

Laboratorio IoT

Prof. Paolo Napoletano

a.a. 2020/2021

Surveillance System

Team

- Marco Latella - Mat. 829498
- Michele Loporati – Mat. 834976

Materials

Description of the ingredients employed

Board

- 6x NodeMCU ESP8266

Sensors, Actuators and Resistances

- 5x PIR Motion Sensors
- 5x RFID RC522 + 5 Cards
- 5x LEDs Red
- 5x 220Ω Resistances
- 5x Buttons

Software



Telegram



Method

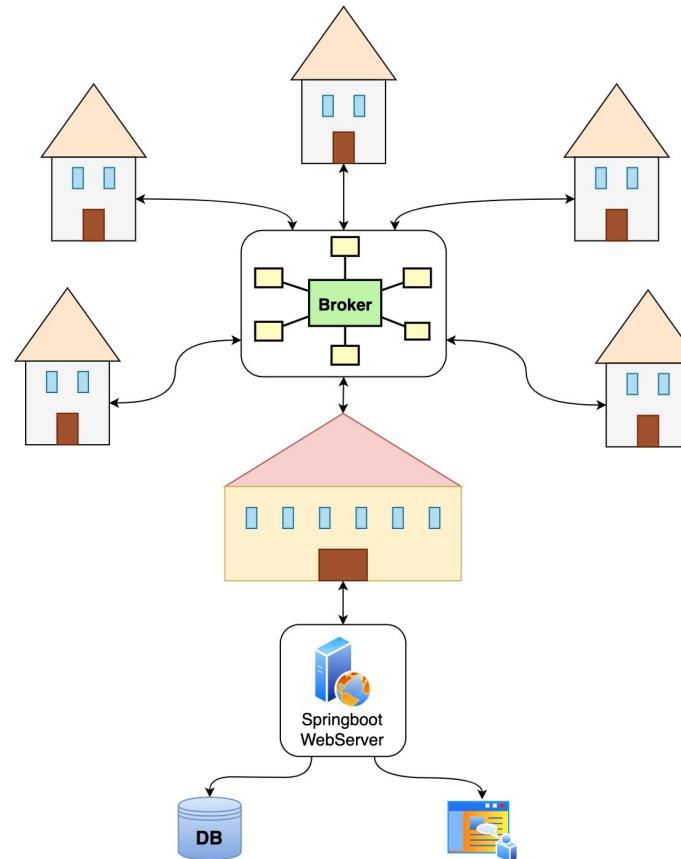
Description system: choices, parameters, use cases

SURVEILLANCE SYSTEM

The "Surveillance System" allows to monitor and manage the security of houses and buildings through the use of endpoints, equipped with a motion sensor and an RFID reader.

Three principal entities:

- Web Server
- Interpreter
- End-points



Method

Description system: choices, parameters, use cases

User Web Interface

USER PANEL

- Dashboard
- Logout

User_0004

Dashboard

Contract expires in 24 days

Activated Products

ID	User	Contract	Armed	Mac Address	Alarm
0	User_0004	Active		E8:DB:84:C5:F9:91	

Method

Description system: choices, parameters, use cases

Admin Web Interface

ADMIN PANEL

Dashboard

Admin

Dashboard

Logout

4

Total Users



4

Active Contracts



0

Active Systems



2

Connected Systems



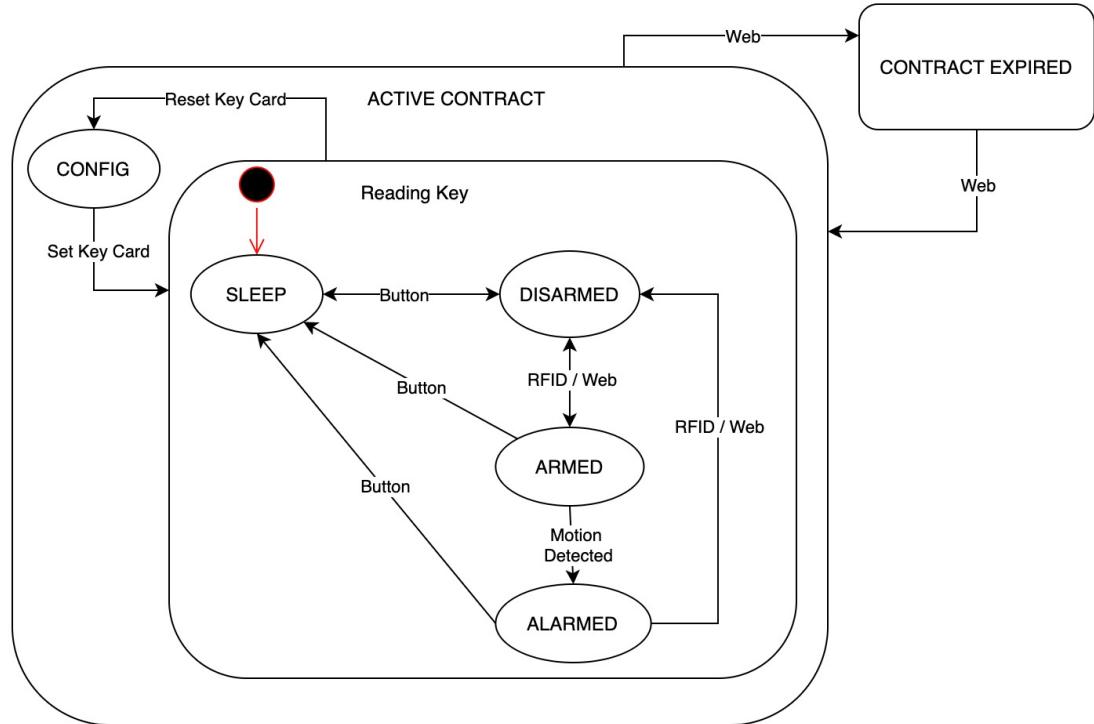
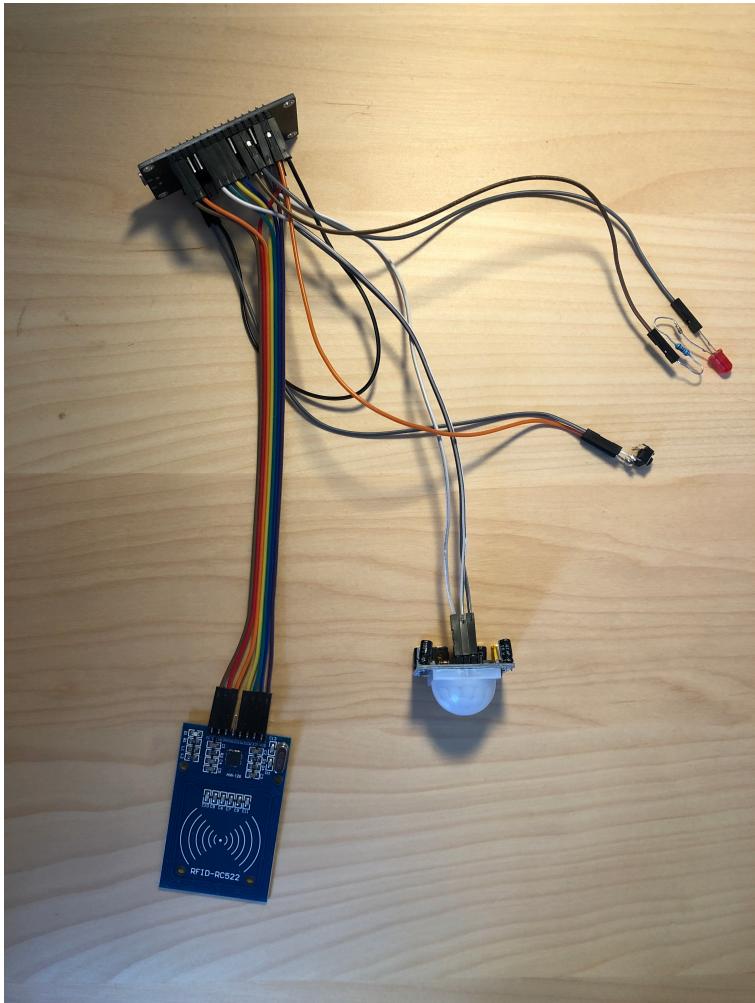
Activated Products

