

Project Development Phase Works Done on Each Sprints

Date	14.11.2022
Team ID	PNT2022TMID01394
Project Name	Inventory Management System for Retailers

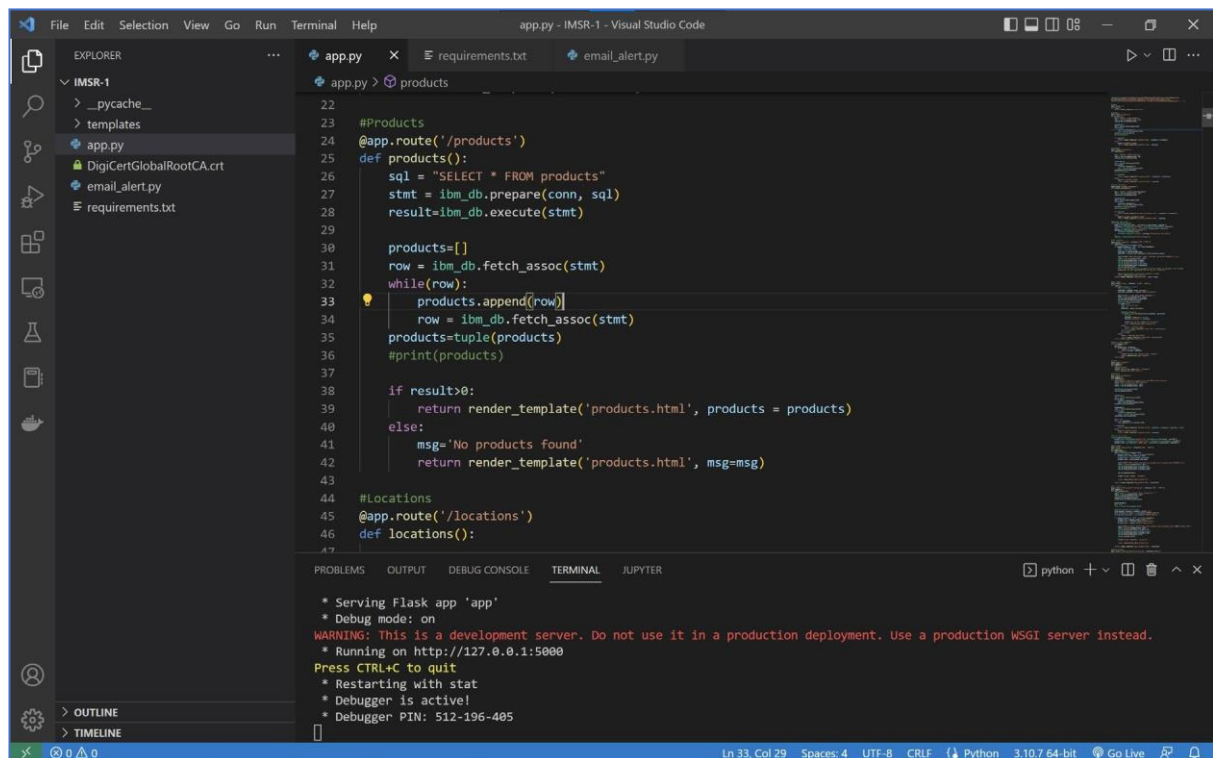
Introduction:

1. Sprint 1 – Backend
2. Sprint 2 – Frontend
3. Sprint 3 – IBM Cloud Integration + Integration of SendGrid
4. Sprint 4 – Deploying the application using Docker and Kubernetes

Sprint 1 – Backend:

All the routes to each page and APIs are created.

Example: (For Products page)



```
File Edit Selection View Go Run Terminal Help
app.py - IMSR-1 - Visual Studio Code

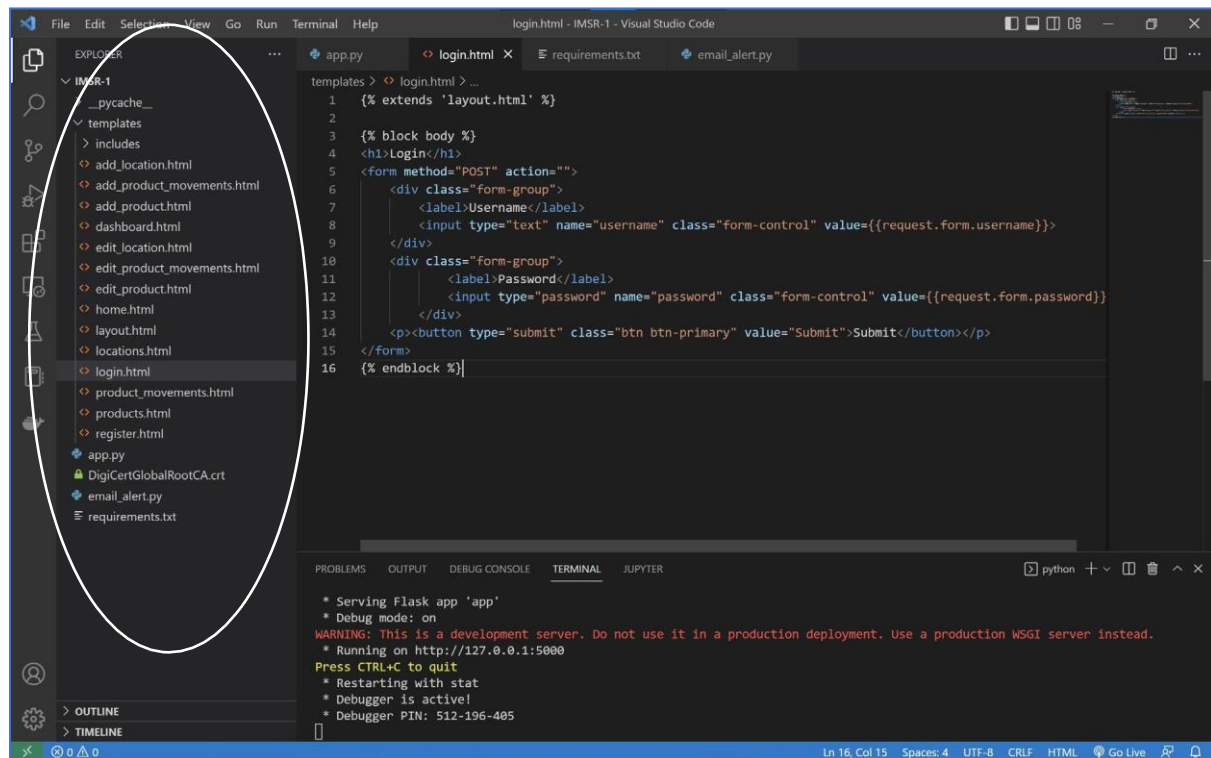
EXPLORER
IMSR-1
  > __pycache__
  > templates
  app.py
  DigiCertGlobalRootCA.crt
  email_alert.py
  requirements.txt

app.py
22
23 #Products
24 @app.route('/products')
25 def products():
26     sql = "SELECT * FROM products"
27     stmt = ibm_db.prepare(conn, sql)
28     result=ibm_db.execute(stmt)
29
30     products=[]
31     row = ibm_db.fetch_assoc(stmt)
32     while(row):
33         products.append(row)
34         row = ibm_db.fetch_assoc(stmt)
35     products=tuple(products)
36     #print(products)
37
38     if result>0:
39         return render_template('products.html', products = products)
40     else:
41         msg='No products found'
42         return render_template('products.html', msg=msg)
43
44 #Locations
45 @app.route('/locations')
46 def locations():
47
TERMINAL
python
* Serving Flask app 'app'
* Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on http://127.0.0.1:5000
Press CTRL+C to quit
* Restarting with stat
* Debugger is active!
* Debugger PIN: 512-196-405
```

