Environmental Monitoring using IoT Devices

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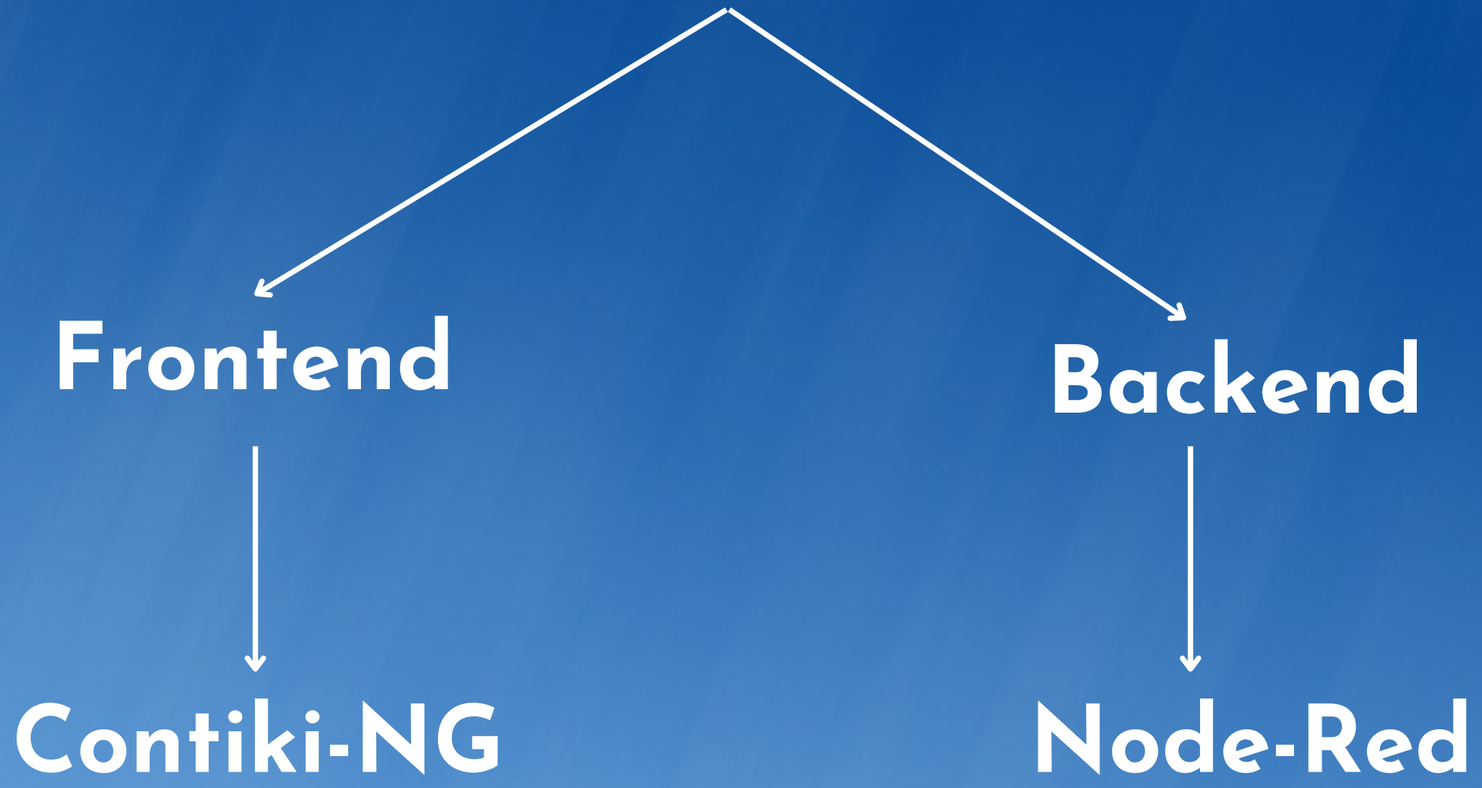
Goals

- Network of IOT devices running Contiki-NG
- Readings of Temperature and humidity are reported to backend
- Backend logs maximum and minimum daily temperature and humidity for each month
- Persistent data

