University of Murcia

Faculty of Computer Science
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Integration of Serious Games and IoT Data Management Platforms to Motivate Behavioural Change for Energy Efficient Lifestyles

Global IoT Submmit 2017
Geneva, June 6-9 2017

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Horizon 2020

Agenda

1)Introduction
2)Preliminary Study
3)Proposed system
4)Conclusions

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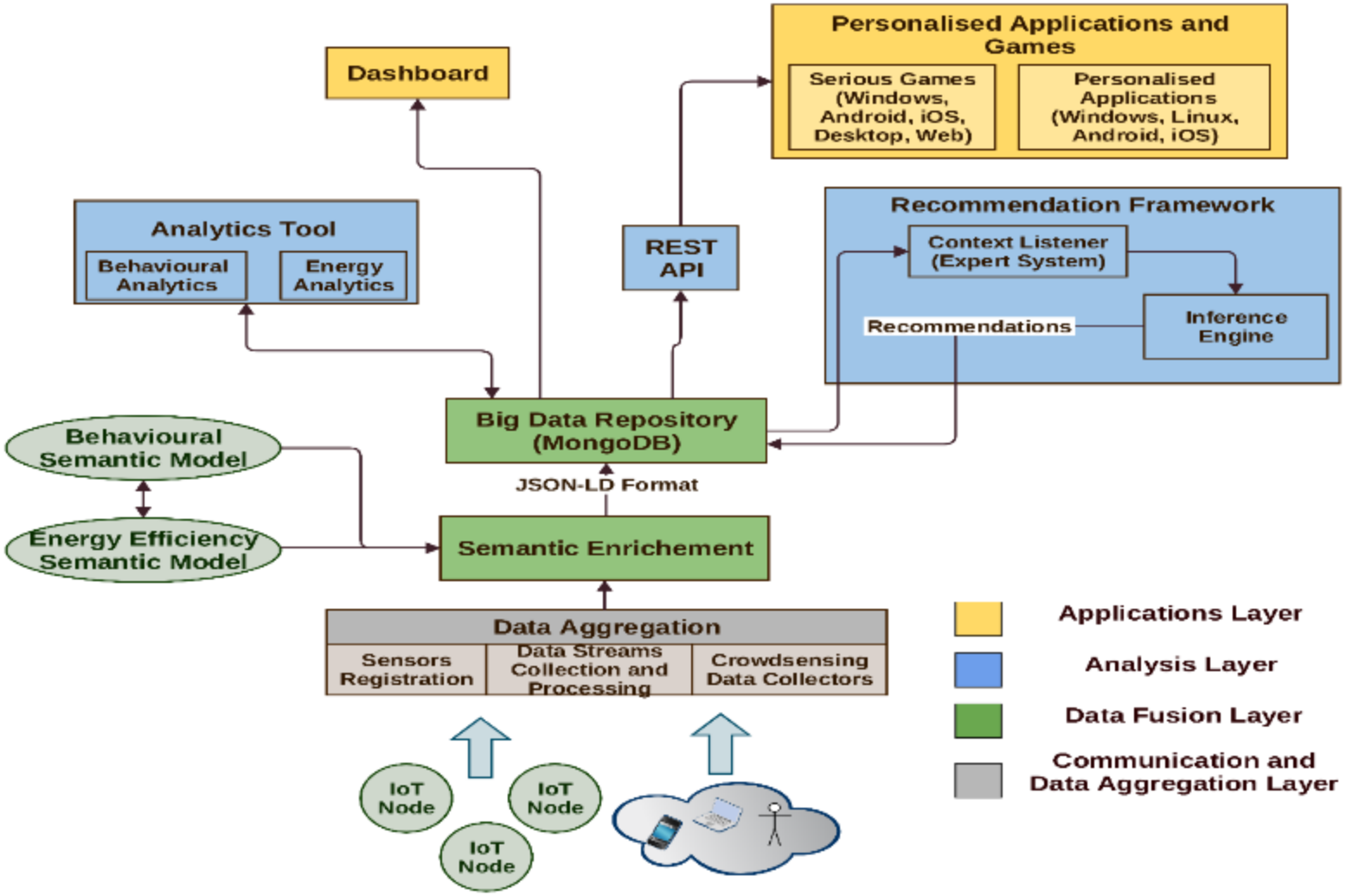
Introduction (1/3)

- Several reports claim that the building sector has consumed around 30-40% of the overall final energy for the last years
- Buildings not leverage opportunities to increase energy efficiency.
- IoT instrumental tool to come up with new approaches for the timely monitoring of the energy consumption
- Solutions solely based on IoT not enough without the right incentives or motivation of citizens
- Serious games as learning tools to raise awareness and inform about certain issues or challenges

Introduction (2/3)



Introduction (3/3)

- The present work introduces an innovative solution to encourage users of abuilding to adopt energy efficient lifestyles.
- It comprises:
  - serious-game mobile application
  - server-side mechanism to monitor energy parameters of the building

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Preliminary Study

- To target the final users a set of questionnaires was made.
- They identify the sensitivity about playing games and energy consumption
- Results:
  - Great adoption of mobile devices in the building's users
  - Certain energy inefficient routines related to the usage of HVAC
- They will be used to properly generate the rewards and the scores of the game.

