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University of West Attica
Department of Informatics & Computer Engineering

A low-cost Smart Home for the assistance of elderly persons and patients

Michael Galliakis
Department of Informatics and Computer Engineering
University of West Attica
Greece
cnt16003@uniwa.gr

Christos Skourlas
Department of Informatics and Computer Engineering
University of West Attica
Greece
cskourlas@uniwa.gr

Eleni Galiotou
Department of Informatics and Computer Engineering
University of West Attica
Greece
egali@uniwa.gr

Ioannis Voyiatzis
Department of Informatics and Computer Engineering
University of West Attica
Greece
voyageri@uniwa.gr

KEYWORDS
Smart home, Assistive Information System for Elderly Persons / Patients, internet of things, Arduino micro-controller.

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- Related Work
- Technological framework
- Requirements analysis and use cases
- Software Architecture
- Real scenarios for using the system
- Mechanisms and software applications
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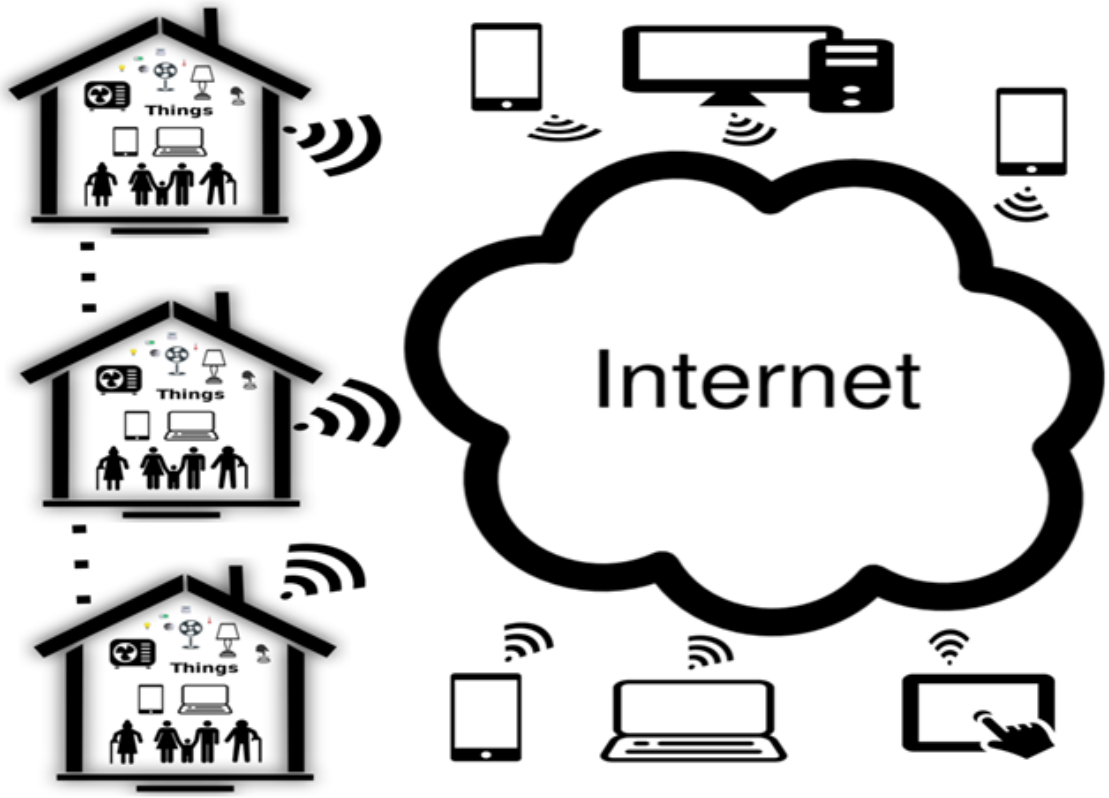
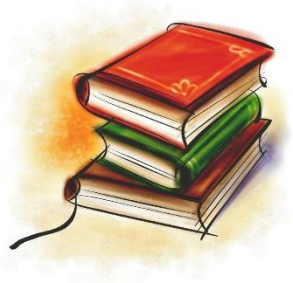
Introduction



Smart homes for the assistance of elderly persons and patients

Related work

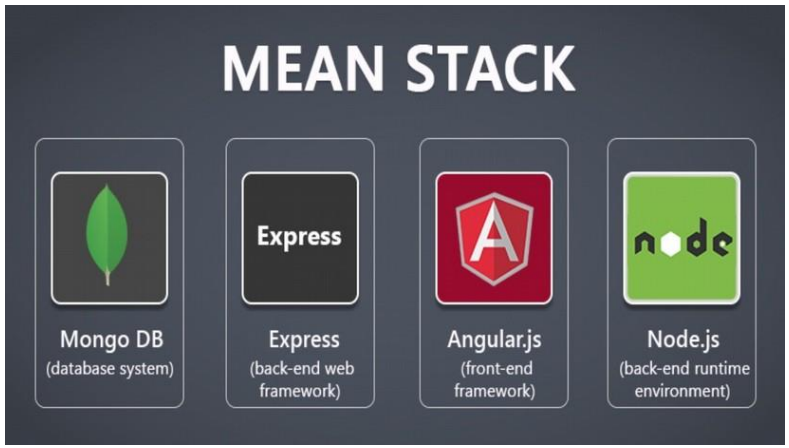


• Towards the Development of a Cognitive Sensors Network Based Home for Elder Care (2010)	Gaddam, A., Mukhopadhyay, S. and Gupta, G.
• Smart home for elderly care, based on Wireless Sensor Network (2015).	Ransing, R. and Rajput, M.
• Smartphone based continuous monitoring system for home-bound elders and patients (2014)	Megalingam, R., Pocklassery, G., Jayakrishnan, V., Mourya, G. and Thulasi, A.
• Framework of ubiquitous healthcare system based on cloud computing for elderly living (2013).	Ou, Y., Shih, P., Chin, Y., Kuan, T., Wang, J. and Shih, S.

