AMANDA

The world in your hands

AutonoMous self powered miniAturized iNtelligent sensor for environmental sensing anD asset tracking in smArt IoT environments

The AMANDA Project

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Agenda

We will briefly discuss the following

- The AMANDA Card as monitoring companion

- Use cases related to air quality and Covid-19

- Extended use cases related to air quality and Covid-19

- So much more (many other possibilities)

The AMANDA Card. Our air quality monitoring companion

- The AMANDA Card is a powerful portable system in a familiar format
  - It is in a form that most people are used to carry (small, light)

- We can take it with us
  - It can be easily worn, placed in a purse, put in a pocket

- We can place it somewhere and leave it work for us
  - Place it on a table, on a stand, fix it on the ceiling or somewhere else

- We can combine both modes
  - Take it with us when needed
 - Leave it work on a fix place when needed
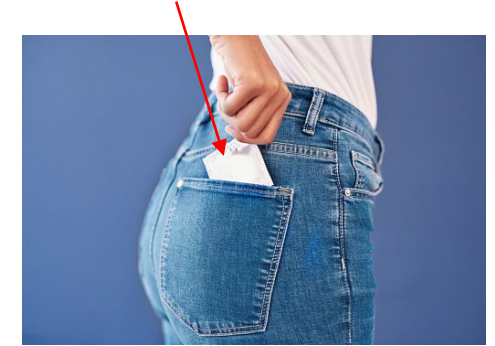
The AMANDA Card. The air quality monitoring companion

The AMANDA Card includes blocks that enable:

- Energy autonomy
    - Once the energy storage is full, you can use it for a long time
- Air quality sensing (and other sensors)
- Local processing, low-power non-volatile storing
- Near, short, far communication features

All in a familiar portable format:

- Fits in your pocket
- Fits in your purse
- Fits on your table
- Fits on/in so many other places
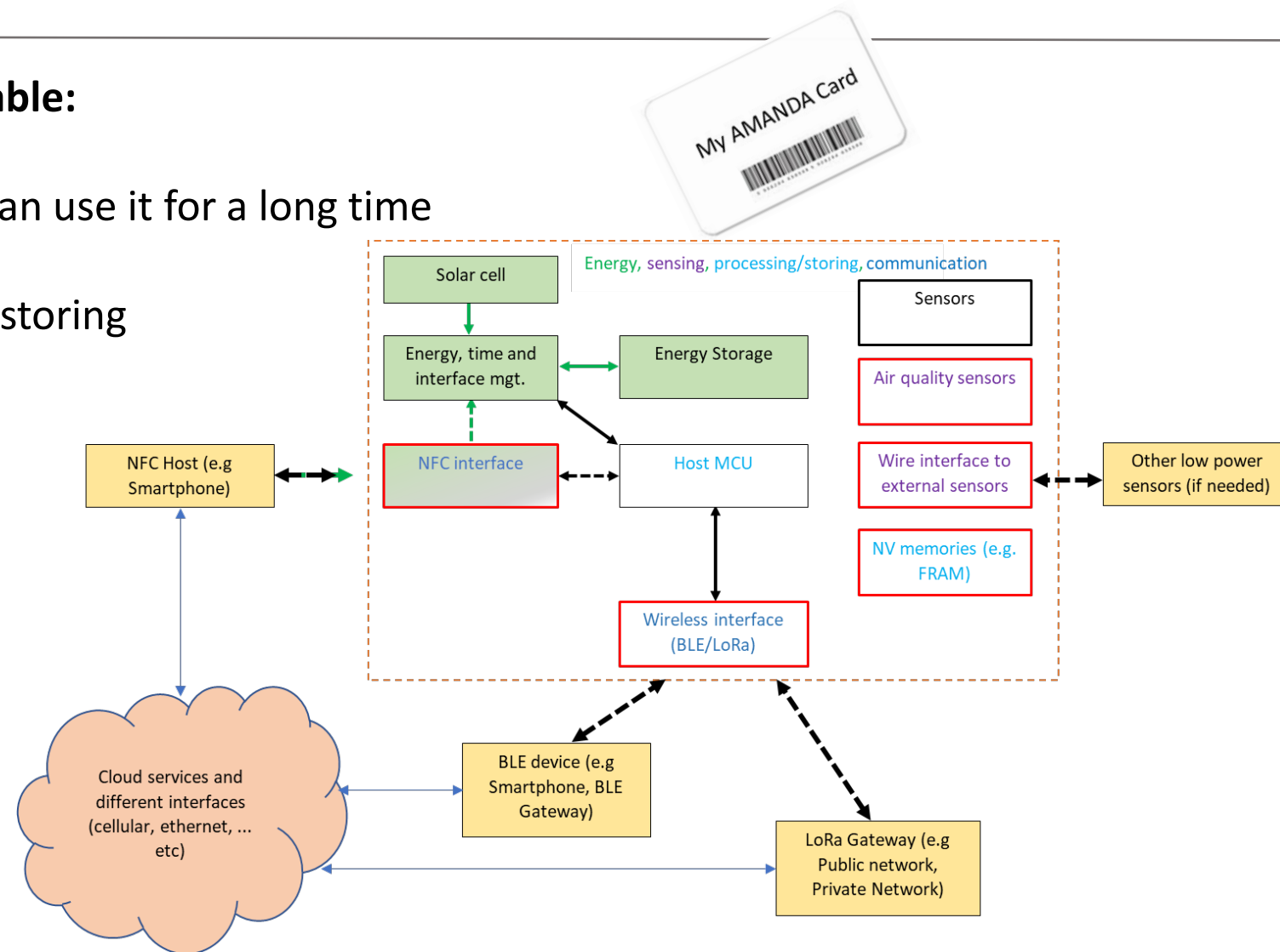
The AMANDA Card. Our air quality monitoring companion

