

RemoteTControl

Preliminary Report V1

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Overview

This preliminary report aims at defining an architecture for the RemoteTControl Project. The goals of this report are mentioned below

Goals

1. Wireless Connectivity.
2. Easy-integrations
3. High Availability, fail-safe and commercial product.

Specifications

The system is divided into 4 different layers which should communicate with each other in real time.

Layers

- Hardware - MCU
- Processing Layer - Server {Ubuntu Server 18.04(recommended)}(for visualization and data logs)
- Transport Layer - MQTT(communication protocol) and REST API
- Network Layer - WiFi

Components Required(for Prototype)

The list below is a suggested list of components for the 1st prototype

- DS18B20
 - https://www.amazon.com/DGZZI-Stainless-Encapsulated-Temperature-Water-proof/dp/B07PRWTL51/ref=sr_1_8?crd=2HMD8A0TRHCJ5&dchild=1&keywords=ds18b20+waterproof&qid=1613021786&sprefix=ds18b20%2Caps%2C432&sr=8-8
- ESP32 Dev Module
 - https://www.amazon.com/KeeYees-Development-Bluetooth-Microcontroller-ESP-WROOM-32/dp/B07QCP2451/ref=sr_1_2?dchild=1&keywords=esp32+dev kit&qid=1613021908&sr=8-2
- 12Amps SSR
 - https://www.amazon.com/CZH-LABS-Module-4-32VDC-100-240VAC-Channel/dp/B07WG7YKVW/ref=sr_1_22_sspa?crd=310W5FRQ69URV&dchild=1&keywords=solid%2Bstate%2Brelay&qid=1613022043&sprefix=solid%2Bstate%2Bre%2Caps%2C263&sr=8-22-spons&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUE1VWk0xT00yWUM3MUUuZW5jcnlwdGVkSWQ9QTEwMTUwMTQzQzBYTDEwWUYwQlg0JmVuY3J5cHRlZEFkSWQ9QTA2MzgxMjQxMjc3WEtGMjQzNzFWJndpZGdldE5hbWU9c3BfYnRmJmFjdGlvbj1jbGlja1JlZGlyZWNOJmRvTm90TG9nQ2xpY2s9dHJ1ZQ&th=1
- Voltage Level Shifter
 - https://www.amazon.com/KeeYees-Channels-Converter-Bi-Directional-Shifter/dp/B07LG646VS/ref=sr_1_1?crd=1PHH3FKCZJLBS&dchild=1&keywords=voltage+level+shifter&qid=1613022454&sprefix=voltage+level%2Caps%2C364&sr=8-1
- GPRS Module SIM800L
 - https://www.amazon.com/DAOKI-SIM800L-MicroSIM-Quad-Band-3-7-4-2V/dp/B08212SNVQ/ref=sr_1_1?dchild=1&keywords=sim800l&qid=1613022505&sr=8-1
- 5V 5Amp Power Supply
 - https://www.amazon.com/ALITOVE-Converter-5-5x2-1mm-100V-240V-Security/dp/B078RT3ZPS/ref=sr_1_1_sspa?dchild=1&keywords=5v+5+amp+power+supply&qid=1613022793&sr=8-1-spons&pssc=1&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUFKOVE1TTVVUkFJT1YmZW5jcnlwdGVkSWQ9QTA3NjYzNzAxUzRYNO NHUFRWDE3JmVuY3J5cHRlZEFkSWQ9QTA5NjExNjQyVzFLOFIEVkpUOTVVJndpZGdldE5hbWU9c3BfYXRmJmFjdGlvbj1jbGlja1JlZGlyZWNOJmRvTm90TG9nQ2xpY2s9dHJ1ZQ==

- Buck Converter
 - https://www.amazon.com/MP1584EN-Converter-Melife-Adjustable-Step-Down/dp/B089N899HN/ref=sr_1_47?crid=B34CHDVE07TX&dchild=1&keywords=buck+converter+3+amp&qid=1613022830&srefix=buckconv%2Caps%2C370&sr=8-47