Technological framework

Technological concepts and choices:

- *Unit (e.g sensors, switches, electrical devices)*
- *Arduino*
- *Raspberry*
- *RESTFul Api / Web Services*
- *Socket*



Programming and tools:

- *Java*
- *MEAN stack (MongoDB, Express, Angular, NodeJS)*
- *Maven, Gradle, Git, JSON*

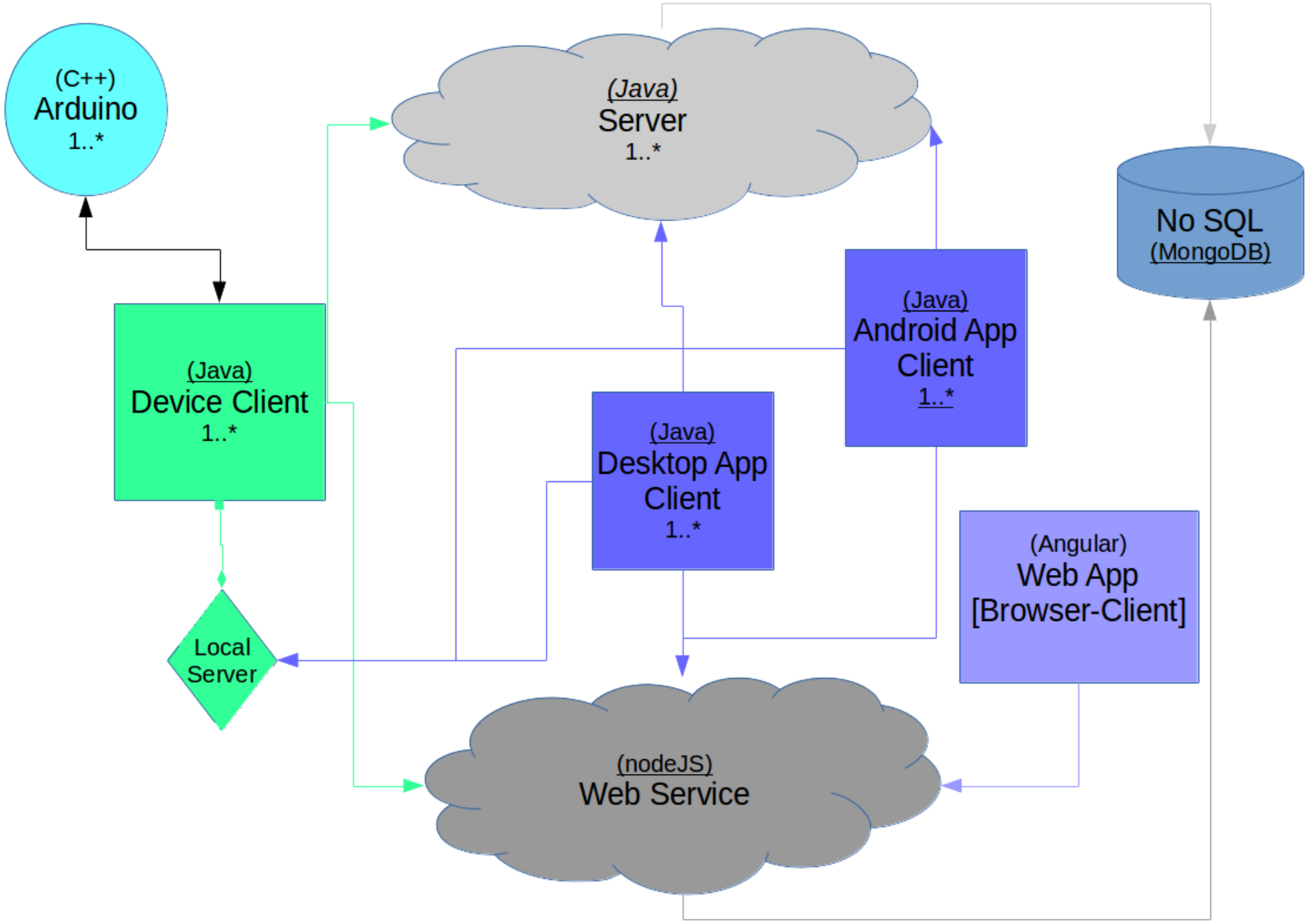
Requirements analysis

- ✓Real-time monitoring
- ✓Update the status
- ✓Receive notifications
- ✓Schedule of updating the status

