

Industrial Internship Report on Temperature and Humidity Monitoring System

**Prepared by
Samarth Sharma**

Executive Summary

This report provides details of the Industrial Internship provided by upskill Campus and The IoT Academy in collaboration with Industrial Partner UniConverge Technologies Pvt Ltd (UCT).

This internship was focused on a project/problem statement provided by UCT. We had to finish the project including the report in 6 weeks' time.

My project was Temperature and Humidity Monitoring System.

This internship gave me a very good opportunity to get exposure to Industrial problems and design/implement solution for that. It was an overall great experience to have this internship.

TABLE OF CONTENTS

1	Preface	3
2	Introduction	6
2.1	About UniConverge Technologies Pvt Ltd	6
2.2	About upskill Campus	12
2.3	Objective	13
2.4	Reference	14
2.5	Glossary.....	14
3	Problem Statement.....	15
4	Existing and Proposed solution.....	16
5	Proposed Design/ Model	18
5.1	High Level Diagram	18
5.2	Low Level Diagram	19
5.3	Interfaces	20
6	Performance Test.....	21
6.1	Test Plan/ Test Cases	Error! Bookmark not defined.
7	My learnings.....	23
8	Future work scope	24

1 Preface

I worked on the project for 6 weeks and it was quite ample time to learn and implement things that were very new or little known to me, every week I set the target for myself regarding project work that I had to complete for given week also learning new things that were taught to me through upskill portal as for the per week content to study. it also helped a lot in making of this project as well as giving an insight into how does a real solution based iot company works and what are the essentials required for its smooth operation.

Relevant internships play a crucial role in career development. Internships provide practical, hands-on experience in a specific field or industry. They allow you to apply the theoretical knowledge you've gained in your academic studies to real-world situations. This experience helps you develop practical skills, gain industry-specific knowledge, and understand how different concepts are applied in the workplace. Internships offer a valuable opportunity to immerse yourself in a particular industry and gain exposure to its dynamics, trends, and practices. This exposure allows you to understand the inner workings of the industry, its culture, and the challenges it faces. It also helps you build a professional network and establish connections with industry professionals, which can be beneficial for future job opportunities. As I told earlier that this internship gives insights of a working company which is related to my field of study.

Internships provide an opportunity to develop confidence in your abilities and gain a sense of professionalism. As you navigate the workplace, interact with colleagues and superiors, and take on responsibilities, you learn how to conduct yourself professionally, handle challenges, and communicate effectively. This boosts your self-assurance and prepares you for future career endeavors.

For this internship with uct by upskill campus, I prepared a project to monitor temperature and humidity of a room. I used Arduino, ESP8266, DHT11, OLED Display. While working with IOT, in Industry we need to Control Environmental Conditions of Work place to Modify working method as to give optimum and efficient output. Temperature and Humidity are two important factors of Workplace to be measured, to solve the above problem this project monitors the temperature and humidity of room using DHT!! Sensor and display it on OLED Display and upload it on MQTT Server using Wi-Fi Module ESP8266.

I feel very lucky that I got this Opportunity given by UCT to get my internship with upskill and learn variety of things that helps to get more exposure also support my theoretical knowledge to get a job in this industry which is working to advance in industrial revolution 4.0.

I feel this is a very good bridge to fill the gap for students who are not aware of the practicality and potential of electronics as a field of work, this is very good initiative by UniConverge Technologies as well as Upskill to train the future job seekers making them a step closer to step into this industry.

This program was well planned and executed to make this journey as smooth as possible for students who are attending this internship the program was divide into six weeks of step-by-step progressive arrangement to make students learn slowly and efficiently.

Week 1: week 1 was given to Study about Internship Project providing company "UniConverge Technologies Pvt Ltd", which domains does it work, what kind of products/solutions does it work, which technologies does it use, what kind of work does it related to your internship domain. Also rectify what problem statement you have to work on and what can you do to solve the problem and therefore plan out the project work needed