Architecture

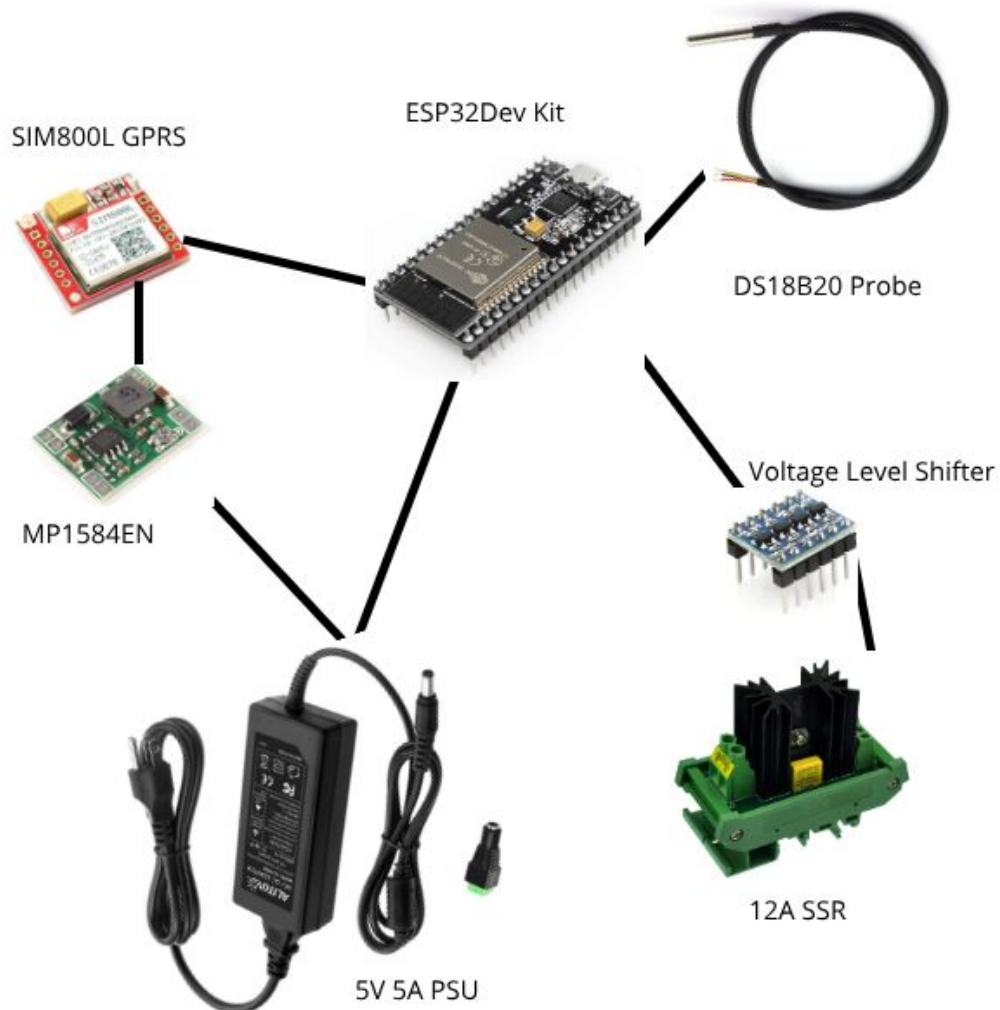
The complete product has

- Sensor Node

A complete System is referred to as a Product in this report.

