Smart Gardening System – Project Proposal

1. Project Description

The Smart Gardening System is an IoT-based solution designed to automate and optimize garden irrigation and monitoring using real-time data. The primary goal is to reduce water wastage, monitor environmental parameters, and ensure optimal growth conditions for plants without requiring constant human supervision.

Main Goals:
1. Automate the watering process based on real-time soil moisture data.
2. Monitor environmental factors such as temperature, humidity, and sunlight.
3. Generate interrupt if abnormal conditions are detected (e.g., dry soil, high temperature).
4. Use sustainable and low-cost hardware components for energy-efficient operation.

2. Design Outline

System Architecture:

- Sensor Node (Remote Node):
    - Hardware: Raspberry Pi Pico (using Zephyr)
    - Sensors:
        - Adafruit TSL2591 High Dynamic Range Digital Light Sensor (I2C digital sensor for ambient light measurement)
        - MCP9700/9700A (Analog temperature sensor for ambient temperature)
        - Adafruit STEMMA Soil Sensor – I2C Capacitive Moisture Sensor (I2C digital sensor for soil moisture)
- Base Node:
    - Hardware: Another Raspberry Pi Pico running Zephyr.
    - Functionality: Implements a custom Zephyr sensor driver to communicate with the sensor node (using UART) and expose sensor data through the Zephyr Sensors API.

- Communication Protocol:
    - Between Sensor Node and Base Node: UART communication.
    - Within Sensor Node: I2C for the TSL2591 and Soil Sensor, ADC for the MCP9700

Working Principle:
1. Sensors collect data and send it to the Raspberry Pi.
2. Based on pre-defined thresholds (e.g., soil moisture < 30%), the Raspberry Pi triggers an interrupt.
3 . Users can monitor and manually override controls through a web interface or mobile app.

3. Hardware Requirements

Component	Description
2 x Raspberry Pi	Main controller for processing and logic
Adafruit STEMMA Soil Sensor – I2C Capacitive	Detects moisture content in soil
MCP9700/9700A Temperature Sensor	Detects Temperature
Adafruit TSL2591 Digital Light Sensor	Monitors light intensity
Jumper Wires & Breadboard	For circuit connections
Power Supply	3.3V power supply for Raspberry Pi

4. Time Plan

Week	Tasks
15	Research and finalize design; gather hardware
16	Setup Raspberry Pi and test individual sensors
17	Integrate sensors and relay with Raspberry Pi
18	Write code for data acquisition and automation logic
19	Based on pre-defined thresholds, the Raspberry Pi triggers an interrupt. And testing.
21	Final testing, calibration, and optimization
23	Documentation and final presentation preparation