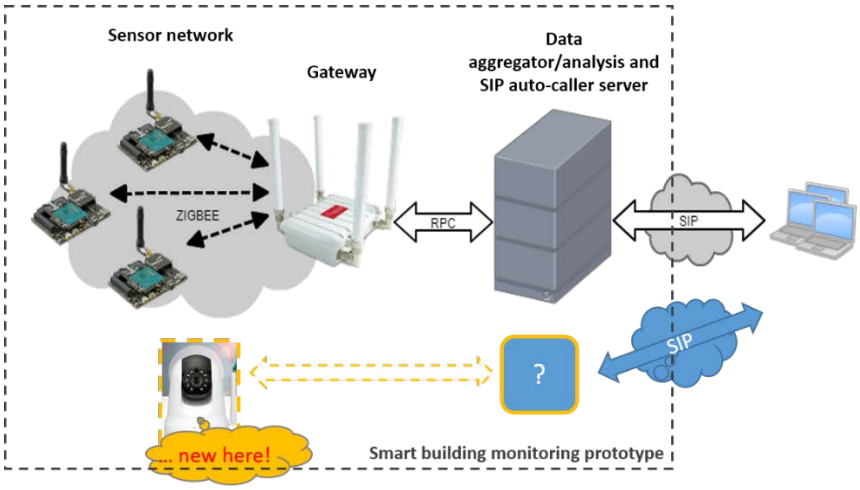
Title:

IoT gateway that supports automated video call to a remote monitoring SIP client for sensor-based smart building monitoring (in Next Generation Networks)

Scope:

Nowadays in IoT, the one-way communication is no longer the predominant type of data transmission between sensors and cloud apps as we often encounter an emerging need for remote controlling and adjustment of smart devices (meters, sensors, actuators, etc.). Therefore, the two-way (bidirectional) communication plays a key role in today's IoT architecture. In addition, there is an emerging trend to integrate rich sources of information (image or real time audio/ video) with traditional sensor data to enhance situation awareness of a smart building monitoring agent. This master thesis presents, examines, designs, implements, and evaluates the communication of an IoT gateway with a cloud application with respect of the two-way communication feature and the video streaming support using the Session Initiation Protocol (SIP). The following steps are proposed to fulfil this objective:

- Based on the relative bibliography, the popular Session Initiation Protocol (SIP) will be compared to other possibly attractive protocols for sensor data transport, mindful of the two afore-mentioned features (bi-directionality, video streaming).
- Integration of a web camera as an added part of an existing sensor network through a dedicated HW (e.g. Rasbery) able to host a SIP client application.
- Implementation and evaluation of data exchange incl. video transport : SIP architecture, functionalities and features will be studied towards a development that provides seamless integration of video streaming with sensor data in next generation networks (3.5G, 4G, and 5G).



To facilitate the development the following recources are available:

- An open source SIP based API (based on Linphone library) and testbed (testing environemnt) that handles the signalling commands for automated calls that originate from telematics, sensors and user equipment such as tablets and smartphones that was recently released by the EU-co-funded NEXES project.
- (Smart building monitoring platform) SW that enables an automated data-only call [following IETF draft spesification found in https://tools.ietf.org/html/draft-ietf-ecrit-data-only-ea-13] and handles sensor data storing and formatting. The relevant application (Android) has been developed by the I-SENSE Research Group (http://i-sense.iccs.ntua.gr/)
- Real data acquisition from an existing (3G enabled) sensor network. The relevant hardware (communication nodes and gateway) is provided by the I-SENSE Research Group (http://i-sense.iccs.ntua.gr/)

The main application areas include infrastructure monitoring through sensors and smart devices and the subsequent automated multimedia calls support.

Required:

- Theoretical background on Mobile Communications and Networks, Multimedia Services
- Some experience with a programming language such as Python, Java, C++

Optional: Any hands-on experience with SIP will be considered an asset.

What you will learn: Familiarity with IP data transport protocols and data formats in the IoT context, implementing and testing an end-to-end IoT client-cloud system with our help, experience on SIP-based multimedia sharing apps.

Supervisors:

Νικόλαος Ουζούνογλου (nuzu@cc.ece.ntua.gr)

Άγγελος Αμδίτης (angelos@esd.ece.ntua.gr)

Further info:

Αθανασία Τσέρτου (atsertou@iccs.gr); Αναστασία Μπολοβίνου(anastasia.bolovinou@iccs.gr);
Ευάγγελος Σδόγγος (evangelos.sdongos@iccs.gr)