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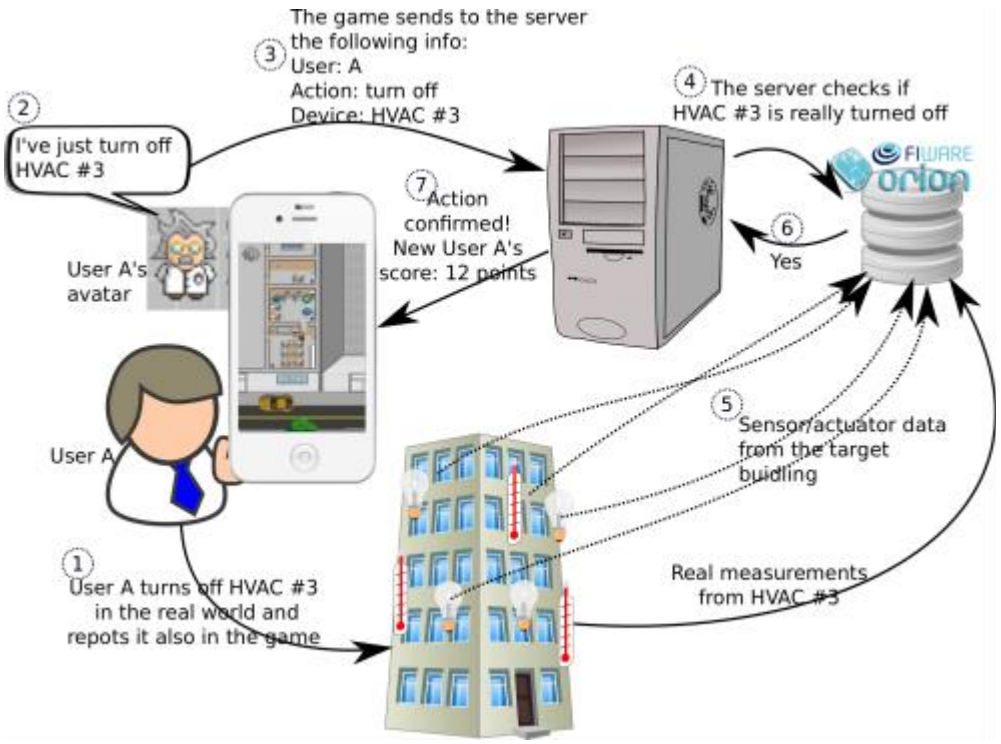
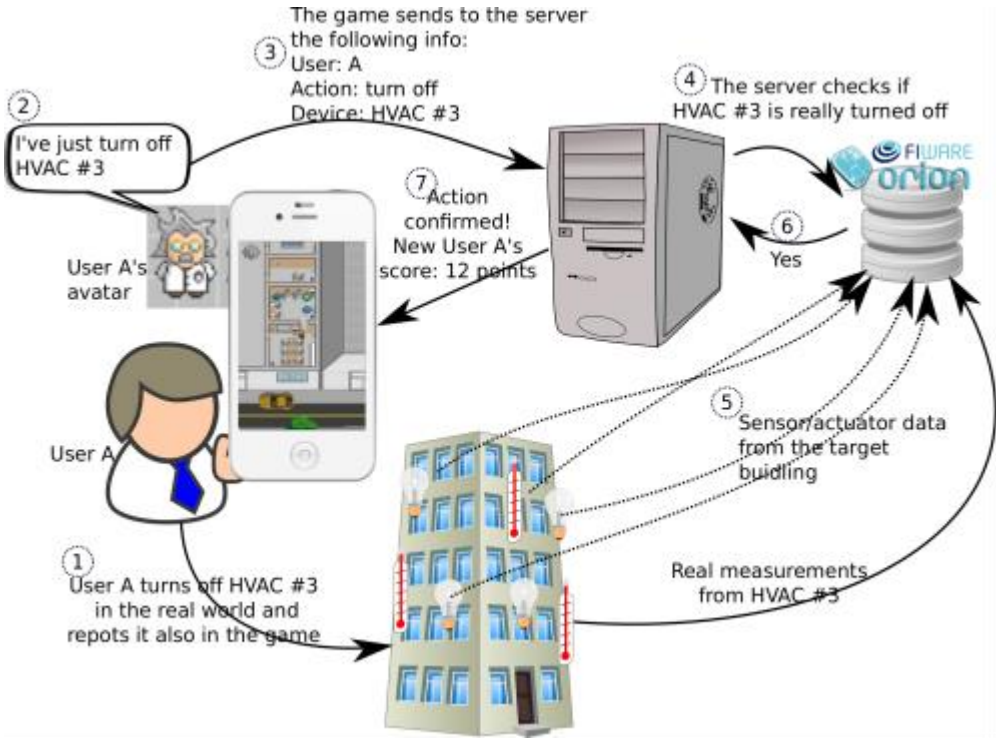
Proposed System. Overview (1/2)