Sprint 2 – Frontend:

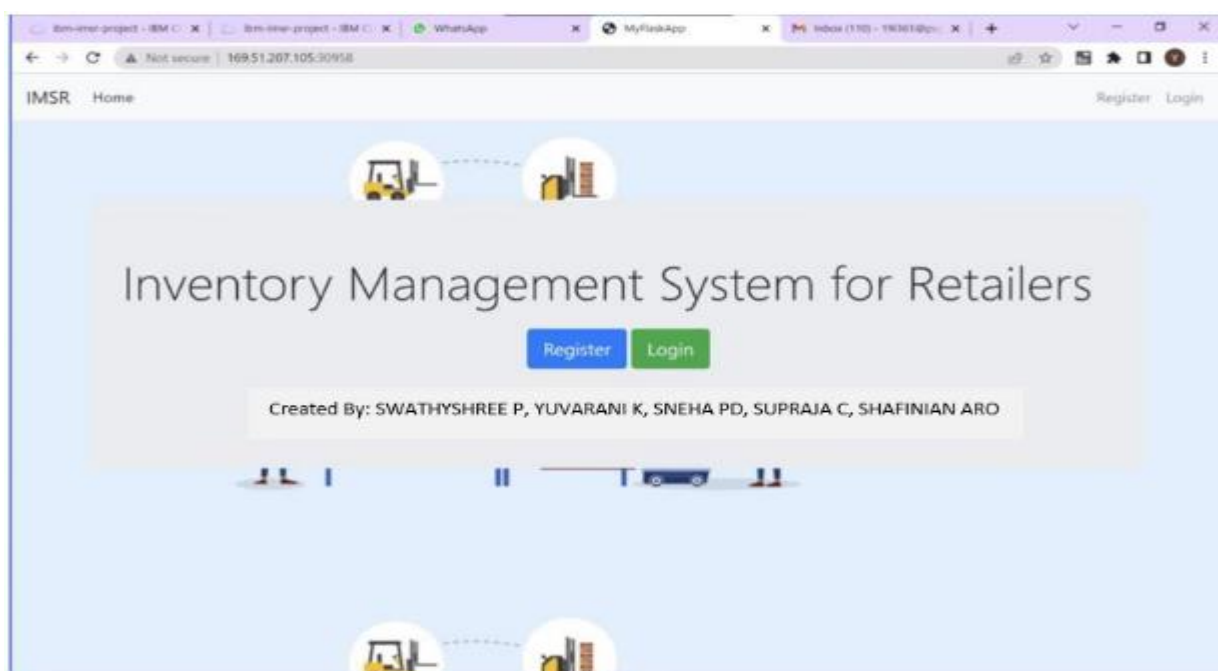
The frontend is written using HTML, CSS (using Bootstrap) and JavaScript for all the pages to which the routes created in Sprint 1.

For Example: (The Hierarchy of different pages and the code for login page)

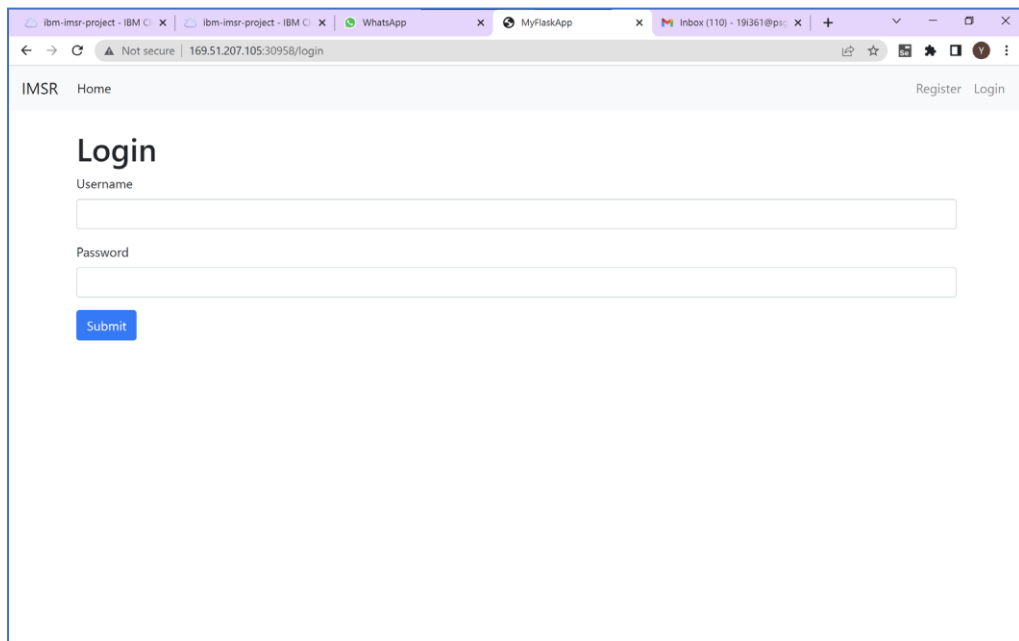


Sample FrontEnd Pages:

Home Page:



Login Page:



A screenshot of a web browser displaying the login page of a project named 'ibm-imrs-project'. The browser's address bar shows the URL '169.51.207.105:30958/login'. The page has a light gray header with 'IMSR' and 'Home' on the left, and 'Register' and 'Login' on the right. The main content area is titled 'Login' in a large, bold font. Below the title are two input fields: 'Username' and 'Password'. A blue 'Submit' button is positioned below the password field.

ibm-imrs-project - IBM C X ibm-imrs-project - IBM C X WhatsApp X MyFlaskApp X Inbox (110) - 19361@ps: X

