PROJECT DOCUMENTATION

INVENTORY MANAGEMENT SYSTEM FOR RETAILERS

Team ID : PNT2022TMID48220

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYED AMMAL ENGINEERING COLLEGE, RAMANATHAPURAM

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Abstract

For organizations that handle transactions involving consumer goods, an inventory management system is critical for quality control. A huge retail store could runout of supply of a critical item if inventory is not properly managed. When it's time to reorder, an effective inventory management system will notify the retailer.

This inventory management system is also useful for tracking huge shipments automatically. Counting each pair of stocks by hand will almost certainly result in a mistake. The risk of human error can be reduced by using an automated inventory management system.

An Inventory Management System also aids in the tracking of retail product theft, providing useful information regarding store revenues and the need for theft-prevention devices.

The central computer system then keeps track of this data. The purchase order can also include a list of items that need to be pulled for packaging and shipping. In this situation, the Inventory Management System can perform a range of tasks. It can assist a warehouse worker in locating things on an order list, encoding shipment information such as tracking numbers and delivery addresses and removing purchased items from the inventory tally to maintain a correct count of in-stock items.

All of this information works together to give firms real-time inventory tracking data. The simple search in a database makes it easy to find and look at inventory information in real-time.

BRAINSTORM

Template

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

10 minutes to prepare
1 hour to collaborate
2-8 people recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.

Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

Open article

1 Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

How might we (your problem statement)?

Key rules of brainstorming
To run an smooth and productive session

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.

2 Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

Aadharsh Ram	Bhuvaneshwar	Dheepak Raaj	Jyotir Aditya Giri
While billing, scanning the bar codes detects the product and manages stock according to the quantity sold	Demand based stopping of pre ordering (Least sold goods).	To have a track of seasonal selling products and to keep those products in stock during the demand.	Predicting the Future sales analysis of the products using machine learning algorithms and past data available dataset.
Providing Key Performance Indicator for analysing stock.	Providing daily reports on the stock and inventory details for better Business analysis.	Advertise the presence of the store in all the nearest geographic locations.	Centralized transportation system among the shop branches along with the product tracking functionality.
Keep a proft and loss records of all the stocks.	Tax and GST clearance regularly.	Tine consuming	Easy and fast billing system
Make sure to heve free door deliveries to the nearest areas and to avoid late deliveries.	Tax and GST clearance regularly.	Purchase order history	Easy to access

Need some inspiration?
See a finished version of this template to kickstart your work.

Open example

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

Prediction and analysis

Predicting the future sales analysis of the existing product.

Predicting the success ratio of the new arrivals

Features

24*7 opening of the store and availbility of shift wise helpers in the store.

Transparency in the billing

Showcasing the customer feedback to the public regarding both the product and the store

Management

Managing all the expiry nearing products and expired products clearance.

Stock management and strategic plan management.

Product delivery management to the customers.

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

Share the mural
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

Export the mural
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.

Open the template →

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.

Open the template →

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.

Open the template →

Share template feedback

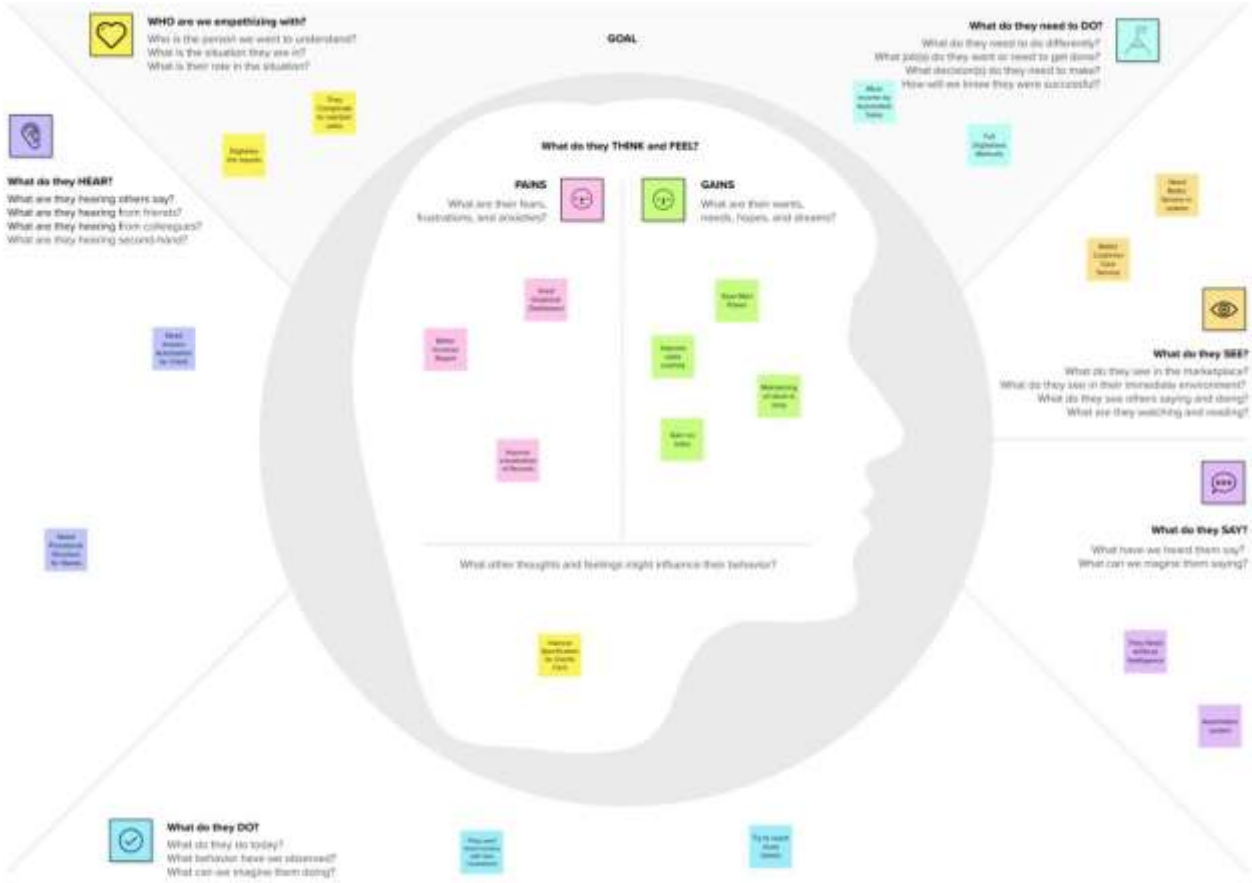
EMPATHY MAP CANVAS

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's
behaviors and attitudes.

It is a useful tool to helps teams better understand their users.

Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

Inventory Management System for Retailers – Empathy Map



Empathy Map Link

https://app.mural.co/invitation/mural/inventorymanagement3365/1667222002231?sender=u06be9dfccc5acce22dd28119&key=19387703-b64c-4ff6-b368-494a1ca8042d

LITERATURE SURVEY

1. Research on the optimization of Retailer Inventory Strategy based on System DynamicsSimulation

LINK : https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6252235
AUTHOR : Yang Lin, Hou Kaihu, Zhong Jinyuan

The supply chain inventory management aims at meeting customers' demands, reducing inventory cost and increasing enterprise profit. We need to place an order and replenish productions when the inventoryis under safety stock quantity. We can appropriately combine with historical records and product sale reports through a dynamic simulation analysis, and then provide variable parameters which are similar to the reality operation situation. So a simulation model is established and it must meet customers' demands, operate smoothly and use up the inventory in time. Therefore, we can use the method of system dynamic simulation to optimize the variable parameters in a two-stage supply chain inventory system. We simplify the model actually and assume that it primarily consisted of a manufacturer and a retailer. Moreover,it can describe the process of supplying an order directly from a manufacturer to a retailer. The model should meet the customers' demands primarily, and we need to reset the variable parameters of adjustment production time, demand production delay time and demand sale time to get a better retail inventory strategy ultimately. System dynamics (SD) was created during the mid-1950sby Professor Jay Forrester of the Massachusetts Institute of Technology. A system is integrated by multiple elements, such as constraint conditions, inputs, outputs and feedbacks. They are all included in the complex of systems and the environment. The theory foundation of system dynamics consists of classical fluid mechanics and feedback control theory. It is a discipline that focuses on cognizingand solving system problems, connecting with natural science and social science as well. It is widely used within the company, between businesses and businesses, among regions and even in cross border strategydecisions. System dynamics is usually called “strategic decision laboratory” Supply chain inventory management system is an integrated system, and the operation process of the supply chain is much more complex in reality than a simulation model. This paper focused on a two-stage supply chain inventory management system and it was simplified rationally. We used vensim software to establish models and simulate the system and provided some better supply chain inventory operation projects by adjusting the value of Apt, Dpd, Dst and other parameters. And the retailer inventory storage strategy was optimized under an uncertain environment ultimately. We made a conclusion that the method was feasible through analyzing an example. And a better inventory storage strategy was given to the retailer. The simulation model which we researched was a simplified one, so it couldn't react to the whole storage operation process of the supply chain system roundly and objectively. Since the theory of system dynamics is integrated and complex.

2. EFFECTS OF YIELD AND LEAD-TIME UNCERTAINTY ON RETAILER MANAGED AND VENDORMANAGED INVENTORY MANAGEMENT

LINK : https://ieeexplore.ieee.org/document/8922591
AUTHOR : SOONKYO LEE, YOUNG JOO KIM, TAESU CHEONG AND SEUNG HO YOO [2019]

Generally, there are various elements of uncertainty in a supply chain. In particular, uncertainties in lead time, demand, and yield are very important in the semiconductor industry. Higher uncertainty can lead to bullwhip effects that can undermine the performance of the entire supply chain. This study examines the relationship between uncertainty in the supply chain and the outcome of inventory replenishment policies. Specifically, we analyze the effects of well-known uncertainties on manufacturer production quantity and retailer order quantity decisions in a decentralized supply chain. In addition, we also analyze and compare the effects of these uncertainties for the retailer-managed inventory and the vendor-managed inventory policies. Using numerical experiments, a comparative analysis of the two alternatives is conductedto determine suitable options for improving supply chain performance. In general, the performance of vendor-managed inventory is better than that of retailer-managed inventory, but we observe from the numerical experiments that there exist circumstances under which retailer-managed inventory shows better supply chain performance. y, we examine models that analyze the impact of supply uncertainty in retailer-managed and vendor-managed decentralized supply chains on supply chain performance. We thus identify optimal production and order quantities for centralized and decentralized supply chains under lead-time,yield, and demand uncertainty. For the RMI model, when yield is low, the retailer always attempts to order more than the optimal quantity, which might lead to the bullwhip effect. Therefore, in order to minimize the impact of the

bullwhip effect, the manufacturer wishes to obtain and utilize its yield information so that they can better gauge the exact level of demand. The centralized production quantity is always greater than the production quantity of the VMI, which is quite intu itive. Under the same conditions, it would be more advantageous for the manufacturer under the VMI model to set the wholesale price higher; however, because the retailer's profit decreases rapidly as the wholesale price increases, there needs to be an appropriate agreement to ensure a fair distribution. As we have confirmed in this study, under the decentralized supply chain model, the total profit of the VMI and RMI models increases as the unit cost decreases, the holding cost decreases,the salvage value increases, and as the lead-time and yield uncertainty decrease. Therefore, we confirm through the numerical studies that higher yield or lead-time uncertainty generally leads to lower expected profits for both the manufacturer and retailer no matter which inventory management policy is utilized. Overall,the profit for the RMI model is higher than that for the VMI model. In addition, for certain parameters (unit cost and wholesale price), we observe that, although total profit increases or remains the same, there is a conflict of interest between the retailer and the manufacturer. One of the limitations of this study is that we do not propose appropriate contracts that coordinate a decentralized supply chain under either the RMI or VMI model when both yield and lead-time uncertainty exists. Therefore, we believe that the result of our studycan be used as the foundation for in-depth research into supply chain contracts.Another limitation is that weassume that the retailer knows the manufacturer's yield and lead-time information. Thus, our study can be extended to a decentralized supply chain where this information is not fully available to the retailer.
In addition, we consider a supply chain consisting of a single manufacturer and a single retailer. Thus, our study can be extended to more complex supply chains (e.g., multiple retailers or three-echelon supply chainsincluding a distributor) and evaluate the impact of simultaneous yield and lead-time uncertainty.

3) A Study of Inventory Management System Case StudyLINK:
https://www.researchgate.net/publication/327793184_A_Study_of_Inventory_Management_System_Case_Study
AUTHOR: Nazar Sohail,2Tariq Hussain Sheikh, : Received: April 19, 2018, Accepted: May 22, 2018

Inventory management is a challenging problem area in supply chain management. Companies need tohave inventories in warehouses in order to fulfil customer demand, meanwhile these inventories have holding costs and this is frozen fund that can be lost. Therefore, the task of inventory management is tofind the quantity of inventories that will fulfil the demand, avoiding overstocks. This paper presents a case study for the steel manufacturing industry (Small Scale Industry) on inventory management. The relationship between the inventory management and company performance was determined based on inventory days and return on asset (ROA) analysis. The research found that company X had a few inventory problems such as unorganized inventory arrangement, large amount of inventory days / no cycle counting and no accurate records balance due to unskilled workers. The study also proved that there was a significant relationship between return on asset (ROA) and inventory days. This paper alsoprovides recommendation to the company and for further research.

Inventory management has to do with keeping precise records of finished goods that are ready for shipment. This often means posting the production of newly completed goods to the inventory totals as well as subtracting the most recent shipments of finished goods to buyers. When the company has a return policy in place, there is usually a subcategory contained in the finished goods inventory to account for any returned goods that are reclassified or second grade quality. Accurately maintaining figures on the finished goods inventory makes it possible to quickly convey information to sales personnel as to what is available and readyfor shipment at any given time. The ROI of Inventory management will be seen in the forms of increased revenue and profits, positive employee atmosphere, and on overall increase of customer satisfaction. The next step of the present research will be the application of achieved results of demand forecasts, safety stockand reorder points into simulation software in order to achieve more accurate results.

4) Research paper on Inventory management system

LINK : https://www.irjet.net/archives/V5/i4/IRJET-V5I448.pdf
AUTHOR : Punam Khobragade* , Roshni Selokar* , Rina Maraskolhe* Prof.Manjusha Talmale+ 2018

Inventory Management System is software which is helpful for the businesses operate hardware stores, where storeowner keeps the records of sales and purchase. Mismanaged inventory means disappointed customers, too much cash tied up in warehouses and slower sales. This project eliminates the paper work, human faults, manual delay and speed up process. Inventory Management System will have the ability to track sales and

available inventory, tells a storeowner when it's time to reorder and how much to purchase.Inventory Management System is a windows application developed for Windows operating systemswhich focused in the area of Inventory control and generates the various required reports.
This paper presents an alarm about the information section in the bill which in view of desktop application. It's a straightforward desktop application inwhich the network to the immediate distribution center with the goal that information ought to be refreshed in store for the confirmation. It's a secure application in which theno information spillage from the stockroom. And furthermore gives the one table organization look so that after the finish of month we know about what we sold.

5) A Study of Inventory Management System of Linamar India Pvt. Ltd, Pune

LINK : https://amity.edu/userfiles/admaa/da2a0paper%204.pdf
AUTHOR : Anajali Mishra & Harshal Anil Salunkhe ,2018

The aim of the study is to examine the inventory management process. The significance of this research is based on the benefits that can be obtained by identifying the issues of inventory control. The methodology used are unstructured interviews, on-site study, and annual report analysis. Inventory management is an important area of manufacturing industry. If company fails to manage inventory, they will face failure. It is a challenge for the company to maintain fair inventory. There are various inventory management techniques available for maintaining fair inventory level in the company. The basic objective of this paper is to study about inventory management techniques used in Linamar India Pvt. Ltd. and find out some measures for improvement on inventory management process of the concerned company. The present system of inventory management of the company is good. For improvement of the present inventory management system, company should adopt other inventory management techniques.
The Inventory management is significant for any manufacturing organization. It helps the organization in smooth running of its activities and in reducing the cost of managing the inventory. From the above data study, it can be concluded that Linamar India Private Limited is managing its inventory very efficiently. The techniques undertaken by the organization are helping it in continuous flow of its production activities. EOQ,safety stock analysis, ABC analysis are being undertaken efficiently and effectively. Inventory turnover ratiois also showing an increasing trend which indicates that sales of the organization is increasing every year.

6) Development of Inventory Management System

LINK : https://ieeexplore.ieee.org/document/5478077
AUTHOR : Yang Fan ,2010

This paper introduces Agent technology into domestic storage management and uses the autonomy, reactivity and sociality of Agent to realize the seamless connection among enterprises by defining interaction and cooperation mechanisms among different Agents, thereby achieving the aim of reducing and even eliminating inventory, so it is a feasible thought and method for enterprises to realize effective storage management. This paper mainly designs a storage management system model based on multi-Agent and describes main Agent cooperation processes of the system.
In the design of storage management system model based on multi-Agent in this paper, we use a hierarchical federation multi-Agent system organization structure and the cooperation among Agents is based on improved contract net protocol, which enhances system performance on the whole. Next, we will analyze from Agent performance and system processing efficiency. The autonomy of Agent in the model is mainly manifested as follows,It can carry out task allocation independently when accepting tasks. It can distinguishcommodity kinds for the tasks submitted by users and look for suitable task undertakers according to the grades and names of these commodities, the process doesn't need user's intervention and it can be finished independently. When a task can not be finished in time, the system can reallocate the task independently. After a task is allocated, the original task needs to be undertaken by another Agent due to some unexpectedmatters, the system will reallocate the task.After a task is finished, the system can report on its own initiativeand doesn't need user's surveillance. Interaction is mainly manifested as follows: Agents can communicate with each other by sending message and Agents cooperate with their own behaviors and finish the execution of tasks through these interactions. It can be seen from the foregoing communication message among Agentsthat Agents in this model have interaction and strong interactive ability and there is a time constraint when they interact with each other. Reactivity is mainly manifested as follows: MatManagerAgent can place an order according to bidding information of various Agents and StoManagerAgent can also make different responses to the messages sent

by MatManagerAgent according to its own conditions, it can accepts the order or refuse the order. When production management Agent doesn't agree with this order, storage management Agent makes a response in time to cancel this order. Using hierarchical federation multi-Agentsystem organization structure in the model can solve system management well and realize centralized management in domain and it doesn't need that every Agent in domain has rich knowledge and ability, which is convenient for system implementation and the performance of the whole system will not decrease. Adopting distributed processing among federations also conforms to the practical environment of the systemand convenient implementation technology, which makes interaction and cooperation among different organization Agents easy. Adopting the model system based on improved contract net protocol can reduce communication traffic and interaction among Agents effectively and make system processing efficiency and stability higher. Increasing constraint conditions of bidding activity will also reduce the bidding activities of some Agents who don't have bidding qualifications, thereby reducing communication and increasing processing efficiency. In the places where tasks need interaction frequently, if these information interactionsare not improved, a bottleneck will form and users need to issue new tasks frequently, which may cause system crash. The improved contract net protocol considers many possible cases in bidding, introduces three evaluation indexes and combines the ability information of Agent with historical circumstances of finishing tasks before to provide a forceful foundation for manager Agent to select the optimal successful bidder. Theimproved contract net protocol is favorable for not only optimizing task allocation scheme but also increasingtask allocation success rate and task completion quality.