The Amanda Card can work "alone"

- Measure and process data
- Store data, even if there is no energy (FRAM)
- Retrieve the stored data (e.g. using the NFC interface)

The AMANDA card can communicate with many other systems

- Share data with other cards
- Share data with Smartphones (BLE, NFC)
- Share data with servers over LPWAN or BLE interfaces
- That enables more processing and more work in networks
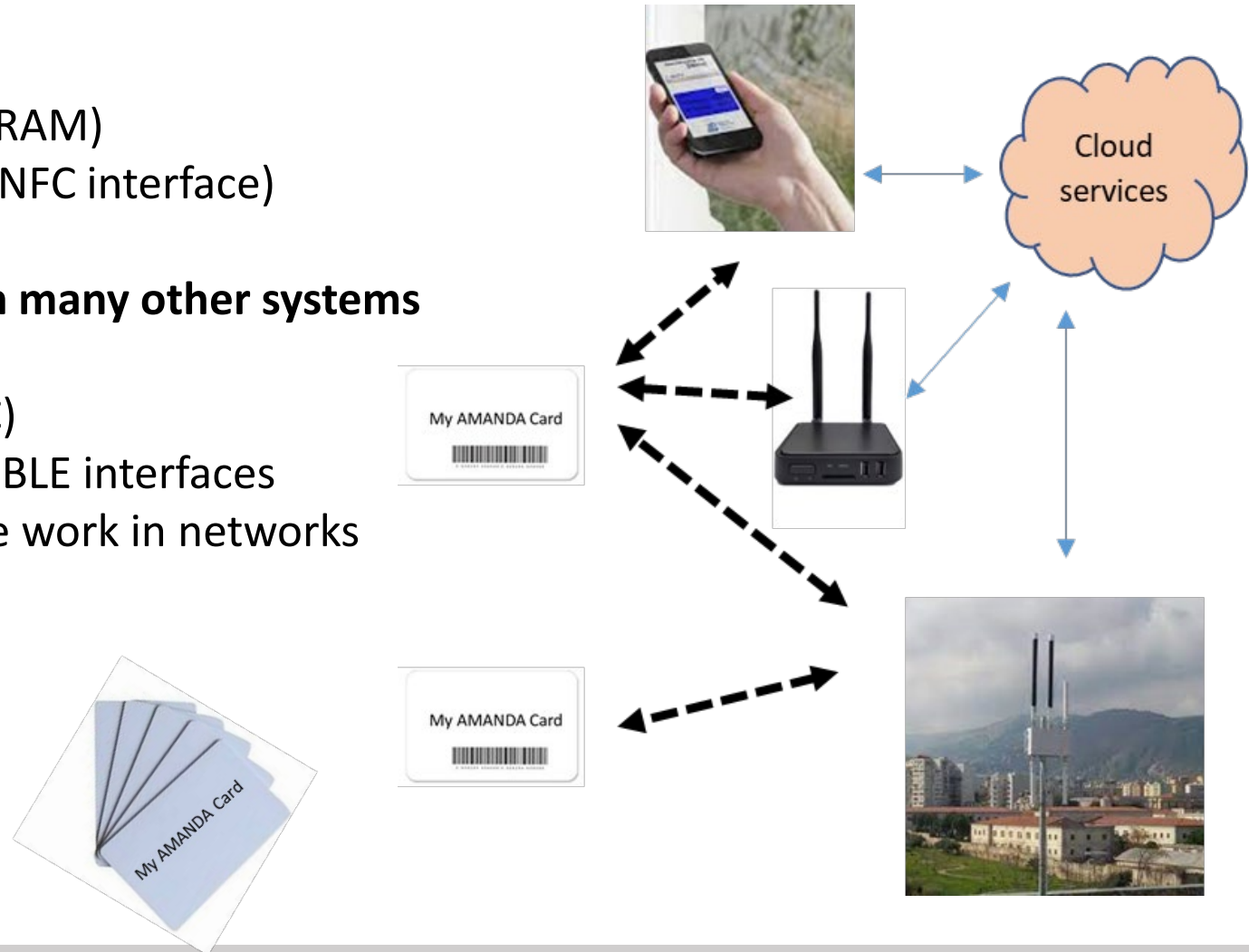
The AMANDA Card. Our air quality monitoring companion

