# COLD CHAIN MONITORING

**A PROJECT REPORT**

***Submitted by***


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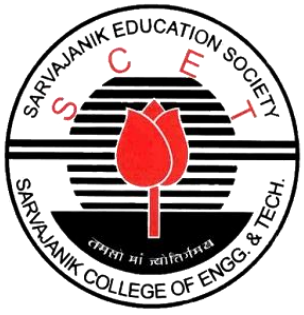
***In fulfillment for the award of the***

***degree of***

**BACHELOR OF ENGINEERING**


**Department of Information Technology**

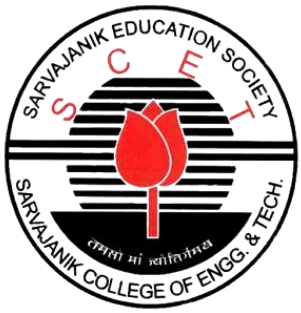






**Sarvajanik College of Engineering and Technology, Surat**

**Gujarat Technological University, Ahmedabad**

**April - May, 2019**




# Sarvajanik College of Engineering and Technology, Surat

Information Technology Department

2019

## CERTIFICATE

**Date: _____**

This is to certify that the project entitled **"COLD CHAIN MONITORING"** has been carried out by **ABHISHEK DESAI(150420116010), PARTH GOHIL(150420116017), FENIL MANGUKIYA(150420116028). MOHIT SAVALIYA(150420116050), ROMIN VAGHANI(150420116027)** under my guidance in fulfillment of the degree of Bachelor of Engineering in Information Technology(8th Semester) of Gujarat Technology University, Ahmedabad during the academic year 2019.

**Prof. Ashish Kharvar**
**Project Guide**

**Dr. Mita Parikh**
**Head of the Department**

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| 2 results | Our system focus on supply chain through ocean carrier | es.scribd.com vdocuments.site |
| Unique | Product is loaded in these reefers and stored under temperature and atmosphere management | - |
| 31,000 results | For fresh food it is important in addition to | shop.allrecipes.com shop.allrecipes.com bhg.com researchgate.net healthtap.com graciesravioli.com researchgate.net perishablepundit.com |
| Unique | We are indebted to all those who gave their precious reviews to us on | - |
| Unique | Last but not the least, thanks to Sarvajanik College of Engineering and Technology for giving | - |
| Unique | Perishable supply chain is the market for all commodities that required temperature cold chain management | - |
| Unique | Perishable product include frozen and fresh food, pharmaceutical, chemical and many others specialty products | - |
| Unique | ocean vessels and airplanes that are interconnected through distribution points such as ports and warehouse | - |

Before putting a single word about the project, we would like to thank all those people who have directly or indirectly helped us in making our project and turn it into a successful piece of work. Many people have contributed in this project in a variety of ways. Words are not enough to describe their support to us. But still we would like to thank all of them.We would like to thank our Head of Department Dr. Mita Parikh and our Guide Prof. Ashish Kharvar and Prof. Vivaksha Jariwala who guided us as much as possible and giving us valuable information regarding to our project.This project wouldn't have been successful without the constant help and motivation extended by our colleagues and friends who were always with us whenever we needed.This was the first professional step towards a high-profile career in it. So, we are thankful to our I.T. department for facilities that were provided to us in accessing the labs. It was a great experience where we learnt a lot of thing related to our field. We are indebted to all those who gave their precious reviews to us on our work and apologize if we have missed anyone.Last but not the least, thanks to Sarvajanik College of Engineering and Technology for giving us the platform for representing this project.Perishable supply chain is the market for all commodities that required temperature cold chain management and controlled environment to transport these products to market. Perishable product include frozen and fresh food, pharmaceutical, chemical and many others specialty products such as flowers, plants etc. The perishable supply chain consist of many forms of transportation such as trucks, trains, ocean vessels and airplanes that are interconnected through distribution points such as ports and warehouse distribution centers. Our system focus on supply chain through ocean carrier. Product is loaded in these reefers and stored under temperature and atmosphere management. For fresh food it is important in addition to

# Index

# List of Figures

# Acknowledgements

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# Abstract

Perishable supply chain is the market for all commodities that required temperature cold chain management and controlled environment to transport these products to market. Perishable product include frozen and fresh food, pharmaceutical, chemical and many others specialty products such as flowers, plants etc. The perishable supply chain consist of many forms of transportation such as trucks, trains, ocean vessels and airplanes that are interconnected through distribution points such as ports and warehouse distribution centers. Our system focus on supply chain through ocean carrier. Product is loaded in these reefers and stored under temperature and atmosphere management. For fresh food it is important in addition to temperature management, to control the atmosphere in the container includes humidity. Our system will help to solve the worldwide 30% food waste problem and allow ocean carriers increased productivity and margins.

# 1. Introduction

## 1.1 Problem Summary and Introduction

Perishable supply chain is the market for all commodities that required temperature cold chain management and controlled environment to transport these products to market. Perishable product include frozen and fresh food, pharmaceutical, chemical and many others specialty products such as flowers, plants etc. The perishable supply chain consist of many forms of transportation such as trucks, trains, ocean vessels and airplanes that are interconnected through distribution points such as ports and warehouse distribution centers. Our system focus on supply chain through ocean carrier. Product is loaded in these reefers and stored under temperature and atmosphere management. For fresh food it is important in addition to temperature management, to control the atmosphere in the container includes humidity, CO2, O2 and ozone. Our system will help to solve the worldwide 30% food waste problem and allow ocean carriers increased productivity and margins.


**Figure 1.1 Perishable supply chain by ship**

## 1.2 Aim and objectives of the project

The project discloses a real-time cold-chain transportation monitoring system. Wireless device which send temperature[1], humidity, CO2, ozone and GPS data to local server where operators can see in real time. Device also send real time alert to operator of any event occurs like temperature or any other environmental elements exceed predefined threshold value.

Following are the objective of our project:

- Real time alert
- Reduces wastage of Perishable product
- Remote monitoring
- Maintain quality of product

## 1.3 Problem Specifications

Globally 30% of food is wasted because product doesn't get specific temperature and atmosphere in their journey from manufacturing to the customer. Also consumer not get the good quality of perishable foods and other products.

## 1.4 Brief literature review and Prior Art Search (PAS) about the project.

Prior art search result in patent databases

| S.N | Search Query | *Example*: ((led **OR** "light emitting diode") **AND** display **NOT** LCD) | IPO | Espacenet | Patent Scope | Google Patent |
|---|---|---|---|---|---|---|
| 1. | Cold chain AND temperature AND alert OR monitor AND lorawan OR lora AND container OR reefer | | | 220 | | |
| 2. | cold chain OR supply chain AND monitor | | | 334 | | |
| 3. | cold chain OR supply chain AND monitor AND lora | | | 2 | | |

Important prior art details

| Sr. No. | Title | Application No. | Priority date |
|---|---|---|---|
| **1.** | On vehicle ECU terminal of real time monitoring refrigerator van humiture | CN201721518234U | 15/11/2017 |
| **2.** | Railway carriage is keep in transportation of multi -functional cold chain logistics | CN201721157289U | 11/09/2017 |
| **3.** | Intelligent cold-chain delivery device | CN201711494241 | 31/12/2017 |
| **4.** | Temperature monitoring equipment with alarming function | CN201721613874U | 28/11/2017 |
| **5.** | Bacteria cold chain management electronic tags with temperature takes notes, warns and trace to source | CN201721562200U | 21/11/2017 |
| **6.** | Cold chain logistics intelligent movement fridge based on VIP material | CN201720279581U | 22/03/2017 |
| **7.** | Real-time cold-chain transportation temperature monitoring system | CN201711221275 | 29/11/2017 |
| **8.** | Wireless temperature and humidity sensor is used to waterproof dustproof cold chain | CN201721363992U | 23/10/2017 |
| **9.** | RFID-based cold chain temperature and humidity monitoring system | CN201711285749 | 07/12/2017 |
| **10.** | Intelligent cold-chain logistics monitoring system based on multimode communication | CN201711381196 | 20/12/2017 |
| **11.** | Three-dimensional temperature field temperature measuring system for wireless power supply refrigerator and control method thereof | CN201711465782 | 28/12/2017 |
| **12.** | Remote cold chain distribution vehicle monitoring system based on intelligent vehicle-mounted box and Internet[3] of vehicle | CN2018105369 | 03/01/2018 |
| **13.** | Cold chain logistics system with medical product automatic remote monitoring function | CN201711085015 | 07/11/2017 |
| **14.** | Damp -proofing freezer humiture monitoring equipment | CN201721201829U | 07/11/2017 |
| **15.** | A GSP temperature wetness monitoring appearance for medicine is cold -stored | CN20172470069U | 27/24/2017 |
| **16.** | Freezer humiture monitoring equipment with waterproof function | CN201721206959U | 19/09/2017 |
| **17.** | Freezer humiture automatic monitoring device | CN201721206967U | 19/09/2017 |
| **18.** | Freezer humiture on -line monitoring device | CN201721206943U | 19/09/2017 |
| **19.** | Freezer humiture monitoring equipment | CN201721206704U | 19/09/2017 |
| **20.** | Refrigerator car temperature orientation inspect equipment | CN201721206678U | 19/09/2017 |
| **21.** | Environment monitoring and recording tag with remote sensing capability | 12/722958 | 03/12/2010 |

| | | | |
|---|---|---|---|
| **22.** | cold-chain logistics management system | CN101719233A | 2009/08/27 |
| **23.** | Cold chain transportation | CN101853566A | 2010/05/18 |
| **24.** | Early warning method | CN20171878521 | 2018/04/06 |
| **25.** | Temperature and humidity monitoring | CN20151850433 | 2016/02/03 |