7) INVENTORY MANAGEMENT INFORMATION SYSTEM DEVELOPMENT AT BPRTIK KEMKOMINFO JAKARTA

LINK : https://ieeexplore.ieee.org/document/8089303
AUTHOR : Elvi Fetrina1 , Eri Rustamaji2 , Tatat Nuraeni3 ,Yusuf Durrachman4 ,2022

The Institute of Training and Research for Information and Communication Technology (BPRTIK) is an institution under the Ministry of Communications and Information Technology (KEMKOMINFO). Since this Institution manages its inventories by using spreadsheet so that the data are not synchronized properly and prone duplication of data. The inventory reports such as maintenance process reports are also done manuallyand are recorded in papers that have not been organized into a single database, making those reports are vulnerable to a loss or corruption of data. In addition, the process of task's assignment and monitoring are still done manually by using a memo or even verbally which then lead to the undocumented reports. In this study, the data were collected by interview, observation and literature study. Rapid Application Development(RAD) and Object-Oriented Approach using Unified Modeling Language (UML) were used as the system development and design methods respectively. The results of this study is inventory management informationsystem, which can support and manage the inventory's processes such as the process of controlling and monitoring, maintenance, assignment and reporting.
Inventory Management Information System is able to facilitate the performance of the division of state property and asset inventory management process starts from the process control, maintenance, filing, purchasing, external service, reception, assignment to the reporting process.The system was built using Rapid Application Development (RAD) and Unified Modeling Language (UML) With this system, the data is stored directly into the database so it will minimize the possibility of loss or damage data .

8) An IoT Application for Inventory Management with a Self-Adaptive Decision Model

LINK : https://ieeexplore.ieee.org/document/7917105
AUTHOR : Lizong Zhang,Nawaf Alharbe,Anthony S. Atkins ,2022

Safety storage in large warehouse is an urgent issue to be addressed by both the local authorities and businesses, especially after the Tianjin explosions. This paper proposes an inventory management system for a warehousing company. The system integrates RFID technology and a self-Adaptive distributed decision

support model for inbound and outbound actives, inventory location suggestions and incident handling. The model consists of three major components: environment recognition, knowledge merging and the decision making. In addition, a 'selfadaptive' feature is adopted for adjusting the knowledge used in decision making procedure. An experiment is also outlined to validate the utilisations of our model and the proposed system. In this paper, a novel inventory management system designed for storage company is described. It uses the RFID technology for tracking the movement of goods, and a proposed self-adaptive distributed decision support model is introduced to enable the system automatically 'fit' to its deployed environment by adjusting

of the nodes' knowledge base. The proposed model provides a more generic approach for decision supportin inventory management. It uses a distributed schema and all decision makings are carried out by the nodes individually to avoid any possible delay caused by network communications. The model uses the result of scenario recognition as a benchmark for knowledge selection to create a local knowledge base that used by node individually to carry out the decisions with its own rule-based system. In addition, a selfadaption step is introduced to further modify the local knowledge base for better adaption to the scenario where the node deployed. A simulation experiment is then carried out in this paper, in order to prove the utilization of the proposed inventory management system, as well as the self-adaptive model. This design is also confirmed by another chemical storage company, and they estimated the design could bring 10% work efficiency improvement to their current work procedures.

9) **Study On A New System for Inventory Control**

LINK : https://ieeexplore.ieee.org/document/4659581
AUTHOR : ZHU Xiaoyu LI Xiaojiu , 2022

As we all know, inventory control is important in a clothing company and Agent Technology has become very popular in the last few years as a new approach to developing software systems. This paper study on a newt system for inventory control using plannin and distributed agents in apparel indursty. Multi Agent Systems (MAS), a term used to describe the incorporation of multiple types of agents into various systems, is a way of designing and implementing a system with the advantages of agent entities. We chose to use agents as a decision support tool for use in a Retail Inventory Management System. Since the management of inventoryis crucial to the success of most companies, and since we see a potential major role for agents in the business process management MAS seems a likely choice for a decision support platform. This work stems from our prior work in simulating a MAS inventory system, then implementing the system for production use.
Agents can help design an Inventory Management System that is reliable, more accurate, intelligent, distributed, scalable, faster, and simpler in design. Such a system is very much needed in this time and in the future especially with the growing economy and the growth of the Internet. The future of such systems lies in creating a component that can negotiate online orders for restocking inventory with online suppliers. Our current decision support system is limited to the inventory system (excluding supply chain activities) fora medium sized department store in China. We plan to add to this system a simulation of the store's supply chain (or at least some part of it) to test how the inventory system will behave in a more dynamic scenario (i.e. testing various supply chain situations).

10) **Study on Auto enterprise inventory management**
LINK : https://ieeexplore.ieee.org/document/6114678
AUTHOR : Zhang Guirong,Mu Yuxin ,2022

This paper aims at solving the following problems: our country autocar business inventory managment, unreasonablesupply chain inventory managment mode of cooperation , unreasonablevibrator type recifier the network, imappropriate new technique information technique and physical distribution, physical distribution system reaction capability scarcity and all the components purchased by the storekeeper according to his mastery of the stock. This paper puts forward a series of measures like a total inventory management, strengthening production management and lowering in products inventory, strengthening the marketing management to reduce inventory, strengthening the whole coordination of enterprise and countermeasures to improve the management inventory level. To improve the present stock situation of the car enterprises, they should not only strengthen their internal supply chain management, but also strengthen the coordination and cooperation between supply chain enterprises and the whole coordination countermeasures so as to improve the management level of the inventory. A set of supply chain enterprise identity of credit evaluation system and effective performance evaluation system and incentive mechanism should be established as well as supply chain cooperation monitoring and control system in order to vitalize the whole supply chain.

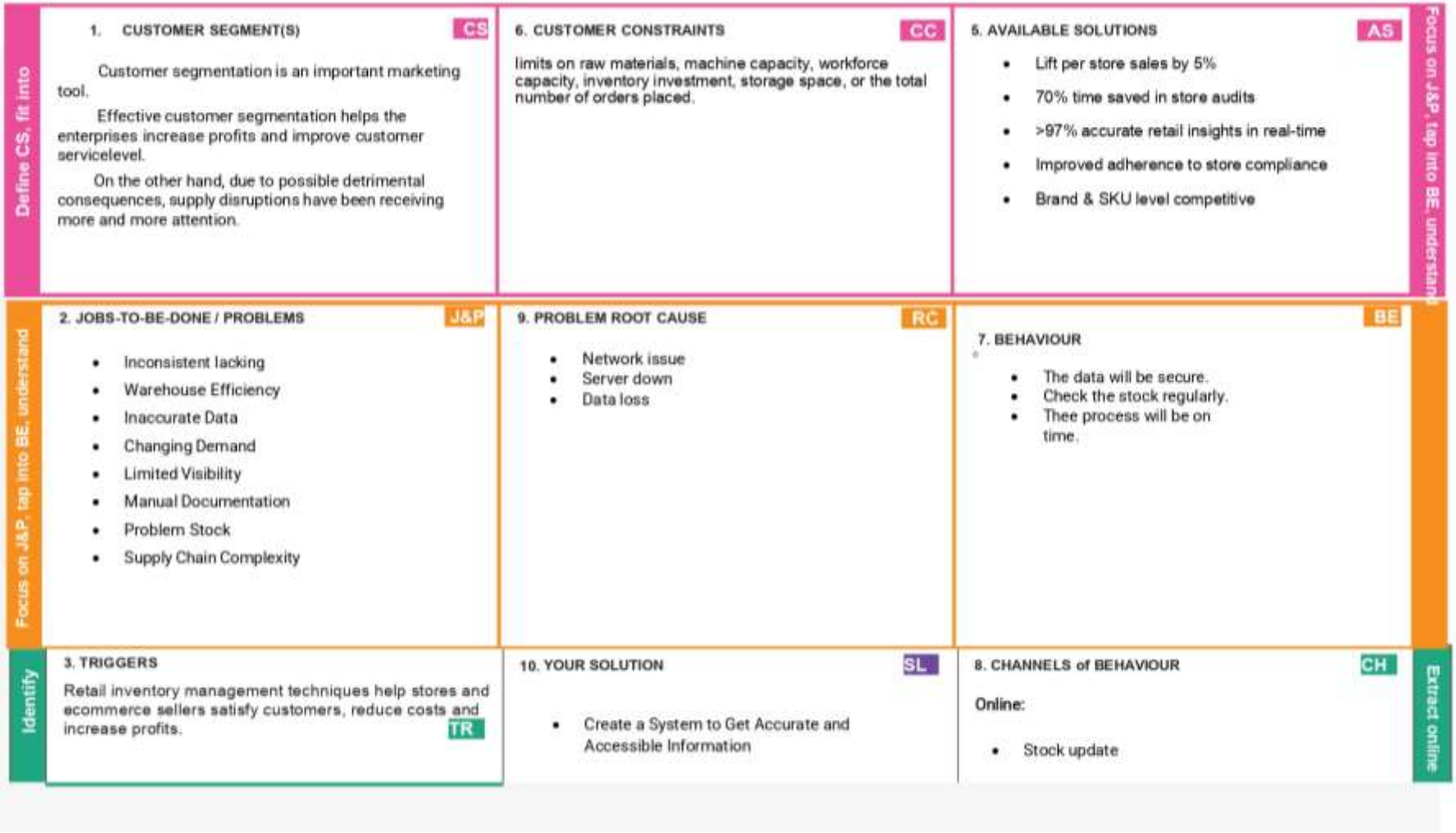
PROBLEM STATEMENT

Customer Problem Statement Template

The primary goal of this project is to develop a desktop programme that will enable retailers to keep track of all inventory-related data, including stock management, sales data, and purchase data. The tool gives retailers total visibility into what is kept in their inventory, flexible management of their products, and the ability to request more stock as and when it is required.

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS – 1	Supplier	To make on time delivery possible	I am unable to provide the requested goods.	Of the inaccurate data and limited Visibility	Dainty
PS - 2	Retailer	Meet customer demand without running out of stock or carrying excess supply	It seems hard to keep track of the products that customers have requested.	Of lack of a proper software	Frustrated
PS - 3	Shopper	To purchase goods	The items I prefer are no longer available	Of unawareness of the retailers	Annoyed

PROBLEM SOLUTION FIT



4. EMOTIONS: BEFORE / AFTER

Before:

Over work and stack unavailable

After:

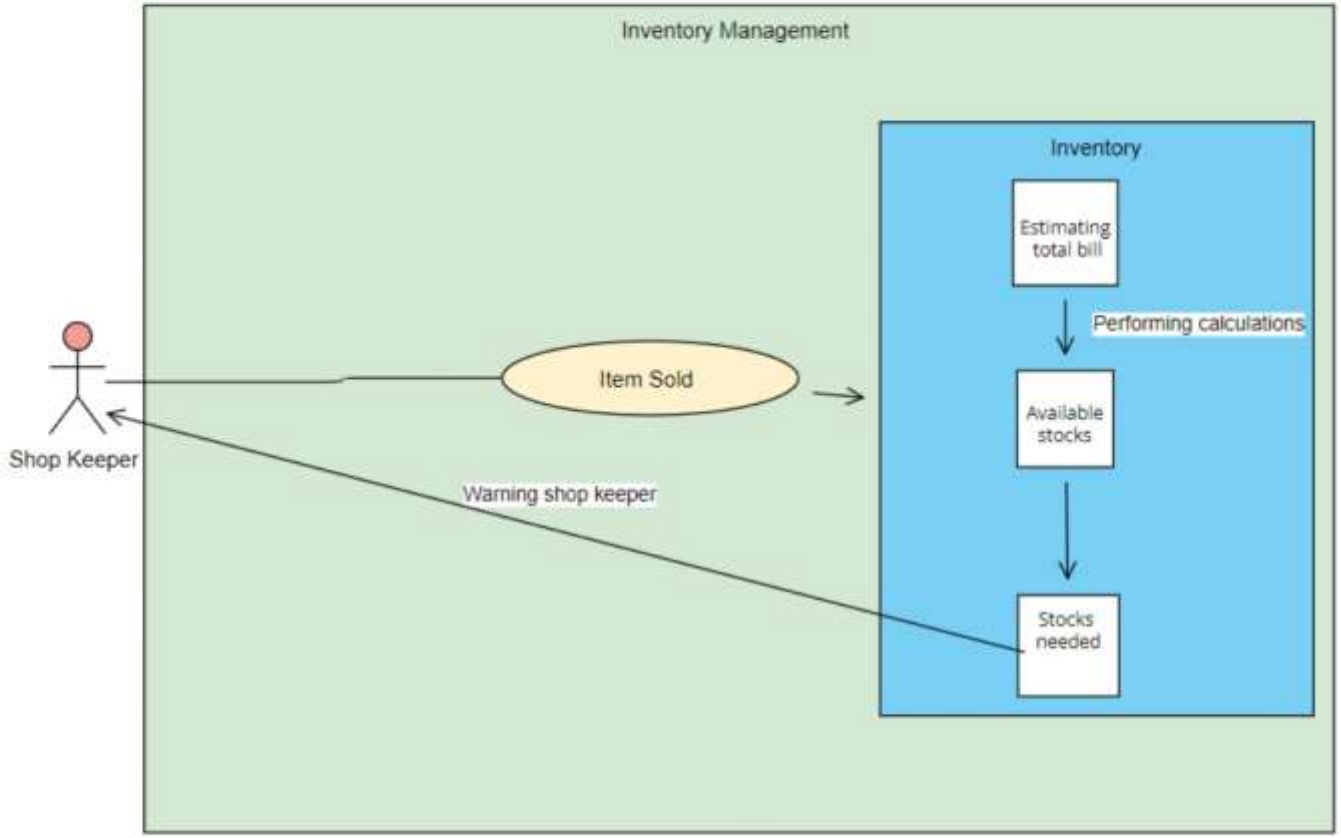
Easy work

EM

- Create a Unique Process Customized forBusiness type.
- Keep an eye on Contemporary trends in the industry.
- Be prepared for fluctuations in supply and demand.

- Stock needed
- Maintaining the stock above the warning level
- Calculating the current stock by using the billing info

Solution Architecture

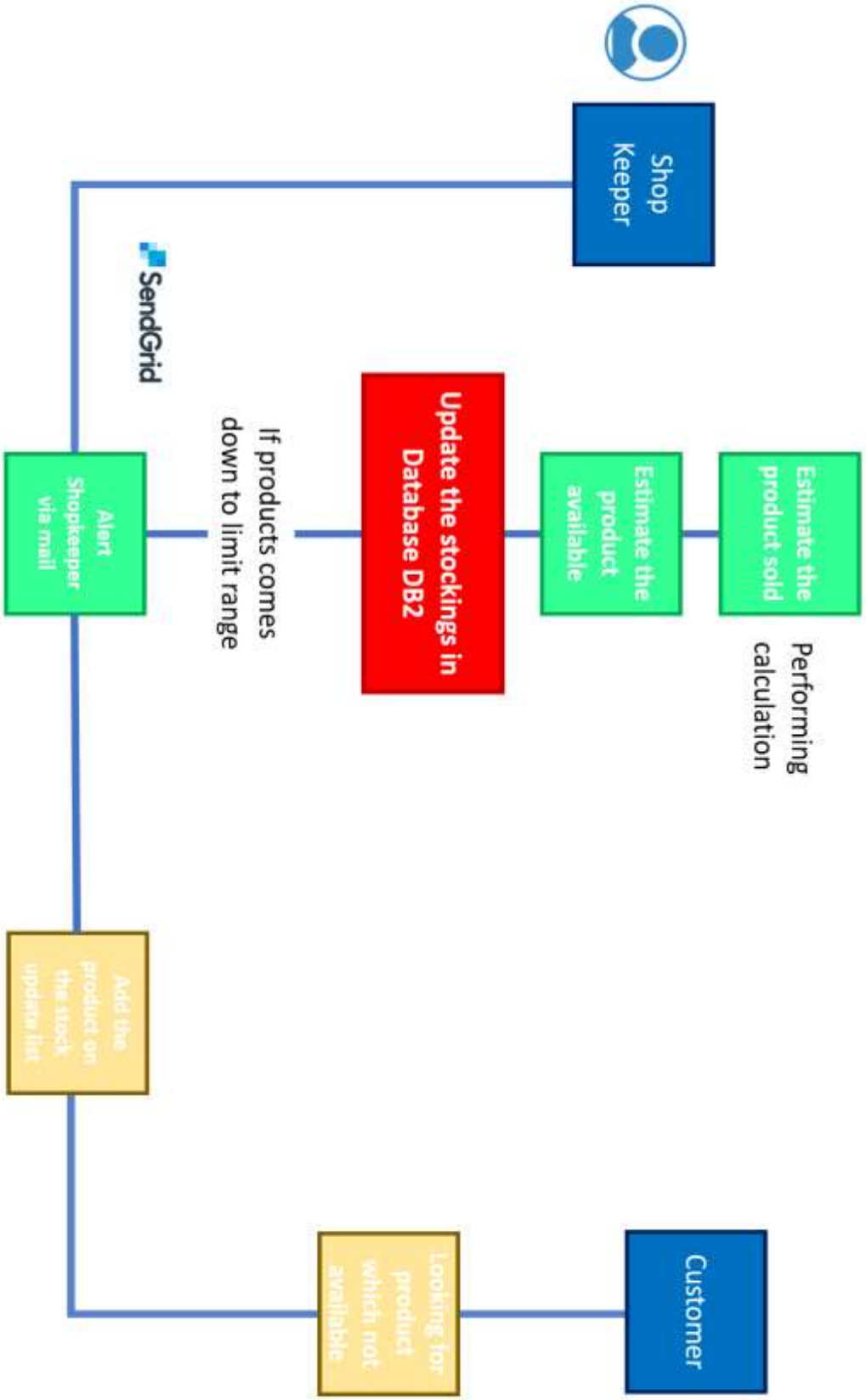


PROPOSED SOLUTION

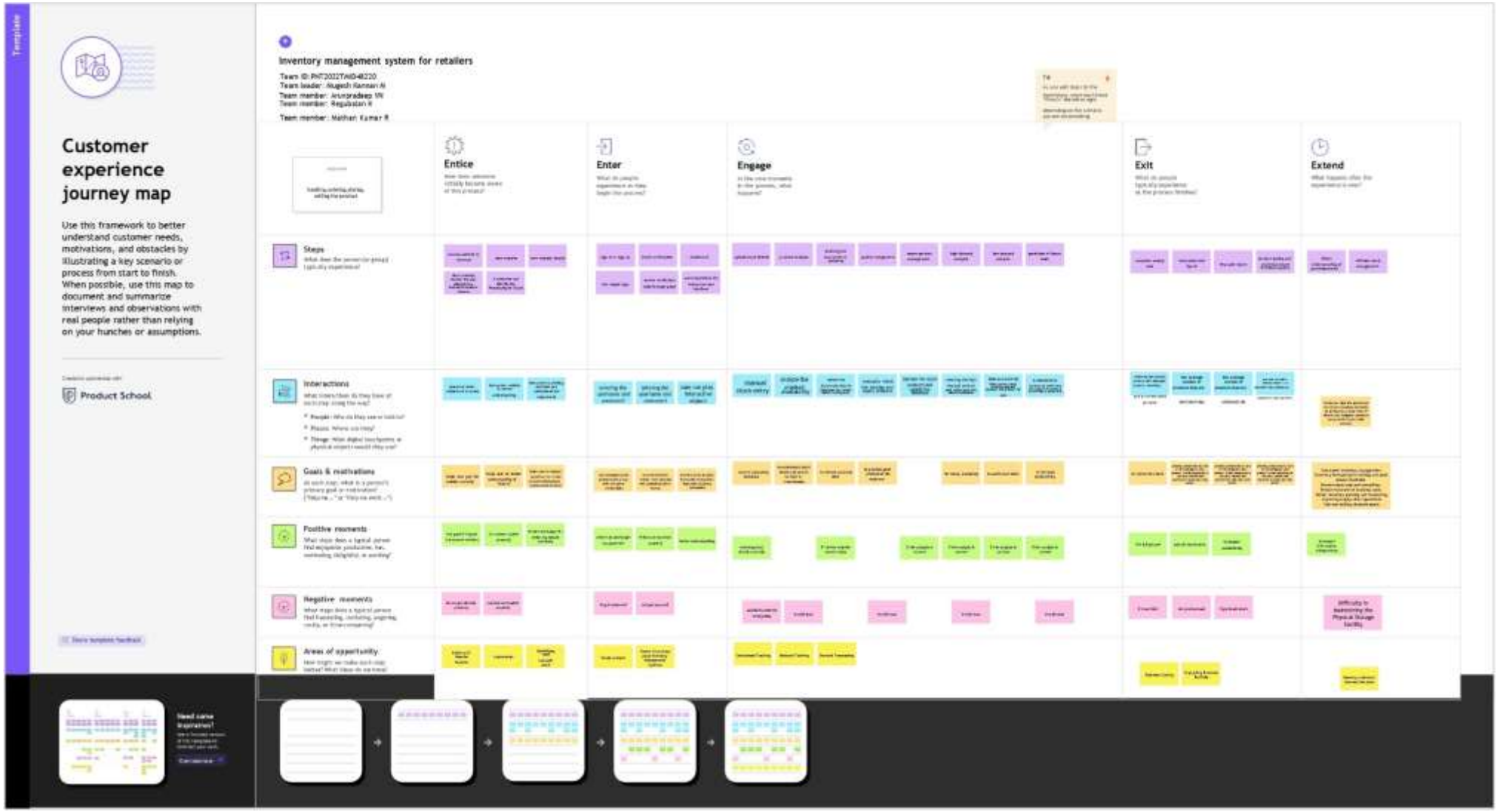
S.NO.	Parameter	Description
1	Problem Statement	To solve the need that the shopkeepers doesn't have the systematic way to keep theirrecord of inventory data.
2	Idea / Proposed Solution	An application which retailers successfully log in to the application, that they can updatetheir inventory details, also users will be ableto add new stock by submitting essential details related to the stock. They can view details of the current inventory. The System will automatically send an email alert to the retailers, if the stock reduced to the limited amount found in the inventory. So that they can order new stock.
3	Novelty / Uniqueness	With this inventory management system, the shopkeeper not only can fill the inventory butalso reduce the wastage of goods. The users can register the stocks that they need by logging in from their account.
4	Social Impact / Customer Satisfaction	Customer Satisfaction is entirely depend onthe services which they expected. If the retailer's system exceeds with customer's expectation, the customers will be satisfied.
5	Business Model	With the better inventory management system, Update the inventory without any need of manpower. Retailer can live up withuser's need and be on the flow with current sale products and they can update the inventory with that products.
6	Scalability of the Solution	To create a scalable inventory managementsystem, the retailer have to 1. Keeping low inventory levels asmuch as possible 2. Keep an eye on Sales Projections 3. Use ODM (On-Demand Manufacturing). ODM refers to manufacture or in this case, updatethe products which are highly in demand.