**The basic operations at firmware level can be described as below**

- Low Power mode (sleep as long as possible to save energy)
- Measure and process the data. Store if needed
- Alert/communicate (using the short/long range communication)

Once the energy storage is full, the card can work for a long time "in the dark". The lifetime depends on the use cases (the energy they required).

- Several days are possible in a simple case where mems sensor data is advertised using BLE

Different transmission energy loads:
10uJ, 20uJ, 50uJ
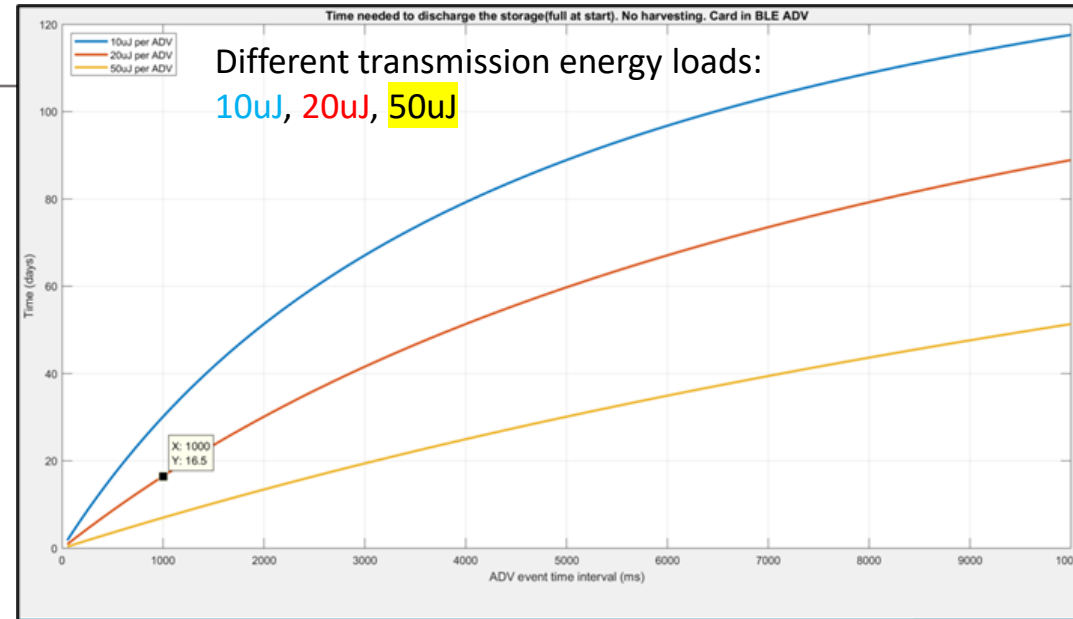
Simulation of Life time (days) vs transmission interval (ms)