## Closest Prior art

| Sr. No. | Application Number | Summary of Invention | % similarity | Novelty Point |
|---|---|---|---|---|
| **1.** | CN201720279581U | The technical problem to be solved by the invention is to overcome the problem that the existing cold chain logistics temperature remote monitoring system has only one temperature detecting module for detecting and not setting the temperature, and provides a real-time temperature monitoring system for cold chain transportation. | 75 | Use humidity and other environmental sensors as well. |
| **2.** | CN201711221275 | In view of the deficiencies of the prior art, the present invention aims to provide a cold chain temperature and humidity monitoring system based on RFID, which solves the problem that there is no centralized processing and analysis platform in the prior art. In order to solve the above technical problem, the present invention is implemented by the following technical solutions. An RFID-based cold chain temperature and humidity monitoring system, comprising. The data collection layer is configured to collect and send temperature and humidity information of the plurality of monitored nodes by using a plurality of terminal collection devices, where each monitored node is provided with an active electronic tag, and the active electronic tag can be sent Monitoring the temperature and humidity information of the node and the label information of the monitored node. | 50 | Use long range technology to make it remote. |

| | | | | |
|---|---|---|---|---|
| 3. | CN201721363992U | The technical problem to be solved by the present invention is to provide an intelligent cold chain logistics monitoring system based on multimode communication, which is convenient for users to use and monitors the state of the freight car and the state of the cargo in real time. The invention is realized as follows: an intelligent cold chain logistics monitoring system based on multi-mode communication, connected to an in-vehicle ECU, comprising an in-vehicle sensing module, a vehicle-mounted repeater, a cold chain server and a terminal, wherein the vehicle mounted repeater respectively Connecting an in-vehicle sensing module and a cold chain server, the cold chain server is connected to the terminal, the in-vehicle repeater is connected to an in-vehicle ECU, and the in-vehicle sensing module comprises a temperature sensor, a humidity sensor, and a vehicle state real-time monitoring sensor And a positioning unit, wherein the vehicle-mounted repeater is respectively connected to the temperature sensor, the humidity sensor, the vehicle state real-time monitoring sensor, and the positioning unit. | 75 | Use low power technology like lorawan. |
| 4. | CN201711285749 | It is an object of the present invention to provide a cold chain delivery vehicle remote monitoring system based on a smart car box and a car network to solve the problems raised in the above background art. To achieve the above object, the present invention provides the following technical solutions:<br>A remote monitoring system for a cold chain distribution vehicle based on a smart car box and a vehicle network, comprising a smart car box, a WEB server, a database server, an application server and a management platform, wherein the smart car box comprises a GPS module, temperature and humidity. | 50 | System should focus more on sensing data like temperature, humidity etc. |

| | | | | |
|---|---|---|---|---|
| | | The sensor module, the data sensor module, the MCU, the communication module, the signal input end of the MCU is respectively connected to the GPS module, the temperature and humidity sensor module and the data sensor module, and the MCU is also connected to the WEB server, the database server, and the application server through the communication module, the WEB server The database server and the application server exchange information with the expert system and the management platform. The management platform also connects the expert system and the cold chain car, and the expert system is also connected to the cold chain car. | | |
| **5.** | CN201711381196 | In view of the deficiencies of the prior art, the present invention provides a cold chain logistics system for automated remote monitoring of medical supplies.<br>The technical solution adopted by the present invention to solve the above technical problems is: a cold chain logistics system for automatic remote monitoring of medical supplies, which comprises a cold chain distribution vehicle running in an area and a plurality of independent medical product storage boxes on the vehicle, which will be in the area The medical supplies storage box is combined in a local area network, and a total server is set up in the local area network and connected to the Internet. Each local area network total server is responsible for the control and data collection of all medical supplies storage boxes in the network, and the data collection is performed by various local area networks. The total server performs pre-processing, and then the data or control information of each local area network server is uploaded to the Internet mail server. | 25 | Use wide area network instead of local area network. |

## 1.5 Plan of their work

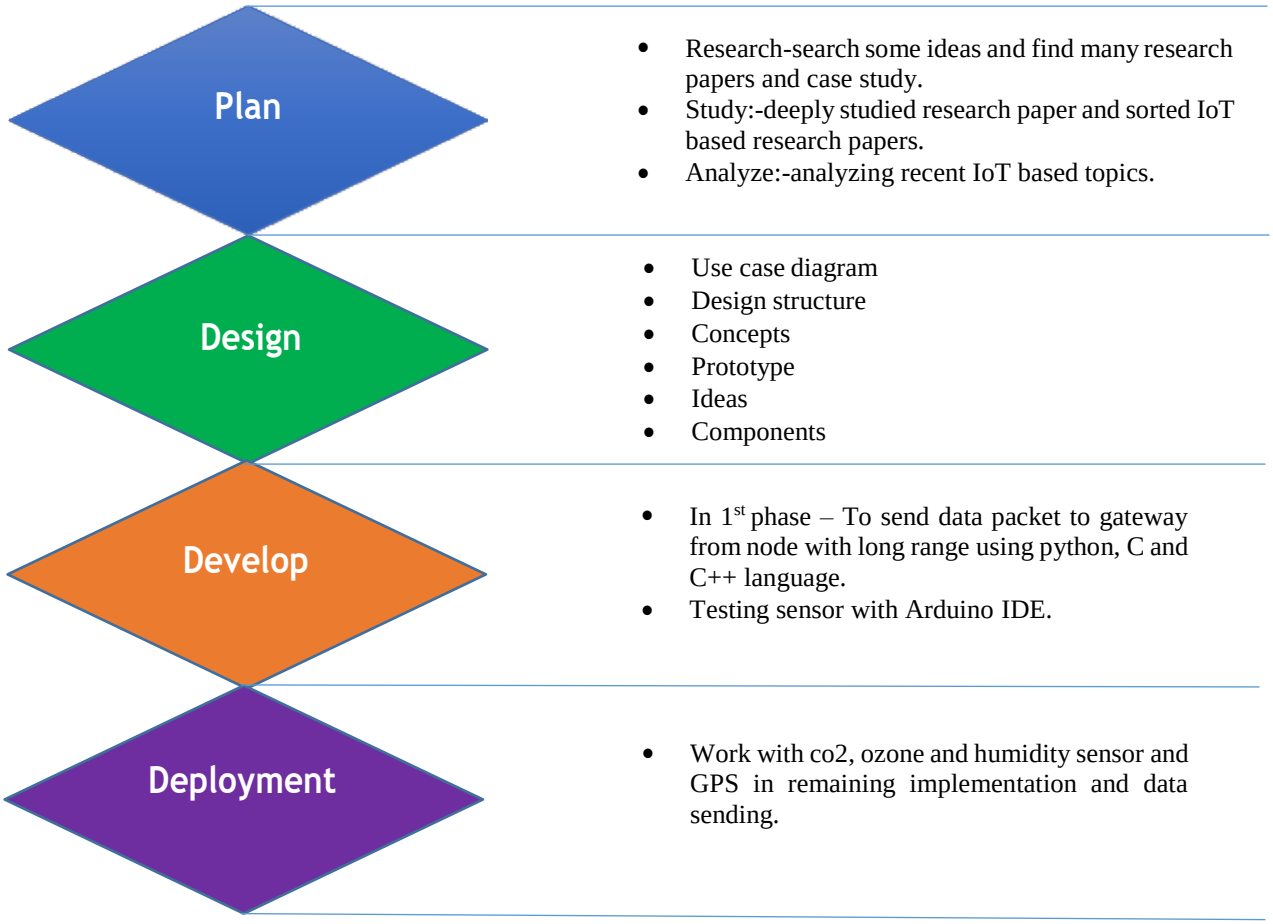


**Figure 1.5 Plan, Design, Develop, Deployment Layout**

## 1.6 Materials / Tools required

### Hardware tools

| | |
|---|---|
| TEC1-12706 module | Arduino |
| Raspberry pi | Temperature sensor |
| Humidity sensor | LoRa shields[2][6] |
| Cooling fan with heat sink | Buzzer |