← → ↻ Not secure | 169.51.207.105:30958/login

IMSR Home Register Login

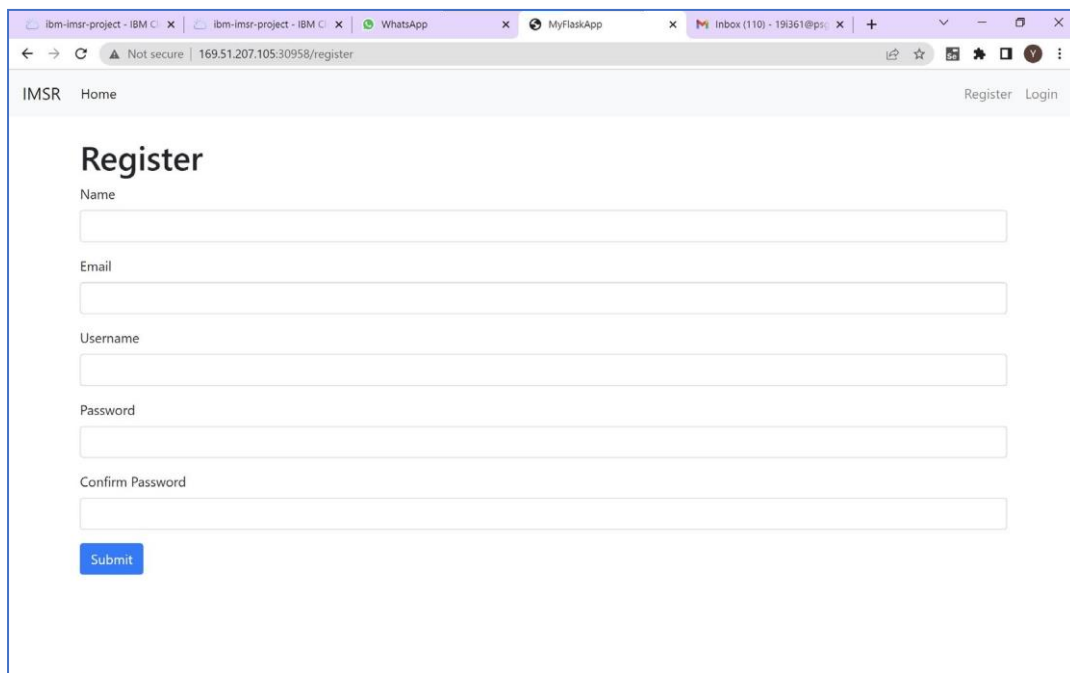
Login

Username

Password

Submit

Register Page:



A screenshot of a web browser displaying the register page of the same project. The browser's address bar shows the URL '169.51.207.105:30958/register'. The page has a light gray header with 'IMSR' and 'Home' on the left, and 'Register' and 'Login' on the right. The main content area is titled 'Register' in a large, bold font. Below the title are five input fields: 'Name', 'Email', 'Username', 'Password', and 'Confirm Password'. A blue 'Submit' button is positioned below the 'Confirm Password' field.

ibm-imrs-project - IBM C X ibm-imrs-project - IBM C X WhatsApp X MyFlaskApp X Inbox (110) - 19361@ps: X

← → ↻ Not secure | 169.51.207.105:30958/register

IMSR Home Register Login

Register

Name

Email

Username

Password

Confirm Password

Submit

Products Page:

ibm-imsr-project - IBM Cxibm-imsr-project - IBM CxWhatsAppMyFlaskAppInbox (110) - 19361@ps: x

Not secure | 169.51.207.105:30958/products

IMSRHomeProductsLocationProduct MovementsLogoutDashboard

Products

Add Product

Product ID	Product Cost	Product Quantity		
Bedspreads	600	100	Edit	Delete
Cutlery	1500	495	Edit	Delete
Shampoo	50	520	Edit	Delete

Product Movements Page:

ibm-imsr-project - IBM Cxibm-imsr-project - IBM CxWhatsAppMyFlaskAppInbox (110) - 19361@ps: x

Not secure | 169.51.207.105:30958/product_movements

IMSRHomeProductsLocationProduct MovementsLogoutDashboard

Product Movements

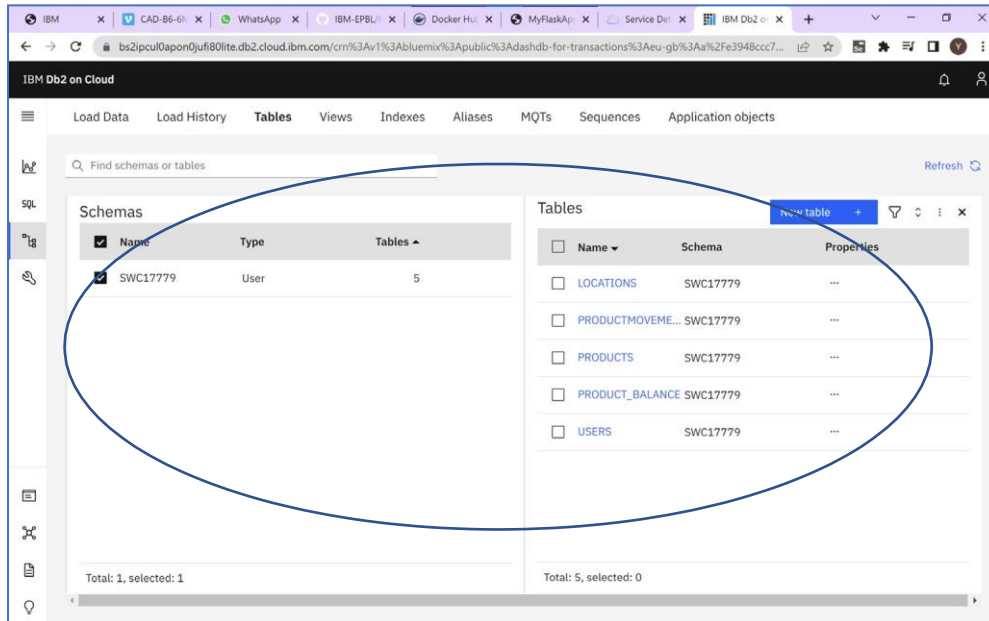
Add Product Movements

Movement ID	Time	From Location	To Location	Product ID	Quantity	
41	2022-11-14 04:32:57.213981	Chennai	Main Inventory	Shampoo	20	Delete
42	2022-11-14 04:51:47.519001	Chennai	Karnataka	Shampoo	1553	Delete
40	2022-11-14 03:57:52.649656	Bangalore	Chennai	Shampoo	100	Delete