Hardware Architecture - Sensor Node

Hardware Architecture

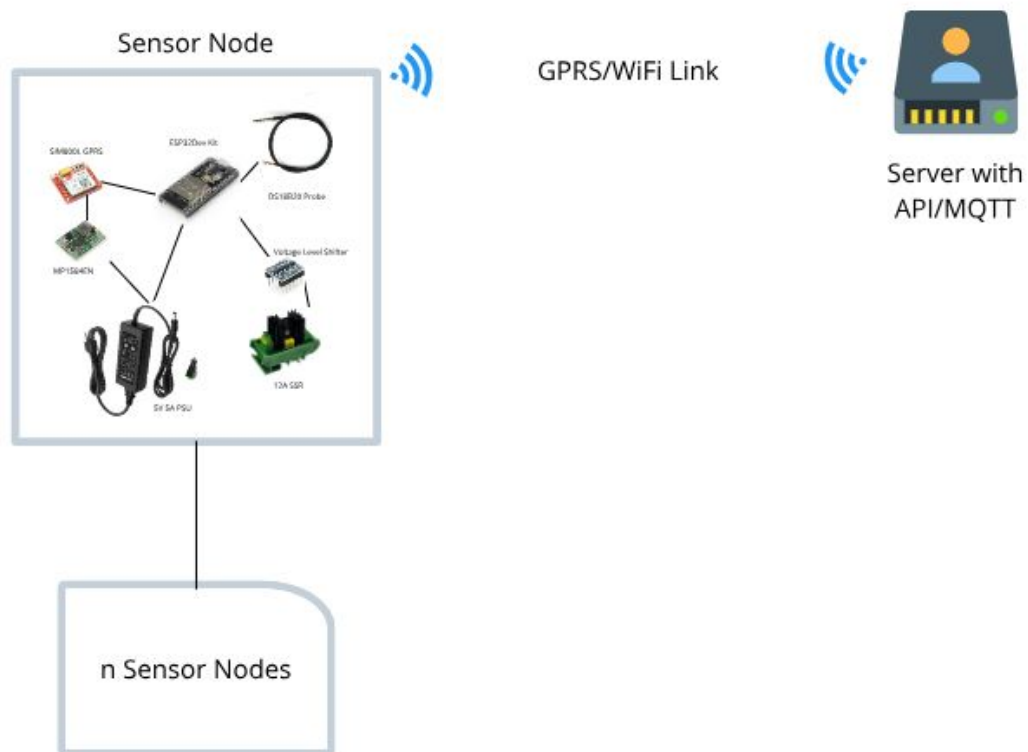


Above shown is the RemoteTControl hardware with different working units connected to the master ESP32 Dev Kit.

The ESP32 Gets the temperature data from the server using REST API calls or via MQTT and then implements PI(or similar) control.

Complete Architecture

Hardware Architecture



The complete architecture of the product is shown above.

Software Architecture

Multiple Nodes management

The sensor nodes should have unique identifiers which are the MAC address of ESP32 which will be used to uniquely identify each Node.

SensorNodeID;[DataString]

- SensorNodeID is a unique ID of Sensor Node
- [DataString] contains the sensor value

The communication is done over WiFi and data is shared to the Server(and the webapp) over MQTT.

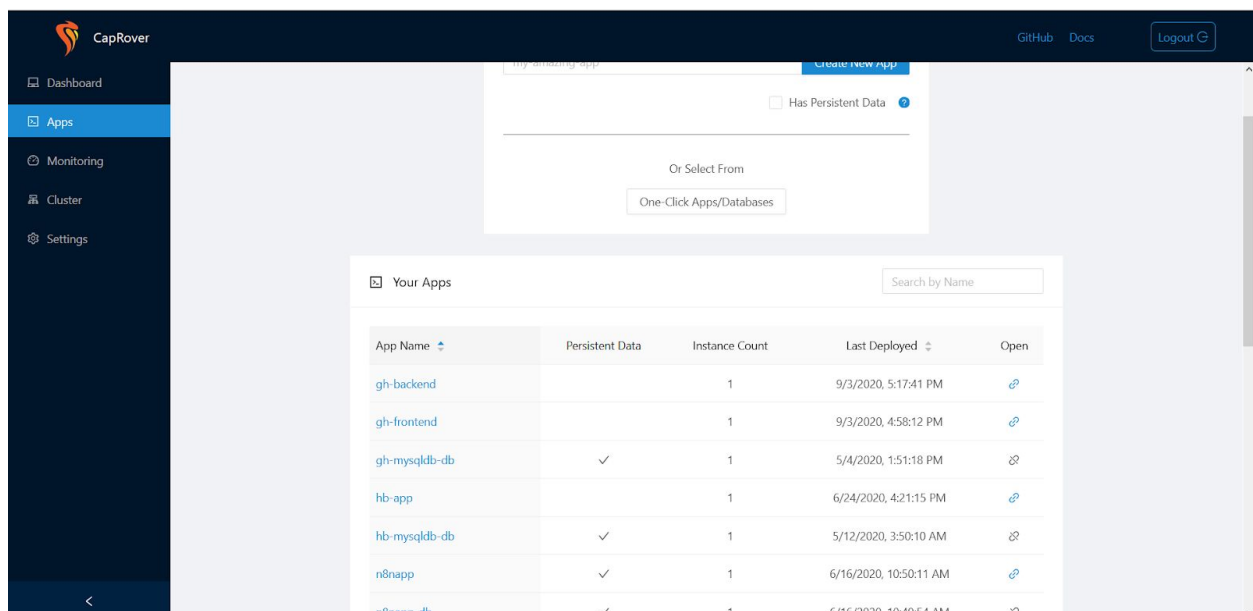
Management and CI/CD Pipeline

As decided earlier we will use Github for delivering the code. The developers from my team will be working on Hardware, Firmware, Backend, Frontend and apps simultaneously and for modularity we will dockerize different components of the app.