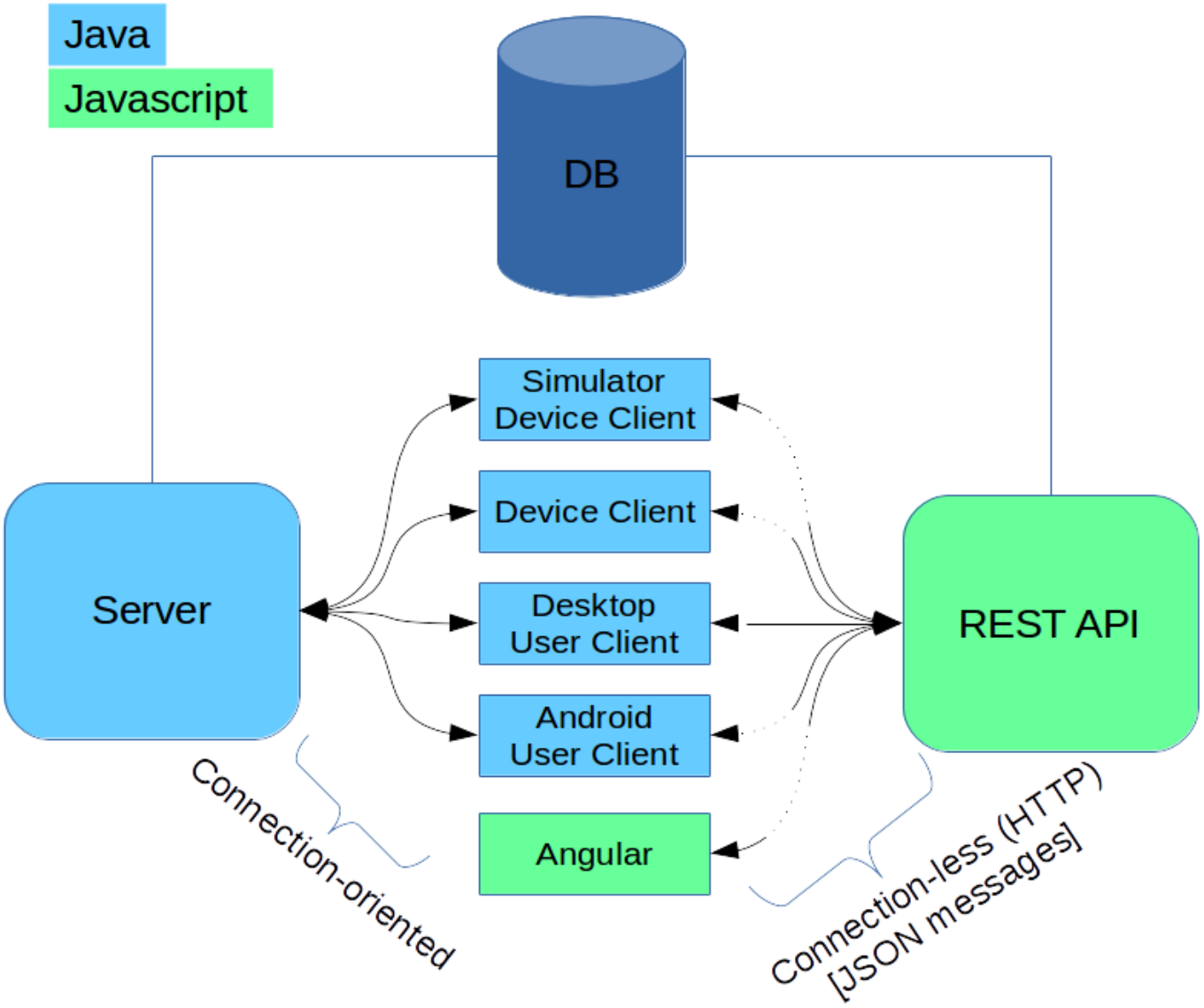
Use cases

- ✓Medication reminder
- ✓Notification in case of danger
- ✓Preventive check
- ✓Management of electrical appliances