### Software tools

| | |
|---|---|
| Arduino-IDE | Putty |
| Flask | Raspbian OS |

# 2. Design: Analysis, Design Methodology and Implementation Strategy

## 2.1AEIOU Summary Canvas

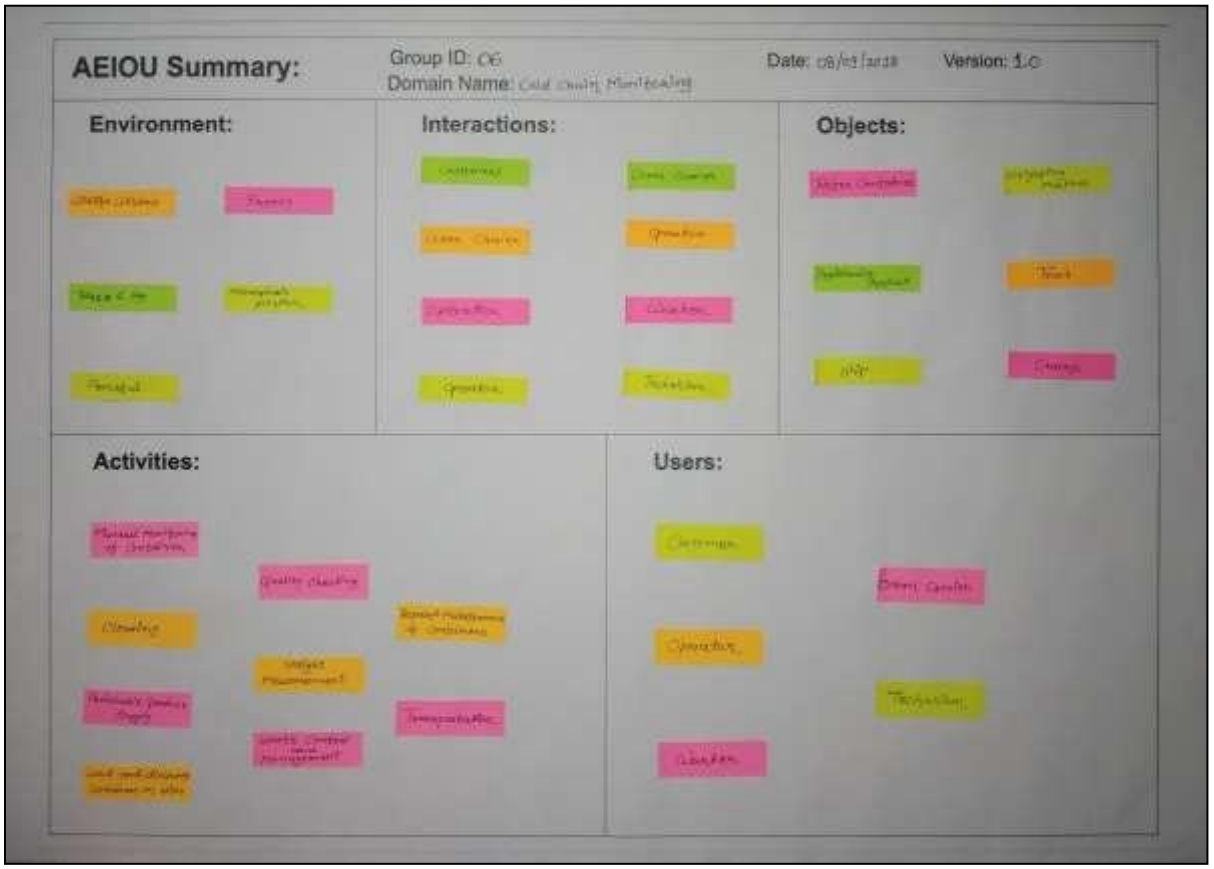


**Figure 2.1- AEIOU Summary**

- **ENVIRONMENT**

| | |
|---|---|
| • Wildlife collisions | • Frenzy |
| • Haze | • fog |
| • Atmospheric pollution | • Peaceful |

## ➢ INTERACTIONS

| |
|---|
| Customer ←→ Ocean Carrier |
| Ocean Carrier ←→ Operator |
| Operator ←→ Worker |
| Operator ←→ Technician |

## ➢ ACTIVITES

| | |
|---|---|
| Manual Monitoring of Containers | Cleaning |
| Perishable Product Supply | Load and discharge Containers on Ship |
| Quality Checking | Weight Measurement |
| Waste control and management | Repair maintenance & containers |
| Transportation | |

## ➢ Objects

| | |
|---|---|
| Refer container | Perishable product |
| Ship | Weighting machine |
| Truck | Crane |

- **USRS**

| | |
|---|---|
| Customer | Operator |
| Worker | Ocean Carrier |
| Technician | |

## 2.2 Empathy Mapping


**Figure 2.2- Empathy Mapping Canvas**

## ➢ USER

- ***Alex (Worker)***

## ➢ STACKHOLDER

| | |
|---|---|
| Operator | Worker |
| Technician | Friend |
| Parent | Neighbors |
| Doctor | Family |

## ➢ ACTIVITES

| | | |
|---|---|---|
| Take reading of containers | Container loading | Eating |
| Driving | Watching T.V. | Sleeping |
| Shopping | Swimming | Playing & Walking |
| Bathing | Travelling | Gossip |

## 2.3 Ideation Canvas


**Figure 2.3 - Ideation Canvas**

- **People**

| | |
|---|---|
| Operator | Worker |
| Technician | Ocean Carrier |
| Customer | Retailer |
| Whole seller | Transporter |

- **Activities**

| | | |
|---|---|---|
| Management of ship | Contract with Ocean Carrier | Load and discharge containers on ship |
| Analysis reading of container | Transportation of product | Quality checking |
| Repair & maintain containers[9] | Waste management | Real time alarm triggering |

- **Situation / Location / Context**

| | | |
|---|---|---|
| Alarm triggered | Fire | Device battery discharge |
| Unavailability of technician | Network error | Port |
| Wastage of product | Unable to locate container[10] | Power lost |

- **Props / Possible Solutions**

| | |
|---|---|
| Fire Extinguisher | Power generator |
| Solar powered battery | Replica of gateway & server[4] |
| Locate container using GPS | |

## 2.4 Product Development Canvas

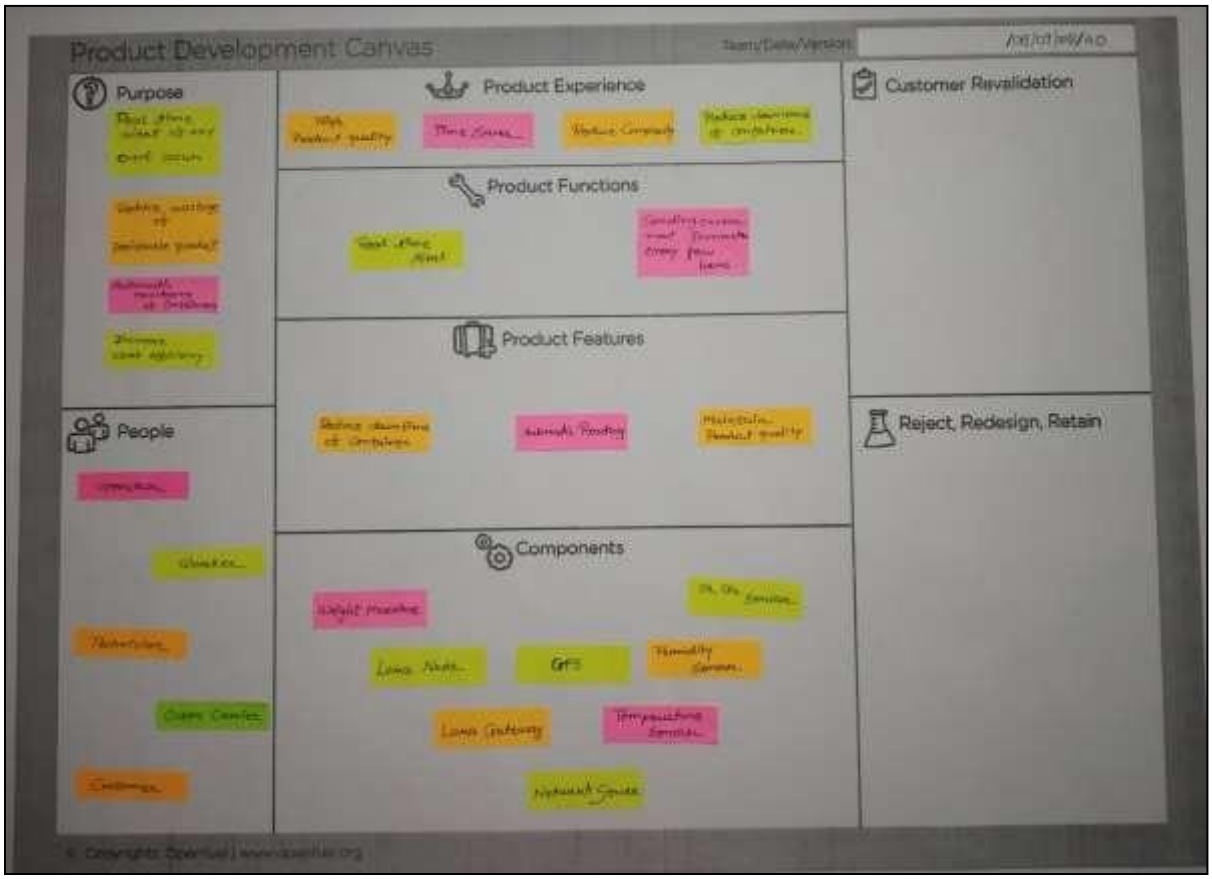


**Figure 2.4.1 - Product Development Canvas**

- **Purpose**

| |
|---|
| Real time alert of any event occur |
| Reduce wastage of perishable product |
| Automatic monitoring of containers |
| Increase work efficiency |

- **People**

| | |
|---|---|
| Operator | Worker |
| Technician | Ocean Carrier |
| Customer | - |

- **Product Experience**

| | |
|---|---|
| High product quality | Time saver |
| Reduce complexity | Reduce downtime of container |

- **Product Functions**

| |
|---|
| Real time alert |
| Sending environment parameter every few hours |

- **Product Features**

| |
|---|
| Reduce downtime of container |
| Automatic reading |
| Maintain product quality |

- **Components**

| | |
|---|---|
| Weight machine | O2, CO2 sensor |
| Lora node | GPS |
| Humidity sensor | Lora gateway |
| Temperature sensor | Network server |