For Continuous Integration and Delivery we will be using CapRover running on a bare metal Ubuntu 18.04 instance and each component of the project's github repository will be linked to the respective Containers running in the Caprover. It will allow fully-automated delivery.

We will use our own company's production server running on AWS for testing and delivery during the development time. After that we can transfer the files to your own AWS and details of migration are mentioned in the Terms and Condition section of this report.

My automation engineer will work on this.



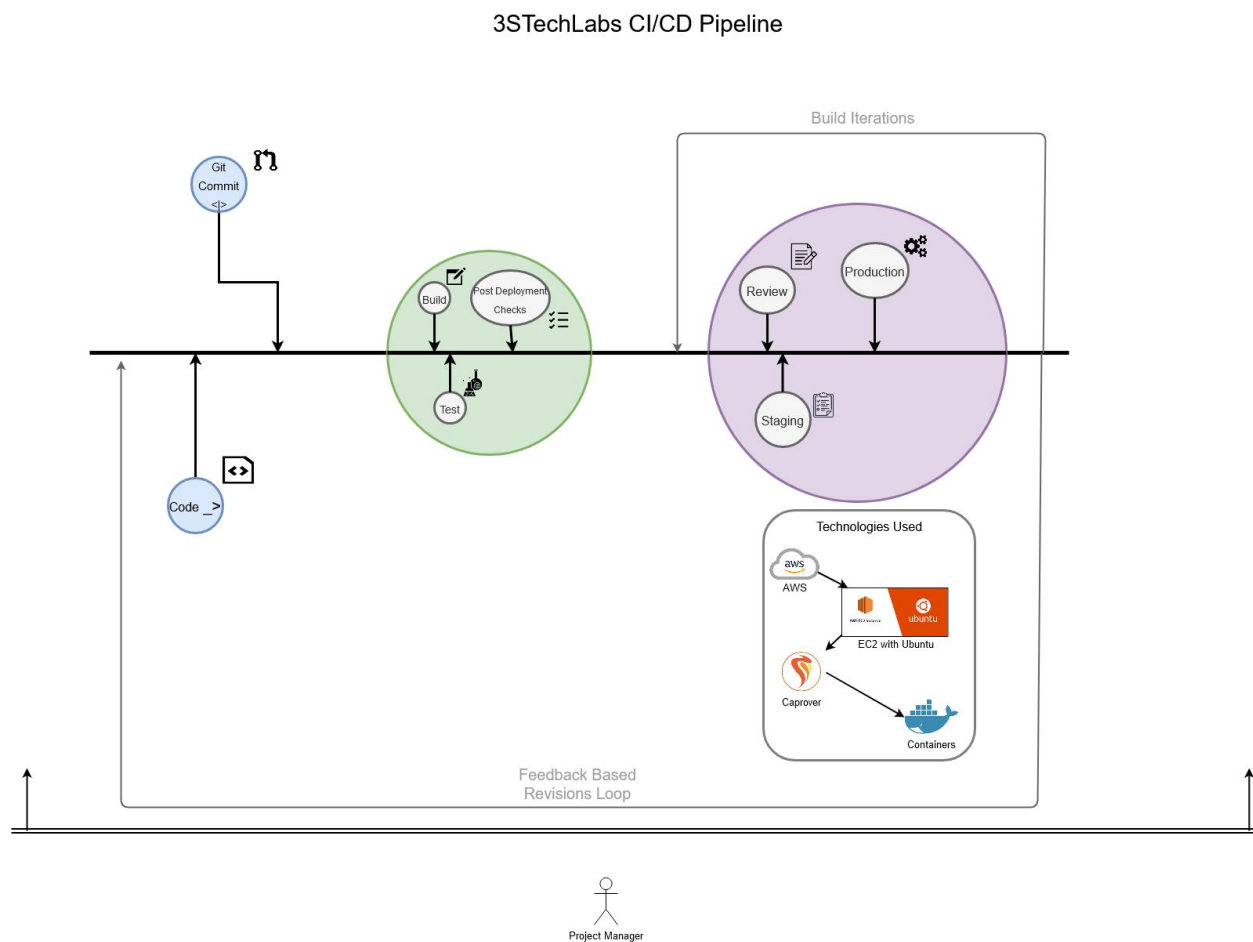
The screenshot shows the CapRover dashboard interface. On the left is a dark sidebar with navigation links: Dashboard, Apps (selected), Monitoring, Cluster, and Settings. The main area displays a 'Create New App' modal window with a search bar and a 'Has Persistent Data' checkbox. Below the modal, there's a section titled 'Your Apps' with a search bar and a table of deployed applications.

