

## Final Deliverables Report

<b>Date</b>	14.11.2022
<b>Team ID</b>	PNT2022TMID24071
<b>Project Name</b>	Inventory Management System for Retailers

### Team members and their Contribution:

<b>Name</b>	<b>Roll no</b>	<b>Contribution</b>
Dwaraka kavyasudha	111419104028	Frontend – 5 Pages, Integration of Sendgrid, Deployment of using docker and Kubernetes.
Mandi ObulReddy	111419104058	Frontend – 5 Pages, Documentation
Menta Venkata Sai Charan	111419104061	Frontend – 4 Pages, Documentation
Konka Venkata sai lakshmi	111419104049	Backend Fully (For all 14 Pages), Integration of IBM Cloud, Deployment of using docker and Kubernetes.

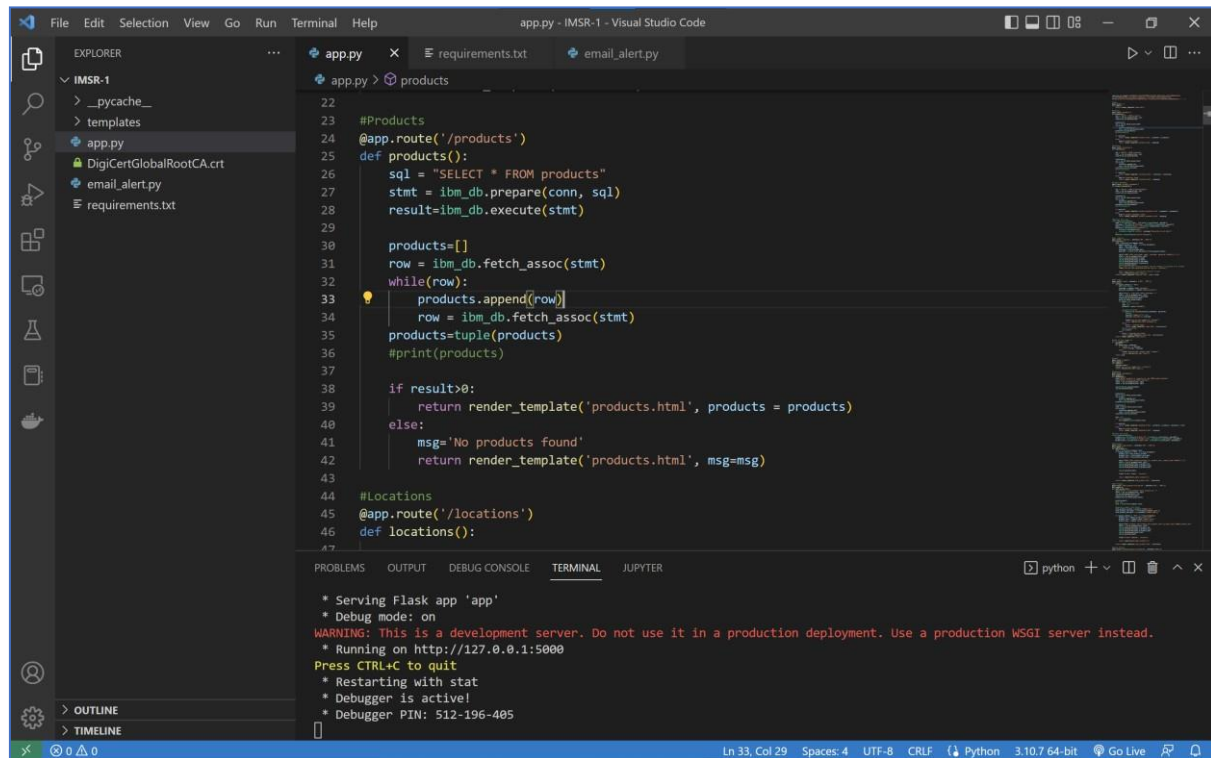
### Introduction:

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)



The screenshot shows the Visual Studio Code editor with a project named 'app.py - IMSR-1'. The Explorer panel on the left shows the file structure: `IMSR-1` (folder), `__pycache__` (folder), `templates` (folder), `app.py` (file), `DigiCertGlobalRootCA.crt` (file), `email_alert.py` (file), and `requirements.txt` (file). The main editor displays the `app.py` file with the following code:

```
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
```

The bottom panel shows the TERMINAL output:

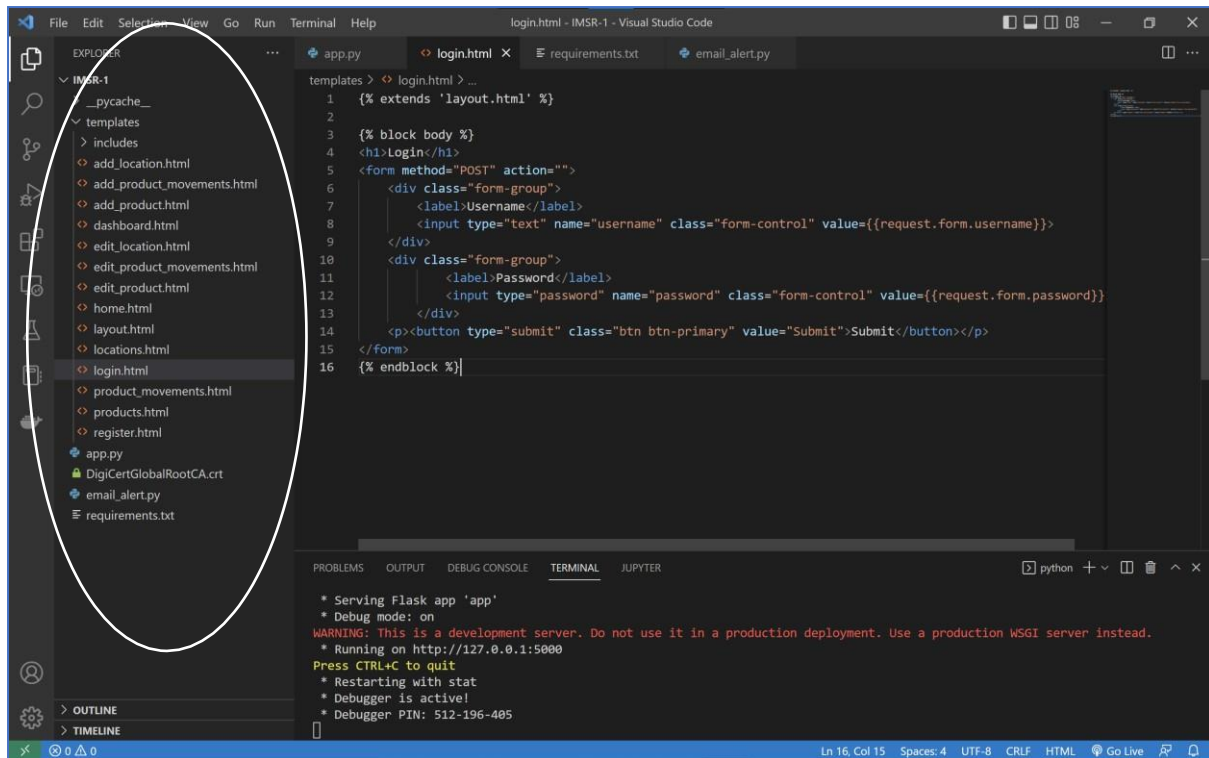
```
* Serving Flask app 'app'
* Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on http://127.0.0.1:5000
Press CTRL+C to quit
* Restarting with stat
* Debugger is active!
* Debugger PIN: 512-196-405
```

The status bar at the bottom indicates: Ln 33, Col 29, Spaces: 4, UTF-8, CRLF, Python, 3.10.7 64-bit, Go Live.

## 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)

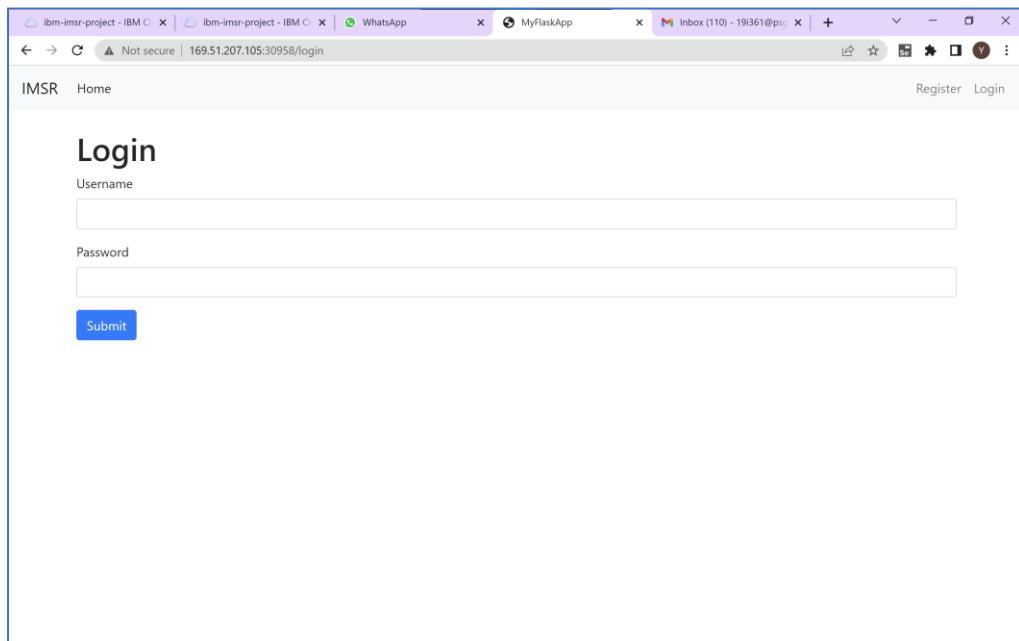


Sample FrontEnd Pages,

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, black font. Below the title, there are two input fields: 'Username' and 'Password'. A blue 'Submit' button is positioned below the password field. The browser's tab bar shows several open tabs, including 'ibm-imrs-project - IBM C...', 'WhatsApp', 'MyFlaskApp', and 'Inbox (110) - 19361@ps...'.

ibm-imrs-project - IBM C | ibm-imrs-project - IBM C | WhatsApp | MyFlaskApp | Inbox (110) - 19361@ps | +