## 2.5 Business Model Canvas

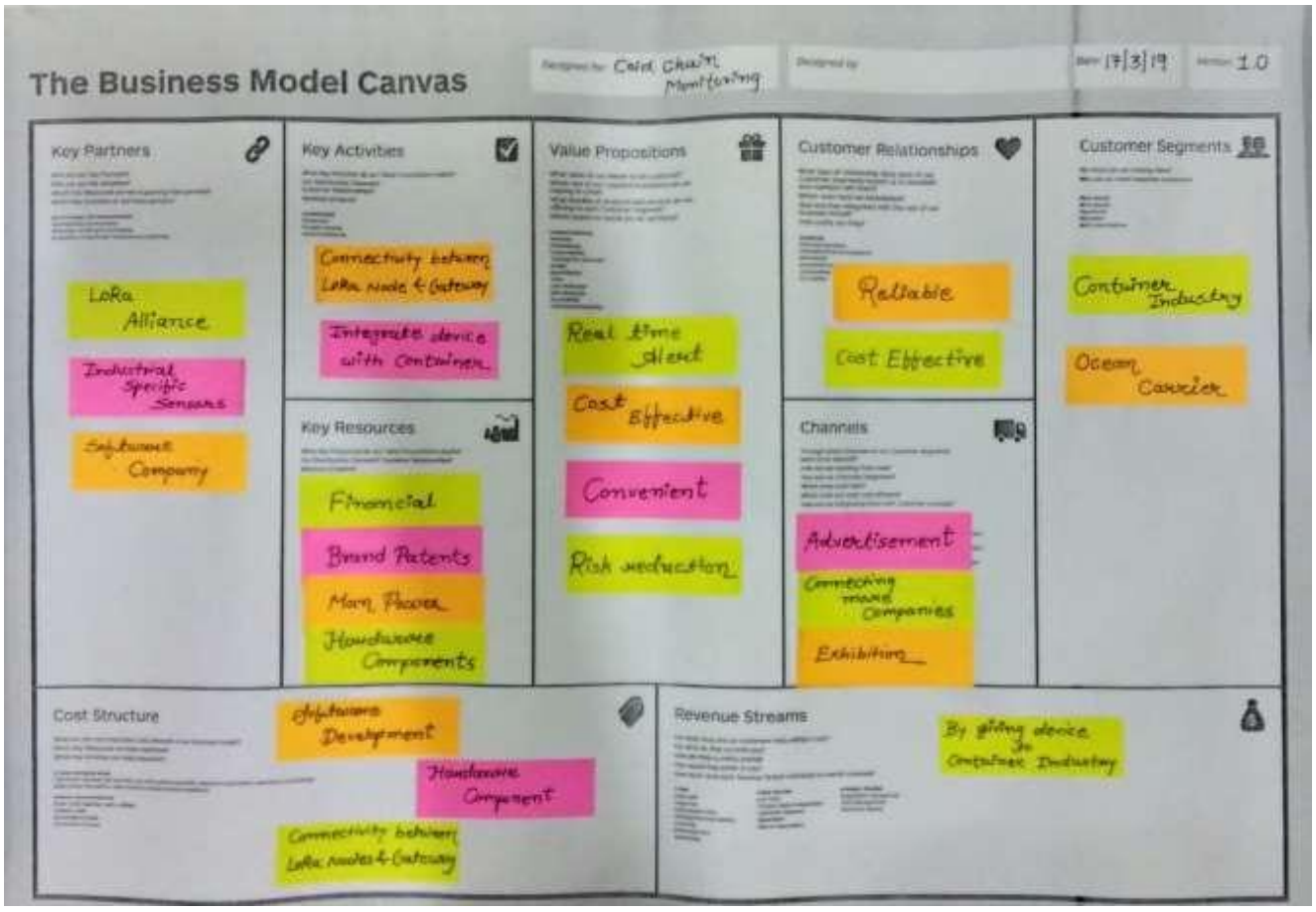


**Figure 2.5 - Business Model Canvas**

- **Key partners**

| |
|---|
| LoRa Alliance |
| Industrial specific sensors |
| Software company |

- **Key Activities**

| |
|---|
| Connectivity between LoRa node[8] ← Gateway |
| Integrated device with container |

- **Key Resources**

| | |
|---|---|
| Financial | Man Power |
| Brand Patents | Hardware Components |

- **Value Propositions**

| | |
|---|---|
| Real time alert | Convenient |
| Cost Effective | Risk reduction |

- **Customer Relationship**

| | |
|---|---|
| Reliable | Cost Effective |

- **Channels**

| |
|---|
| Advertisement |
| Connecting more companies |
| Exhibition |

- **Customer Segments**

| |
|---|
| Container Industry |
| Ocean Carrier |

- **Cost Structure**

| |
|---|
| Software Development |
| Hardware Component |
| Connectivity between LoRa Nodes and Gateway[5] |

- **Revenue Streams**

| |
|---|
| By giving device to container industry |

## 2.6 UML diagram

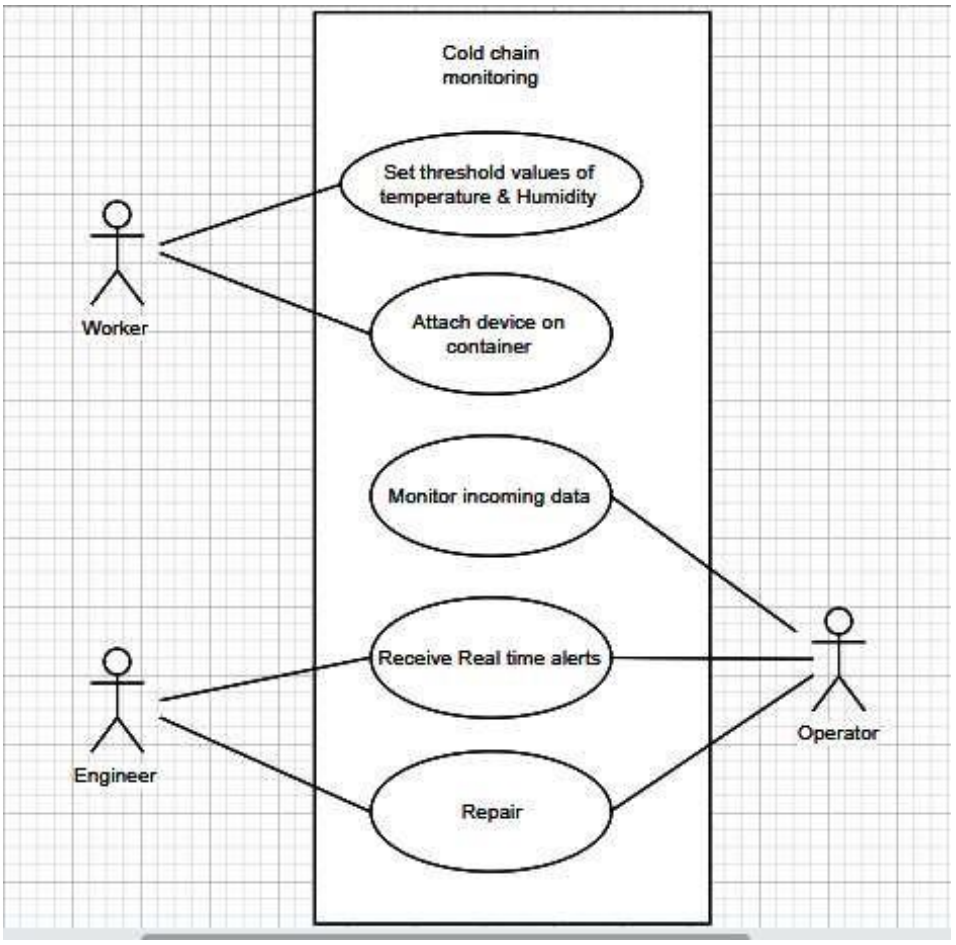


**Figure 2.6 UML Diagram**

# 3. Implementation

## 3.1Tools

### Hardware tools

| | |
|---|---|
| TEC1-12706 module | Arduino |
| Raspberry pi | Temperature sensor |
| Humidity sensor | LoRa shields |
| Cooling fan with heat sink | Buzzer |

### Software tools

| | |
|---|---|
| Arduino-IDE | Putty |
| Flask | Raspbian OS |

We need to measure temperature and humidity in containers, so for that we used DHT11 (humidity + temp) sensor. We connect this sensor to Arduino + LoRa shield. So our LoRa node is made of this three things:-DHT11 sensor, Arduino and LoRa shield. Now this device will be attached on each container on ship. It will send this data to LoRa gateway which is positioned at the central office on ship. LoRa gateway is made of Arduino, LoRa shield, Raspberry pi and buzzer. Whenever threshold value of temperature or humidity exceeds, buzzer attached to LoRa gateway will make sound and alert operators. Container id and sensor data will be sent to operators in terms of notification. Data will be stored in database running on raspberry pi. Operator can see data in real time.

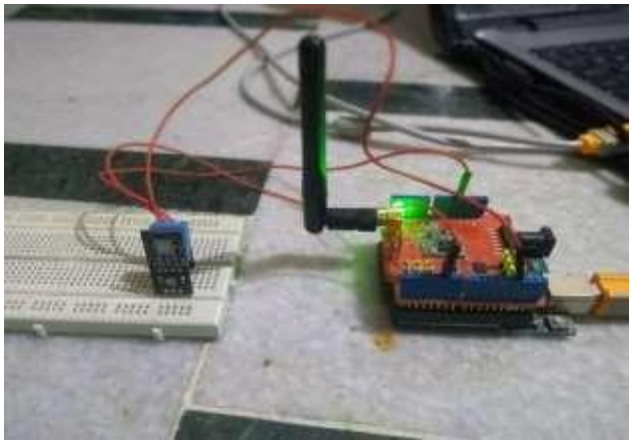

**Figure 3.1- Tested sensors with Arduino**

**Figure 3.2- Give power connection to module**

**Figure 3.3 - Buzzer sounds as alert**

# 4. Summary of the Results

Perishable supply chain is the market for all commodities that require temperature cold chain management and a controlled environment to transport these products to market. Major transportation medium for these products is through ocean. Product is stored inside reefer containers throughout the journey. Workers on ship has to monitor each container manually on the ship to check whether product is in safe environment and take reading of temperature and other environmental parameters. Now these manual checking is less efficient and hazardous to worker's safety. Our remote container monitoring system attach a device on each container which include sensors like temperature and humidity which send this data to central server where operators can see data in real time. Our system also includes real time alert system based on predefined threshold values. Which leads to reduce wastage of product and safety of workers on ship.

# 5 References

**[1].** New online temperature acquisition system for reefer containers in Group TCB terminals

**https://www.youtube.com/watch?v=aYTE_iHDafM**

**[2].** Use Lora shield and rpi to build a LoRawan gateway

**https://www.instructables.com/id/Use-Lora-Shield-and-RPi-to-Build-a-LoRaWAN-Gateway/**

**[3].** Building a global internet of things network together.

**https://www.thethingsnetwork.org/**

**[4].** Single Channel LoRawan Gateway code

**https://github.com/tftelkamp/single_chan_pkt_fwd** **[5].**

Lora shield introduction

**http://wiki.dragino.com/index.php?title=Lora_Shield**

**[6].** What is Lora and LoRawan?

**https://www.youtube.com/watch?v=6WMzRrmMjOU**

**[7].** Lora/lorawan Modulation Types and Chirp Spread Spectrum

**https://www.youtube.com/watch?v=lg0eZWZFKiE**

**[8].** Background information about lorawan

**https://www.thethingsnetwork.org/docs/lorawan/**

**[9].** Limitations of LoRawan

**https://www.thethingsnetwork.org/docs/lorawan/limitations.html**

**[10].** LoRawan Security

**https://www.thethingsnetwork.org/docs/lorawan/security.html**

# 6. Appendix

## PPR (Periodic Progress Report) Semester 1

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|---|---|---|---|---|---|
| **College** | : | SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY, SURAT | | | |
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| **EnrollmentNo** | : | 150420116010 | **Department** | : | Information Technology |
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| **Email** | : | abhishekdesai303@gmail.com | **Semester** | : | Semester 7 |

### PPR Details

**Periodic Progess Report : First PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

1) Many researches through internet on "Iot " and reading case study for our project.Then we select our project idea from the case study. 2) we have analyzed all the requirements of our project and prepare the abstract of project. 3) we gathered all the information about our project from different resources. 4) we discussed existing system problem and think about the possible solution.