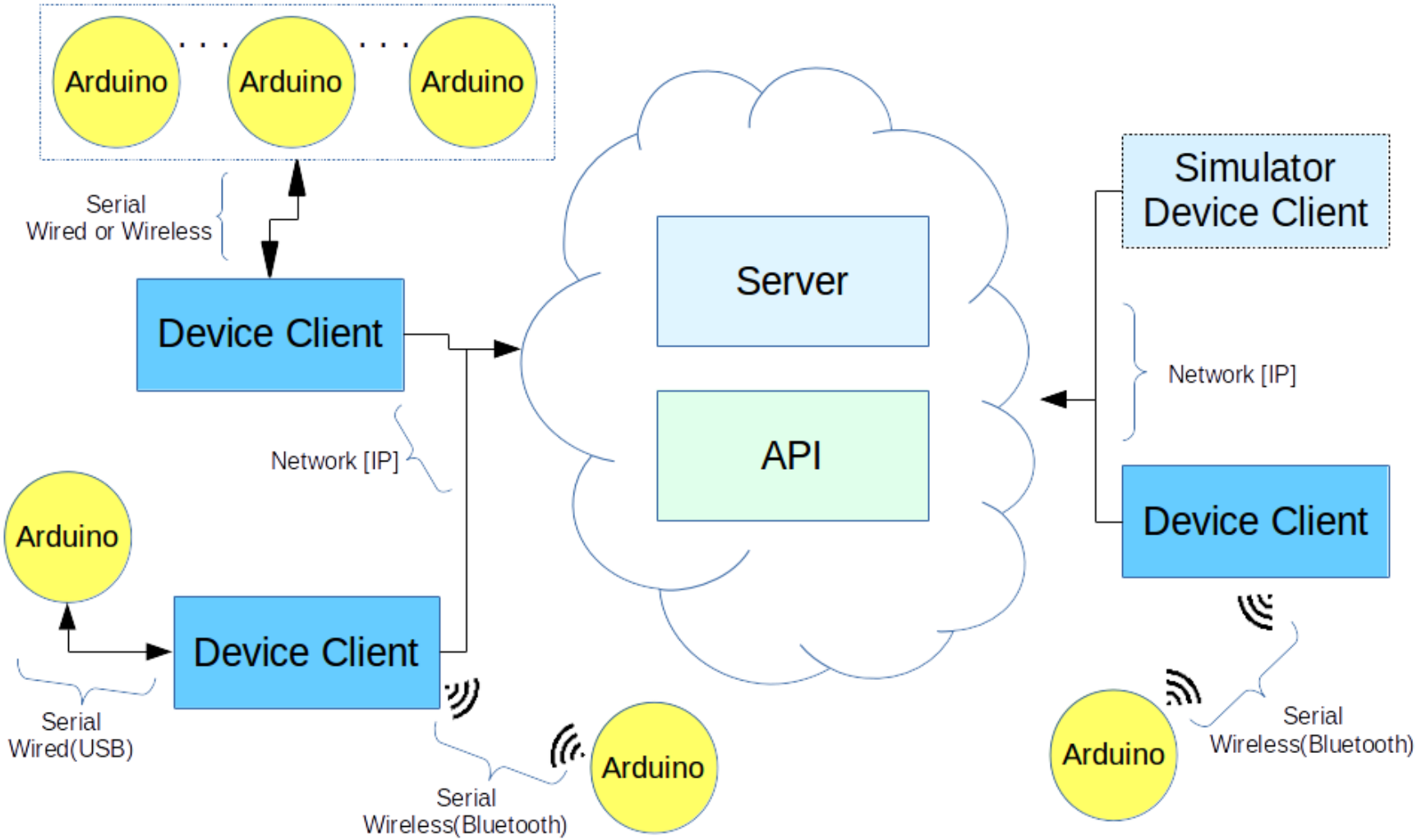
Software Architecture



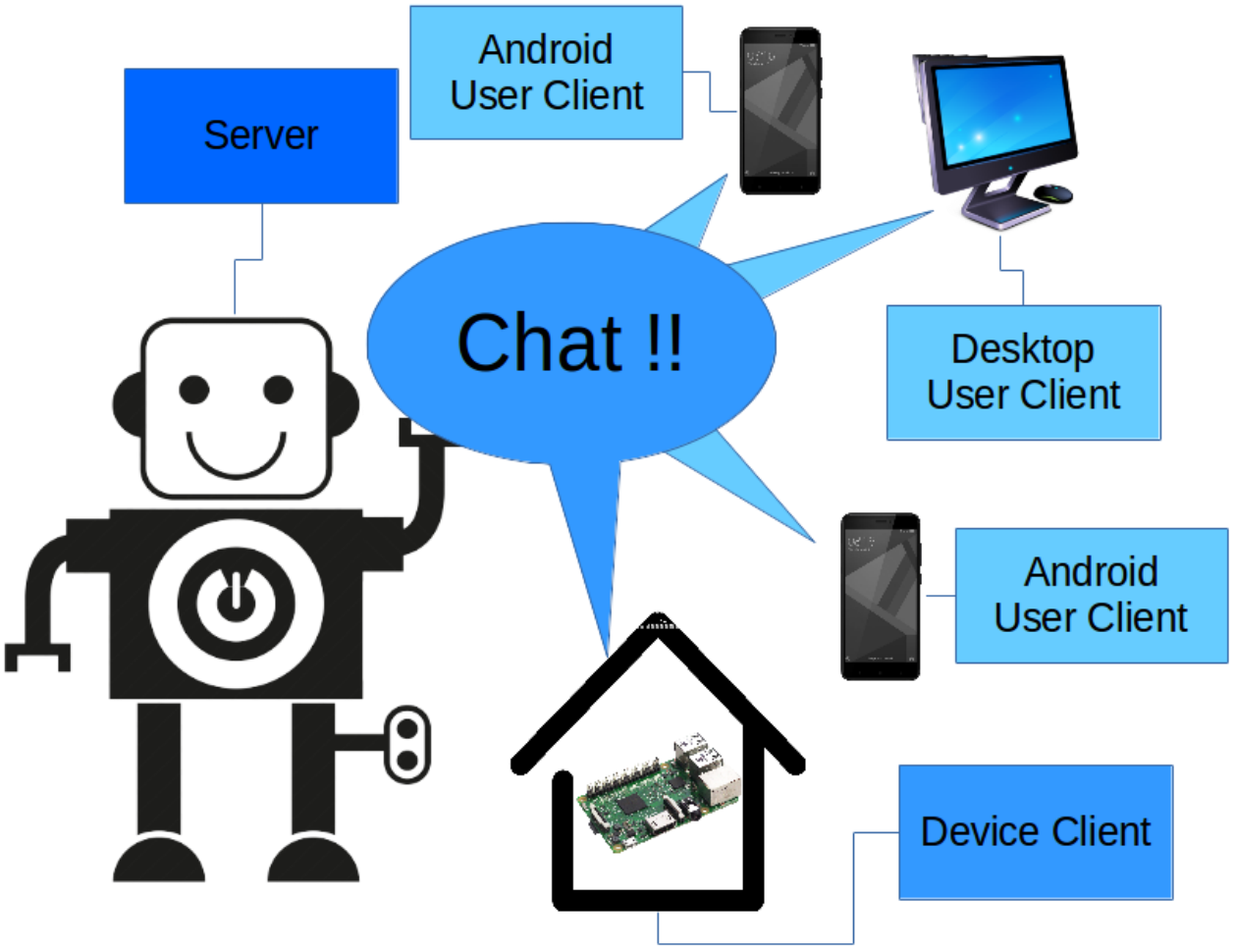
Software Architecture



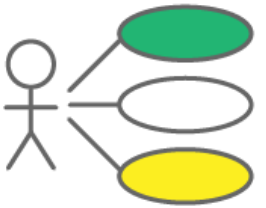
Software Architecture

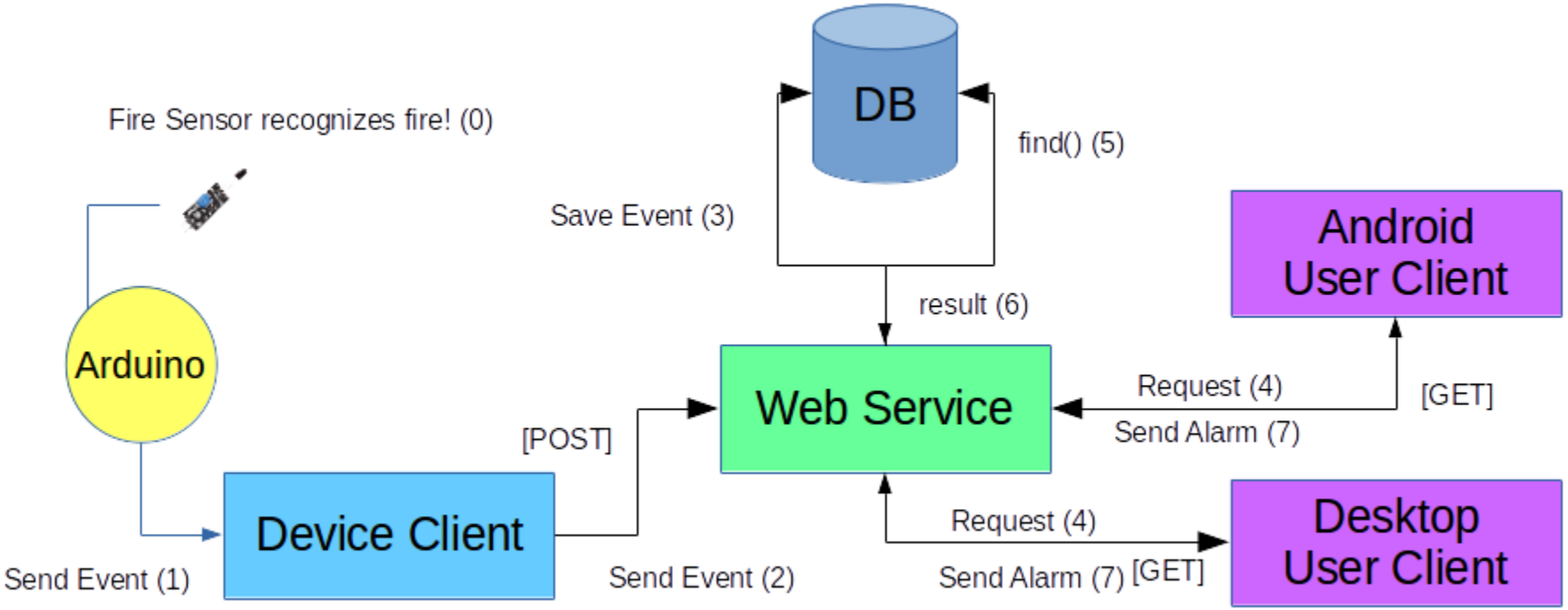


