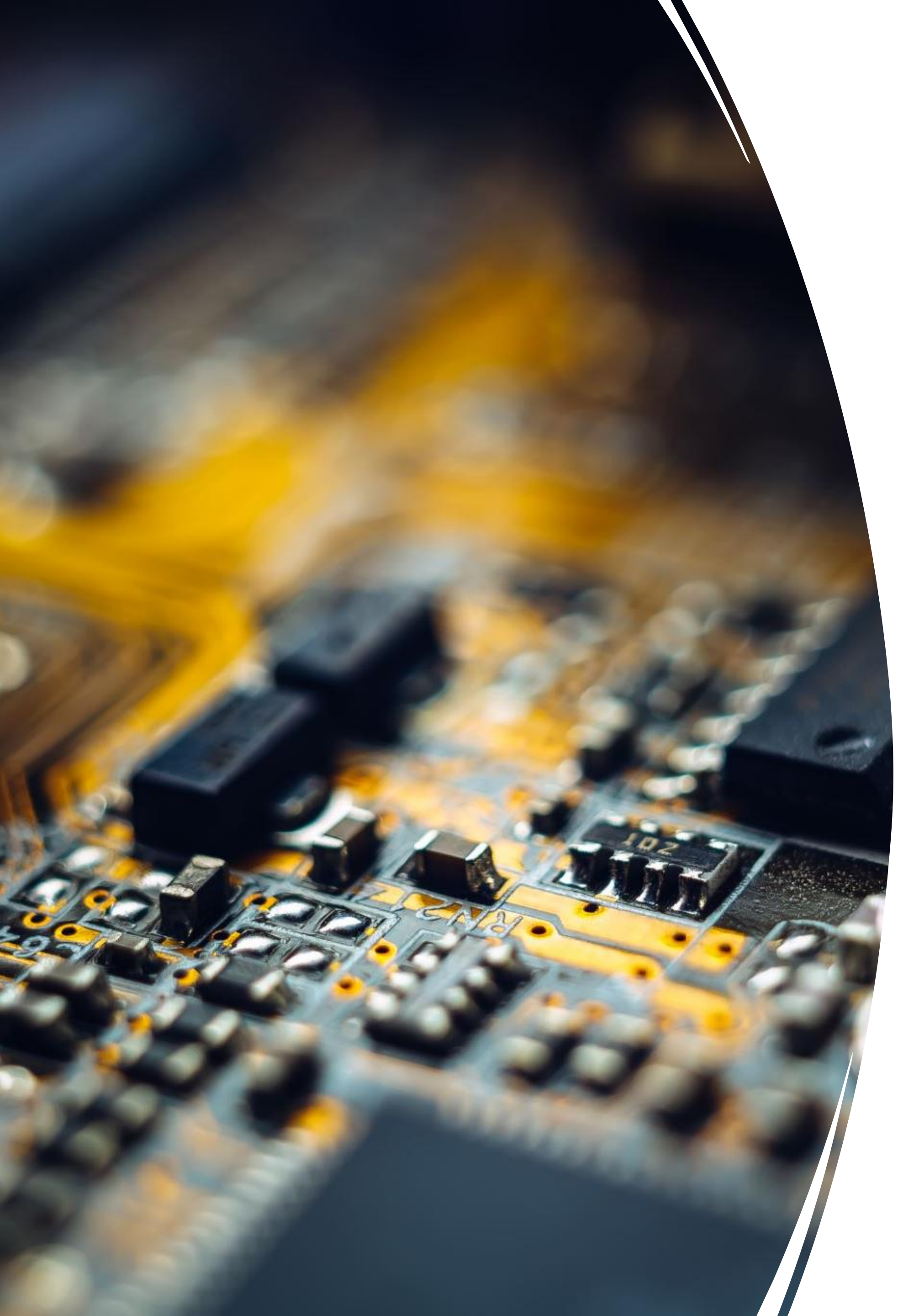


FRANKFURT UNIVERSITY OF APPLIED SCIENCES

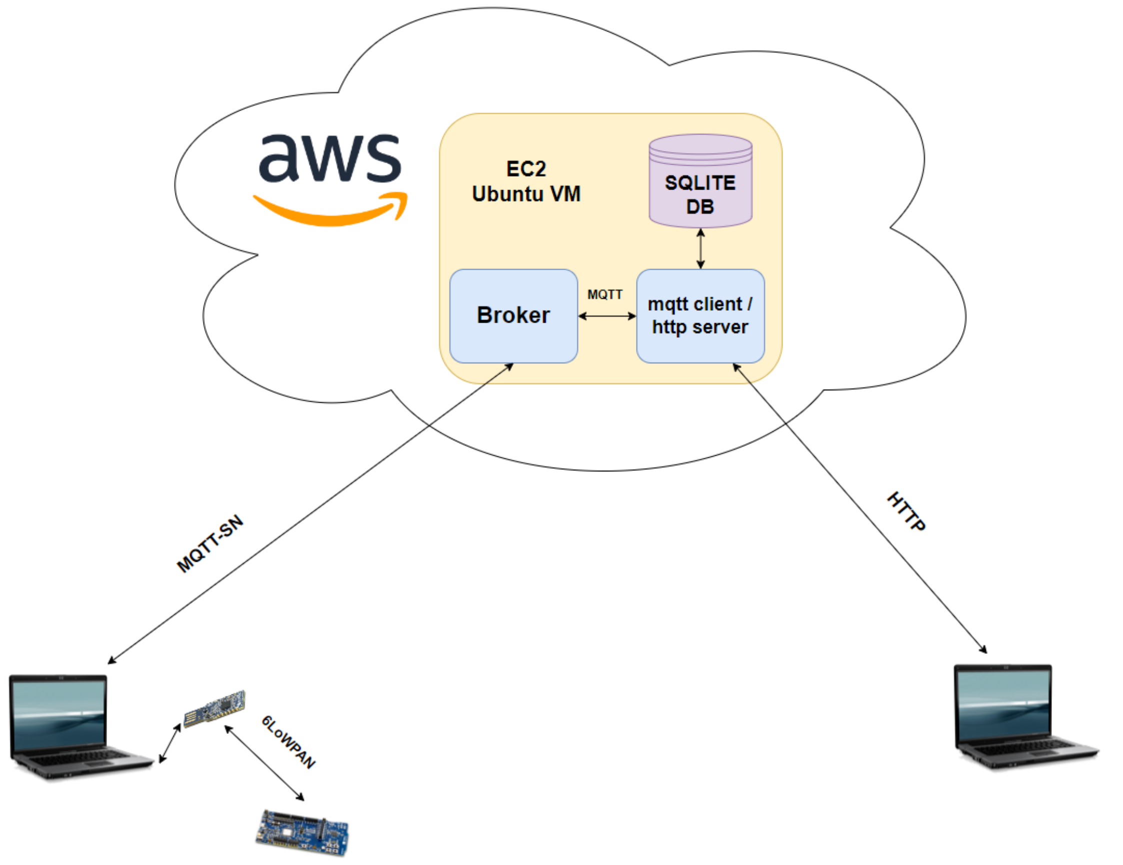
IoT - From the Microcontroller to the Cloud

Alexander Atanassov, Binyam Tekeste

Structure

1. System Architecture
2. Components:
   a) Sensor Node
   b) Border Router and Host
   c) Cloud
   d) User Interface
3. Achievements
4. Demonstration
5. Conclusion

