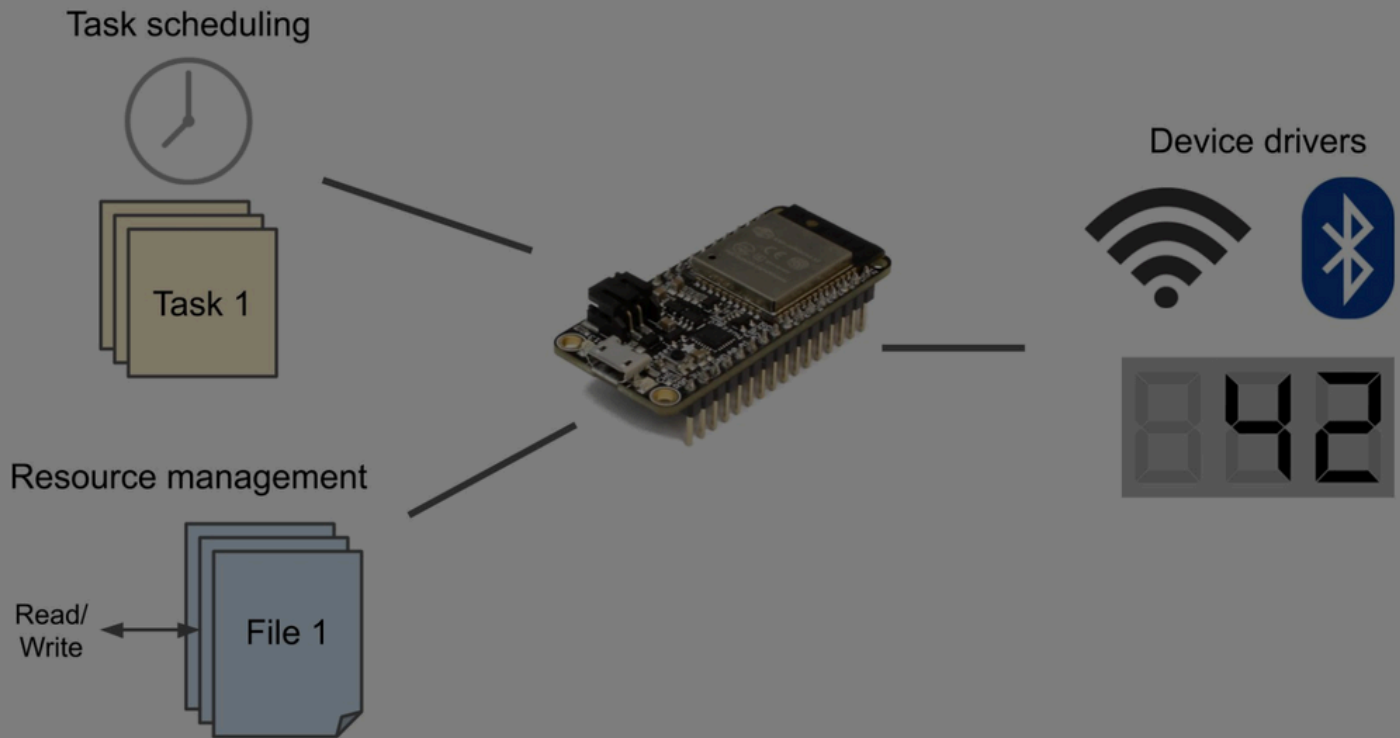


Real-Time Operating System (RTOS)



TASK CATEGORIES FOR INDUSTRIAL INSPECTION ROBOT (ESP32 + FREERTOS)

High Priority (Critical Control & Safety)

- TaskSafety
 - Monitors emergency stop, battery, watchdog.
 - If triggered → stops motors immediately.
 - Priority: Highest (must preempt everything).
- TaskMotorControl
 - Handles motor movement (PWM).
 - Receives movement commands from navigation task.
 - Runs at short intervals (e.g., every 10ms).
 - Priority: High.
- TaskDashboardComms
 - Wi-Fi + WebSocket/MQTT link to dashboard.
 - Receives commands (manual control, stop, path update).
 - Sends sensor data + alerts.
 - Priority: Medium-low.

Medium Priority (Core Sensing & Perception)

- TaskUltrasonic
 - Reads HC-SR04 distances.
 - Pushes obstacle data into a queue for navigation.
 - Priority: Medium-high.
- TaskGasSensors
 - Reads MQ-9 & MQ-135 via ADC.
 - Pushes concentration values to logging + comms.
 - Priority: Medium.
- TaskThermalCamera
 - Reads MLX90640 over I²C.
 - Processes heat map (basic threshold).
 - Sends anomalies to comms.
 - Priority: Medium.

Lower Priority

- none