User	Reset RFID	Contract	Armed	Mac Address	Alarm	Connected
User_0001				8C:AA:B5:7C:8B:EC		
User_0002				8C:AA:B5:7C:EA:1F		
User_0003				E8:DB:84:C5:6B:18		
User_0004				E8:DB:84:C5:F9:91		

Method

Description system: choices, parameters, use cases

Endpoints



Config: blink every 900ms
Disarmed: blink every 5000ms
Armed: light remains on
Alarmed: blink every 300ms
Sleep: double blink every 1500ms
Contract Expired: light remains off

Method

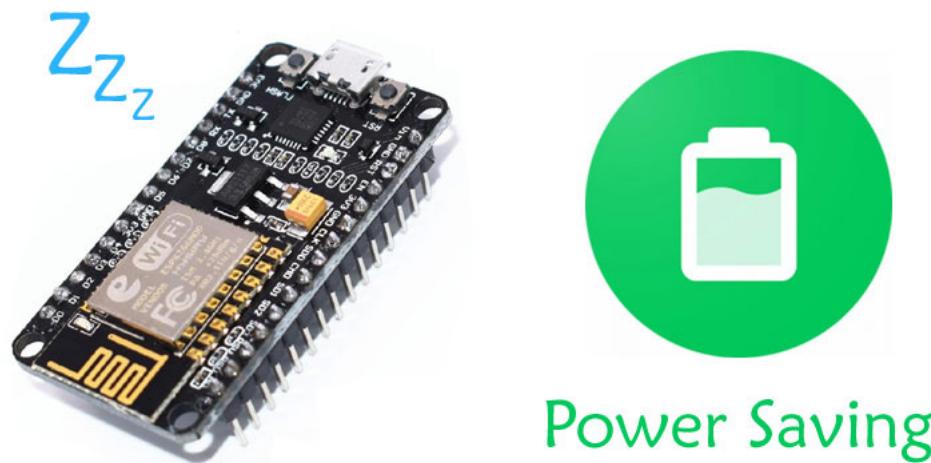
Description system: choices, parameters, use cases

Deep Sleep Mode

Deep sleep mode is used to reduce the energy consumption while the user is at home or don't want to use the alarm service.

The user can set the system in deep sleep mode pressing a button, and wake it up pressing and holding the same button for 2 seconds.

While the system is in deep sleep mode, it wakes up itself every 1,5 sec. to check if the button is pressed, and every ~65 sec. send data to database.



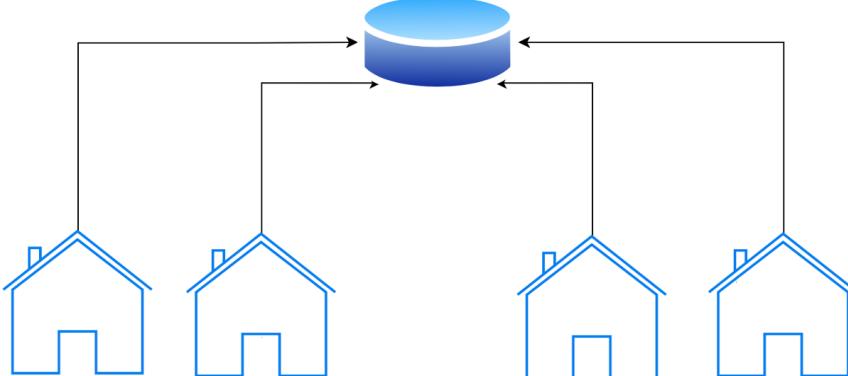
Method

Description system: choices, parameters, use cases

Data Saved by endpoints

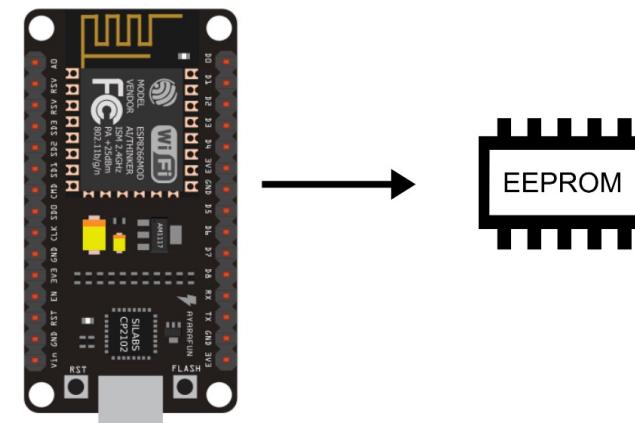
on MySQL:

- ID
- TIMESTAMP
- Mac Address
- User ID
- Active Contract
- Connected System
- System Armed
- System Alarmed



on EEPROM:

- active_contract
- to_initialize
- sleep_mode
- setted_key
- bot_activated
- chat_id



DEMO

Description system: choices, parameters, use cases

120 Chats Surveillance_System_Bot bot

09:41 127.0.0.1:8080/admin Admin

Dashboard

4 Total Users

4 Active Contracts

0 Active Systems

3 Connected Systems

Activated Products

User	Reset RFID	Contract	Armed	Mac Address	Alarm	Connected
User_0001	🔧	📝	🔴	8C:AA:B5:7C:8B:EC	!	🔌
User_0002	🔧	📝	🔴	8C:AA:B5:7C:EA:1F	!	🔌
User_0003	🔧	📝	🔴	E8:DB:84:C5:6B:18	!	🔌
User_0004	🔧	📝	🔴	E8:DB:84:C5:F9:91	!	🔌

DEMO

Description system: choices, parameters, use cases

Dashboard

Admin

4

Total Users



4

Active Contracts



0

Active Systems



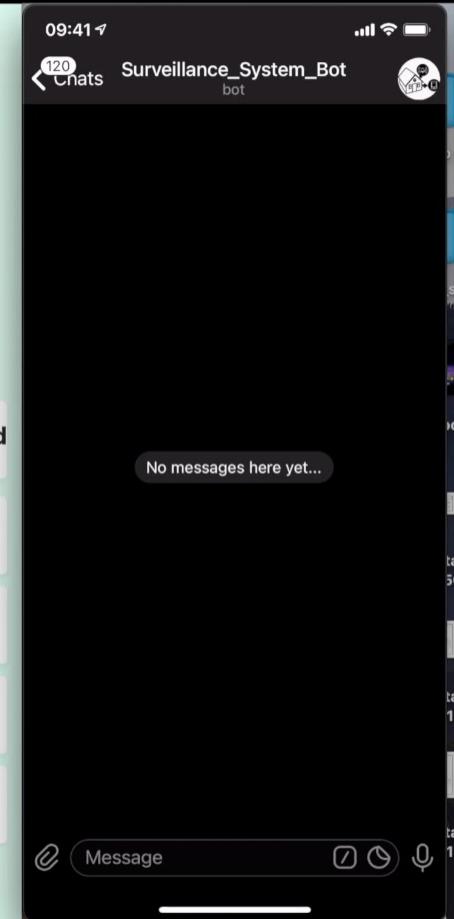
3

Connected Systems



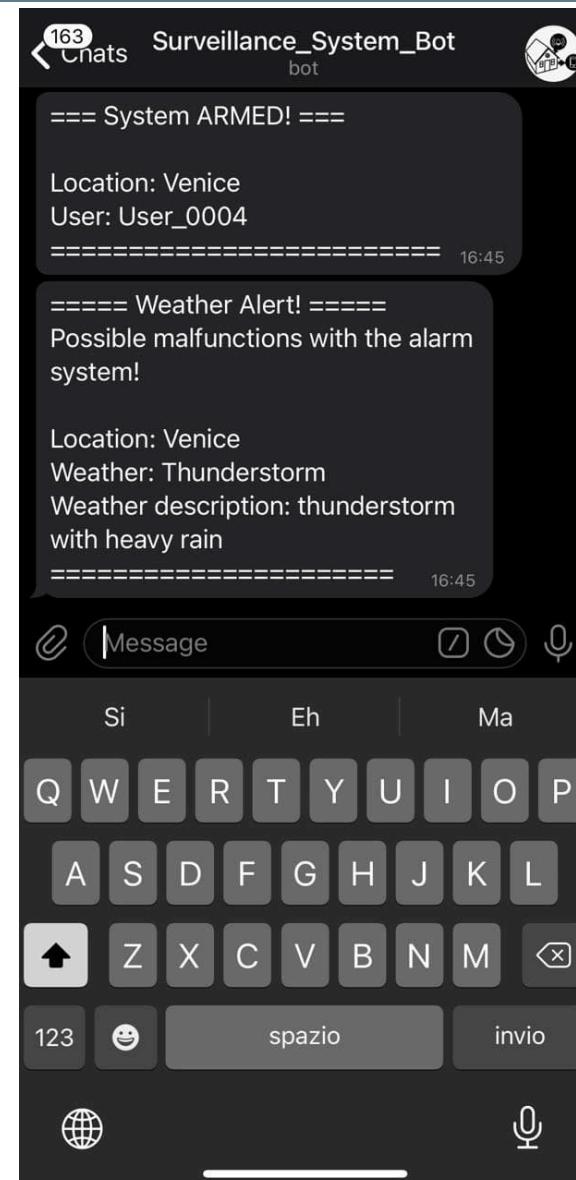
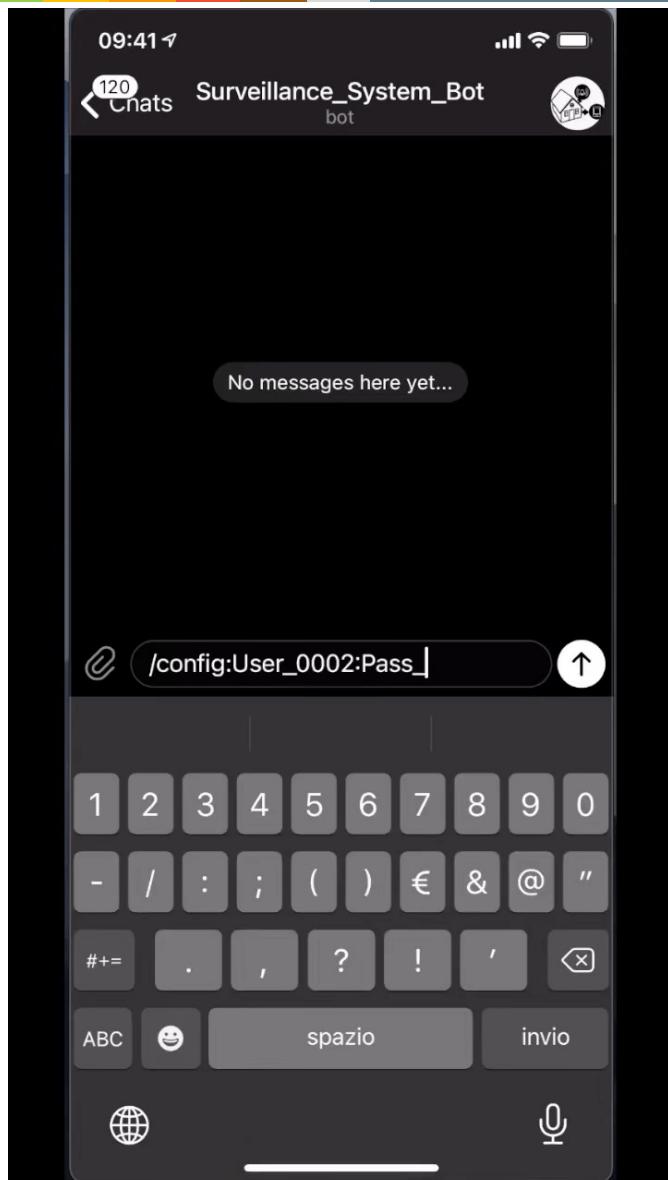
Activated Products

User	Reset RFID	Contract	Armed	Mac Address	Alarm	Connected
User_0001				8C:AA:B5:7C:8B:EC		
User_0002				8C:AA:B5:7C:EA:1F		
User_0003				E8:DB:84:C5:6B:18		
User_0004				E8:DB:84:C5:F9:91		