Technologies



Frontend

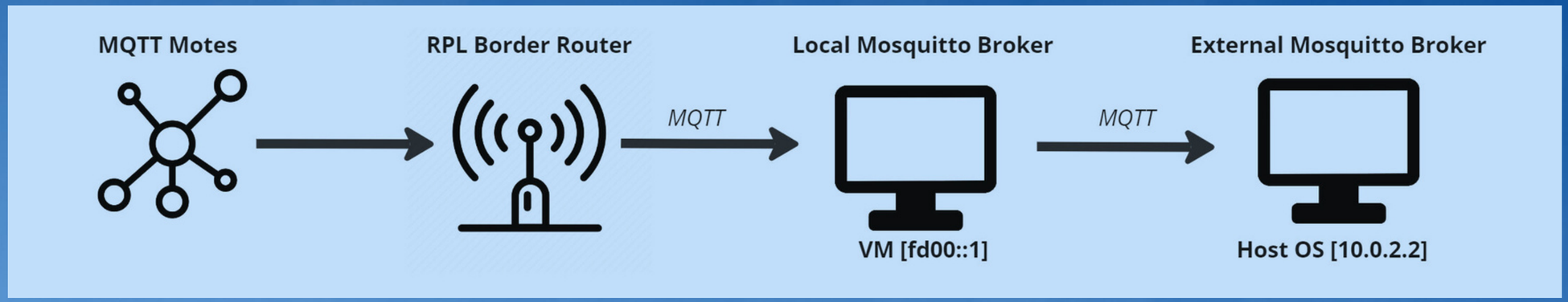
Assumptions

- Devices are constantly reachable from the border router either through one or multiple steps
- Simulation uses a *costant loss unit-disk graph model (CL-UDGM)* with interference range set to 0