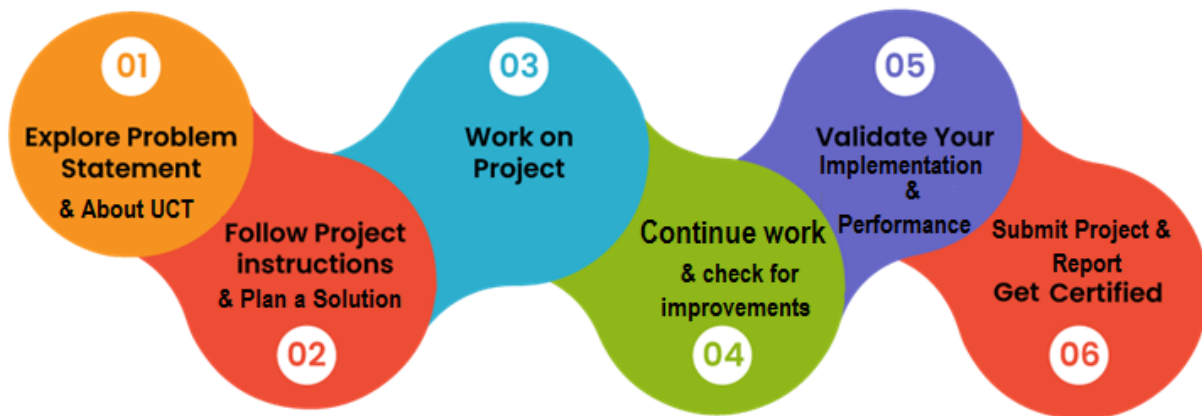
Week 2: week 2 was opportunity to start designing and working out the solution you chose to give and start designing and collecting all things you want or want to know in order to do your project

Week 3: week 3 I started implementing the design and collect all resources needed to make it easier for me to do this

Week 4 : week 4 was planned to check your direction of your work and look for optimum ways to make it efficient to work faster

Week 5: Week 5 planned to execute and realise tour design and work and rest it to solve the problem statement

Week 6: Week 6 was planned to troubleshoot and debug your project to refine the output



My overall experience was that This practical exposure allowed me to develop a deeper understanding of the industry and gain valuable insights into the challenges and opportunities it presents. I am grateful for the opportunity to have a practical learning experience that complemented my theoretical knowledge and prepared me for future career endeavors.

I Would like to thanks my father, Sudhir Sharma who is also electrical engineer and helped me throughout this project and my classmates and teachers who guided me to execute this project.

My message to your juniors and peers would de that I feel it is very important for the students to grab this opportunity with both hands and work out your six weeks to gain heavy advantage over others while recruitment and take this internship very seriously and complete your work time to time in order to benefit yourself as this will help them and build the base for their bright future

2 Introduction

2.1 About UniConverge Technologies Pvt Ltd

A company established in 2013 and working in Digital Transformation domain and providing Industrial solutions with prime focus on sustainability and RoI.

For developing its products and solutions it is leveraging various **Cutting Edge Technologies** e.g. **Internet of Things (IoT), Cyber Security, Cloud computing (AWS, Azure), Machine Learning, Communication Technologies (4G/5G/LoRaWAN), Java Full Stack, Python, Front end** etc.



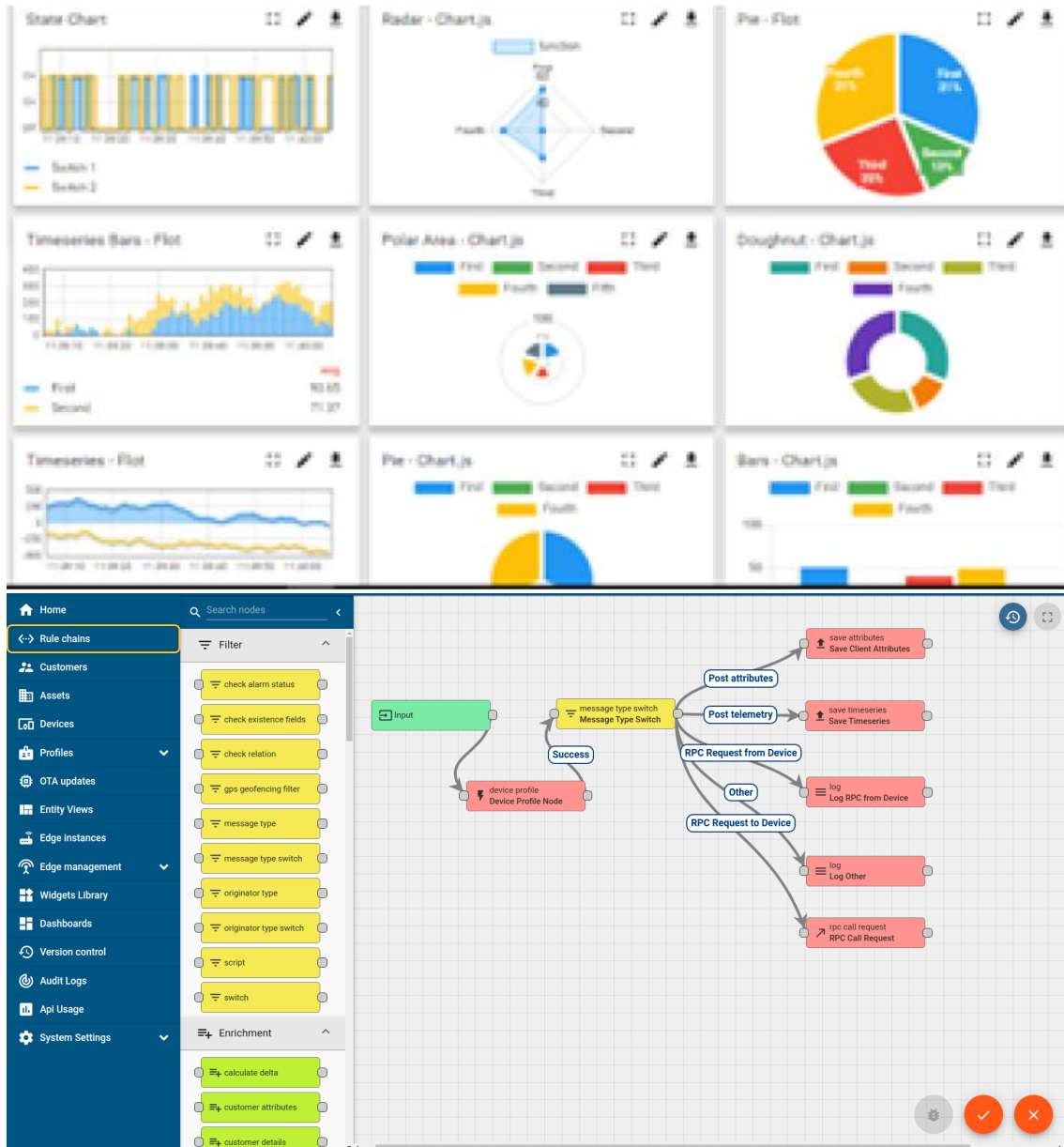
i. UCT IoT Platform ()

UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable “insight” for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- It enables device connectivity via industry standard IoT protocols - MQTT, CoAP, HTTP, Modbus TCP, OPC UA
- It supports both cloud and on-premises deployments.

It has features to

- Build Your own dashboard
- Analytics and Reporting
- Alert and Notification
- Integration with third party application (Power BI, SAP, ERP)
- Rule Engine



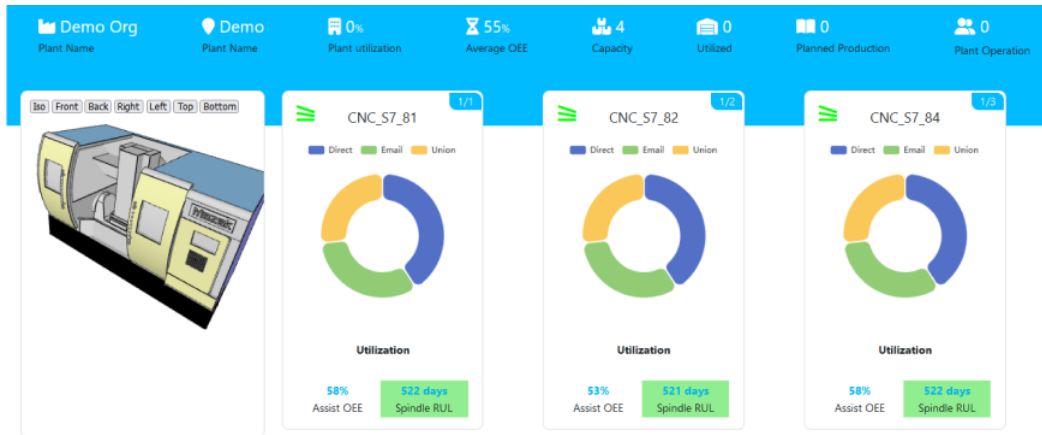
ii. **FACTORY** **WATCH**)

Factory watch is a platform for smart factory needs.

It provides Users/ Factory

- with a scalable solution for their Production and asset monitoring
- OEE and predictive maintenance solution scaling up to digital twin for your assets.
- to unleash the true potential of the data that their machines are generating and helps to identify the KPIs and also improve them.
- A modular architecture that allows users to choose the service that they want to start and then can scale to more complex solutions as per their demands.

Its unique SaaS model helps users to save time, cost and money.