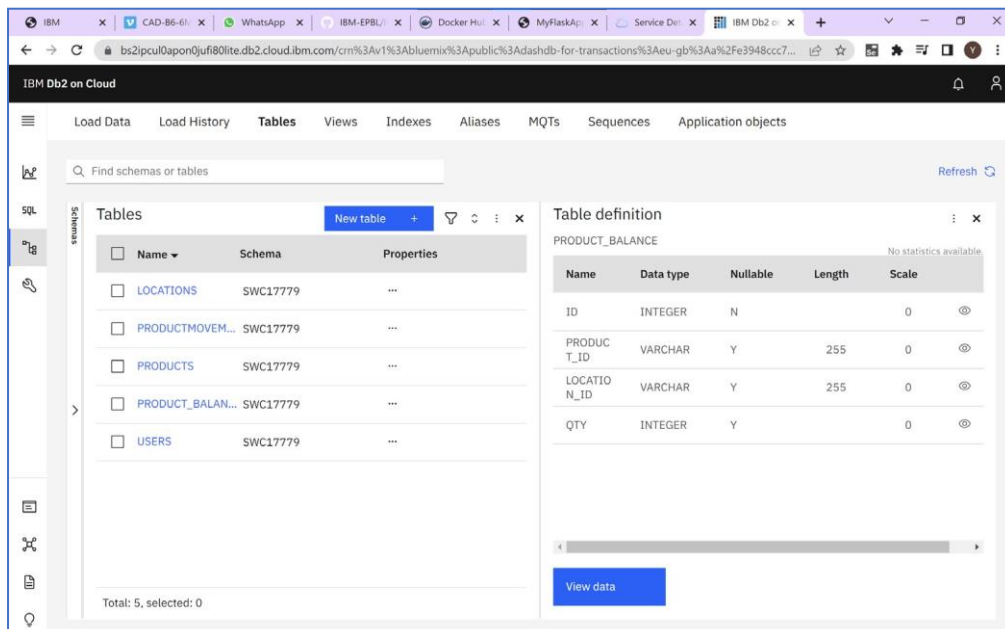
Sprint 3 - IBM Cloud Integration + Integration of SendGrid:

IBM Cloud Integration:

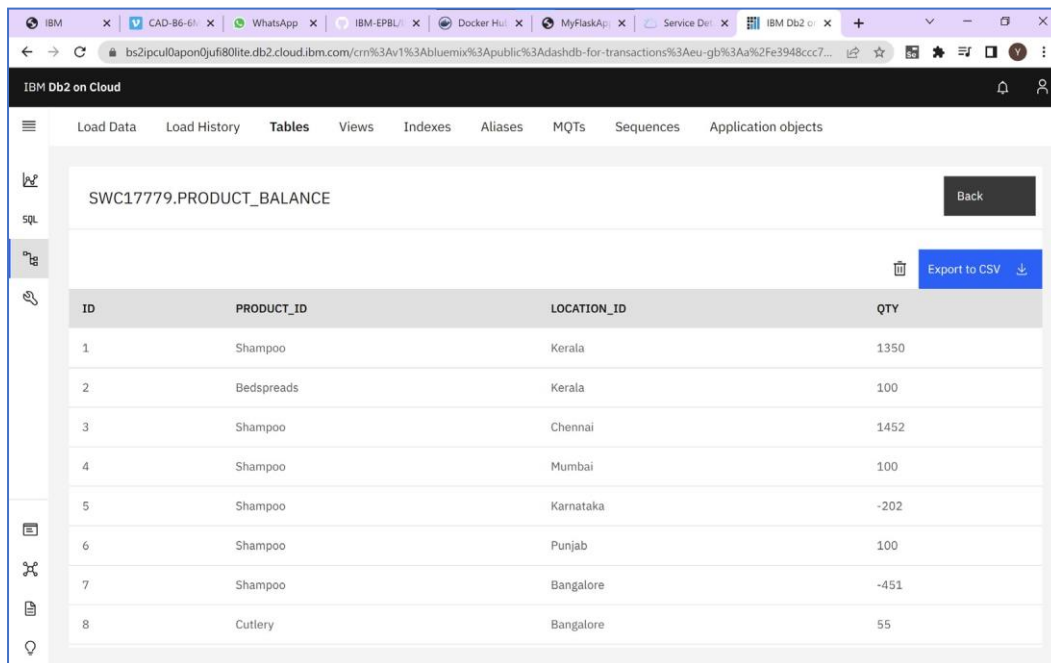
5 tables created for our project:



Schema of the particular table (For Example: Product_Balance)



Data of a particular table (For Example: Product_Balance)



The screenshot shows the IBM Db2 on Cloud console interface. The table 'SWC17779.PRODUCT_BALANCE' is displayed with the following data:

ID	PRODUCT_ID	LOCATION_ID	QTY
1	Shampoo	Kerala	1350
2	Bedspreads	Kerala	100
3	Shampoo	Chennai	1452
4	Shampoo	Mumbai	100
5	Shampoo	Karnataka	-202
6	Shampoo	Punjab	100
7	Shampoo	Bangalore	-451
8	Cutlery	Bangalore	55

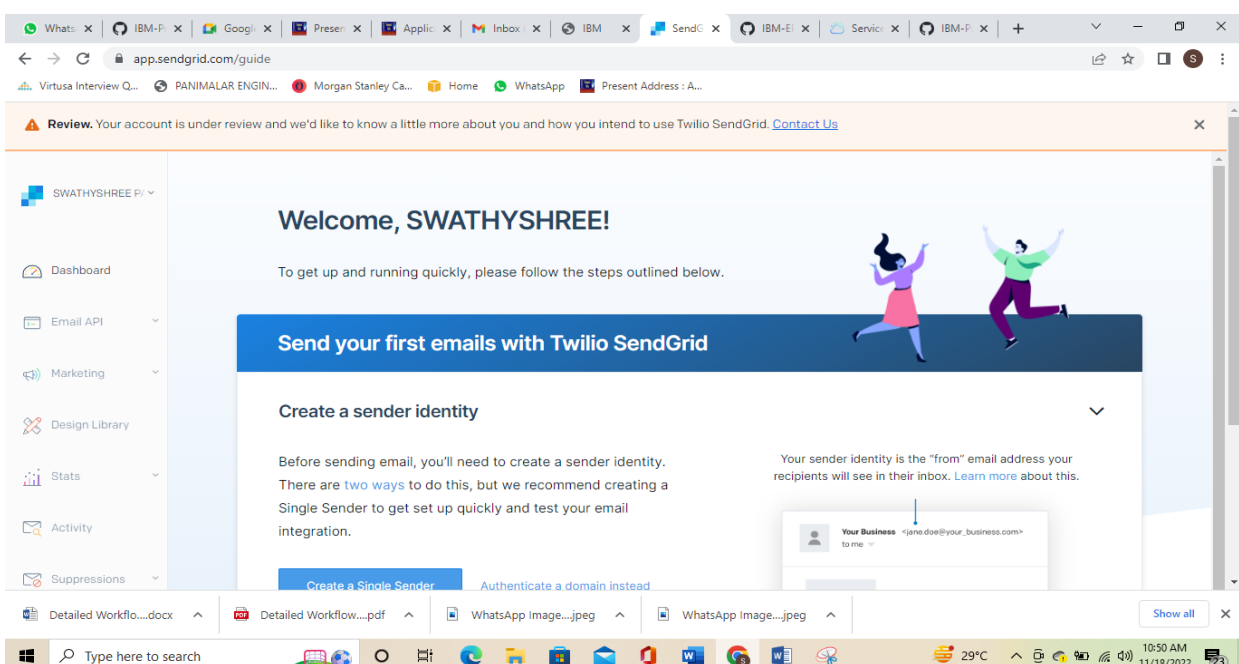
Code for Connection of IBM Database,

```
conn=ibm_db.connect("DATABASE=bludb;HOSTNAME=55fbc997-9266-4331-afd3-888b05e734c0.bs2io90l08kqb1od8lcg.databases.appdomain.cloud;PORT=;SECURITY=SSL;SSLServerCertificate=DigiCertGlobalRootCA.crt;UID=;PWD=;",',','')
```

