

IoT Water Leak Detector with Auto Shutoff and Multi-Zone Alerts

An ESP32 leak detector with zone probes that sounds a local alarm, closes a solenoid valve automatically, and pushes zone-identified alerts to the owner's phone.

Title

IoT Water Leak Detector with Auto Shutoff and Multi-Zone Alerts — zoned sensing with automatic valve closure.

Introduction / Background

Water leaks are discovered after the damage: a burst washing-machine hose floods the flat while nobody is home, and the main valve needs a person to close it. Battery-powered spot alarms help only if someone hears them. This project builds the full response chain — detect the leak, identify which zone it is in, sound a local alarm, close a solenoid valve on the supply line automatically, and push a phone notification naming the zone — on an ESP32 with WiFi.

It is a compact study in event-driven embedded design: normally-idle sensing, fast actuation on trigger, and cloud notification as the last mile.

Problem Statement

A leak detector that only beeps is half a solution when the house is empty. The missing pieces are automatic water shutoff at the moment of detection and a remote alert that says where the leak is. The build must therefore combine zoned sensing, a valve actuator with status feedback, and cloud push — while staying fail-safe if power or WiFi drops.

Objectives

- Monitor four independent zones with water-probe sensors.
- Close a 12 V solenoid valve automatically within seconds of any zone triggering (design target under 5 s).
- Sound a local buzzer and show the affected zone on an OLED.
- Push a zone-identified notification to the owner's phone via Blynk.
- Latch the shutdown until manual reset; report valve state on the display.

Proposed Methodology

Each zone uses a conductivity probe module whose digital output goes low when water bridges its contacts; the ESP32 polls all four zones continuously. On any trigger the firmware executes a fixed response sequence: energise the buzzer, drive the valve relay/MOSFET to close the normally-open solenoid valve, update the OLED with the zone name and timestamp, and fire a Blynk event push naming the zone. The shutdown latches — the valve stays closed and the alarm stays on until the physical reset button is pressed after the leak is cleared. A heartbeat LED and periodic Blynk status confirm the node is alive; WiFi loss never blocks the local shutoff path.

System Architecture / Working

Sensing: 4× water-probe modules on cables, one per zone. Controller: ESP32 running the poll → decide → actuate → notify loop. Actuation: relay/MOSFET driver switching the 12 V solenoid valve on the supply line. Local HMI: buzzer + OLED (zone, valve state). Cloud: Blynk push notifications and a status dashboard. Power: 12 V for the valve, 5 V for logic.

Hardware / Software Requirements

- Hardware: ESP32 dev board, 4× water probe sensor modules, 12 V solenoid valve (normally open), relay/MOSFET driver module, buzzer, 0.96" OLED display, 12 V + 5 V supplies, tubing/fittings for demo.
- Software: Arduino IDE, Blynk IoT app/account.

Expected Outcomes

A working detector that closes the valve within seconds of a probe getting wet (design target under 5 s from trigger to valve-closed), identifies the zone on the OLED and in the phone alert, and latches until manual reset — demonstrated with a wet sponge per zone. Timing is a design target verified by the buyer during testing, not a measured claim.

Applications

- Kitchens, bathrooms and washing-machine points in homes.
- Server rooms and labs with water lines nearby.
- Vacation homes monitored remotely.
- Demonstration of event-driven IoT actuation for viva.

Future Scope

- Flow-meter anomaly detection for slow leaks.
- Motorised ball valve for lower power draw.
- GSM fallback alerts when WiFi is down.
- Integration with home-automation hubs.