An aggregation platform for IoT-based healthcare

Illustration for bioimpedancemetry, temperature and fatigue level monitoring.

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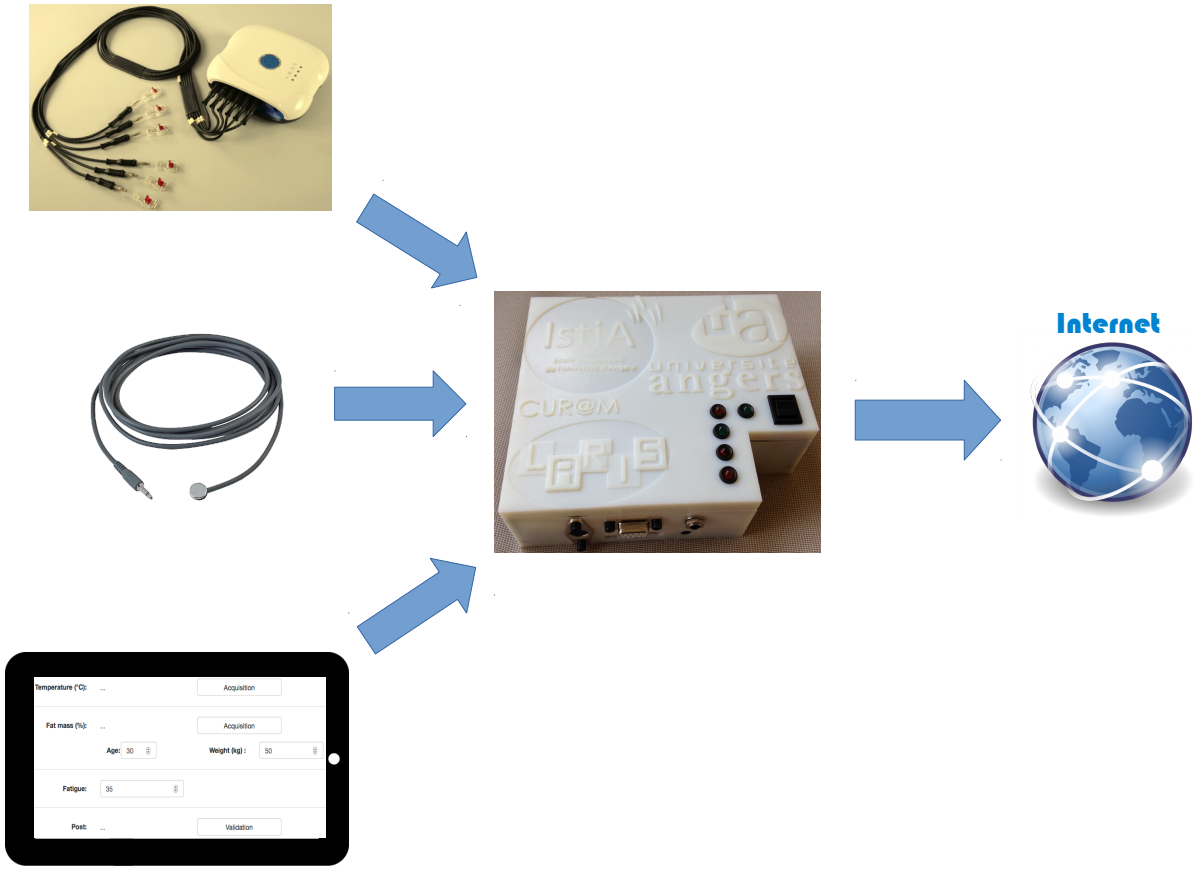
The IoT Healthcare

- Emerging field.
- Interconnect medical device.
- In-Home Patient Telemonitoring.
  - Medical application with form : MoovCareTM [1]
  - Mainstream sensors : Wearable devices
- Closed systems :
  How to build your own acquisition system ? Architecture ? Technologies ?

1. Improving Survival in Patients Treated for a Lung Cancer Using Self-Evaluated Symptoms Reported Through a Web Application, **Fabrice Denis et al**, 2015, American Journal of Clinical Oncology

Scientific contribution

An example of home-made aggregation platform using up to date technologies.