Real scenarios

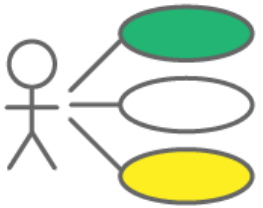


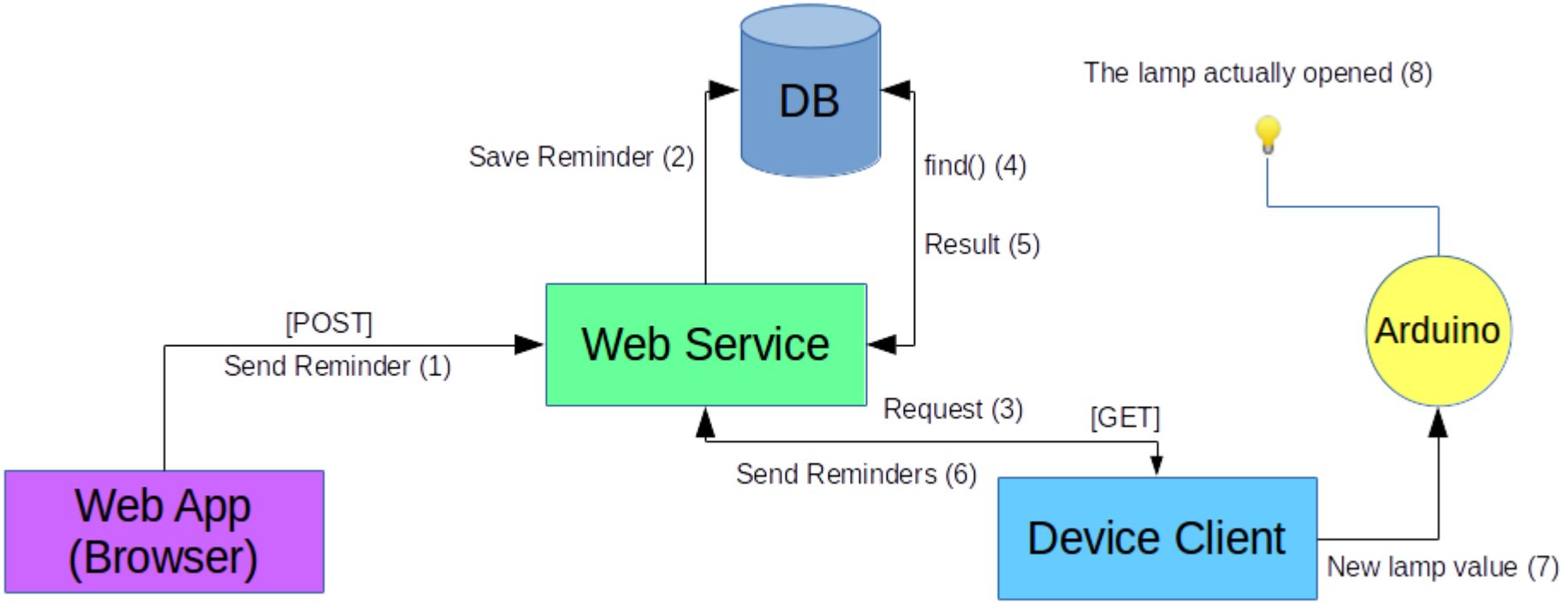
Real scenarios



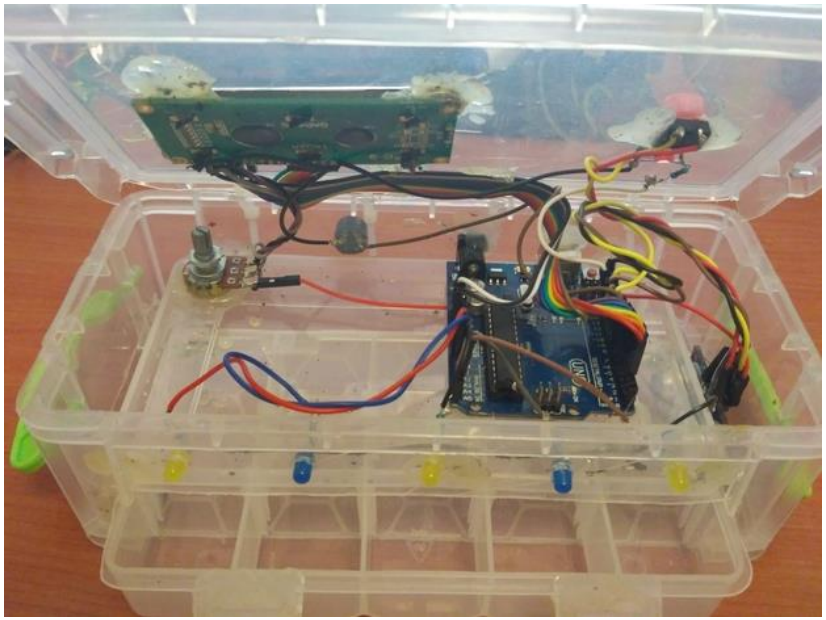


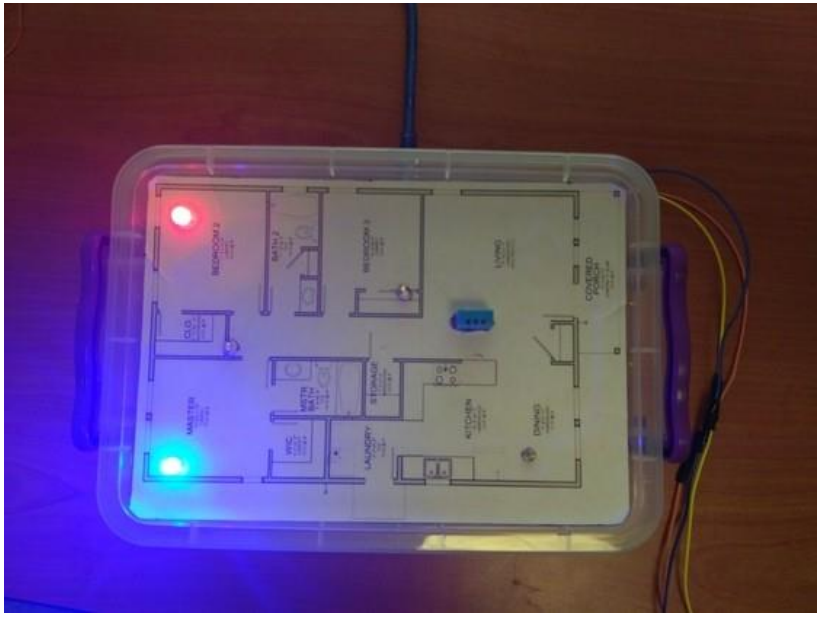