DEMO - Telegram BOT + OpenWeather

Description system: choices, parameters, use cases



Power Consumption

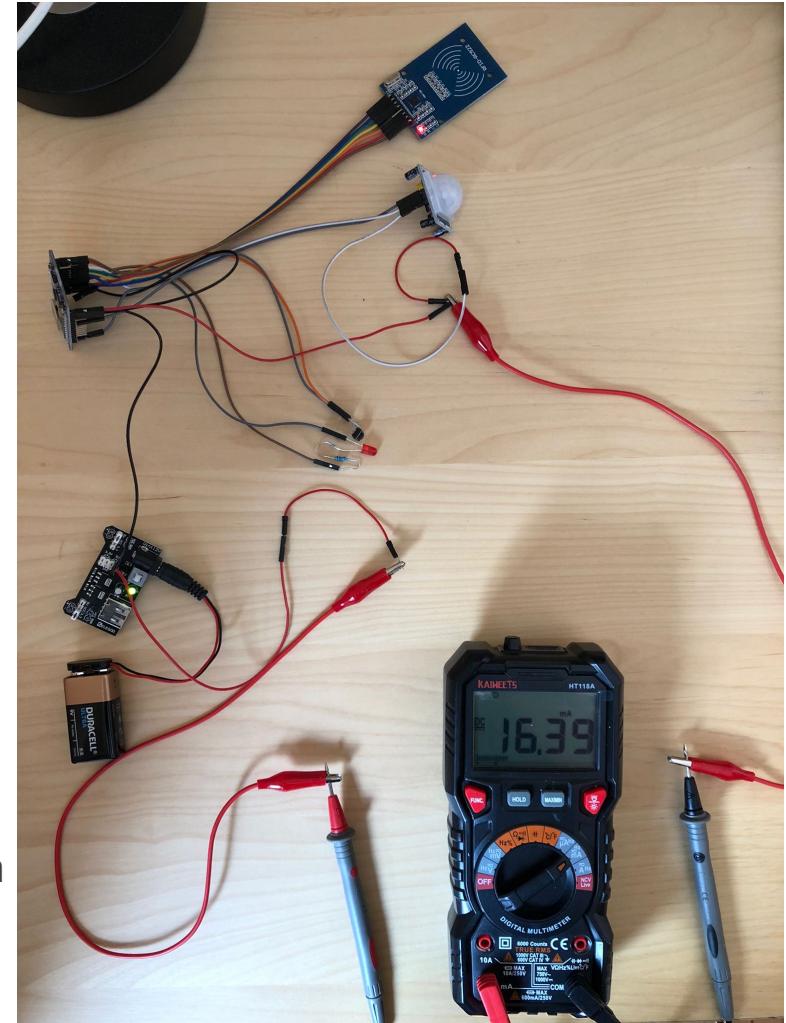
Description system: choices, parameters, use cases

Estimated Power Consumption

- **Deep Sleep Mode (22,8 mA / 0,114 Wh):**
 - ~0 mA (Sleep - 1,5 sec.)
 - ~16/50 mA (wake up every 1,5 sec.)
 - ~86/94 mA (wake up every after ~ 65 sec.)
- **Wake (92 mA / 0,46 Wh):**
 - ~91/92/93 mA (Disarmed)
 - ~91/92 mA (Armed)
 - ~91/92 mA (Alarmed)

Daily Consumption Example

Assuming 10h with wake system and 14h with the system in sleep mode, the average consumption is ~0,26 W/h (6,19 W/day). A 9V battery with 580mA, in a day like the one in the example, will last less than a day.



Final remarks

Encountered Problems and Future Developments

□ Problems

- The system freez up when it wakes up (often)
- Too short control of the telegram messages slow down the system
- Delays from requests to openWeather service slow down the system
- Too long MQTT messages cause the disconnection from the broker (in particular for the last will message)

□ Future Developments

- Migration of the bot on a dedicated server to use a single bot in multithreading mode
- Add a feature to allow to the operative center to change the city from web
- Improve the stability of the system
- Try to reduce more the energy consumption