**2. What challenge you have faced ?**

we have some issues and problems with connectivity like how to connect device that take sensor data from containers that send data to central gateway wirelessly without internet.

**3. What support you need ?**

We need advice from our senior, internal guide and other experts, who can guide us a right flow to work on project.also Iot based websites help to learn the work on our project.

**4. Which literature you have referred ?**

1) We read case study from the book named "enterprise Iot". This book gives the base of our project. 2) After read case study, we analyzed some research paper related to our project for new solution and understand how we can implement our project.We visit website of "Orbcomm", which provide industrial "Iot"solution in container industry. We analyze their solution and learn from it.

**Document :** Download

### Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

None

**Comment by HOD :**

None

**Comment by Principal :**

None

**Comment by University Admin :**

None

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## PPR Details

**Periodic Progess Report : Second PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have search for hardware components which are required for our project like arduino and different sensors which are for Co2, Humidity, Temperature.

**2. What challenge you have faced ?**

In our project we have to need to learn some new programming language like python programming for raspberry pi and another language for arduino IDE. We have still faced problem of long range wireless communication for transmitting data.

**3. What support you need ?**

We need support from our respected guides for some problem we faced during our work and need some guideline about some hardware components.

**4. Which literature you have referred ?**

We have preferred wireless long range communication research paper in IEEE Explore portal to solve our problem.We have find the device named Lora Shield for arduino.

**Document :** Download

## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

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**Comment by HOD :**

None

**Comment by Principal :**

None

**Comment by University Admin :**

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## PPR Details

**Periodic Progess Report : Third PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have decided to purchase hardware components which are require in first stage of project. And finally we purchased Lora Shield from online store Ali express.

**2. What challenge you have faced ?**

After deciding for purchase of hardware parts, we search for it on online stores because Lora Shield is not available on any shops in India. Finally lots of searching work we found it on Ali express. First challenge is for international payment because we dont have international payment card. After solve this we make our first order and we pay for it, but in second order we lost our money because of cancellation of order. After 3 to 5 days first order was also canceled. After some days we make third order we successfully purchase it.

**3. What support you need ?**

We need help and support for learning python in first stage of project.We start leanring it from online websites and books.

**4. Which literature you have referred ?**

We learn python from https://www.w3schools.com/python and we also refered books for it.

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

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**Comment by HOD :**

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**Comment by Principal :**

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**Comment by University Admin :**

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## PPR Details

**Periodic Progess Report : Forth PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

After order Lora Wan shield we got it in 20 days.Now we have to checkit that it is work properly or not.We check it by LED testing program and some sensors also.

**2. What challenge you have faced ?**

During testing of Lora Wan Shield we found one p[roblem that one was working but another was not .We checked it many times but what is the problem we not get it.After so many tries we found a fault and we correct it.Now both Lora shield is working properly.

**3. What support you need ?**

For project implementation we have to learn how to connect components properly and implement program for on hardware.for that we need proper guidance about coding for hardware device.

**4. Which literature you have referred ?**

For learning hardware programing we referred some websites and some articles related to hardware and Iot services.

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

None

**Comment by HOD :**

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**Comment by Principal :**

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**Comment by University Admin :**

None

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|---|---|---|---|---|---|
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## PPR Details

**Periodic Progess Report : First PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

After reading some case study we get one topic from"enterprise iot" book.We have carefully analyzed all the requirements of our project and prepare the abstract of project.We discussed existing system problem and think about the possible solution and also discuss of our topic with our guide and co-guide.

**2. What challenge you have faced ?**

We have some problem with connectivity like how to connect device that take sensor data from containers that send data to central gateway without internet.

**3. What support you need ?**

We need advice from our senior, internal guide and other experts, who can guide us a right flow to work on project.We need hardware components like raspberry pi in our project which our department provided.

**4. Which literature you have referred ?**

We read case study from "enterprise iot" book which gives the basic idea of our project.We read some research paper for new solution related our project and understand how we can implement our project.We also visit website of "Maersk line" and "Orb comm", which is the biggest company in container industry. We understand and learn their solution.

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

None

**Comment by HOD :**

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**Comment by Principal :**

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**Comment by University Admin :**

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## PPR Details

**Periodic Progess Report : Second PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have search for hardware components which are required for our project like arduino and different sensors which are for CO2, Humidity, Temperature.

**2. What challenge you have faced ?**

In our project we need to learn some new programming language like python programming for raspberry pi and another language for arduino IDE. We have still faced problem of long range wireless communication for transmitting data.

**3. What support you need ?**

We need support from our respected guides for some problem we faced during our work and need some guideline about some hardware components.

**4. Which literature you have referred ?**

We have preferred wireless long range communication research paper in IEEE Explore portal to solve our problem.We have find the device named Lora Shield for arduino.

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

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**Comment by HOD :**

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**Comment by Principal :**

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**Comment by University Admin :**

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## PPR Details

**Periodic Progess Report : Third PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have decided to purchase hardware components which are require in first stage of project. And finally we purchased Lora Shield from online store Ali express.

**2. What challenge you have faced ?**

After deciding for purchase of hardware parts, we search for it on online stores because Lora Shield is not available on any shops in India. Finally lots of searching work we found it on Ali express. First challenge is for international payment because we dont have international payment card. After solve this we make our first order and we pay for it, but in second order we lost our money because of cancellation of order. After 3 to 5 days first order was also canceled. After some days we make third order we successfully purchase it.

**3. What support you need ?**

We need help and support for learning python in first stage of project.We start learning it from online websites and books.

**4. Which literature you have referred ?**

We learn python from https://www.w3schools.com/pythonand we also referred books for it.

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

None

**Comment by HOD :**

None

**Comment by Principal :**

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**Comment by University Admin :**

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## PPR Details

**Periodic Progess Report : Forth PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

After order Lora Wan Shield we got it in 20 days. Now we have to check it that it is work properly or not. We check it by LED testing program and some sensors also.

**2. What challenge you have faced ?**

During testing of Lora Wan shield we found one problem that one was working but another was not. We checked it many times but what is the problem we not get it. After so many tries we found a fault and we correct it. Now both Lora Shield is working properly.

**3. What support you need ?**

For project implementation we have to learn how to connect components properly and implement program for on hardware. For that we need proper guidance about coding for hardware device.

**4. Which literature you have referred ?**

For learning hardware programing we referred some websites and some articles. Websites: 1. https://www.instructables.com 2. https://create.Arduino.cc

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## Comments

**Comment by Internal Guide :**

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**Comment by External Guide :**

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**Comment by HOD :**

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**Comment by Principal :**

None

**Comment by University Admin :**

None

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| **Email** | : | fenilmangukiya2121@gmail.com | **Semester** | : | Semester 7 |

## PPR Details

**Periodic Progess Report : First PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

Our idea comes from a case study in book "enterprise iot". We have carefully analyzed all the requirements of our project and prepare the abstract of project. We discussed existing system problem and think about the possible solution.

**2. What challenge you have faced ?**

We have some issues with connectivity like how to connect device that take sensor data from containers that send data to central gateway wirelessly without internet.

**3. What support you need ?**

We need advice from our senior, internal guide and other experts, who can guide us a right flow to work on project. We need hardware components like raspberry pi in our project which our department provide.

**4. Which literature you have referred ?**

We read case study from the book named "enterprise iot". This book gives the base of our project. We read some research paper for new solution and understand how we can implement our project. We visit website of "Maersk line", which is the biggest company in container industry. We understand their solution. We also visit website of "orbcomm", which provides industrial iot solution to container industry.

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

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**Comment by HOD :**

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**Comment by Principal :**

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**Comment by University Admin :**

None

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| **College** | : | SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY, SURAT | | | |
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## PPR Details

**Periodic Progess Report : Second PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

Our idea comes from a case study in book "enterprise iot". We have carefully analyzed all the hardware and software requirements of our project and find components online and buy some of them. We discussed existing system problem and think about the possible solution.

**2. What challenge you have faced ?**

We have some issues with connectivity like how to connect device that take sensor data from containers that send data to central gateway wirelessly without internet.We want long range of 2-3 km for our project where wifi and bluetooth fails.So we have to find some other wireless technology.

**3. What support you need ?**

We need advice from our senior, internal guide and other experts, who can guide us a right flow to work on project. We need hardware components like raspberry pi in our project which our department provide.

**4. Which literature you have referred ?**

We read case study from the book named "enterprise iot". This book gives the base of our project. We read some research paper for new solution and understand how we can implement our project. We visit website of "Maersk line", which is the biggest company in container industry. We understand their solution of remote container monitoring.

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

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**Comment by HOD :**

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**Comment by Principal :**

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## PPR Details

**Periodic Progess Report : Third PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We bought some of the necessary hardware including lorawan shields for arduino and raspberrypi and we also started working with temperature and humidity sensor.

**2. What challenge you have faced ?**

One of the biggest challenge of our project is to implement lorawan protocol and send data from lora node to gateway.It has very less documentation and protocol is in its infancy.

**3. What support you need ?**

We need advice from our senior, internal guide and other experts, who can guide us a right flow to work on project.

**4. Which literature you have referred ?**

We read case study from the book named "enterprise iot". This book gives the base of our project. We read many papers and github repositories on implementation of lorawan.

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

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**Comment by HOD :**

None

**Comment by Principal :**

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**Comment by University Admin :**

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## PPR Details

**Periodic Progess Report : Forth PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We bought two lora shields, one for node and one for gateway.We successfully tested both the shields with arduino and raspberry pi with blinking led program.We have worked with temperature and humidity sensors and print the data into OLED display.