Real scenarios

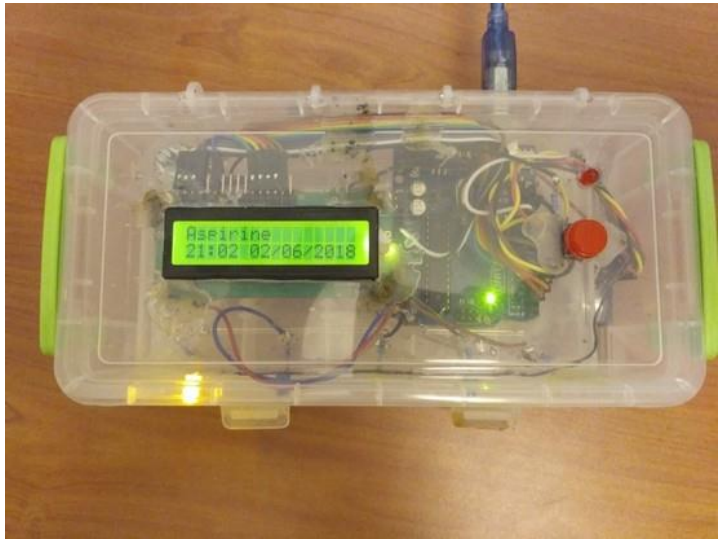


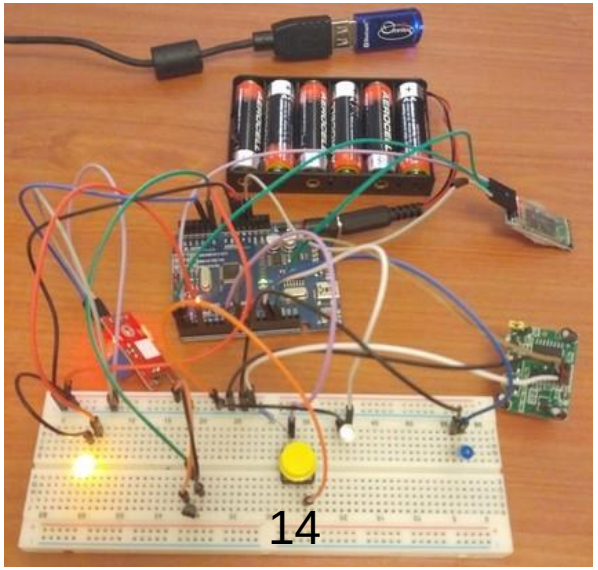


Mechanisms

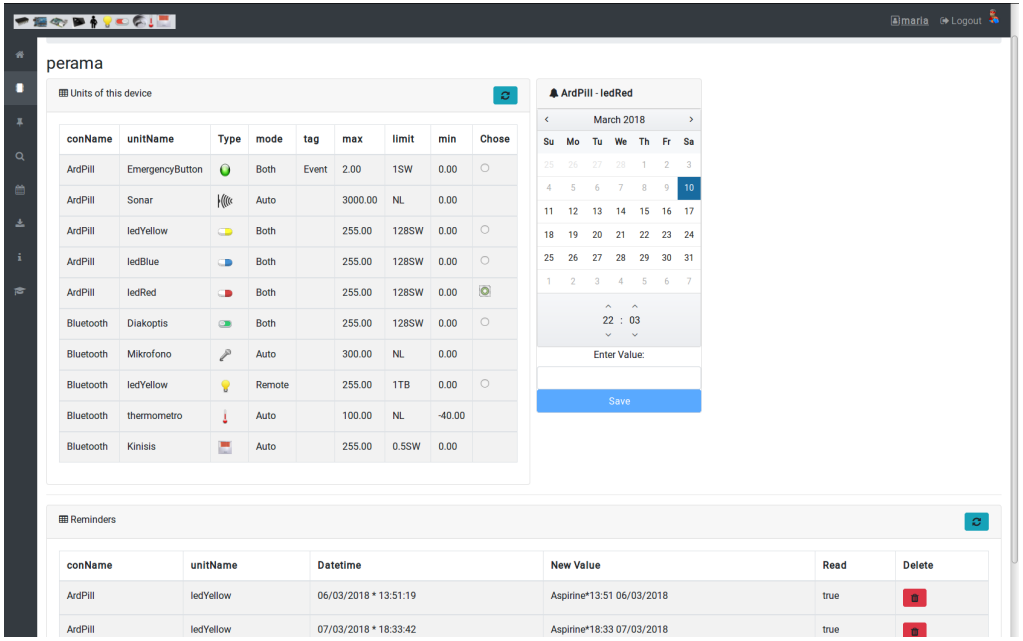


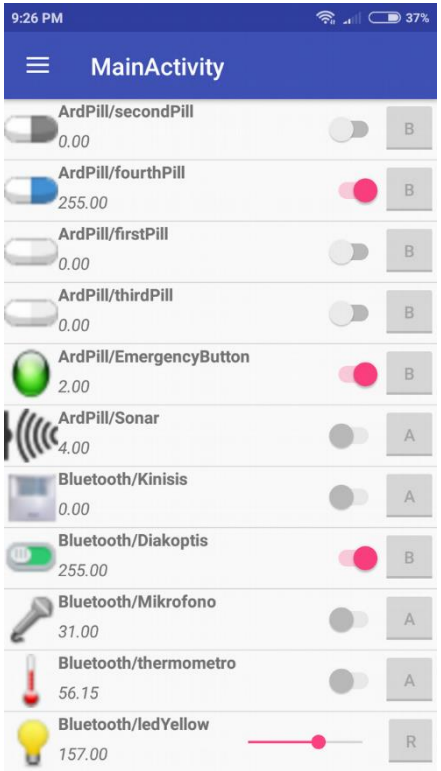