Machine	Operator	Work Order ID	Job ID	Job Performance	Job Progress		Output		Rejection	Time (mins)				Job Status	End Customer
					Start Time	End Time	Planned	Actual		Setup	Pred	Downtime	Idle		
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i



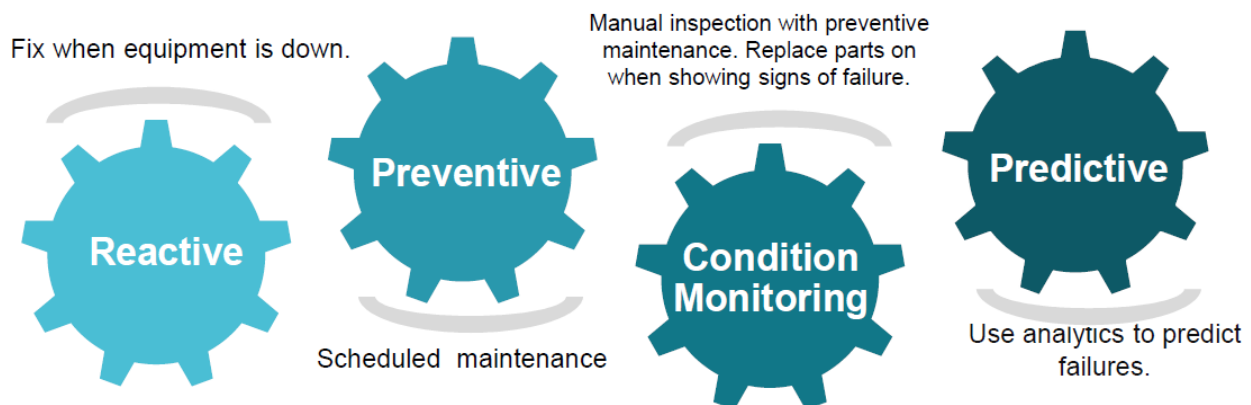


iii. LoRaWAN based Solution

UCT is one of the early adopters of LoRAWAN technology and providing solution in Agritech, Smart cities, Industrial Monitoring, Smart Street Light, Smart Water/ Gas/ Electricity metering solutions etc.

iv. Predictive Maintenance

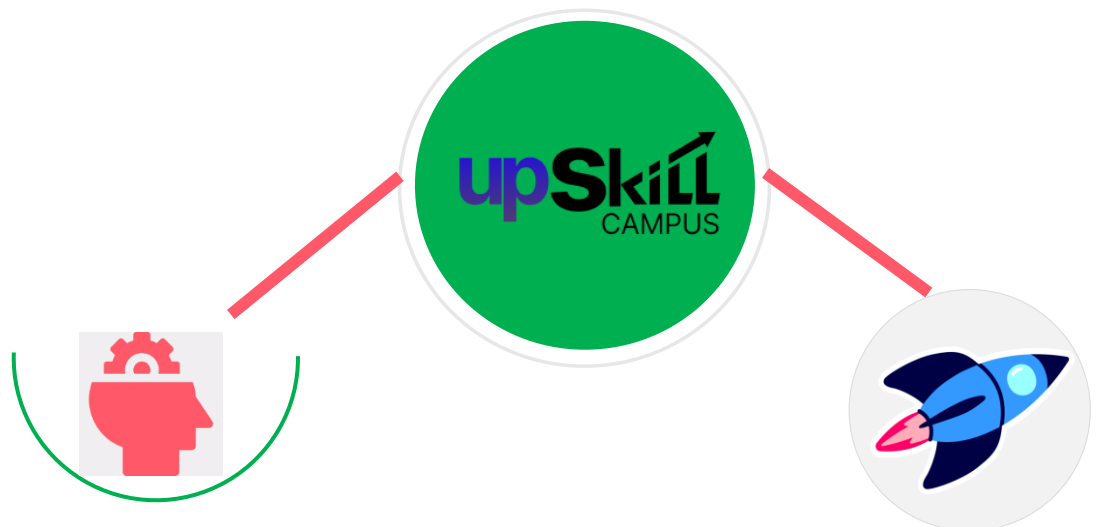
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