**2. What challenge you have faced ?**

Lora is very new wireless technology with very less documentation and references.So it is hard to work with them.Even lora has 863-868 MHZ frequency band in which india doesnt support 867 and 868 MHZ frequency and it is banned.So we have to set lora in frequency range of 863-866 MHZ.

**3. What support you need ?**

Our teacher already provide us with sensors and raspberrypi, but we want more support and guidance on wireless technology lorawan.

**4. Which literature you have referred ?**

We have referred many github repositories and web pages for implementation of lorawan. 1.https://www.instructables.com/id/Use-Lora-Shield-and-RPi-to-Build-a-LoRaWAN-Gateway/ 2.https://github.com/tuxdotf/PI0W_single_chan_pkt_fwd

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

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**Comment by HOD :**

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**Comment by Principal :**

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**Comment by University Admin :**

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|---|---|---|---|---|---|
| **College** | : | SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY, SURAT | | | |
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| **Email** | : | mvsavaliya24@gmail.com | **Semester** | : | Semester 7 |

## PPR Details

**Periodic Progess Report : First PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

• Our idea comes from a case study in book "enterprise iot". • We have carefully analyzed all the requirements of our project and prepare the abstract of project. • We discussed existing system problem and think about the possible solution.

**2. What challenge you have faced ?**

• We have some issues with connectivity like how to connect device that take sensor data from containers that send data to central gateway wirelessly without internet.

**3. What support you need ?**

• We need advice from our senior, internal guide and other experts, who can guide us a right flow to work on project. • We need hardware components like raspberry pi and arduino in our project which our department provide.

**4. Which literature you have referred ?**

• We read case study from the book named "enterprise iot". This book gives the base of our project. • We read some research paper for new solution and understand how we can implement our project. • We visit website of "Maersk line" and "Orbcomm", which is the biggest company in container industry. We understand their solution.

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

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**Comment by HOD :**

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**Comment by Principal :**

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## PPR Details

**Periodic Progess Report : Second PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have search for hardware components which are required for our project like arduino and different sensors which are for CO2, Humidity, Temperature.

**2. What challenge you have faced ?**

In our project we need to learn some new programming language like python programming for raspberry pi and another language for arduino IDE. We have still faced problem of long range wireless communication for transmitting data.

**3. What support you need ?**

We need support from our respected guides for some problem we faced during our work and need some guideline about some hardware components.

**4. Which literature you have referred ?**

We have preferred wireless long range communication research paper in IEEE Explore portal to solve our problem.We have find the device named Lora Shield for arduino.

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## Comments

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**Comment by University Admin :**

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## PPR Details

**Periodic Progess Report : Third PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have decided to purchase hardware components which are require in first stage of project. And finally we purchased Lora Shield from online store Ali express.

**2. What challenge you have faced ?**

After deciding for purchase of hardware parts, we search for it on online stores because Lora Shield is not available on any shops in India. Finally lots of searching work we found it on Ali express. First challenge is for international payment because we dont have international payment card. After solve this we make our first order and we pay for it, but in second order we lost our money because of cancellation of order. After 3 to 5 days first order was also canceled. After some days we make third order we successfully purchase it.

**3. What support you need ?**

We need help and support for learning python in first stage of project.We start learning it from online websites and books.

**4. Which literature you have referred ?**

We learn python from "https://www.w3schools.com/python" and we also referred books for it.

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

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**Comment by HOD :**

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**Comment by Principal :**

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**Comment by University Admin :**

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## PPR Details

**Periodic Progess Report : Forth PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

After order Lora Wan Shield we got it in 20 days. Now we have to check it that it is work properly or not. We check it by LED testing program and some sensors also.

**2. What challenge you have faced ?**

During testing of Lora Wan shield we found one problem that one was working but another was not. We checked it many times but what is the problem we not get it. After so many tries we found a fault and we correct it. Now both Lora Shield is working properly.

**3. What support you need ?**

For project implementation we have to learn how to connect components properly and implement program for on hardware. For that we need proper guidance about coding for hardware device.

**4. Which literature you have referred ?**

For learning hardware programing we referred some websites and some articles. Websites: 1. https://www.instructables.com 2. https://create.arduino.cc

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

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| **Email** | : | rominvaghani12@gmail.com | **Semester** | : | Semester 7 |

## PPR Details

**Periodic Progess Report : First PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

• After read many case-study from "enterprise iot" book. Then we select our project idea from this case-study. • We have carefully analyzed all the requirements of our project and prepare the abstract of project. • We have discussed a problem which is exist in the current and we have find all the possible solutions and among them we have choose best solution for our project idea.

**2. What challenge you have faced ?**

• We have faced some problem related to network connectivity. In our project, we have required networks which is help to transmit data from one point to another point.

**3. What support you need ?**

• We have need of our faculty's guidance and senior who did the task related to this area.

**4. Which literature you have referred ?**

• We read case study from the book named "enterprise iot". This book gives the base of our project. • After read case study, we analyzed some research paper related to our project for new solution and understand how we can implement our project. • We have searched many videos related to this topics and we have learnt it from Iot. • We have also searched many blogs related to this topic and we have learnt that how the whole system is working.

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

None

**Comment by HOD :**

None

**Comment by Principal :**

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## PPR Details

**Periodic Progess Report : Second PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

we search for required hardware components for our projects which are arduino and different sensors like co2,temperature and humadity. we have searched coding applications like arduino IDE and raspbian OS for our hardware components. after then we have installed raspbian os on our raspberry pi.

**2. What challenge you have faced ?**

In our project, we have still faced issue with long range wireless communication for transmitting data.

**3. What support you need ?**

In our project, our facultys support is there and also enthutech companys customer care support is helpful to us.

**4. Which literature you have referred ?**

we have reffered "LoRa Shield for Arduino" blog on dragino companys website. we have also learnt many more from youtube.

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**Comment by Internal Guide :**

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## PPR Details

**Periodic Progess Report : Third PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

In our project, we are learning programming language which is useful in our arduino. we have purchased some new sensors which is useful in our projects.

**2. What challenge you have faced ?**

In our projects, long range wireless communication(LORAWAN) is making some issues in our projects.

**3. What support you need ?**

We have needed support of our faculty for deep learning in arduino and sensors.

**4. Which literature you have referred ?**

we have reffered some youtube videos for learning in arduino. we have reffered some blog on the internet for learning in sensors.

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## Comments

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**Comment by External Guide :**

None

**Comment by HOD :**

None

**Comment by Principal :**

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## PPR Details

**Periodic Progess Report : Forth PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

we are learning a raspberry pi and ardiuno programming. This programming will help in our project. Also we are learning hardware implementation of lorawan on the raspberry pi and ardiuno.

**2. What challenge you have faced ?**

Lorawans connectivity is the biggest challenge for us. Also communication between lorawan node and lorawan gateway is challenge for us.

**3. What support you need ?**

We have need of our faculty's guidance and senior who did the task related to this area.

**4. Which literature you have referred ?**

We have read many blogs. Also we have watch many videos related to this topic. Youtube is good literature for us.

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## Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

None

**Comment by HOD :**

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**Comment by Principal :**

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**Comment by University Admin :**

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## PPR (Periodic Progress Report) Semester 2

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#### PPR Details

**Periodic Progess Report : First PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have developed connectivity between two lora modules.We succesfully connected all sensors like temperature ,humidity and gps to arduino and send it to lora gateway

**2. What challenge you have faced ?**

The problem we have most of faced is connectivity.It is very documented and very few tutorials out there on internet.

**3. What support you need ?**

We wanted the support from EC faculty to guide us about circuit.

**4. Which literature you have referred ?**

We have referred youtube videos from mobilefish about lora and also refer documentation,case study about lora.

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#### Comments

**Comment by Internal Guide :**

None

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### PPR Details

**Periodic Progess Report : Second PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have developed IR system to give input limit range of temperature,humadity and etc.

**2. What challenge you have faced ?**

Although we are able to give input via IR system we still cant store data on microcontroller.

**3. What support you need ?**

We need application developement support to show data on mobile and web application.

**4. Which literature you have referred ?**

We used "developer.android.com" website to make a mobile application and how to transfer data to mobile aplication.

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**Comment by External Guide :**

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### PPR Details

**Periodic Progess Report : Third PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have developed web server on rasberrypi so that operators can connect to raspberrypi wifi and can monitor data.

**2. What challenge you have faced ?**

We faced issues in making raspberrypi as wifi access point.

**3. What support you need ?**

We need documentation support by raspberrypi foundation to implement server on raspberrypi3.

**4. Which literature you have referred ?**

We have referred IR receiver and sender tutorial from online resources.

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### PPR Details

**Periodic Progess Report : Forth PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have used flask web framework to implement web server on raspberrypi3.We also used complex event processing to implement real time alerts.

**2. What challenge you have faced ?**

we are facing issues regarding sending real time alerts to operators.

**3. What support you need ?**

We need support regarding product designing of our project.

**4. Which literature you have referred ?**

We used "flask.pocoo.org" official documentation of flask web framework to implement web server on raspberrypi3.

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### Comments

**Comment by Internal Guide :**

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**Comment by External Guide :**

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### PPR Details

**Periodic Progess Report : First PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

Almost half the project will be done.

**2. What challenge you have faced ?**

some connectivity problem we faced.

**3. What support you need ?**

we need how to solve the problem related the connectivity problem.

**4. Which literature you have referred ?**

The Things netwok

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### PPR Details

**Periodic Progess Report : Second PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

Almost half of the project will be done.

**2. What challenge you have faced ?**

we faced the problem related to connectivity.

**3. What support you need ?**

we need the solution related connectivity.

**4. Which literature you have referred ?**

The Things Network

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### Comments

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### PPR Details

**Periodic Progess Report : Third PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have developed web server on raspberrypi so that operators can connect to raspberrypi wifi and can monitor data

**2. What challenge you have faced ?**

We faced issues in making raspberrypi as wifi access point.