SOLUTION ARCHITECTURE

Solution Architecture Diagram



CUSTOMER JOURNEY MAP

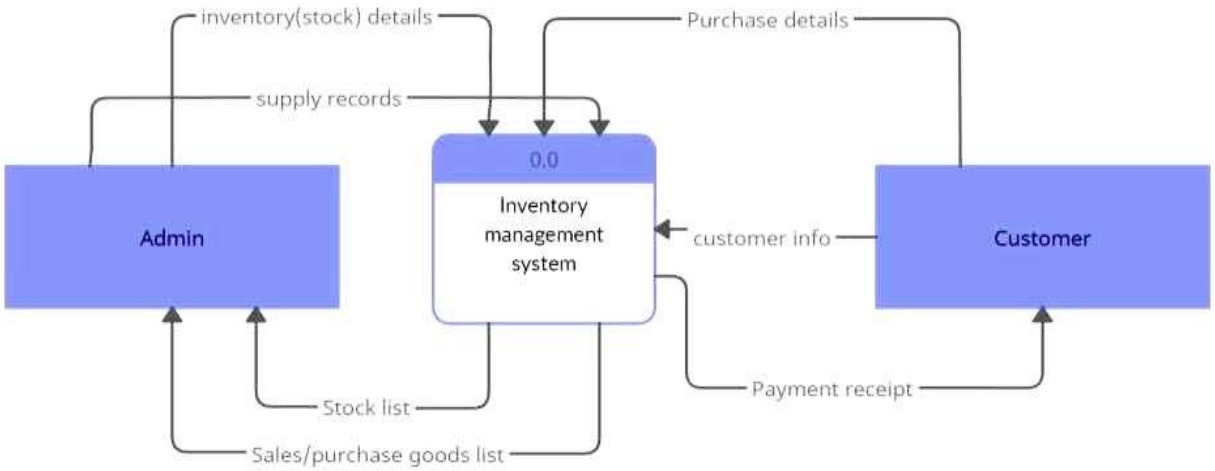


DATAFLOW DIAGRAM AND USER STORIES

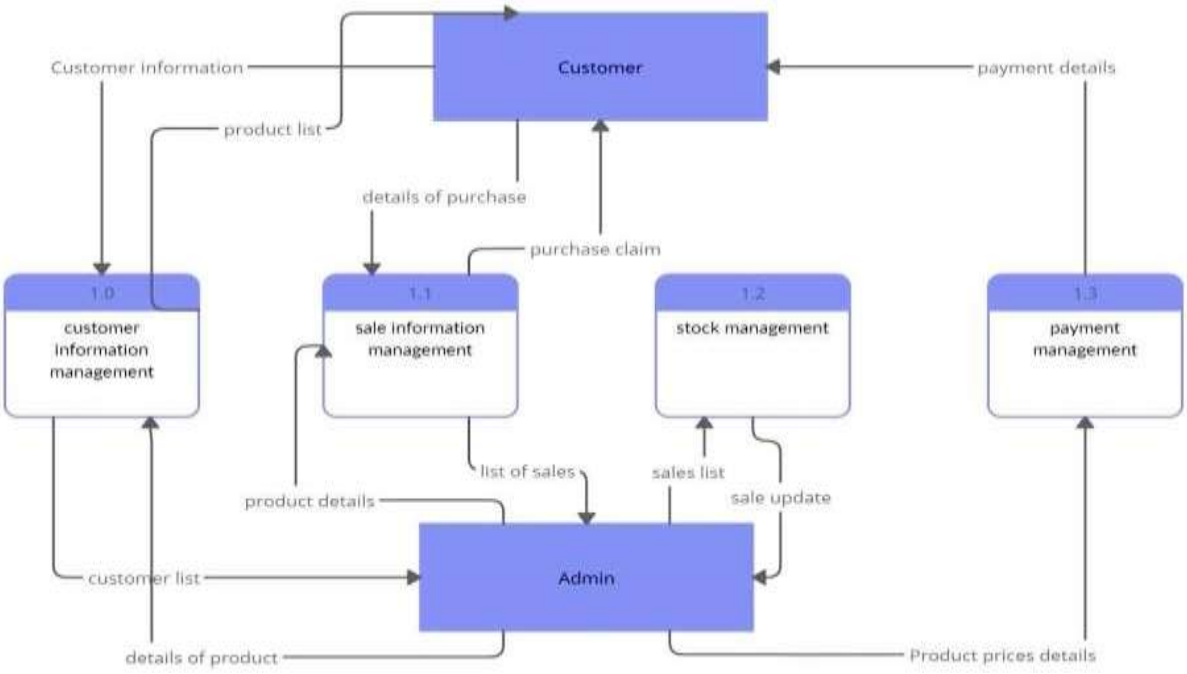
Data flow diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

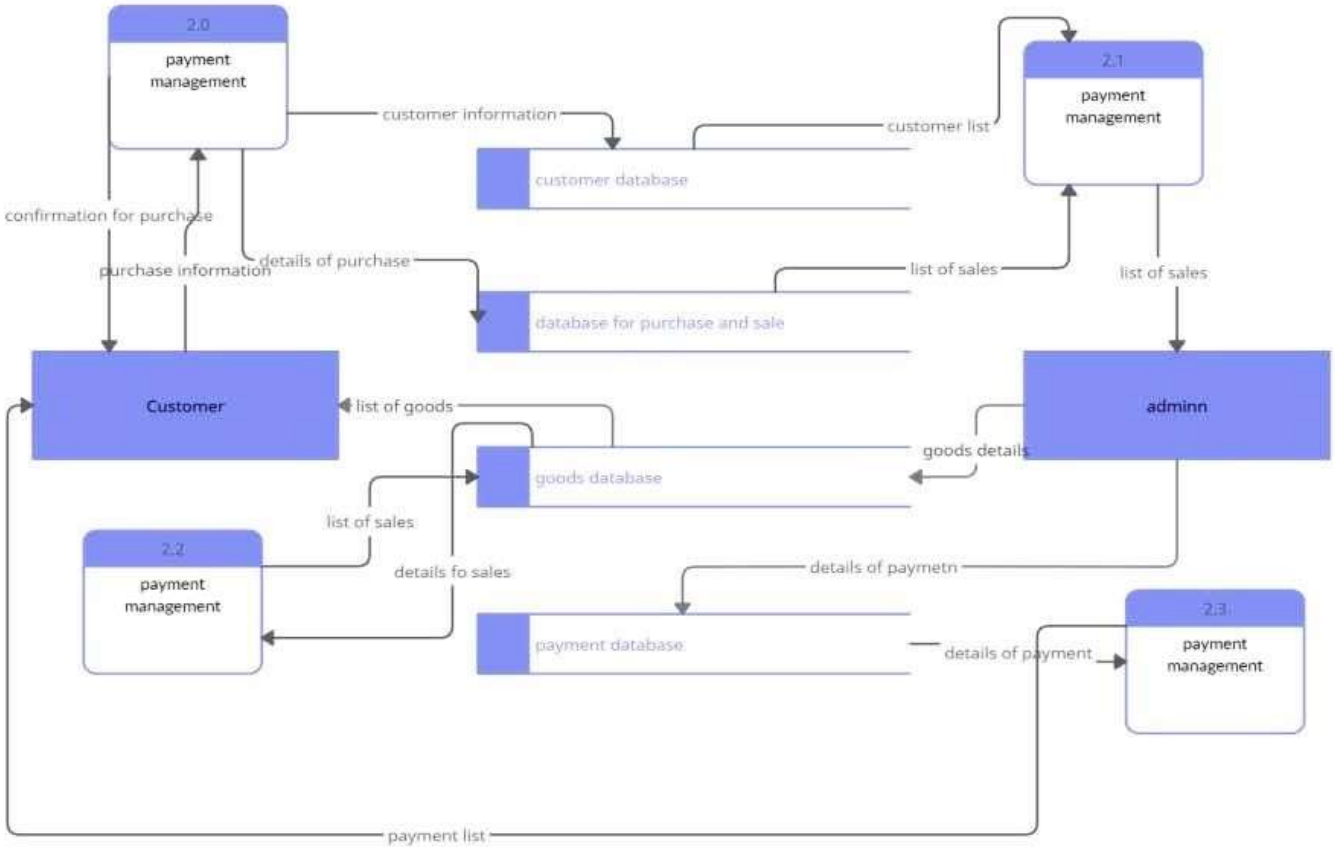
Level 0 Data Flow Diagram for inventory management system for retailers:



Level 1 Data Flow Diagram for inventory management system for retailers:



Level 2 Data Flow Diagram for inventory management system for retailers:



User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can receive conformationemail and click confirm button	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can access my account	High	Sprint-1
	Dashboard	USN-6	As a user, it displays the stock , current saledemand product	I can see available stock ,daily sale	High	Sprint-2
Customer (Web user)	Application	USN-7	As a user, I can register, sign in, and shop the products simply	I can access account anywhere	High	Sprint-3

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer Care Executive	Update inventory details	USN-8	To monitor the track of inventory andavailability	I can improve the productivity	High	Sprint-4
Administrator	Update purchased stock	USN-9	To update purchased goods in database	I can update the new purchased product	High	Sprint-3
Customer care executive	Customer feedback verification	USN-10	To get a clear understanding about our application and for the convenience of theuser	I can fulfil the customer expectations	High	Sprint-4
	Inventory control	USN-11	To avoid stock overflow and run out	I can alert mail if stock run Out	Medium	Sprint- 2
Administrator	Quality checking	USN-12	To maintain the product and improving the customer relationship	I can improve my productquality	High	Sprint-4

Solution Requirements

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User login	Login with usernameLogin with password
FR-4	Centralized Record of all product	Product name, Stock keep unit, brand, retail price,product category, lot number , expire date, vendor details, wholesale cost, minimum reorder amount,case quantity amount, reorder lead time
FR-5	Stock location identification	Provide number label for- Shelf, Rack and Boxes
FR-6	Periodical stock checking	Physical counting and Cycle counting
FR-7	Integration of sales and inventorydata	sales administration and database upkeepFIFO,LILO according to the goods
FR-8	Purchase management and Forecasting	Order review and placement, Avoid risk stock, reviewproduct, priorities purchases based on an item's profitability, popularity, and lead time, ABC,FSC,XYZ,JIT techniques
FR-9	Markdown and promotion	Show product discount, Maintain enough stock on hand to meet demand.
FR-10	Management of Receiving Stock	Accurately recording goods on an inventory
FR-11	Returns Management System	Check for damage or defects and return to vendor asneeded If sellable add it to inventory counts

FR-12	Determination of death stock	Return to the vendor for credits
FR-13	Inventory KPIs(Key Performance Indicator)	Sale KPIs, Receive KPIs, Operational KPIs, EmployeeKPIs

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	This system must be easy to use by both managers and chefs, such that they do not need to read an extensive number of manuals; it must be quickly accessible by both managers and chefs; it must be intuitive and simple in the way it displays all relevantdata and relationships; and the menus of the system are easily navigable by the users with buttons thatare easy to understand.
NFR-2	**Security**	The security requirements deal with the primarysecurity. Only authorized users can access the system with user name and password of administrator.
NFR-3	**Reliability**	The system must give accurate inventory status to the user continuously. Any inaccuracies are corrected by regularly comparing the actual levels tothe levels displayed in the system. The system must successfully add any recipe, ingredients, vendors, or special occasions given by the user and provide estimations and inventory status in relevance to the newly updated entities.
NFR-4	**Performance**	The system must not lag, because the workers usingit don't have downtime to wait for it to complete anaction. The system must successfully complete updating the databases, adding new recipes, ingredients, vendors, and occasions every time the user requestssuch a process. All the functions of the system must be available tothe user every time the system is turned on. The calculations performed by the system must comply with the norms set by the user and should not vary unless explicitly changed by the user.

NFR-5	**Availability**	The software will be available only to administratorof the organization and the product as well as customer details will be recorded by him. He can add customers, Update and delete them as well asadd new products and manage them
NFR-6	**Scalability**	The ability of a system to handle a growing amountof work.

TECHNOLOGY STACK

Technical Architecture:

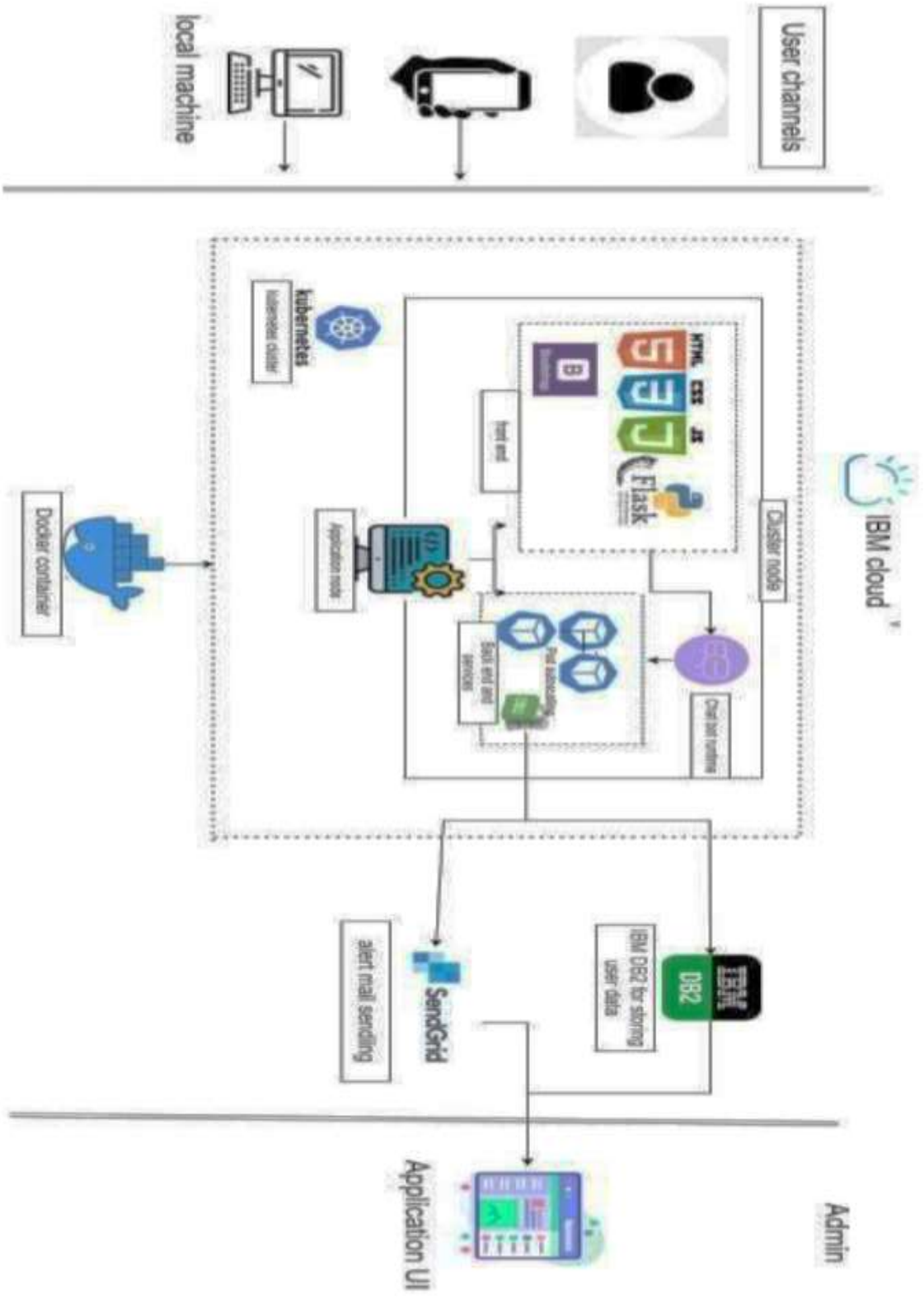


Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	• html provides the basic structure of a web page • CSS is used to describe the colour, size, etc. of a web page • JavaScript is a backend framework • Bootstrap is a built in class in CSS for more and instant style • Python flask makes web developer life easy to build a web-application	Bootstrap, python-,flask, HTML, CSS, JS
2.	Security Implementations	For the authentication purpose	Sendgrid
3.	Scalable Architecture	It breaks the architecture into smaller pieces (micro services) and makes them loosely coupled for improving scalability.	Kubernetes
4.	Availability	Docker packages an application and all its dependencies into a virtual container that can run on anywhere	Docker
5.	Performance	Kubernetes services provide load balancing and simplify container management across multiple hosts.	Kubernetes

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	It provides an interaction between application and user	HTML, CSS, JavaScript ,python flask
2.	Application Logic-1(Authorization)	getting the necessary details of the user in order to create an account themselves for user authentication	Python
3.	Application Logic-2(Notification)	After successful authentication, the system will email a user ID, user password, and send an alert mail to the user to inform them of product availability.	Sendgrid
4.	Application Logic-3(Interaction)	It is an automated software that is used to provide more interaction and communication. It helps the user to understand the software better	IBM Watson Assistant
5.	Database	The database stores the inventory details	MySQL
6.	Cloud Database	It is the first priority storage location for the goods (inventory) provided as a service in the IBM Cloud.	IBM DB2
7.	File Storage	The software's file storage, high security and high availability	IBM cloud object storage
8.	External API-1(Payment API)	The purpose of the external API used in the application is to provide payment management services	IBM Weather API, etc.
9.	External API-2(Authentication)	The purpose of the external API used in the application is to provide authentication	authentication API
10.	Infrastructure (Server / Cloud)	Application Deployment on Cloud	Kubernetes,