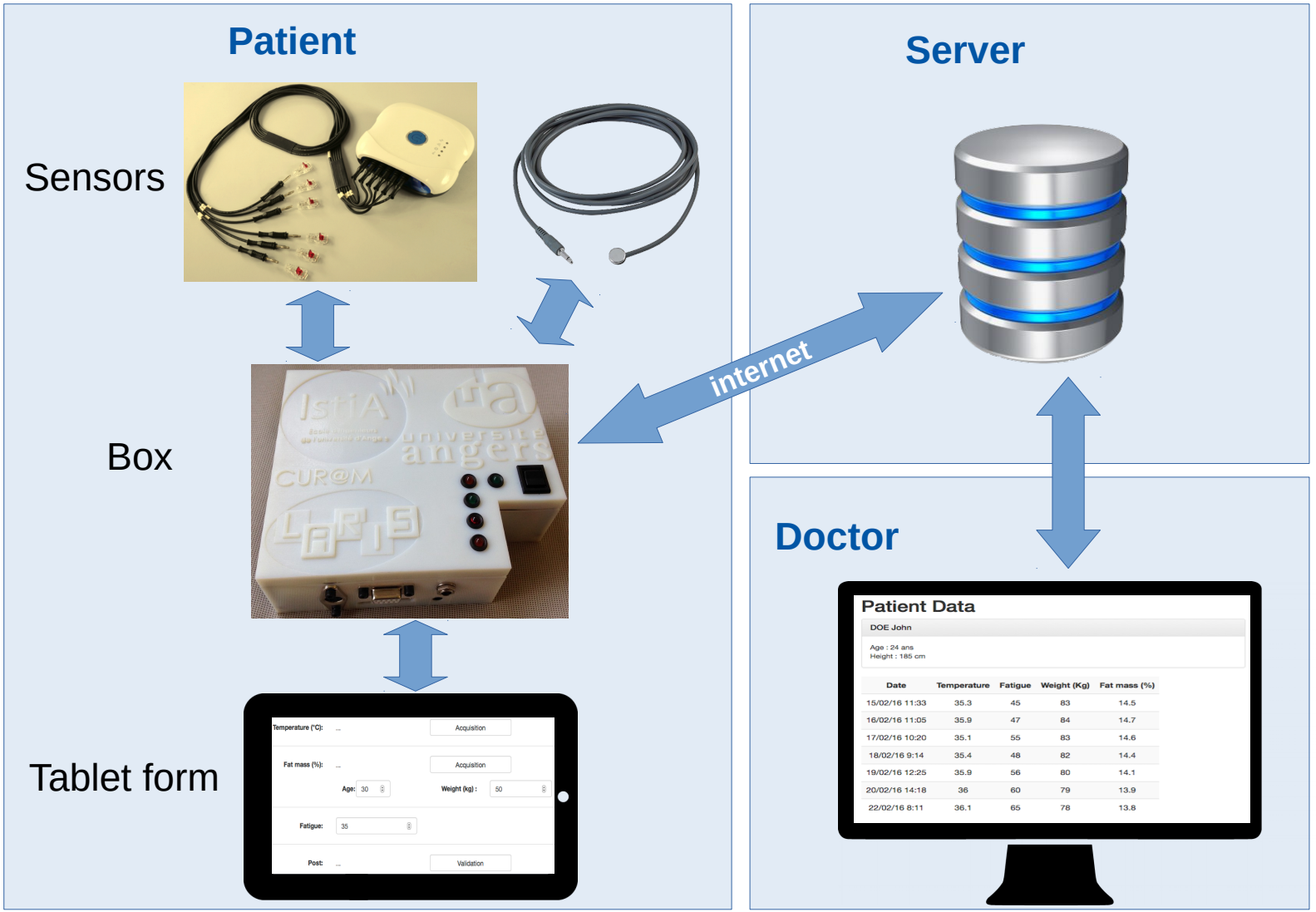


An in-home aggregation platform

- A Box : the core of the aggregation platform
- 2 particular sensors : bioimpendancemetry and temperature.
- A form-tablet : fatigue level, weight, ...