Note: DigiCertGlobalRootCA.crt should be downloaded and configured within the project folder.

SendGrid Integration:

Creation of SendGrid account:



The screenshot shows the Twilio SendGrid welcome page. The page includes a sidebar with navigation links: Dashboard, Email API, Marketing, Design Library, Stats, Activity, and Suppressions. The main content area displays a welcome message for 'SWATHYSHREE P.' and instructions on how to get up and running quickly. A prominent blue banner reads 'Send your first emails with Twilio SendGrid'. Below this, a section titled 'Create a sender identity' explains that a sender identity is needed before sending emails. It offers two ways to create a sender identity: 'Create a Single Sender' and 'Authenticate a domain instead'. A sample email address is shown: 'Your Business <jane.doe@your_business.com> to me'.

Code for email alert:

The screenshot displays the Visual Studio Code interface with the following components:

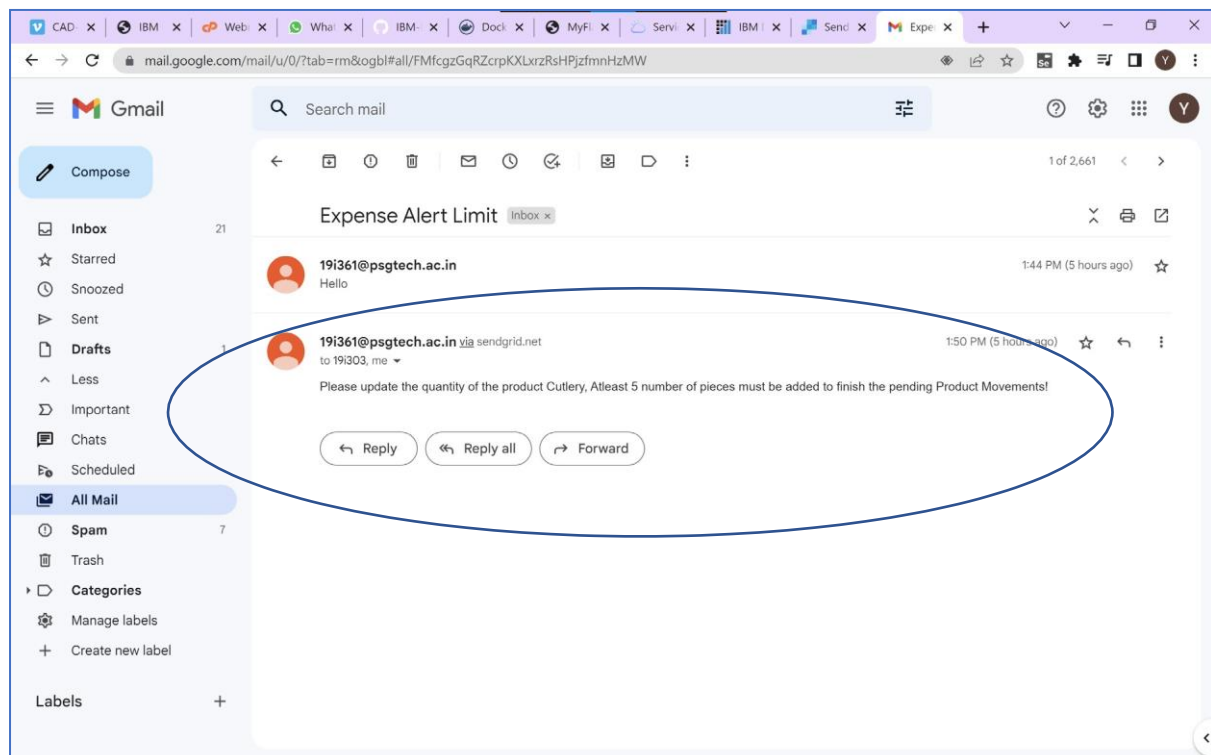
- File Explorer (Left):** Shows the project structure for 'IMSR-1', including files like `_pycache_`, `templates`, `app.py`, `DigiCertGlobalRootCA.crt`, `email_alert.py`, and `requirements.txt`.
- Code Editor (Center):** Displays the `email_alert.py` file. The code defines an `alert` function that uses `smtplib` and `mimemultipart` to send an email. The function takes `main_msg` as an argument and constructs an email with 'From', 'To', 'Subject', and 'Body' fields. It then attempts to send the email via an SMTP server (smtp.sendgrid.net) and prints the result or an error message.
- Terminal (Bottom):** Shows the output of the script execution. It indicates that the email alert was successfully sent, including details like the email address, subject, and body content.

```
1 import smtplib
2 from email.mime.multipart import MIMEMultipart
3 from email.mime.text import MIMEText
4 from email.mime.base import MIMEBase
5
6 def alert(main_msg):
7     mail_from = '191361@psgtech.ac.in'
8     mail_to = '191303@psgtech.ac.in'
9     msg = MIMEMultipart()
10    msg['From'] = mail_from
11    msg['To'] = mail_to
12    msg['Subject'] = 'Alert Mail On Product Shortage! - Regards'
13    mail_body = main_msg
14    msg.attach(MIMEText(mail_body))
15
16    try:
17        server = smtplib.SMTP_SSL('smtp.sendgrid.net', 465)
18        server.ehlo()
19        server.login('apikey', 'API_KEY')
20        server.sendmail(mail_from, mail_to, msg.as_string())
21        server.close()
22        print("mail sent")
23    except:
24        print("issue")
25
```

Terminal Output:

```
* Detected change in 'C:\\Users\\yaswa\\Downloads\\IBM\\inventory_management_system_flask-master copy\\IMSR-1\\email_alert.py', reloading
* Restarting with stat
* Debugger is active!
* Debugger PIN: 512-196-405
* Detected change in 'C:\\Users\\yaswa\\Downloads\\IBM\\inventory_management_system_flask-master copy\\IMSR-1\\email_alert.py', reloading
* Restarting with stat
```

Email Received on Shortage of materials at particular warehouse or Main Inventory:



Sprint 4 (Deploying the application using Docker and Kubernetes):

Note: Make sure to create a Dockerfile in the project folder.