MILESTONE AND ACTIVITY LIST

Activity Number	Activity Name	Detailed Activity Description	Assigned To	Duration (Start to End Date)	Status
1	Create Flask Project	An application Framework written in Python	All Members	-	Completed
2	Create IBM Cloud	Create and log into IBMCloud	All Members	-	Completed
3	Install IBM Cloud CLI	General-Purpose developer tool that provides access to your IBM Cloud Account	All Members	-	Completed
4	Docker CLI	Use Docker CLI configuration to customize settings	All Members	-	Completed
5	Create Account in SendGrid	Create account in SendGrid to sendmails	All Members	31 Oct 2022 to 5 Nov 2022	In Progress
		IMPLEMENTING WEB APPLICATION			
6	Create UI to Interact with Application	Pages such as Registration, Login page, Displaying items etc.	All Members	07 Nov 2022 to 12 Nov 2022	In Progress
7	Create IBM Db2 and connect withPython	Create IBM Db2 service in IBM Cloud and connect with python codeusing DB.	All Members	07 Nov 2022 to 12 Nov 2022	Not Completed
		INTEGRATING SENDGRID SERVICES			
8	SendGrid Integration withPython Code	To send emails from the applicationswe need to integrate the SendGrid Service.	All Members	07 Nov 2022 to 12 Nov 2022	Not Completed
		DEPLOYMENT OF APP IN IBM CLOUD			
9	Containerize the App	Need to create Docker Image ofthe application and push into theIBM Container Registry	All Members	07 Nov 2022 to 12 Nov 2022	Not Completed
10	Upload Image to IBM Container Registry	Upload the Image to IBM Container Registry	All Members	14 Nov 2022 to 19 Nov 2022	Not Completed
11	Cluster Deploy in Kubernetes	Once the image is uploaded the IBM Container registry deploy the image toIBM Kubernetes Cluster	All Members	14 Nov 2022 to 19 Nov 2022	Not Completed

SPRINT DELIVERY PLAN

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	4
Sprint-1		USN-2	As a user, I can register for the application through E-mail	1	Medium	4
Sprint-1	Confirmation	USN-3	As a user, I will receive confirmation email once I have registered for the application	2	Medium	4
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	2	High	4
Sprint-2	Dashboard	USN-5	As a user, I can view the products which are available	4	High	4
Sprint-2	Add items to cart	USN-6	As a user, I can add the products I wish to buy to the carts.	5	Medium	4
Sprint-3	Stock Update	USN-7	As a user, I can add products which are not available in the dashboard to the stock list.	5	Medium	4
Sprint-4	Request to Customer Care	USN-8	As a user, I can contact the Customer Care Executive and request any services I want from the customer care.	5	Low	4
Sprint-4	Contact Administrator	USN-9	I can be able to report any difficulties I experience as a report	5	Medium	4

Project Tracker, Velocity & Burndown Chart

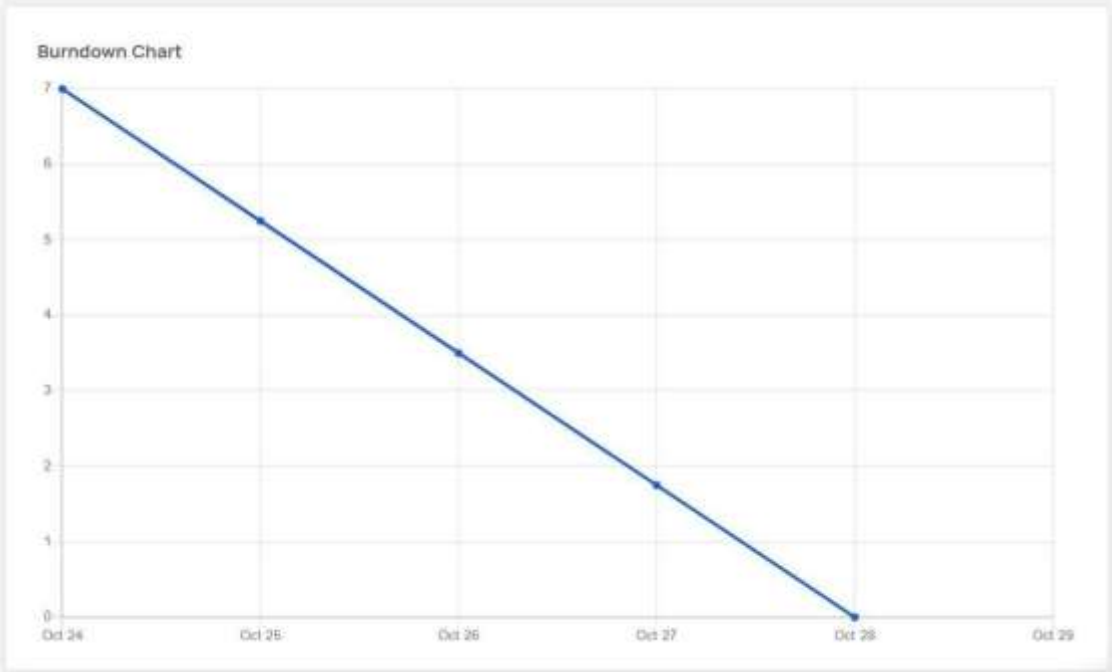
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	7	6 Days	24 Oct 2022	29 Oct 2022	7	29 Oct 2022
Sprint-2	9	6 Days	31 Oct 2022	05 Nov 2022	9	05 Nov 2022
Sprint-3	5	6 Days	07 Nov 2022	12 Nov 2022	5	12 Nov 2022
Sprint-4	10	6 Days	14 Nov 2022	19 Nov 2022	10	19 Nov 2022

Velocity

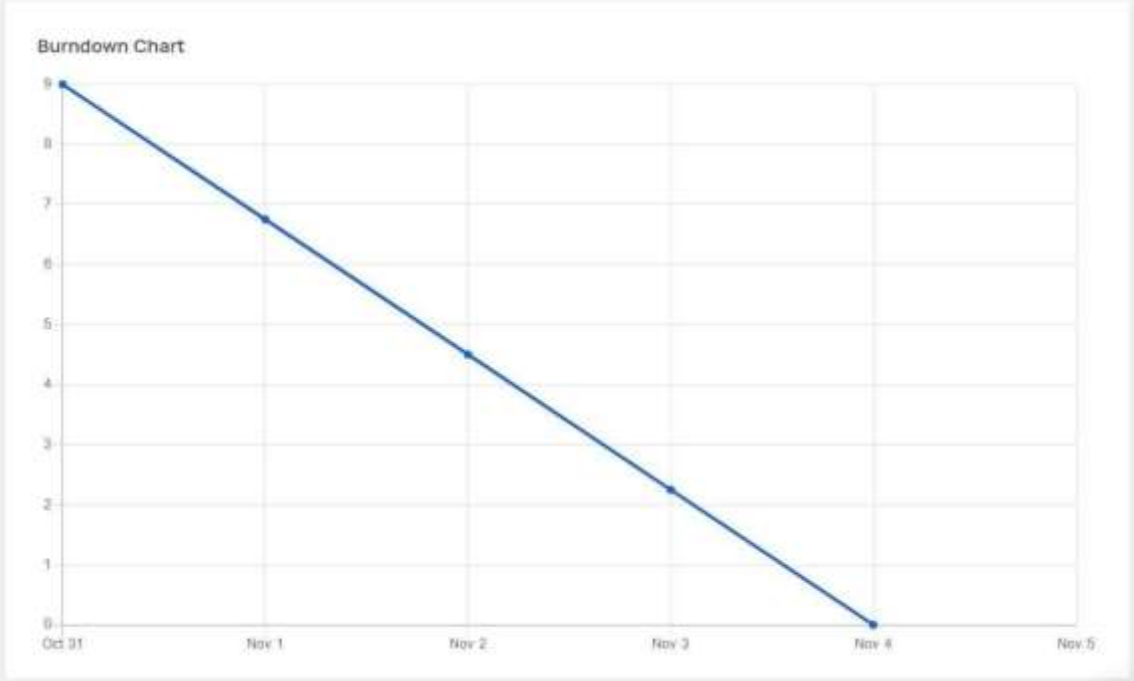
Sprints	Sprint Duration	Velocity	Actual Velocity
Sprint 1	6	7	0.85
Sprint 2	6	9	0.66
Sprint 3	6	5	1.2
Sprint 4	6	10	0.6

Burndown Chart :