Software applications





Software applications

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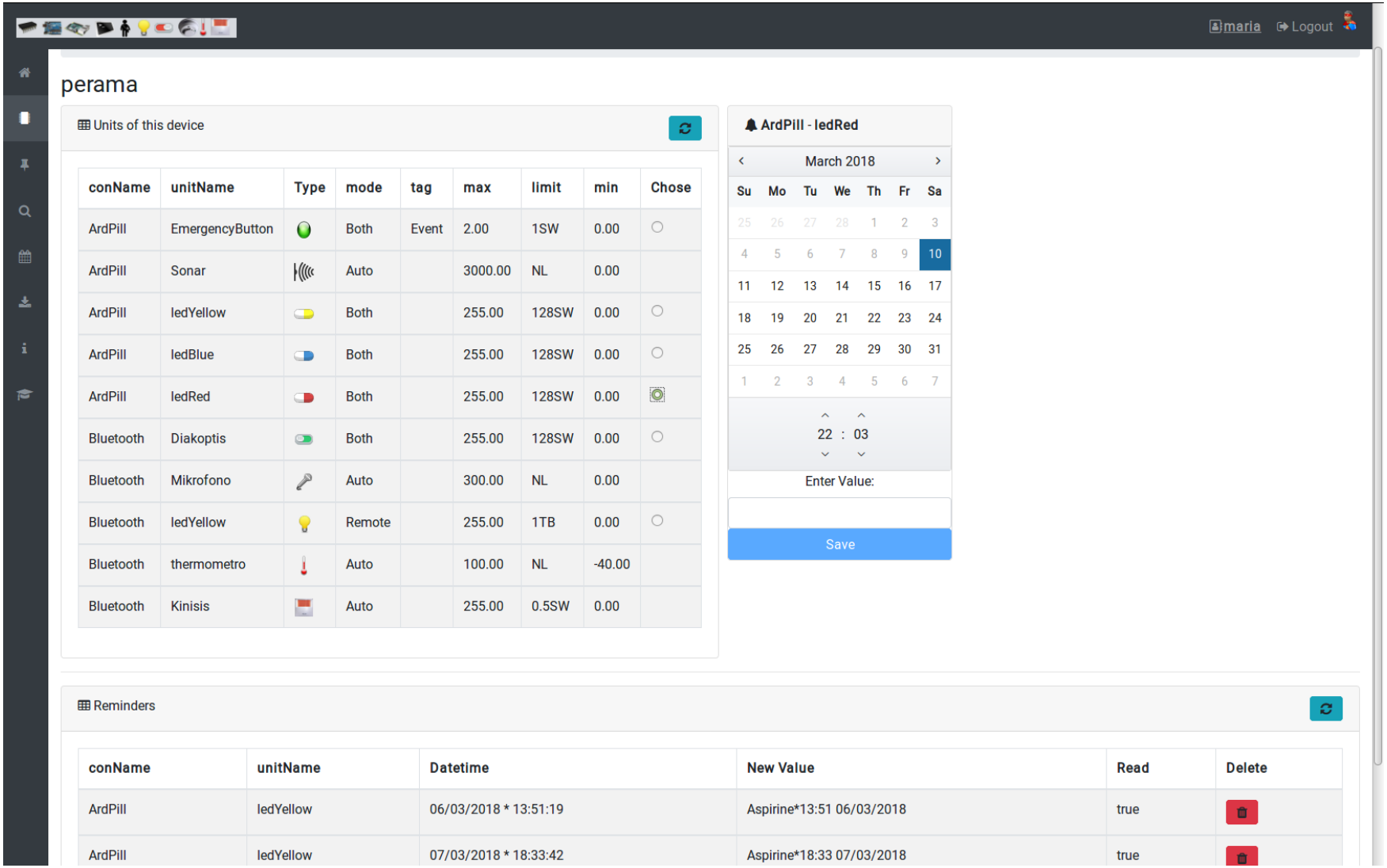
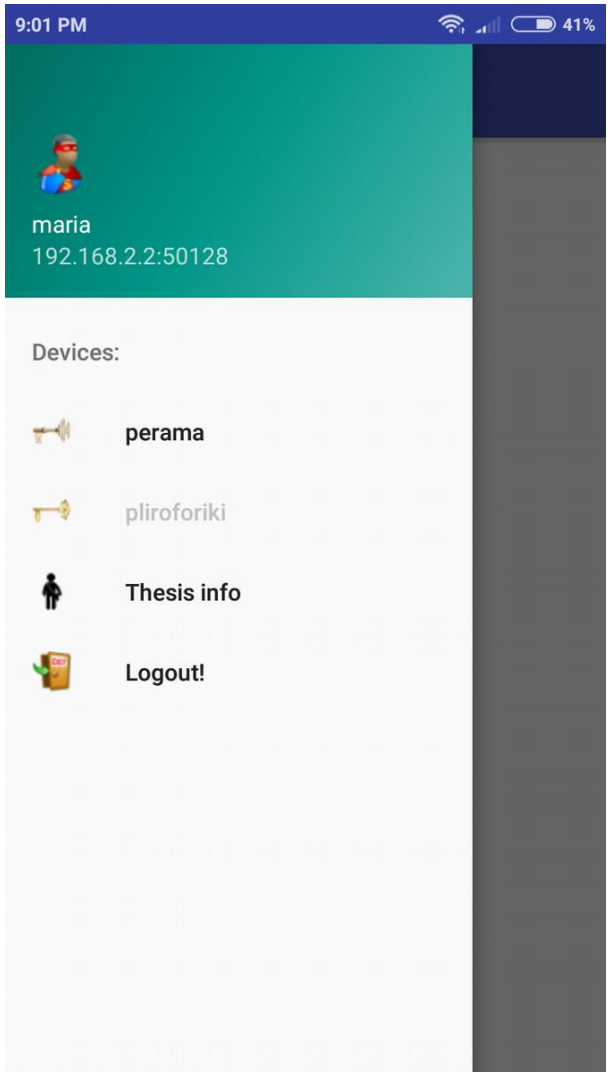
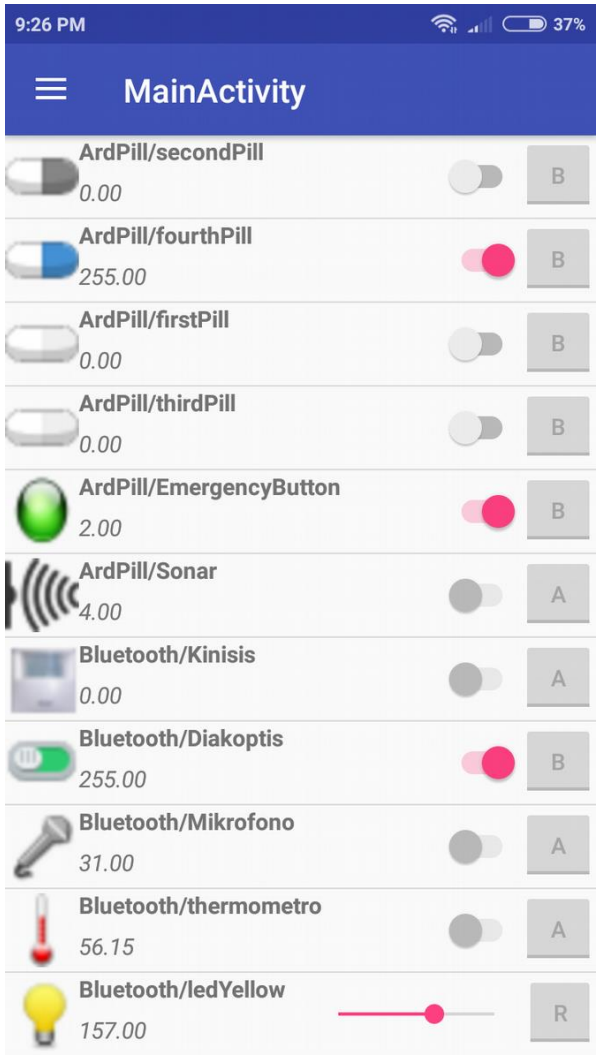