← → ↻ ⚠ Not secure | 169.51.207.105:30958/login

IMSR Home Register Login

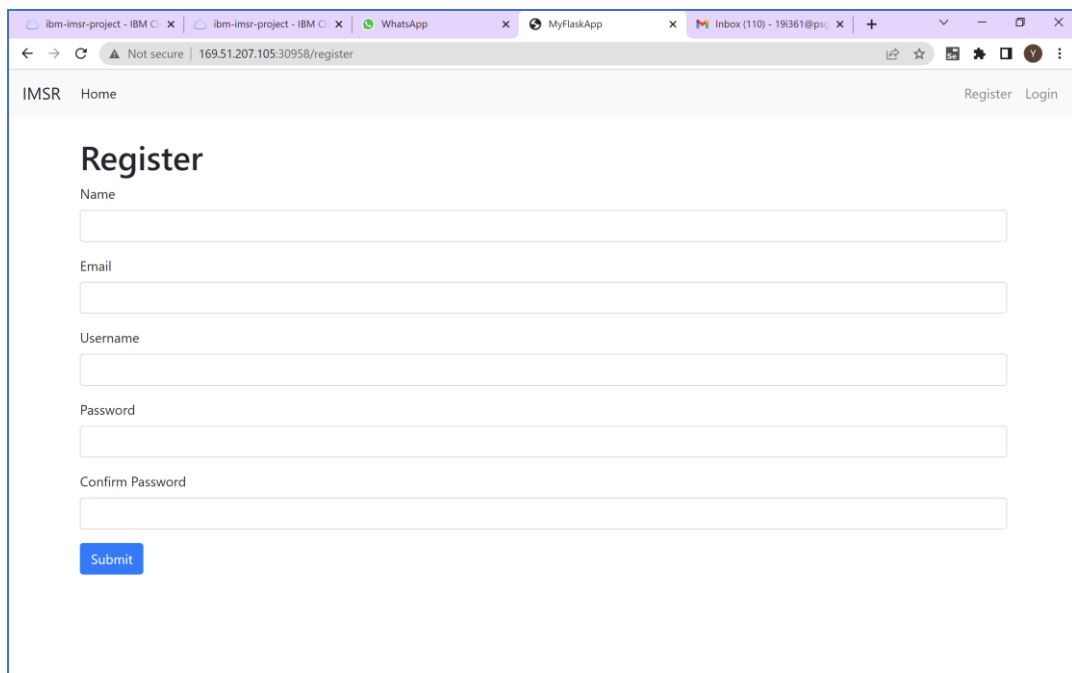
## Login

Username

Password

Submit

## Register Page,



A screenshot of a web browser displaying the register page of the same 'ibm-imrs-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, black font. Below the title, there are five input fields: 'Name', 'Email', 'Username', 'Password', and 'Confirm Password'. A blue 'Submit' button is positioned below the 'Confirm Password' field. The browser's tab bar shows several open tabs, including 'ibm-imrs-project - IBM C...', 'WhatsApp', 'MyFlaskApp', and 'Inbox (110) - 19361@ps...'.

ibm-imrs-project - IBM C | ibm-imrs-project - IBM C | WhatsApp | MyFlaskApp | Inbox (110) - 19361@ps | +

← → ↻ ⚠ Not secure | 169.51.207.105:30958/register

IMSR Home Register Login

## Register

Name

Email

Username

Password

Confirm Password

Submit

## Products Page,

The screenshot shows a web browser window with multiple tabs. The active tab is 'ibm-imsr-project - IBM C'. The address bar shows '169.51.207.105:30958/products'. The page has a navigation bar with 'IMSR', 'Home', 'Products', 'Location', and 'Product Movements'. A 'Logout' and 'Dashboard' link are in the top right. The main heading is 'Products'. Below it is a green 'Add Product' button. A table lists products with columns: Product ID, Product Cost, Product Quantity, Edit, and Delete.

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

## Product Movements Page,

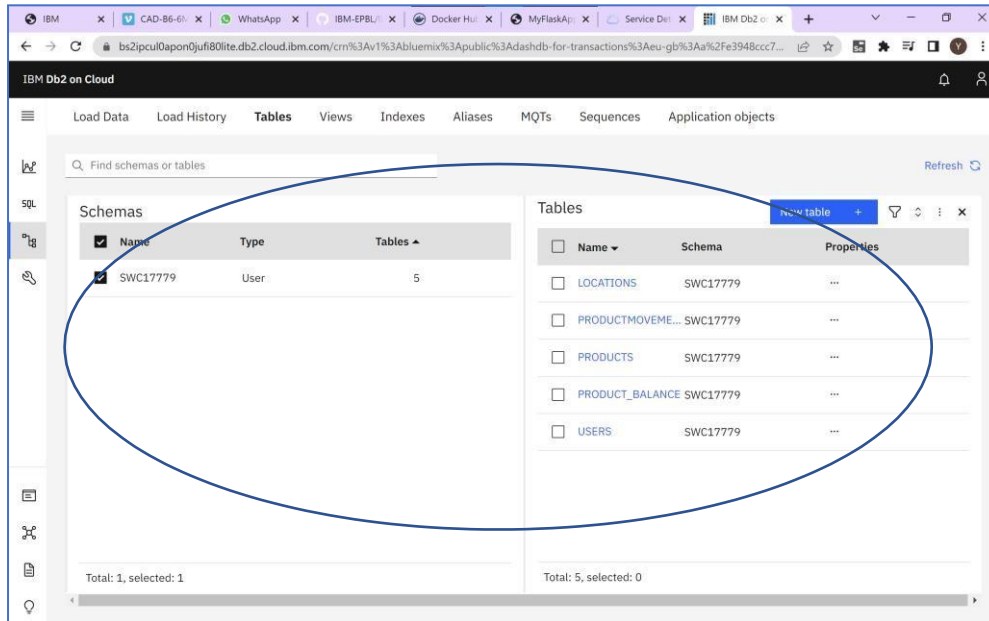
The screenshot shows a web browser window with multiple tabs. The active tab is 'ibm-imsr-project - IBM C'. The address bar shows '169.51.207.105:30958/product\_movements'. The page has a navigation bar with 'IMSR', 'Home', 'Products', 'Location', and 'Product Movements'. A 'Logout' and 'Dashboard' link are in the top right. The main heading is 'Product Movements'. Below it is a green 'Add Product Movements' button. A table lists product movements with columns: Movement ID, Time, From Location, To Location, Product ID, Quantity, and Delete.