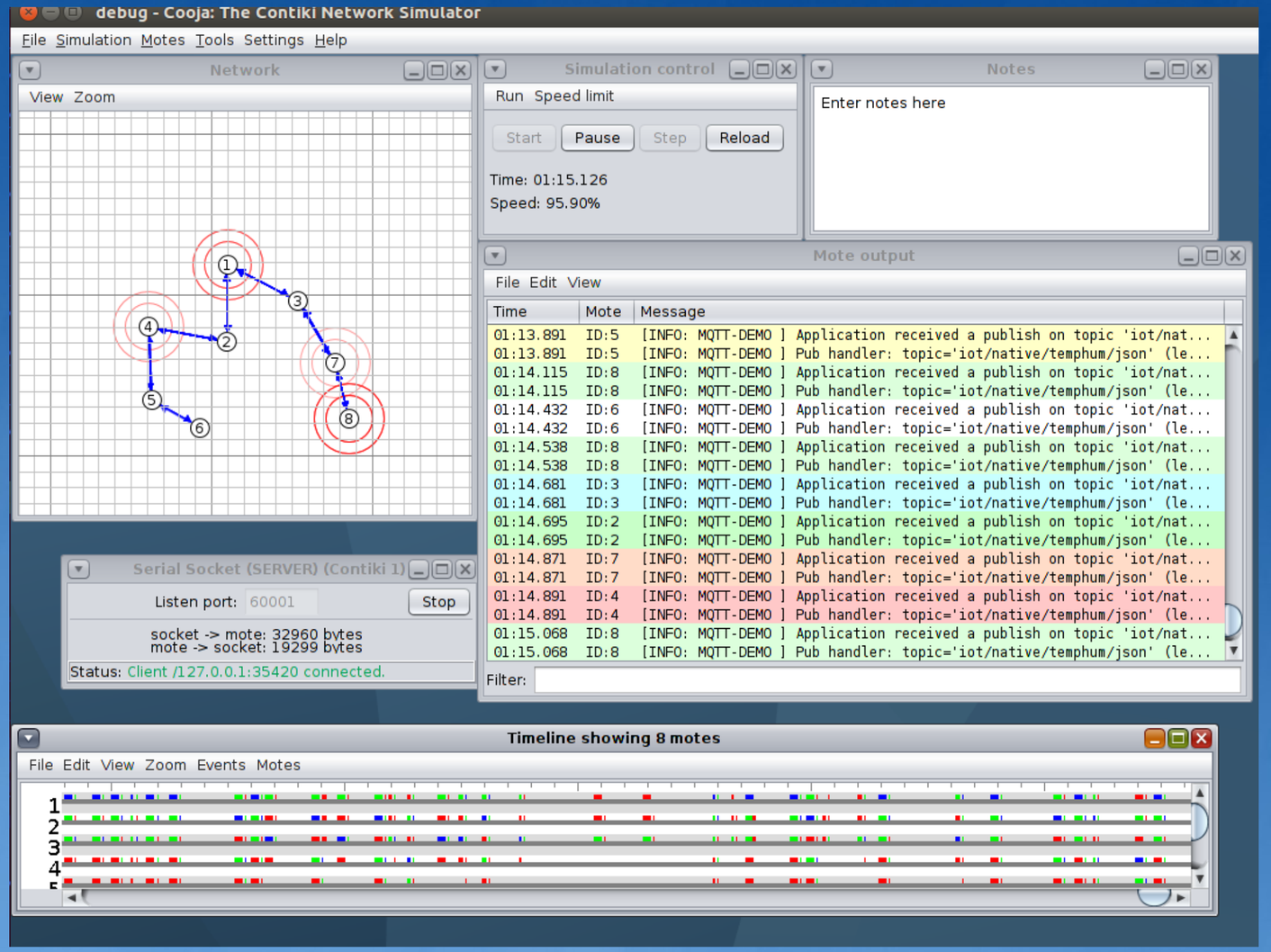
Design

- Messages sent using MQTT with QoS set to zero
- Motes communicates using RPL tree protocol
- Two types of motes:
  - MQTT motes compute and send humidity and temperature readings
  - Root of the RPL tree
- MQTT motes saves in a buffer last six readings:
  - If last reading value is greather than a threshold it is sent
  - Else the average of the last six reading is sent

Deployment


MQTT Motes
RPL Border Router
Local Mosquitto Broker
External Mosquitto Broker
MQTT
MQTT
VM [fd00::1]
Host OS [10.0.2.2]