Presentation Plan

Global overview



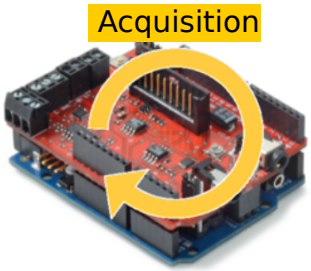
Global Architecture

Box

Power management

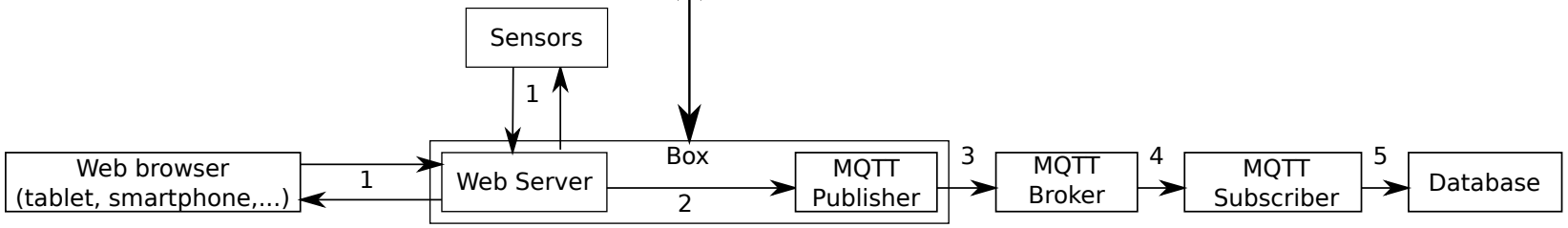
Bioimpedance Sensor

Raspberry Pi

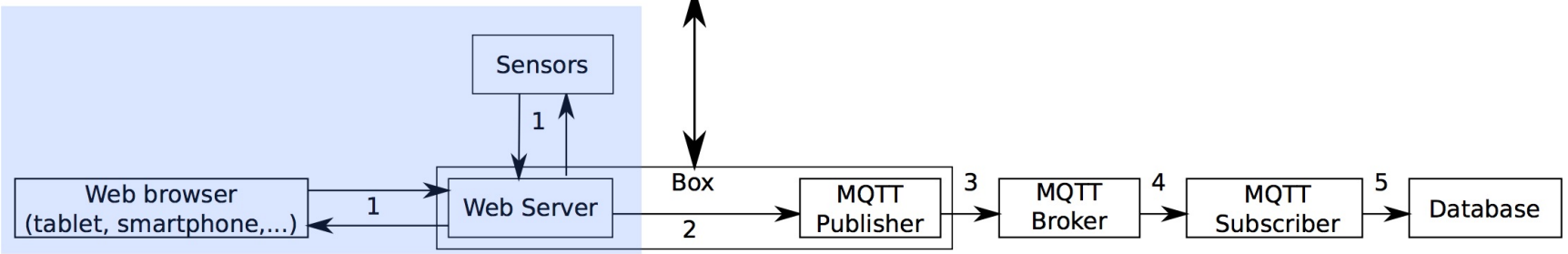


Arduino and Shield

Temperature Sensor