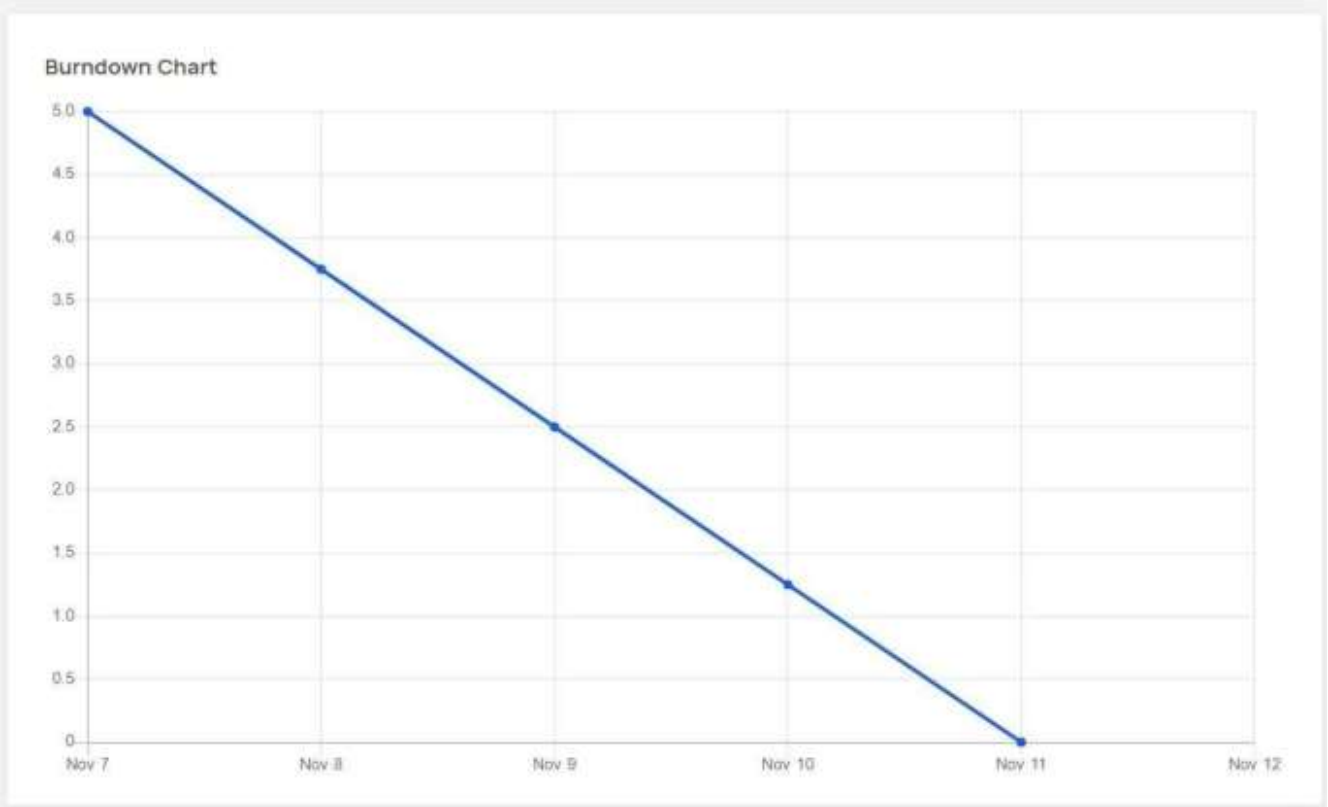
Sprint 1



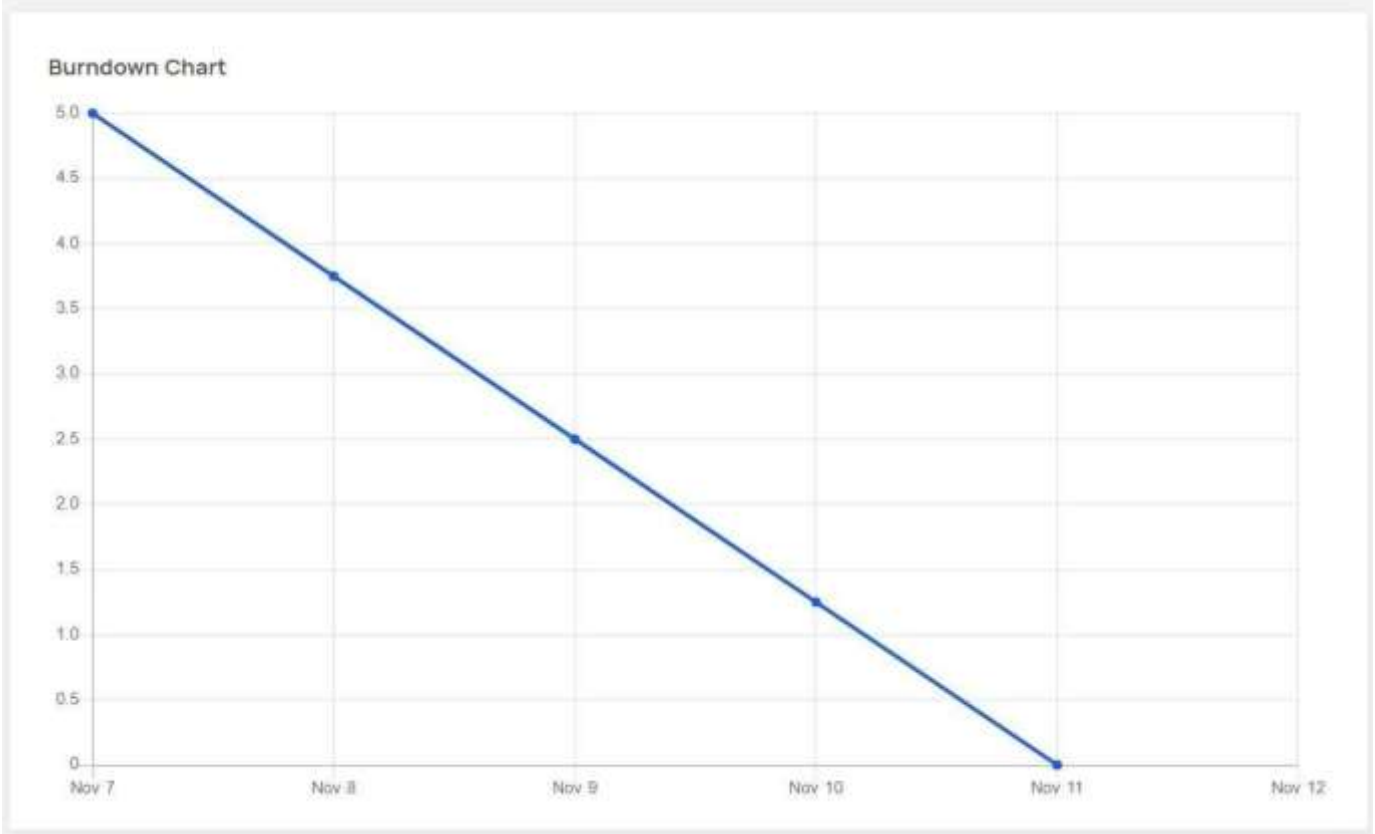
Sprint 2



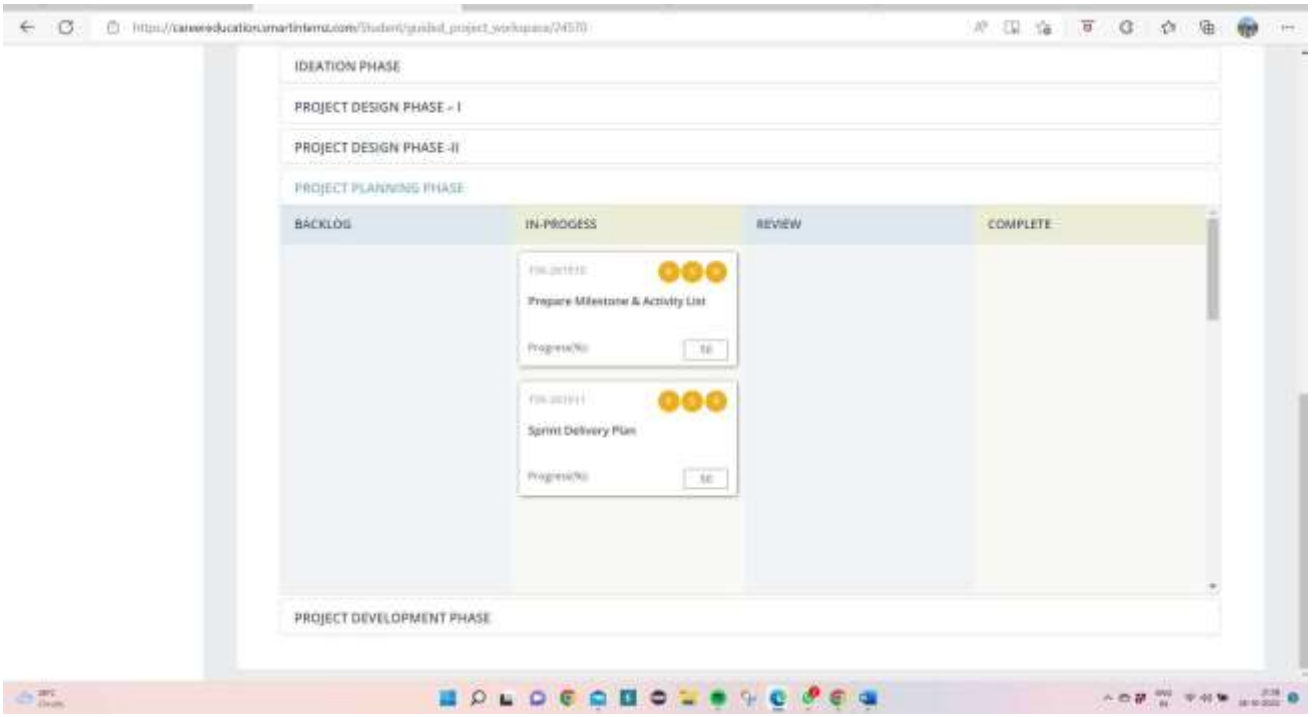
Sprint 3



Sprint 4



Project Tool: JIRA

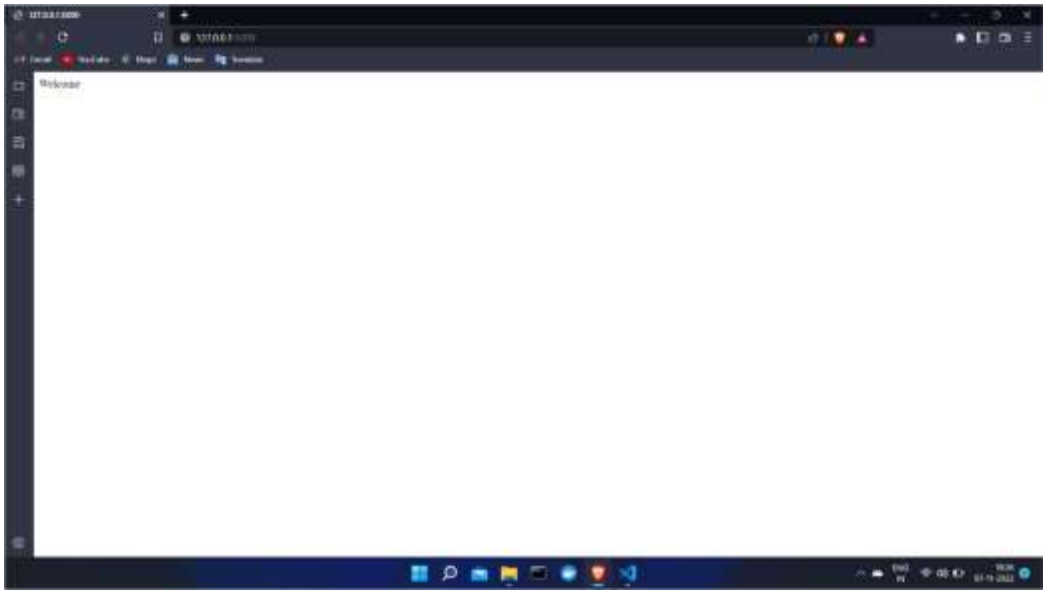


FLASK APP CREATION

Code

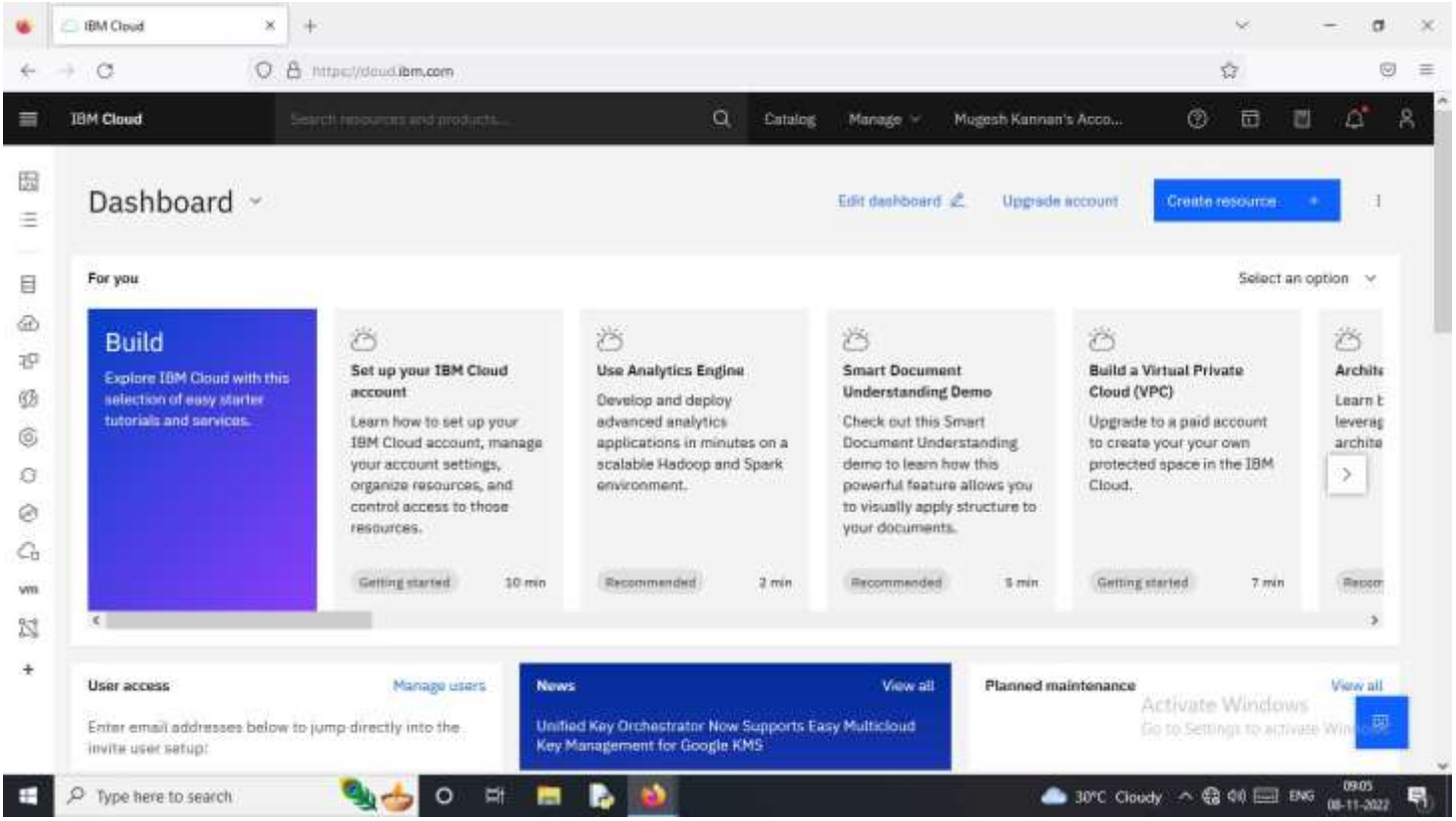
```python
from flask import Flask, render_template , request , redirect
import sqlite3 as sql
app = Flask(__name__)

@app.route('/')
def index():
    return 'Welcome'

if __name__ == '__main__':
    app.run()
```

Output

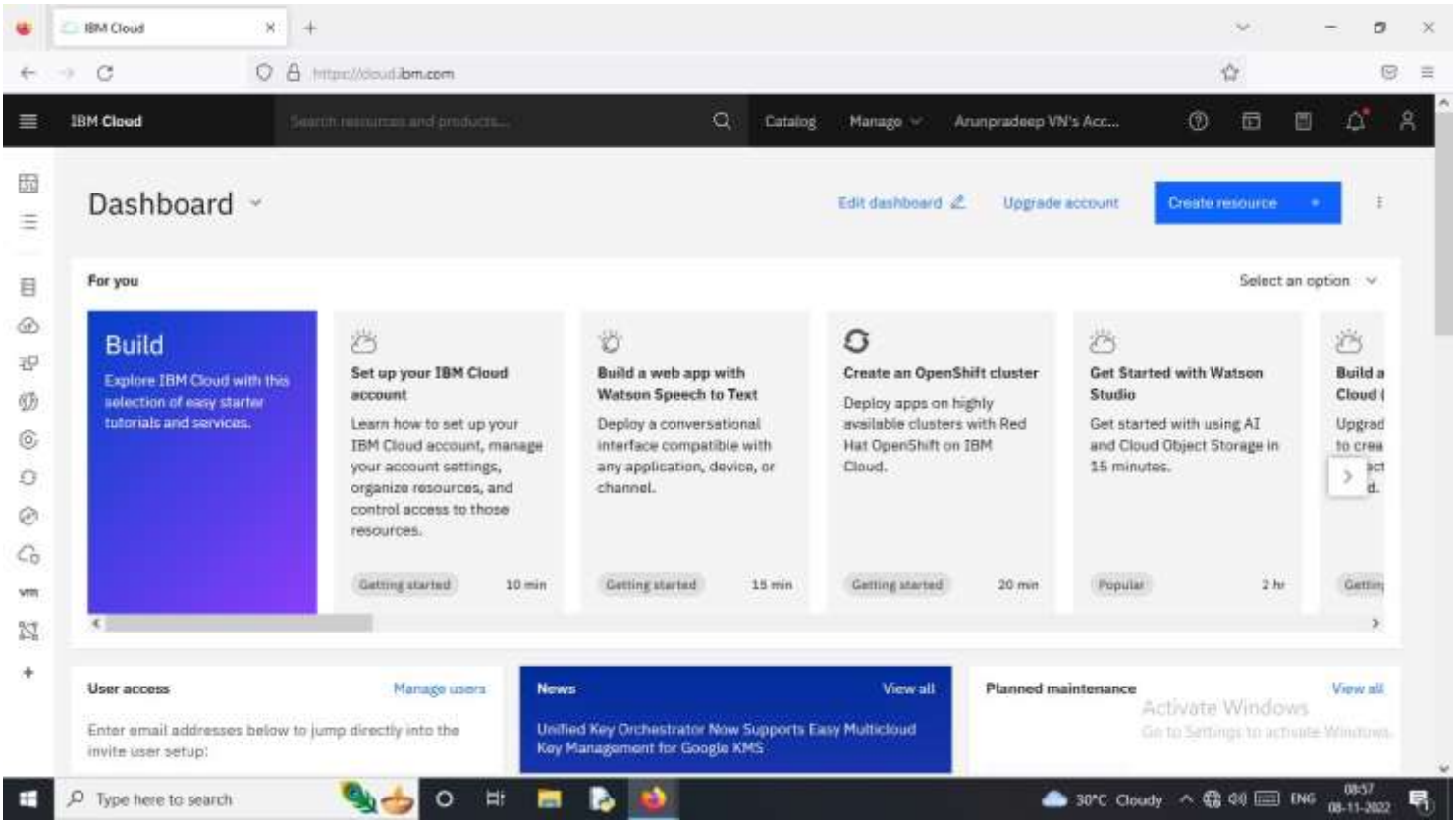


IBM CLOUD ACCOUNT CREATION

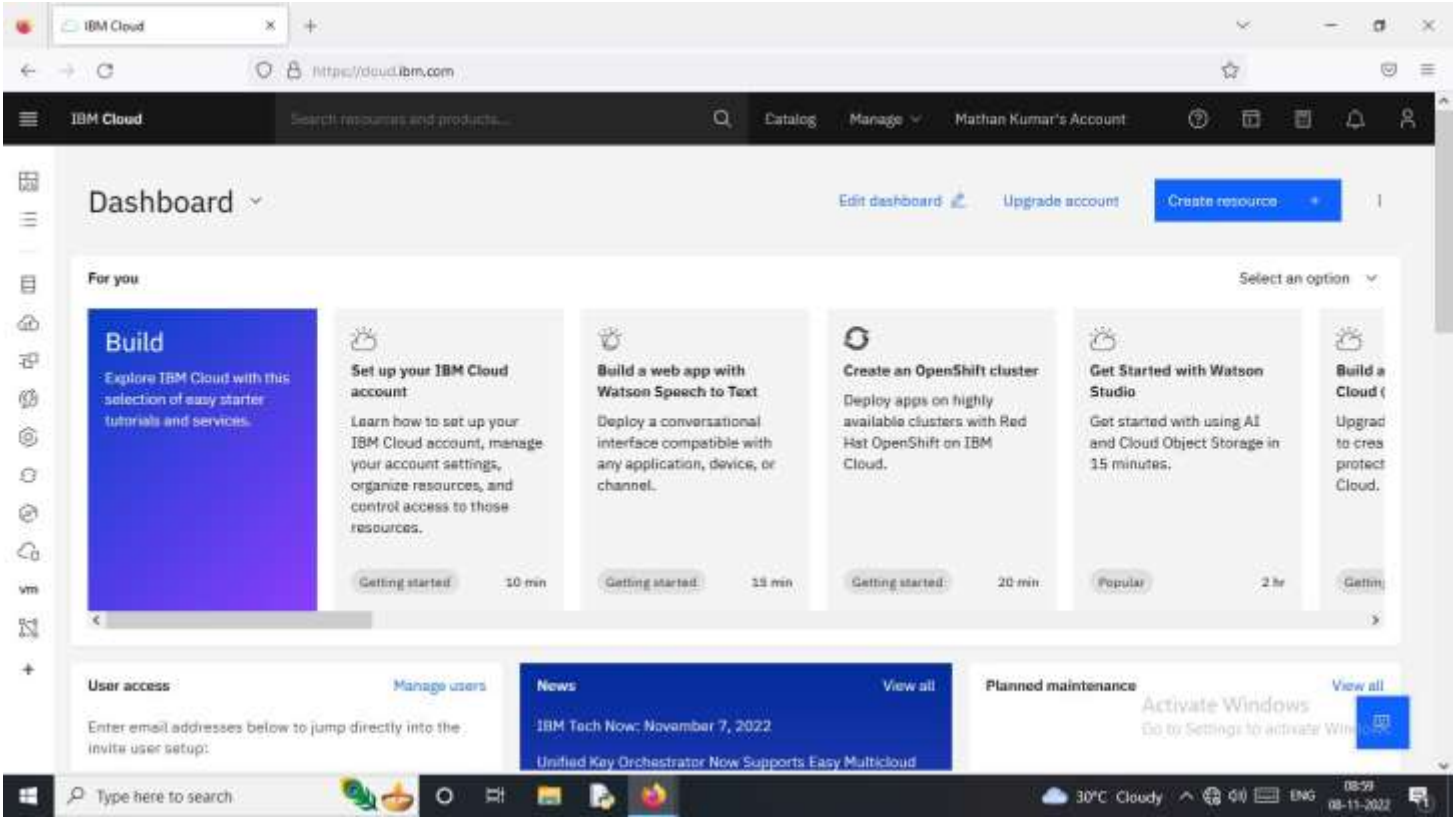
Mugesh kannan



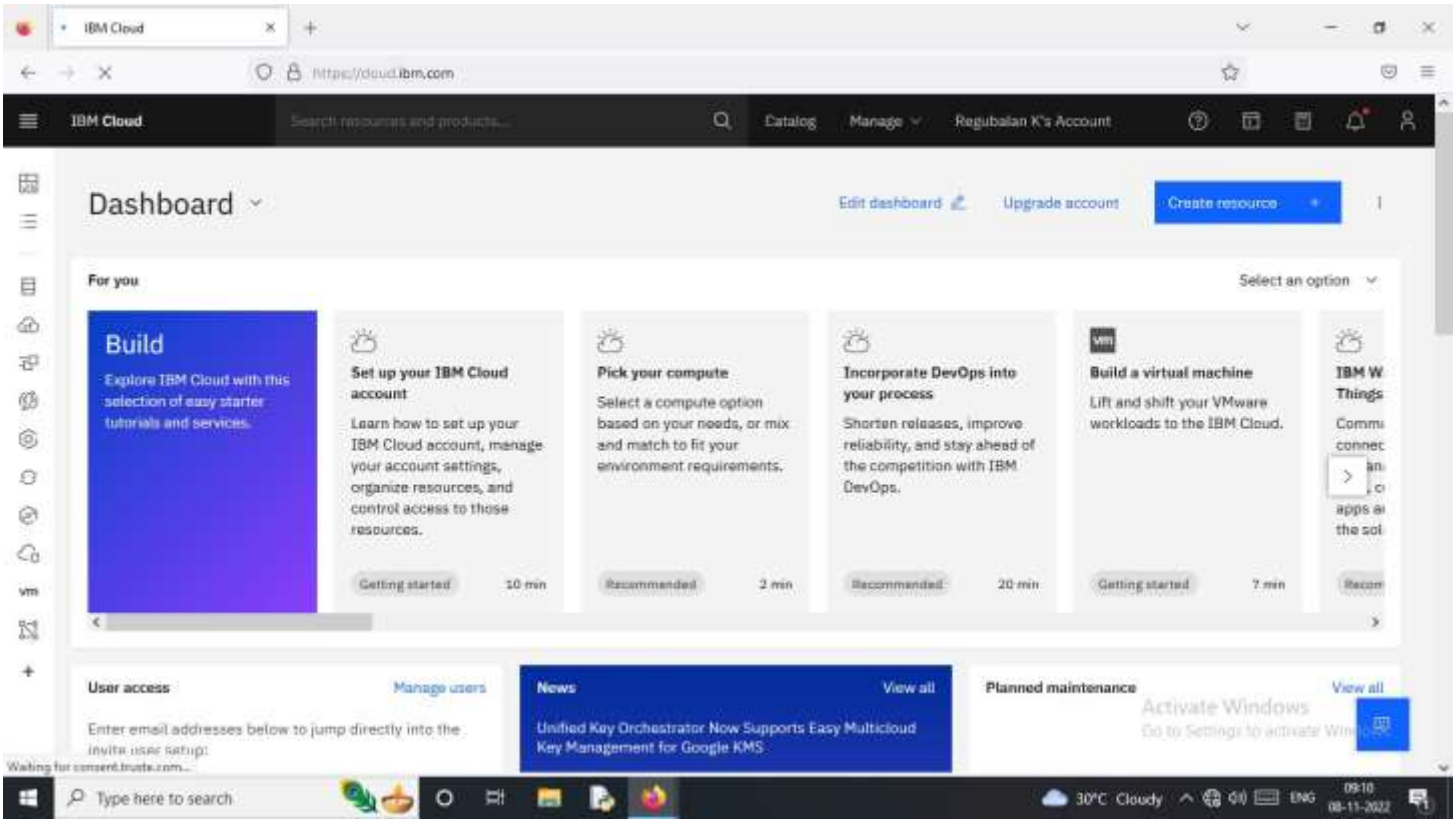
Arunpradeep



Mathan Kumar



Regubalan



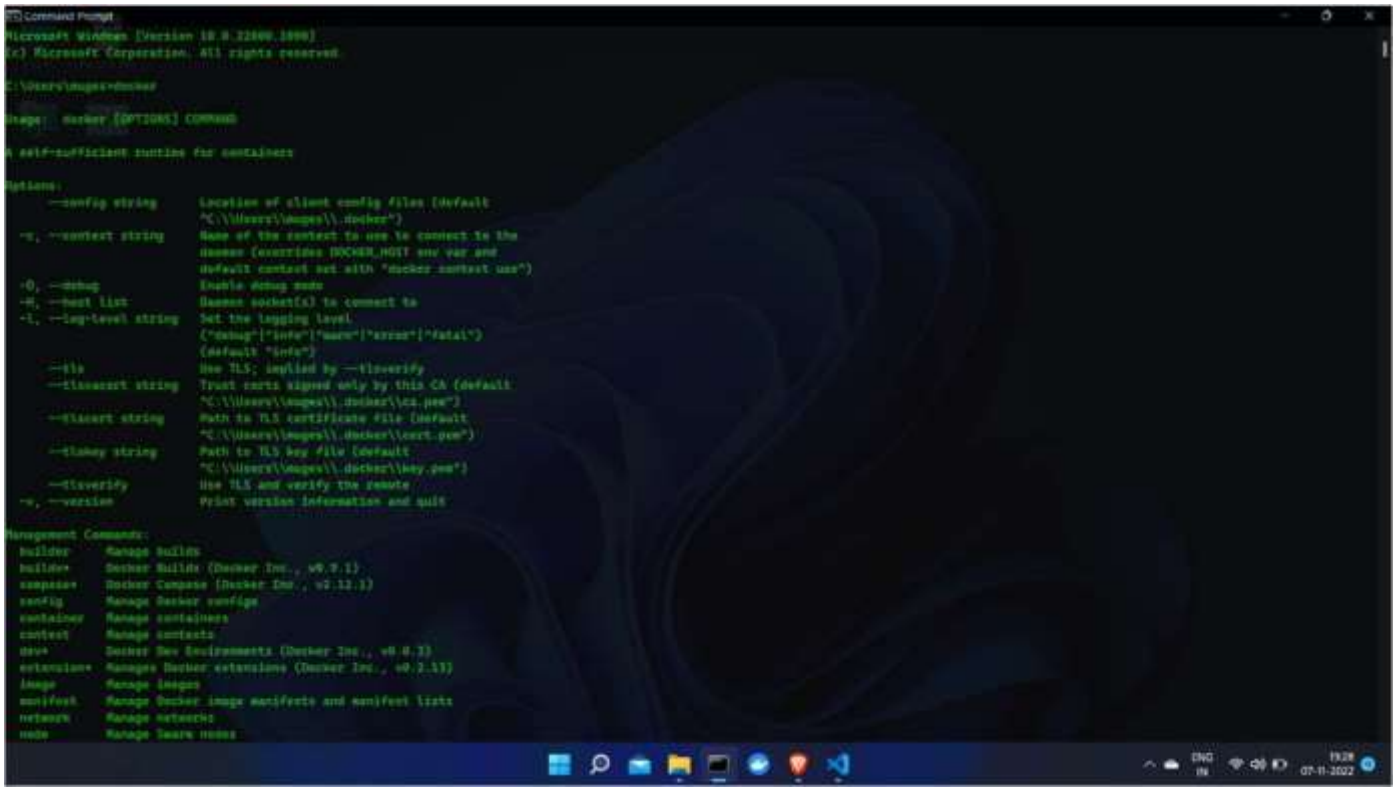
DOCKER CLI INSTALLATION

Docker CLI Installation:

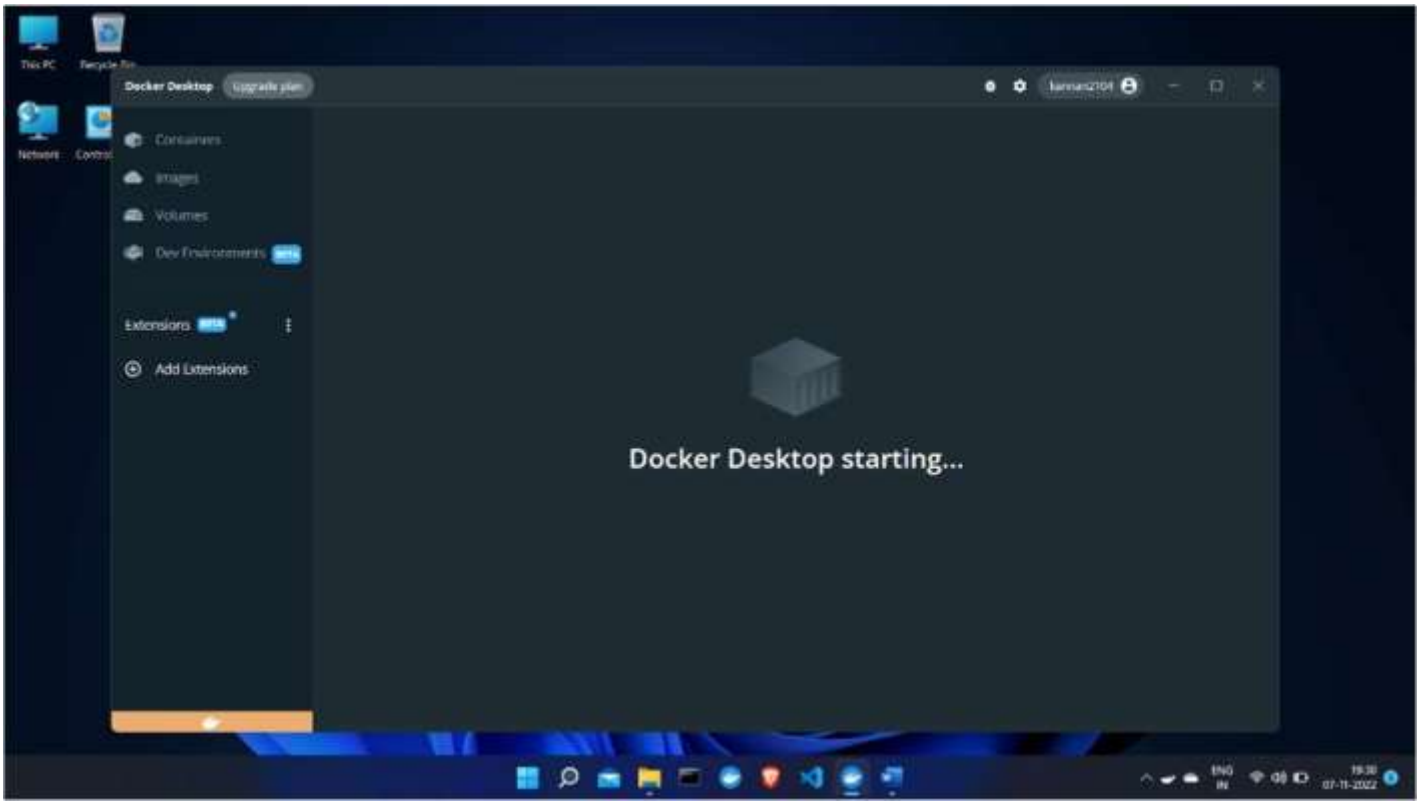
Command

>> start /w “” “Docker Desktop Installer.exe” install

Docker CLI Installation :



Docker Desktop:

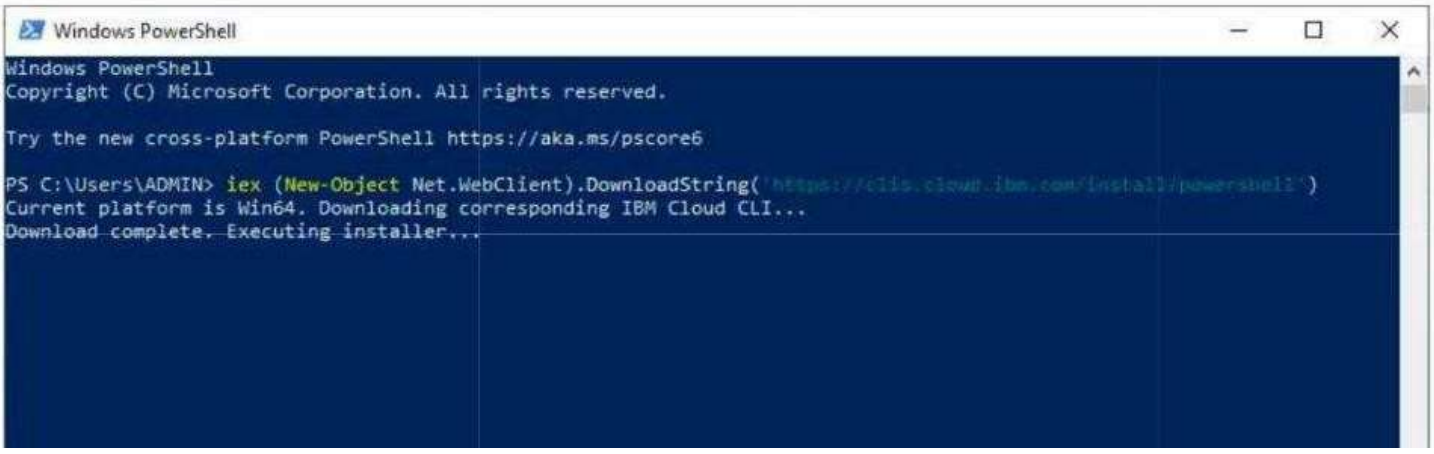


IBM CLOUD CLI INSTALLATION

RUN THE FOLLOWING COMMAND AS ADMINISTRATOR IN POWERSHELL:

Command :

iex(New-Object Net.WebClient).DownloadString('https://clis.cloud.ibm.com/install/powershell')

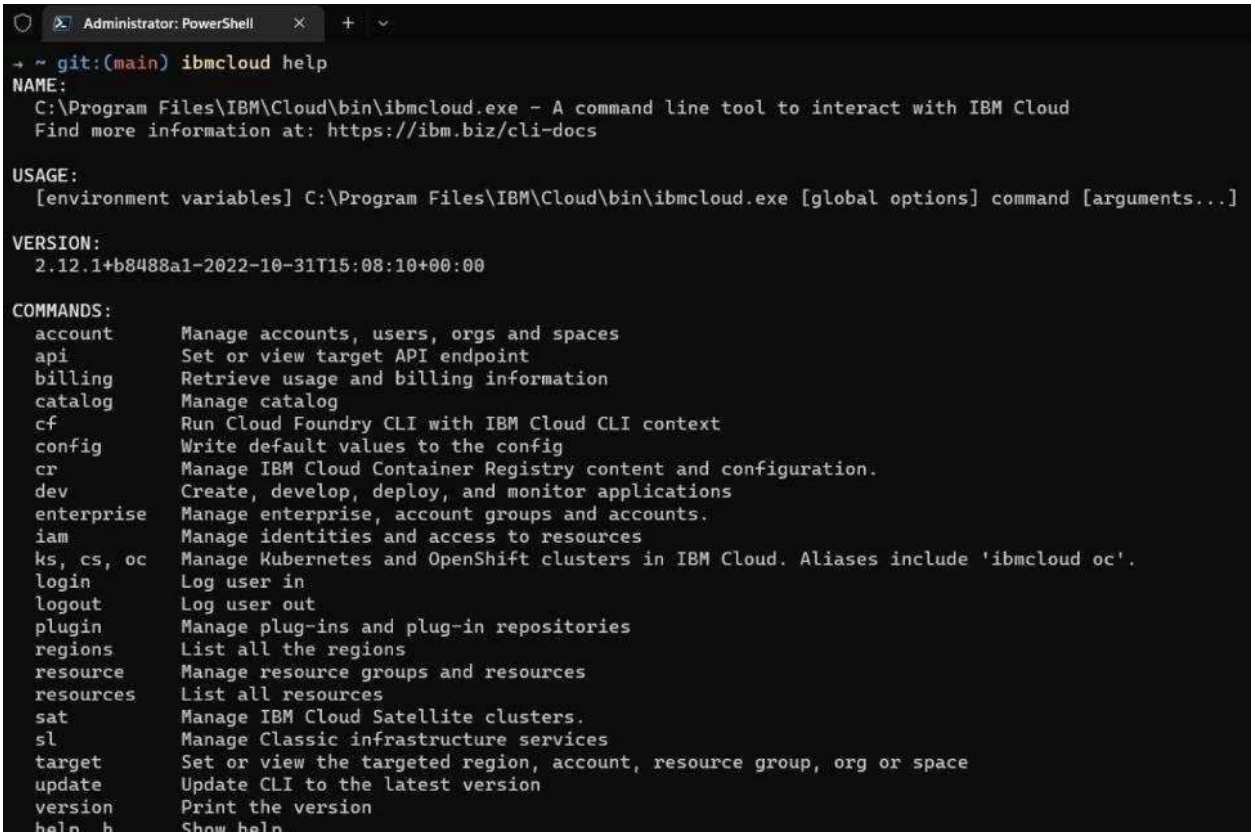


CHECK IF IBM CLOUD CLI IS CORRECTLY INSTALLED:

Command :

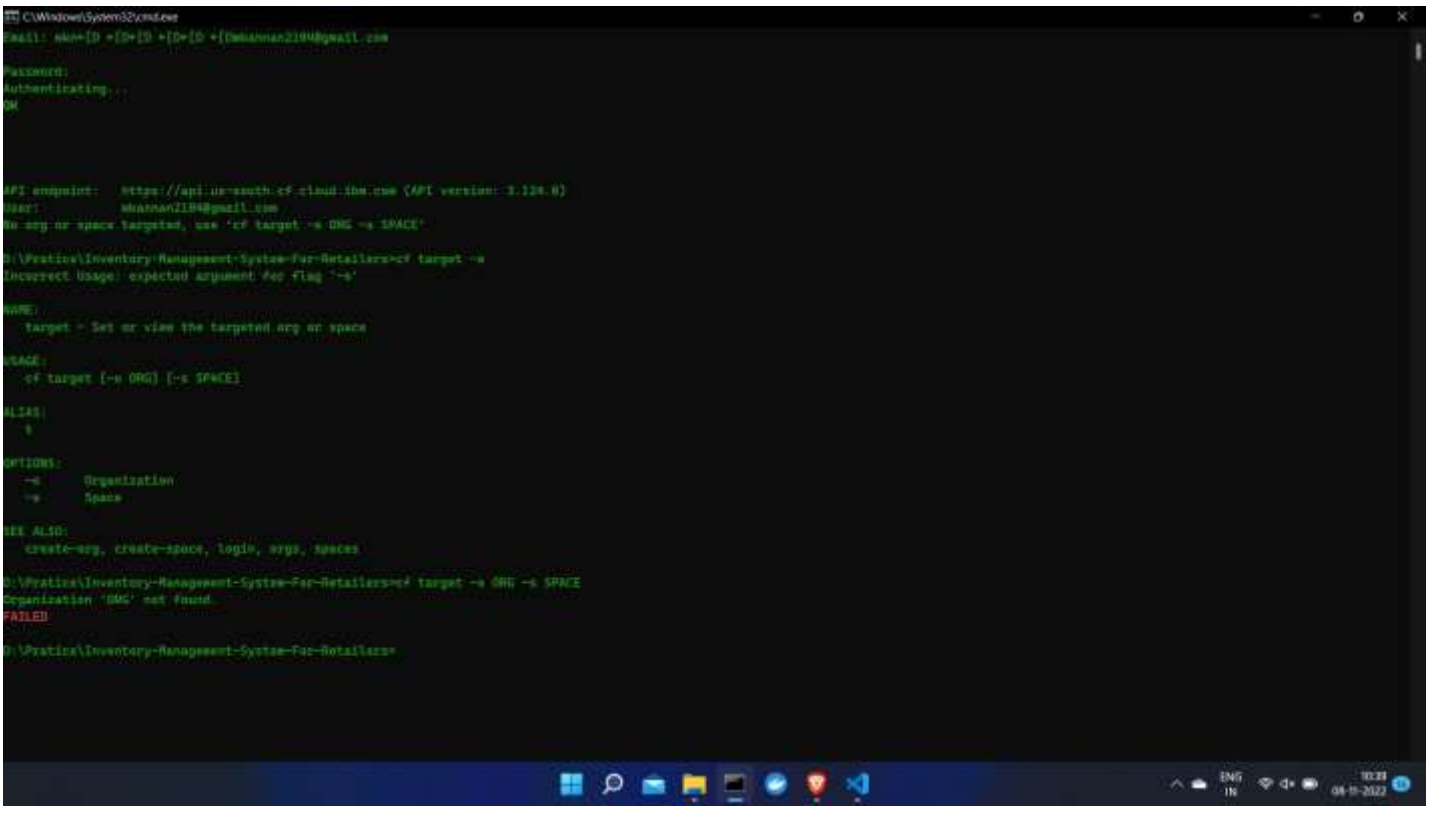
ibmcloud

help



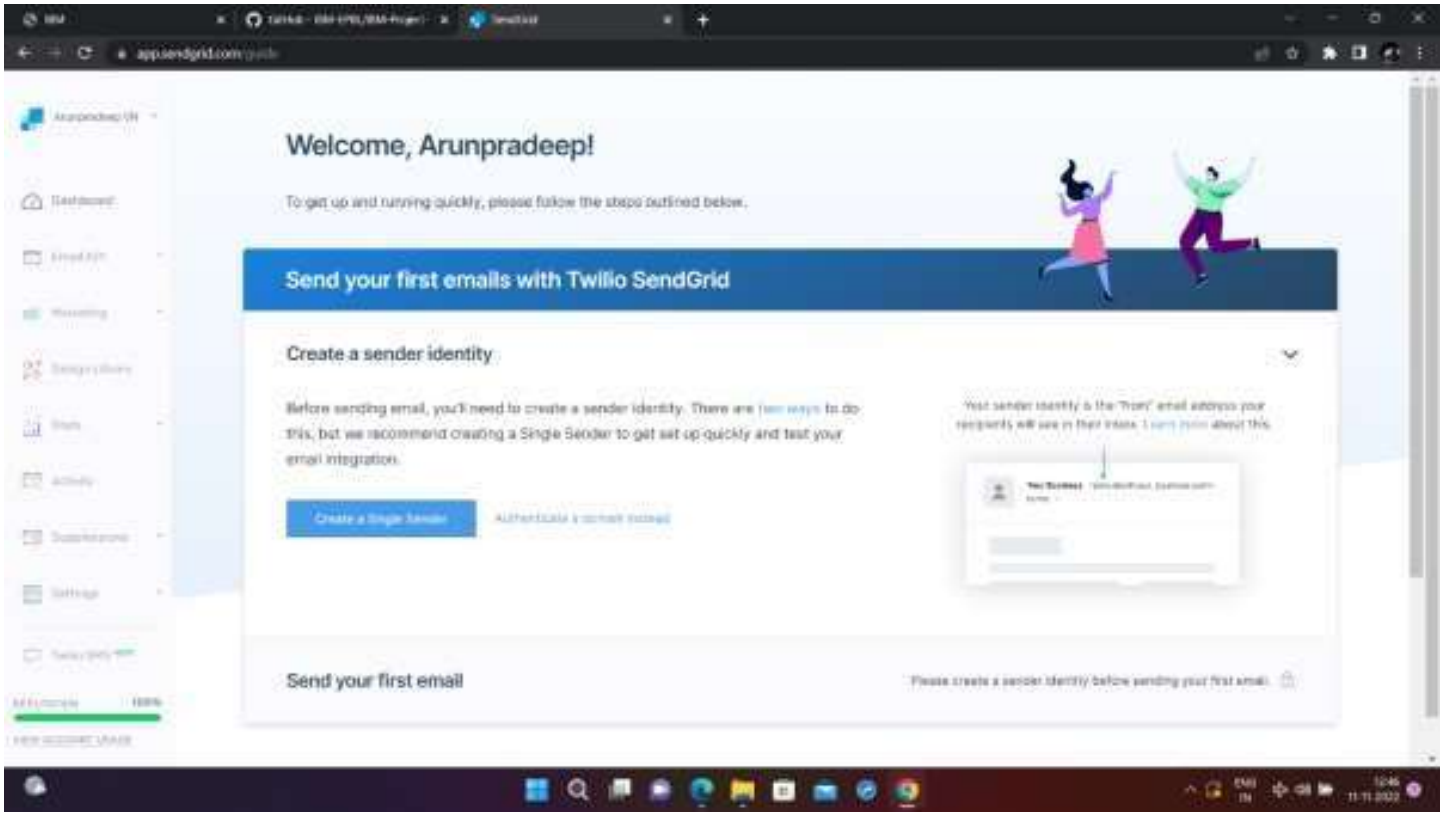
CONFIGURE OUR ENVIRONMENT:

Command : ibmcloud login

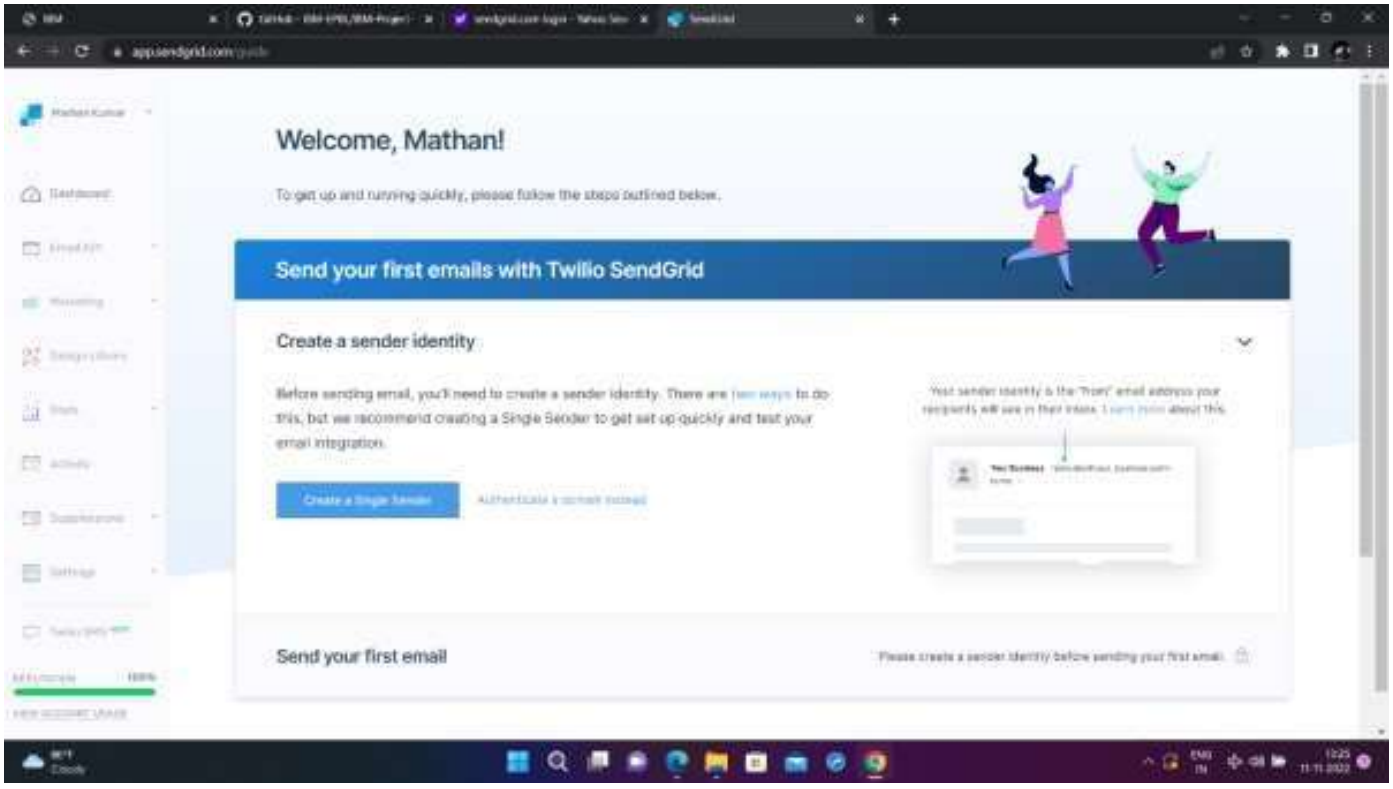


SENDGRID ACCOUNT CREATION

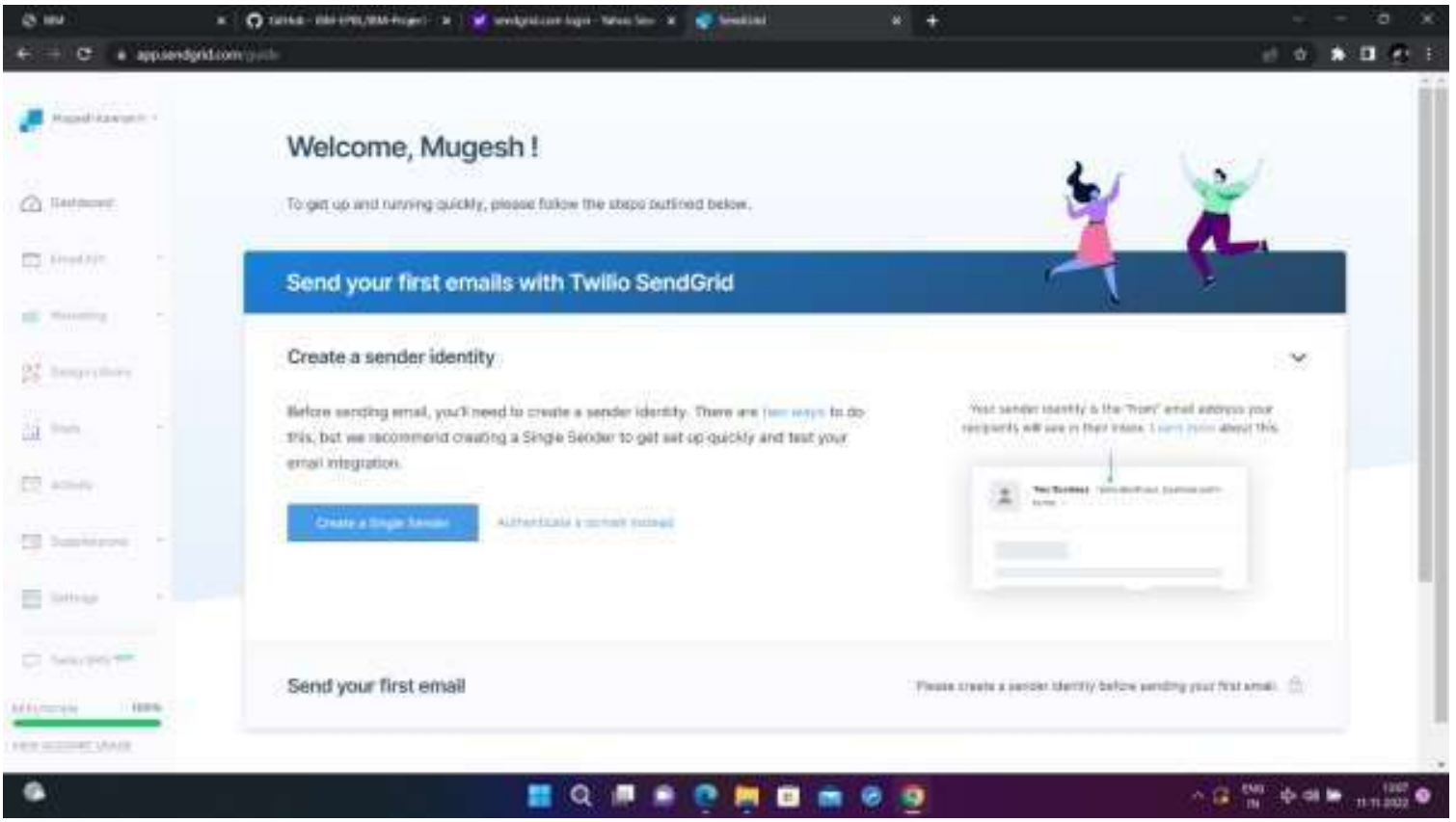
Arunpradeep



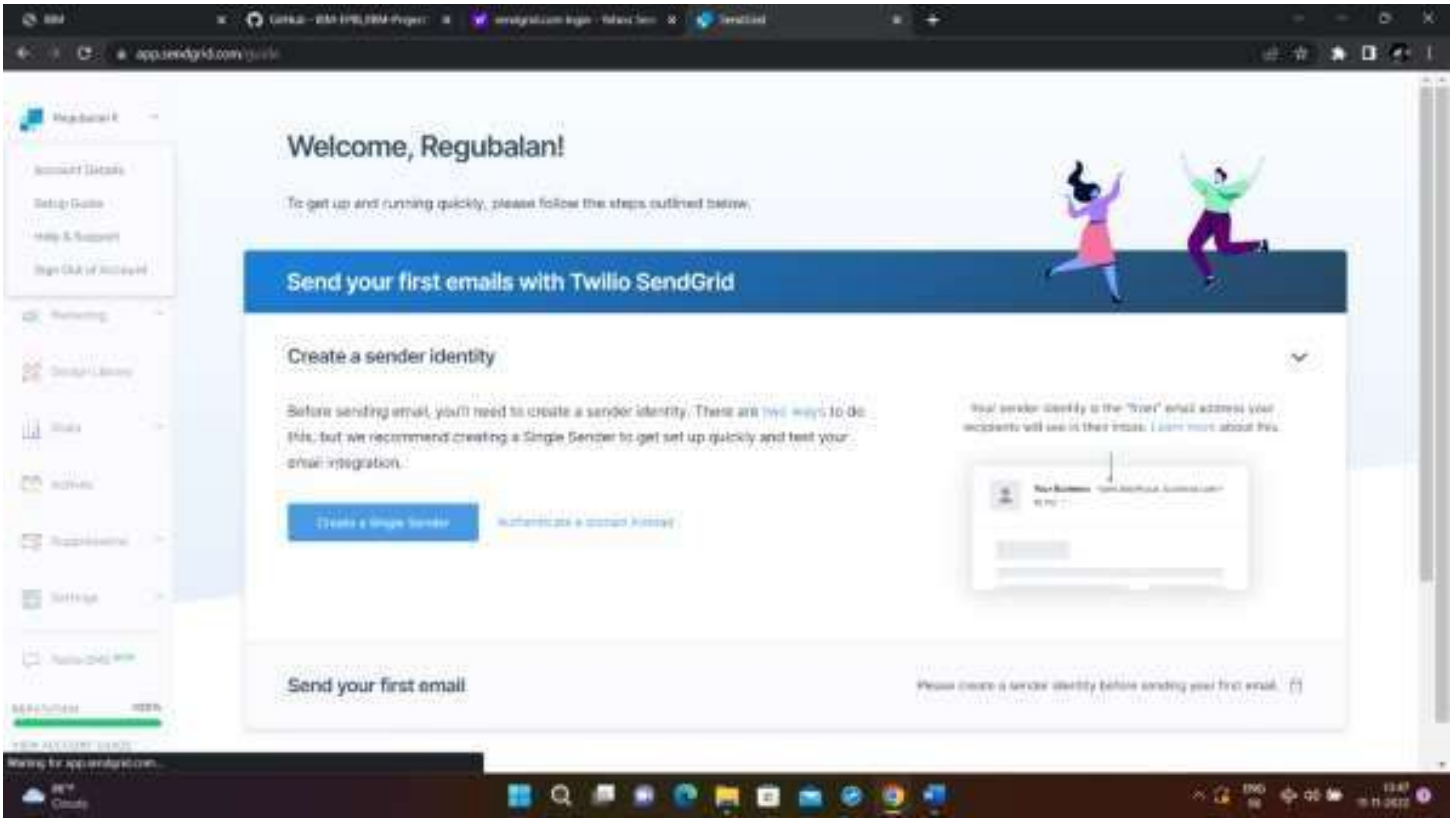
Mathan Kumar



Mugesh Kannan

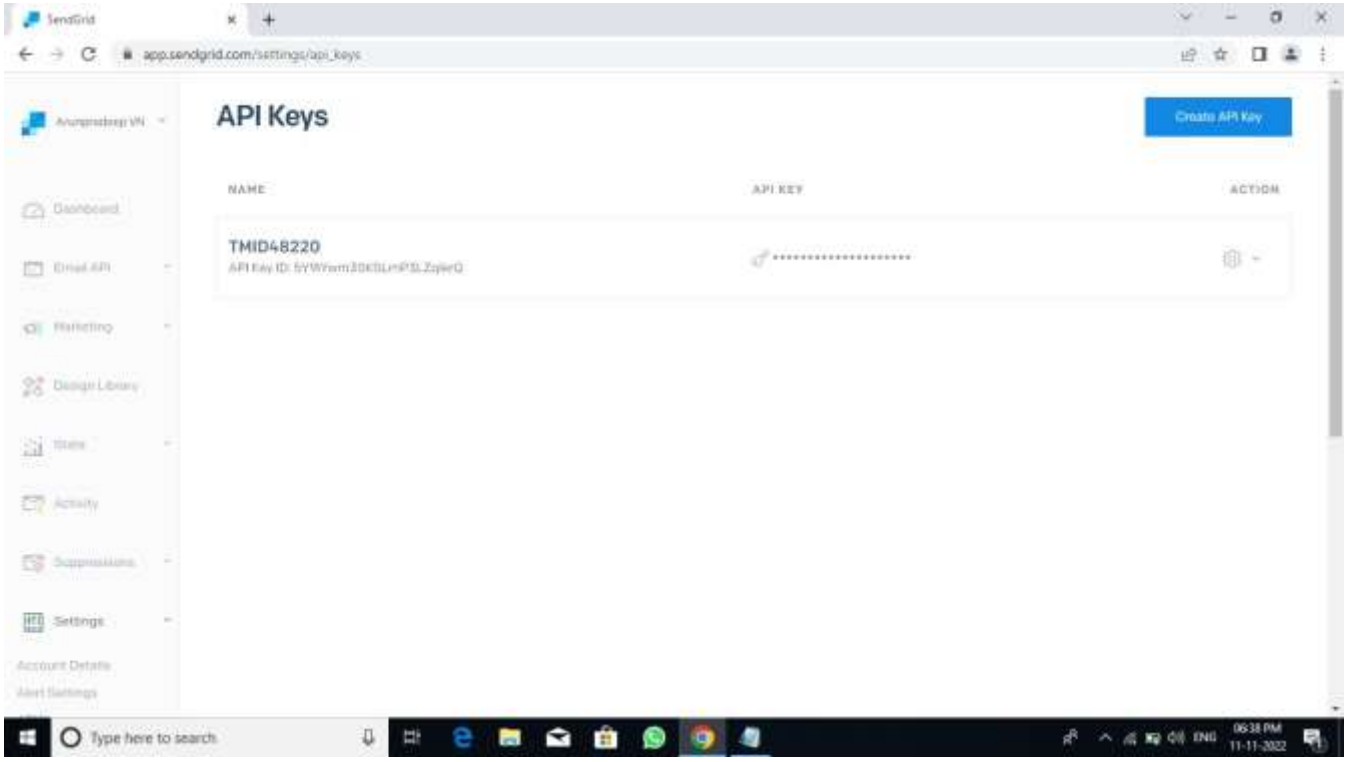


Regubalan

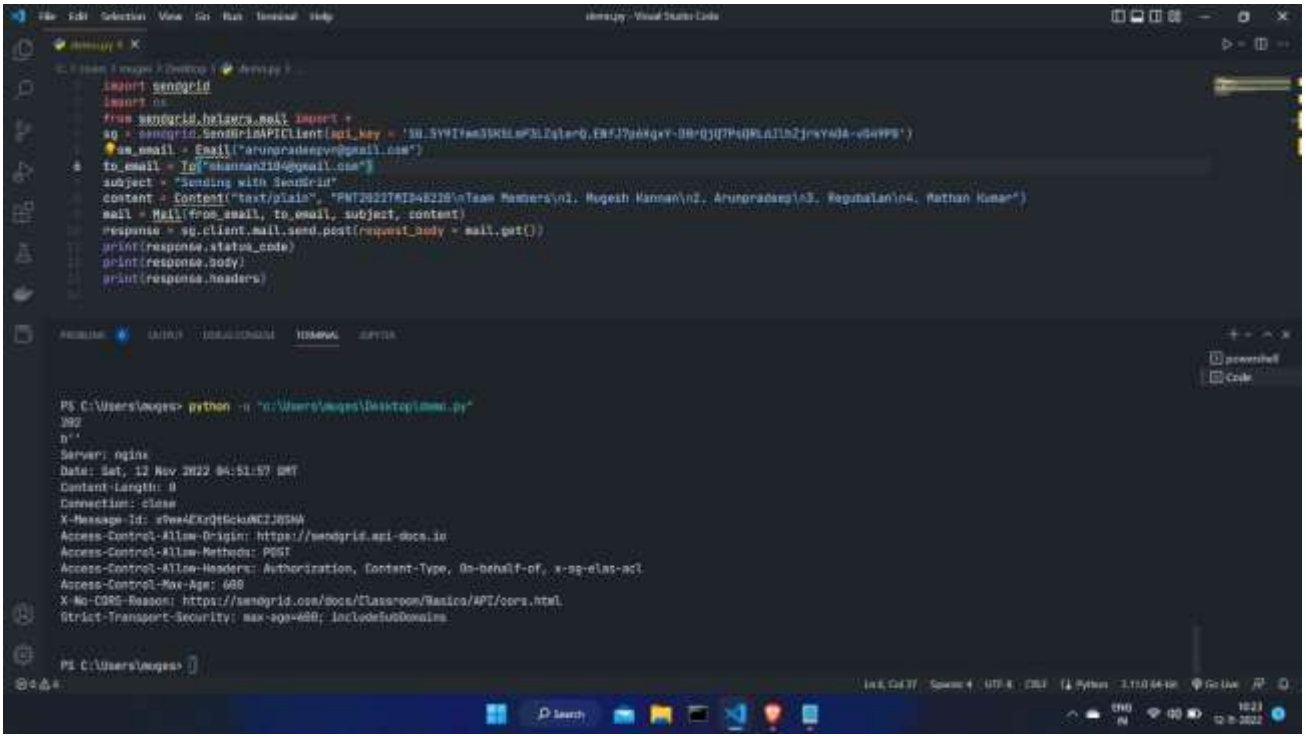


SENDGRID INTEGRATION WITH PYTHON CODE

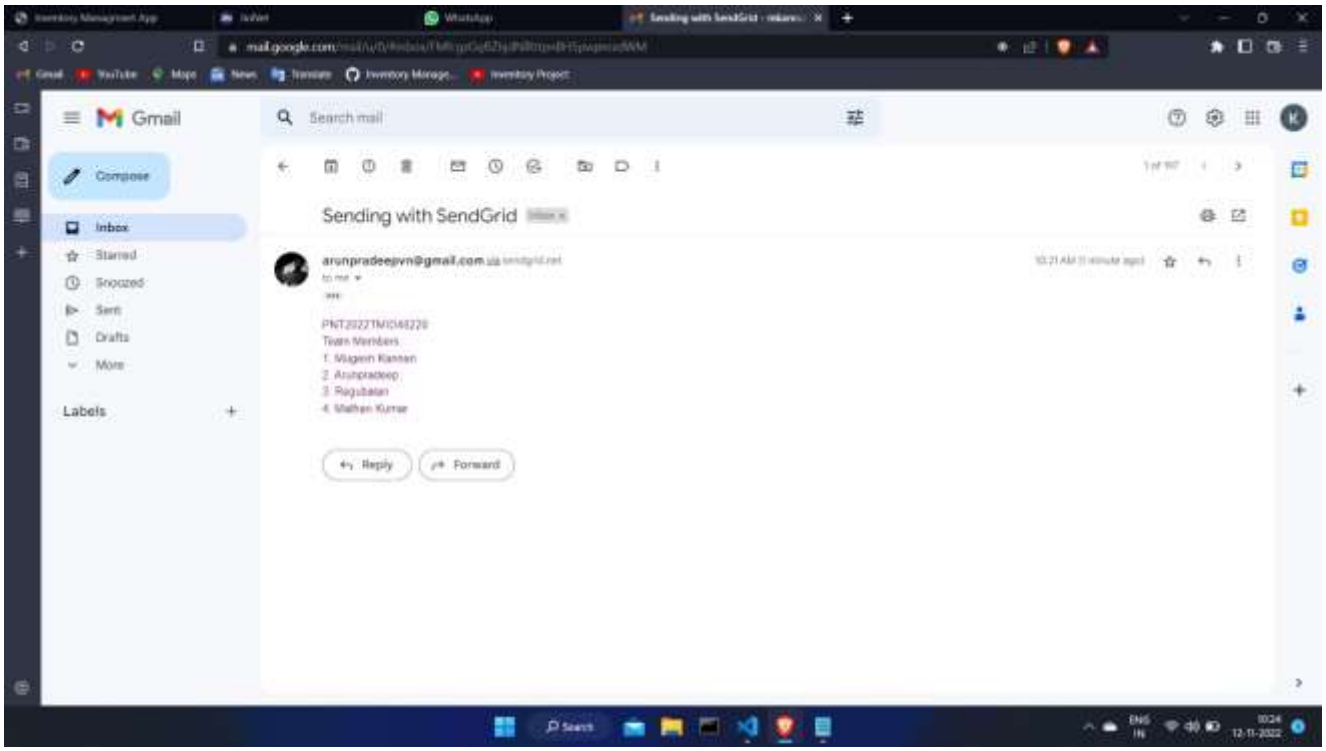
Creating an API Key



Running the python file through the terminal

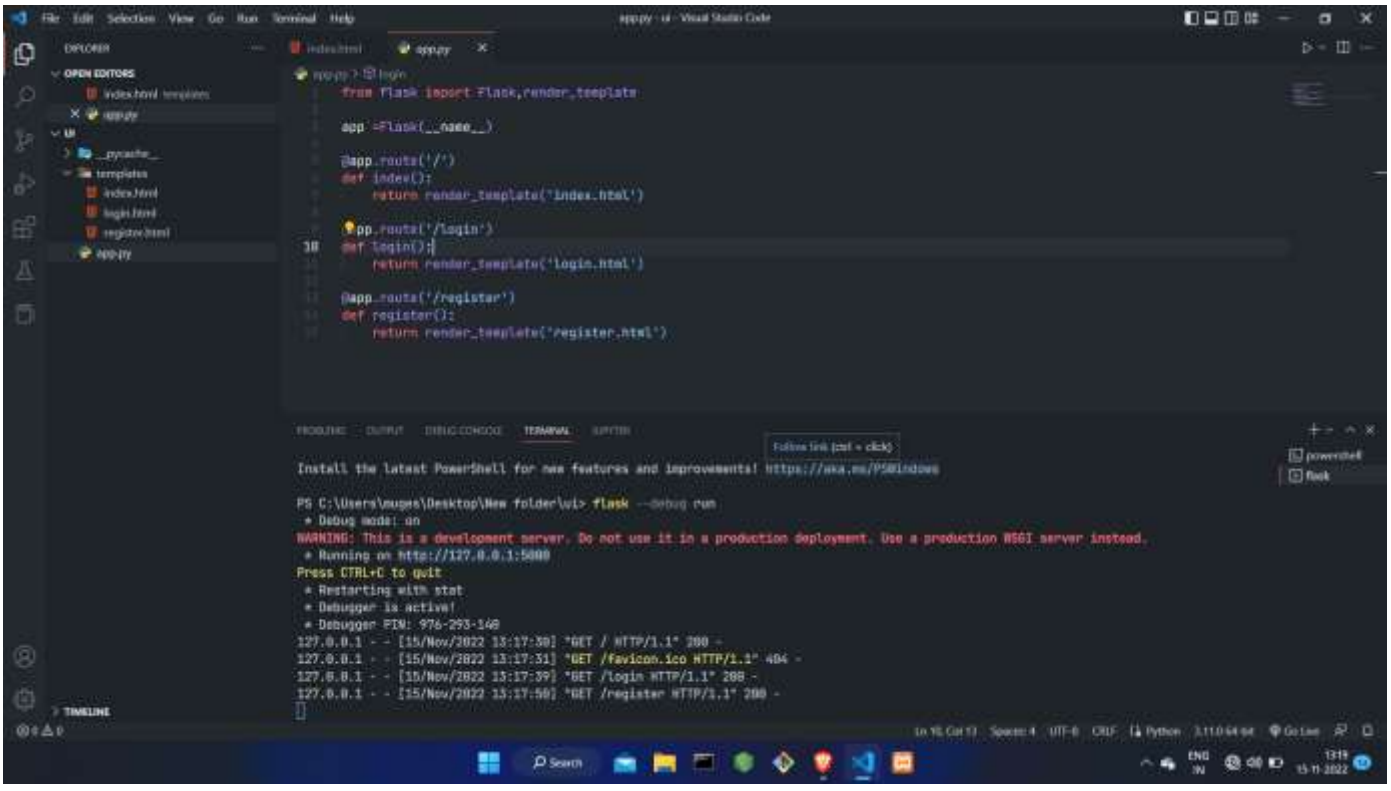