Movement ID	Time	From Location	To Location	Product ID	Quantity	Delete
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

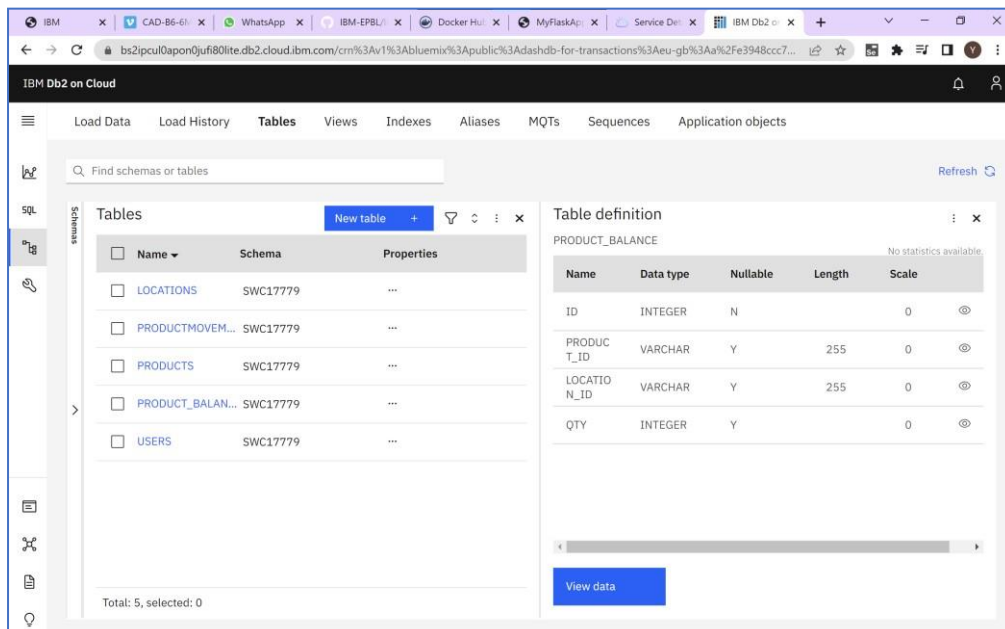
### Sprint 3 - IBM Cloud Integration + Integration of SendGrid:

#### IBM Cloud Integration:

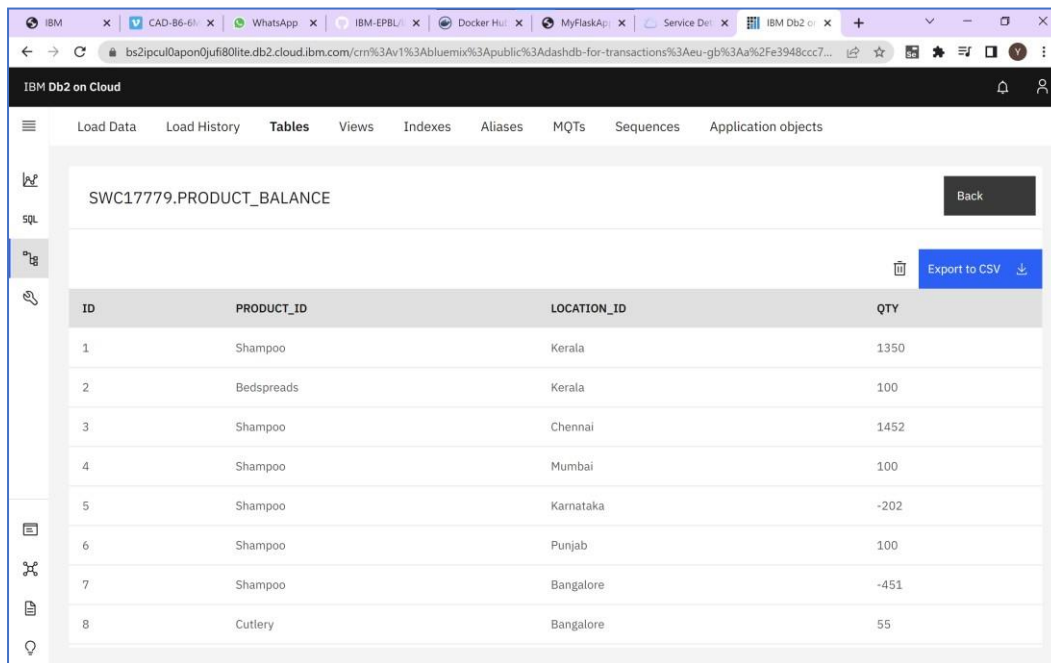
5 tables created for our project,



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 top navigation bar includes 'Load Data', 'Load History', 'Tables', 'Views', 'Indexes', 'Aliases', 'MQTs', 'Sequences', and 'Application objects'. The 'Tables' tab is selected, and the table 'SWC17779.PRODUCT\_BALANCE' is displayed. A 'Back' button is in the top right. Below the table name, there is an 'Export to CSV' button. The table data is as follows:

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

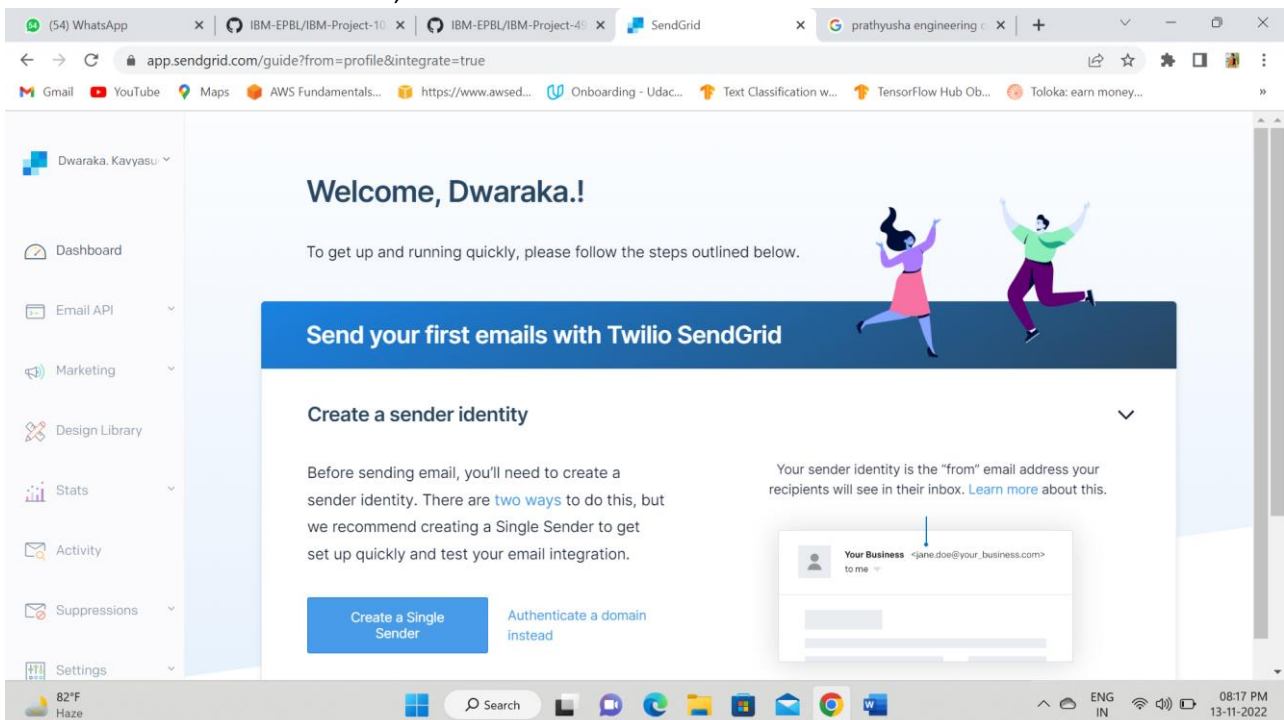
Code for Connection of IBM Database,

```
conn=ibm_db.connect("DATABASE=b1udb;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.

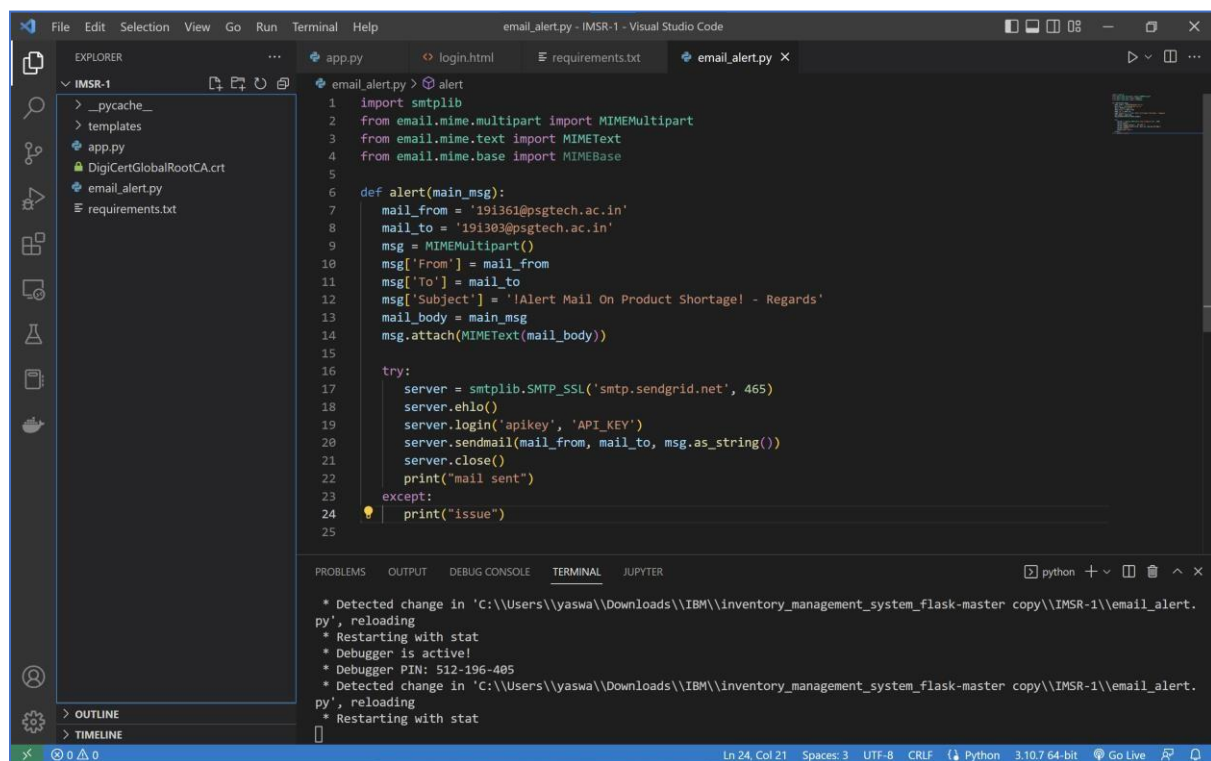
## SendGrid Integration:

Creation of SendGrid account,



The screenshot shows the SendGrid dashboard. The top navigation bar includes 'Dashboard', 'Email API', 'Marketing', 'Design Library', 'Stats', 'Activity', 'Suppressions', and 'Settings'. The 'Welcome, Dwaraka!' message is displayed, followed by the instruction 'To get up and running quickly, please follow the steps outlined below.' The main section is titled 'Send your first emails with Twilio SendGrid' and 'Create a sender identity'. It explains that before sending email, a sender identity must be created. There are two ways to do this, but it recommends creating a Single Sender to get set up quickly and test email integration. A button 'Create a Single Sender' is visible. A secondary option 'Authenticate a domain instead' is also present. A small illustration of two people running is shown on the right.

Code for email alert:

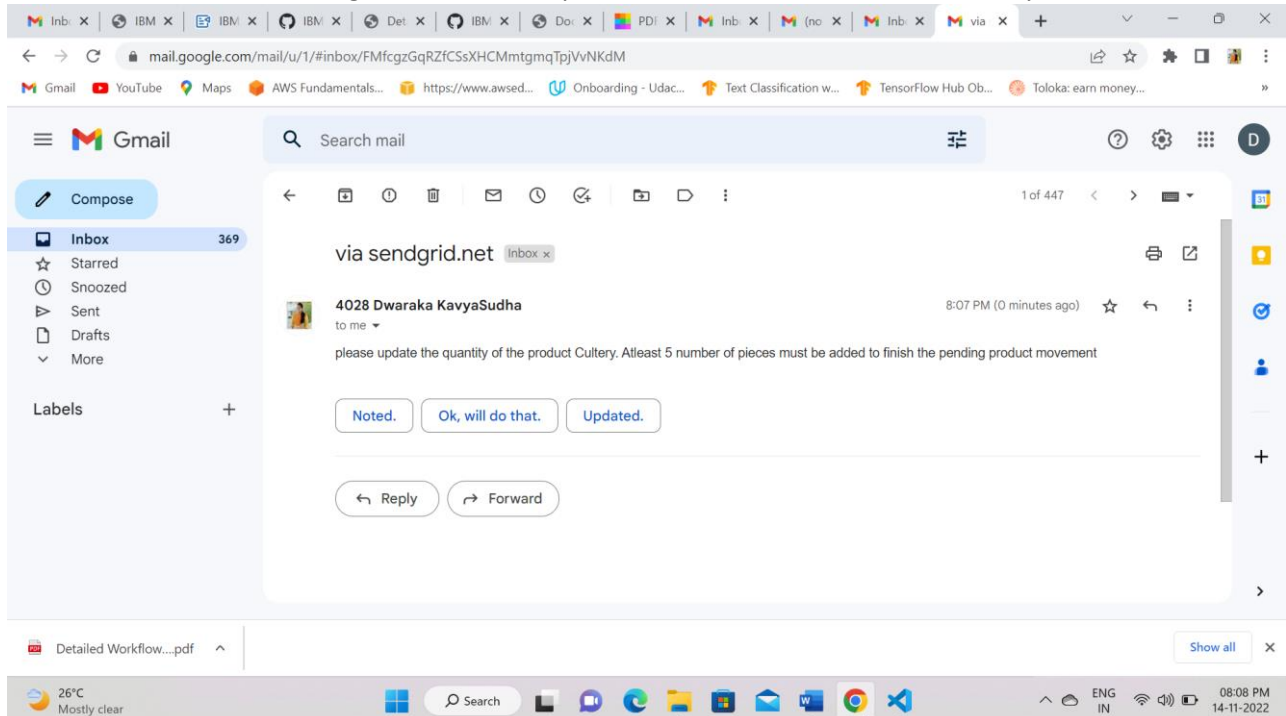


