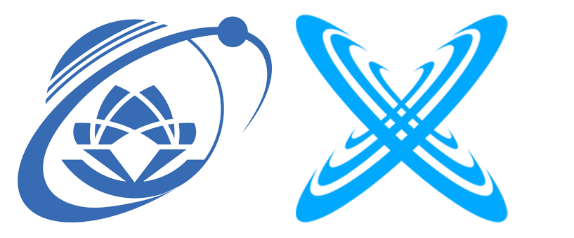
**UNIVERSITY OF INFORMATION TECHNOLOGY, VNU-HCM**

**FACULTY OF COMPUTER NETWORKS AND COMMUNICATION**



**FINAL PROJECT REPORT**

WIRELESS EMBEDDED NETWORK SYSTEMS COURSE

**GENERAL INFORMATION**

**Project title**: **Air quality monitoring with Arduino ESP8266.**

**Group: 7**

**Members of the project:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Number** | **Name** | **Student ID** | **Major** |
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**Instructor:** Assoc Prof. Lê Trung Quân

**Report:** 22/10/2023 – 21/12/2023

*Ho Chi Minh city, December 16th, 2023.*

1. **Introduction**
   1. **Overview**

Outdoor air pollution is a major environmental health problem affecting everyone. WHO estimates that in 2019, some 37% of outdoor air pollution-related premature deaths were due to ischaemic heart disease and stroke, 18% and 23% of deaths were due to chronic obstructive pulmonary disease and acute lower respiratory infections respectively, and 11% of deaths were due to cancer within the respiratory tract. According to IQAir, Ho Chi Minh City’s Live AQI Index is in the range of 60 to 91, which joined the Moderate group and ranked at 23 on AQI US ranking.

* 1. **Tools**

Below is a list of hardwares and softwares used for this project:

1. Arduino ESP8266 (Wemos D1 R2): a low-cost Wi-Fi microchip, with built-in TCP/IP networking software, and microcontroller capability.
2. DHT11: a low-cost digital sensor for sensing temperature and humidity.
3. MQ135: a gas sensor that has a high sensitivity to ammonia, sulfide, and benzene-based vapors, and is ideal for monitoring smoke and other harmful gases.
4. Arduino IDE: an IDE that connects to the Arduino hardware to upload programs and communicate with them.
5. Blynk: an IOT platform that enables the prototyping, deployment, and remote management of connected electronic devices at any scale.
6. Amazon Web Service (AWS): a subsidiary of Amazon that provides on-demand cloud computing platforms and APIs to individuals, companies, and governments, on a metered, pay-as-you-go basis.
7. LAMP server: stands for 4 components (Linux-Apache-MySQL-PHP).
   1. **Objectives**

In the scope of this project, we hope to raise people’s awareness about air polution along with examine the problem to find out some solution to improve air quality.

1. **System design analysis**
   1. **Overview**

**A diagram of a computer network

Description automatically generated**

*Figure 1. System design*

* 1. **Entity**

On the above, there are **4** entities in our design:

1. User: people who have read-only permission, able to interact with system through user interface.
2. Administator: people who have full-access permission, able to maintain, troubleshoot whole system.
3. Server: entity that is responsible for receiving information from nodes, analyzing from forecaster, sending data to administrator and user.
4. Node: entity that oversees collecting data, sending data to server.
   1. **Network flow**

In this design, we start the flow at node:

1. The node collects data from sensor, then requests POST method to LAMP server.
2. The node node also sends data to Blynk server at the same time.
3. LAMP server receives data from node, then stores it in MySQL (MariaDB).
4. User access to Blynk app, watch information in real-time. If there is any trouble, user can receive notification through email or app.
5. (Extension) Forecaster calls GET method from LAMP server, process data and send forecast to Blynk server.
   1. **Notes**

Unforturnately, we did not have enough resources to build the forecast block in this project.

1. **LAMP server**

**A diagram of a computer network

Description automatically generated**

*Figure 2. LAMP server*

* 1. **Server content**

As mentioned before, server contains **4** components:

1. Linux: Amazon Linux 2.
2. Apache: 2.4.58
3. MySQL (MariaDB): 10.5.18
4. PHP: 8.2.9
   1. **AWS**

For hosting server online, we use **4** services:

* + 1. Elastic Compute Cloud (EC2)
    2. Route 53
    3. Simple Storage Service (S3)
    4. Identity Access Management (IAM)

1. **Conclusions**

* Throughout this project, we would like to raise people’s awareness about air polution. Outdoor air pollution is a major environmental health problem affecting everyone in low-, middle-, and high-income countries.
* The system built in this project is not very match the reality.

1. **References**

[World Air Quality Index (AQI) Ranking | IQAir](https://www.iqair.com/world-air-quality-ranking)

[Install LAMP on Amazon Linux 2 - Amazon Elastic Compute Cloud](https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ec2-lamp-amazon-linux-2.html)

[Air quality monitoring system (IoT), using DHT11 & MQ135 & ESP8266 (youtube.com)](https://www.youtube.com/watch?v=wKxRwpLii9E)