Test mail received via SendGrid

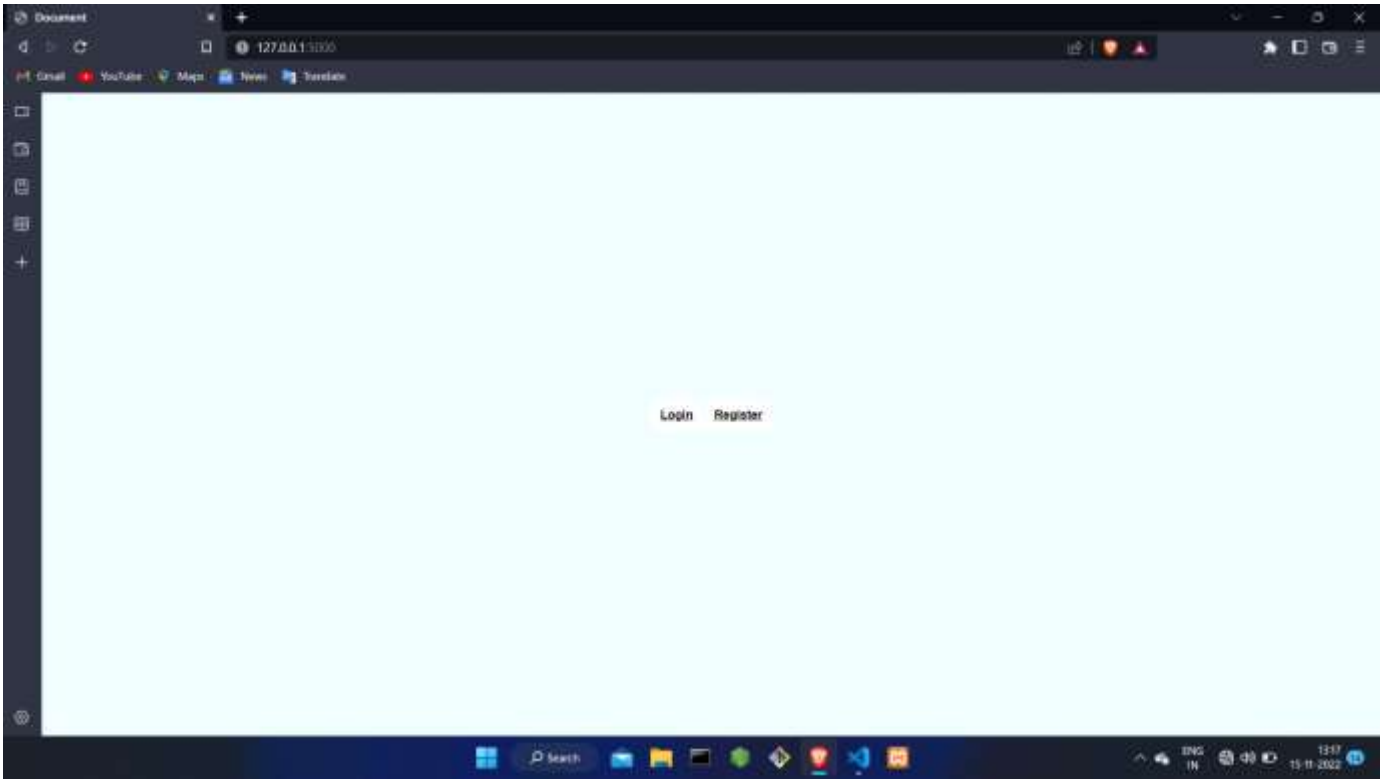


CREATE UI TO INTERACT WITH APPLICATOIN

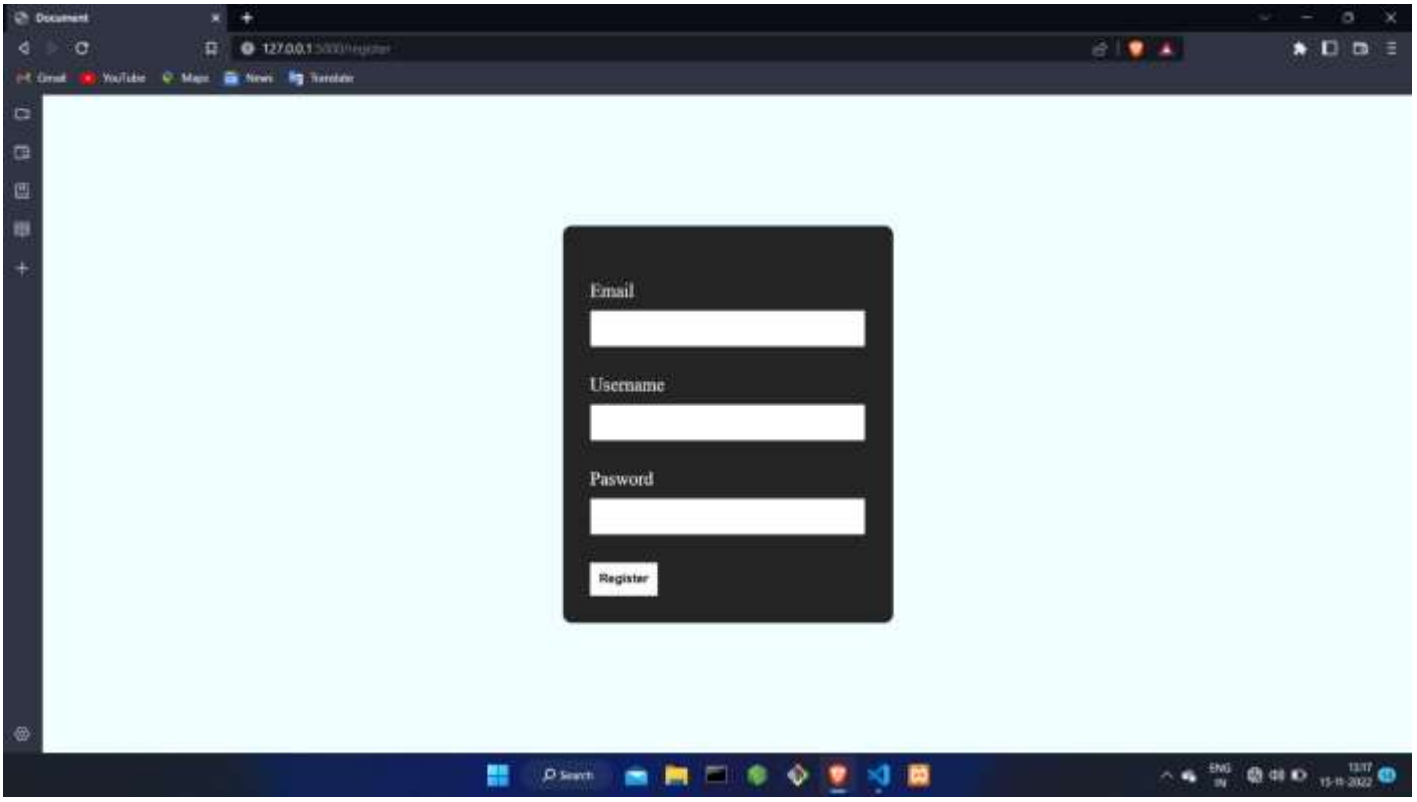
Simple User Interface Code



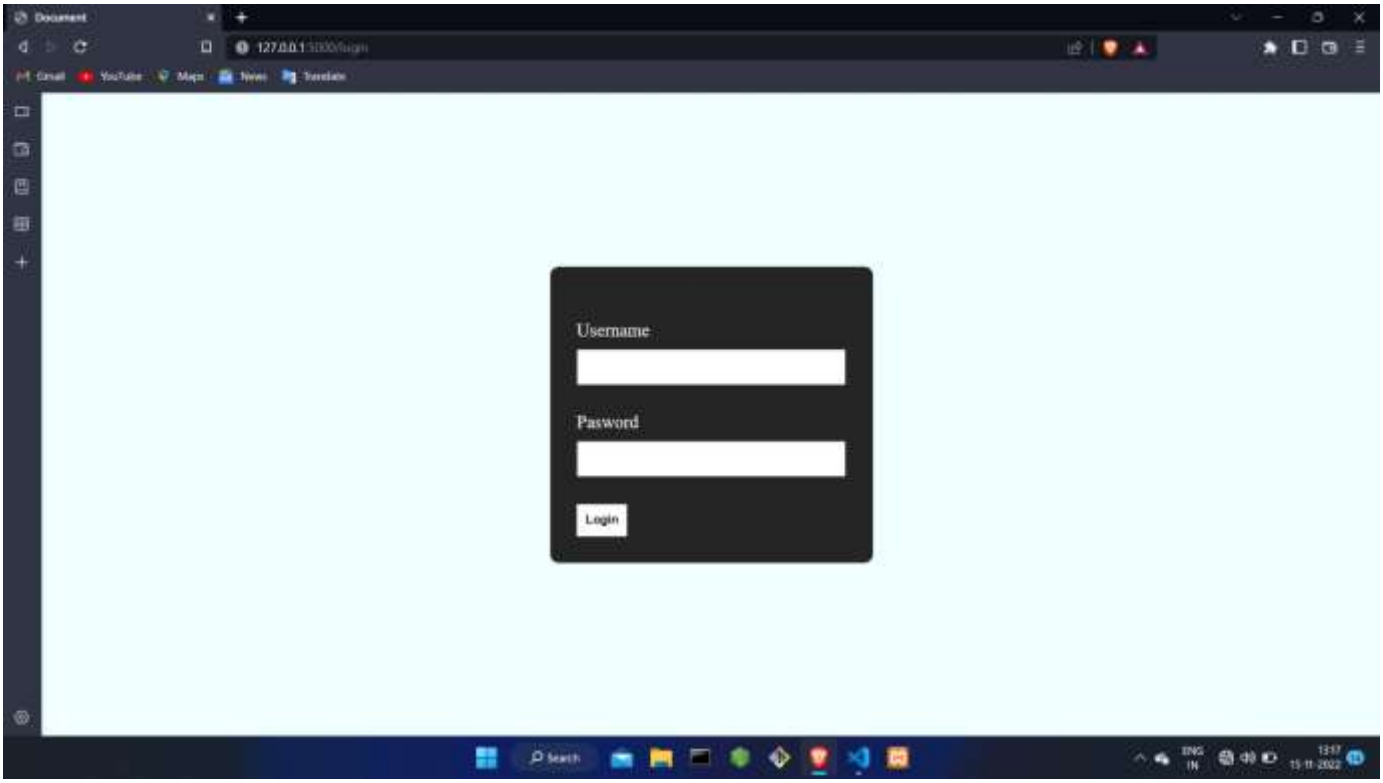
Index page



Registration Page

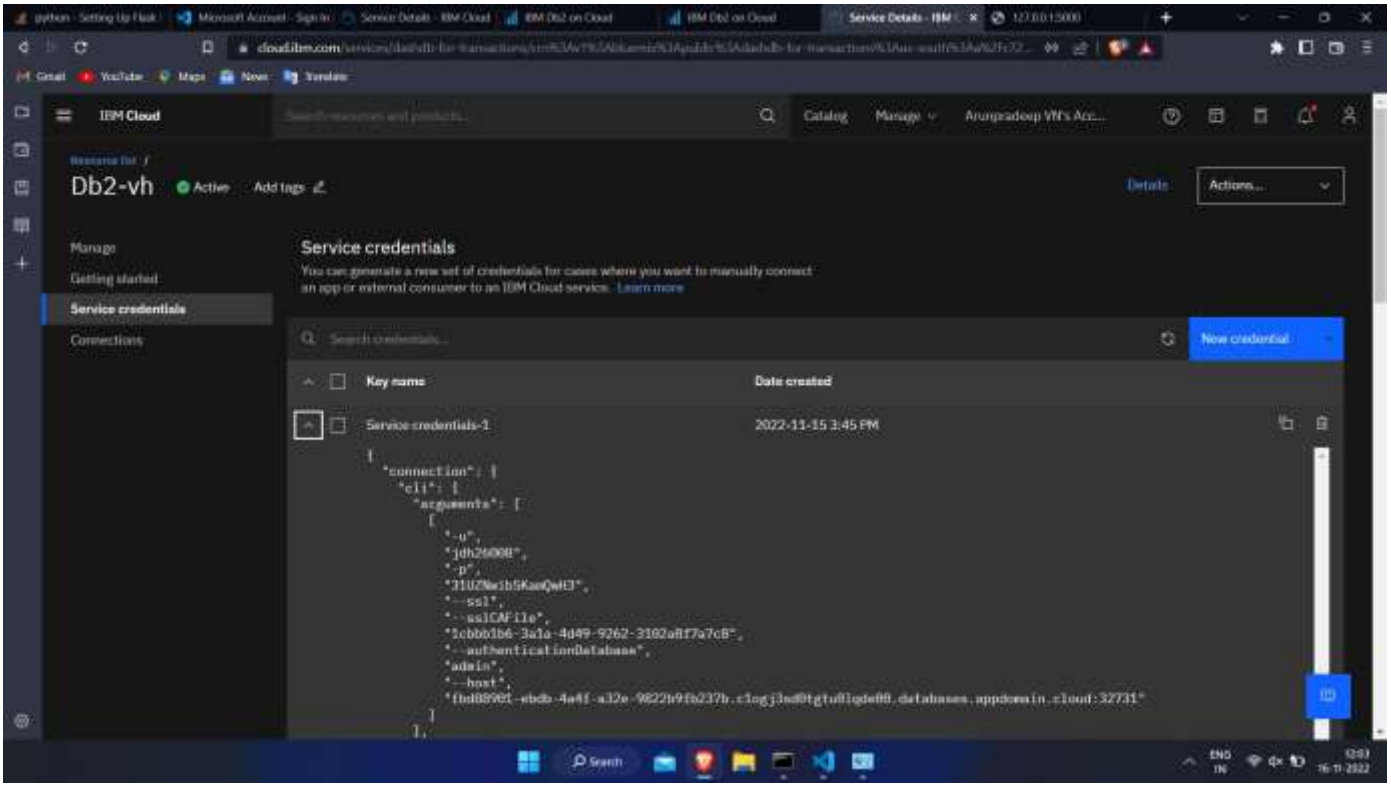


Login Page

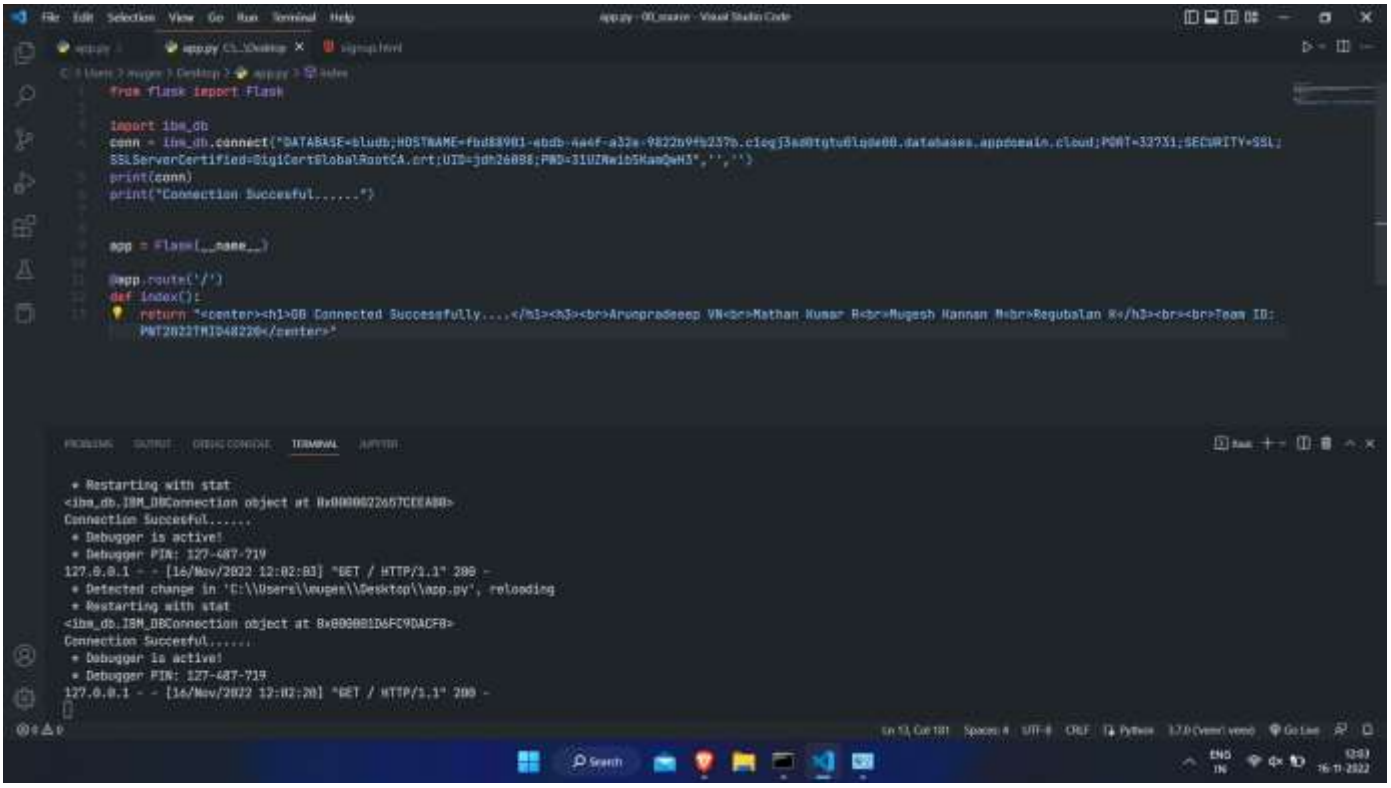


IBM DB2 CREATION AND CONNECTION WITH PYTHON

Creating IBM DB2



Database connection using python



Output: Connection Successful