INTERNET OF THINGS PROJECT

For this project we intend to build a complete IoT solution, from the device to the application. We'll start by defining the desired IoT vertical, by observing current market and by defining the requirements of our product.

During this project, we expect that you deliver 5 written reports that will summarize your efforts on reaching the objective. Deadlines are published at moodle and should be strictly followed.

PHASE 1 – REQUIREMENTS DEFINITION AND DATA ACQUISITION

The first part of building your own IoT solution requires that you are aware of the challenges, in this first report you need to define the different components of the solution you will be developing. You should select one of the different verticals presented on the class and define the complete solution, including architecture, hardware and software.

Consider the following examples of verticals from where you can choose from:

- Logistics tracking;
- Gardening watering system management;
- Smart building management;
- Smart metering for utilities;
- Parking monitoring;
- Mobility and traffic monitoring;
- Waste management solution;
- Smart access control;

This list is not exhaustive, and you can propose your own idea.

When defining the solution be aware of the limitations of the use case, such as for example energy supply, space constraints, processing power, hardware and software costs, communication technologies, etc.

The solution must have a minimum of two sensors preferably with a digital interface, e.g. I2C or SPI, and an actuator, e.g. Relay or LED. Note that the GNSS/GPS module is considered a sensor. Moreover, The IoT node will be powered by a battery, or a supercapacitor, and it is mandatory to report its state-of-charge (SoC). To this end, the internal or an external analog-to-digital converter (ADC) should be used. The power profile of the overall solution must be measured and based on the capacity of the energy storage the IoT node autonomy should be determined.

WHAT TO INCLUDE ON THE REPORT (MAX 4 PAGES)?

- A description of the functional requirements for your solution;
- A state-of-the art comparing existing similar solutions;
- An architecture for your solution;
- Hardware and software requirements;
- List of expected acquired parameters;
- Mock-up of the dashboard (for example on “draw.io”).

PHASE 2 – NETWORK PLANNING

On the Network Planning phase, you will plan and design an IoT network to support your solution. This process begins with traffic and coverage requirements that should provide information about the geographical area to be covered and the expected resources demand. Then, the theorical network dimensioning will be carried out, obtaining the theorical number of required gateways. Finally, you will perform the gateways radio coverage using a simulation tool, for example Radio Mobile.

WHAT TO INCLUDE ON THE REPORT?

- Capacity and radio coverage requirements;
- Radio coverage planning;
- Network design;
- Report on what was performed in order to achieve the objectives for this phase.

PHASE 3 – APPLICATION DEVELOPMENT

On this phase you will develop the application side of your solution, you will build a dashboard that will present the data according to the initial requirements. Consider that you can build your solution on different platforms, as a suggestion for fast deployment you can use Cayenne or Node-RED.

WHAT TO INCLUDE ON THE REPORT?

- A list of changes of the initial requirements (if any);
- A more detailed state-of-the art comparing different application servers;
- Software architecture drawing, considering not only the developed application but also the APIs available on other components;
- Screenshots of the application complying with the functional requirements;
- Report on what was performed in order to achieve the objectives for this phase;
- Application user manual.

PHASE 4 – DATA MODELLING AND PROCESSING

During this phase, students will determine the data that will be stored, depending on the selected problem. For each type of data, it is necessary to define a proper model, but also a modelling strategy for the database. In the end, the data that is stored needs to be processed and shown in a dashboard (using Node-RED or other tool).

WHAT TO INCLUDE ON THE REPORT?

- A list of changes of the initial requirements (if any);
- A final diagram showing the overall architecture of the solution, including the visualization tools;
- Identification of the data need to be stored, their source, and its frequency;
- Description of the adopted model adopted for each source (or combinations of sources), aligned with the FIWARE data models;
- Description of the database modelling, including the list of metadata that will be considered;
- Examples of the implemented dashboards;
- URL of the deployed solution;
- Report on what was performed in order to achieve the objectives for this phase.