```
1 import smtplib
2 from email.mime.multipart import MIMEMultipart
3 from email.mime.text import MIMEText
4 from email.mime.base import MIMEBase
5
6 def alert(main_msg):
7     mail_from = '191361@psgtech.ac.in'
8     mail_to = '191303@psgtech.ac.in'
9     msg = MIMEMultipart()
10    msg['From'] = 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
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL JUPYTER

```
* Detected change in 'C:\Users\yvaswa\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\yvaswa\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,

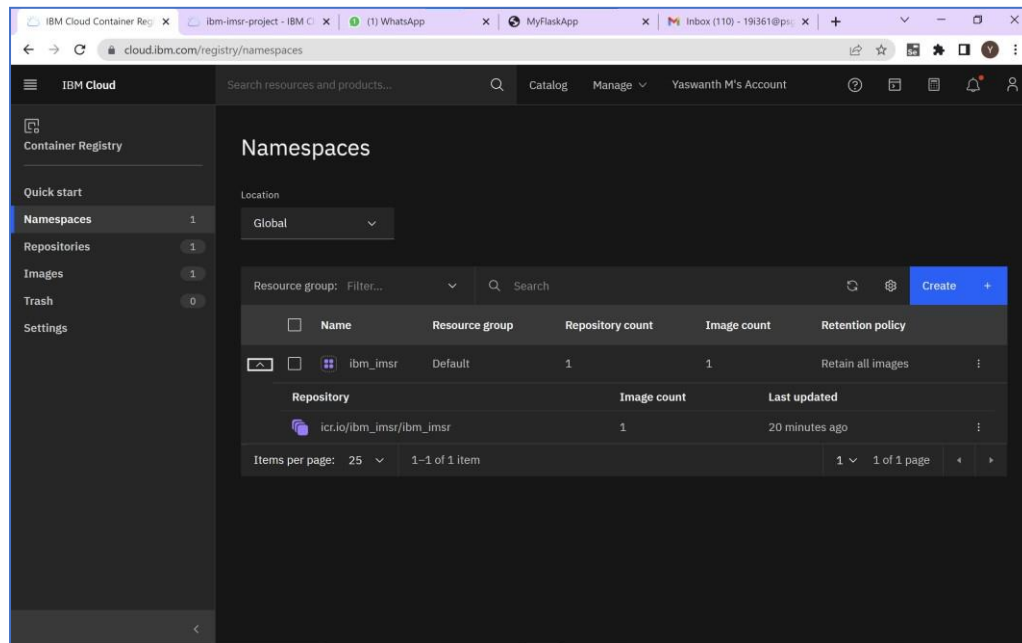
```
File "/usr/local/lib/python3.11/site-packages/flask/app.py", line 1820, in full_dispatch_request
PS C:\Users\yaswa\Downloads\IBM\IMSR-1> docker build -t yaswanthmanoharan/ibm_imsr .
[+] Building 2.7s (11/11) FINISHED
=> [internal] load build definition from Dockerfile                                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):
```

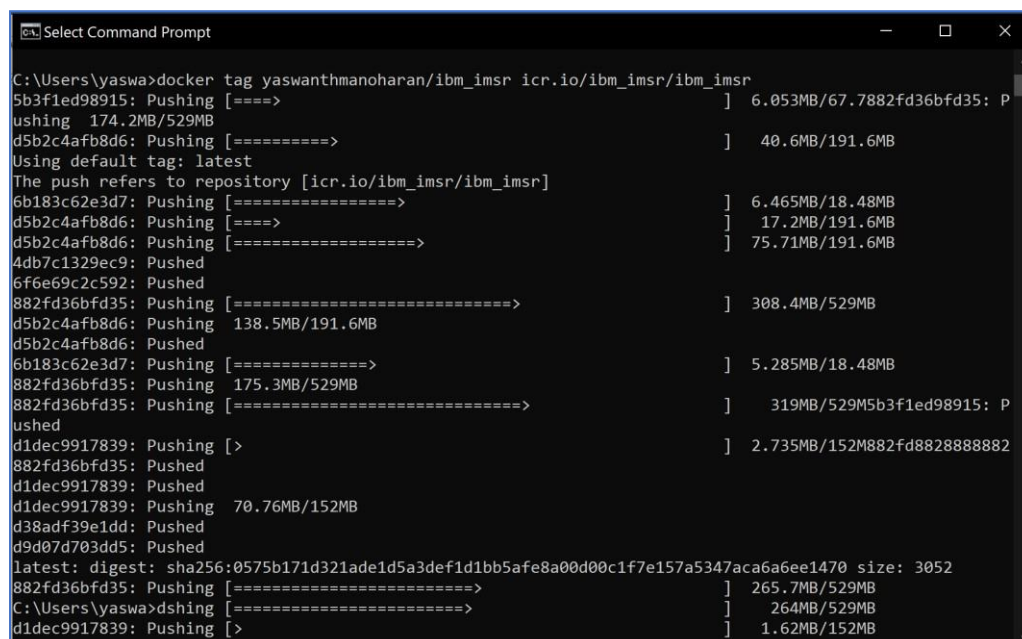
Create a valid Deployment.yaml file,