**3. What support you need ?**

We need application development support to show data on mobile and web application.

**4. Which literature you have referred ?**

We used "developer.android.com" website to make a mobile application.

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### PPR Details

**Periodic Progess Report : Forth PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have used flask web framework to implement web server on raspberrypi3. We also used complex event processing to implement real time alerts.

**2. What challenge you have faced ?**

We are facing issues regarding sending real time alerts to operators.

**3. What support you need ?**

We need support regarding product designing of our project.

**4. Which literature you have referred ?**

we used "flask.pocoo.org" official documentation of flask web framework to implement web server on raspberrypi3.

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### Comments

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### PPR Details

**Periodic Progess Report : First PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

After completion of 7th sem, we have developed connectivity between two lora modules.We successfully connected all sensors like temperature,humidity and gps to arduino and send it to lora gateway.

**2. What challenge you have faced ?**

Main challenge of our project is connectivity.It is very poorly documented and very few tutorials out there on internet.

**3. What support you need ?**

We wanted the support from EC faculty to guide us about circuit.

**4. Which literature you have referred ?**

We have referred youtube videos from mobilefish about lora.

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### PPR Details

**Periodic Progess Report : Second PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have developed IR system to give input limit range of temperature and humidity.

**2. What challenge you have faced ?**

Although we are able to give input via IR system we still cant store data on microcontroller.

**3. What support you need ?**

We need documentation support by raspberrypi foundation to implement server on raspberrypi3.

**4. Which literature you have referred ?**

We have referred IR receiver and sender tutorial from online resources.

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### Comments

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### PPR Details

**Periodic Progess Report : Third PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have developed web server on raspberrypi so that operators can connect to raspberrypi wifi and can monitor data.

**2. What challenge you have faced ?**

We faced issues in making rasp berrypi as wifi access point.

**3. What support you need ?**

We need application development support to show data on mobile and web application.

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### PPR Details

**Periodic Progess Report : Forth PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have used flask web framework to implement web server on raspberrypi3. We also used complex event processing to implement real time alerts.

**2. What challenge you have faced ?**

We are facing issues regarding sending real time alerts to operators.

**3. What support you need ?**

We need support regarding product designing of our project.

**4. Which literature you have referred ?**

we used "flask.pocoo.org" official documentation of flask web framework to implement web server on raspberrypi3.

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### PPR Details

**Periodic Progess Report : First PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

After the completion of the 7th semester, we have developed connectivity between two LoRawan modules. We were able to make a connection successfully between all sensors of temperature, humidity, and GPS to Arduino and send it to LoRawan gateway.

**2. What challenge you have faced ?**

One of the main challenges of our project is the connectivity establish. It is very poorly documented and very few tutorials out there on the internet.

**3. What support you need ?**

We needed support from EC faculty of our college to guide us about the circuit.

**4. Which literature you have referred ?**

We have referred youtube videos from "mobiletish" channel about LoRawan.

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### PPR Details

**Periodic Progess Report : Second PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have developed an IR system to give input limit range for temperature and humidity.

**2. What challenge you have faced ?**

Although, we are able to give input through the IR system we still cannot store data on the microcontroller.

**3. What support you need ?**

We need documentation support by the raspberry pi foundation to implement server on raspberrypi3.

**4. Which literature you have referred ?**

We have referred an IR receiver and senders tutorial from online resources.

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### Comments

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| **StudentName** | : | Savaliya Mohit Vilasbhai | | | |
| **EnrollmentNo** | : | 150420116050 | **Department** | : | Information Technology |
| **MobileNo** | : | 8866511582 | **Discipline** | : | BE |
| **Email** | : | mvsavaliya24@gmail.com | **Semester** | : | Semester 8 |

### PPR Details

**Periodic Progess Report : Third PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have developed web server on raspberry pi so that, operators are connected to raspberry pi wifi and can monitor data.

**2. What challenge you have faced ?**

We had faced issues in making raspberry pi as a wifi access point.

**3. What support you need ?**

We need application development support to display data on mobile and web application.

**4. Which literature you have referred ?**

We used a website to make a mobile application which is: "developer.android.com".

**Document :** Download

### Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

None

**Comment by HOD :**

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| **StudentName** | : | Savaliya Mohit Vilasbhai | | | |
| **EnrollmentNo** | : | 150420116050 | **Department** | : | Information Technology |
| **MobileNo** | : | 8866511582 | **Discipline** | : | BE |
| **Email** | : | mvsavaliya24@gmail.com | **Semester** | : | Semester 8 |

### PPR Details

**Periodic Progess Report : Forth PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We have used flask web framework to implement web server on raspberrypi3. We also used complex event processing to implement real-time alerts.

**2. What challenge you have faced ?**

We have faced many issues regarding sending real-time alerts to operators.

**3. What support you need ?**

We need support regarding desire model of product which we are working on.

**4. Which literature you have referred ?**

We used "flask.pocoo.org" official documentation of flask web framework to implement web server on raspberrypi3.

**Document :** Download

### Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

None

**Comment by HOD :**

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| **StudentName** | : | Vaghani Romin Rameshbhai | | | |
| **EnrollmentNo** | : | 150420116057 | **Department** | : | Information Technology |
| **MobileNo** | : | 7048598894 | **Discipline** | : | BE |
| **Email** | : | rominvaghani12@gmail.com | **Semester** | : | Semester 8 |

### PPR Details

**Periodic Progess Report : First PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

In our project, we add Arduino and removed raspberry pi from our model. Our project needs more signal strength so that we have added Arduino instead of raspberry pi. We have developed a code for it.

**2. What challenge you have faced ?**

One biggest challenge in our project is signal strength. Till now, raspberry pi gives signal strength but it is not sufficient to use it in our real-life model.

**3. What support you need ?**

We need the support of our faculty members and our senior students who have worked in this area.

**4. Which literature you have referred ?**

We refer "youtube.com" for learning in the area of Arduino. Some blogging websites also help a lot. "Medium.com" is one of the best media for learning.

**Document :** Download

### Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

None

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| **MobileNo** | : | 7048598894 | **Discipline** | : | BE |
| **Email** | : | rominvaghani12@gmail.com | **Semester** | : | Semester 8 |

### PPR Details

**Periodic Progess Report : Second PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We developed an IR system for giving input in a limited range of temperature and humidity.

**2. What challenge you have faced ?**

we have given the input by an IR system, but still, we cant be able to store data on the microcontroller.

**3. What support you need ?**

We need the support of the raspberry pi foundation to implement server on raspberrypi3. We also need the support of our senior college students who have implemented these types of project in his past.

**4. Which literature you have referred ?**

We referred youtube for getting information about how IR receiver and sender works. We also referred to some tutorial based on the IR system.

**Document :** Download

### Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

None

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| **StudentName** | : | Vaghani Romin Rameshbhai | | | |
| **EnrollmentNo** | : | 150420116057 | **Department** | : | Information Technology |
| **MobileNo** | : | 7048598894 | **Discipline** | : | BE |
| **Email** | : | rominvaghani12@gmail.com | **Semester** | : | Semester 8 |

### PPR Details

**Periodic Progess Report : Third PPR**

**Project :** Cold Chain Monitoring

**Status :** Reviewed

**1. What Progress you have made in the Project ?**

We developed a web server on the raspberry pi. Using these web server operators can connect to raspberry pi wifi and can monitor data.

**2. What challenge you have faced ?**

In this, we faced issues in making raspberry pi as a wifi access point.

**3. What support you need ?**

We need the support of application development, because using application we can be able to show data on mobile and web application.

**4. Which literature you have referred ?**

w referred googles android developer website "developer.android.com" to make mobile application