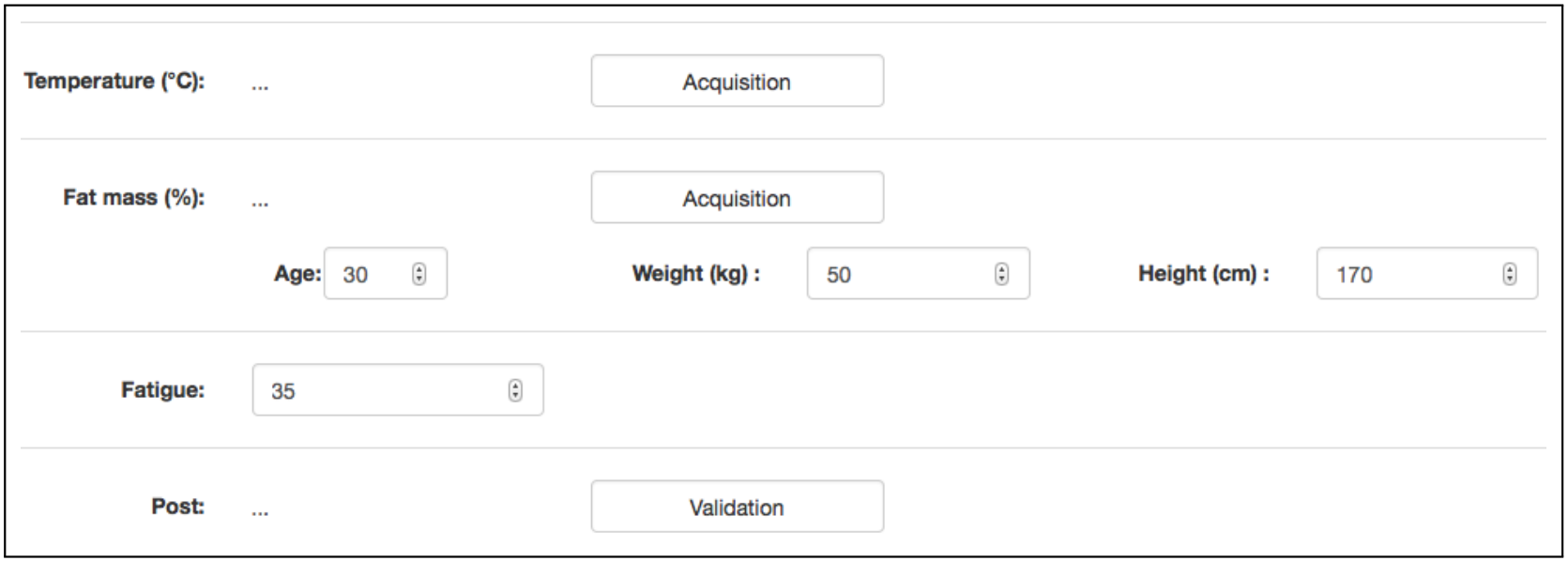


Global Architecture – Patient Web Server

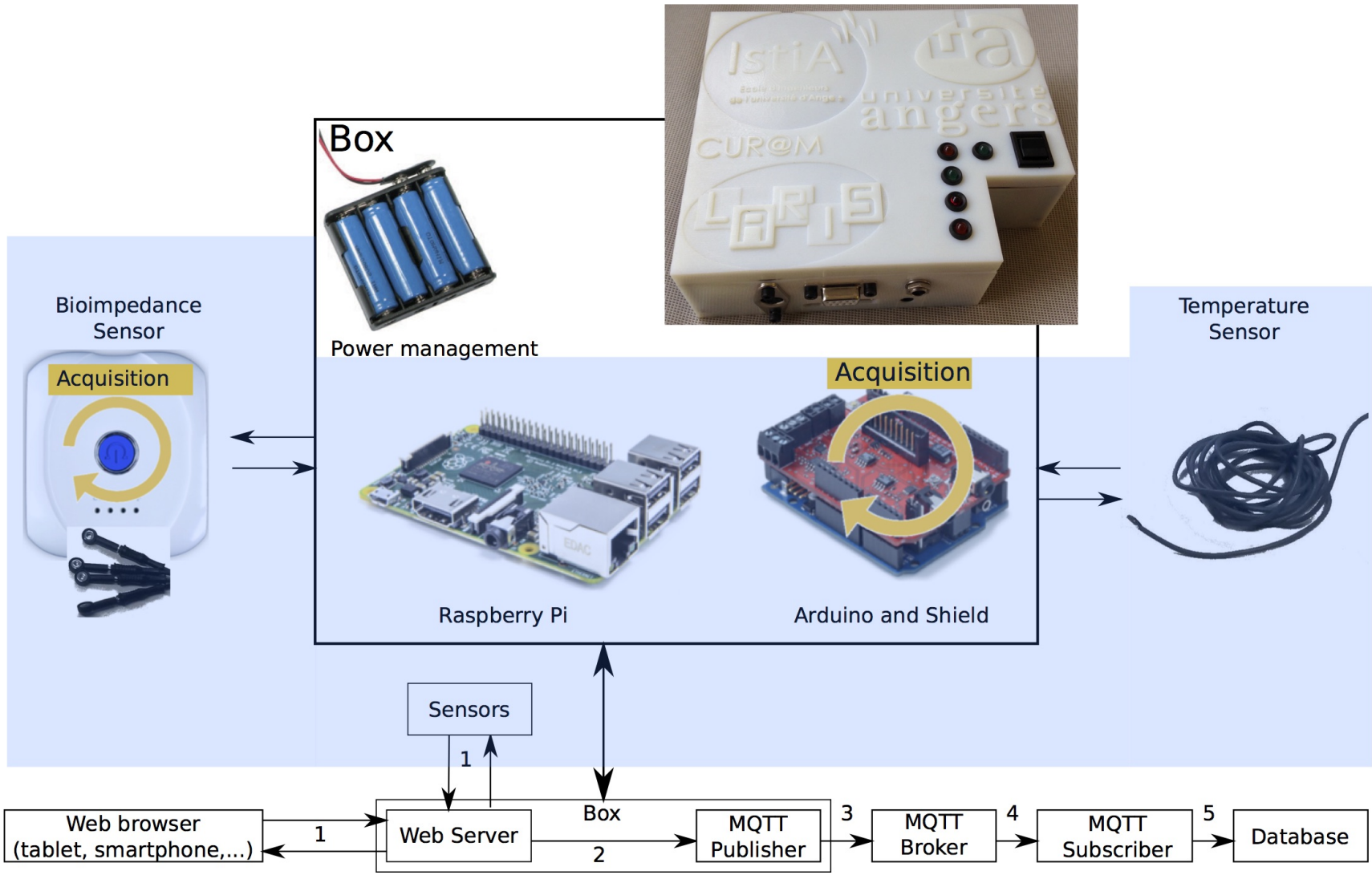


Patient Web Server

- Tablet connects the web server running on the box (Raspberry Pi)
- Wifi connection
- Server : REST architecture in Python (Flask)
- AJAX Request (for latency).