Login into DockerHub in Project Folder using command prompt. This connects local docker desktop to cloud docker hub.

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19044.2130]
(c) Microsoft Corporation. All rights reserved.

C:\Users\yaswa\Downloads\IBM\inventory_management_system_flask-master copy\IMSR-1>docker login
Authenticating with existing credentials...
Login Succeeded

Logging in with your password grants your terminal complete access to your account.
For better security, log in with a limited-privilege personal access token. Learn more at https://docs.docker.com/go/access-tokens/

C:\Users\yaswa\Downloads\IBM\inventory_management_system_flask-master copy\IMSR-1>
```

Building an image for our project,

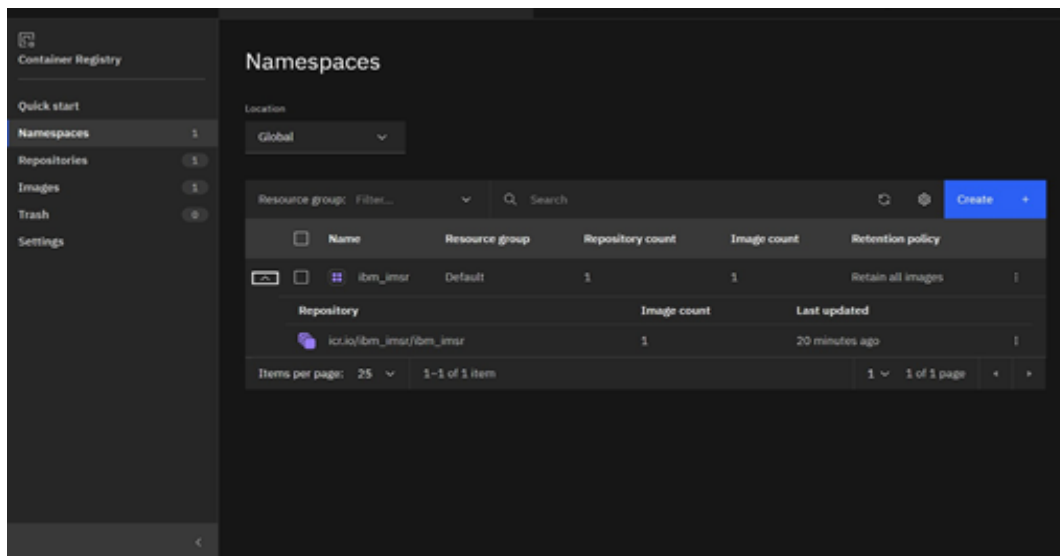
```
File "/usr/local/lib/python3.11/site-packages/flask/app.py", line 1820, in full_dispatch_request
PS C:\Users\yaswa\Downloads\IBM\IMSR-1> docker build -t yaswanthmanoharan/ibm_imsr .
[+] Building 2.7s (11/11) FINISHED
=> [internal] load build definition from Dockerfile                                0.0s
=> => transferring dockerfile: 32B                                                0.0s
=> [internal] load .dockerignore                                                  0.0s
=> => transferring context: 2B                                                    0.0s
=> [internal] load metadata for docker.io/library/python:latest                 2.4s
=> [auth] library/python:pull token for registry-1.docker.io                   0.0s
=> [internal] load build context                                                 0.0s
=> => transferring context: 24.29kB                                              0.0s
=> CACHED [2/5] WORKDIR /inventory                                              0.0s
=> CACHED [3/5] COPY requirements.txt requirements.txt                          0.0s
=> CACHED [4/5] RUN pip install -r requirements.txt                             0.0s
=> [5/5] COPY . .                                                                0.0s
=> exporting to image                                                            0.1s
=> => exporting layers                                                            0.0s
=> => writing image sha256:0afb0c793a704eaf85acc886443c57a0cbeca9473b841897ef4a9162f3c4bd06 0.0s
=> => naming to docker.io/yaswanthmanoharan/ibm_imsr                            0.0s

Use 'docker scan' to run Snyk tests against images to find vulnerabilities and learn how to fix them
PS C:\Users\yaswa\Downloads\IBM\IMSR-1> docker run -p 8080:5000 yaswanthmanoharan/ibm_imsr
* Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI serve
r instead.
* Running on all addresses (0.0.0.0)
* Running on http://127.0.0.1:5000
* Running on http://172.17.0.2:5000
Press CTRL+C to quit
172.17.0.1 - - [14/Nov/2022 03:57:11] "GET /login HTTP/1.1" 200 -
172.17.0.1 - - [14/Nov/2022 03:57:22] "POST /login HTTP/1.1" 302 -
172.17.0.1 - - [14/Nov/2022 03:57:23] "GET /dashboard HTTP/1.1" 200 -
172.17.0.1 - - [14/Nov/2022 03:57:27] "GET /product_movements HTTP/1.1" 200 -
172.17.0.1 - - [14/Nov/2022 03:57:30] "GET /add_product_movements HTTP/1.1" 200 -
[2022-11-14 03:57:37,822] ERROR in app: Exception on /add_product_movements [POST]
Traceback (most recent call last):
```


Create a valid Deployment.yaml file,