2.2 About upskill Campus (USC)

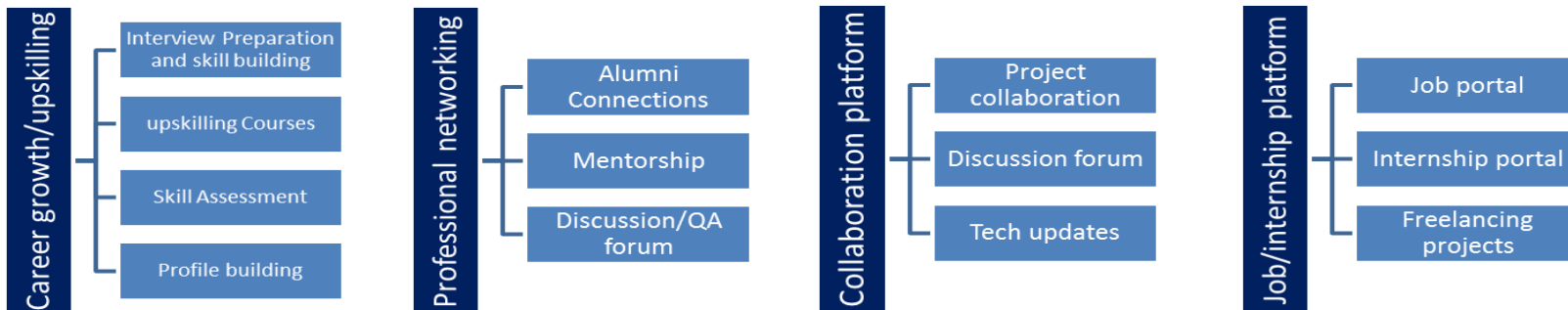
upskill Campus along with The IoT Academy and in association with Uniconverge technologies has facilitated the smooth execution of the complete internship process.

USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.



Seeing need of upskilling in self-paced manner along-with additional support services e.g. Internship, projects, interaction with Industry experts, Career growth Services

upSkill Campus aiming to upskill 1 million learners in next 5 year



2.3 The IoT Academy

The IoT academy is EdTech Division of UCT that is running long executive certification programs in collaboration with EICT Academy, IITK, IITR and IITG in multiple domains.

2.4 Objectives of this Internship program

The objective for this internship program was to

- ▣ get practical experience of working in the industry.
- ▣ to solve real world problems.

- to have improved job prospects.
- to have Improved understanding of our field and its applications.
- to have Personal growth like better communication and problem solving.

2.5 Reference

- [1] <https://www.upskillcampus.com/>
- [2] <https://www.uniconvergetech.in/digital-transformation-industry>
- [3] <https://www.uniconvergetech.in/>

2.6 Glossary

Terms	Acronym
IoT	Internet of things
IITK	Indian Institute of Technology Kanpur
IITR	Indian Institute of Technology Roorkee
USC	Upskill Campus
LoRaWAN	Long Range Wide Area Network

3 Problem Statement

While working with IOT, in Industry we need to Control Environmental Conditions of Work place to Modify working method as to give optimum and efficient output. Temperature and Humidity are two important factors of Workplace to be measured.

Many industries, such as pharmaceuticals, food and beverage, and electronics, have strict temperature and humidity requirements for their products. Monitoring these parameters ensures that the products are stored, transported, and processed under optimal conditions, thereby maintaining their quality and integrity.

Industries are often subject to regulatory standards and guidelines that specify temperature and humidity ranges for certain processes or products. Implementing a monitoring system helps ensure compliance with these regulations, preventing potential penalties, product recalls, or damage to the company's reputation.

Temperature and humidity fluctuations can adversely affect sensitive equipment, machinery, and assets. Monitoring these parameters allows for proactive maintenance and troubleshooting, reducing the risk of equipment failure, prolonging the lifespan of assets, and minimizing costly downtime.

Overall, a temperature and humidity monitoring system in industry is crucial for maintaining product quality, complying with regulations, protecting assets, ensuring safety, improving energy efficiency, and optimizing processes. It enables proactive management, reduces risks, and contributes to the overall success of the organization.

4 Existing and Proposed solution

The temperature and humidity monitoring system used currently are not connected to IoT and it poses as a limitation to these devices. Without IoT connectivity, the system requires manual data retrieval from each monitoring device or data logger. This process can be time-consuming, especially if there are multiple monitoring points spread across a large area or multiple locations.

Without real-time connectivity, the system cannot immediately notify relevant personnel of temperature or humidity deviations. This delay in alerting can result in delayed corrective actions, potentially impacting product quality, equipment, or environmental conditions. But with OLED display we can monitor Realtime parameters.

Without IoT connectivity, it becomes difficult to monitor temperature and humidity in real-time from a remote location. This can be a limitation for industries where centralized or remote monitoring is essential, such as supply chain management or remote facilities. But with my design we can monitor from far away by MQTT Server.

4.1 Code submission (GitHub link):

<https://github.com/Samarth1022/internship-Project/blob/6b79d3b6f9aa92c4bcd3b3c3ee91ced5d6e45f20/Temperature%20and%20humidity%20monitoring%20system>

Placeholders: Replace these placeholders with your wifi/mqtt details

- my wifi SSID
- My wifi password
- MQTT_SERVER_ADDRESS
- MQTT_USERNAME
- MQTT_PASSWORD

4.2 Report submission (GitHub link) :

<https://github.com/Samarth1022/internship-Project.git>

5 Proposed Design/ Model

To solve the above problem this project monitors the temperature and humidity of room using DHT!! Sensor and display it on OLED Display and upload it on MQTT Server using Wi-Fi Module ESP8266

Temperature monitoring system is designed to measure and track temperature levels in various environments. They use sensors, data loggers, and other technologies to capture temperature data, which can be analyzed and monitored in real-time

IoT-based systems utilize sensors that are connected to the internet, enabling remote monitoring and data analysis. These systems can provide real-time temperature data, send alerts for temperature deviations, and offer advanced analytics capabilities for predictive maintenance and optimization.