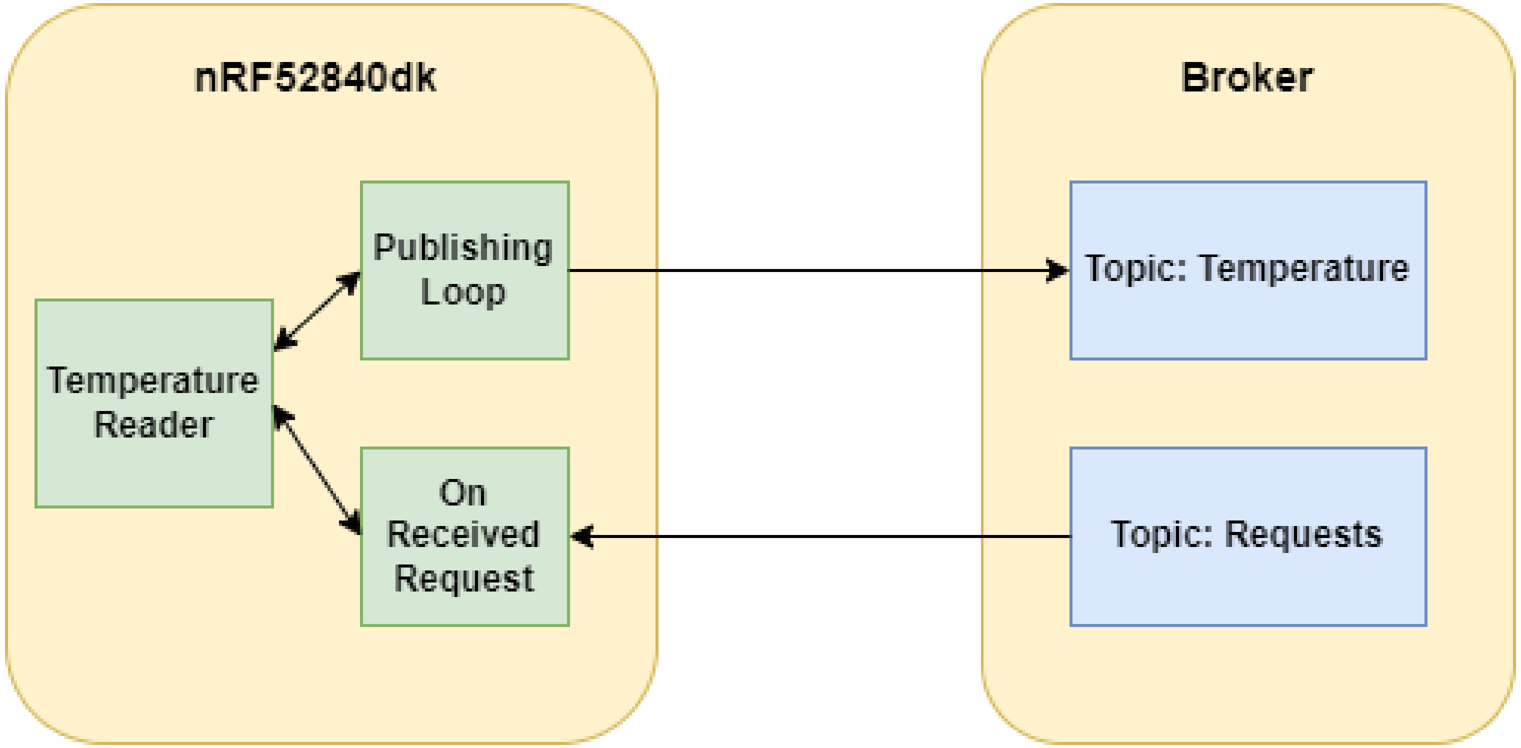
System Architecture



System Components

Sensor Node

- Used modules: SAUL, EMCUTE



Border Router and Host

Border Router: nRF52840dongle

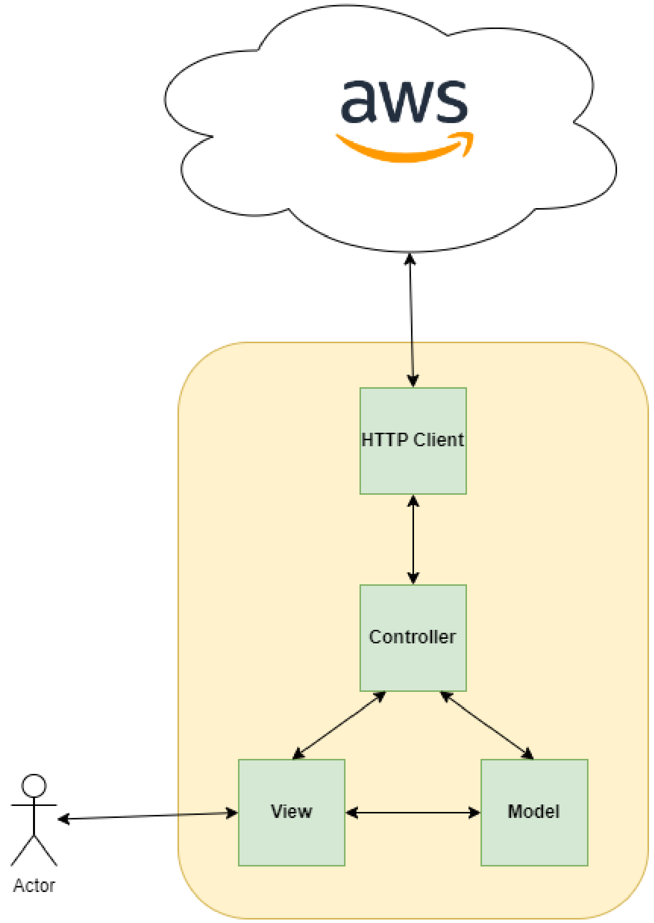
- Route packets
- Based on “gnrc_border_router” program