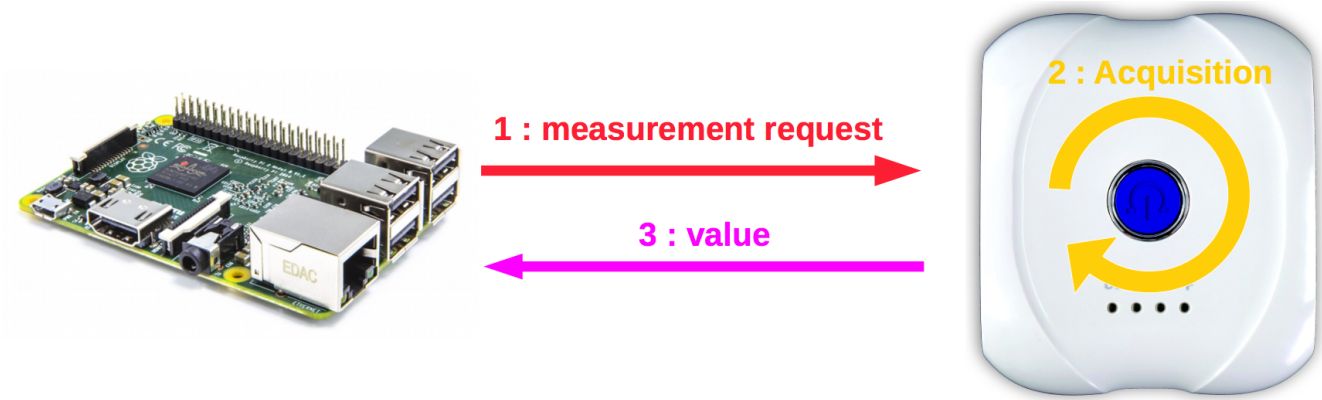
Global Architecture – Sensors



The Sensors

- Wired sensors : USB and jack
- Temperature sensor by jack (e-health by cooking-hacks)
- Bioimpedancemeter by USB (Z-metrix by Bioparhom)
  - Fat mass
  - Lean mass
  - Total body water
  - Extracellular water