5.1 High Level Diagram

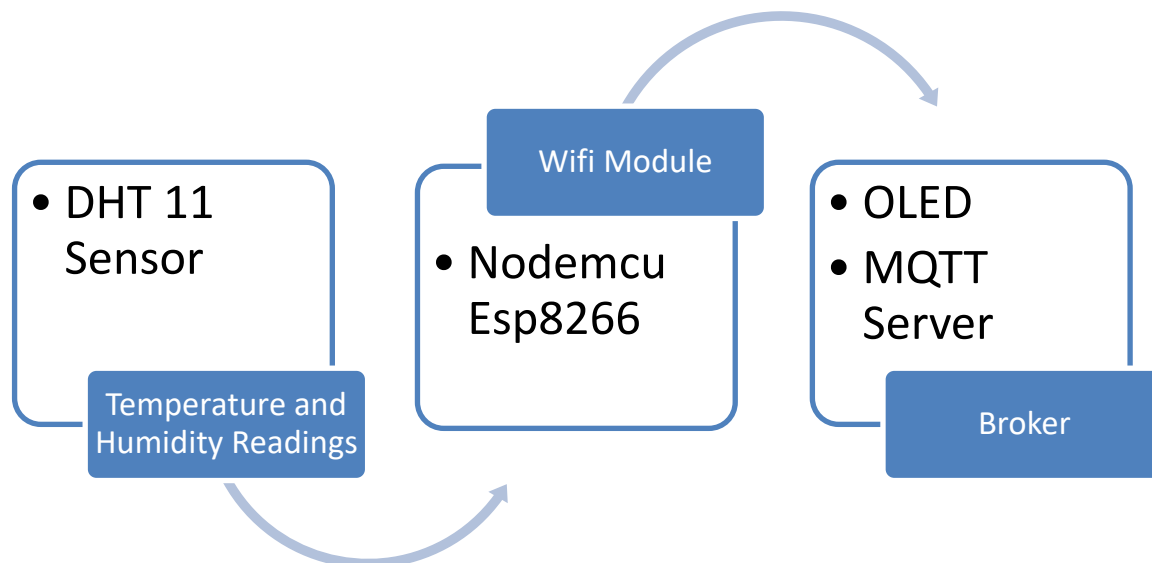
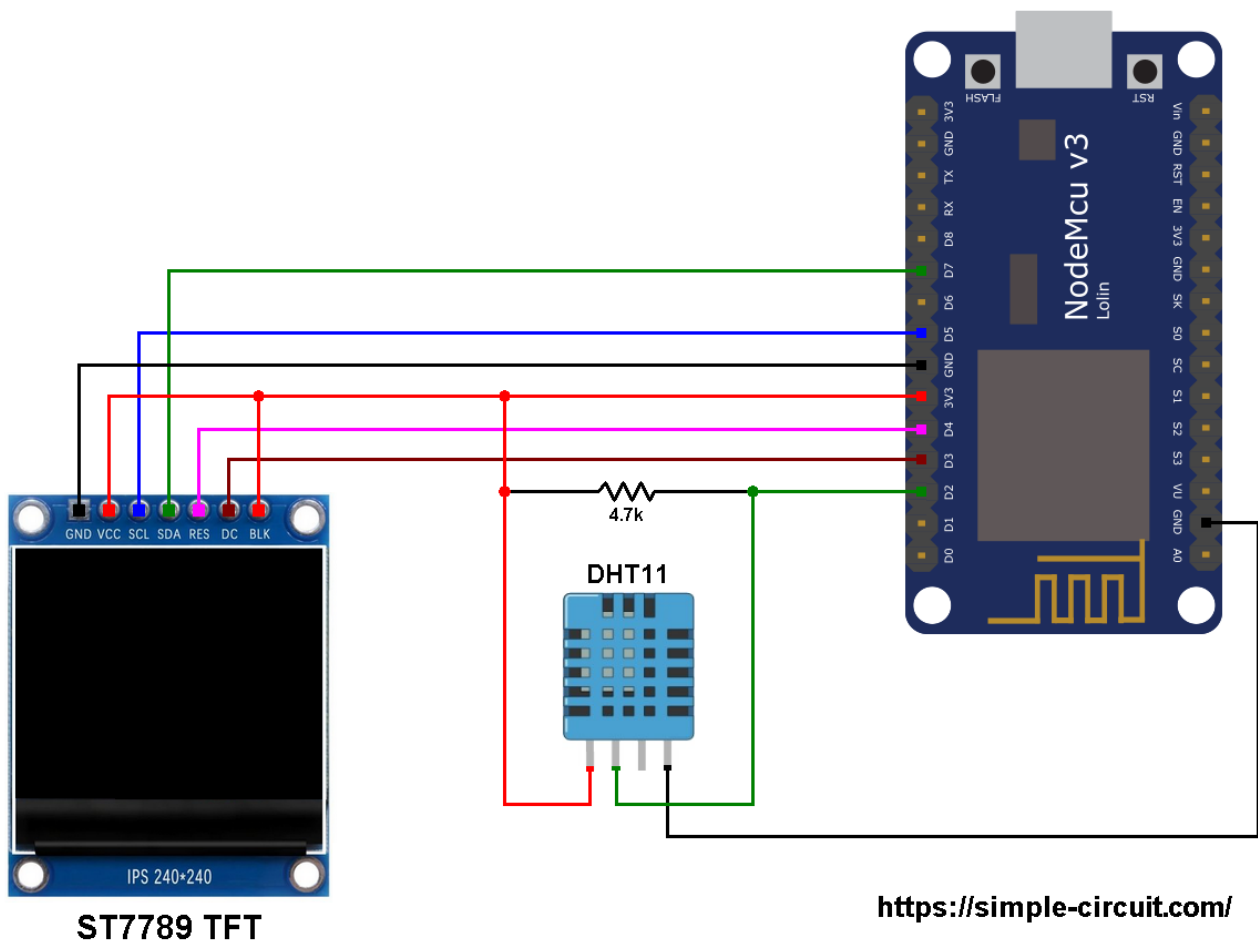
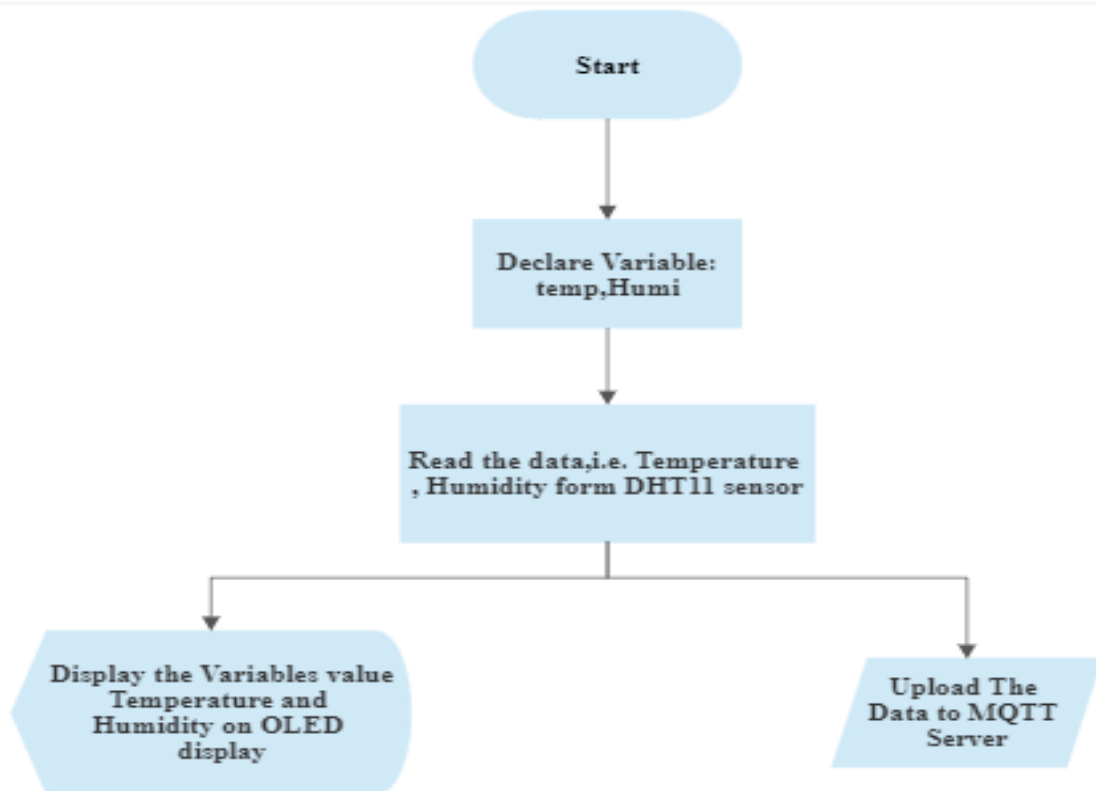


Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM

5.2 Low Level Diagram



5.3 Interfaces, Program Flow



6 Performance Test

To perform a performance test on the project, you can evaluate various aspects such as the response time, reliability, and scalability. Here are some considerations for conducting a performance test:

Response Time: Measure the time it takes for the system to read the temperature from the DHT11 sensor, display it on the OLED display, and publish it to the MQTT server. Monitor the response time and ensure it meets your requirements.

