0BIRZEIT UNIVERSITY

Electrical and Computer Engineering

ENCS5325 - Wireless Sensor Networks and Internet of Things – summer 2025

Assignment: Python + Packet Tracer

Due date: Friday 19-9-2025

Objectives:

After finishing this assignment, you should be able to:

- Write a fully working client and server programs using Python Sockets.
- Write a simulator of an application with a Cloud and an Edge layers.
- Use simple data aggregation and visualization.

Problem Description: A Smoke Detection and Fire Alarm System:

You are required to design and simulate a smoke detection and fire alarm system that integrates **edge devices, a home gateway, and a cloud layer** together in one IoT based system. The description of the system as follows:

1. Edge Layer

- The edge layer consists of **fire, smoke, and CO_2 sensors** deployed in at least **two remote rooms**.
- Smoke detectors should be strategically placed in **critical areas** such as bedrooms, washrooms, the dining room, and the kitchen.
- These detectors are wirelessly connected to a **home gateway** that monitors and manages their status.

2. System Functionality

- **Smoke Detection:**
  - When smoke is detected, the sensor immediately reports to the gateway.
  - The gateway triggers a local **alarm notification to the user**.
- **CO_2 Monitoring:**
  - A CO_2 detector continuously monitors air quality.
  - If CO_2 concentration exceeds **a threshold**, an alert is issued to indicate poor air quality and potential hazards.
- **Fire Response:**
  - If fire is detected, the gateway automatically activates the **fire sprinklers** to suppress flames.

- Simultaneously, **alarms** are triggered to alert occupants and, if configured, notify an external monitoring service.

3. Cloud Layer

- The gateway is connected to the **cloud**, where it transmits alarms and updates to the **Fire Management Department**.
- The cloud layer consists of a **central server** that hosts a **dashboard**, providing real-time visualization of system status and latest events.

Report:

Attach a report (**.pdf**) with your solution that includes:

1. Screenshots of the program outputs with discussion.

2. Types of sensors used and threshold you define for each sensor with full descriptions.

3. Protocol messages you specify between the cloud and gateway.

4. Name sensors with your ID number (e.g. CO2_ID)

You need also to submit the (**.py**) file for the cloud part and the (**.pkt**) file for the edge part.