App Name	Persistent Data	Instance Count	Last Deployed	Open
gh-backend		1	9/3/2020, 5:17:41 PM	Open
gh-frontend		1	9/3/2020, 4:58:12 PM	Open
gh-mysqldb-db	✓	1	5/4/2020, 1:51:18 PM	Open
hb-app		1	6/24/2020, 4:21:15 PM	Open
hb-mysqldb-db	✓	1	5/12/2020, 3:50:10 AM	Open
n8napp	✓	1	6/16/2020, 10:50:11 AM	Open
n8napo-db	✓	1	6/16/2020, 10:49:54 AM	Open

From the picture above you can see that all of the services like backend, frontend and database etc are running in separate containers allowing a smooth delivery pipeline.

3STechLabs' CI/CD Standard Pipeline

Below is our well-tested CI/CD Pipeline for project management and delivery. This has been proven to work for our 10+ Full-Stack IoT Projects and Products.



(For a detailed look, please open the image file of above diagram)

Node Casing

Sensor Node in a Case

There could be multiple approaches to design cases for the device. A mockups are given below



Case 1.0 Sensor Node 3D Model



Questions and Their Answers

1. Could you develop a prototype for us?

- Do you want me to send you the completed prototype to your address? If yes, unfortunately I can't do this at this moment and neither can I commit anything like that because of the current Covid-19 situation the flights are delayed eventually delaying the shipments and in some cases even missing the delivery altogether.
- On other hand, I will provide you
 - Complete Code
 - Circuit diagrams
 - A complete report on how to setup and configure things.
- You can use all the delivered files and documentation to assemble. the prototype yourself.

Milestones Breakdown

1. Sensor Node Device Design - **Milestone 1** **\$250**
 - a. Hardware and Firmware + Setup Document
 - b. Breadboard Based POC with components mentioned in the list above
 - c. Layout based on the picture you shared
 - d. Development Time 15 Days
2. Sensor Node Device Design **\$280**
 - a. Components Selection(BOM) and Schematics Design
 - b. PCB Design
 - c. Consultancy is Mass-manufacturing/Lean-production
3. Web Dashboard design with REST API end-points **\$200**
 - a. (if not already developed)
 - b. NodeRED Based
 - c. Development time 12 Days
4. Casing Design **\$150**
 - a. (optional)
 - b. Could be 3D Printed using a 3D Printer
 - c. Development time 6 Days

Maximum Development time 18-21 Days for prototype.

Note: the above milestones cover a complete prototype. For a production ready solution, the components developed based on the above mentioned milestones will be used.

Terms and Conditions

- We will not ship anything physically unless otherwise decided, instead, you will be provided with a setup document with completion of each milestone which will be easy to follow and will contain all of the necessary information.
- The client will bear the R&D cost(components for single nodes and their shipments to the company). Companies will try to source as many components as possible from local sources but in case of some specific sensor/actuator unavailability, the company will ask the client to ship that components to the company's address via amazon.
- Client will bear all of the shipment costs.
- {Production Ready; Can be used Commercially} milestones are the ones that can be used in a commercial environment.
- Hardware Development is divided into multiple smaller parts. The parts are given below
 - a. There are few milestones with overlapping development timelines and will be catered in that way. The time breakdown given in Milestones Breakdown time is approximately the maximum time that this project will take.
 - b. The 3D casing design is something that will be finalized at the end of the project because it depends upon the final size of the circuit.
 - c. 3STechLabs will provide all the files necessary for the productionRemoteTControl Project. If you want 3STechLabs to handle mass-production for you, we will charge for that else we will let you know the trusted vendors that you can contact and can get things manufactured on your own.

In this document, the company refers to 3STechLabs.

If you agree to this report please fill-out the form below.

<https://naumanshakir3s.typeform.com/to/jZlJP>

Profile

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I'm a Full-Stack IoT Developer and have done more than 150 hardware projects and running an IoT and Hardware Design House

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