Software applications

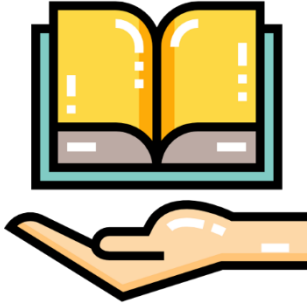




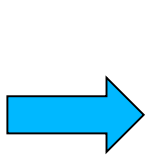
Future activities

- Application Clients for other mobile phones
- Cover more units
- Use of biosensors
- Communication of wearable devices
- Device Client replaced by cheap android mobile

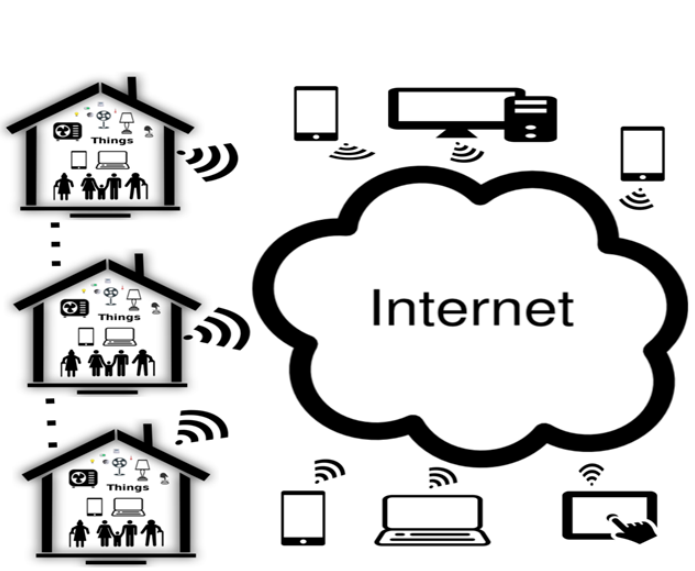
Conclusions

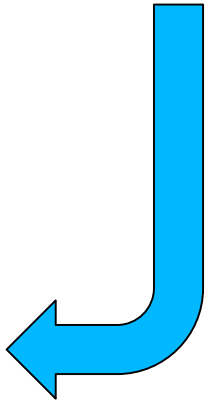


- ✓ Low cost
- ✓ Open software/hardware
- ✓ Cutting-edge technologies



- ➢ Distributed system
- ➢ Internet of Things





Questions?

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THANK
YOU

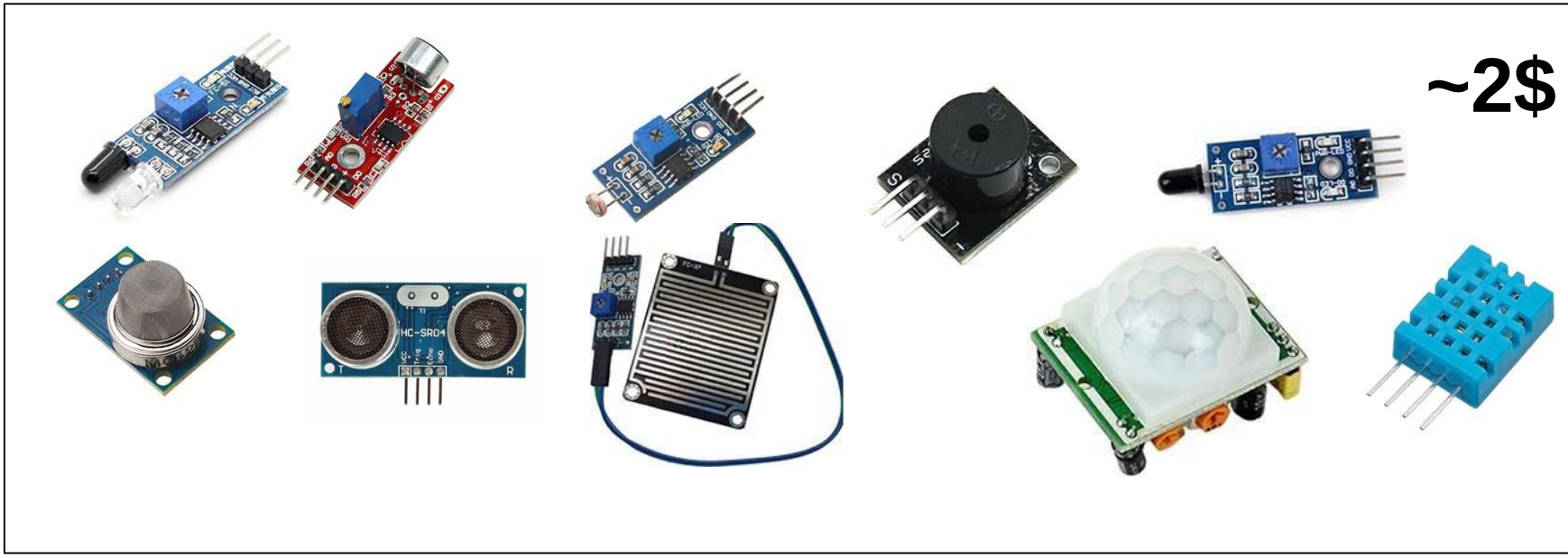
Costs

3€ Greece (1,5$ Abroad)

~35$ & ~35 €

7€ Greece (2,5$ Abroad)

From 2,5€ Greece



Choices

Arduino → Open hardware, great support community.

Raspberry → Small economical Computer, includes wireless and wired network card, bluetooth support, powerful computing power.

RESTFul Api & Web Services → Flexible communication, easily future expandable.

Socket → Real time communication, low traffic, low power consumption.

Java → Powerful programming language for many uses.

Angular ->Less coding, Javascript (browsers language), Security, Dynamic, Data binding, no page refresh, Supported by Google.

NodeJS (Express) → Webservice development facilities. JSON data are already considered objects. It fits perfectly with MongoDB.

MongoDB → For future use. Sensor recording.

Maven, Gradle -> Powerful tools for software project management.

JSON → Ready Javascript object, Less overhead, read easier by human.

Git → The best tool for app versioning.

Platforms and Programming tools

- ✓ *IntelliJ IDEA (Java IDE) for all Java applications (except Android)*
- ✓ *WebStorm (Javascript IDE) for Web Service and Angular.*
- ✓ *Android Studio (Android IDE) for Android app. Arduino IDE for the arduino codes.*
- ✓ *Git (Repository on Gitlab.com) for versioning of all applications.*

Deployment


MongoDB
Java Server
Java Server
Java Server
Java Server
Web Service
Angular
Web App