Sensors Management



Global Architecture – MQTT protocol

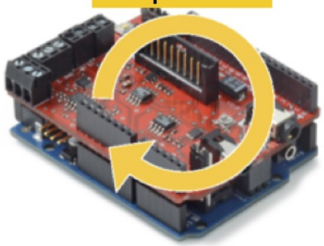
Box

Power management

Bioimpedance Sensor

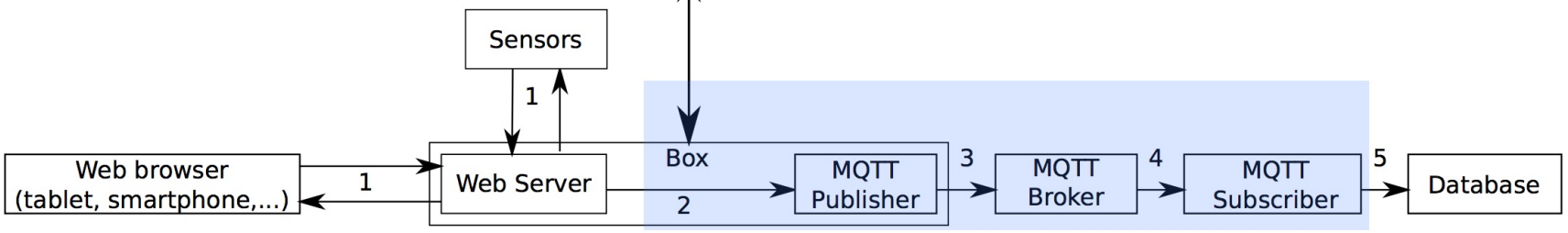
Raspberry Pi

Acquisition

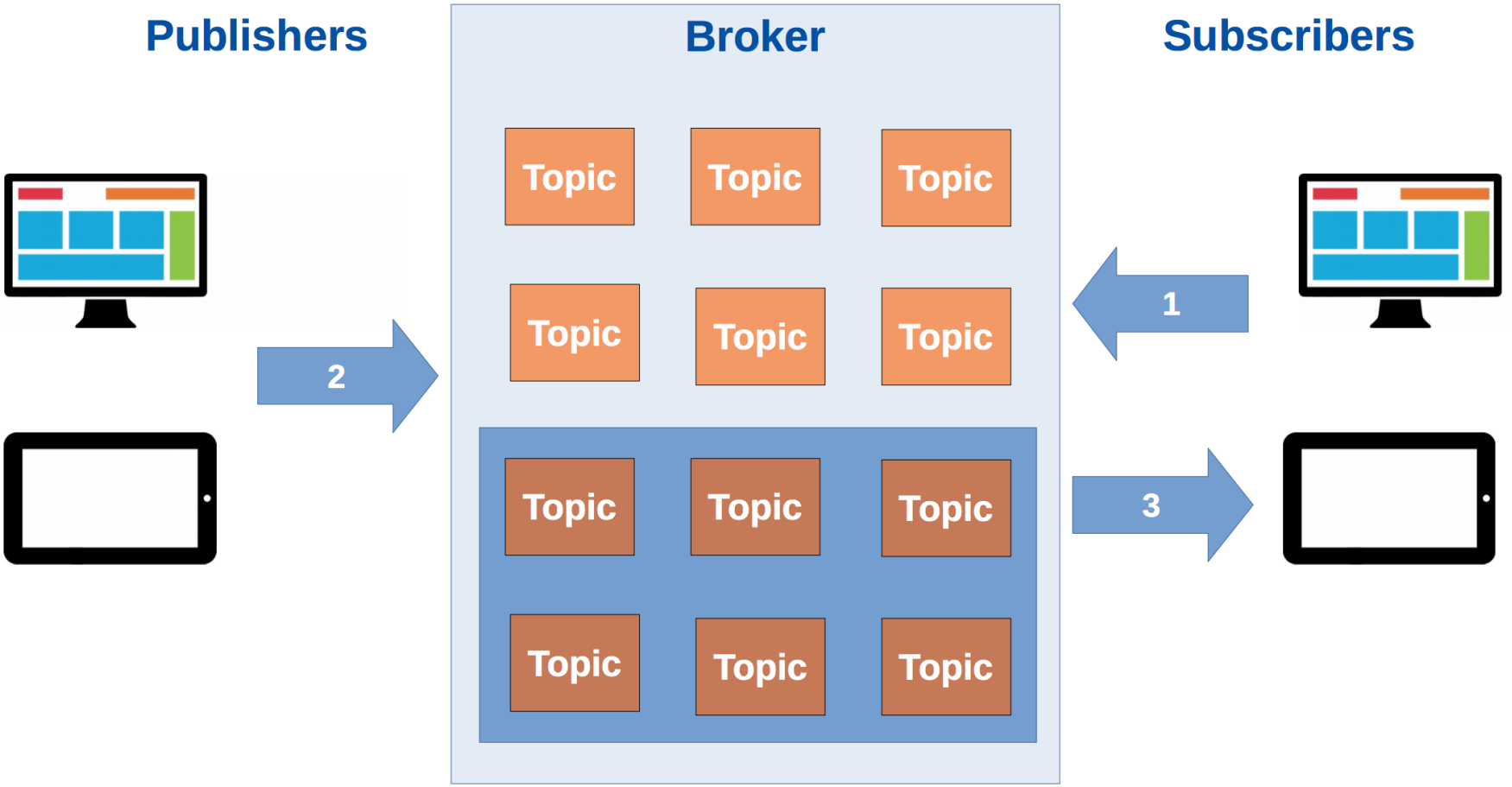


Arduino and Shield

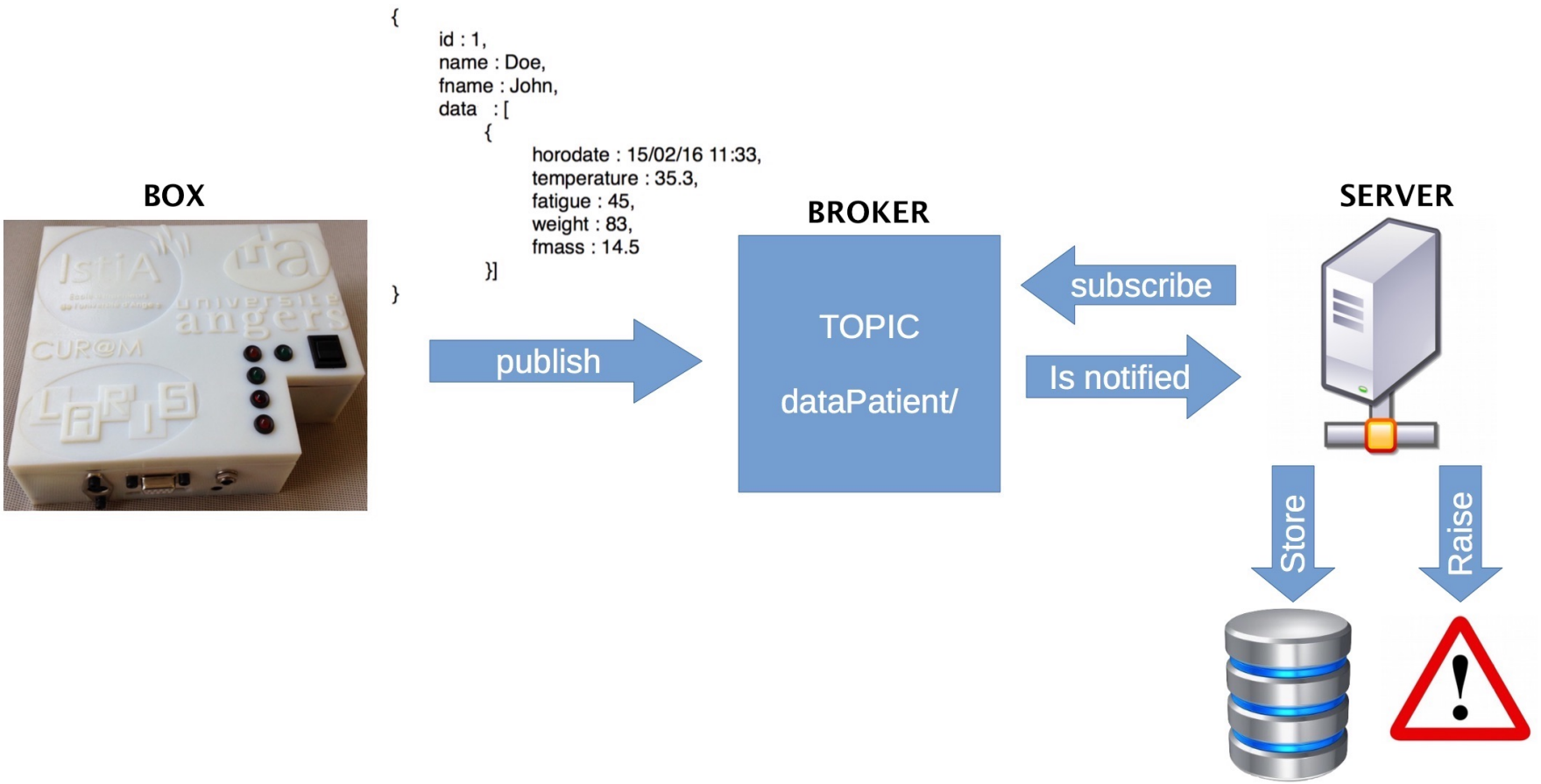