```
PS C:\Users\yaswa\Downloads\IBM\IMSR-1> kubectl apply -f deployment.yaml
deployment.apps/ibmimsr created
PS C:\Users\yaswa\Downloads\IBM\IMSR-1> []
```

Create a namespace in IBM Container registry:

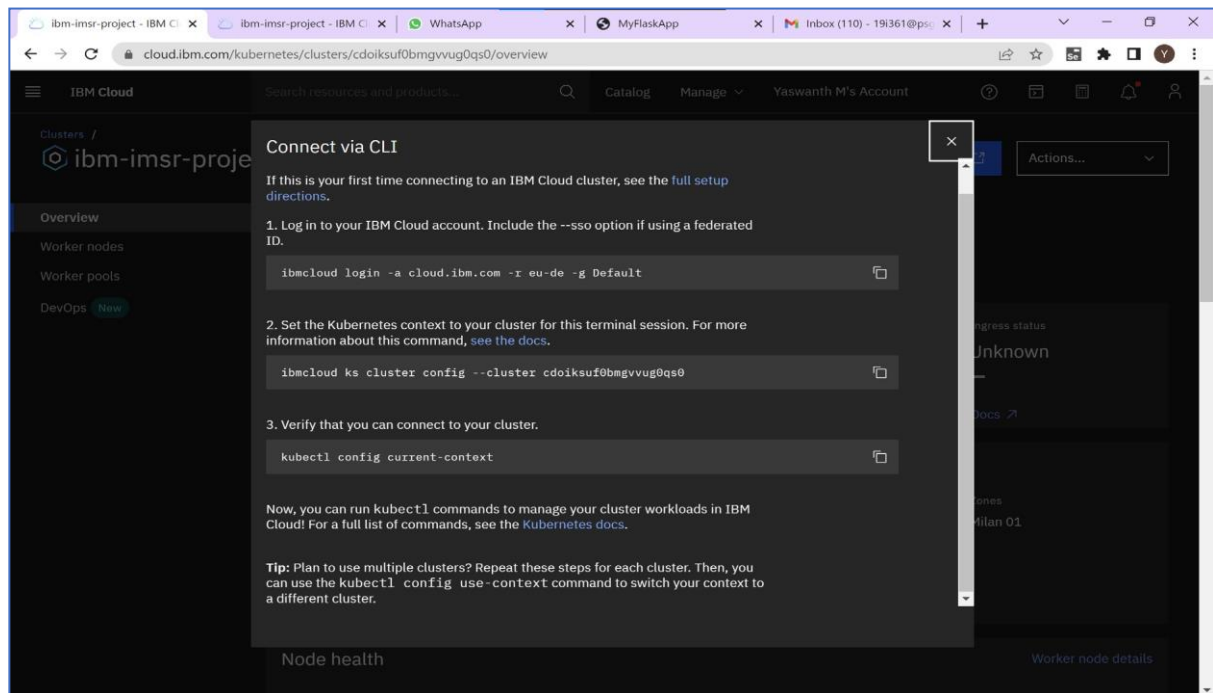


Pushing the project into IBM container Registry:

```
Select Command Prompt
C:\Users\yaswa>docker tag yaswanthmanoharan/ibm_imsr icr.io/ibm_imsr/ibm_imsr
5b3f1ed98915: Pushing [====>] 6.053MB/67.7882fd36bfd35: P
ushing 174.2MB/529MB
d5b2c4afb8d6: Pushing [=====>] 40.6MB/191.6MB
Using default tag: latest
The push refers to repository [icr.io/ibm_imsr/ibm_imsr]
6b183c62e3d7: Pushing [=====>] 6.465MB/18.48MB
d5b2c4afb8d6: Pushing [====>] 17.2MB/191.6MB
d5b2c4afb8d6: Pushing [=====>] 75.71MB/191.6MB
4db7c1329ec9: Pushed
6f6e69c2c592: Pushed
882fd36bfd35: Pushing [=====>] 308.4MB/529MB
d5b2c4afb8d6: Pushing 138.5MB/191.6MB
d5b2c4afb8d6: Pushed
6b183c62e3d7: Pushing [=====>] 5.285MB/18.48MB
882fd36bfd35: Pushing 175.3MB/529MB
882fd36bfd35: Pushing [=====>] 319MB/529M5b3f1ed98915: P
ushed
d1dec9917839: Pushing [>] 2.735MB/152M882fd882888882
882fd36bfd35: Pushed
d1dec9917839: Pushed
d1dec9917839: Pushing 70.76MB/152MB
d38adf39e1dd: Pushed
d9d07d703dd5: Pushed
latest: digest: sha256:0575b171d321ade1d5a3def1d1bb5afe8a00d00c1f7e157a5347aca6a6ee1470 size: 3052
882fd36bfd35: Pushing [=====>] 265.7MB/529MB
C:\Users\yaswa>dshing [=====>] 264MB/529MB
d1dec9917839: Pushing [>] 1.62MB/152MB
```

Note: Create a Kubernetes Cluster in IBM Cloud and wait for the work node to get fully deployed.

Then, Login into Kubernetes Cluster using the following commands,



Expose your application using the following command and check for the port number using the next command.

```
Command Prompt
OK
The configuration for cdoiksuf0bmgvvug0qs0 was downloaded successfully.
Added context for cdoiksuf0bmgvvug0qs0 to the current kubeconfig file.
You can now execute 'kubectl' commands against your cluster. For example, run 'kubectl get nodes'.
If you are accessing the cluster for the first time, 'kubectl' commands might fail for a few seconds while RBAC synchronizes.

C:\Users\yaswa>kubectl get pods
NAME                                READY   STATUS             RESTARTS   AGE
ibm-inventory-management-system-for-retailers-6cd7dfcc7b-8q2w2  1/1     Running            0          10h
ibm-project-9bbbf47d-5vn2w         1/1     Running            0          9h
ibmimsr-586d66c8c8-kkjqp          0/1     ContainerCreating  0          26s

C:\Users\yaswa>kubectl expose deployment ibmimsr --type=NodePort --name=ibmimsr
service/ibmimsr exposed

