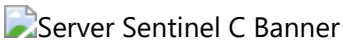
Server-Sentinel-C



> A C-based simulation of a mission-critical environmental controller for data centers, featuring a state-driven design, escalating alerts, and an emergency shutdown protocol based on ASHRAE standards.

Contents

Project Brief

CO253 - Introduction to Programming and Networking for Electrical Engineering

Project Objective

Students will develop software-only simulations of embedded systems using the C programming language. This is a foundational exercise intended to simulate real-world behavior of embedded devices while focusing on clean coding practices and logical system design. Graphical features are optional and may be developed using SDL or any cross-platform GUI library.

Project Allocation

Our group has been assigned with following project along with custom parameters.

Project Description

Temperature Logger – Monitors and logs temperature values and provides alerts.

Group 20:

- Project: Temp/Humidity Logger
- Alert Threshold: 60
- Log Size: 120

Features

Our implementation expands on the basic requirements with a comprehensive approach:

- **Advanced State Management:** Four operational states(NORMAL,CAUTION,DANGER,SHUTDOWN)
- **Dual-Parameter Monitoring:** Tracks both temperature and humidity with distinct thresholds
- **Circular Buffer Logging:** Maintains a 120-entry historical log with automatic oldest-entry replacement
- **Escalating Alert System:** Progressive alerts based on environmental conditions
- **Simulated Scenarios:** Multiple environmental test scenarios including cooling failures and humidity spikes
- **Time-Based Shutdown Protocol:** Automatic system shutdown after sustained critical conditions

Key Parameters

Parameter	Condition	Description
Caution Temperature	> 45°C	System enters CAUTION state
Critical Temperature	> 60°C	System enters DANGER state
Caution Humidity	> 70% or < 30%	System enters CAUTION state
Critical Humidity	> 80% or < 20%	System enters DANGER state
Shutdown Timer	20 simulated seconds	Time at Critical Temperature before SHUTDOWN

Repository Structure

Directory	Purpose	Contents
`/docs`	Documentation	Architecture, flowcharts, and module specifications
`/docs/modules`	Module Documentation	Detailed documentation for each system module
`/include`	Header Files	Function prototypes and data structure definitions
`/src`	Source Code	Implementation files for all modules
`/bin`	Compiled Binaries	Executable files and compiled objects

Project Plan

Phase 1: Architecture & Design (The Blueprint Phase)

- [x] Define system requirements
- [x] Establish repository structure
- [ ] Complete system architecture documentation
- [ ] Design system flowcharts
- [ ] Define module interfaces
- [ ] Finalize data structures

Phase 2: Core Logic Development (The Coding Phase)

- [ ] Implement smart_data.c module
- [ ] Implement logger.c module
- [ ] Implement system_logic.c module
- [ ] Implement user_interface.c module
- [ ] Implement main.c controller
- [ ] Create Makefile

Phase 3: Testing & Refinement (The Validation Phase)

- [ ] Develop test plan
- [ ] Execute scenario testing
- [ ] Code review and refactor
- [ ] Performance optimization

Phase 4: GUI Integration (Optional Phase)

- [ ] Select GUI library
- [ ] Design UI components
- [ ] Integrate with core logic
- [ ] GUI testing

Phase 5: Final Testing & Deployment (The Launch Phase)

- [ ] Final system testing
- [ ] Compile for different platforms
- [ ] Create deployment package
- [ ] Project presentation and documentation

Project Stats

Commits 27 | Completion 8% | Open Issues 4 | Pull Requests 2 | Contributors 6 | Watchers 0

issues 0 open | pull requests 0 open

Detailed Stats

| Lines of Code | ~2,500 (projected) | - | | Documentation Pages | 7 | - |

Metric	Value	Progress
Phase 1 Tasks	2/6 completed (33%)	33%
Phase 2 Tasks	0/6 completed (0%)	0%
Phase 3 Tasks	0/4 completed (0%)	0%
Phase 4 Tasks	0/4 completed (0%)	0%
Phase 5 Tasks	0/4 completed (0%)	0%
Total Tasks	2/24 completed	8%

🚀 Getting Started

> ⚠ **Note:** This project is currently in Phase 1 (Architecture & Design). Build instructions will be added in Phase 2.

Prerequisites (Planned) 🧰

- GCC compiler (version 9.0+) 🛠️
- Make build system 🏗️
- SDL2 library (for optional GUI components) 🖼️

Building (Coming in Phase 2) 🏗️

```
# Clone the repository
git clone https://github.com/Oshadha345/server-sentinel-c.git

# Navigate to project directory
cd server-sentinel-c

# Compile the project
make

#Running (Coming in Phase 2)
# Run the program
./bin/server-sentinel
```

📊 System State Diagram

```
stateDiagram-v2
        [*] --> NORMAL
        NORMAL --> CAUTION: Temp > 45°C OR Humidity < 30% OR > 70%
        CAUTION --> NORMAL: Temp < 45°C AND 30% < Humidity < 70%
        CAUTION --> DANGER: Temp > 60°C OR Humidity < 20% OR > 80%
        DANGER --> CAUTION: Temp < 60°C AND 20% < Humidity < 80%
        DANGER --> SHUTDOWN: Critical Temp for > 20 seconds
        SHUTDOWN --> [*]
```

Diagram Mermaid

🛠️ Tech Stack

Languages & Tools

C Git GitHub VS Code Make GitHub Actions

Libraries

Development Standards

👥 Team

Group 20 members with their responsibilities:

Name	Index	Role	Responsibilities
Prasad V.G.A. (Asitha)	E/21/313	Developer	Smart data simulation module 🤓
Rathnasiri R.S. (Rumal)	E/21/326	Developer	User interface and testing 💻 🖌️
Rathnayaka P.G.I.N.B. (Induka)	E/21/327	Developer	Logger module and data structures 📝
Ratnayake R.M.K.T. (Kaweesha)	E/21/334	Developer	Project documentation and reporting 📑
Samarakoon S.M.O.T. (Oshadha)	E/21/345	Developer	System architecture, integration, and coordination 🏗️
Samaranayaka W.W.M.A. (Asanga)	E/21/346	Developer	System logic implementation 🧠

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