Simulation

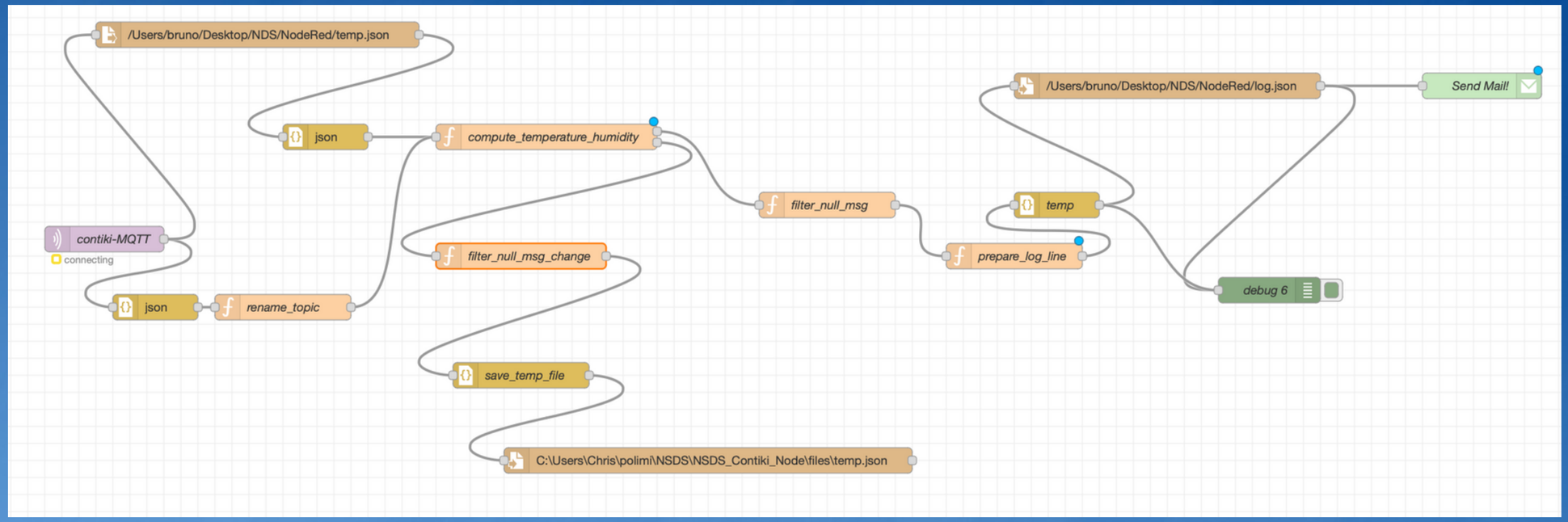

debug - Cooja: The Contiki Network Simulator
File Simulation Motes Tools Settings Help
Network
View Zoom
Simulation control
Run Speed limit
Start Pause Step Reload
Time: 01:15.126
Speed: 95.90%
Notes
Enter notes here
Mote output
File Edit View
Time Mote Message
01:13.891 ID:5 [INFO: MQTT-DEMO] Application received a publish on topic 'iot/nat...
01:13.891 ID:5 [INFO: MQTT-DEMO] Pub handler: topic='iot/native/temphum/json' (le...
01:14.115 ID:8 [INFO: MQTT-DEMO] Application received a publish on topic 'iot/nat...
01:14.115 ID:8 [INFO: MQTT-DEMO] Pub handler: topic='iot/native/temphum/json' (le...
01:14.432 ID:6 [INFO: MQTT-DEMO] Application received a publish on topic 'iot/nat...
01:14.432 ID:6 [INFO: MQTT-DEMO] Pub handler: topic='iot/native/temphum/json' (le...
01:14.538 ID:8 [INFO: MQTT-DEMO] Application received a publish on topic 'iot/nat...
01:14.538 ID:8 [INFO: MQTT-DEMO] Pub handler: topic='iot/native/temphum/json' (le...
01:14.681 ID:3 [INFO: MQTT-DEMO] Application received a publish on topic 'iot/nat...
01:14.681 ID:3 [INFO: MQTT-DEMO] Pub handler: topic='iot/native/temphum/json' (le...
01:14.695 ID:2 [INFO: MQTT-DEMO] Application received a publish on topic 'iot/nat...
01:14.695 ID:2 [INFO: MQTT-DEMO] Pub handler: topic='iot/native/temphum/json' (le...
01:14.871 ID:7 [INFO: MQTT-DEMO] Application received a publish on topic 'iot/nat...
01:14.871 ID:7 [INFO: MQTT-DEMO] Pub handler: topic='iot/native/temphum/json' (le...
01:14.891 ID:4 [INFO: MQTT-DEMO] Application received a publish on topic 'iot/nat...
01:14.891 ID:4 [INFO: MQTT-DEMO] Pub handler: topic='iot/native/temphum/json' (le...
01:15.068 ID:8 [INFO: MQTT-DEMO] Application received a publish on topic 'iot/nat...
01:15.068 ID:8 [INFO: MQTT-DEMO] Pub handler: topic='iot/native/temphum/json' (le...
Filter:
Serial Socket (SERVER) (Contiki 1)
Listen port: 60001
Stop
socket -> mote: 32960 bytes
mote -> socket: 19299 bytes
Status: Client /127.0.0.1:35420 connected.
Timeline showing 8 motes
File Edit View Zoom Events Motes
1
2
3
4

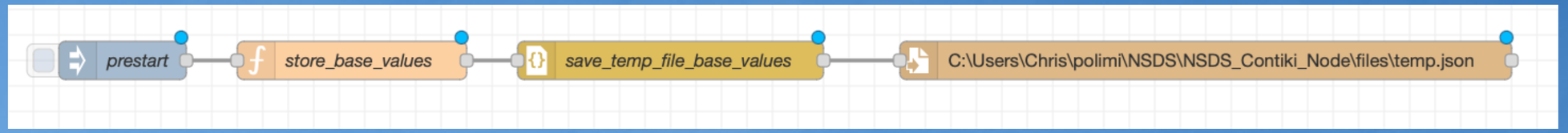
Backend

Assumptions

- Single messages contain both temperature and humidity values
- Few readings can be lost without affecting overall result
- Arrival rate is low enough for updating a file every time a message arrives
- Messages arrive only with an equal of newer day

Design


/Users/bruno/Desktop/NDS/NodeRed/temp.json
json
compute_temperature_humidity
/Users/bruno/Desktop/NDS/NodeRed/log.json
Send Mail!
filter_null_msg
temp
contiki-MQTT
connecting
filter_null_msg_change
prepare_log_line
json
rename_topic
debug 6
save_temp_file
C:\Users\Chris\polimi\NSDS\NSDS_Contiki_Node\files\temp.json


prestart
store_base_values
save_temp_file_base_values
C:\Users\Chris\polimi\NSDS\NSDS_Contiki_Node\files\temp.json

Deployment

- When launching the backend the prestart flow should be launched
- The path of the file nodes should be changed using the desired path of the user
- Upon crashes nothing should be done, everything is automatically handled