Host: Ubuntu VM

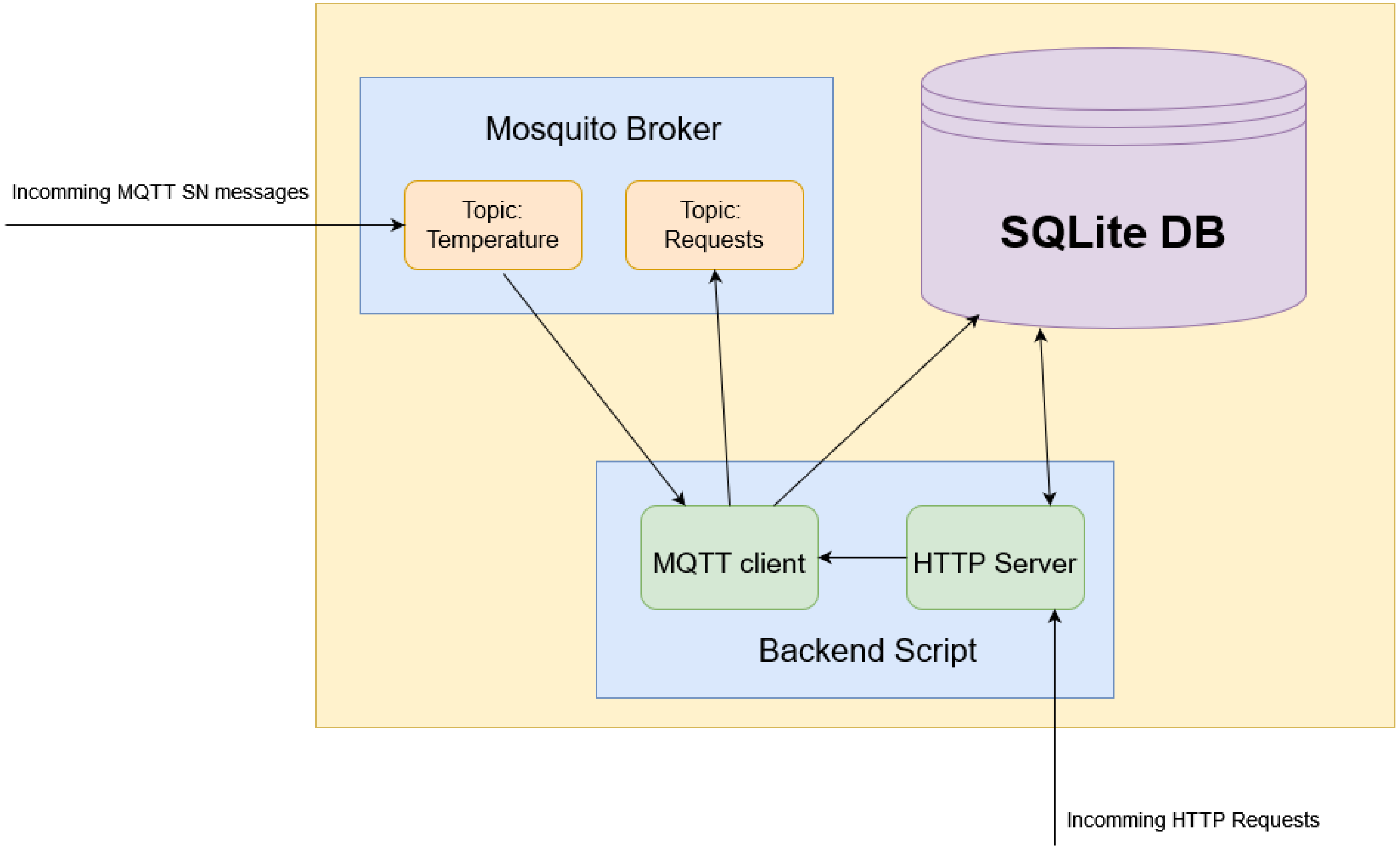
- Connect boards, flash programs & displays the console
- IPv6 packets forwarding
- Wireguard tunnel for IPv6 connection

User Interface

- Desktop Application
- Language: Python
- Libraries: Tkinter, Matplot
- Model-View-Controller Architecture



Cloud



- Backend Script:
  - Language: Python
  - Libraries: PAHO, FLASK

Achievements

- Reading temperature values
- Communicating with the cloud via MQTT-SN
- Process and store data in the cloud
- Reaching the cloud from a local UI via HTTP
- Display and plot the data
- Send requests from the UI to the sensor node via the cloud

Conclusion

- All requirements are achieved
- Focus: Overall working system
- Could be refined:
  - Disconnection stability (MQTT)
  - Real timestamps
- Knowledge improvement in:
  - Networking (IPv6)
  - AWS
  - Linux
  - Microcontroller programming
  - Python

Sources

- RIOT Documentation: https://doc.riot-os.org/
- RIOT Github Repository: https://github.com/RIOT-OS/RIOT
- Tkinter: https://www.pythontutorial.net/tkinter/tkinter-mvc/
- Flask: https://flask.palletsprojects.com/en/2.3.x/
- Paho: http://www.steves-internet-guide.com/into-mqtt-python-client/

Questions?