Stability and Reliability: Run the project for an extended period to check for stability and reliability. Monitor if the system maintains consistent readings, remains connected to the Wi-Fi network, and successfully publishes data to the MQTT server without interruptions.

Data Accuracy: Validate the accuracy of temperature readings by comparing them with a trusted reference source. Ensure that the displayed values and published data accurately represent the actual temperature.

Scalability: Test the project's scalability by adding multiple temperature sensors and OLED displays. Monitor if the system can handle increased sensor inputs, display the data correctly, and publish it to the MQTT server without degradation in performance.

Load Testing: Simulate high load scenarios by continuously requesting temperature readings and monitoring the system's performance under heavy usage. Evaluate if the system remains responsive and stable under such conditions.

Network Performance: Assess the impact of network conditions on the project. Introduce network latency, packet loss, or low bandwidth to evaluate how the system handles adverse network conditions.

Resource Usage: Monitor the resource utilization of the microcontroller (e.g., memory, CPU) during operation. Ensure that the project operates within the resource limits of the hardware to maintain performance and stability.

Error Handling: Introduce unexpected scenarios such as disconnections from Wi-Fi or MQTT server failures. Evaluate how the project handles and recovers from such errors, ensuring it can gracefully handle exceptional conditions.

By conducting these performance tests, you can assess the reliability, efficiency, and scalability of the project. It will help you identify any areas for improvement and ensure that the system meets your requirements under different operating conditions.

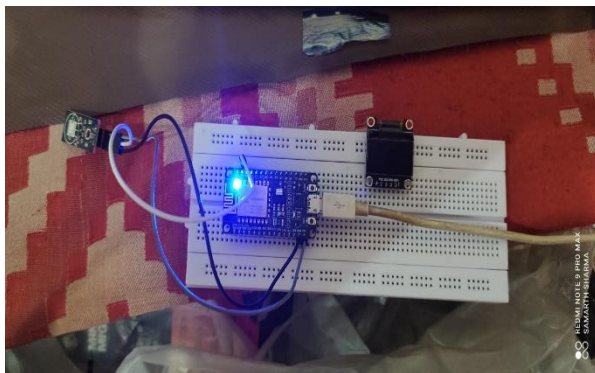
7 My learnings

I learnt many things while doing this project like how to work with sensors how to troubleshoot if any error arises in the project. This project provides hands-on experience in integrating an IoT device (NodeMCU ESP8266) with a sensor (DHT11) to collect real-time temperature data. Understanding how to connect and interact with sensors is a fundamental skill in the field of IoT.

Developing the code for the Arduino board and NodeMCU ESP8266 involves programming in C/C++. This project helped me strengthen your programming skills in embedded systems, which is valuable in various industries and opens up opportunities in areas like robotics, automation, and IoT development.

Implementing MQTT communication between the NodeMCU ESP8266 and the MQTT server introduces you to data communication protocols. Understanding protocols like MQTT and their application in IoT systems is crucial for developing scalable and efficient IoT solutions.

I learned about coding in Arduino IDE and interface of ide and debugging of code. I learnt about serial monitor to check the reading of dht11 sensor and framing the output and with data reading



8 Future work scope

In future I would like to take this project forward and add some features as it is right now only a minimal project working to meet its requirement with as less decoration and features to make it easier to use or interface

I would like to Incorporate user interface elements such as buttons or a touchscreen to allow users to interact with the system. This could include features like setting temperature thresholds, toggling display modes, or accessing historical data.

I can also Develop a mobile application that connects to the project's MQTT server, allowing users to remotely monitor and control the system. The app could display real-time temperature readings, provide alerts, and offer additional features like data visualization and historical analysis and expand the project to support multiple DHT11 sensors. This enhancement would enable monitoring temperature in different locations or rooms and provide more comprehensive data analysis and insights.

Lastly as working with IoT I would like to Integrate the project with popular home automation systems like Amazon Alexa or Google Home. This integration would enable voice-controlled temperature monitoring and management, providing a seamless smart home experience.