**Document :** Download

### Comments

**Comment by Internal Guide :**

None

**Comment by External Guide :**

None

**Comment by HOD :**

# Business Model Canvas

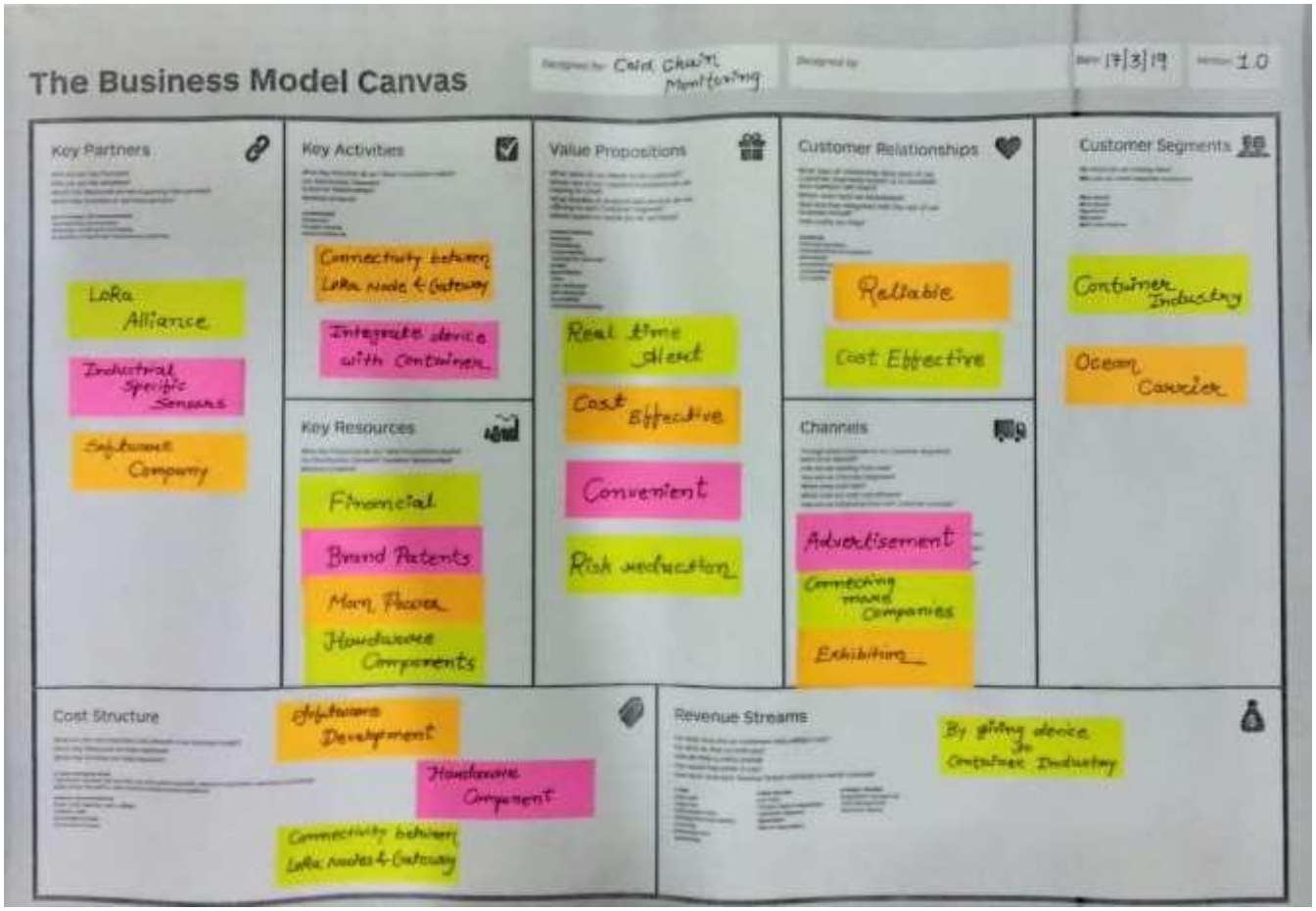


**Figure 6.3- Business Model Canvas**

# Business Model Canvas Report

**Value Proposition: What do you do?**

- Real time alert
- Cost effective
- Convenient
- Risk reduction

**Customer Segment: Who do you help?**

- Container Industry
- Ocean carrier

**Customer Relationship: How do you interact?**

- Cost effective
- Reliable

**Distribution Channels: How do you reach them?**

- Advertisement
- Connecting more companies
- Exhibition

**Key Partners: Who will help you?**

- LoRa Alliance
- Software company
- Industrial specific sensors

**Key Activities: How do you do it?**

- Integrate device with container
- Add connectivity between LoRa nodes & gateway

**Key Resources: What do you need?**

- Financial
- Man power
- Brand patents
- Hardware components

**Cost Structure: What will it cost?**

- Add connectivity between LoRa nodes & gateway
- Hardware component
- Software development

**Revenue Streams: How will you make it?**

- By giving device to container industry

# Patent Drafting Exercise

| | | |
|---|---|---|
| **College** | : | SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY, SURAT |
| **Department** | : | Information Technology |
| **Discipline** | : | BE |
| **Semester** | : | Semester 8 |
| **Project Name** | : | Cold Chain Monitoring |
| **Team ID** | : | 44257 |

## Form 1 – APPLICATION FOR GRANT OF PATENT

**Applicants :**

| Sr. No | Name | Nationality | Address | Mobile No. | Email Id |
|---|---|---|---|---|---|
| 1 | Mangukiya Fenil Jagadishbhai | Indian | Information Technology , SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY, SURAT , Gujarat Technologycal University. | 8460962464 | fenilmangukiya2121@gmail.com |
| 2 | Desai Abhishek Himmatbhai | Indian | Information Technology , SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY, SURAT , Gujarat Technologycal University. | 7818805600 | abhishekdesai303@gmail.com |
| 3 | Gohil Parth Mukeshbhai | Indian | Information Technology , SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY, SURAT , Gujarat Technologycal University. | 7621004212 | parthmgohil0509@gmail.com |
| 4 | Savaliya Mohit Vilasbhai | Indian | Information Technology , SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY, SURAT , Gujarat Technologycal University. | 8866511582 | mvsavaliya24@gmail.com |
| 5 | Vaghani Romin Rameshbhai | Indian | Information Technology , SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY, SURAT , Gujarat Technologycal University. | 7048598894 | rominvaghani12@gmail.com |

**Inventors :**

| Sr. No | Name | Nationality | Address | Mobile No. | Email Id |
|---|---|---|---|---|---|
| 1 | Mangukiya Fenil Jagadishbhai | Indian | Information Technology ,<br>SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY,<br>SURAT ,<br>Gujarat Technologycal University. | 8460962464 | fenilmangukiya2121@gmail.com |
| 2 | Desai Abhishek Himmatbhai | Indian | Information Technology ,<br>SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY,<br>SURAT ,<br>Gujarat Technologycal University. | 7818805600 | abhishekdesai303@gmail.com |
| 3 | Gohil Parth Mukeshbhai | Indian | Information Technology ,<br>SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY,<br>SURAT ,<br>Gujarat Technologycal University. | 7621004212 | parthmgohil0509@gmail.com |
| 4 | Savaliya Mohit Vilasbhai | Indian | Information Technology ,<br>SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY,<br>SURAT ,<br>Gujarat Technologycal University. | 8866511582 | mvsavaliya24@gmail.com |
| 5 | Vaghani Romin Rameshbhai | Indian | Information Technology ,<br>SARVAJANIK COLLEGE OF ENGINEERING & TECHNOLOGY,<br>SURAT ,<br>Gujarat Technologycal University. | 7048598894 | rominvaghani12@gmail.com |

# Form 2 - PROVISIONAL/COMPLETE SPECIFICATION

**1 . Title of the project/invention :**

Cold Chain Monitoring

**2. Preamble to the description :**

Provisional

**3. Description**

**a) Field of Project / Invention / Application :**

Container Industries,Ocean carrier

**b) Prior Art / Background of the Project / Invention :**

The project discloses a real-time cold-chain transportation monitoring system. Wireless device, which send temperature, humidity, CO2, ozone and GPS data to local server where operators can see in real time. Device also send real time alert to operator of any event occurs like temperature or any other environmental elements exceed predefined threshold value.
Real time alert
Reduces wastage of Perishable product
Remote monitoring
Maintain quality of product

**c) Summary of the Project / Invention :**

Perishable supply chain is the market for all commodities that require temperature cold chain management and a controlled environment to transport these products to market. Major transportation medium for these products is through ocean. Product is stored inside reefer containers throughout the journey. Workers on ship has to monitor each container manually on the ship to check whether product is in safe environment and take reading of temperature and other environmental parameters. Now these manual checking is less efficient and hazardous to workers safety. Our remote container monitoring system attach a device on each container which include sensors like temperature,humidity,CO2 and GPS and send this data to central server where operators can see data in real time. Our system also includes real time alert system based on predefined threshold values. Which leads to reduce wastage of product and safety of workers on ship.

**d) Objects of Project / Invention :**

1.Real time alert

2. Reduces wastage of Perishable product

3. Easy control of containers

4. Reduce in labors work

5. Maintain quality of product

7.Safety of labors

8. To increase efficiency of transportation

**e) Drawings :**

**f) Description of Project / Invention : (full detail of project) :**

Globally 30% of food is wasted because product does not get specific temperature and atmosphere in their journey from manufacturing to the customer. In addition, consumer not get the good quality of perishable foods and other products.Perishable supply chain is the market for all commodities that require temperature cold chainmanagement and a controlled environment to transport these products to market. Majortransportation medium for these products is through ocean. Product is stored inside reefer containers throughout the journey. Workers on ship has to monitor each container manually on the ship to check whether product is in safe environment and take reading of temperature and other environmental parameters. Now these manual checking is less efficient and hazardous to workers safety. Our remote container monitoring system attach a device on each container which include sensors like temperature,humidity,CO2 and GPS and send this data to central server where operators can see data in real time. Our system also includes real time alert system based on predefined threshold values. Which leads to reduce wastage of product and safety of workers on ship.

**g) Examples :**

**h) Claims (Not required for Provisional Application) / Unique Features of Project**

Real time alert

Remote monitoring

long range wireless network system

**h) Claims (Not required for Provisional Application) / Unique Features of Project**

Real time alert

Remote monitoring

long range wireless network system

**4. Claims**

**5. Date and signature**

**6. Abstract of the project / invention :**

Perishable supply chain is the market for all commodities that required temperature cold chain management and controlled environment to transport these products to market. Perishable product include frozen and fresh food, pharmaceutical, chemical and many others specialty products such as flowers, plants etc. The perishable supply chain consist of many forms of transportation such as trucks, trains, ocean vessels and airplanes that are interconnected through distribution points such as ports and warehouse distribution centers. Our system focus on supply chain through ocean carrier. Product is loaded in these reefers and stored under temperature and atmosphere management. For fresh food it is important in addition to temperature management, to control the atmosphere in the container includes humidity, CO2, O2 and ozone. Our system will help to solve the worldwide 30% food waste problem and allow ocean carriers increased productivity and margins.

## Form 3 – STATEMENT AND UNDERTAKING UNDER SECTION 8

**Name of the applicant(s) :**

I/We, Mangukiya Fenil Jagadishbhai ,Desai Abhishek Himmatbhai ,Gohil Parth Mukeshbhai ,Savaliya Mohit Vilasbhai ,Vaghani Romin Rameshbhai

**Name,Address and Nationality of the joint applicant :**

Hereby declare :

(i) that I/We have not made any application for the same/substantially the same victim invention outside India.

(ii) that the rights in the application(s) has/have been assigned to

| Name of the Country | Date of Application | Application Number | Status of the Application | Date of Publication | Date of Grant |
|---|---|---|---|---|---|
| N/A | N/A | N/A | N/A | N/A | N/A |

(iii)That I/We undertake that upto the date of grant of the patent by the Controller, I/We would keep him informed in writing the details regarding corresponding applications for patents filed outside India within three months from the date of filing of such application.

Dated this 6 day of April 2019

**To be signed by the applicant or his authorised registered patent agent :**

Signature.....

**Name of the Natural Person who has signed :**

Mangukiya Fenil Jagadishbhai ,Desai Abhishek Himmatbhai ,Gohil Parth Mukeshbhai ,Savaliya Mohit Vilasbhai ,Vaghani Romin Rameshbhai

To,
The Controller of Patents,
The Patent Office,
At Mumbai