Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	15 October 2022
Team ID	PNT2022TMID35839
Project Name	SmartFarmer- IoT Enabled Smart Farming Application
Maximum Marks	4 Marks

Technical Architecture:-

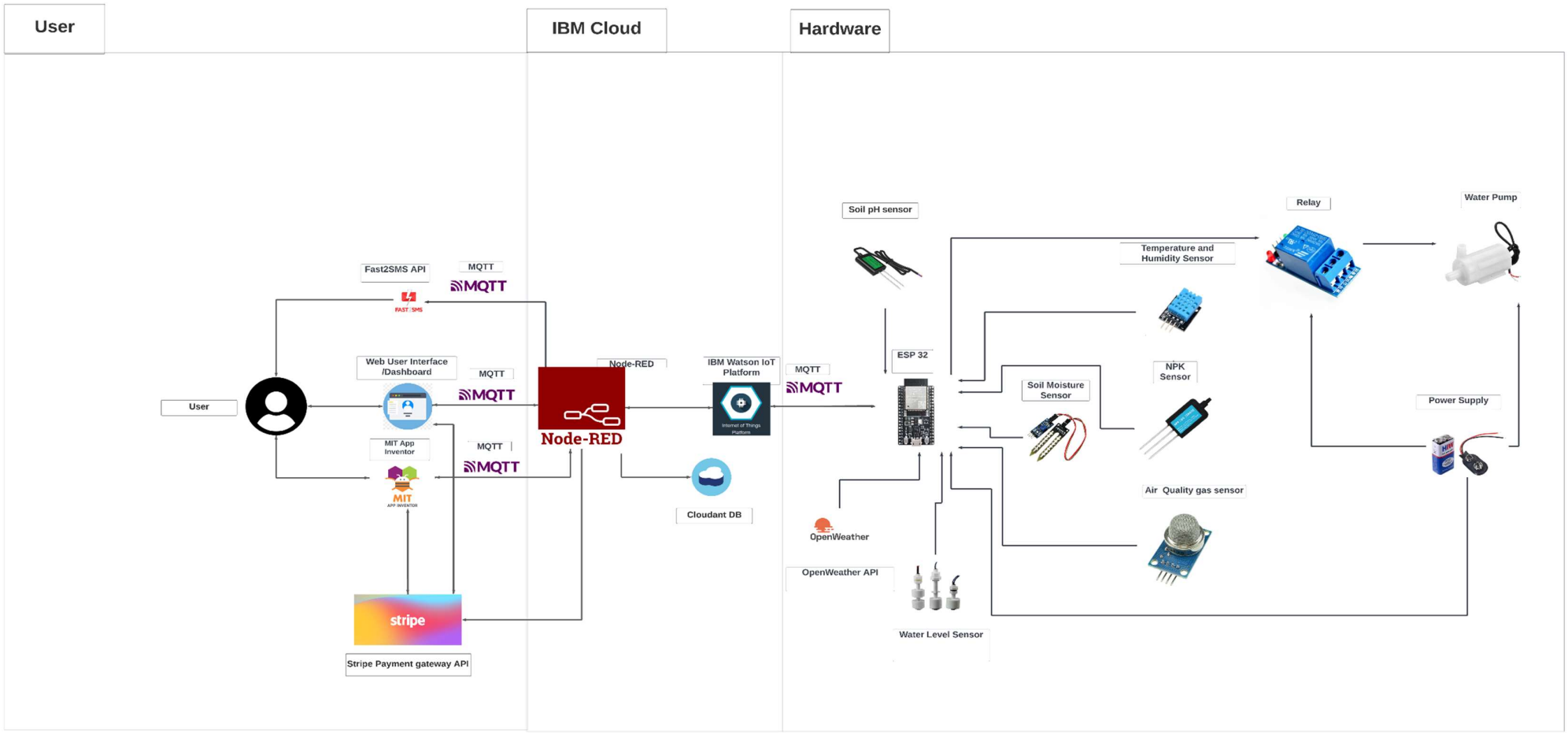

Table-1 : Components & Technologies:-

S.No	Component	Description	Technology
1.	User Interface-1	Values from IBM Watson IoT Platform are displayed using NodeRED dashboard which is then displayed to user from which sensor values are noted and motor is operated	NodeRED Dashboard
2.	User Interface-2	Values from IBM Watson IoT platform are displayed using an Mobile Application to the user from which sensor values are noted and motor is operated	MIT App Inventor
3.	Hardware component-1	Values from sensor are sent to IBM Watson IoT Platform and to operate from button click in user interface	ESP32 board(ESP32 Devkit V1), C++
4.	Hardware component -2	Used to obtain water level of container from which water is let out	Water level Sensor(FS-37A)
5.	Hardware component-3	Used to measure pH level of soil to check soil acidity	Soil pH sensor
6.	Hardware component-4	Used to measure volumetric water content in soil	Soil moisture sensor(AR 605)
7.	Hardware component-5	Used to measure environmental temperature and humidity	Temperature and Humidity sensor (DHT 11)
8.	Hardware component-6	Used to measure nutrients in soil like Nitrogen, Phosphorous, Potassium to determine soil fertility	NPK sensor
9.	Hardware component-7	Used to detect contaminants in air like ammonia CO2 and smoke	Air quality gas sensor(MQ135)
10.	Hardware component-8	Used to amplify output from ESP32 with external power supply to operate water pump	Relay
11.	Hardware component-9	Used to drive water from container and provide water to soil	Water pump(EK1893)
12.	Hardware component-10	Used to provide power to ESP32 board and Relay	Power supply(5V battery)
13.	Application Logic-1	IBM Watson IoT platform receives data from the devices, manages connection between the devices and helps to build software application	IBM Watson IoT Platform
14.	Application Logic-2	NodeRED service provides way analyse data obtained , display information online and use APIs to integrate external services and interact with mobile application	Node RED Service, NodeJS
15.	Cloud Database	Database Service on Cloud is used to store sensor data	IBM Cloudant DB
16.	External API-1	Allows to send alerts to farmer when sensor parameter value threshold is exceeded	Fast2SMS API

17.	External API-2	Used to provide accurate local weather data like temperature, humidity, pressure, wind speed etc for analysis	OpenWeather API
18.	External API-3	Allows to accept variety of payment methods for subscription payment through a single API	Stripe Payment Gateway API

Table-2: Application Characteristics:-

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	List the open-source frameworks used	Fast2SMS API, OpenWeather API, Stripe Payment gateway API
2.	Security Implementations	List all the security / access controls implemented, use of firewalls etc.	Two step authentication(Password and OTP)
3.	Scalable Architecture	A 3 tier architecture with user interface, cloud services and hardware is implemented	3 tier- architecture
4.	Availability	Availability of application all around the world so that users can access data from anywhere in the world remotely is provided by the IoT platform .Balancing availability of information for multiple users at a time is done by load balancer	IBM Watson IoT Platform, IBM load balancer
5.	Performance	Use of MQTT for data transfer helps in optimizing performance for data transfer and ESP32 is used which is a multi-core processor with high processing speed which helps in providing high performance	IBM Watson IoT Platform, MQTT,ESP32 Board