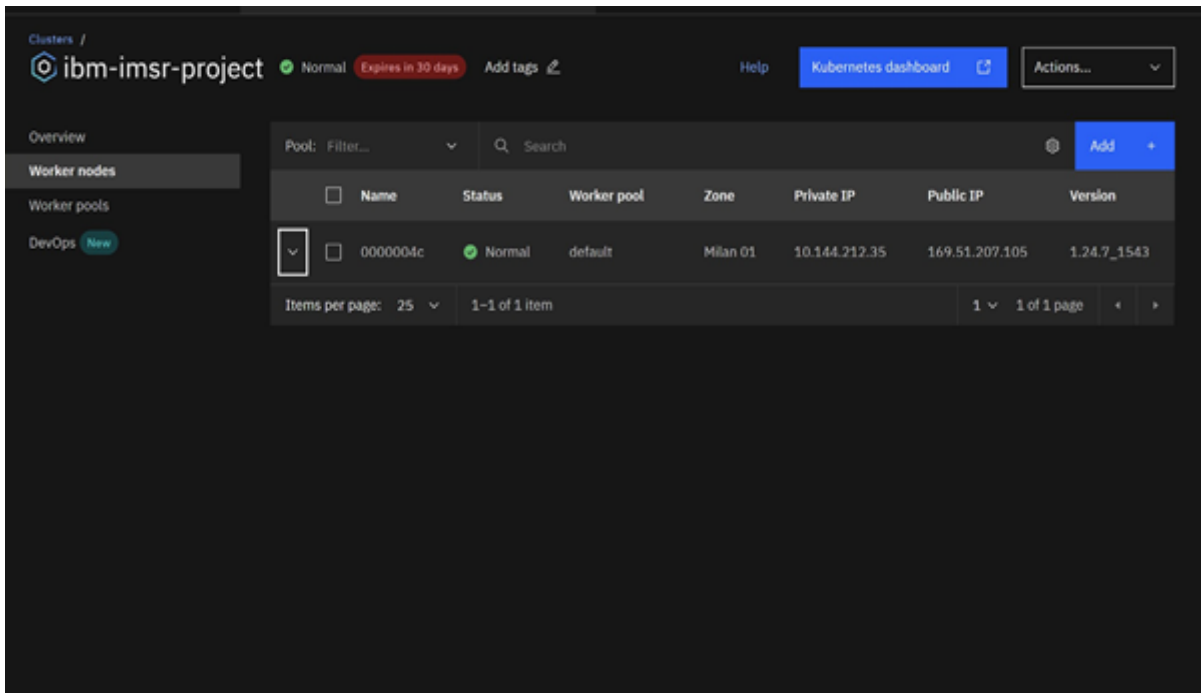
C:\Users\yaswa>kubectl describe service ibmimsr
error: unknown command "describe" for "kubectl"

Did you mean this?
  describe

C:\Users\yaswa>kubectl describe service ibmimsr
Name:                ibmimsr
Namespace:            default
Labels:               app=ibmimsr
Annotations:          <none>
Selector:             app=ibmimsr
Type:                 NodePort
IP Family Policy:     SingleStack
IP Families:          IPv4
IP:                   172.21.98.28
IPs:                  172.21.98.28
Ports:                <unset> 5000/TCP
TargetPort:           <unset> 30958/TCP
NodePort:             172.30.116.13:5000
Endpoints:            172.30.116.13:5000
Session Affinity:     None
External Traffic Policy: Cluster
Events:               <none>

C:\Users\yaswa>
```

Then, Check for the public IP address in your IBM Kubernetes Cluster under Worker Node:



The screenshot shows the IBM Cloud Kubernetes Service console for a cluster named 'ibm-imsr-project'. The 'Worker nodes' tab is selected, displaying a table of worker nodes. The table has columns for Name, Status, Worker pool, Zone, Private IP, Public IP, and Version. One worker node is listed with the name '0000004c', status 'Normal', worker pool 'default', zone 'Milan 01', private IP '10.144.212.35', public IP '169.51.207.105', and version '1.24.7_1543'. The public IP address is highlighted with a red box.

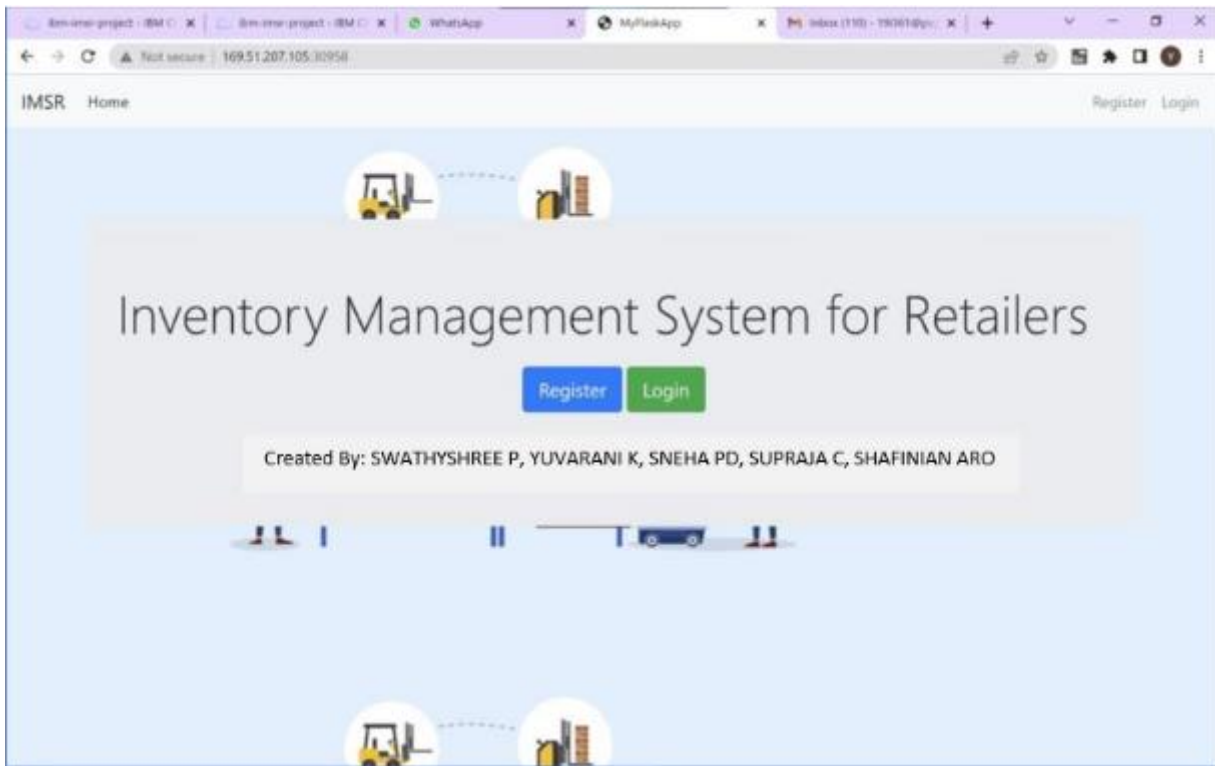
	Name	Status	Worker pool	Zone	Private IP	Public IP	Version
<input type="checkbox"/>	0000004c	Normal	default	Milan 01	10.144.212.35	169.51.207.105	1.24.7_1543

Thus we have the Public IP address and the Nodeport.

Now just type in this format - <Public_IP>:<NodePort>

For our Inventory management system application it is, **169.51.207.105:30958**

Type this in the browser and click enter to access the deployed application:



Result:

Thus In this way We developed a “Inventory management System for Retailers” using Python, Sendgrid and IBM Cloud Services (IBM DB2, IBM Container registry, IBM Kubernetes).

For queries,

Contact – 19i361@psgtech.ac.in or swathyshree2002@gmail.com or 19i303@psgtech.ac.in

Thank You!