Bachelor PO - RIOT im Internet of Things

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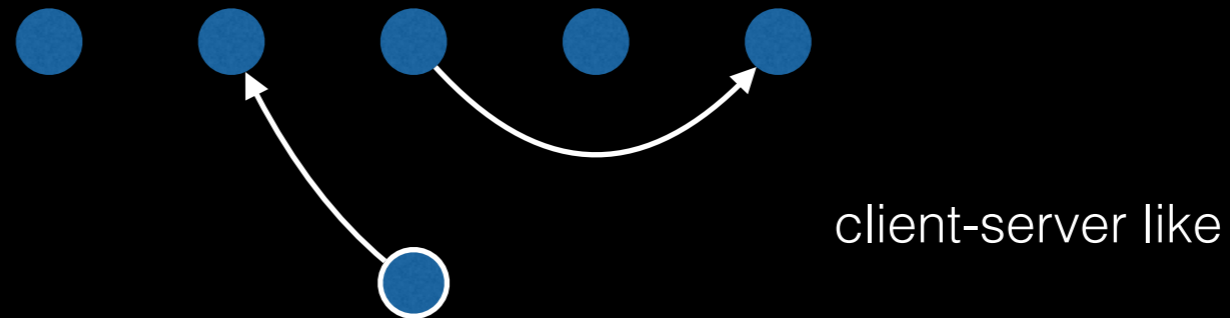sebastian.meiling@haw-hamburg.de