```
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,

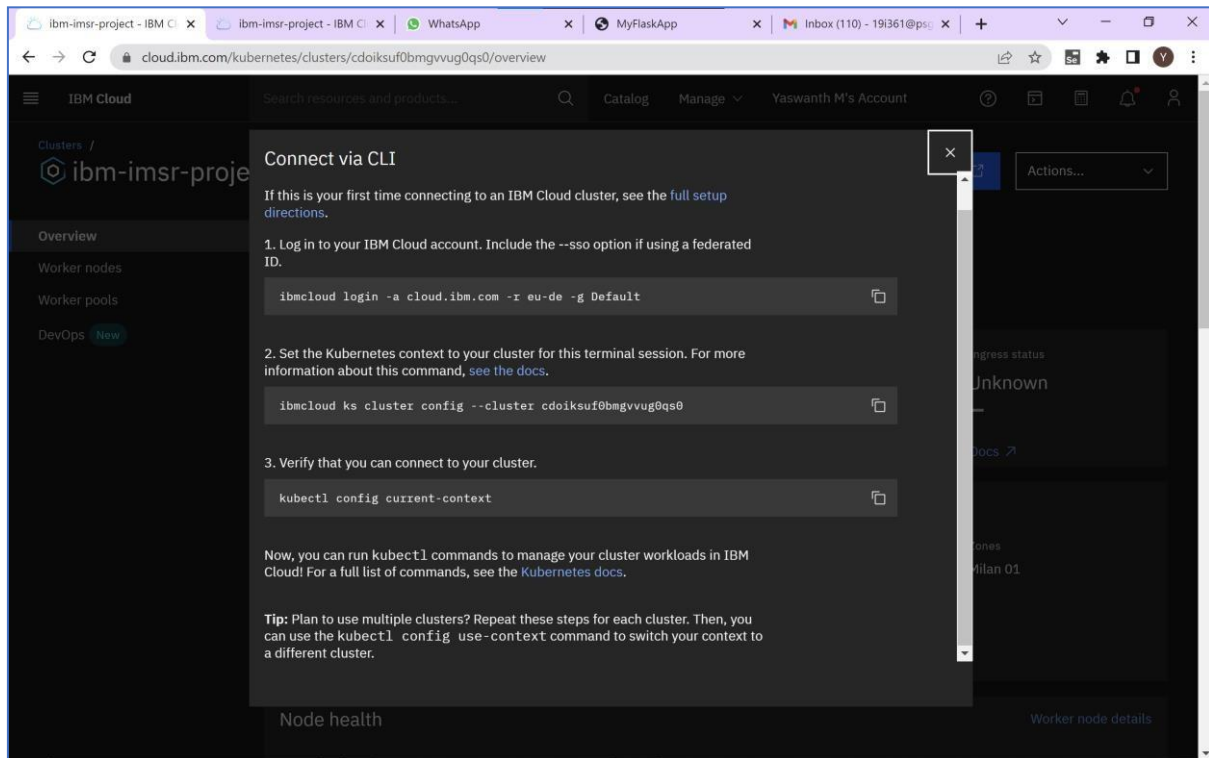


Pushing the project into IBM container Registry,



**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
C:\Users\yaswa>
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-9bbb47d-5vn2w          1/1     Running            0          9h
ibmimsr-586d66c8c8-kkjqp          0/1     ContainerCreating  0          26s