Temperature Sensor



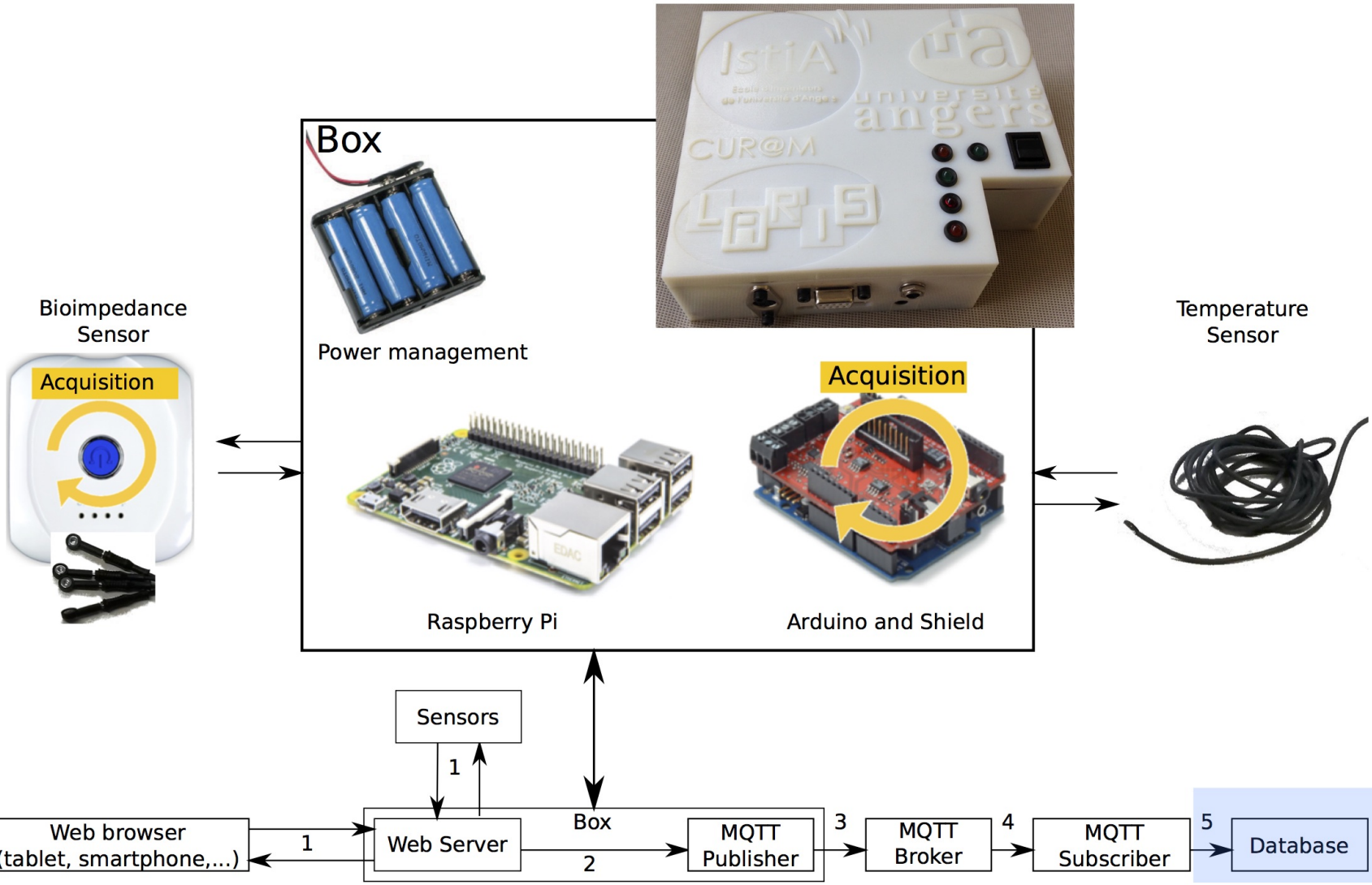
The MQTT protocol : A standard in IoT field



MQTT into the project



Global Architecture – Doctor Web Server



Doctor Web Server

- NoSQL Database : MongoDB
- REST architecture in NodeJS

Discussion

Often third party experimental works consider a tablet/smartphone for aggregation : No Box.

Advantages of our approach :

- connectivity
- extensibility

Drawback of our approach :

- dedicated box
  (cost, less wearable)

Conclusion

- Detailed and complete example
- Standard modern technologies
- Next step : real healthcare applications

Thank you for your attention