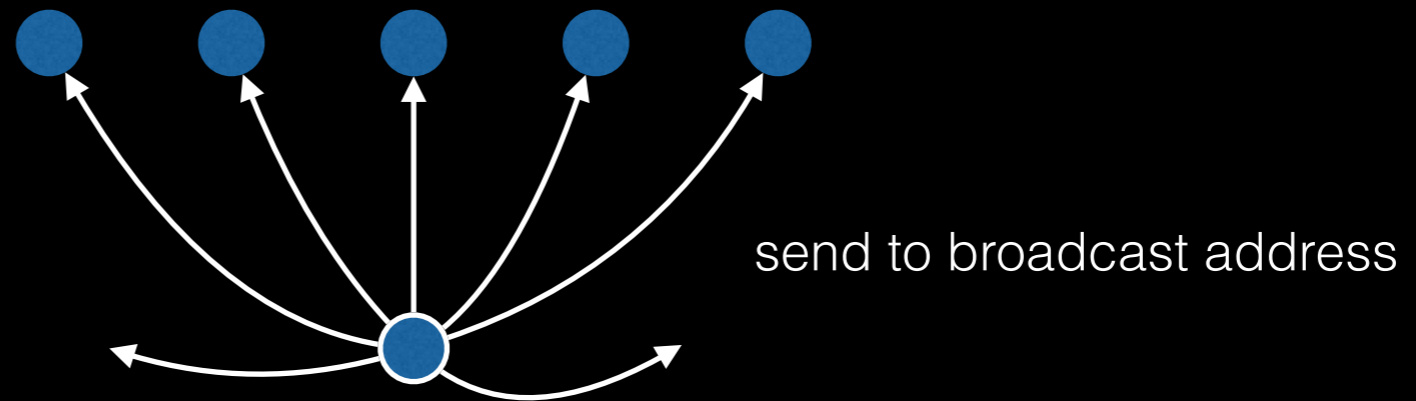# Agenda

1. Network communication
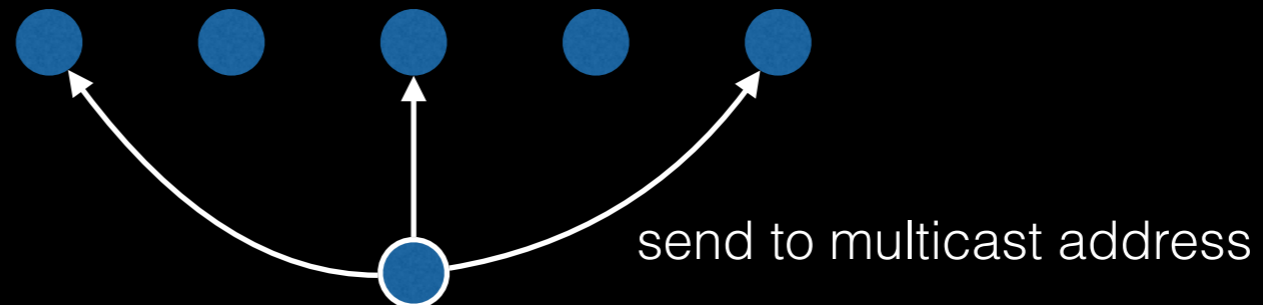
2. HTTP + REST

3. RIOT + COAP

RIOT

Patterns

- Unicast 1:1

client-server like

- Broadcast 1:*

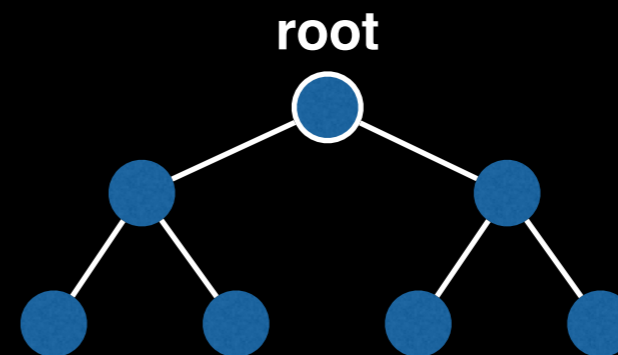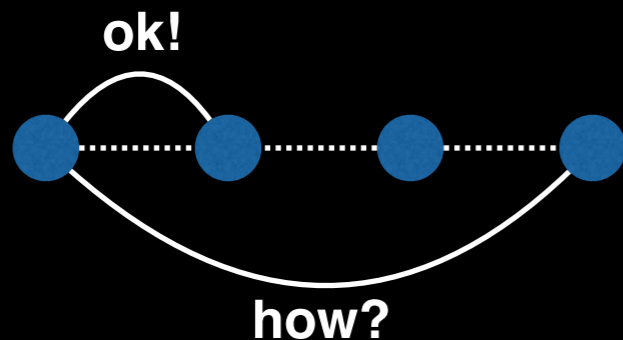send to broadcast address

- Multicast 1:n

send to multicast address

Multihop

- characteristics of sensor networks:

  - low power, lossy, wireless connections

  - multiple hops between sender and receiver

- requires routing protocol for sensor networks

- RIOT uses RPL to enable multihop routing

- RPL supports 1:n and m:1 communication, 1:1 unicast also possible, but less efficient

Signaling

- Polling
  - (periodic) request data from sensor node
  - 1 request [+ 1 ACK] + 1 response/data [+ 1 ACK]

- Timer
  - periodically send sensor data to server/gateway
  - 1 data message [+ 1 ACK]

- Event
  - send sensor data triggered by event, e.g., threshold
  - 1 data message [+ 1 ACK]

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RESTful API

- uses standardized HTTP methods:

  - GET retrieve data item, 1 GET-Request + 1 Response [+ 2 ACKs]

  - PUT update data item, 1 PUT-Message + 1 Response [+ 2 ACKs]

  - POST create data item, 1 POST+ 1 Response (new ID) [+ 2 ACKs]

- resources are encoded and accessed via URLs:

```
https://en.wikipedia.org/wiki/Wireless_sensor_network

schema  <- host = IP ->  <----      PATH      ---->

send [GET /wiki/Wireless_sensor_network] to en.wikipedia.org
```

- example usages:

  - GET /temperature or   GET /temperature/node01/

  - PUT /temperatures/node01/2015-10-16_08-55-10

  - POST /temperatures/node01/

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COAP

- Constrained Application Protocol, RFC 7252

- lightweight HTTP equivalent for the IoT

- wide variety of payload types (like MIME)

- uses UDP transport, unlike HTTP+TCP

- optional ACK-like mechanism and retries

- libraries for C/C++, Java, Python, etc...

- see: http://coap.technology

RIOT

- COAP support by *libcoap* or *microcoap*

- we recommend microcoap:

  - lightweight and simple, ACK piggyback

  - but, server only; no client side

- add to Makefile:

```
usepkg += microcoap
```

- https://github.com/RIOT-OS/RIOT/tree/master/examples/microcoap_server

RIOT

www.riot-os.org