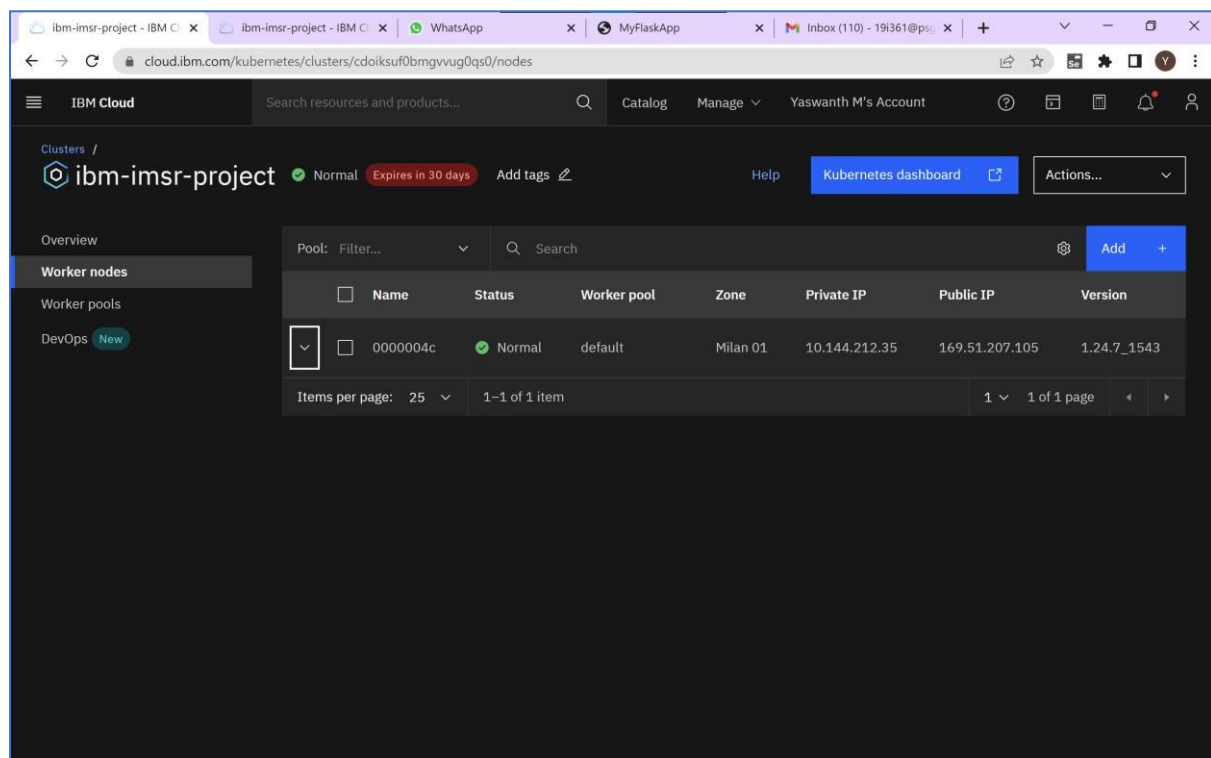
C:\Users\yaswa>kubectl expose deployment ibmimsr --type=NodePort --name=ibmimsr
service/ibmimsr exposed

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
Port:         <unset> 5000/TCP
TargetPort:   5000/TCP
NodePort:     <unset> 30958/TCP
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,

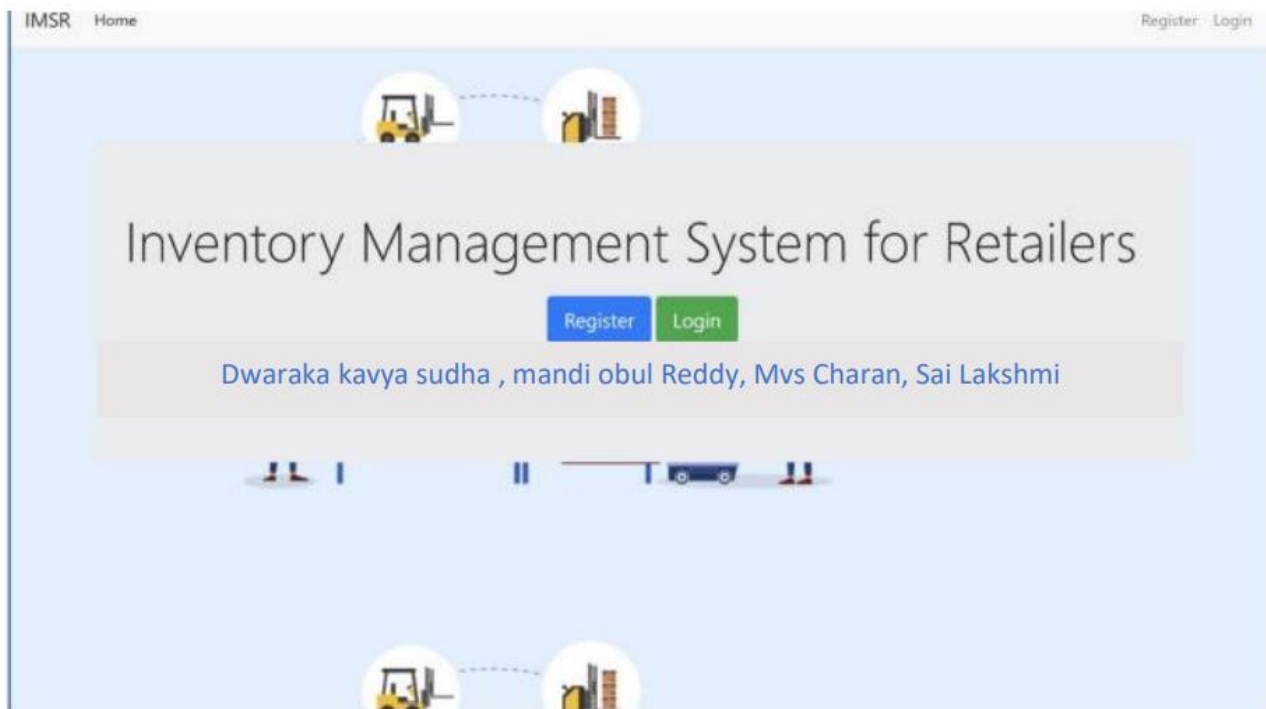


Thus we have the Public IP address and the Nodeport.

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).

# Thank You!