An aggregation platform for IoT-based healthcare Illustration for bioimpedancemetry, temperature and fatigue level monitoring.

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Healthy IoT - october 18-19, 2016



The context Scientific contribution The project Summary

The IoT Healthcare

- Emerging field.
- Interconnect medical device.
- In-Home Patient Telemonitoring.
 - Medical application with form : MoovCareTM¹
 - Mainstream sensors : Wearable devices
- Closed systems :

How to build your own acquisition system? Architecture? Technologies?

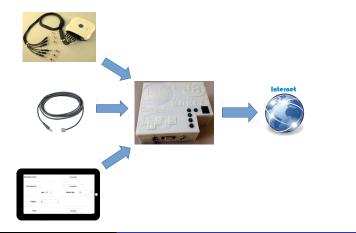
1. Improving Survival in Patients Treated for a Lung Cancer Using Self-Evaluated Symptoms Reported Through a Web Application, Fabrice Denis et al, 2015, American Journal of Clinical Oncology

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The context Scientific contribution The project Summary

Scientific contribution

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



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The context Scientific contribution **The project** Summary

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, ...







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The context Scientific contribution The project Summary

Presentation Plan

1. System Overview

- 2. Software & Hardware architecture
 - 2.1 Sensors
 - 2.2 Patient Web Server
 - 2.3 MQTT
 - 2.4 Doctor Web Server

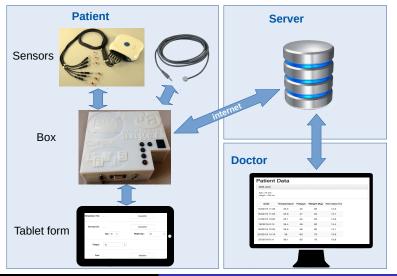


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Global overview

Global overview



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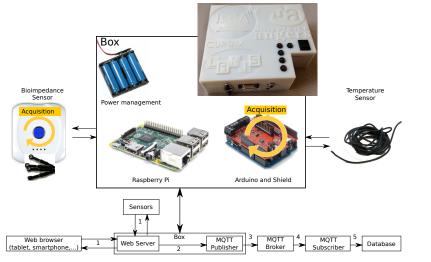
An aggregation platform for IoT-based healthcare



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Patient Web Server Sensors MQTT Doctor Web Server

Global Architecture

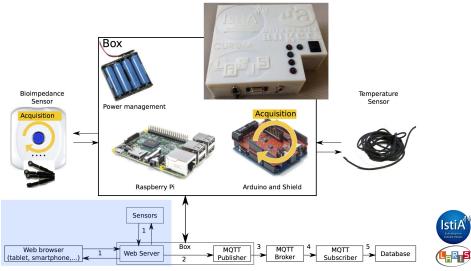


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Patient Web Server Sensors MQTT Doctor Web Server

Global Architecture - Patient Web Server



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Introduction Patient Web Server System overview Sensors Software and hardware architecture MQTT Conclusion Doctor Web Server

Patient Web Server

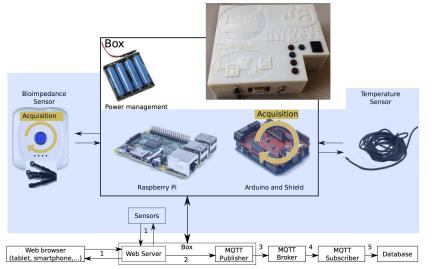
- Tablet connects the web server running on the box (Raspberry Pi)
- Wifi connection
- Server : REST architecture in Python (Flask)
- AJAX Request (for latency).

Temperature (°C):		Acquisition				
Fat mass (%):		Acquisition				
	Age: 30 🔅	Weight (kg) : 50	٤	Height (cm) :	170	٢
Fatigue:	35					
Post:		Validation				

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Global Architecture - Sensors



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The Sensors

Wired sensors : USB and jack

 Temperature sensor by jack (e-health by cooking-hacks)

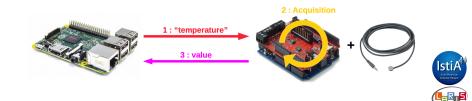
- Bioimpedancemeter by USB (Z-metrix by Bioparhom)
 - Fat mass
 - Lean mass
 - Total body water
 - Extracellular water



Patient Web Server Sensors MQTT Doctor Web Server

Sensors Management



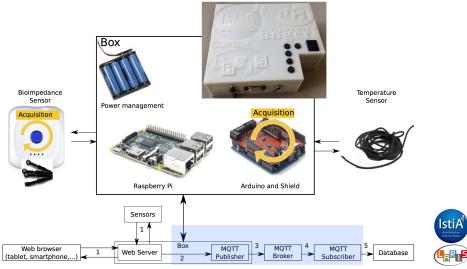


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Global Architecture – MQTT protocol

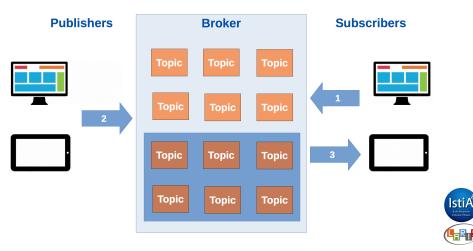


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Patient Web Server Sensors MQTT Doctor Web Server

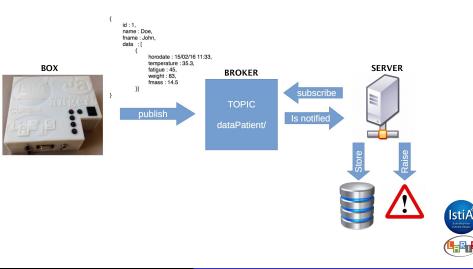
The MQTT protocol : A standard in IoT field



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Patient Web Server Sensors MQTT Doctor Web Server

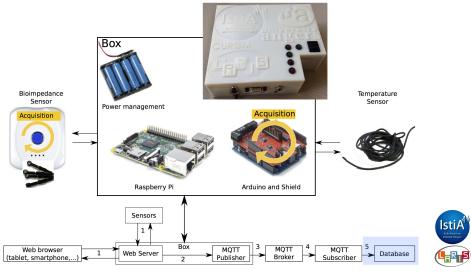
MQTT into the project



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Global Architecture - Doctor Web Server



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Patient Web Server Sensors MQTT Doctor Web Server

Doctor Web Server

 NoSQL Database : MongoDB

 REST architecture in NodeJS

Age : 24 ans					
Height : 185 om					
Date	Temperature	Fatigue	Weight (Kg)	Fat mass (%)	
5/02/16 11:33	35.3	45	83	14.5	
8/02/16 11:05	35.9	47	84	14.7	
/02/16 10:20	35.1	55	83	14.6	
8/02/16 9:14	35.4	48	82	14.0	
			82	14.4	
19/02/16 12:25	35.9	56			
20/02/16 14:18	38	60	79	13.9	
22/02/16 8:11	36.1	65	78	13.8	
4.55 4.50 4.45 4.40		\backslash			
- 25			\mathbf{A}		
125 125			\backslash		
125					
125 125 125 115					
1.35 1.25 1.25 1.15 1.15					
435 439 429 415 419 406					
4.35 4.25 4.25 4.15 4.10 4.05 4.00					
4.35 4.25 4.25 4.15 4.15 4.05 4.00 1.05 1.00					



Discussion Conclusion

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

