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Smart sensors for data acquisition

The current situation

- We are experiencing an exponential growth of devices connected to the Internet.
- Enormous amount of data is being generated every second.
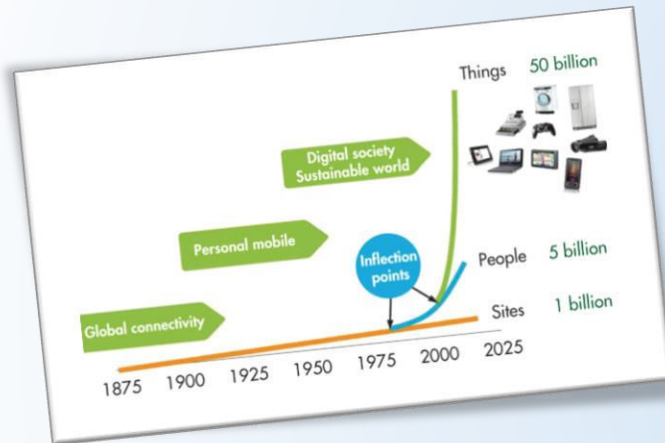- To handle this trend, we need to overcome several obstacles.

Figure 1 - Number of devices connected to the Internet

Challenges = Space for solution

QUESTIONS

- What kind of data do we need from devices?
- How should devices be interconnected?
- What information can we gain from generated data?

A PROPOSAL AS A POSSIBLE ANSWER

- Create a smart sensor.
- Acquire generated data using an appropriate protocol.
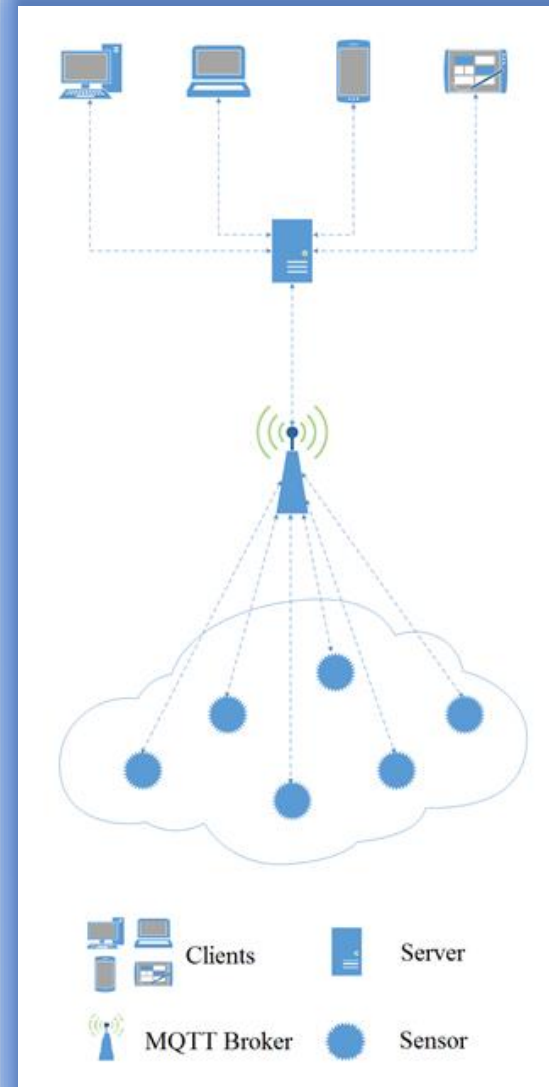- Use data for a system adaptation to the environment.

Figure 2 - The proposed architecture

Smart sensor

- The purpose of smart sensor is not to merely send data but to send entire information when it's needed.
- To calculate the information value, an algorithm based on Tsallis entropy was used.

$$S_\alpha = \frac{1}{\alpha - 1} * \left(1 - \sum_{i=1}^{n} p_i^\alpha \right), \alpha \geq 0, a \neq 1$$

Equation 1 - Tsallis Entropy

Communication channel

- To transfer information from smart sensors, I decided to use MQTT, which is:
  - A lightweight broker-based publish/subscribe messaging protocol.
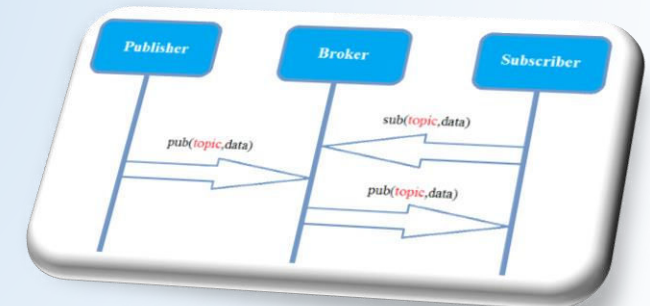 - Ideal for use in constrained environments.

Figure 3 - MQTT protocol

The use of acquired information

- I've created a web application that is able to:
  - Adapt to the environment.
  - Detect non-standard situation.
  - Learn how to solve problems.
  - Give advices on situations that happened in the past.