- The game casts each player to his avatar.
- This allows the player to report his energy-related activities (arrows 1-3)
- A ranking of green users generated



Proposed System. Overview (2/2)

- Server collects data of several sensors deployed at the building (arrow 5)
- To keep track and validate the players' activities (arrows 4, 6, 7)
- We opted for FIWARE open enablers



Proposed System. Game Dynamics (1/4)

- Once the user has generated his own avatar, it is **located in the game scenario**.
- Currently, **the scenario is La Nave building**, a research center at the University of Murcia, Spain.
- **By just touching** the screen, the user can make his **avatar move around** the building.

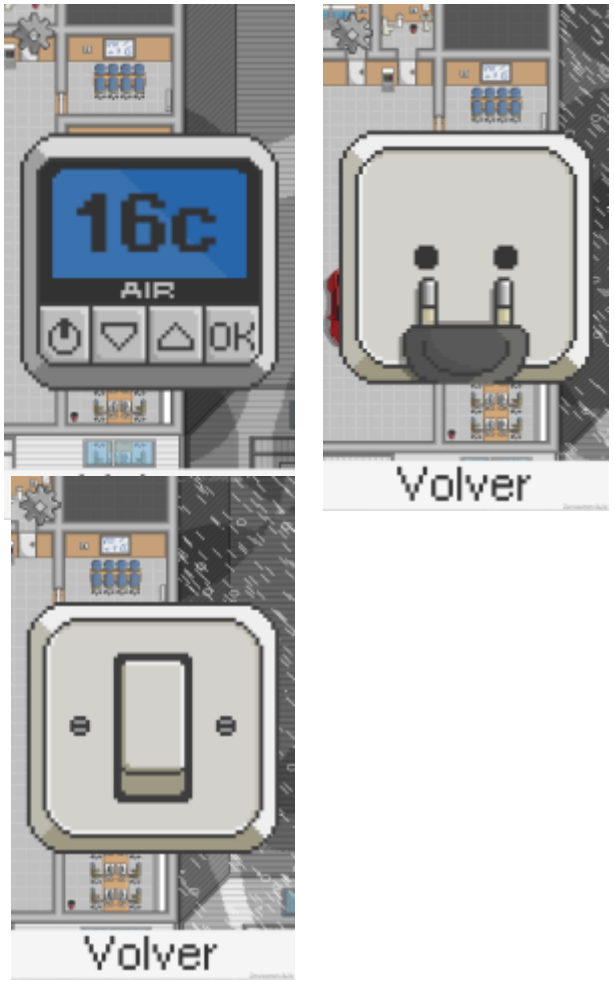
Proposed System. Game Dynamics (2/4)

- In the scenario, the different **appliances and actuators** the user can interact with are **displayed as icons**.
- User report their **energy-related actions by interacting with such icons**.
- **Each action will provide** them with a certain amount of **points**.
- It should be noticed that we have tried that **the location of each icon corresponds with the actual location of each actuator** in the building.

Proposed System. Game Dynamics (3/4)

- The game currently supports four actions

a) Turn on/off a HVAC.
b) Adjust the temperature regulation of a HVAC.
c) Switch on/off the lights of a room.
d) Turn on/off an appliance of a room.



Proposed System. Game Dynamics (4/4)

- In order to provide a more realistic scenario the game gets the **current weather conditions** from the ORION data and displays it in the scenario.
  - In the upper fig: rain conditions.
  - In the lower fig: heavy rain + wind conditions.
- **Sound is also included** to represent wind, thunders, etc.

Proposed System. Server Side

- Storage of the IoT sensors of the building using the FIWARE ORION context broker.
- ORION compliant with the NGSI information model
- ORION automatically updates each entity instance every time its associate real sensor delivers new data to the server
- A set of mechanisms developed on top of ORION to validate users actions
- For example: HVAC actions validated by comparing current and previous regulated temperature

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Conclusions

- Meaningful energy savings in the household sector is paramount.
- Need to combine IoT solutions along with other mechanisms to engage users to adopt energy-efficient lifestyles
- This work introduces novel serious-game that allows players to report their energy actions
- The solution makes use of IoT sensors and the FIWARE platform to confirm such actions and reward players.
- Further work will focus on deploying the game in its target building and the subsequent study of the energy-related achievements of the solution.

Partially funded by:

ENTROPY

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Fondo Europeo de Desarrollo Regional
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