Phases of the card activities
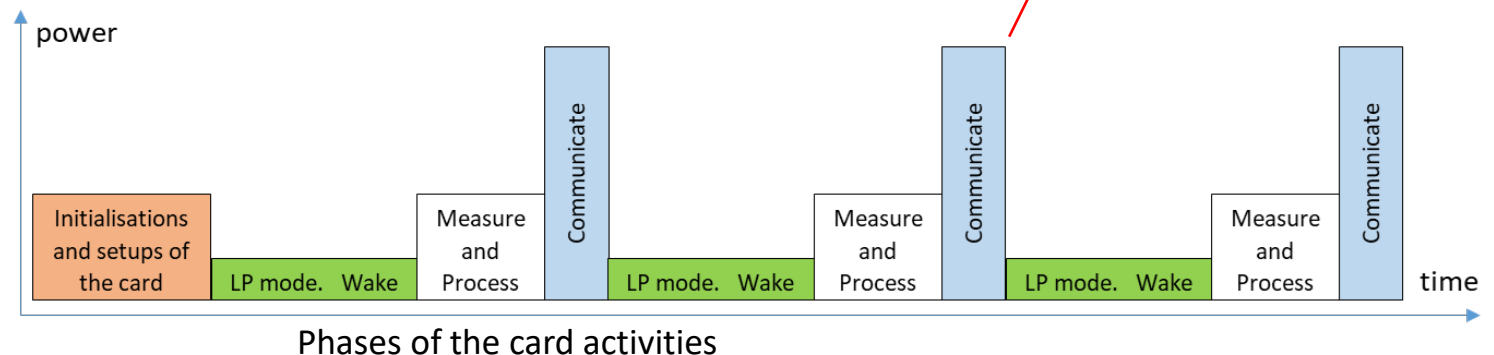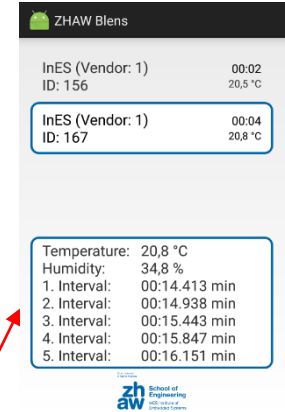
Use cases related to air quality and covid-19

How can you use the card?

- In your office: You share an office with many others
  - Place the card on your desk or keep it in your pocket
  - Use it to alert you directly
  - Use it to send alert to your smartphone, your PC, another system (via gateway)

- In a crowd: at an indoor sport event, in the movies, on the beach, in a concert hall, at church. You are on the road: You are on the bus/train/car
  - Place the card on your seat, keep it in your pocket (obviously, proper air circulation is needed)
  - Take it in a small carrier around your neck
  - Use it to alert you directly
  - Use it to log measurements
  - Use it in conjunction with your smartphone or other devices

Air quality in a building

- In a building: place the cards and let them work for all
  - You want to avoid that people crowd a small space for a long time
  - Several cards are placed at different positions
  - They monitor the local air quality (e.g. CO_2) levels and alarm local users
  - They monitor the local air quality (e.g. CO_2) and send the data to a concentrator for local processing, evaluation, decision

- Advantages of the card
  - You can quickly install it
  - You can easily add other sensors that bring some other advantages
  - Energy autonomous. There is a flexibility in choosing the place (light illumination should be good in a building)

Crowd counting

- How many people are in a given area
  - Use the camera on the AMANDA Card to count people and alert if the grouping is not good
  - Inform people
  - Pass on the information

- Privacy
  - No private data should be passed on
  - The limited processing power and internal/external communication links allow counting, but does not allow video streaming

Other uses

- Monitor position of equipment or goods
  - The card is equipped with indoor/outdoor location features, based on BLE/LoRaWAN
  - 50 cm indoors, 20-200 meters outdoors
  - No extra energy cost (the data frame is used for locating the card)

- Monitor the temperature of goods
  - Put a card with the goods and activate temperature monitoring
  - You can easily add other sensors that bring some other advantages
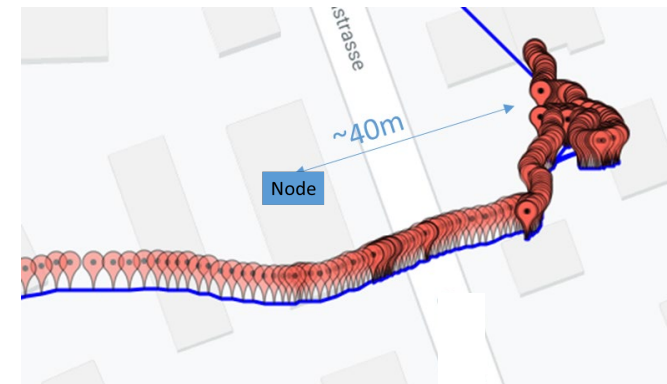
Other uses

- Low-cost system for traceability
  - Done today mostly with smartphones
    - But there are situations where we do not have a smartphone
    - There are people who do not have a smartphone (actually, most people do not have smartphones)
  - The resources in the AMANDA Card allow the estimation of distance (RSSI with BLE)
  - The card can log information about those it "came in contact with"
  - That information can be transferred to a server using a gateway and help for traceabiliy

The end

Thanks for your attention

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Thank you
Q&A

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